

7600SD/HD/MHD-REF

REFERENCE GENERATOR



Instruction Manual
Software Version 3.0.0.8



Affiliate with the N.V. KEMA in The Netherlands



CERTIFICATE

Certificate Number: 510040.001

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Including its implementation, meets the requirements of the standard:

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Scope:

The design, manufacture and support of video and audio hardware and software products and related systems.

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Grass Valley Web Site

The www.grassvalley.com web site offers the following:

Online User Documentation — Current versions of product catalogs, brochures, data sheets, ordering guides, planning guides, manuals, and release notes in .pdf format can be downloaded.

FAQ Database — Solutions to problems and troubleshooting efforts can be found by searching our Frequently Asked Questions (FAQ) database.

Software Downloads — Download software updates, drivers, and patches.



END-OF-LIFE PRODUCT RECYCLING NOTICE

Grass Valley's innovation and excellence in product design also extends to the programs we've established to manage the recycling of our products. Grass Valley has developed a comprehensive end-of-life product take back program for recycle or disposal of end-of-life products. Our program meets the requirements of the European Union's WEEE Directive, the United States Environmental Protection Agency, and U.S. state and local agencies.

Grass Valley's end-of-life product take back program assures proper disposal by use of Best Available Technology. This program accepts any Grass Valley branded equipment. Upon request, a Certificate of Recycling or a Certificate of Destruction, depending on the ultimate disposition of the product, can be sent to the requester.

Grass Valley will be responsible for all costs associated with recycling and disposal, including freight. However, you are responsible for the removal of the equipment from your facility and packing the equipment to make it ready for pickup.

For further information on the Grass Valley product take back system please contact Grass Valley at + 800 80 80 20 20 or +33 1 48 25 20 20 from most other countries. In the U.S. and Canada please call 800-547-8949 or 530-478-4148, and ask to be connected to the EH&S Department. Additional information concerning the program can be found at: www.thomsongrassvalley.com/environment



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Preface

About This Manual

This manual covers the complete details of the 7600REF Reference Generator, including installation, setup, operation, and specifications.

In addition to this manual, a *7600REF Installation and Safety Manual* is included with every frame to ensure that the required regulatory and safety information for this product is available when the frame is received.

All documentation relating to this product and other Grass Valley Modular products can be found on-line in PDF format at this URL:

www.grassvalley.com/docs/modular

Safety Summary

Read and follow the important safety information below, noting especially those instructions related to risk of fire, electric shock or injury to persons. Additional specific warnings not listed here may be found throughout the manual.

WARNING Any instructions in this manual that require opening the equipment cover or enclosure are for use by qualified service personnel only. To reduce the risk of electric shock, do not perform any servicing other than that contained in the operating instructions unless you are qualified to do so.

Safety Terms and Symbols

Terms in This Manual

Safety-related statements may appear in this manual in the following form:

WARNING Warning statements identify conditions or practices that may result in personal injury or loss of life.

CAUTION Caution statements identify conditions or practices that may result in damage to equipment or other property, or which may cause equipment crucial to your business environment to become temporarily non-operational.

Terms on the Product

The following terms may appear on the product:

DANGER — A personal injury hazard is immediately accessible as you read the marking.

WARNING — A personal injury hazard exists but is not immediately accessible as you read the marking.

CAUTION — A hazard to property, product, and other equipment is present.

Symbols on the Product

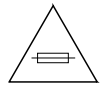
The following symbols may appear on the product:



Indicates that dangerous high voltage is present within the equipment enclosure that may be of sufficient magnitude to constitute a risk of electric shock.



Indicates that user, operator or service technician should refer to product manual(s) for important operating, maintenance, or service instructions.



This is a prompt to note fuse rating when replacing fuse(s). The fuse referenced in the text must be replaced with one having the ratings indicated.



Identifies a protective grounding terminal which must be connected to earth ground prior to making any other equipment connections.



Identifies an external protective grounding terminal which may be connected to earth ground as a supplement to an internal grounding terminal.



Indicates that static sensitive components are present which may be damaged by electrostatic discharge. Use anti-static procedures, equipment and surfaces during servicing.

Warnings

The following warning statements identify conditions or practices that can result in personal injury or loss of life:

Dangerous voltage or current may be present — Disconnect power and remove battery (if applicable) before removing protective panels, soldering, or replacing components.

Do not service alone — Do not internally service this product unless another person capable of rendering first aid and resuscitation is present.

Remove jewelry — Prior to servicing, remove jewelry such as rings, watches, and other metallic objects.

Avoid exposed circuitry — Do not touch exposed connections, components or circuitry when power is present.

Use proper power cord — Use only the power cord supplied or specified for this product.

Ground product — Connect the grounding conductor of the power cord to earth ground.

Operate only with covers and enclosure panels in place — Do not operate this product when covers or enclosure panels are removed.

Use correct fuse — Use only the fuse type and rating specified for this product.

Use only in dry environment — Do not operate in wet or damp conditions.

Use only in non-explosive environment — Do not operate this product in an explosive atmosphere.

High leakage current may be present — Earth connection of product is essential before connecting power.

Dual power supplies may be present — Be certain to plug each power supply cord into a separate branch circuit employing a separate service ground. Disconnect both power supply cords prior to servicing.

Double pole neutral fusing — Disconnect mains power prior to servicing.

Use proper lift points — Do not use door latches to lift or move equipment.

Avoid mechanical hazards — Allow all rotating devices to come to a stop before servicing.

Cautions

The following caution statements identify conditions or practices that can result in damage to equipment or other property:

Use correct power source — Do not operate this product from a power source that applies more than the voltage specified for the product.

Use correct voltage setting — If this product lacks auto-ranging power supplies, before applying power ensure that the each power supply is set to match the power source.

Provide proper ventilation — To prevent product overheating, provide equipment ventilation in accordance with installation instructions.

Use anti-static procedures — Static sensitive components are present which may be damaged by electrostatic discharge. Use anti-static procedures, equipment and surfaces during servicing.

Do not operate with suspected equipment failure — If you suspect product damage or equipment failure, have the equipment inspected by qualified service personnel.

Ensure mains disconnect — If mains switch is not provided, the power cord(s) of this equipment provide the means of disconnection. The socket outlet must be installed near the equipment and must be easily accessible. Verify that all mains power is disconnected before installing or removing power supplies and/or options.

Route cable properly — Route power cords and other cables so that they are not likely to be damaged. Properly support heavy cable bundles to avoid connector damage.

Use correct power supply cords — Power cords for this equipment, if provided, meet all North American electrical codes. Operation of this equipment at voltages exceeding 130 VAC requires power supply cords which comply with NEMA configurations. International power cords, if provided, have the approval of the country of use.

Use correct replacement battery — This product may contain batteries. To reduce the risk of explosion, check polarity and replace only with the same or equivalent type recommended by manufacturer. Dispose of used batteries according to the manufacturer's instructions.

Troubleshoot only to board level — Circuit boards in this product are densely populated with surface mount technology (SMT) components and application specific integrated circuits (ASICs). As a result, circuit board repair at the component level is very difficult in the field, if not impossible. For warranty compliance, do not troubleshoot systems beyond the board level.

Sicherheit – Überblick

Lesen und befolgen Sie die wichtigen Sicherheitsinformationen dieses Abschnitts. Beachten Sie insbesondere die Anweisungen bezüglich Brand-, Stromschlag- und Verletzungsgefahren. Weitere spezifische, hier nicht aufgeführte Warnungen finden Sie im gesamten Handbuch.

WARNUNG Alle Anweisungen in diesem Handbuch, die das Abnehmen der Geräteabdeckung oder des Gerätegehäuses erfordern, dürfen nur von qualifiziertem Servicepersonal ausgeführt werden. Um die Stromschlaggefahr zu verringern, führen Sie keine Wartungsarbeiten außer den in den Bedienungsanleitungen genannten Arbeiten aus, es sei denn, Sie besitzen die entsprechende Qualifikationen für diese Arbeiten.

Sicherheit – Begriffe und Symbole

In diesem Handbuch verwendete Begriffe

Sicherheitsrelevante Hinweise können in diesem Handbuch in der folgenden Form auftauchen:

WARNUNG Warnungen weisen auf Situationen oder Vorgehensweisen hin, die Verletzungs- oder Lebensgefahr bergen.

VORSICHT Vorsichtshinweise weisen auf Situationen oder Vorgehensweisen hin, die zu Schäden an Ausrüstungskomponenten oder anderen Gegenständen oder zum zeitweisen Ausfall wichtiger Komponenten in der Arbeitsumgebung führen können.

Hinweise am Produkt

Die folgenden Hinweise können sich am Produkt befinden:

GEFAHR — Wenn Sie diesen Begriff lesen, besteht ein unmittelbares Verletzungsrisiko.

WARNUNG — Wenn Sie diesen Begriff lesen, besteht ein mittelbares Verletzungsrisiko.

VORSICHT — Es besteht ein Risiko für Objekte in der Umgebung, den Mixer selbst oder andere Ausrüstungskomponenten.

Symbole am Produkt

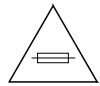
Die folgenden Symbole können sich am Produkt befinden:



Weist auf eine gefährliche Hochspannung im Gerätegehäuse hin, die stark genug sein kann, um eine Stromschlaggefahr darzustellen.



Weist darauf hin, dass der Benutzer, Bediener oder Servicetechniker wichtige Bedienungs-, Wartungs- oder Serviceanweisungen in den Produkthandbüchern lesen sollte.



Dies ist eine Aufforderung, beim Wechsel von Sicherungen auf deren Nennwert zu achten. Die im Text angegebene Sicherung muss durch eine Sicherung ersetzt werden, die die angegebenen Nennwerte besitzt.



Weist auf eine Schutzerdungsklemme hin, die mit dem Erdungskontakt verbunden werden muss, bevor weitere Ausrüstungskomponenten angeschlossen werden.



Weist auf eine externe Schutzerdungsklemme hin, die als Ergänzung zu einem internen Erdungskontakt an die Erde angeschlossen werden kann.



Weist darauf hin, dass es statisch empfindliche Komponenten gibt, die durch eine elektrostatische Entladung beschädigt werden können. Verwenden Sie antistatische Prozeduren, Ausrüstung und Oberflächen während der Wartung.

Warnungen

Die folgenden Warnungen weisen auf Bedingungen oder Vorgehensweisen hin, die Verletzungs- oder Lebensgefahr bergen:

Gefährliche Spannungen oder Ströme — Schalten Sie den Strom ab, und entfernen Sie ggf. die Batterie, bevor sie Schutzabdeckungen abnehmen, löten oder Komponenten austauschen.

Servicearbeiten nicht alleine ausführen — Führen Sie interne Servicearbeiten nur aus, wenn eine weitere Person anwesend ist, die erste Hilfe leisten und Wiederbelebungsmaßnahmen einleiten kann.

Schmuck abnehmen — Legen Sie vor Servicearbeiten Schmuck wie Ringe, Uhren und andere metallische Objekte ab.

Keine offen liegenden Leiter berühren — Berühren Sie bei eingeschalteter Stromzufuhr keine offen liegenden Leitungen, Komponenten oder Schaltungen.

Richtiges Netzkabel verwenden — Verwenden Sie nur das mitgelieferte Netzkabel oder ein Netzkabel, das den Spezifikationen für dieses Produkt entspricht.

Gerät erden — Schließen Sie den Erdleiter des Netzkabels an den Erdungskontakt an.

Gerät nur mit angebrachten Abdeckungen und Gehäuseseiten betreiben — Schalten Sie dieses Gerät nicht ein, wenn die Abdeckungen oder Gehäuseseiten entfernt wurden.

Richtige Sicherung verwenden — Verwenden Sie nur Sicherungen, deren Typ und Nennwert den Spezifikationen für dieses Produkt entsprechen.

Gerät nur in trockener Umgebung verwenden — Betreiben Sie das Gerät nicht in nassen oder feuchten Umgebungen.

Gerät nur verwenden, wenn keine Explosionsgefahr besteht — Verwenden Sie dieses Produkt nur in Umgebungen, in denen keinerlei Explosionsgefahr besteht.

Hohe Kriechströme — Das Gerät muss vor dem Einschalten unbedingt geerdet werden.

Doppelte Spannungsversorgung kann vorhanden sein — Schließen Sie die beiden Anschlußkabel an getrennte Stromkreise an. Vor Servicearbeiten sind beide Anschlußkabel vom Netz zu trennen.

Zweipolige, neutrale Sicherung — Schalten Sie den Netzstrom ab, bevor Sie mit den Servicearbeiten beginnen.

Fassen Sie das Gerät beim Transport richtig an — Halten Sie das Gerät beim Transport nicht an Türen oder anderen beweglichen Teilen fest.

Gefahr durch mechanische Teile — Warten Sie, bis der Lüfter vollständig zum Halt gekommen ist, bevor Sie mit den Servicearbeiten beginnen.

Vorsicht

Die folgenden Vorsichtshinweise weisen auf Bedingungen oder Vorgehensweisen hin, die zu Schäden an Ausrüstungskomponenten oder anderen Gegenständen führen können:

Gerät nicht öffnen — Durch das unbefugte Öffnen wird die Garantie ungültig.

Richtige Spannungsquelle verwenden — Betreiben Sie das Gerät nicht an einer Spannungsquelle, die eine höhere Spannung liefert als in den Spezifikationen für dieses Produkt angegeben.

Gerät ausreichend belüften — Um eine Überhitzung des Geräts zu vermeiden, müssen die Ausrüstungskomponenten entsprechend den Installationsan-

weisungen belüftet werden. Legen Sie kein Papier unter das Gerät. Es könnte die Belüftung behindern. Platzieren Sie das Gerät auf einer ebenen Oberfläche.

Antistatische Vorkehrungen treffen — Es gibt statisch empfindliche Komponenten, die durch eine elektrostatische Entladung beschädigt werden können. Verwenden Sie antistatische Prozeduren, Ausrüstung und Oberflächen während der Wartung.

CF-Karte nicht mit einem PC verwenden — Die CF-Karte ist speziell formatiert. Die auf der CF-Karte gespeicherte Software könnte gelöscht werden.

Gerät nicht bei eventuellem Ausrüstungsfehler betreiben — Wenn Sie einen Produktschaden oder Ausrüstungsfehler vermuten, lassen Sie die Komponente von einem qualifizierten Servicetechniker untersuchen.

Kabel richtig verlegen — Verlegen Sie Netzkabel und andere Kabel so, dass Sie nicht beschädigt werden. Stützen Sie schwere Kabelbündel ordnungsgemäß ab, damit die Anschlüsse nicht beschädigt werden.

Richtige Netzkabel verwenden — Wenn Netzkabel mitgeliefert wurden, erfüllen diese alle nationalen elektrischen Normen. Der Betrieb dieses Geräts mit Spannungen über 130 V AC erfordert Netzkabel, die NEMA-Konfigurationen entsprechen. Wenn internationale Netzkabel mitgeliefert wurden, sind diese für das Verwendungsland zugelassen.

Richtige Ersatzbatterie verwenden — Dieses Gerät enthält eine Batterie. Um die Explosionsgefahr zu verringern, prüfen Sie die Polarität und tauschen die Batterie nur gegen eine Batterie desselben Typs oder eines gleichwertigen, vom Hersteller empfohlenen Typs aus. Entsorgen Sie gebrauchte Batterien entsprechend den Anweisungen des Batterieherstellers.

Das Gerät enthält keine Teile, die vom Benutzer gewartet werden können. Wenden Sie sich bei Problemen bitte an den nächsten Händler.

Consignes de sécurité

Il est recommandé de lire, de bien comprendre et surtout de respecter les informations relatives à la sécurité qui sont exposées ci-après, notamment les consignes destinées à prévenir les risques d'incendie, les décharges électriques et les blessures aux personnes. Les avertissements complémentaires, qui ne sont pas nécessairement repris ci-dessous, mais présents dans toutes les sections du manuel, sont également à prendre en considération.

AVERTISSEMENT Toutes les instructions présentes dans ce manuel qui concernent l'ouverture des capots ou des logements de cet équipement sont destinées exclusivement à des membres qualifiés du personnel de maintenance. Afin de diminuer les risques de décharges électriques, ne procédez à aucune intervention d'entretien autre que celles contenues dans le manuel de l'utilisateur, à moins que vous ne soyez habilité pour le faire.

Consignes et symboles de sécurité

Termes utilisés dans ce manuel

Les consignes de sécurité présentées dans ce manuel peuvent apparaître sous les formes suivantes:

AVERTISSEMENT Les avertissements signalent des conditions ou des pratiques susceptibles d'occasionner des blessures graves, voire même fatales.

ATTENTION Les mises en garde signalent des conditions ou des pratiques susceptibles d'occasionner un endommagement à l'équipement ou aux installations, ou de rendre l'équipement temporairement non opérationnel, ce qui peut porter préjudice à vos activités.

Signalétique apposée sur le produit

La signalétique suivante peut être apposée sur le produit:

DANGER — risque de danger imminent pour l'utilisateur.

AVERTISSEMENT — Risque de danger non imminent pour l'utilisateur.

MISE EN GARDE — Risque d'endommagement du produit, des installations ou des autres équipements.

Symboles apposés sur le produit

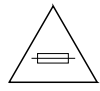
Les symboles suivants peut être apposés sur le produit:



Signale la présence d'une tension élevée et dangereuse dans le boîtier de l'équipement ; cette tension peut être suffisante pour constituer un risque de décharge électrique.



Signale que l'utilisateur, l'opérateur ou le technicien de maintenance doit faire référence au(x) manuel(s) pour prendre connaissance des instructions d'utilisation, de maintenance ou d'entretien.



Il s'agit d'une invite à prendre note du calibre du fusible lors du remplacement de ce dernier. Le fusible auquel il est fait référence dans le texte doit être remplacé par un fusible du même calibre.



Identifie une borne de protection de mise à la masse qui doit être raccordée correctement avant de procéder au raccordement des autres équipements.



Identifie une borne de protection de mise à la masse qui peut être connectée en tant que borne de mise à la masse supplémentaire.



Signale la présence de composants sensibles à l'électricité statique et qui sont susceptibles d'être endommagés par une décharge électrostatique. Utilisez des procédures, des équipements et des surfaces antistatiques durant les interventions d'entretien.

Avertissements

Les avertissements suivants signalent des conditions ou des pratiques susceptibles d'occasionner des blessures graves, voire même fatales:

Présence possible de tensions ou de courants dangereux — Mettez hors tension, débranchez et retirez la pile (le cas échéant) avant de déposer les couvercles de protection, de défaire une soudure ou de remplacer des composants.

Ne procédez pas seul à une intervention d'entretien — Ne réalisez pas une intervention d'entretien interne sur ce produit si une personne n'est pas présente pour fournir les premiers soins en cas d'accident.

Retirez tous vos bijoux — Avant de procéder à une intervention d'entretien, retirez tous vos bijoux, notamment les bagues, la montre ou tout autre objet métallique.

Évitez tout contact avec les circuits exposés — Évitez tout contact avec les connexions, les composants ou les circuits exposés s'ils sont sous tension.

Utilisez le cordon d'alimentation approprié — Utilisez exclusivement le cordon d'alimentation fourni avec ce produit ou spécifié pour ce produit.

Raccordez le produit à la masse — Raccordez le conducteur de masse du cordon d'alimentation à la borne de masse de la prise secteur.

Utilisez le produit lorsque les couvercles et les capots sont en place — N'utilisez pas ce produit si les couvercles et les capots sont déposés.

Utilisez le bon fusible — Utilisez exclusivement un fusible du type et du calibre spécifiés pour ce produit.

Utilisez ce produit exclusivement dans un environnement sec — N'utilisez pas ce produit dans un environnement humide.

Utilisez ce produit exclusivement dans un environnement non explosible — N'utilisez pas ce produit dans un environnement dont l'atmosphère est explosible.

Présence possible de courants de fuite — Un raccordement à la masse est indispensable avant la mise sous tension.

Deux alimentations peuvent être présentes dans l'équipement — Assurez vous que chaque cordon d'alimentation est raccordé à des circuits de terre séparés. Débranchez les deux cordons d'alimentation avant toute intervention.

Fusion neutre bipolaire — Débranchez l'alimentation principale avant de procéder à une intervention d'entretien.

Utilisez les points de levage appropriés — Ne pas utiliser les verrous de la porte pour lever ou déplacer l'équipement.

Évitez les dangers mécaniques — Laissez le ventilateur s'arrêter avant de procéder à une intervention d'entretien.

Mises en garde

Les mises en garde suivantes signalent les conditions et les pratiques susceptibles d'occasionner des dommages à l'équipement et aux installations:

N'ouvrez pas l'appareil — Toute ouverture prohibée de l'appareil aura pour effet d'annuler la garantie.

Utilisez la source d'alimentation adéquate — Ne branchez pas ce produit à une source d'alimentation qui utilise une tension supérieure à la tension nominale spécifiée pour ce produit.

Assurez une ventilation adéquate — Pour éviter toute surchauffe du produit, assurez une ventilation de l'équipement conformément aux instructions d'installation. Ne déposez aucun document sous l'appareil — ils peuvent gêner la ventilation. Placez l'appareil sur une surface plane.

Utilisez des procédures antistatiques - Les composants sensibles à l'électricité statique présents dans l'équipement sont susceptibles d'être endommagés par une décharge électrostatique. Utilisez des procédures, des équipements et des surfaces antistatiques durant les interventions d'entretien.

N'utilisez pas la carte CF avec un PC — La carte CF a été spécialement formatée. Le logiciel enregistré sur la carte CF risque d'être effacé.

N'utilisez pas l'équipement si un dysfonctionnement est suspecté — Si vous suspectez un dysfonctionnement du produit, faites inspecter celui-ci par un membre qualifié du personnel d'entretien.

Acheminez les câbles correctement — Acheminez les câbles d'alimentation et les autres câbles de manière à ce qu'ils ne risquent pas d'être endommagés. Supportez correctement les enroulements de câbles afin de ne pas endommager les connecteurs.

Utilisez les cordons d'alimentation adéquats — Les cordons d'alimentation de cet équipement, s'ils sont fournis, satisfont aux exigences de toutes les réglementations régionales. L'utilisation de cet équipement à des tensions dépassant les 130 V en c.a. requiert des cordons d'alimentation qui satisfont aux exigences des configurations NEMA. Les cordons internationaux, s'ils sont fournis, ont reçu l'approbation du pays dans lequel l'équipement est utilisé.

Utilisez une pile de remplacement adéquate — Ce produit renferme une pile. Pour réduire le risque d'explosion, vérifiez la polarité et ne remplacez la pile que par une pile du même type, recommandée par le fabricant. Mettez les piles usagées au rebut conformément aux instructions du fabricant des piles.

Cette unité ne contient aucune partie qui peut faire l'objet d'un entretien par l'utilisateur. Si un problème survient, veuillez contacter votre distributeur local.

Regulatory Notices

Certifications and Compliances

FCC Emission Control

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. Changes or modifications not expressly approved by Grass Valley can affect emission compliance and could void the user's authority to operate this equipment.

Canadian EMC Notice of Compliance

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

EN55022 Class A Warning

In a domestic environment, products that comply with Class A may cause radio interference in which case the user may be required to take adequate measures.

Canadian Certified Power Cords

Canadian approval includes the products and power cords appropriate for use in the North America power network. All other power cords supplied are approved for the country of use.

Canadian Certified AC Adapter

Canadian approval includes the AC adapters appropriate for use in the North America power network. All other AC adapters supplied are approved for the country of use.

FCC Emission Limits

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesirable operation. This device has been tested and found to comply with FCC Part 15 Class B limits for a digital device when tested with a representative laser-based fiber optical system that complies with ANSI X3T11 Fiber Channel Standard.

Certifications:

For specific 7600REF certifications, refer to [Table 13 on page 104](#).

Category	Standard	Designed/tested for compliance with:
Safety	ANSI / UL60950	"Standard for Safety of Information Technology Equipment - Safety - Part 1: General Requirements", (ANSI/UL 60950-1, First Edition, Dated April 1, 2003, with revision through and including November 26, 2003.)
	IEC 60950	"Standard for Safety for Information Technology Equipment - Safety - Part 1: General Requirements", (IEC 60950-1, First Edition, 2001, Corrigendum 1:10-2002)
	CAN/CSA C22.2, No. 60950	"Standard for Safety of Information Technology Equipment - Safety - Part 1: General Requirements", (CAN/CSA-C22.2 No. 60950-1-03, First Edition Dated April 1, 2003, with revisions through and including November 26, 2003)
	EN60950	Safety of Information Technology Equipment, including Electrical Business Equipment.
	2006/95/EC	Low Voltage Directive
EMI	EMC Directive 2004/108/EC via EN 55103-1 and 2	Audio, Video and Entertainment Lighting Control for the European Community.
	EN 55103-1 standards	Electromagnetic compatibility. Product family standard for audio, video, audio-visual and entertainment lighting control apparatus for professional use. Part 1 Emissions, Environment E1/E2 EN 55022: Class A Radiated and Conducted Emissions EN 61000-3-2: Power Line Harmonic Emissions, Radiated Magnetic Field Emissions, Peak Inrush Current
	EN55103-2 standards	Electromagnetic compatibility--Product family standard for audio, video, audio-visual and entertainment lighting control apparatus for professional use. Part 2 Immunity, Environment E1/E2 EN 50082-1: Immunity EN 61000-4-2: Electrostatic Discharge "ESD" Immunity EN 61000-4-3: Radiated RF Electromagnetic Field Immunity EN 61000-4-4: Electrical Fast Transient/Burst "EFT" Immunity EN 61000-4-5: Surge Immunity EN 61000-4-6: Conducted RF Immunity EN 61000-4-11: Voltage Dips, Short Interruptions and Voltage Variations Annex A - Radiated Magnetic Field Immunity Note: This only applies to assemblies sensitive to magnetic fields
	US FCC Class A Canada FCC Industry Canada	CISPR Pub. 22 (1985)
	Australia & New Zealand:	AS/NZS CISPR 22

Category	Standard	Designed/tested for compliance with:
Safety	UL1419	Professional Video and Audio Equipment

ESD Protection

Electronics today are more susceptible to electrostatic discharge (ESD) damage than older equipment. Damage to equipment can occur by ESD fields that are smaller than you can feel. Implementing the information in this section will help you protect the investment that you have made in purchasing Grass Valley equipment. This section contains Grass Valley's recommended ESD guidelines that should be followed when handling electrostatic discharge sensitive (ESDS) items. These minimal recommendations are based on the information in the [Sources of ESD and Risks](#) area. The information in [Grounding Requirements for Personnel on page 29](#) is provided to assist you in selecting an appropriate grounding method.

Recommended ESD Guidelines

Follow these guidelines when handling Grass Valley equipment:

- Only trained personnel that are connected to a grounding system should handle ESDS items.
- Do not open any protective bag, box, or special shipping packaging until you have been grounded.

Note When a Personal Grounding strap is unavailable, as an absolute minimum, touch a metal object that is touching the floor (for example, a table, frame, or rack) to discharge any static energy before touching an ESDS item.

- Open the anti-static packaging by slitting any existing adhesive tapes. Do not tear the tapes off.
- Remove the ESDS item by holding it by its edges or by a metal panel.
- Do not touch the components of an ESDS item unless it is absolutely necessary to configure or repair the item.
- Keep the ESDS work area clear of all nonessential items such as coffee cups, pens, wrappers and personal items as these items can discharge static. If you need to set an ESDS item down, place it on an anti-static mat or on the anti-static packaging.

Sources of ESD and Risks

The following information identifies possible sources of electrostatic discharge and can be used to help establish an ESD policy.

Personnel

One of the largest sources of static is personnel. The static can be released from a person's clothing and shoes.

Environment

The environment includes the humidity and floors in a work area. The humidity level must be controlled and should not be allowed to fluctuate over a broad range. Relative humidity (RH) is a major part in determining the level of static that is being generated. For example, at 10% - 20% RH a person walking across a carpeted floor can develop 35kV; yet when the relative humidity is increased to 70% - 80%, the person can only generate 1.5kV.

Static is generated as personnel move (or as equipment is moved) across a floor's surface. Carpeted and waxed vinyl floors contribute to static build up.

Work Surfaces

Painted or vinyl-covered tables, chairs, conveyor belts, racks, carts, anodized surfaces, plexiglass covers, and shelving are all static generators.

Equipment

Any equipment commonly found in an ESD work area, such as solder guns, heat guns, blowers, etc., should be grounded.

Materials

Plastic work holders, foam, plastic tote boxes, pens, packaging containers and other items commonly found at workstations can generate static electricity.

Grounding Requirements for Personnel

The information in this section is provided to assist you in selecting a grounding method. This information is taken from ANSI/ESD S20.20-2007 (Revision of ANSI/ESD S20.20-1999).

Table 1. Product Qualification

Personnel Grounding Technical Requirement	Test Method	Required Limits
Wrist Strap System*	ANSI/ESD S1.1 (Section 5.11)	$< 3.5 \times 10^7$ ohm
Flooring / Footwear System – Method 1	ANSI/ESD STM97.1	$< 3.5 \times 10^7$ ohm
Flooring / Footwear System – Method 2 (both required)	ANSI/ESD STM97.1 ANSI/ESD STM97.2	$< 10^9$ ohm < 100 V

Product qualification is normally conducted during the initial selection of ESD control products and materials. Any of the following methods can be used: product specification review, independent laboratory evaluation, or internal laboratory evaluation.

Table 2. Compliance Verification

Personnel Grounding Technical Requirement	Test Method	Required Limits
Wrist Strap System*	ESD TR53 Wrist Strap Section	$< 3.5 \times 10^7$ ohm
Flooring / Footwear System – Method 1	ESD TR53 Flooring Section and ESD TR53 Footwear Section	$< 3.5 \times 10^7$ ohm
Flooring / Footwear System – Method 2 (both required)	ESD TR53 Flooring Section and ESD TR53 Footwear Section	$< 1.0 \times 10^9$ ohm

* For situations where an ESD garment is used as part of the wrist strap grounding path, the total system resistance, including the person, garment, and grounding cord, must be less than 3.5×10^7 ohm.

7600SD/HD/MHD-REF

Reference Generator

Product Overview

The 7600REF Synchronizing Pulse Generator is one of the most flexible SPG units available on the market today. It is suitable for any digital or mixed format environment where a high quality digital SPG is required. This manual covers the installation and operation of the three available models along with full technical specifications.

Refer to [7600REF Models on page 32](#) for specific functionality available for each of the model types: 7600SD-REF, 7600HD-REF, and 7600MHD-REF.

Each 7600REF model has the following basic functionality:

- Five independently timed analogue outputs that can be configured as black/burst or analogue video test signal outputs,
- Three SD-SDI video outputs with four channels of embedded AES audio and EDH
- Two AES-3 silence outputs
- 10MHz/27MHz/Word Clock output
- All SDI and analogue black/burst outputs offer full timing control and are individually selectable for 525/625 standard operation
- 5/10 MHz Reference input
- Dual power supplies that auto-sense line rates with separate mains connections for power backup in the case of one power supply failure
- Looping Genlock input
- ANALOGUE AUDIO/REMOTES connector that provides:
 - A serial communication port,
 - Analogue audio output test tones,
 - Power fail output status, and
 - Fan failure status, and GPI input output control connections.

7600REF Models

Functionality specific to the three different 7600REF models is described below.

7600SD-REF Reference Signal Generator

This model features the following functionality:

- SD-SDI and analogue video test signal patterns,
- Analogue and AES audio test tones (including GLITS), and
- Full-field test patterns.

7600HD-REF Reference Signal Generator

This model provides the same features as the SD version in addition to the following:

- HD-SDI video test patterns, and
- A one slot HD Tri-level sync module provides 4 tri-level sync outputs, each output individually configured from the front panel.

7600MHD-REF Master HD Reference Signal Generator

This module expands the 7600HD-REF model to include the following:

- A one slot GPS receiver module with a GPS antenna input and a GPS 1 PPS output allows for locking to a high stability time and oscillator reference,
- Two LTC timecode outputs available on the LTC D-25 connector and the addition of VITC timecode to the Analogue and SDI test signals, and
- Network Time Protocol (NTP) with both Client and Server modes. NTP is intended for synchronizing function for changeover units (such as the 7620PX) to keep them both in sync. It also provides a means of updating software via TFTP (Trivial File Transfer Protocol).

Installation

Follow the instructions below to unpack, install, and cable the 7600REF frame.

Unpacking

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

In the event the unit has been damaged or does not match your order, contact the Grass Valley Sales office listed on *Contacting Grass Valley on page 4*.

Module/Software Installation

All hardware modules are installed at the factory and shipped inside the unit. Module functionality included in the model configuration depends on the model type (see *7600REF Models on page 32*). Any software functionality included with the model is already installed and enabled.

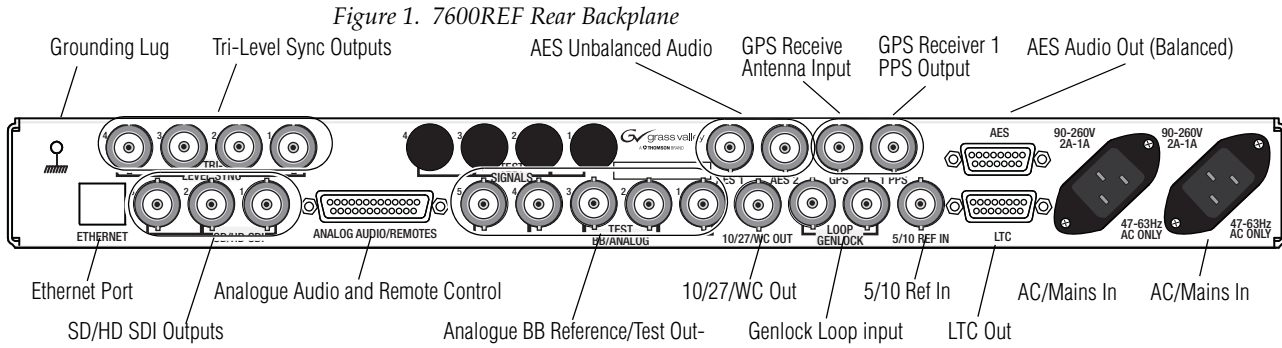
Rack Mounting

The 1 RU rack frame has integral rack mounting ears on the frame front cover for direct mounting into a standard 19 inch rack. Carefully place the unit in your rack and firmly attach it to the rack using four standard rack screws (not provided).

CAUTION This unit has air intakes on one side of the unit and fan-assisted exhaust vents on the other side of the unit. Ensure that these have an unobstructed air flow, otherwise the unit will overheat. Pay particular attention to ensure that any rack wiring or cable trays do not obstruct the vent. 60 mm (2.36 in.) of clear space should be allowed between the vents and any potential obstruction.

Rear Panel Connections

The rear connectors for the 7600REF frame are shown in [Figure 1](#). Presence of hardware and software functionality depends on the model you have purchased (see [7600REF Models on page 32](#)). Cabling instructions for each of the connectors are explained in detail in this section.



Grounding Lug

The unit is provided with a single 4 mm (0.16 in.) ground lug on the far left of the rear panel. Incoming mains ground from the IEC connector is internally bonded to both the chassis and technical 0V to meet safety requirements and performance specifications. The stud allows the addition of an ground strap, if required, for rack installations.

Ethernet Port

Each 7600REF model is equipped with a 10/100 base-T Ethernet port. This port may be configured for either dynamic (DHCP) address mode or static address mode. Configuration is done in the Setup menu (see [Setup Menus – Top Level on page 75](#)). The 7600REF should be connected to the network in the same way as other networked devices (such as a computer or printer) with a 1:1 CAT 5 RJ-45 cable.

Tri-Level Sync Reference (7600HD-REF and 7600MHD-REF Models)

The TRI-LEVEL SYNC REFERENCE BNCs will output four independently configured tri-level sync outputs. Setup is done in the Options menu ([Option 3: HD Tri-Level Sync \(7600HD-REF and 7600MHD-REF Models\) on page 97](#)).

SD/HD SDI Test Outputs

The outputs from the SD/HD SDI TEST BNCs 1, 2, and 3, provide three independently configured test signals. If the HD video capability is present, further HD video formats are available. Each test pattern also has text positioning and an AFD (Active Format Description) control. The three outputs are configured in the Digital Video menu (*Digital Video Menus – Top Level on page 49*).

On the 7600MHD-REF model, these outputs also offer a combination of the following LTC (Longitudinal Timecode) features with LTC capability:

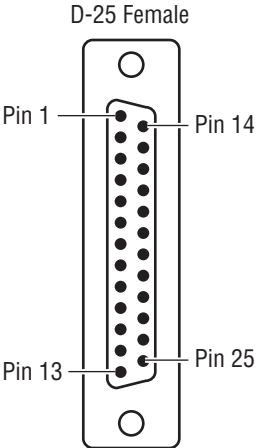
- Digital VITC (SMPTE S266) for standard definition signals only, and
- ATC (SMPTE RP188) for standard definition or high definition SD signals.

Analogue Audio/Remotes

The 25 pin Sub-D connector labeled ANALOGUE AUDIO/REMOTES provides a serial communication port, the analogue audio output tones, power fail output status, fan failure status, and the GPI connections.

Pinouts for the ANALOGUE AUDIO/REMOTES connector are given in [Table 3](#). Each of the connector function is described in detail in this section.

Table 3. ANALOGUE AUDIO/REMOTES Connector Pinouts

ANALOGUE AUDIO/REMOTES	Pin	Function	Pin	Function
 <p>D-25 Female</p> <p>Pin 1</p> <p>Pin 14</p> <p>Pin 13</p> <p>Pin 25</p>	1	Fan OK -1 (Pair with pin 16. Closed if OK)	14	Power OK 1
	2	RS422 CTS – (minus)	15	Power OK 2
	3	RS422 RXD + (plus)	16	Fan OK - 2
	4	RS422 TXD + (plus)	17	GPI0 - Output 1
	5	RS422 RTS – (minus)	18	GPI0 - Input 2
	6	RS422 TXD – (minus)	19	GPI0 - Input 1
	7	GND	20	RS422 CTS + (plus)
	8	RS422 RXD – (minus)	21	GPI0 - Output 2
	9	GND	22	RS422 RTS + (plus)
	10	+ 12V DC / 0.3A	23	Analogue Audio Out 1 – (minus)
	11	Analogue Audio Out 1 + (plus)	24	Analogue Audio Out 2 – (minus)
	12	Analogue audio Out 2 + (plus)	25	GND
	13	GND		

Fan Failure Output

This open collector output senses the current drawn by the cooling fans fitted to the enclosure. The detector indicates a failure if a fan is stuck and/or an open circuit is detected.

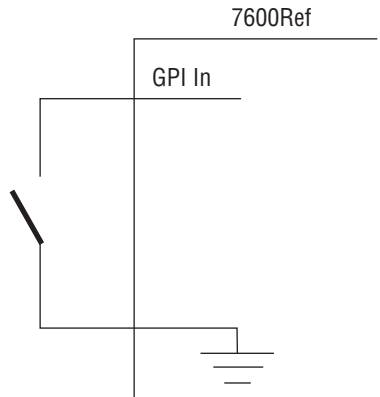
GPI Inputs 1 and 2

The General Purpose Interface (GPI) inputs 1 and 2 are configured in software using the menus described in [Setup – GPIO Control on page 81](#) to provide any of the following functions:

- Force freerun mode
- Force Genlock mode
- Force external 10MHz lock mode
- Step through SDI output 1 test patterns
- Step through SDI output 2 test patterns
- Step through SDI output 3 test patterns
- Step through setup memories

The single-ended 7600REF GPI inputs are activated when connected to a ground connection on the 25 pin Sub-D connector as shown in [Figure 2](#). The two GPI inputs are pin 18 and pin 19 as listed in [Table 3 on page 35](#). The inputs can withstand +/- 20V and draw approximately 600uA when activated.

Figure 2. Connection to GPI Inputs



GPI Outputs 1 and 2

The General Purpose Interface (GPI) outputs 1 and 2 are configured in software using the menus described in [Setup – GPIO Control on page 81](#) to provide any of the following functions:

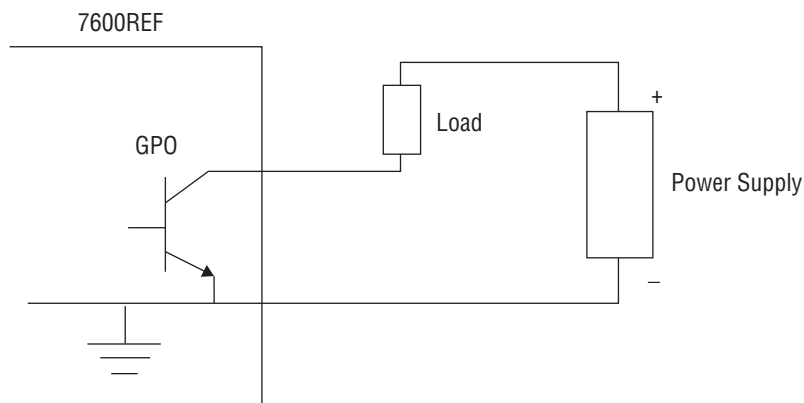
- Loss of genlock input
- Loss of external 10MHz reference
- Line lock error
- Field lock error
- Subcarrier lock error
- Illegal input ScH
- Diagnostic state alert
- Currently locked to external 10MHz
- Currently locked to external genlock
- Currently internal/freerun mode

The GPI outputs are single-ended open collector outputs with a 30V/190mA rating not to exceed 600 mW dissipation. The two GPI outputs are pin 17 and pin 21 as listed in [Table 3 on page 35](#). It is intended that the GPO be activated when one or more of the above conditions is true (for example, loss of genlock input and/or line lock error).

To use an output, a load should be connected between the output and an external power supply, with the negative end of the power supply connected back to the ground pin on the 25 pin Sub-D connector.

As an alternate to an external power supply, a +12V, 300mA feed is available on pin 10 of the Sub-D connector.

Figure 3. Connection to GPI Outputs



Analogue BB Reference/Test

The five ANALOGUE BB REFERENCE/TEST BNCs provide independent black burst reference signals and/or video test signal outputs as configured in the Analogue Video menus (see [Analogue Video Menus – Top Level on page 61](#)).

10/27/WC Output

The 10/27/WC BNC provides either a 10MHz, 27MHz, or Word Clock output. The output type is configured in the Setup/Clock Output menu ([Setup Menus – Top Level on page 75](#)).

Genlock Loop Input

The GENLOCK LOOP BNCs provide an external genlock reference input to the device. Genlock configuration is done in the Lock menu ([Lock Mode Menus – Top Level on page 72](#)).

5/10 Ref In

The 5/10 REF IN BNC accepts either a 5MHz or 10MHz reference input.

GPS BNCs (7600MHD-REF Model)

The BNCs for the GPS input and 1PPS output shown in [Figure 9 on page 56](#) are present with the 7600MHD-REF model. GPS installation is described in [GPS Antenna Requirements on page 90](#). GPS setup is described in [Option Slot 1: GPS \(7600MHD-REF Only\) on page 89](#).

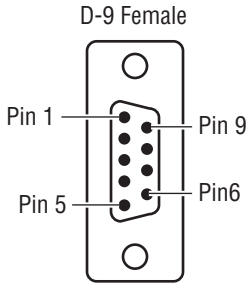
AES 1/AES 2 (7600MHD-REF Model)

When the GPS module is installed, the BNCs for AES 1 and AES 2 unbalanced audio outputs are present. Setup for AES outputs is described in [Digital Video – AES Configuration on page 59](#).

AES Outputs

The AES 9 pin Sub-D female connector provides balanced AES audio 1 and AES 2 outputs. The pinouts and their functions for this connector are shown in [Table 4](#). Setup of these outputs is done in the Audio/AES menu described in [Digital Video – AES Configuration on page 59](#).

Table 4. AES Pin Sub-D Pinout

AES Audio Out	Pin	Function
 <p>D-9 Female</p> <p>Pin 1</p> <p>Pin 5</p> <p>Pin 9</p> <p>Pin 6</p>	1	AES 1 + (plus)
	2	AES 1 – (minus)
	3	Shield
	4	N/C
	5	0V GND
	6	Shield
	7	AES 2 + (plus)
	8	AES 2 – (minus)
	9	Shield

AES audio may also be accessed through the unbalanced AES 1 and AES 2 BNCs when they are present. This requires the GPS function with the 7600MHD-REF model. See [Option Slot 1: GPS \(7600MHD-REF Only\) on page 89](#).

Timecode LTC Output (7600MHD-REF Model)

The LTC (Longitudinal Timecode) 9 pin Sub-D female connector provides LTC 1 and LTC 2 outputs with the 7600MHD-REF model. The LTC function provides the following:

- Two outputs of LTC. For configuration, see [Setup – LTC Menu \(7600MHD-REF only\)](#) on page 79.
- Vertical Interval Timecode (VITC) superimposed on analogue waveforms. This is enabled or disabled in accordance with the current group arrangement of the analogue signal outputs. See [Analogue Video – VITC \(7600MHD-REF Models Only\)](#) on page 63 for configuration.
- SDI outputs will offer a combination of Digital VITC (SMPTE S266) for standard definition signals only and ATC (SMPTE RP188) for standard definition or high definition SD signals. See [Digital Video – VITC \(7600MHD-REF Models Only\)](#) on page 56.

The pinouts and their functions for this connector are shown in [Table 5](#).

Table 5. LTC Output Sub-D Pinout

LTC Out	Pin	Function
	1	LTC 1 + (plus)
	2	LTC 1 – (minus)
	3	Shield
	4	N/C
	5	0V GND
	6	Shield
	7	LTC 2 + (plus)
	8	LTC 2 – (minus)
	9	Shield

AC Mains Connection and Fusing

CAUTION The power supply cord is used as the main power disconnection device. Ensure that the socket outlet is located/installed near the equipment and is easily accessible.

ATTENTION Le cordon d'alimentation est utilisé comme interrupteur général. La prise de courant doit être située ou installée à proximité de l'équipement et être facile d'accès.

Each 7600REF model is fitted with two independent AC mains power supplies. Each power supply has its own dedicated IEC mains plug on the rear of the unit.

The correct power cords for the line standard of the region the product has been shipped to are included in the shipping box. The power supplies used in this the unit are a switch mode design and are auto-sensing to handle a wide input voltage range. See the Specifications in [Table 13 on page 104](#) for the voltage and frequency ranges.

Power Supply Replacement

If one of the power supplies fails, a replacement unit can be acquired from Customer Service and can be installed by the customer in the field.

To replace a 7600REF power supply:

CAUTION Make sure power to the unit is completely disconnected by removing both AC cords from both power supply connections on the rear of the unit.

1. Remove the top cover of the frame by removing the 13 screws holding the cover to the frame. Determine which power supply unit needs to be replaced.
2. Tilt the frame up and on the bottom of the frame remove the two screws holding the defective power supply unit to the frame chassis.
3. On the front of the power supply unit, remove the 2-pin connector labeled J1 coming from the AC Main assembly. Note the orientation of the connector when removing it.
4. On the rear of the power supply unit, remove the 4-pin rear connector labeled J2 from the power supply attached to the cable coming from the rear of the main circuit board. Note the orientation of the connector when removing it.
5. Lift the defective power supply out of the chassis.
6. Install the new unit by reversing the steps above noting cable connector orientation. These connectors are keyed so they cannot be installed improperly.

Operation

This section of the manual will cover using the front panel for configuration and adjustments.

When the unit is powered up by connecting one or both of the AC Mains connections, initialization messages will appear on the LCD display as the unit configures the internal hardware.

Once initialization is complete, the following message indicating a normal operational status will be displayed:

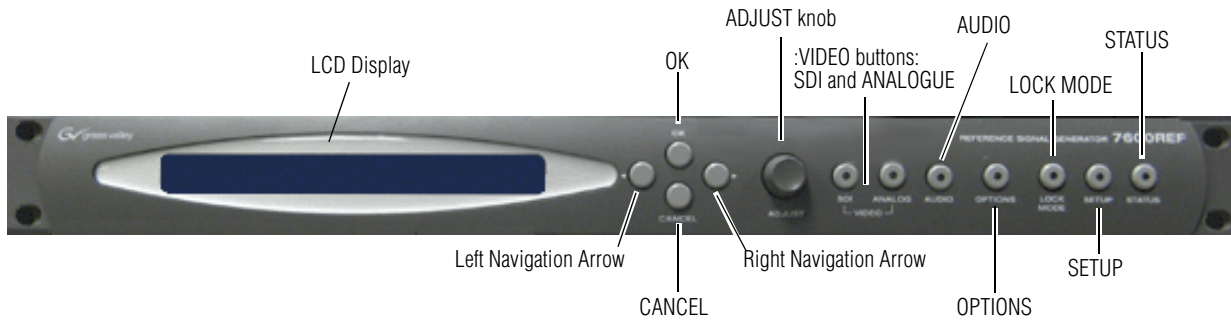
7600REF Main Menu

<Digital Video> Analogue Video Audio →

Front Panel Control Description

The front panel is shown in [Figure 4](#).

Figure 4. Front Panel Display



The front panel has the following main functional areas (see [Figure 4](#)):

- A Liquid Crystal Display (LCD) used to show information to guide the user through operating the various functions and to show status information.
- Front Panel Buttons
 - Left and right arrow buttons for menu navigation
 - **OK** and **CANCEL** buttons to initiate or exit the currently selected function
 - **ADJUST** knob for parameter adjustment and/or left/right menu navigation
 - Video **SDI** and **ANALOGUE** function buttons to access SDI or Analogue video menus
 - **AUDIO** function button to access menus for analogue and AES audio menus

- **OPTIONS** function button to access optional menus (options included depend on model type, see [7600REF Models on page 32](#)).
- **LOCK MODE** function button to access menus to set up genlock modes.
- **SETUP** function button for miscellaneous configuration options menus.
- **STATUS** button for accessing diagnostic and status information menus.

Basic Operation

There are a number of basic concepts that once understood will simplify the use of the unit as described below:

- Valid button pushes are indicated by a lamp lit inside a button. In most cases, buttons without a lamp will not be prohibited, allowing rapid changes between functions grouped on each button.
- Invalid button pushes will result in an informative message on the LCD.

Selecting a Function

To change any parameter, the appropriate function button must first be pushed. Once a function button is pushed, that button will remain illuminated and the others will turn off to provide a reminder of which function is active.

Pushing a function button that has sub-functions under it will show the name of the function and the first menu choice. For example, pushing the **SDI** function button will bring you to the top of the SDI menu, **SDI: Select Channels**. Use either the **ADJUST** knob or the left or right arrow buttons to select the choices under this menu: **SDI 1**, **SDI 2**, or **SDI 3**.

The selected choice will be surrounded by brackets < > indicating your choice. Once you reach the desired choice, press the **OK** button to enter that menu. Depending on the sub-function chosen, either a further set of sub-functions or the current value of the function is displayed. Where appropriate, the currently selected option is indicated by asterisks, such as * On * or * 1080p/23.98 * for example.

Changing Values

To change the value of a function, the **ADJUST** knob or the left or right arrow buttons can be used.

In the case of numerical values, there are two functional modes:

- If the overall range of an adjustment is small the **ADJUST** knob always alters the value by the smallest amount possible.
- If a wider range of adjustment is required, a Delta value system is used. Use the right arrow button to select the Delta value in brackets and adjust it to the desired resolution by turning the **ADJUST** knob, then press the left arrow button to select the value then adjust it with the **ADJUST** knob.

An example of this would be setting the Line Offset for SDI 1. Scroll down from Digital Video to SDI 1. Select Video Standard then Timing and scroll to Line and press the OK button. The Line Offset menu will be present on the LCD. Note the Delta value on the right of the LCD indicated by a triangle Delta symbol = 1. You may change the Delta resolution value to 10 or 100 with the knob.

Use the left arrow button to select the Pixel choice field and turn the knob to change the values to 1, 10, or 100. Note that when the Delta value is 1, the values change by steps of one pixel. With a Delta value of 10, the pixels change by steps of 10, 20, 30 etc.). Selecting a Delta value of 100 allows you to change the pixels by 100, 200, 300 etc. Change the Delta resolution if you need a finer offset setting.

As the parameter is changed, the new value will be shown on the LCD. For some functions, the unit responds by actually altering the value immediately. Otherwise the new value is applied when the **OK** button is pushed.

Leaving the Selected Function

Once the parameter has been set the unit can be returned to the normal operating mode or another function chosen by one of the following methods:

- Pressing the current (lit) function button will step up through the menu structure until either the top (normal) level is reached or another menu level of the same function is reached, at which point another menu can be accessed by pressing the **OK** button.
- The **OK** button allow you to descend the menu structure and the current function and the **CANCEL** key allows you to ascend the menu structure.
- At any time any other function key may be pressed causing the menu structure to be traversed sideways. For example, having set an **OUTPUT CONTROL** function, the **SETUP** key may be pushed without having to step back up through the menu first.

Menu Timeout

In addition, there is a built-in timeout mechanism that will automatically step back up through the menu structure until the top level is reached if a key is not pressed within a preset time period. In any event, once the top level is reached, the front porch will once again indicate valid functions by lighting the relevant buttons.

The menu system may be set to auto-revert to the top level after a period of inactivity. The option to enable/disable this feature is located in the *Setup: More* menu on [page 82](#).

Front Panel Lock

Front panel controls may be locked to prevent inadvertent changing of settings. To lock or unlock the controls, press the Left and Right arrows simultaneously.

Configuration and Setup

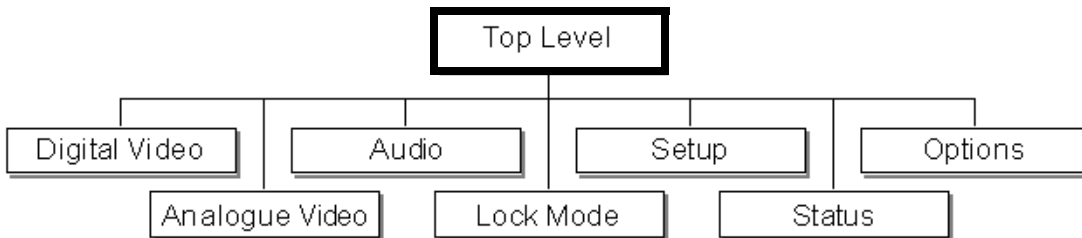
This section covers all of the menus for configuration and setup for all 7600 models in detail. Frames come from the factory with options and option software already installed.

Menus and functionality will differ between 7600-REF models due to different functionality. These differences will be pointed out in the text.

Top Level Menu

The top level menu has the menu branches shown in [Figure 5](#). You may access each top level menu directly by pressing the corresponding button ([Figure 4 on page 42](#)) or scroll through the menu using the arrow keys on the front panel of the frame to reach each menu.

Figure 5. Top Level Menu



The content and features of each top level choice are summarized below. A more detailed description of each top level choice is given later in this manual. Note that the Options branch (on the right side of [Figure 5](#)) is only displayed if specific options (GPS for example) are included in the model. For option functionality for each model type, refer to [7600REF Models on page 32](#).

Digital Video Menus

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

For 7600MHD-REF models, VITC submenus will be present due to the Timecode functionality present in this model. See [Digital Video Menus – Top Level on page 49](#).

Analogue Video Menus

The Analogue Video menus control the format of the five analogue video signals provided on the Analogue BB/Test BNCs on the rear of the frame. These are arranged as a group of three plus a second group of two outputs. This allows the group of three to be set as RGB or YUV in a single operation.

For 7600MHD-REF models, VITC submenus will be present due to the Timecode functionality present in this mode. See [Analogue Video Menus – Top Level on page 61](#).

Audio Menus

The Audio menus control both the AES and analogue audio outputs. For all outputs, control of frequency and amplitude is available. In addition, for the AES outputs, the sample rate and source ident may also be set. See [Audio Menus – Top Level on page 70](#).

Lock Mode Menus

The Lock Mode genlock menus sets the required format of the incoming video signal and defines the behavior of the 7600REF when the genlock signal is applied or removed. See [Lock Mode Menus – Top Level on page 72](#).

Setup Menus

The system Setup menus provide control of the basic configuration of the 7600REF and will be used primarily during the installation phase. Refer to [Setup Menus – Top Level on page 75](#) for details.

System setup includes:

- Configuration of the LTC function (7600MHD-REF model)
- Configuration of the Clock Output
- Comprehensive control of General Purpose Inputs and Outputs, including:
 - the input signal response mode
 - the action resulting from a GPI trigger
 - the event causing a GPO state change
- Check and control of the internal memory
- Setup of the real-time clock (RTC)
- Configuration of the Network Time Protocol (NTP) (7600MHD-REF)

- Functions under the COMMS menu, including:
 - configuration of the Ethernet port
 - configuration of the Serial port
- Functions under the DISPLAY menu, including:
 - enable and control timing of the menu timeout
 - set the display contrast
- Configure the 7600REF as Slave, allowing settings to be received from a Master

Status Menu

The Status menu provides, in read-only mode, the current version of the software, hardware and firmware of the 7600REF. These three values will be required when speaking to Technical Support. It also reports a number of other status items.

In addition, a series of status error messages may be enabled for display on the LCD screen. The final option on this menu displays a summary of the current configuration status. See [Status Menu – Top Level on page 86](#) for details.

Options Menu

The Options menu ([Figure 6 on page 49](#)) is displayed if options are installed. The Option menu lists the type of module fitted in each of the three option slots. Options installed depend on the model type.

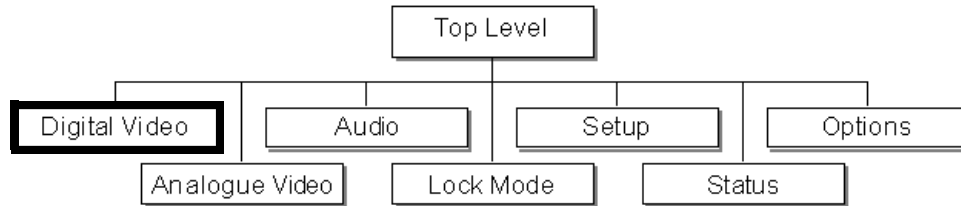
Options available include the following depending on the 7600 model type:

- Option 1: GPS (Global Positioning System) (7600MHD-REF only)
- Option 2: Not used in this application
- Option 3: TLS (Tri-Level Sync) (7600HD-REF and 7600MHD-REF)

Digital Video Menus – Top Level

The top level Digital Video menu is shown in [Figure 6](#).

Figure 6. Top Level Menu – Digital Video



The Digital Video menu provide full control of the configuration of each of the three SDI video outputs. The video standard, timing and appearance of each output are controlled from this sequence of menus shown in [Figure 7 on page 50](#).

In models with Timecode (VITC) and HD capability, the menu is extended to include further options. depending on the model.

The SDI 1-3 menus have the menu branches listed below and shown in [Figure 7 on page 50](#):

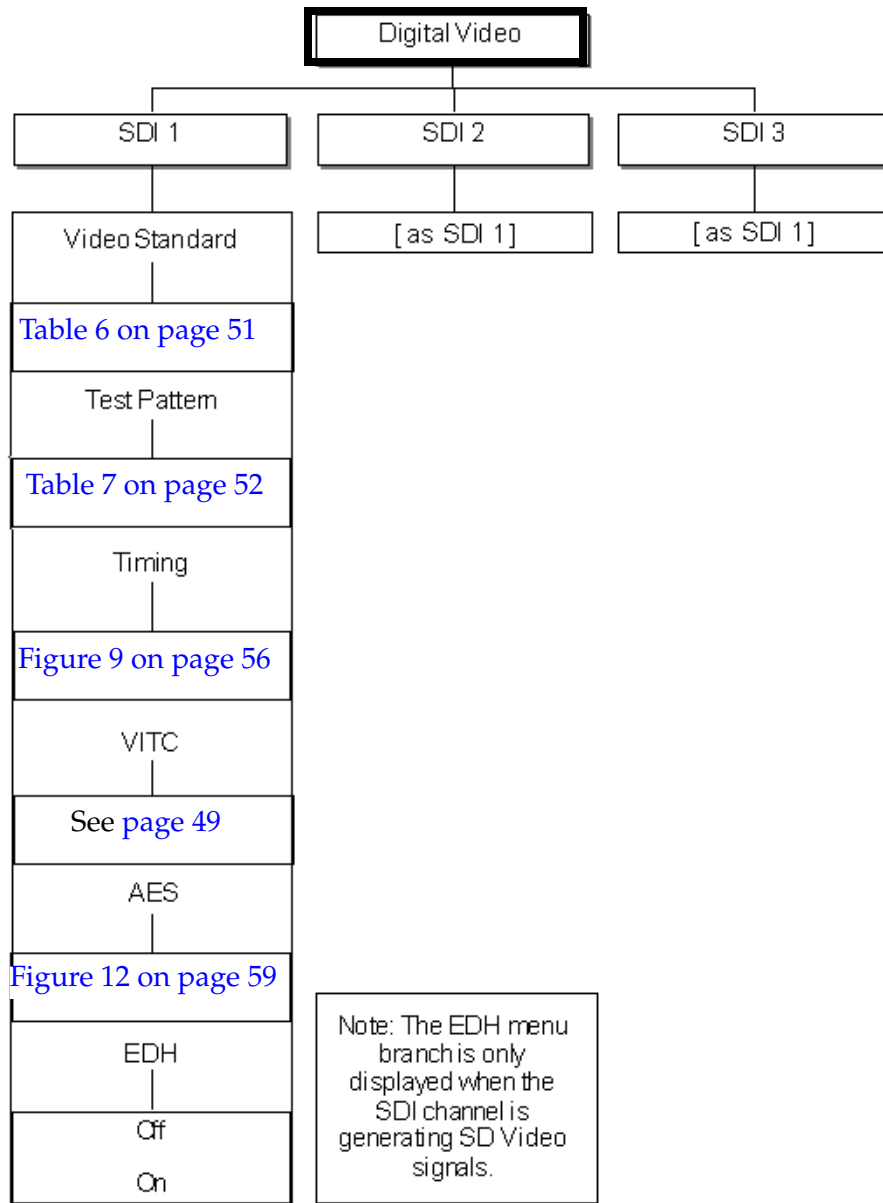
- Video Standard – see [Table 6 on page 51](#) for a listing of the current video standards available.
- Test Pattern – see [Digital Video – Test Patterns on page 52](#) and [Digital Video – Pattern Submenu on page 53](#).
- Timing – see [Digital Video – Timing on page 56](#).
- VITC – see [VITC Within SDI Video Waveform](#) below and [Digital Video – VITC \(7600MHD-REF Models Only\) on page 56](#).
- AES – see [Digital Video – AES Configuration on page 59](#).
- EDH – turn EDH insertion on or off.

VITC Within SDI Video Waveform

The 7600MHD-REF model will have the Timecode software option installed and will provide VITC (Vertical Interval Time Code) menus in appropriate Digital SDI 1-3 video menus.

VITC menus are described in this section unless they are the same as the LTC Timecode setup. For more information on LTC Timecode, refer to [Setup – LTC Menu \(7600MHD-REF only\) on page 79](#).

Figure 7. Digital Video Menu



Digital Video – Video Standard

Selecting Video Standard will bring up the currently available digital video standards listed in [Table 6](#). Select a Video Standard for the SDI outputs.

Table 6. Current Digital Video Standards

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

Digital Video – Test Patterns

Selecting the Test Pattern menu choice, brings up the Test Pattern menu shown in [Figure 8 on page 53](#).

The Test Pattern menu offers the following selections:

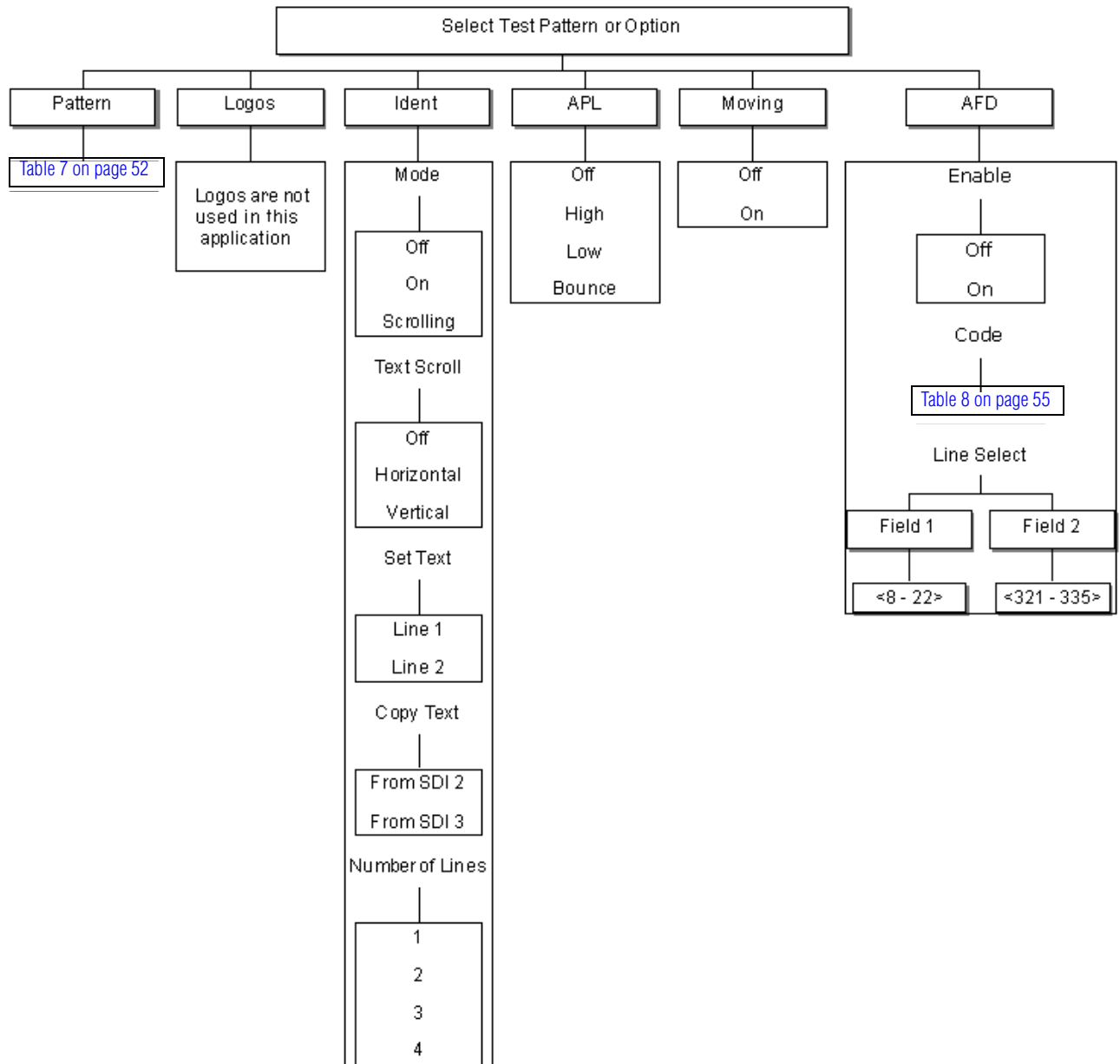
- Patterns – available patterns are listed in [Table 7](#). The test pattern will appear immediately upon selection.
- Logos – not used in this application.
- Ident – up to 4 lines of text may be added to the selected test pattern for identification. Refer to [Using the Ident Menu on page 54](#).
- APL – allows the average picture level mode to be set to High, Low, or Bounce. See [APL Menu on page 54](#).
- Moving – turn a moving pattern on or off for detecting whether a signal is frozen by frame buffer.
- AFD – Refer to the [Active Format Description \(AFD\) Overview on page 55](#) for AFD information.

Table 7. Available SDI Test Patterns

Pattern	Pattern
Full Field Black	5 Riser Stair
Full Field White	Valid 5 Riser Stair
Full Field Red	Luminance Ramp
Digital Grey	Limit Ramp
100% Colour Bars	Valid Ramp
100% Color Bars & Split	Shallow Ramp
EBU Colour Bars & Split	PLUGE
EBU Color Bars	SPLUGE
100% VT Colour Bars	Multiburst
VT Bars & Split	6 Mhz Line Sweep
C-Siting Check	25Hz Lip Sync
SDI Check Field	Bowtie
SDI Green Check Field	Sin X/X
Linearity Grille	4:3 Test Card
Convergence Grille	16:9 Test Card
3T 2T Pulse & Bar	Clean Aperture
5 Riser Luma Stair	

Digital Video – Pattern Submenu

Figure 8. Digital Video –Select Test Patterns or Option Menu



Using the Ident Menu

Up to four lines of text may be set up on a selected test pattern using the Ident menu.

The Ident menu has the following controls:

- Mode – turn the text mode on and off or set to scroll across the screen.
- Text Scroll – set the text scroll off or to scroll horizontally or vertically.
- Set Text – select the line number to enter text into. Use the ADJUST knob to scroll through the alphabetic until you reach the first letter. Use the right arrow to move to the next letter, then select it with the ADJUST knob. Continue until you have the test you want then use the OK button to approve the text. Move to the next line of text with the right arrow button.
- Copy Text – if you are in the menu for SDI Pattern 1, you can copy the text from SDI Pattern 2 or 3.

APL Menu

The APL (Average Picture Level) menu provides the following four modes of APL:

- Off – turns APL off.
- High – selects a repeating pattern of 9 lines of white and 3 lines of the selected test signal.
- Low – selects a repeating pattern of 9 lines of black and 3 lines of the selected test signal
- Bounce – turns on APL Bounce where the signal will alternate between APL High and APL Low every 3 seconds.

Moving Menu

Use the Moving menu to turn a moving pattern on or off. This is used for detecting whether a signal has been freeze-framed via a frame buffer.

Active Format Description (AFD) Overview

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

AFD is available on 7600REF units loaded with firmware version 3.0.0.8 and later. The code can be enabled on main board outputs with version 10 (or later) hardware revision. Check the hardware revision from the Status > Options menu.

Three menu entries ([Figure 8 on page 53](#)) allow the AFD feature to be turned on or off, the insertion line to be selected (on Fields 1 & 2) and the AFD code to be set according to [Table 8](#).

Note The precise interpretation of the code may depend on the standards authority being studied. The code may be represented as decimal or 4-bit binary.

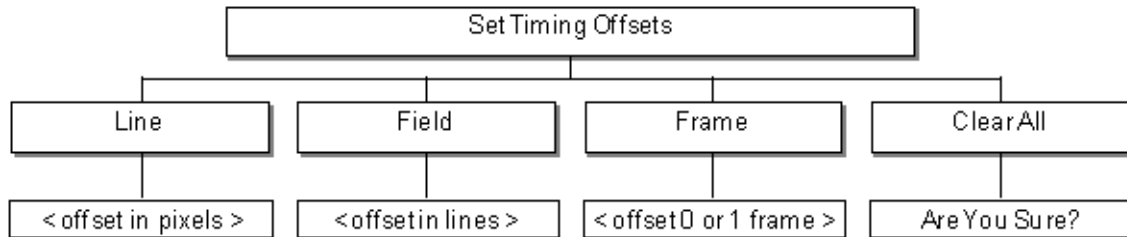
Table 8. AFD Table

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

Digital Video – Timing

Select the Timing choice to bring up the Set Timing offsets menu shown in [Figure 9](#). Set the Line, Field, and Frame offset for the SDI outputs.

Figure 9. Digital Video – Set Timing Offsets Menu



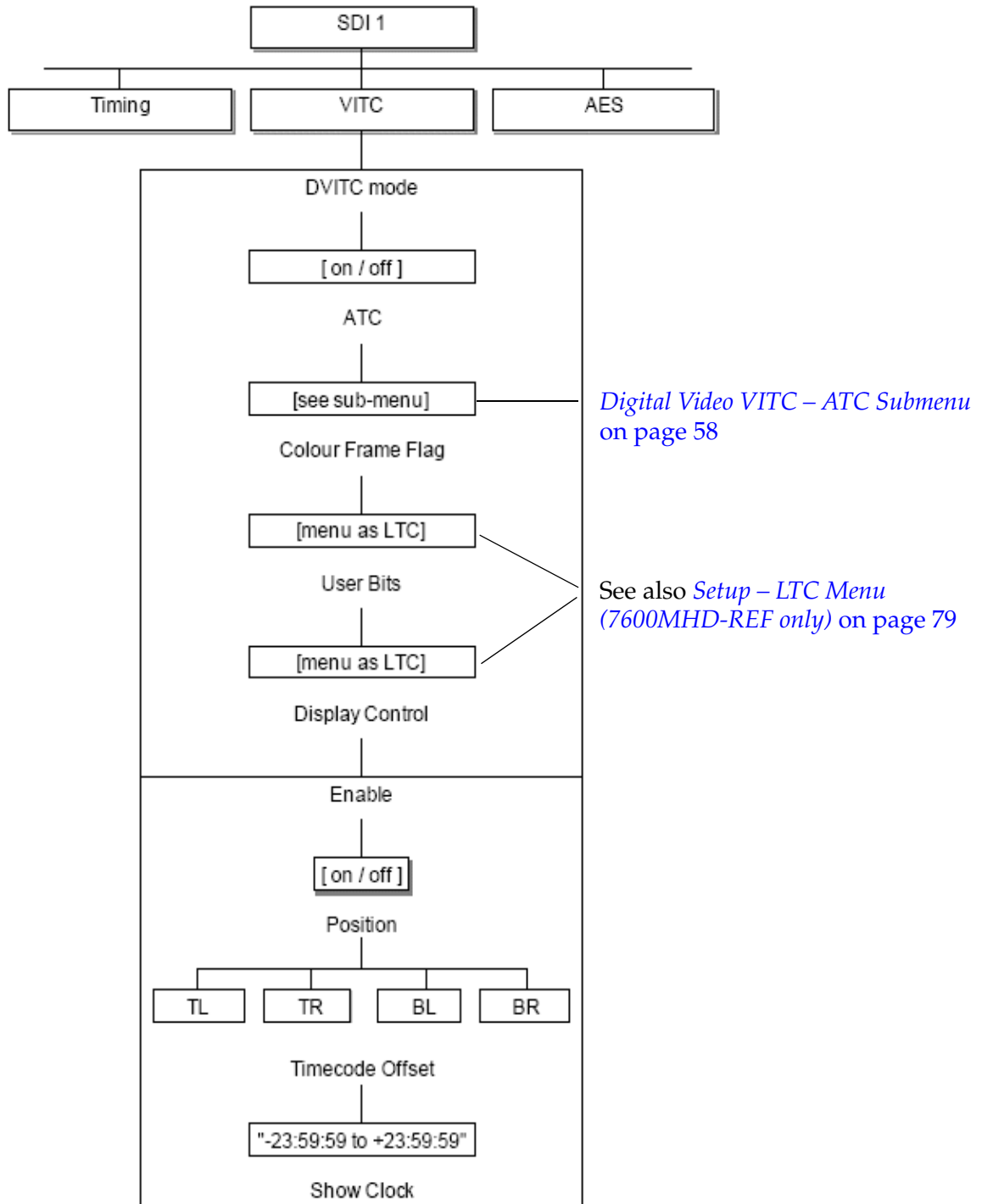
Digital Video – VITC (7600MHD-REF Models Only)

In 7600MHD-REF models, the Timecode software option is installed providing VITC menu branches in the Digital SDI 1-3 video menus where appropriate. The Digital Video – VITC menu is shown in [Figure 10 on page 57](#).

Setups for the DVITC menu include the following:

- DVITC mode – turn DVITC on or off.
- ATC – The ATC (Absolute Time Code) menu is explained in [Digital Video VITC – ATC Submenu on page 58](#) and shown in [Figure 11 on page 58](#).
- Color Frame Flag – this is a single bit within the data stream which indicates whether timecode is related to the video signal. This menu option allows the operator to turn this bit On or Off. This control is the same for LTC explained in [Setup – LTC Menu \(7600MHD-REF only\) on page 79](#).
- User Bits – the primary function of the Flag Bits is to allow the operator to embed a date code within the data stream since timecode represents only embedded time. This conforms to SMPTE S309.
- Display Control
 - Enable – turn display on or off.
 - Position – set VITC position to TL, TR, BL, or BR.
 - Timecode Offset – an additional offset may be applied to any timecode output with a value between -23h: 59m: 59s and +23h: 59m: 59s. The default is 0h: 0m: 0s. This offset is applied immediately. Timecode outputs using the same oscillator frequency will remain in-step using the Timecode JAM settings applied in the Timecode JAM menu.

Figure 10. VITC within SDI Menu

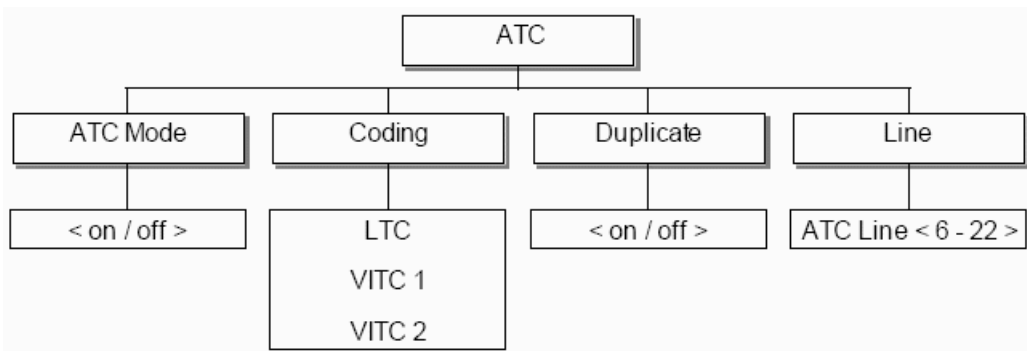


Digital Video VITC – ATC Submenu

The VITC ATC (Absolute Time Code) submenu (Figure 11) allows configuration of the following:

- ATC Mode – allows you to turn ATC mode on or off.
- Coding – indicates where the ATC data to be re-encoded as a VITC signal would appear on 1 or 2 lines in each field
- Duplicate – turn duplication on or off.
- Line – sets the line number where the ATC data to be re-encoded as a VITC signal will appear.

Figure 11. Digital Video VITC – ATC Menu

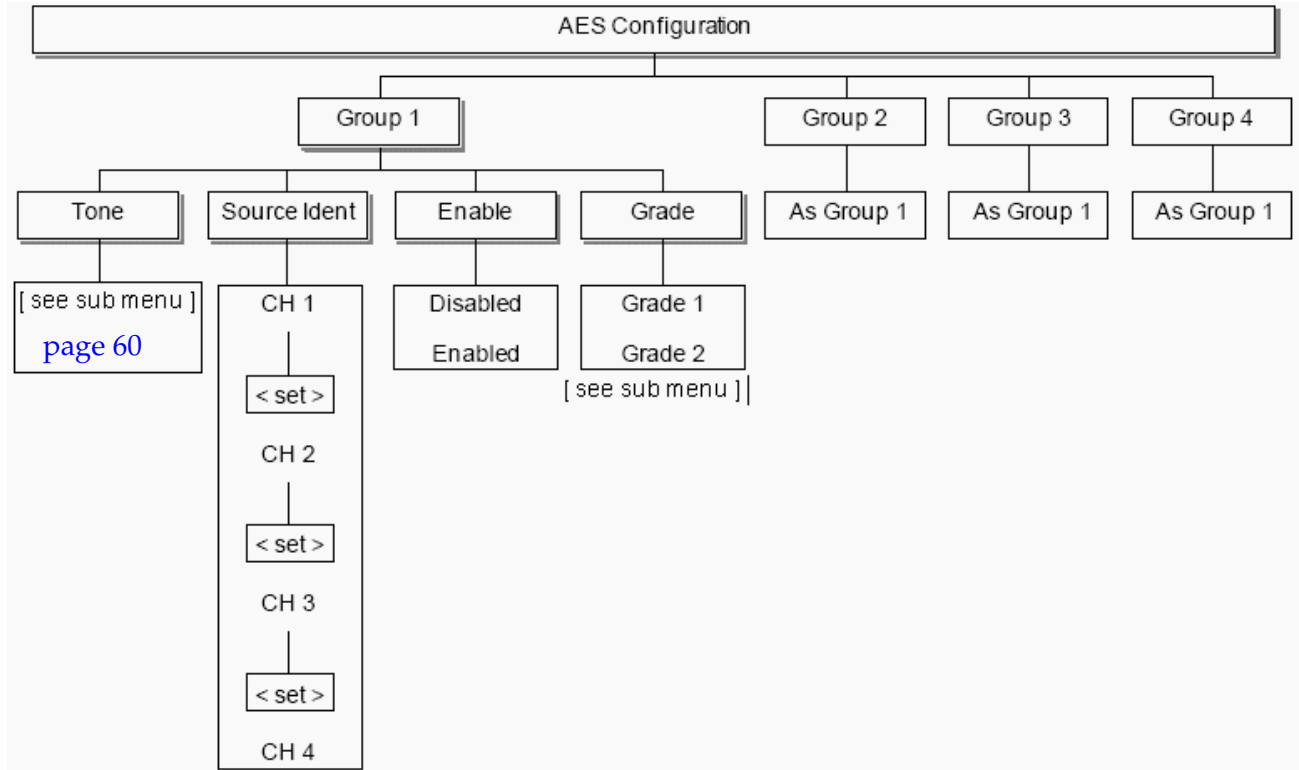


Digital Video – AES Configuration

Configure the AES audio outputs with the AES menu shown in [Figure 12](#).

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

Figure 12. Digital Video – AES Configuration Menu



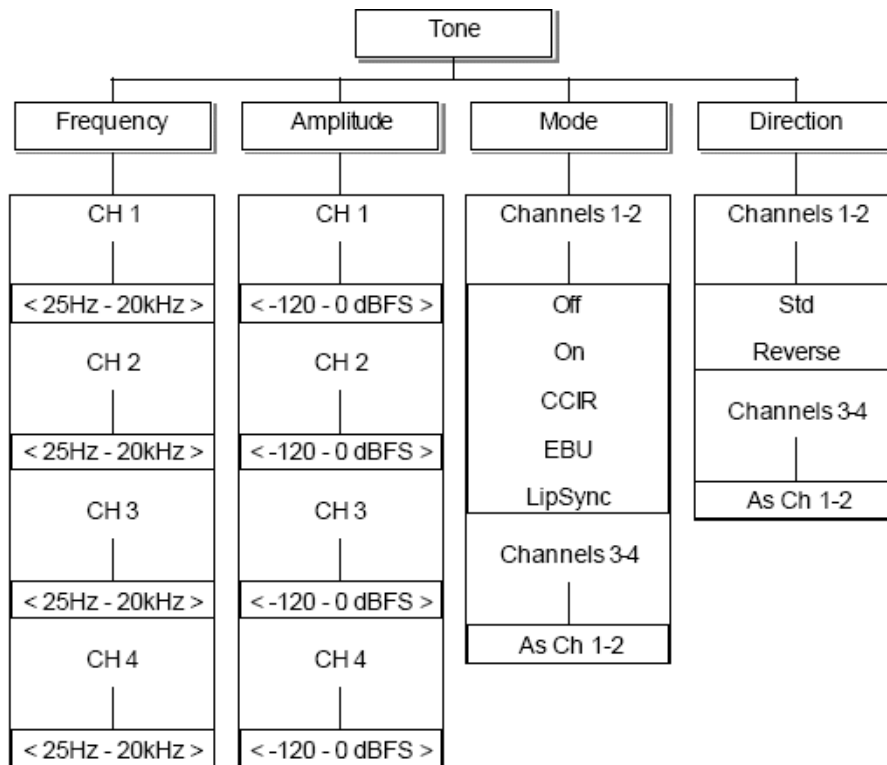
Four simultaneous AES groups are only available with firmware release 3.0.0.8 and later: prior to this, only one of the four groups may be enabled at once. In addition, four simultaneous groups are available on the AES Board with version 10 (or later) hardware revision.

Check the hardware revision from the Status > Options menu. The AES board does not currently support four simultaneous AES groups. In those cases where four simultaneous AES groups are not supported, the menu structure shown above will change, such that the **Group** selection moves down the tree to sit alongside **Grade**.

Tone Submenu

The Tone submenu is present in each Group when the Enable setting is set to **Enabled**. Refer to the AES Configuration Tone submenu in [Figure 13](#).

Figure 13. AES Configuration – Tone Submenu



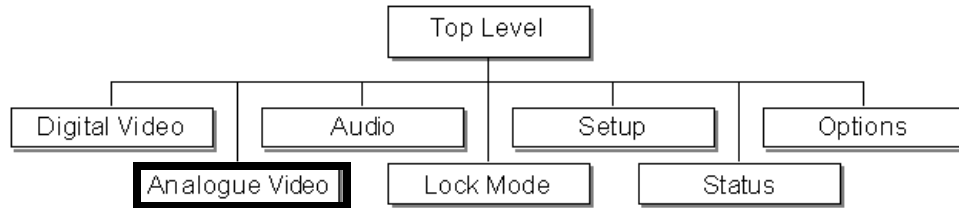
Setting Tone mode to **Off** mutes the signal but retains the AES data within the stream. Setting Tone Mode to **On** will provide continuous tone.

If the AES Group is disabled in the previous menu ([Figure 12 on page 59](#)) then tones will not be provided regardless of any settings in the above Tone submenu.

Analogue Video Menus – Top Level

The top level analogue video menu is shown in [Figure 14](#). The menus follow two common themes: either for Test Pattern signals or for Black/Burst configuration.

Figure 14. Top Level Menu – Analogue Video



The available analogue output connectors are arranged as follows:

- A group of three, configured as:
 - All Black and Burst (see [Analogue Video – All Black and Burst on page 65](#))
 - YUV test pattern (see [Analogue Video – YUV on page 66](#))
 - A single composite video signal, plus two Black and Burst outputs (see [Analogue Video – Comp/BnB/BnB on page 67](#))
 - RGB test pattern ([Analogue Video – RGB on page 68](#))
 - A YC test pattern plus a single Black and Burst output (see [Analogue Video – RGB on page 68](#))
- A group of two, configured as:
 - Both Black and Burst
 - A single composite video signal, plus one Black and Burst Output

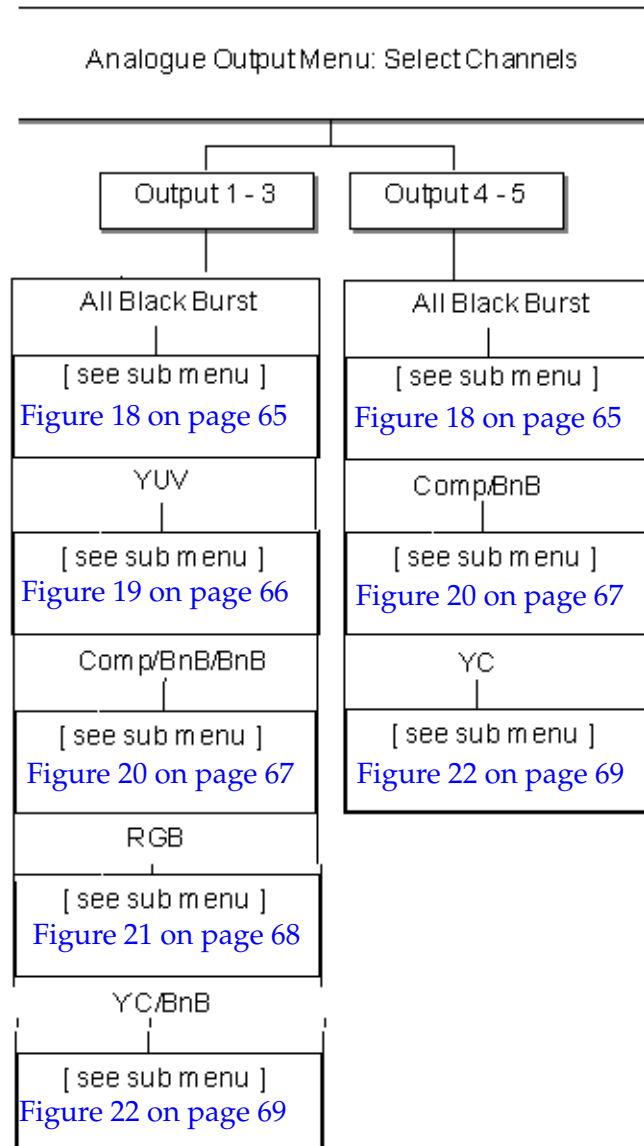
VITC in Analogue Waveforms

The 7600MHD-REF model will have the Timecode software option installed and will provide VITC (Vertical Interval Time code) menus in appropriate analogue video menus. For VITC in analogue waveforms refer to [Analogue Video – VITC \(7600MHD-REF Models Only\) on page 63](#).

VITC menus are described in this section unless they are the same as the LTC Timecode setup. For more information on LTC Timecode, refer to [Setup – LTC Menu \(7600MHD-REF only\) on page 79](#).

The menus follow two common themes, either for the Test Pattern signals or for Black and Burst configuration as shown in [Figure 15](#).

Figure 15. Analogue Video – Select Channels



Analogue Video – VITC (7600MHD-REF Models Only)

On 7600MHD-REF frames with timecode software installed, the additional branch for analogue VITC is present in analogue video menus as appropriate as shown in the example in [Figure 16 on page 64](#).

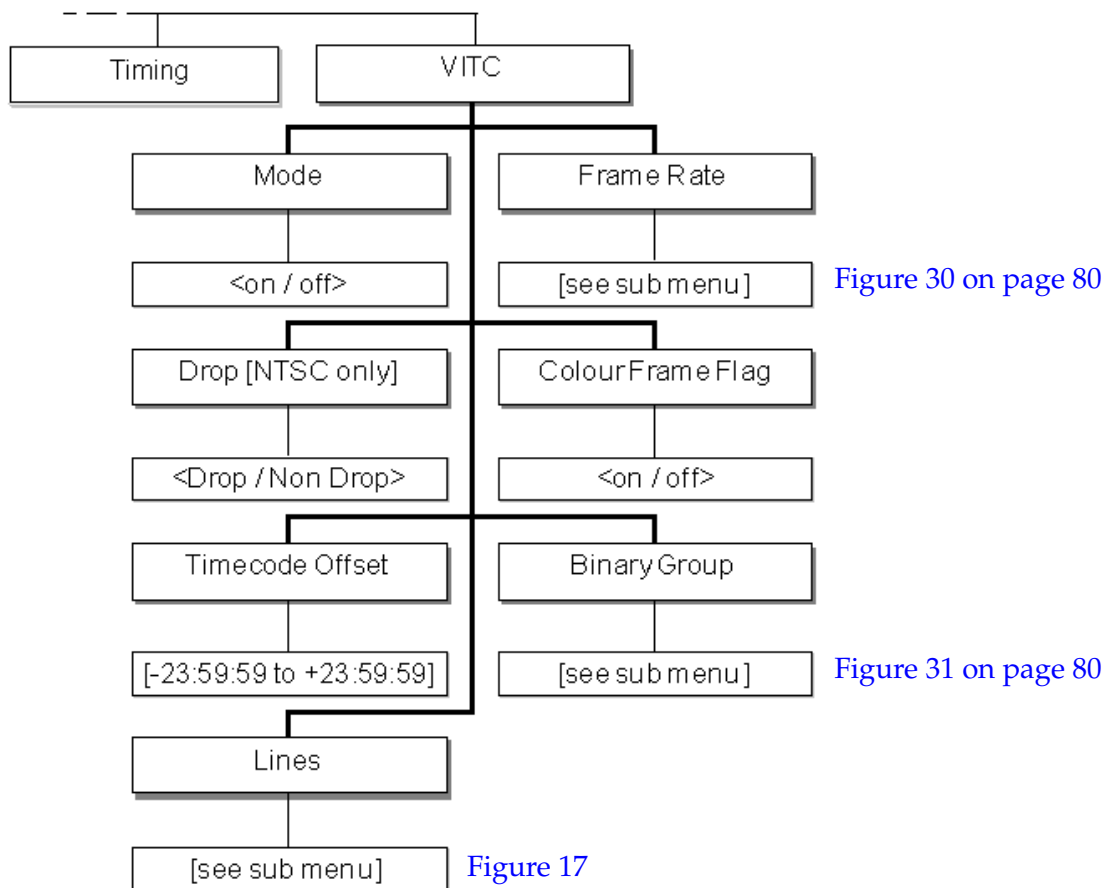
The analogue VITC setup includes the following controls:

- Mode – turn VITC on or off.
- Frame Rate – since LTC is not contained within a video waveform, the timing must be set either explicitly or associated with one of the signal outputs. Refer to the [LTC – Frame Rate Source Submenu on page 80](#).
- Drop (NTSC only) – relates to 525/NTSC line timecode and determines whether frames are dropped to compensate for the non-integer number of NTSC frames per second.

Note There is no Drop entry on the menu when the output in question is set to PAL mode. However, there is an extra Lines option on the menu to allow control over which line the VITC signal is inserted into.

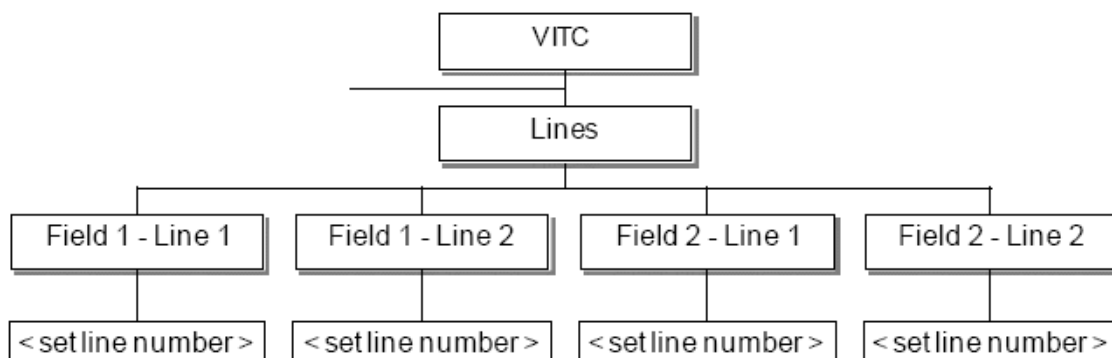
- Colour Frame Flag – this is a single bit within the data stream which indicates whether timecode is related to the video signal. This menu option allows the operator to turn this bit On or Off. This control is the same for LTC explained in [Setup – LTC Menu \(7600MHD-REF only\) on page 79](#).
- Timecode Offset – an additional offset may be applied to any timecode output with a value between -23h: 59m: 59s and +23h: 59m: 59s. The default is 0h: 0m: 0s. This offset is applied immediately. Timecode outputs using the same oscillator frequency will remain in-step using the Timecode JAM settings applied in the Timecode JAM menu.
- Binary Group (User Bits) – the primary function of the Binary Flag User Bits is to allow the operator to embed a date code within the data stream since timecode represents only embedded time. This conforms to SMPTE S309.
- Lines – in PAL mode, this menu allows control over which line the VITC is inserted into. See [Figure 17 on page 64](#).

Figure 16. Analogue Video – VITC Menu



The analogue VITC Lines submenu (Figure 17) allows setting the lines VITC is inserted into. In this example, Line 1 and Line 2 indicate the first and second lines in each Field which have VITC inserted.

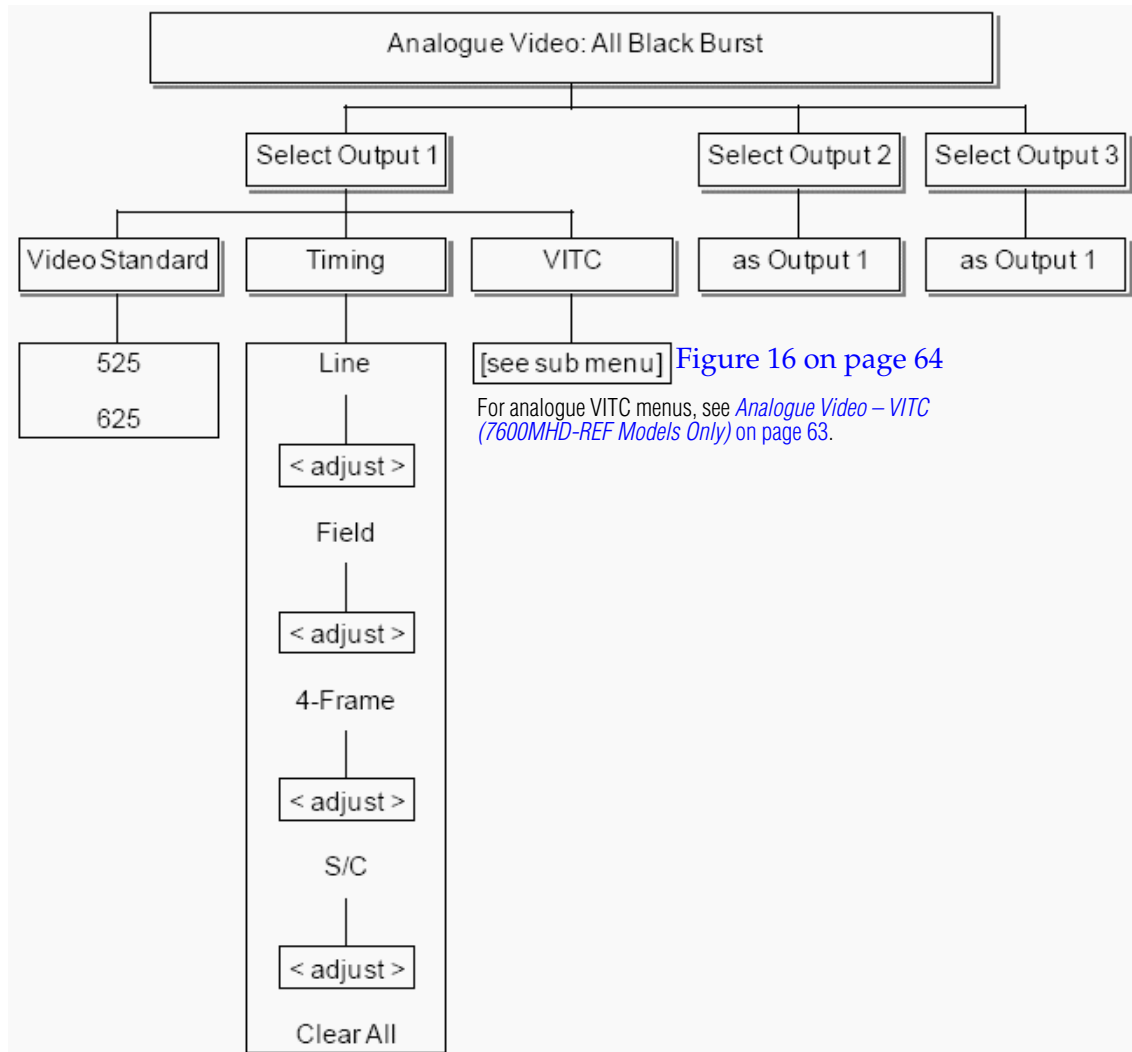
Figure 17. Analogue VITC – Lines Submenu



Analogue Video – All Black and Burst

For configuring the analogue outputs for all black burst, refer to the configuration shown in [Figure 18](#).

Figure 18. Analogue Video – All Black and Burst Menu



Analogue Video – YUV

For configuring the analogue outputs for YUV refer to the menu shown in [Figure 19](#). The analogue video test patterns available are listed in [Table 9](#) below.

Figure 19. Analogue Video – Analogue Outputs YUV

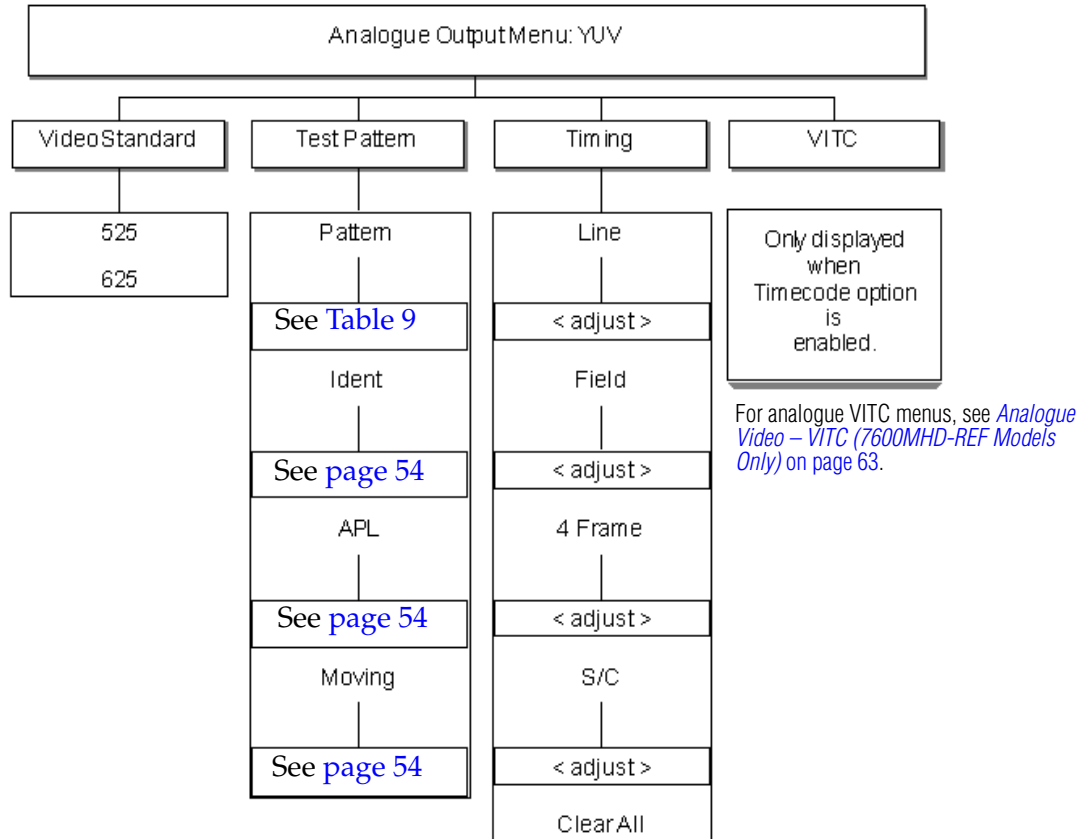


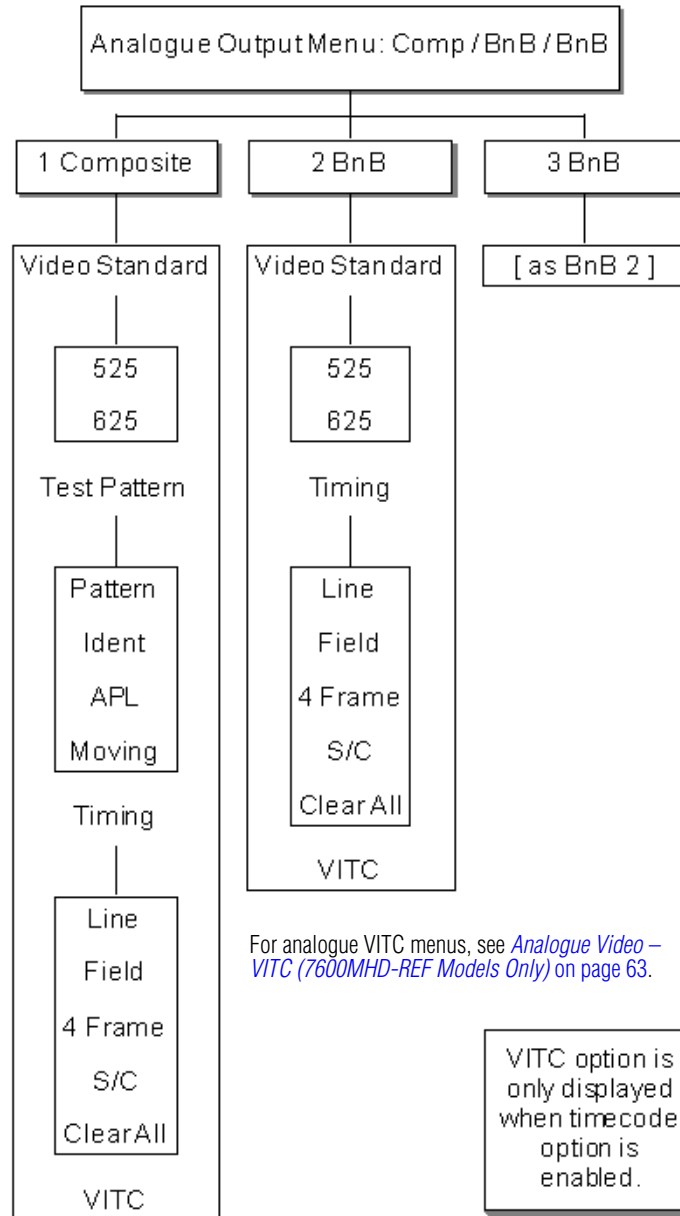
Table 9. Analogue Video Test Patterns

Pattern	
Full Field Black	Luminance Ramp
Full Field White	14 x 19 Grille
Full Field Red	Linearity Grille
100% Color Bars	Convergence Grille
100% Color Bars & Split	PLUGE
EBU Color Bars & Split	SPLUGE
EBU Color Bars	15% White Window
VT Colour Bars	100 White Window
VT Bars & Split	Multiburst
2T Pulse and BarS	Sin X/X
5 Riser Luma Stair	

Analogue Video – Comp/BnB/BnB

For configuring the analogue outputs for 1 composite output, and 2 Black Burst outputs refer to the menu shown in [Figure 20](#).

Figure 20. Analogue Video – Composite and Black and Burst

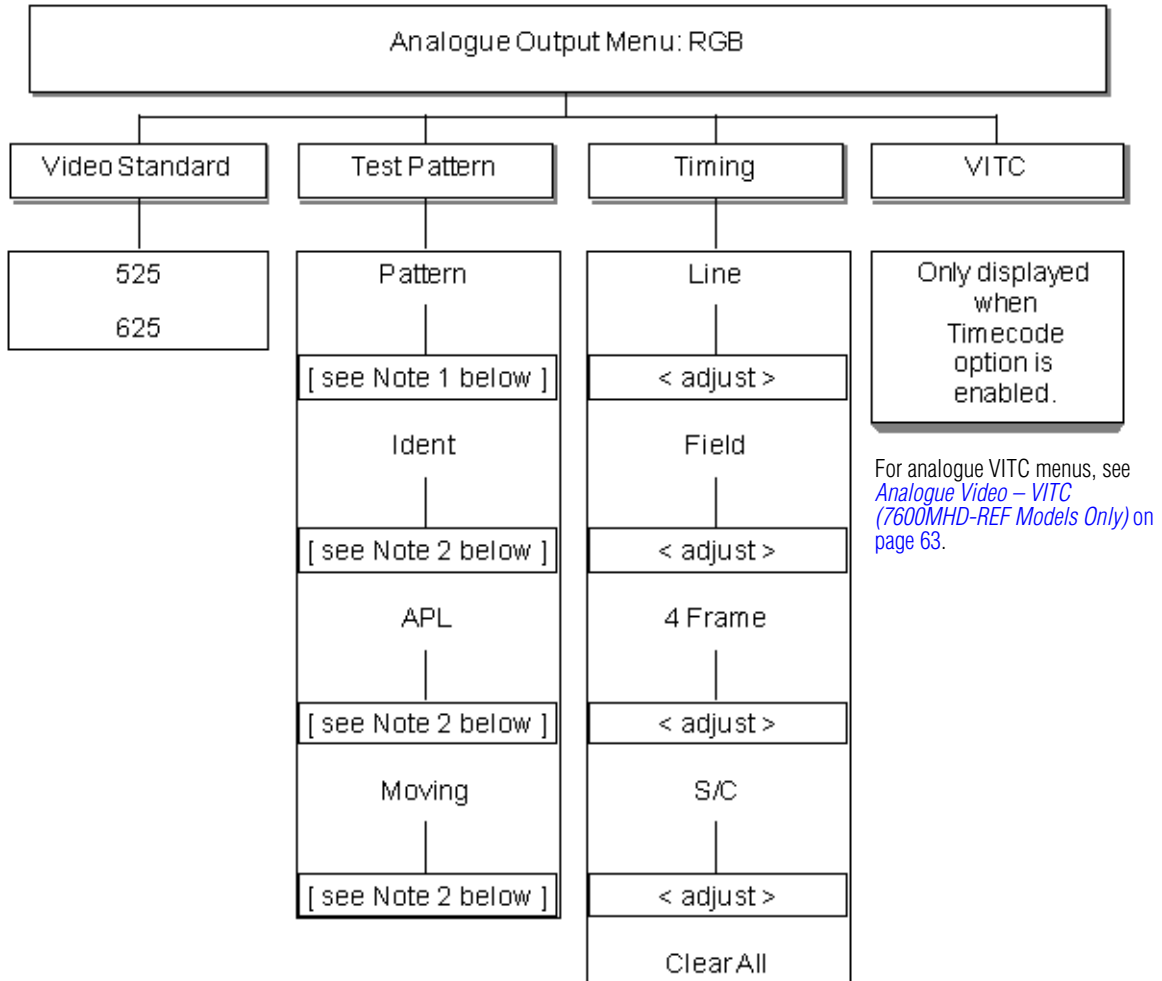


Note: For further detail of the Test Pattern menu, see previous section.

Analogue Video – RGB

The Analogue Output menu for RGB is shown in [Figure 21](#).

Figure 21. Analogue Video – Composite and Black and Burst



Note 1: For details of available patterns, see [Table 9](#) on page 66.

Note 2: For details of these menus, see [Analogue Video Menus – Top Level](#) on page 61.

Analogue Video – YC/BnB

The Analogue Output menu for YC/BnB is shown in [Figure 22](#).

Figure 22. Analogue Output Menu – YC/BnB

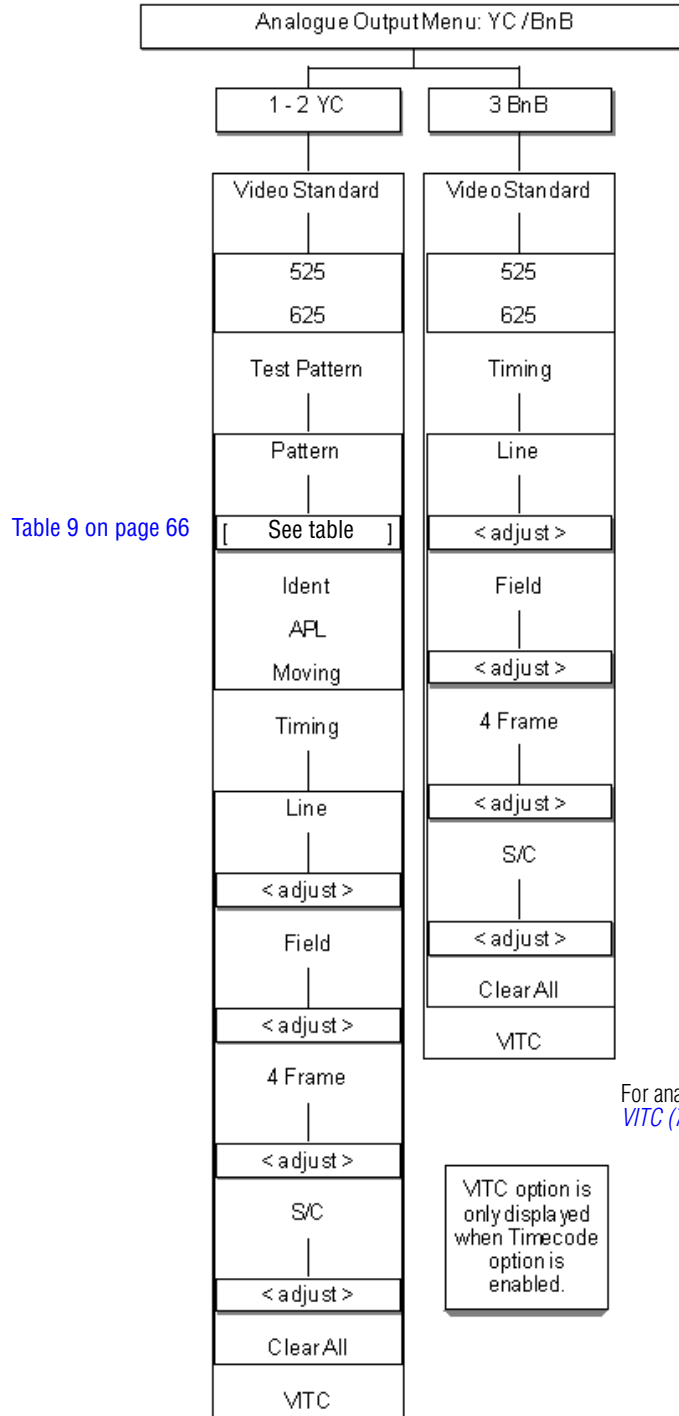


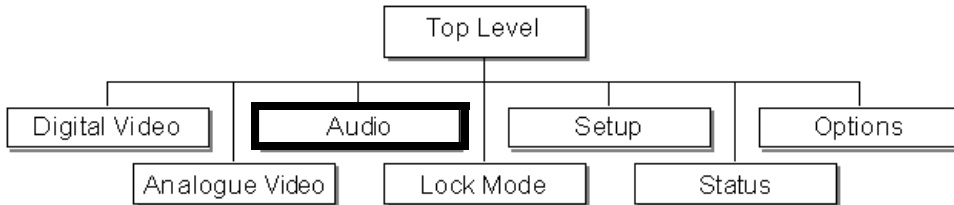
Table 9 on page 66

For analogue VTC menus, see [Analogue Video – VTC \(7600MHD-REF Models Only\)](#) on page 63.

Audio Menus – Top Level

Access to the top level Audio menu is shown in [Figure 23](#). The menus follow two common themes: either for AES or for Analogue audio configuration.

Figure 23. Top Level Menu – Audio



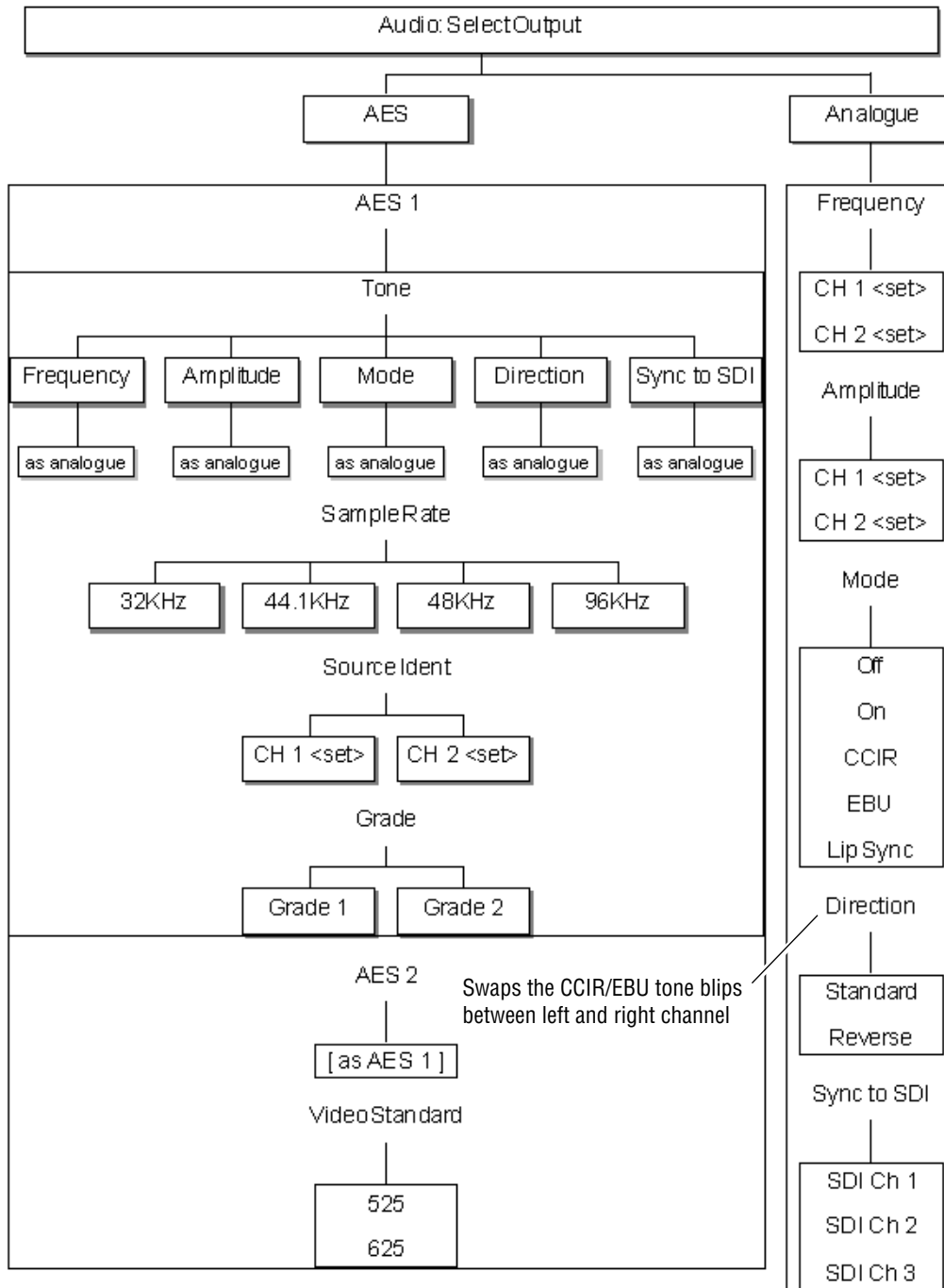
The Audio branch of the top level menu has two branches, AES 1/AES 2 and Analogue ([Figure 24 on page 71](#)) with the following controls:

- AES – configure AES1/AES 2 outputs for the following:
 - Tone,
 - Sample Rate,
 - Source Ident, and
 - Grade.

(The AES 2 menu is identical to the AES 1 menu.)

- Analogue – configure analogue audio outputs for the following:
 - Frequency,
 - Amplitude,
 - Mode,
 - Direction (swaps the CCIR/EBU tone blips between the right and left channels), and
 - Sync to SDI.

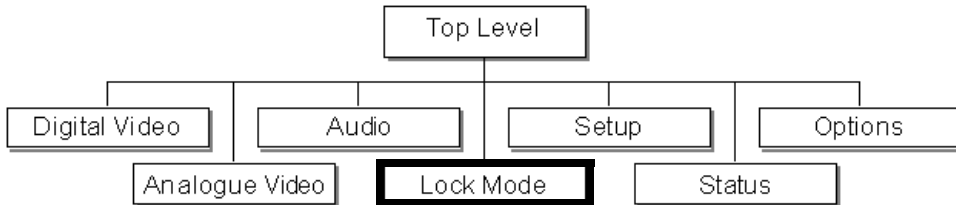
Figure 24. Audio: Select Output Menus



Lock Mode Menu – Top Level

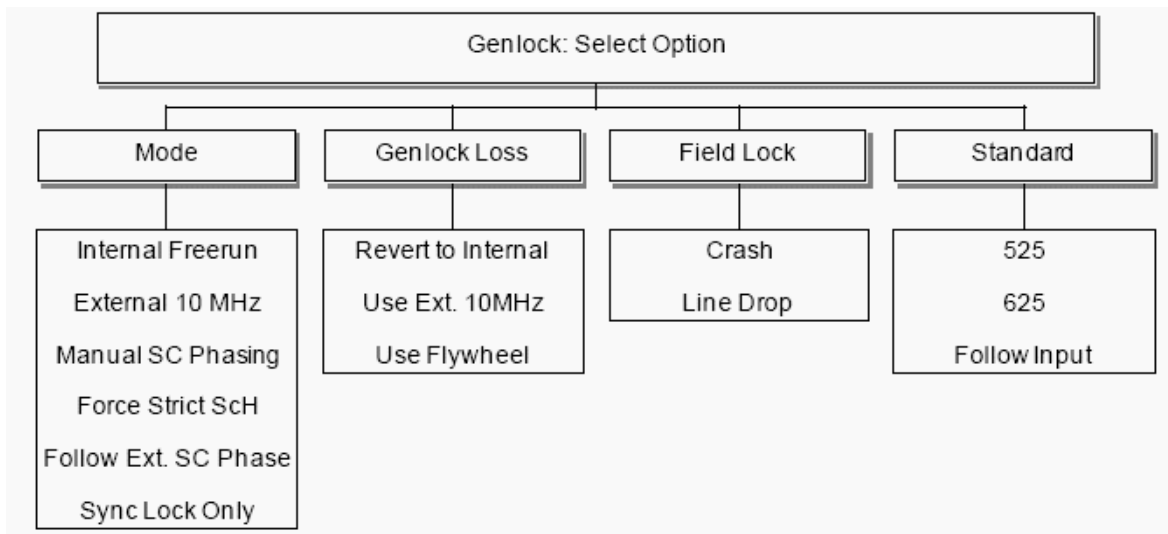
Access to the Lock Mode top level menu is shown in [Figure 25](#). The Lock menus address the genlocking functionality for the module and allows you to set the input standard.

Figure 25. Top Level Menu – Lock Mode



Selecting the Lock mode brings up the Genlock: Select Option menu in [Figure 26](#).

Figure 26. Genlock: Select Option Menu



The Genlock Mode settings of the unit may be changed with the following selections:

- **Mode** – changes the basic genlock mode such as internal (free run) to video ([Genlock – Mode on page 73](#)).
- **Genlock Loss** – sets the behavior of the unit following loss of the genlock signal ([Genlock Loss on page 73](#)).
- **Field Lock** – alters the field lock action – instantaneous or slow lock ([Genlock – Field Lock on page 74](#)).
- **Input Standard** – refer to [Genlock – Input Standard on page 74](#).

To enter a submenu, scroll to the function and select the **OK** button.

Genlock – Mode

Select the type of Genlock mode required by using the Encoder control. All available modes are discussed below.

Note Please be aware that the mode will change immediately when an option is selected.

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

Genlock Loss

Select the operational mode of the unit following loss of the genlock signal from the following choices:

- **Revert to Internal** – if the external reference signal is removed, the unit will use the internal oven maintained oscillator as its master oscillator.
- **External 10MHz** – if the genlock video input is removed, the unit will use the 10MHz input as its master oscillator. if the 10Mhz input is not present when the video input fails, the unit will use the internal oven maintained oscillator as its master oscillator.
- **Use Flywheel** – if the genlock video input is removed, the unit will continue to operate - flywheel - at the same frequency as the genlock input just removed.

Note Note that if the unit is powered up in this mode with no genlock input applied, the 7600REF outputs may not be within specification.

Genlock – Field Lock

Select the mode required from the following choices using the Encoder control or Left and Right keys:

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

Genlock – Input Standard

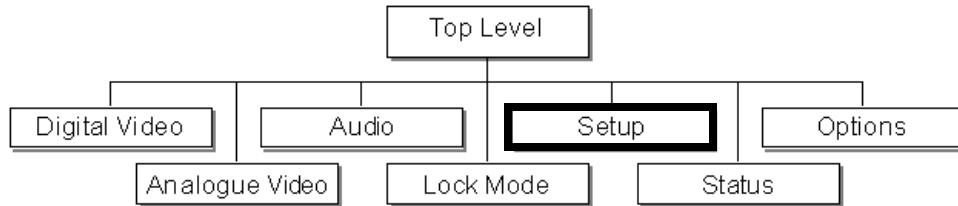
Select the video line standard of the input signal.

- **525**
- **625**
- **Follow input**

Setup Menus – Top Level

Access to the Setup top level menu is shown in [Figure 27](#).

Figure 27. Top Level Menu – Setup



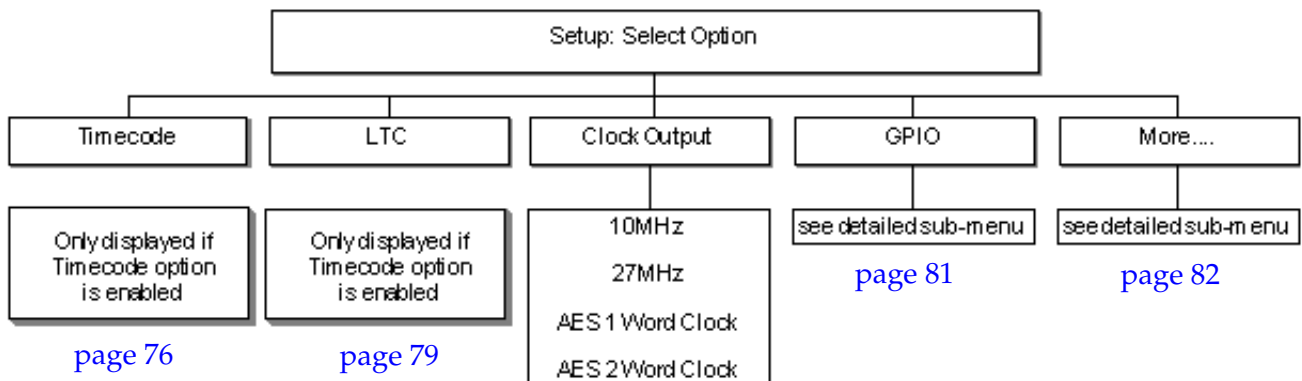
Selecting the Setup top level menu brings up the Setup: Select Option menu ([Figure 28](#)) that has the following functions:

- Timecode (7600MHD-REF model only): see [page 76](#).
- LTC (Longitudinal Time Code) (7600MHD-REF only): see [page 79](#).
- Clock Output – configuration of the Clock Output source.
- GPIO – comprehensive control of General Purpose Inputs and Outputs, including:
 - the input response mode
 - the action resulting from a GPI trigger
 - the event causing a GPO state change

The GPIO submenu for setting up GPI control is explained and shown in [Setup – GPIO Control on page 81](#).

- More... see [Setup: More on page 82](#).

Figure 28. Setup: Select Option Menu



Setup – Timecode (7600MHD-REF only)

The Timecode function will appear in the Setup – Select Option menu (Figure 28 on page 75) with the 7600MHD-REF model and provides the following:

- 2 outputs of Longitudinal Timecode (LTC) on the LTC 9 pin Sub-D connector (refer to *Timecode LTC Output (7600MHD-REF Model)* on page 40 for connector pinout information).
- Vertical Interval Timecode (VITC) superimposed on analogue video waveforms. This is enabled or disabled in accordance with the current group arrangement of the analogue signal outputs.
- Each SDI output offers a combination of:
 - Digital VITC (SMPTE S266) for SD signals only.
 - ATC (SMPTE RP188) for standard definition or high definition SD signals.

The Timecode menu (Figure 29 on page 77) includes the following selections:

- Jam Source
- Jam Mode
- JAM!
- Show Clock
 - **23.98Hz**
 - **24Hz**
 - **25Hz**
 - **29.97Hz (df)**
 - **29.97Hz**
 - **30Hz**

Figure 29. Setup – Timecode and LTC

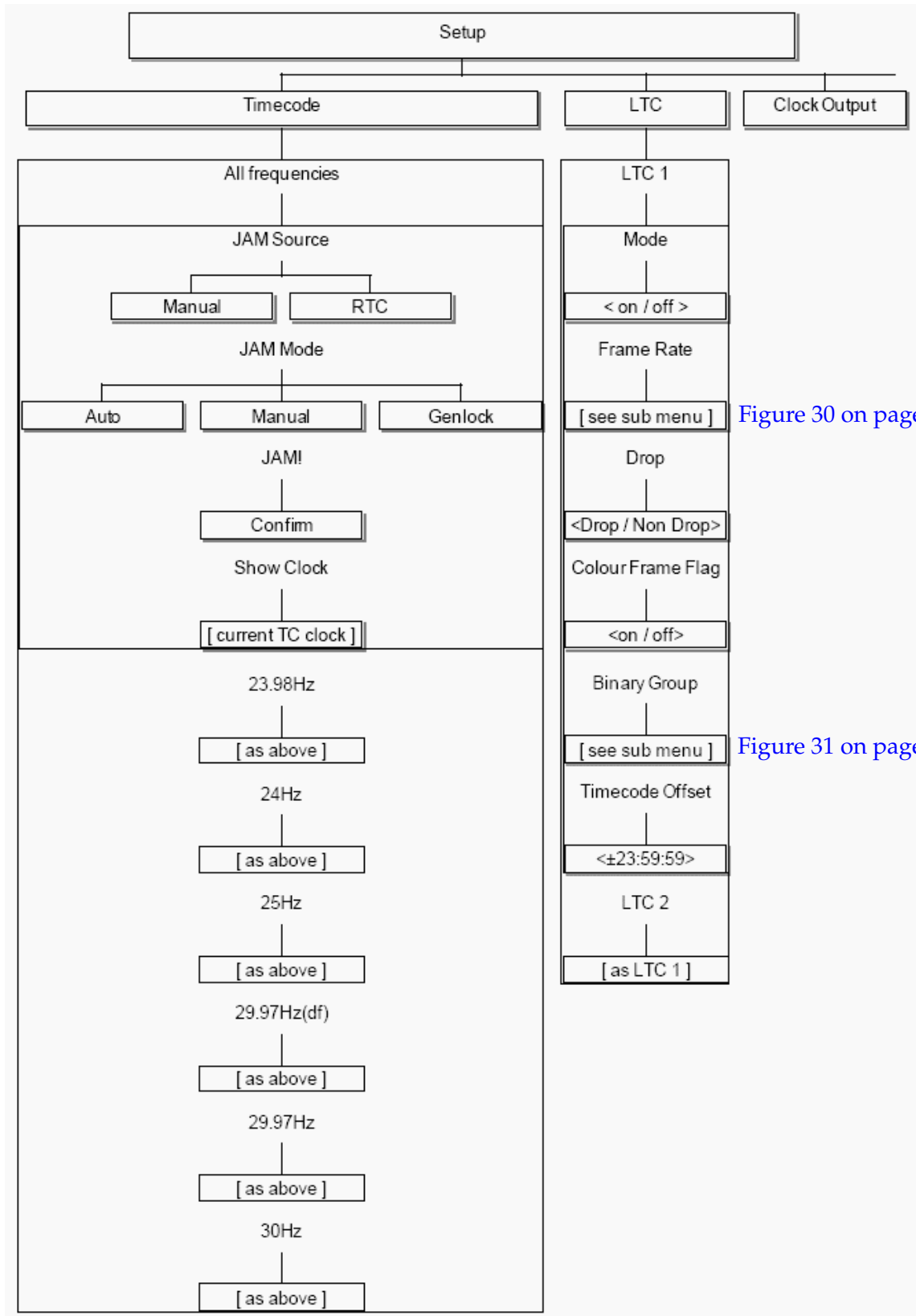


Figure 30 on page 80

Figure 31 on page 80

Timecode JAM

This is the process of setting the time carried on the timecode stream. To avoid discontinuity, it is important to carry this out carefully. The first branch of this submenu lists the base oscillator frequencies (23.98Hz etc.) used to derive the range of output signals. For example, to Jam the timecode for a 625 PAL signal, select the 25Hz option.

Jam Source

Select the Jam source form either:

- Manual: enter values manually
- RTC: uses the Real Time Clock, with the option to apply a manual offset.

JAM Mode

- Auto: sets a scheduled time
- Manual: on command

JAM!

Selecting JAM! initiates the JAM procedure.

Show Clock

Shows the time currently carried on the LTC stream.

Setup – LTC Menu (7600MHD-REF only)

The LTC (Longitudinal Time Code) branch of the Setup menu ([Figure 29 on page 77](#)) will appear on a 7600MHD-REF model with the Timecode menu. The following can be set for LTC 1 and LTC 2:

- Mode – turns the timecode on and off.
- Frame Rate – since LTC is not contained within a video waveform, the timing must be set either explicitly or associated with one of the signal outputs.

Refer to the [LTC Frame Rate Submenu on page 80](#).

- Drop/Non-Drop – relates to 525/NTSC line timecode and determines whether frames are dropped to compensate for the non-integer number of NTSC frames per second.
- Color Frame Flag – this is a single bit within the data stream which indicates whether timecode is related to the video signal. This menu option allows the operator to turn this bit on or off.
- Configure User Bits – the primary function of the Flag Bits is to allow the operator to embed a date code within the data stream since timecode represents only embedded time. This conforms to SMPTE S309.

Refer to the [LTC – Configure User Bits Submenu on page 80](#).

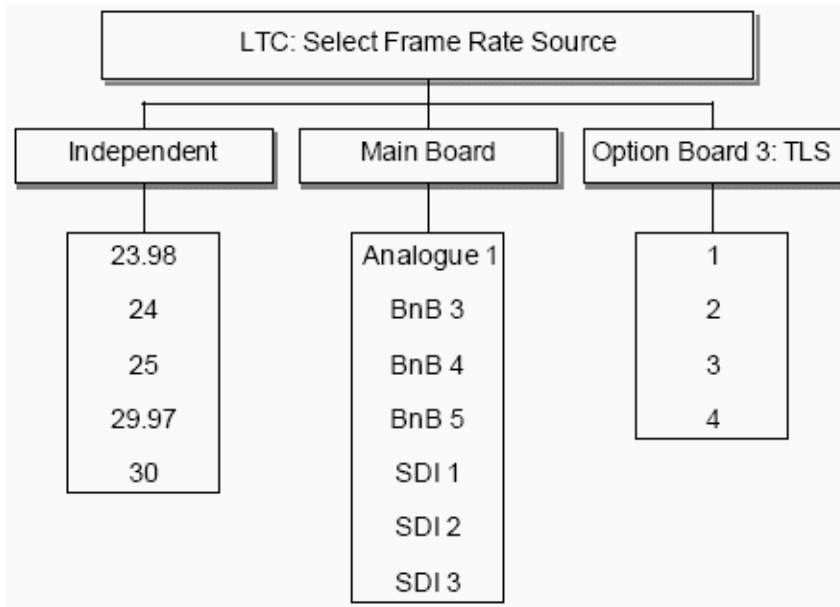
- Timecode Offset – an additional offset may be applied to any timecode output with a value between -23h: 59m: 59s and +23h: 59m: 59s. The default is 0h: 0m: 0s. This offset is applied immediately. Timecode outputs using the same oscillator frequency will remain in-step using the Timecode JAM settings applied in the Timecode JAM menu.

Refer to [Timecode JAM on page 78](#).

LTC – Frame Rate Source Submenu

The LTC Frame Rate Source submenu is shown in [Figure 30](#).

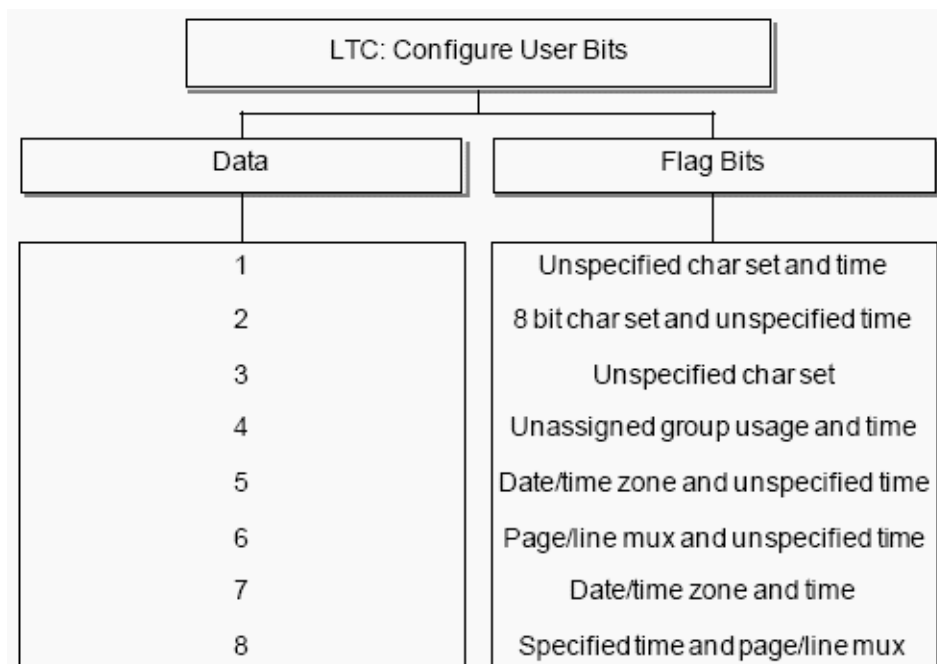
Figure 30. LTC Frame Rate Submenu



LTC – Configure User Bits Submenu

The LTC Configure User Bits submenu is shown in [Figure 31](#).

Figure 31. LTC Configure User Bits Submenu



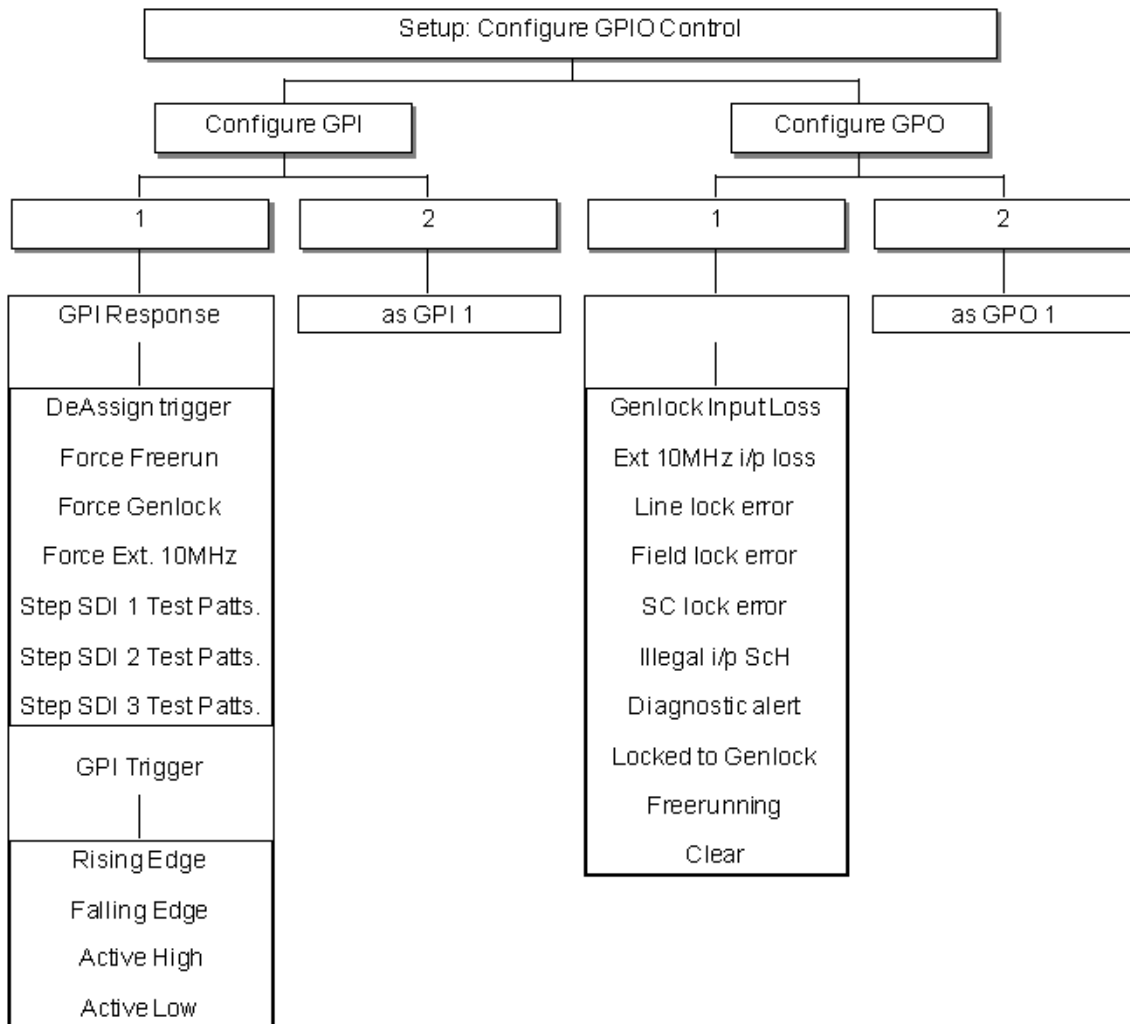
Setup – GPIO Control

The Setup: Configure GPIO Control menu shown in [Figure 32](#) has the following configuration settings:

- Configure GPI – the actions which the 7600REF will carry out when a control signal is applied to GP Input 1 or 2.
- Configure GPO – the signal which will appear on the 7600REF output when a defined condition occurs. As can be seen, this is normally an error or alarm condition.

GPI wiring is described in [GPI Inputs 1 and 2 on page 36](#) and [GPI Outputs 1 and 2 on page 37](#).

Figure 32. GPIO Menu



Setup: More

The Setup: More menu is shown in [Figure 33 on page 83](#) and includes branches for the following functions:

- Config memory – Manage internal memory banks 1-4. A complete operational setup may be stored or retrieved at any time.
- RTC Setup – Set up the real-time clock (RTC) for the sync source, daylight savings on or off, pick the locale, select show, date and time, and time zone.
- NTP – Configure the Network Time (NTP) capability (7600MHD-REF). Refer to [Setup: More – NTP \(7600MHD-REF Model\) on page 84](#) for more detailed information.
- Comms – Configure network communication with the 7600REF (see [Setup: More – Comms on page 85](#)),
- Display – Adjust the LCD display by:
 - Disabling or enabling the menu timeout and setting the time period.
 - Adjusting the display contrast.
- Master/Slave – Configure the 7600REF as Slave, allowing settings to be retrieved from a Master. This is useful when configuring a pair of units in fail-safe mode. Only the Master need be configured; the Slave can request settings from a Master.
- Upgrade – Update the 7600REF including:
 - Server mode and address
 - Additional features and test patterns where applicable.
- Boot Delay – Adjust the boot delay if applicable.

Figure 33. Setup: More Menu

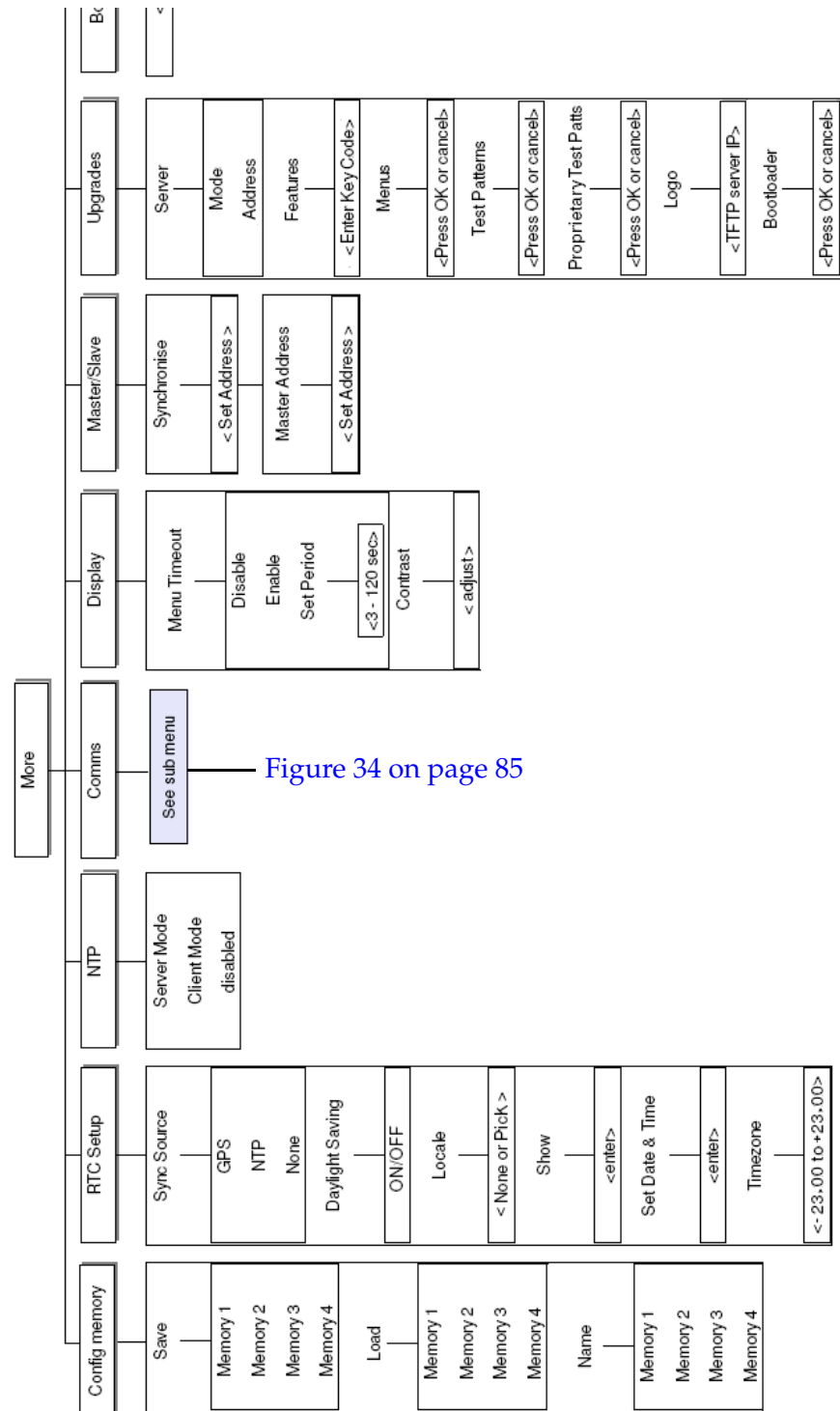


Figure 34 on page 85

Setup: More – NTP (7600MHD-REF Model)

The Network Time Protocol (NTP) software function is included with the 7600MHD-REF model ([Figure 33 on page 83](#)) and offers the following for Server/Client operation:

- Both **Client** and **Server** modes are available. Only one of these modes may be enabled at one time.
- If installed, the menu will offer **Server**, **Client**, and **Disabled**. **Client** and **Server** are mutually exclusive. NTP is intended for change-over units to keep them both in sync.
- The Client can sync to any Internet NTP server.
- When acting as a server, the 7600REF should ideally, have a GPS module installed (included with the 7600MHD-REF model) but this is not a requirement. Even if the server is free running, a slave can still sync to it.

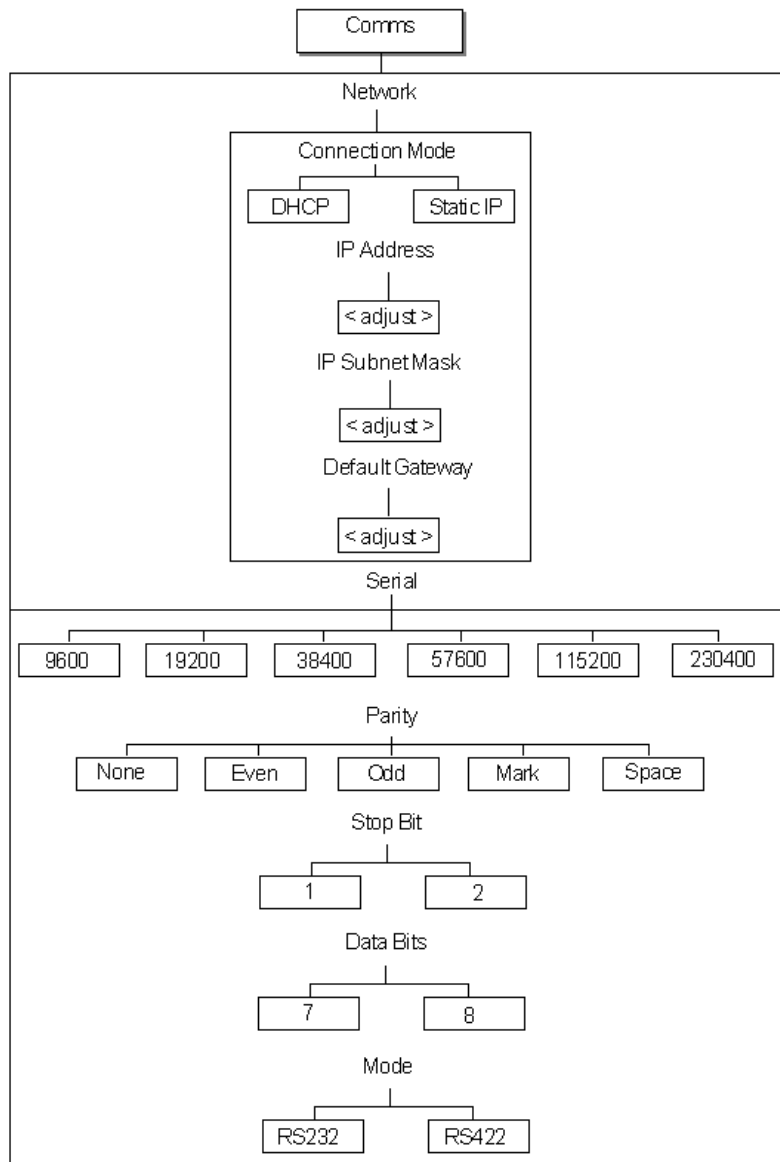
Setup: More – Comms

The Setup: More – Comms menu (Figure 34), provides network and serial port setup.

The Ethernet Port is used to connect the 7600REF to a LAN, or to a laptop PC when performing upgrades. The settings required are primarily governed by the network arrangements at the site and are explained in [Local Area Networks on page 100](#). A network connection will also be required if the NTP function in the 7600MHD-REF model is used.

The serial port is used primarily during the manufacturing process but in RS422 mode it offers a range of functions. Contact Technical Support for more information.

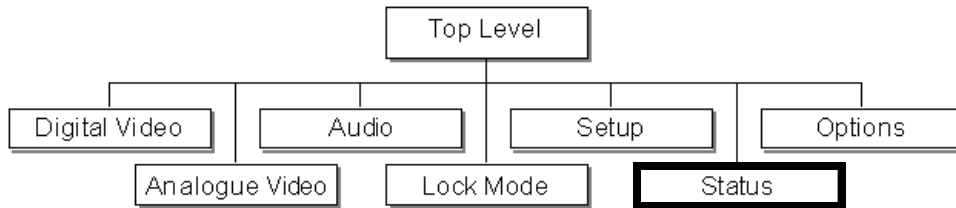
Figure 34. Setup: More – Comms Menu



Status Menu – Top Level

Access to the Status top level menu is shown in [Figure 35](#). Selecting Status will bring up the menu shown in [Figure 36 on page 87](#).

Figure 35. Top Level Menu – Status



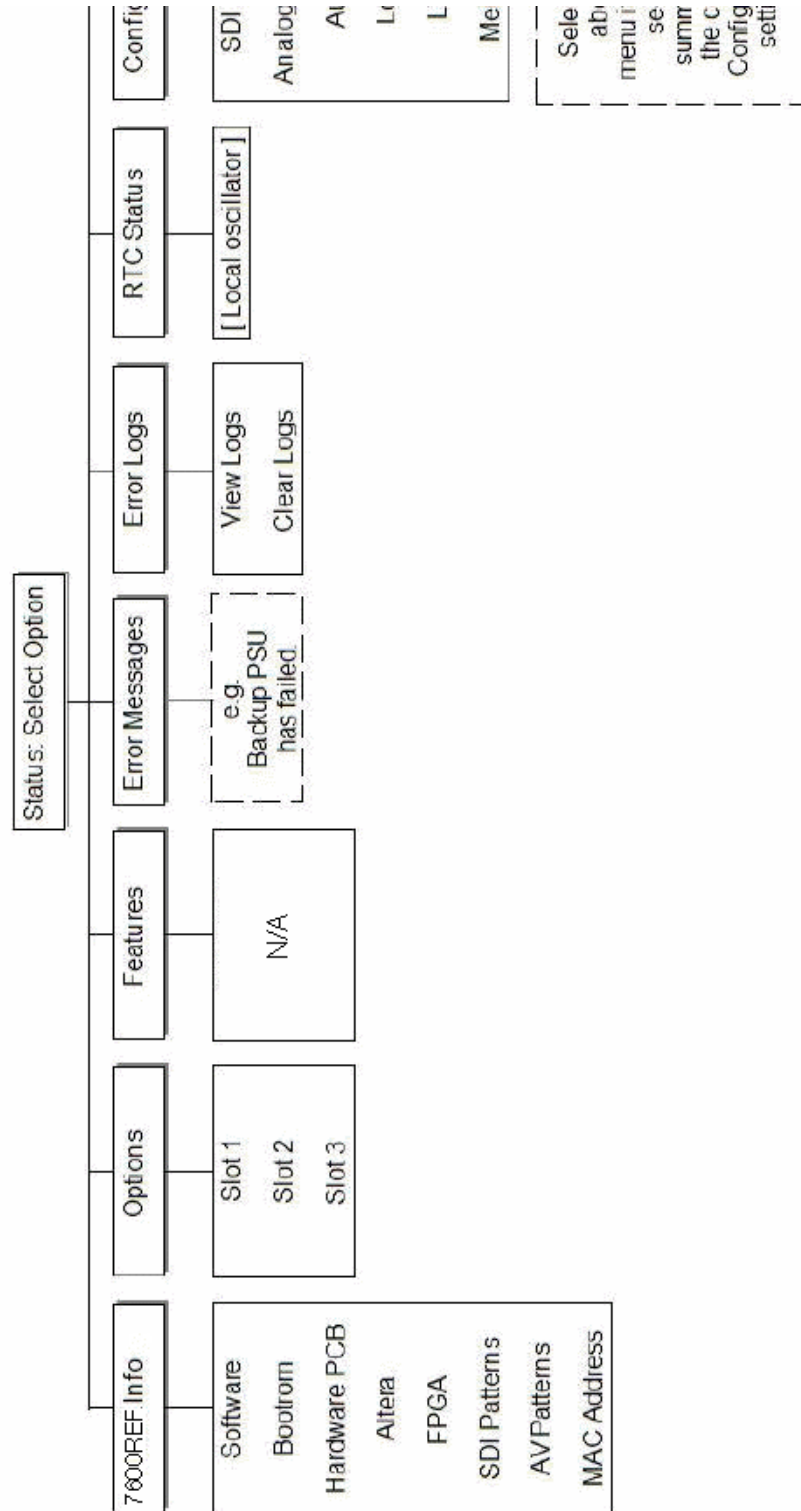
In addition, a dedicated **STATUS** button on the front panel will also bring up this Status menu. Should an error condition such as loss of genlock occur, the lamp in the **STATUS** button on the front panel will flash to draw the attention of the operator. The display text, which can be displayed by pressing the **STATUS** button, will change to indicate that an error message is available.

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

The Status menu ([Figure 36 on page 87](#)) includes the following status reporting items:

- 7600REF Info – reports software and hardware information about the frame.
- Options – shows status of the three possible options. See also [Options Menus –Top Level on page 88](#).
- Features – not applicable for this version.
- Error Messages – error messages will appear when applicable.
- Error Logs – Allows viewing or clearing of logs.
- RTC Status – reports the local oscillator.
- Configuration – selecting a menu item will give a summary of the configuration.

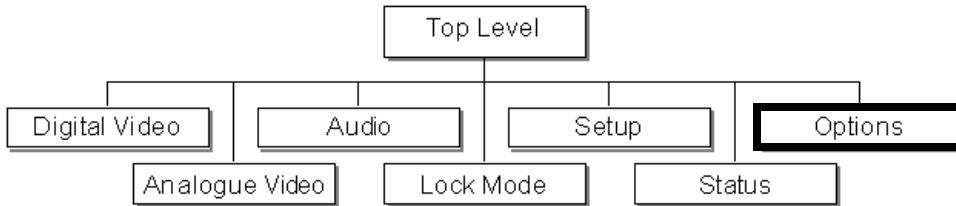
Figure 36. Top Level – Status Menu



Options Menu –Top Level

Access to the Options top level menu is shown in [Figure 37](#).

Figure 37. Top Level Menu – Options



Available hardware and software options on the different model types are enabled at the factory. An option will appear in the menu trees if it is included in the model. Refer to [7600REF Models on page 32](#) for the list of options included in each model.

There are three option slots for adding functionality for different 7600REF models. When options are installed, the Options menu will have the following menus:

- Option 1: GPS (see [Option Slot 1: GPS \(7600MHD-REF Only\) on page 89](#)) on the 7600MHD-REF model.
- Option 2: Not used in this application.
- Option 3: TLS option (see [Option 3: HD Tri-Level Sync \(7600HD-REF and 7600MHD-REF Models\) on page 97](#)).

Option Slot 1: GPS (7600MHD-REF Only)

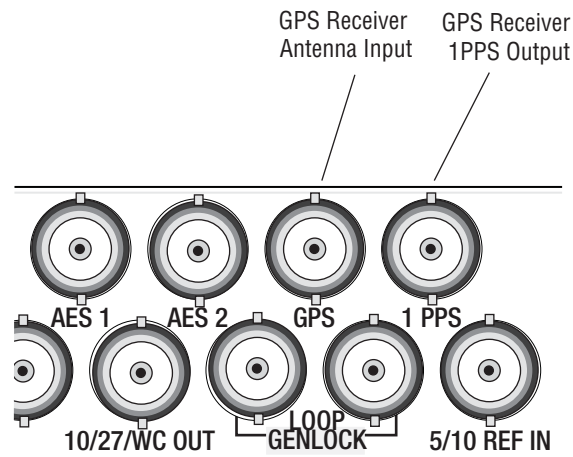
The 7600MHD-REF model will come with the Global Positioning System (GPS) module installed in Option Slot 1. The GPS is currently the only fully-functional Global Navigation Satellite System. More than two dozen GPS satellites are in medium Earth orbit, transmitting signals allowing GPS receivers to determine the receiver's location, speed, and direction.

Note The GPS receiver may only be installed in Slot 1.

GPS also provides a precise time reference used in many applications including synchronization of telecommunications networks.

The GPS BNCs active on the 7600MHD-REF model are shown in [Figure 38](#).

Figure 38. GPS BNCs



- The 1PPS (1 Pulse Per Second) output is a precise TTL level pulse which may be terminated into 75 ohm when connected into external equipment.
- The Antenna input should be connected to a high quality 50 ohm GPS antenna.

GPS Antenna Requirements

The GPS requires an external antenna with the following characteristics:

- Active single antenna powered from the 7600REF antenna connector.
- Currently shipping versions require 5V DC.

Note Earlier versions (before 2007) required 3V DC. Check with Customer Service if you have any doubt about voltage requirement.

- Reception frequency optimized for 1575.42MHz.
- 10dB to 50dB gain as measured at receiver input (antenna performance dictated by antenna manufacturer). Antenna types with lower gain performance cannot support longer cable runs.

Note Magnetic patch antennae suitable for vehicle mounting will also be satisfactory but only with very short cable runs.

Recommended antenna type (See [GPS Outside Manufacturer Equipment Disclaimer on page 92](#)):

- Trimble Bullet III with TNC or F termination at 5V DC. See note above concerning earlier frame 3V DC requirements.
- Other suitable antennae may be available. Check manufacturer's specifications.

Antenna Location

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

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

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

GPS Cable Considerations

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

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

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

GPS Cable Type Suggestions

The following cable types are suggested (see [GPS Outside Manufacturer Equipment Disclaimer on page 92](#)). Refer to [Table 10 on page 92](#) for a cable summary.

- For cable runs <35m (120 feet) use RG59 cable. This is a low cost 75 ohm cable but is relatively easy to source and terminate.
- For cable runs <70m (230 feet) use cable type CT125 (known as CX125 in some markets). This is a 75 ohm cable used for CCTV and Satellite TV installations.
- For cable runs <100m (320 feet) use cable type LMR400. This is a high-quality 50 ohm cable. An ultra flexible version is also available but with slightly higher attenuation, reducing the maximum cable length to 85m. BNC connectors are available for the LMR400 series. Cable type CT150 can also be used for cable runs approaching 100m but it has 75 ohm impedance so the LMR400 is preferred.

Table 10. Recommended Cable Types for Use with Trimble Bullet III Antenna

	RS59	CT125¹	CT167	LMR400
Nominal Impedance (ohms)	75	75	75	50
Nominal Diameter (mm)	6.15	7.8	10.1	10.3
Cable run <35 meters	X	X	X	X
Cable run <50 meters	–	X	X	X
cable run < 70 meters	–	X	X	X
Cable run <100 meters	–	–	X	X

¹ CT125 also marketed as CX125

GPS Outside Manufacturer Equipment Disclaimer

Grass Valley is not connected in any way with any of the above manufacturers. The information above is given in good faith from information in the public domain at the time of this manual release. Many similar antennae and cable types are available and specifications change over time. Some degree of experimentation may be required if the location is shrouded by adjacent structures, buildings, etc. Excessive cable length will adversely affect performance.

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

GPS Acquisition Process

With satisfactory reception, the acquisition process commences automatically and takes around 15 minutes. An enhanced mode (Site Survey) is suitable for static installation and may be initiated from the Site Survey selection on the GPS menu. A complete Site Survey can take around 2 hours. Once completed, it provides more accurate timing signals.

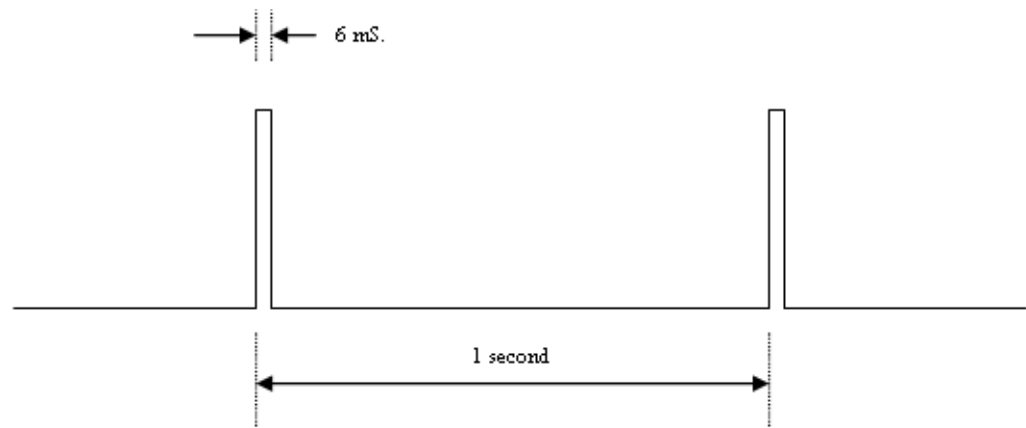
The front panel display provides information on both visible and tracked satellites. An indication of suitable values is given [Table 11](#) for guidance.

Table 11. Visible and Tracked Satellites

Satellites	Minimum	Maximum
Visible	8	10-12
Tracked	5	8-10

A 1 Pulse Per Second (1PPS) signal waveform is illustrated in [Figure 39](#).

Figure 39. 1PPS Signal Waveform



The leading edge of the 6 ms wide, positive going pulse provides the timing reference plane for locking external equipment.

Internally, this signal locks the 27MHz PLL Oscillator such that PAL output signals are both frequency-locked and phase-locked. Any NTSC output signals are frequency-locked but cannot be phase-locked.

GPS Menu Structure

With the 7600MHD-REF model, the GPS option is installed in Slot 1 and will appear in the Options menu branch shown in [Figure 40 on page 95](#).

The Options GPS menu is detailed below.

- **Status** – see [Status Menu – Top Level on page 86](#).
- **PPS Lock** – if the PPS Lock mode is set to On, it only affects the Internal Free Run mode of genlock. The internal oscillator is then locked to the GPS reference.
- **Crash Lock** – if the Crash Lock mode is set to On, the output signal is subject to a single large disturbance followed by a period of approximately 10 minutes for settling. If the Crash Lock is Off, convergence may take many hours.
- **ATR Lock** – the concept of ATR (Absolute Time Reference) is covered by SMPTE Proposal 404 and is also known as SMPTE epoch. It defines a starting point of midnight on January 1st, 1958, at which time all generating equipment is deemed to be phase locked.

In order to make use of the ATR definition, precise date/time provided by the GPS receiver is required. This allows the current state of the 7600REF to be computed with regard to the epoch as defined by ATR. By accurate determination of current time, any ATR equipped items may be locked together again.

- **Site Survey** – a site survey can take up to 2 hours to complete. It may be initiated at any time, but would normally only be carried out when the unit is in a fixed installation location with a high quality antenna. Status of the Site Survey is shown in the Status submenu shown in [Figure 41 on page 96](#).
- **Cable Length** – provides compensation for the propagations delay of the antenna cable.

Figure 40. GPS Menu

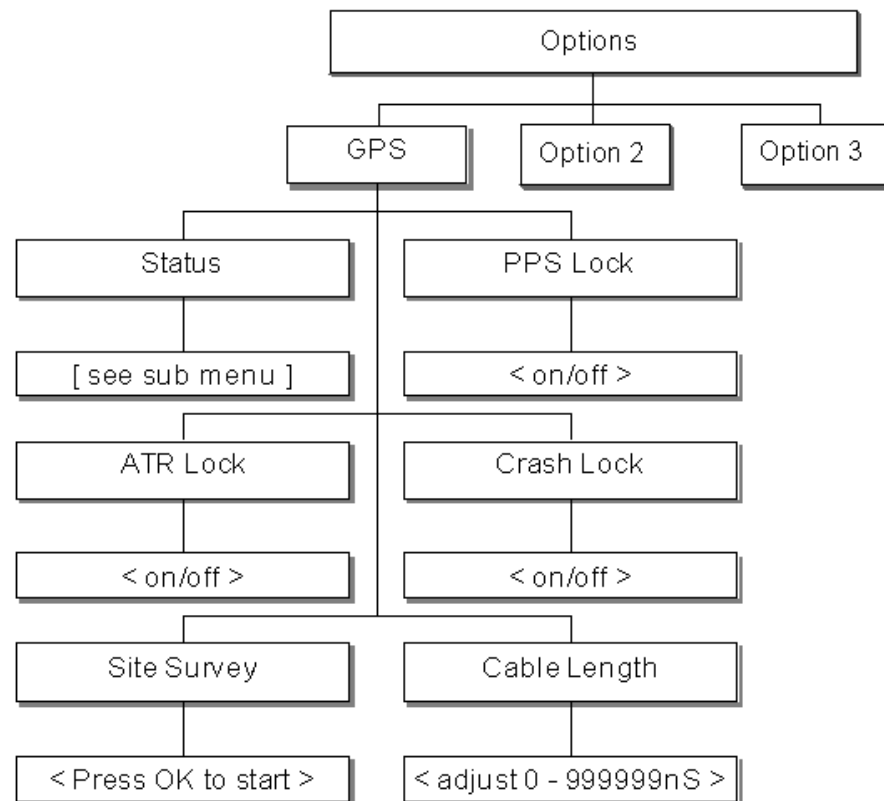


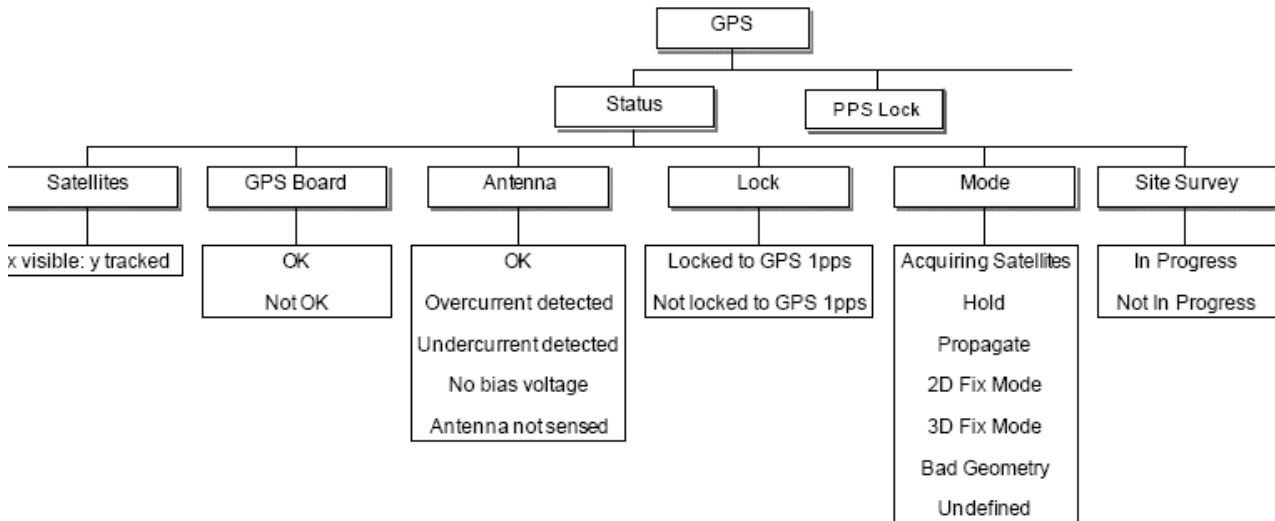
Figure 41 on page 96

The GPS Status submenu is shown in [Figure 41 on page 96](#). It displays the status of the following GPS functions:

- **Satellites** – displays the number of satellites visible and those actively tracked (see [GPS Acquisition Process on page 93](#)). The time taken to acquire satellites can be 10 or 25 minutes since the almanac data is broadcast fairly infrequently.
- **GPS Board OK/Not OK** – shows the current status of the internal GPS board.
- **Antenna** – provides a basic functionality test of the GPS antenna and reports one of the the following:
 - OK
 - Overcurrent detected
 - Undercurrent detected
 - No bias voltage
 - Antenna not sensed
- **Lock** – indicates whether the board is locked to the GPS 1pps signal.

- **Mode** – displays the current mode of the antenna as:
 - Acquiring Satellites
 - Hold
 - Propagate
 - 2D Fix Mode
 - 3D Fix Mode
 - Bad Geometry
 - Undefined
- **Site Survey** – status is displayed as:
 - In Progress
 - Not In Progress

Figure 41. GPS Status Submenu



Option 3: HD Tri-Level Sync (7600HD-REF and 7600MHD-REF Models)

The four available Tri-Level BNCs can be individually configured from the Options 3: TLS menu shown in Figure 42. Each output can be selected for a particular standard as given in Table 12 on page 98. Then the Line, Field, and Frame timing offsets can be adjusted or cleared if desired. The scan format is indicated by P (Progressive), I (Interlaced), or sF (segmented frame).

Note Some timing options are not available with specific standards; this is indicated in Table 12 on page 98.

Figure 42. Option 3: TLS Menu

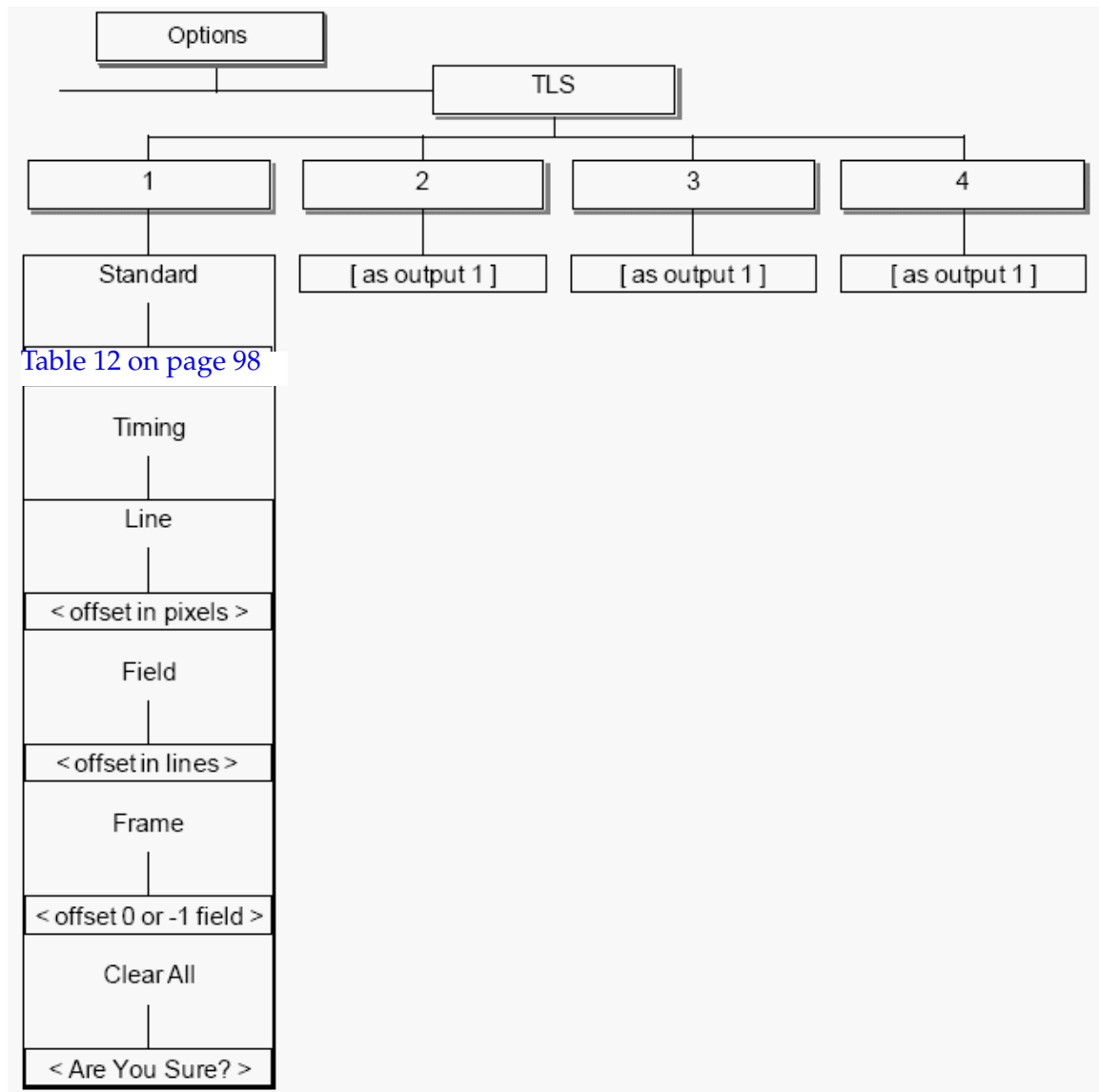


Table 12. Tri-Level Sync Standards

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

Common Configurations for 7600MHD-REF

This section provides instructions on setting up a 7600MHD-REF in two commonly used modes.

GPS Locked SPG and Timecode Generator Configuration

Connect a suitable 50 ohm cable and antennae to your GPS output. Refer to [GPS Antenna Requirements on page 90](#).

Perform the following configuration:

1. Press Option on the front panel and select GPS.
2. Turn PPS Lock, Crash Lock and ATR Lock on (see [Figure 40 on page 95](#)).
3. Select Options, then GPS, then Status and wait for **Locked to 1 PPS** to come on ([Figure 40 on page 95](#)).
4. Navigate to Setup, select More, then under RTC Setup, select the Sync Source as **GPS** (see [Figure 33 on page 83](#)).
5. Go to Setup, Timecode, All Frequencies, ensure **RTC** is selected in Jam Source ([Figure 29 on page 77](#)).
6. Then press **JAM!**.

The 7600MHD-REF Timecode should now reflect the GPS time and the Black and Burst outputs should be locked to the GPS 1 PPS signal.

GPS Locked NTP Server Configuration

Connect a suitable 50 ohm cable and antennae to your GPS output. Refer to [GPS Antenna Requirements on page 90](#).

Perform the following configuration:

1. Press Option on the front panel and select GPS.
2. Turn PPS Lock, Crash Lock and ATR Lock on (see [Figure 40 on page 95](#)).
3. Select Options, then GPS, then Status and wait for **Locked to 1 PPS** to come on ([Figure 40 on page 95](#)).
4. Navigate to Setup, select More, under NTP select **Server Mode** (see [Figure 33 on page 83](#)).
5. Go to Setup, More, Comms and enter the static relevant IP Address, IP Subnet Mask, and Default Gateway ([Figure 34 on page 85](#)).

The 7600MHD-REF should now be serving requests for NTP time.

Using a TFTP Server

The use of an TFTP (Trivial File Transfer Protocol) server with the 7600REF models allows the customer to upgrade software in the field, and, if necessary, generate a copy of the 7600 log file to send to Technical Support for troubleshooting purposes.

The 7600 log is a unique digital signature for each 7600 frame and describes the options that are enabled. As mentioned earlier, options come already enabled from the factory so using this function to create a log file for enabling options should not be required unless requested by Customer Service.

However, software upgrades may be performed in the field using the TFTP server. See [Updating 7600 Software on page 103](#).

To prepare a TFTP Server refer to [Preparing a TFTP Server on page 101](#). The suggested shareware application is called Solarwinds and can be downloaded from <http://solarwinds.com/downloads> if required.

Run the installing program, accepting all default options. Note that you may require Administrative rights under Windows to install new applications.

Local Area Networks

In order to communicate with the TFTP server, the 7600REF must have a valid IP Address in the same subnet (range) as the server.

- If communication is via a company network, then IP addresses may be automatically allocated using DHCP.
- If the 7600REF is connected to a small network specifically established for technical equipment, then static IP addresses may be in use and the 7600 should be configured accordingly.
- If the 7600REF is not currently connected to a LAN, Solarwinds may be installed on a laptop which is then connected to the 7600REF with a crossover Ethernet cable.

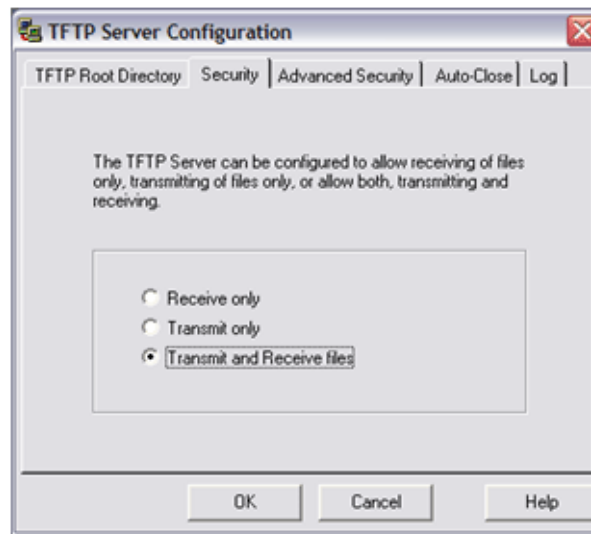
The 7600REF Ethernet port is configured using the Setup menu, then navigating to the Comms menu. Refer to [Setup: More – Comms on page 85](#).

Preparing a TFTP Server

Application of the supplied file requires the use of a TFTP server.

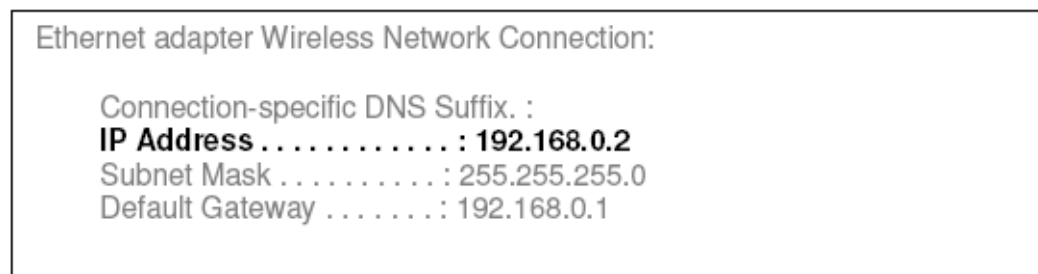
1. Install Solarwinds on a PC which will be accessible by the 7600REF. See the discussion on [Local Area Networks on page 100](#).
2. After installation, from the Windows Start menu, launch Solarwinds TFTP software and select Configure from the File menu.
3. Select the Security tab ([Figure 43](#)) and ensure that the **Transmit and Receive files** option is selected.

Figure 43. TFTP Server Configuration



4. Using Windows Explorer, copy the supplied files into the TFTP root folder normally installed at C:\TFTP-root.
5. Note the IP Address of the TFTP server. On the PC, select **Run** from the Windows Start menu. Type **cmd**, then press **OK**. A command prompt window will open. Type **ipconfig** and press **Enter**. From the text which returns, locate the IP address. Refer to the example in [Figure 44](#).

Figure 44. TFTP Server Configuration



Preparing the 7600REF

1. Power up the 7600 and wait for initialization to complete.
2. Navigate to the Setup, More, Upgrades, Server Address menu (Figure 33 on page 83). Enter the IP address of the TFTP server and press **OK**.

Generating the Log File (Digital Signature)

This process is only necessary when enabling options which is done at the factory. However, at some point this log may be needed when working with Customer Service so the procedure is included here.

1. Navigate the 7600 to Setup, More, Upgrades, Features, Generate Log.
2. A file will now be created in the TFTP root folder. Retrieve this file and email it to Technical Support as requested.
3. This process is for enabling options which should only be necessary when requested by Customer Service.

Updating 7600 Software

When new software code for the 7600REF is available it can come in three forms:

- Firmware
- Changes to test patterns
- Changes to menu structure

This code may be installed using the TFTP server method (see [Preparing a TFTP Server on page 101](#)) with a series of programming files which are available from Technical Support.

Note It is not necessary to generate the log file as described earlier in the option upgrading explanation.

Preparing to Update

Refer to the following sections to set up your 7600 for TFTP server functionality:

- Download and install TFTP Server (see [Using a TFTP Server on page 100](#))
- Local Area Network considerations (see [Local Area Networks on page 100](#))
- Preparing a TFTP Server (see [Preparing a TFTP Server on page 101](#))

Preparing the 7600REF

1. Power up the 7600REF and wait for initialization to complete.
2. Navigate the 7600 to Setup, More, Upgrades, Server Address ([Figure 33 on page 83](#)).
3. Enter the IP address of the TFTP server as previously noted and press the **OK** button.

Completing the Process

1. Navigate the 7600REF to Setup, More, Upgrades and choose the appropriate option for the component being upgraded.
2. The message, **Upgrade Successful**, appears on the 7600REF LCD screen once the upgrade process is complete.
3. The unit is now ready for use with the new code installed.

Specifications

The specifications for the 7600REF Reference Generator frame and modules are given in [Table 13](#).

Table 13. 7600REF Frame Specifications

Parameter	Value
Frame Dimensions	
Width	19 in. rack mounting
Height	44 mm (1.75 in.) 1 Rack Unit
Depth	433 mm (17.0 in.) excluding connectors
Weight	4 kg , 8.82 lbs with no option modules 5 kg, 11 lbs, maximum with option modules
Operating temperature range	0 to 50 degrees C, 32 to 122 degrees F
Storage temperature range	-25 to 70 degrees C, -13 to 158 degrees F
Operating humidity	95% RH non-condensing
Power	
Mains input voltage range (x2)	90-264 VAC, 45-63Hz, 440Hz auto-select
Power consumption (maximum)	60 VA (depending on model)
Internal fuse	3.15 A
EMC¹	
Emissions	EN55103-1, Environment E2
Radiated	EN55103-2, Environment E2
Safety	EN60950
Internal Reference Oscillator Stability	
Nominal error	< ± 0.5 Hz (0.1ppm)
Temperature stability	< ± 0.05 ppm
Ageing rate (per year)	< 0.5 ppm
Warm-up setting time to <0.05 ppm	10 minutes @ 25 degrees C, 77 degrees F
Genlock Video Input Performance	
Note: The unit's lock mode is assumed set to manual subcarrier phasing, correct ScH or follow-external ScH phase, unless otherwise noted.	
Video input type	2 BNC, high impedance loop-through
Return loss @ subcarrier	< -40 dB
Video DC range	< ± 12 V
Video signal amplitude (to remain in spec.)	
625 operation	300 mV sync/burst ± 6 dB
525 operation	285 mV
Sync attenuation (below which signal is indicated as missing)	-8 dB (with respect to 300 mV/625 or 285 mV/525)
Burst attenuation (below which signal will be monochrome)	-8 dB (with respect to 300 mV/625 or 285 mV/525)
Sync frequency lock range	
625 operation	15.625kHz ± 1.5 Hz (± 100 ppm)
525 operation	15.734kHz ± 1.5 Hz (± 100 ppm)

Table 13. 7600REF Frame Specifications

Parameter	Value
Subcarrier lock range	
625 operation	4.43361875MHz \pm 200Hz (\pm 50 ppm) ²
525 operation	3.57954 MHz \pm 200Hz (\pm 50 ppm) ²
Genlock video lockup time	< 7 seconds
Output sync jitter with respect to clean genlock video input	< \pm 3 ns
Output subcarrier jitter with respect to clean genlock video input, lock mode = EXT 1/2/3	< \pm 0.25 degrees
Output subcarrier jitter with respect to clean genlock video input, lock mode = EXT 4	< \pm 2 degrees
Input video ScH phase (over which ScH error is indicated)	+90, \pm 15 degrees, -90, \pm 15 degrees (approximate)
Genlock video sync to output sync timing accuracy, over full operating temperature range	< 5 ns
Genlock video subcarrier to output subcarrier phase accuracy over full operating temperature range	< 5 degrees
Vertical lock up rate, genlock video to output (when unit is set to line drop mode)	1 line/5 fields
Genlock Operational Control	
Horizontal offset adjustment range	\pm 32 μ s
Horizontal offset resolution	1 ns
Horizontal offset accuracy	\pm 5 ns over full range
Subcarrier phase adjustment range	0 to 359.9 degrees
Subcarrier phase resolution	0.1 degree
Line offset adjustment range	1 line steps over entire 525/625 range
10 Mhz Input Performance (lock mode assumed set to external 10 MHz)	
10 MHz input type	1 BNC, 75 ohm terminated
10 MHz input return loss @ 10 MHz	< -35 dB
10 MHz DC range	< \pm 3 V
10 MHz signal amplitude (to stay within spec)	0.5 V to 3 V p-p (terminated)
Signal amplitude (below which signal will be indicated as missing)	0.4 V
10 MHz frequency lock range	10MHz, \pm 200Hz (\pm 20 ppm)
Lockup time	< 0.1 seconds
Output sync jitter with respect to clean 10 MHz input	< \pm 2 ns
Output subcarrier jitter with respect to clean 10 Mhz input	< \pm 0.2 degrees

Table 13. 7600REF Frame Specifications

Parameter	Value
SD-SDI Outputs	
General	
Format	270Mb/s, 10 bit
Standards	ITU-R BT 601, 656, EBU Tech 3267, SMPTE 125M, 244M, 259M, 272M, RP165, RP178
Video	
Output impedance	75 ohm
Amplitude	800 mV p-p \pm 10%
Return loss	>15 dB at 270MHz
Overshoot	< 10%
Jitter	< 0.2 UI, above 10 Hz jitter frequency
Rise/Fall times	0.4 to 1.5 ns (20-80%)
DC offset (AC coupled)	0 \pm 0.5 V
Time offset with respect to main black burst signal	< \pm 100 ns
Embedded Audio	
Active channels	4
Group	Selectable 1, 2, 3, or 4
Sample frequency	48 kHz
Digital coding	24 bits
Audio tone	25 Hz to 20 kHz in 25 Hz steps
Audio level	0 to -120 dBfs
Tone modes	On, Off, CCIR, and EBU
HD-SDI Outputs	
General	
Standards	SMPTE 272M, 292M, 296M
Formats	<ul style="list-style-type: none"> • 1080i: 60Hz, 59.94Hz, 50Hz • 1080p: 30Hz, 29.9 Hz, 2 Hz, 24Hz, 23.98Hz • 1080psF: 30Hz, 29.97Hz, 25Hz, 24Hz, 23.98Hz • 720p: 60Hz, 59.94Hz, 50Hz, 30Hz, 29.97Hz, 25Hz, 24Hz, 23.98Hz
Video	
Output impedance	75 ohm
Amplitude	800 mV p-p, \pm 10%
Return loss to 270 MHz	<ul style="list-style-type: none"> • > 15 dB, 5 MHz to 750 MHz • > 10 dB 750 MHz to 1.485 GHz (typical)
Overshoot	< 10%
Jitter	< 135 ps
Rise/Fall times	< 270 ps (20-80%)
DC offset (AC coupled)	0, \pm 0.5 V

Table 13. 7600REF Frame Specifications

Parameter	Value
Embedded Audio	
Active channels	4
Group	Selectable 1, 2, 3, or 4
Sample frequency	48kHz
Digital coding	24 bits
Audio tone	25Hz to 20kHz in 25Hz steps
Audio level	0 to -120 dBfs
Tone modes	On, Off, CCIR, and EBU
Analogue Video Output Performance	
Output impedance	75 ohm, $\pm 0.2\%$
Sync amplitude	
625 operation	300 mV, ± 3 mV
525 operation	285 mV, ± 3 mV
Burst Amplitude	
625 operation	300 mV, ± 9 mV
525 operation	285 mV, ± 9 mV
Black DC level	0 V, ± 20 mV
Noise to 20 Mhz	< -60 dB (with respect to 700 mV)
Noise above 20 MHz	< -40 dB (with respect to 700 mV)
Sch accuracy, all controls set to zero	± 5 degrees
Sync edge rise time	
625 operation	250 ns, Gaussian
525 operation	140 ns, Gaussian
Burst edge rise time	
625 operation	350 ns, Gaussian
525 operation	300 ns, Gaussian
Timing difference between any analogue video output and any other (all controls set to zero)	± 10 ns
Timing difference between any black burst output and Genlock Video input (all controls set to zero)	± 10 ns
Generation accuracy	10 bit
Timing accuracy channel to channel	< ± 5 ns
Level, 0 dB: p-p	1 V, $\pm 1\%$
Black level, DC	0 V, ± 25 mV
Chrominance/Luminance gain	< 1%
Chrominance/Luminance delay	< 5 ns
Chrominance phase accuracy	< ± 5 degrees
Linearity	< 0.25%
Frequency response to 6 MHz	± 0.2 dB
Differential gain	< 0.5%
Differential phase	< 0.5 degrees
2T K rating	< 0.5%K

Table 13. 7600REF Frame Specifications

Parameter	Value
ScH accuracy	±5 degrees
Line tilt	< 0.5%
Field tilt	< 0.5%
Channel crosstalk (0 to 5.8 MHz)	< -60 dB
AES/EBU Outputs	
Standard	ANSI S4.40 (AES3)
Output channels	4 (2 AES/EBU pairs)
Synchronism	The signal timing is derived from the video clock source, either the internal oven oscillator or the genlock feed. 48 kHz signal is related to video frame as per SMPTE/EBU recommendations.
Grade ³	Meets Grade 1 when genlock lock mode = internal or stable 10 MHz reference used.
Clock jitter ³	< 1 ns
Output connectors	D9 socket (balanced), BNC (unbalanced) - optional with 7600MHD-REF
Signal amplitude	5 V, ±0.3 V
Impedance	110 ohm, ±10%
Tone resolution	24 bit
Tone linearity error	< 1 ppm
Sample frequency control	Selectable from 32 kHz, 44.1 kHz, 48 kHz, or 96 kHz
Tone frequency adjustment	25 Hz to 20 kHz in 25 Hz steps. Left/right channel independent adjustment.
Tone amplitude adjustment	0 to -120 dBfs, left/right channel independent adjustment
Tone identification	Left/right channels can pulse according to EBU/CCIR recommendations
Grade	Grade bit manually adjustable between Grade 1 and Grade 2
User data	User configurable
Other	Both channels may be set to Silence. Channels can be swapped.
Analogue Audio Output Performance	
Signal source	Independent audio generator
Number of channels	2
Output type	Differential, electronically balanced
Output impedance	Low impedance, < 10R
Tone amplitude	+20 dBu to -40 dBu, adjustable
Tone frequency	100Hz to 20kHz in 25Hz steps, left/right channel independent adjustment
Tone identification	Left/right channels can pulse according to EBU/CCIR recommendations.
Clock Output	
Frequency	Selectable 10MHz, 27MHz, or Word Clock
Output impedance	75 ohm, ±1%
Word clock	CMOS compatible 32kHz, 44.1kHz, 48 kHz, or 96 kHz (AES1 sample frequency).
10 MHz	1.2 V, ±100 mV
27 MHz	1 V, ±100 mV

Table 13. 7600REF Frame Specifications

Parameter	Value
GPI	
GPIO Inputs	
Number	2
Type	Grounding
Maximum voltage	±20 V
Operating current	600 µA (approximately)
GPIO Outputs	
Number	2
Type	Open drain
Maximum voltage	30 V
Maximum current	190 mA
Maximum dissipation	600 mW
LTC Timecode (7600MHD-REF Model only)	
Standard	SMPTE S12M, S309M
Output channels	2, electronically balanced
Connector	9-way, Sub-D socket
Level	2 V p-p into 1 kR
Impedance	< 25R per leg
Rise time	40 µs, ±10 µs between 10% and 90% points
Jitter	< 2 µs
Overshoot	< 5%
GPS Antenna (7600MHD-REF Model only)	
Power	Active single antenna power from the receiver module via the antenna connector
Voltage from GPS module	5 V DC
Reception frequency	Optimized for 1575.42MHz
Gain	10dB to 50dB as measured at receiver point (depending on antenna type)
Recommended antenna model	Trimble Bullet III with TNC or F connectors, 5V DC
Miscellaneous	
Setup data retention when unit not powered	> 1000 hours. Unit must have been powered for > 24 hours prior to this.
Serial communication type	RS422/232 (software configured)
Power fail indication	Relay contact, closed under normal operation, open for any failure state.
Fan fail indication	Relay contact, closed under normal operation, open for any failure state.
Option interfaces	Three models are available with various options See 7600REF Models on page 32 .
Ethernet	RJ-45 interface. Software configured for DHCP or static IP address.

¹ Immunity is specified to criterion B – the output may suffer some degradation during the disturbance, but will recover on removal of the disturbance source and continue to operate as intended.

² Assumes 15625Hz (15734.268 Hz NTSC) line frequency and subcarrier varied about nominal subcarrier frequency.

³ When the unit is locked to a genlock feed, the frequency stability of the AES signal is dependant on the quality of that feed.

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