LMNTS®

LOUDNESS MANAGER FOR N TRANSPORT STREAMS

Transport Stream Loudness Processor

Product Manual

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Computer Software Copyrights

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Trademark Information

Congratulations on choosing the Cobalt® LMNTS® Transport Stream Loudness Processor. LMNTS® is part of a full line of processing and conversion gear for broadcast TV environments. The Cobalt Digital Inc. line includes video decoders and encoders, audio embedders and de-embedders, distribution amplifiers, format converters, remote control systems and much more. Should you have questions pertaining to the installation or operation this product, please contact us at the contact information on the front cover.

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Document Version:	V1.5
Release Date:	April 2, 2014
Description of product/manual changes:	- Manual revised to reflect latest user interface, functionality changes per latest software, and latest model designations.

Important Safety Instructions

	Read these instructions.
	Keep these instructions.
	Heed all warnings.
	Follow all instructions.
 **Warning**	Do not use this apparatus near water.
	Clean only with a dry cloth.
 **Warning**	Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
	Do not defeat the safety purpose of polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The wide blade or the third prong are provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
	Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles, and the point where they exit from the apparatus.
 **Warning**	Only use attachments/accessories specified by the manufacturer and in this manual.
	Unplug this apparatus during lightning storms or when unused for long periods of time.
 **Warning**	Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as when the power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.
 **Warning**	This apparatus shall not be exposed to dripping or splashing. Do not place objects such as water containers on the apparatus.
 **Warning**	The AC mains power receptacle on the rear of the apparatus shall only be connected by means of the power cord supplied with this apparatus. No other devices or cables shall be connected to this connector. If the supplied AC power cord is damaged or lost, it shall only be replaced using the AC power cord specified in this manual or by the manufacturer.
	To reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture.
 **Warning**	Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type.
	To reduce the risk of fire, replacement fuses shall be the same type and rating as installed and as specified on the rear label adjacent to the power receptacle fuse holder.

EMC Notices

US FCC Part 15

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 users will be required to correct the interference at their own expense.

Changes or modifications to this equipment not expressly approved by Cobalt Digital Inc. could void the user's authority to operate this equipment.

CANADA

This Class "A" digital apparatus complies with Canadian ICES-003.

EUROPE

This equipment is in compliance with the essential requirements and other relevant provisions of CE Directive 93/68/EEC.

INTERNATIONAL

This equipment has been tested to CISPR 22:1997 along with amendments A1:2000 and A2:2002 and found to comply with the limits for a Class A Digital device.

Table of Contents

Chapter 1

Introduction

Overview

This manual provides installation and operating instructions for the LMNTS™ Transport Stream Loudness Processor (also referred to herein as "LMNTS").

This manual consists of the following chapters:

- **Chapter 1, "Introduction"** – Provides information about this manual and what is covered. Also provides general information regarding LMNTS.
- **Chapter 2, "Installation"** – Provides instructions for installing LMNTS.
- **Chapter 3, "Setup/Operating Instructions"** – Provides instructions for configuring and running LMNTS.

This chapter contains the following information:

LMNTS® Firmware Versions and this Manual

When applicable, Cobalt Digital Inc. provides for continual product enhancements through firmware updates. **Full functionality/features, correction of any known issues, and latest support require the latest firmware version be present on your LMNTS unit.**

The Firmware Version of LMNTS can be checked by clicking the LMNTS **About** tab. See Checking and Updating LMNTS® Firmware (p. 3-22) in Chapter 3, “Operating Instructions” for more information. You can then check our website for the latest LMNTS firmware version as described below.

Check our website and proceed as follows if your LMNTS does not match the latest version:

Firmware version **earlier** than latest version	LMNTS is not loaded with the latest software. Not all functions and/or specified performance described in this manual may be available. You can update LMNTS with new Update software by going to the **Support>Firmware Downloads** link at www.cobaltdigital.com. **Software updates are field-installed without any need to remove, disconnect, or power-down LMNTS.**
Firmware version **newer** than version in manual	A new manual is expediently released whenever firmware is updated **and specifications and/or functionality have changed** as compared to an earlier version (a new manual is not necessarily released if specifications and/or functionality have not changed). A manual earlier than the latest firmware version may not completely or accurately describe all functions available when using the latest firmware. If you manual is out of date, contact Cobalt Support to receive a new manual download via e-mail (manuals are less than 10MB).

Manual Conventions

In this manual, connectors are shown using the exact name shown on LMNTS itself. In this manual, the terms below are applicable as follows:

- **LMNTS** refers to the physical LMNTS unit or its function.
- **System** and/or **Video System** refers to the mix of interconnected production and terminal equipment served by the equipment.

Warnings, Cautions, and Notes

Certain items in this manual are highlighted by special messages. The definitions are provided below.

Warnings

Warning messages indicate a possible hazard which, if not avoided, could result in personal injury or death.

Cautions

Caution messages indicate a problem or incorrect practice which, if not avoided, could result in improper operation or damage to the product.

Notes

Notes provide supplemental information to the accompanying text. Notes typically precede the text to which they apply.

Labeling Symbol Definitions

	Attention, consult accompanying documents.
	Electronic device or assembly is susceptible to damage from an ESD event. Handle only using appropriate ESD prevention practices. If ESD wrist strap is not available, handle card only by edges and avoid contact with any connectors or components.
	Symbol (WEEE 2002/96/EC) For product disposal, ensure the following: • Do not dispose of this product as unsorted municipal waste. • Collect this product separately. • Use collection and return systems available to you.

Safety Summary

Warnings

! WARNING ! **NO USER SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.**

Cautions

CAUTION **This device is intended for environmentally controlled use only in appropriate video terminal equipment operating environments.**

LMNTS Functional Description

Note: Unless otherwise noted, descriptions below apply equally for base LMNTS using IP media interface and versions using ASI option **LMNTS-OPT-ASI-1X1** (which adds ASI input(s) and output(s) to LMNTS).

(See Figure 1-1) LMNTS (Loudness Management for n-Transport Streams) is a transport-based loudness processor that operates in either IP or ASI physical layers (depending on ordered option) to provide transport-based loudness processing. Operating at the MPEG transport layer, LMNTS provides a practical loudness management solution for MVPD operators without the need or complexity of external codecs transferring between baseband and MPEG interfaces.

LMNTS extracts and decodes audio codec packets from the program stream, performs PCM loudness processing, and then re-encodes and re-packets the audio with its stream. A packet buffer holds video packets to re-align video packets with its respective post-processed audio packets (input/output processing offset is a consistent 500 msec delay).

Physically, all data connection to LMNTS is via GigE IP or ASI interfaces using an industry-standard IT hardware platform with no intermediary breakouts.

Media Interface

LMNTS provides up to five, GigE Ethernet ports (**Media 1** thru **Media 5**) for source and destination transport. Option **LMNTS-OPT-ASI-1X1** adds an **ASI IN** and **ASI OUT** 75Ω BNC port. Input/output streams can be transferred to and from IP and ASI ports as desired.

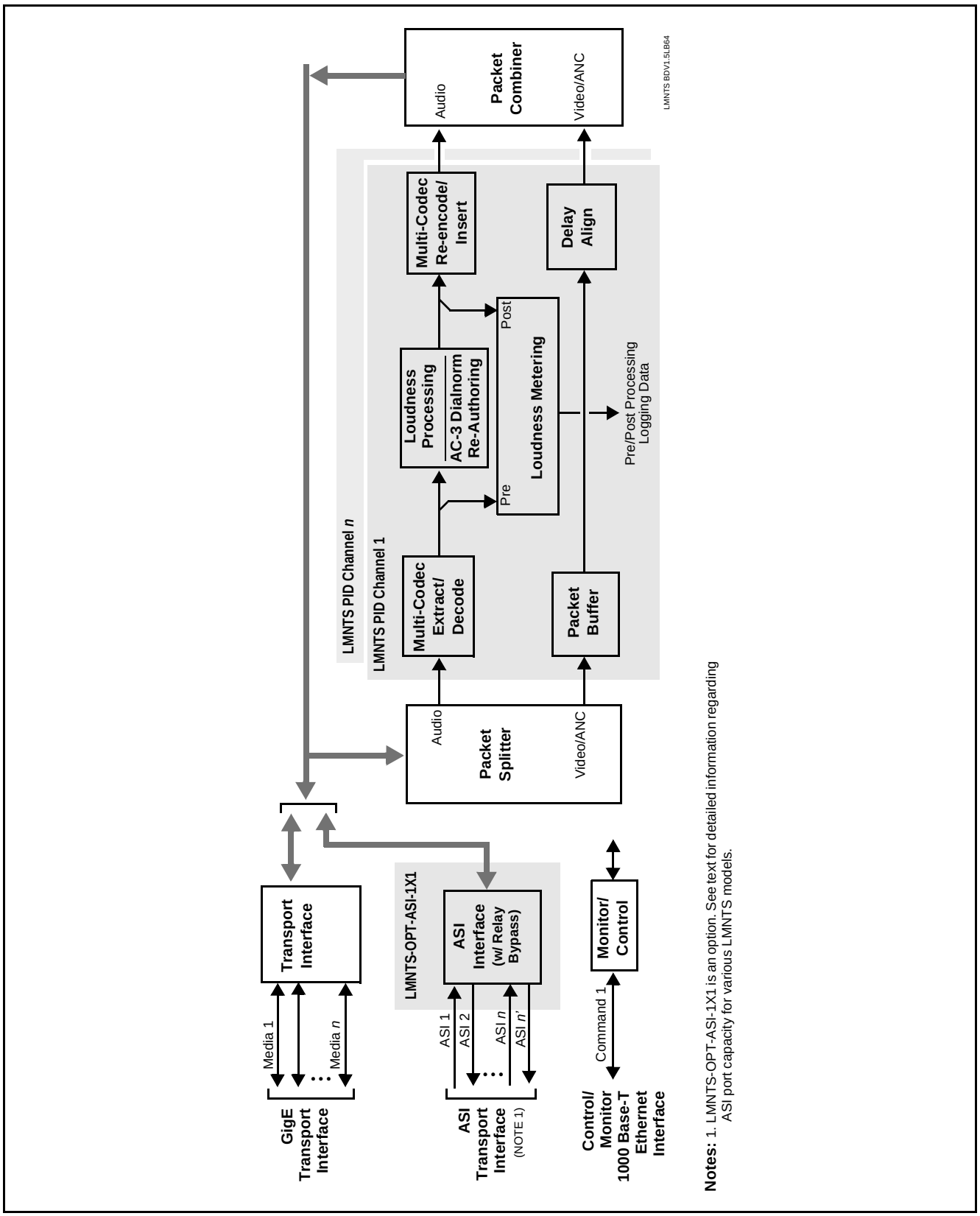

Figure 1-1 LMNTS Functional Block Diagram

Structure Overview of Media, Transport Streams and Programs

(See Figure 1-2) MPEG-encoded DTV programming supported by LMNTS extracts audio programming by decoding and analyzing audio packets belonging to a program. Figure 1-2 shows a basic overview of the DTV MPEG structure that carries the audio data processed by LMNTS.

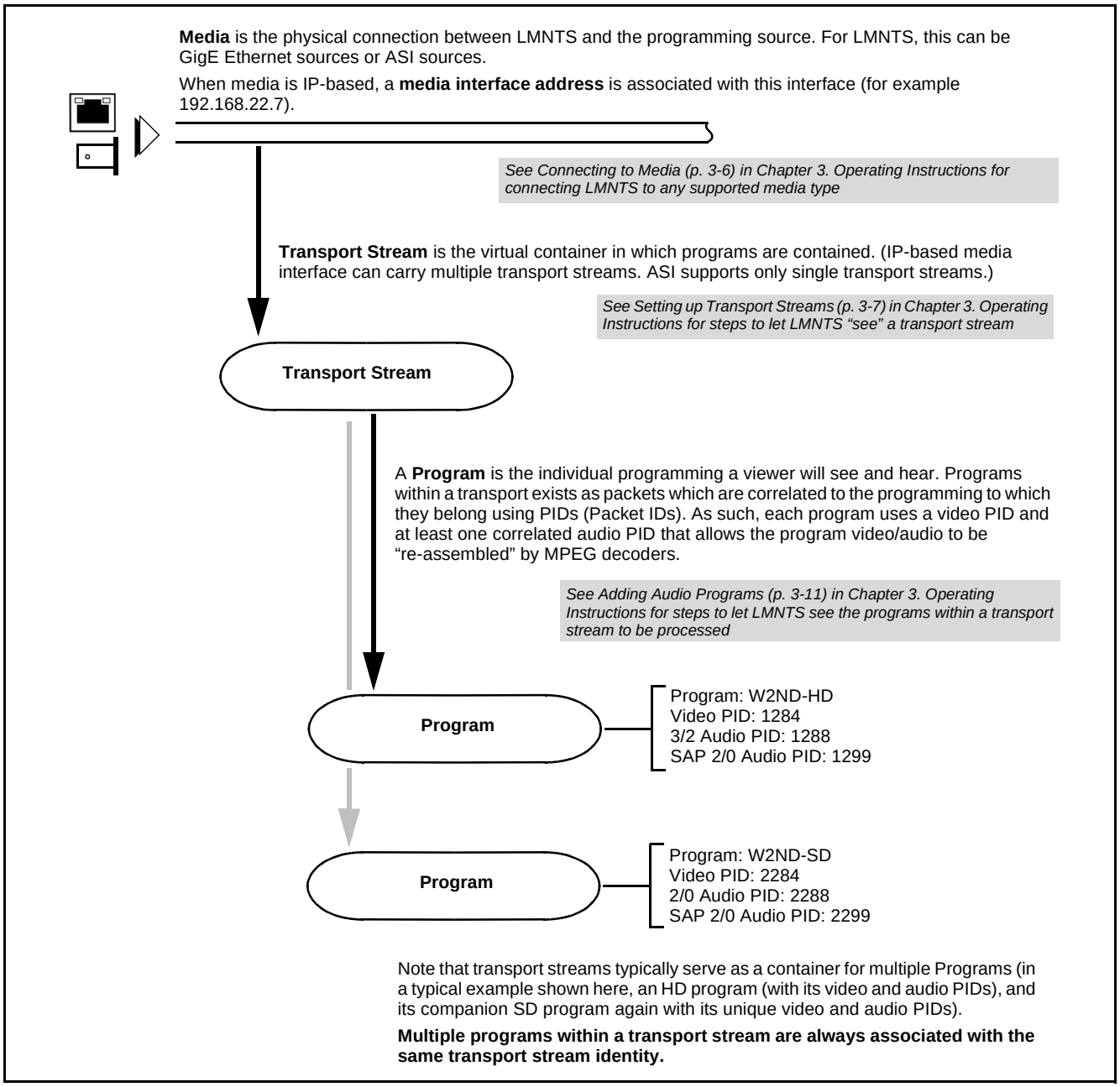

Figure 1-2 Overview of MPEG-Encoded Programming

Configuration Licensing

To allow flexibility in provisioning only the amount and codec types of programs that need to be processed, LMNTS uses licensing to provision program capacity and codec types accommodated as described below.

LMNTS-500	Transport Stream Loudness Processor, 1 Control IP Port, 3 Media IP Ports (10) 5.1-channel capacity, (20) 2.0-channel capacity
LMNTS-1000	Transport Stream Loudness Processor, 1 Control IP Port, 5 Media IP Ports (60) 5.1-channel capacity, (100) 2.0-channel capacity
LMNTS-2000	Transport Stream Loudness Processor, 1 Control IP Port, 5 Media IP Ports (100) 5.1-channel capacity, (140) 2.0-channel capacity
Provisioning Options	
LMNTS-OPT-ASI-1X1	Adds one ASI input and output to LMNTS ((Note 1)
LMNTS-LICENSE-E-AC-3-SURROUND	Loudness processing license for one stream (one PID) of 5.1 (surround) Dolby Digital Plus (E-AC-3). Can also be used to process Dolby Digital (AC-3) (Note 2).
LMNTS-LICENSE-E-AC-3-STEREO	Loudness processing license for one stream (one PID) of 2.0 (stereo) Dolby Digital Plus (E-AC-3). Can also be used to process Dolby Digital (AC-3).
LMNTS-LICENSE-AC-3-SURROUND	Loudness processing license for one stream (one PID) of 5.1 (surround) Dolby Digital (AC-3) (Note 2)
LMNTS-LICENSE-AC-3-STEREO	Loudness processing license for one stream (one PID) of 2.0 (stereo) Dolby Digital (AC-3)
LMNTS-LICENSE-AAC-SURROUND	Loudness processing license for one stream (one PID) of 5.1 (surround) AAC-LC or HE-AACv1
LMNTS-LICENSE-AAC-STEREO	Loudness processing license for one stream (one PID) of 2.0 (stereo) AAC-LC or HE-AACv1
LMNTS-LICENSE-MP1L2	Loudness processing license for one stream (one PID) of MPEG 1 Layer II

Note:

1. Option LMNTS-OPT-ASI-1X1 adds ASI I/O ports as follows:
   - LMNTS-500: Supports up to (2) ASI options (second ASI interface card installed deletes (2) IP media ports)
   - LMNTS-1000: Supports up to (2) ASI options (second ASI interface card installed deletes (2) IP media ports)
   - LMNTS-2000: Supports up to (7) ASI options (second ASI interface card installed deletes (2) IP media ports)
2. 5.1 (surround) license can be used to process a 2.0 (stereo) stream of the same codec type.

Loudness Processing Profiles

The loudness processor function provides loudness processing on up to six PCM audio channels extracted from an associated PID. Several loudness processing profiles are available and are described as follows:

- **TV 5B General** – This is the general, recommended preset for all types of content. It provides moderate dynamic range compression and is calibrated to produce audio having an average dialog loudness of -24 LKFS with no additional output level trim. Use of this preset is generally recommended.
- **TV 5B Light** – Similar to TV 5B General, this preset varies in that multi-band compression is reduced closer to 2:1, thereby providing a more gentle action.

Note: This preset sacrifices agility in loudness control in favor of a more gentle compression profile; this preset may not be suitable for some material.

- **TV 5B Heavy** – Similar to TV 5B General, this preset varies in that multi-band compression is increased for greater level density/ adherence to target at the expense of dynamic range.
- **TV 5B Loud** – Similar to TV 5B Heavy, but with a louder, more punchy perception.
- **ITU Loud Limit** – Utilizes a specially tuned input AGC plus multi-band and a final limiter to gradually adjust the average program loudness to an internally set AGC value, with the multi-band and final limiters acting until the AGC gains control of the level. This preset is most appropriate for ingest or live program material.

Note: This preset bypasses the multi-band AGC. As such, it has less ability to manage spectral balance.

- **Protection Limit** – Bypasses all processing except for final output limiter, which is set only to prevent overload.

Note: Unless the audio received has already been loudness processed, this setting is typically not recommended.

Technical Specifications

Table 1-1 lists the technical specifications for LMNTS.

Table 1-1 Technical Specifications

Item	Characteristic
Part number, nomenclature	• LMNTS-500 Transport Stream Loudness Processor – 1RU, (10) 5.1-channel capacity, (20) 2.0-channel capacity. 1 Control IP Port, 3 Media IP Ports • LMNTS-1000 Transport Stream Loudness Processor – 1RU, (60) 5.1-channel capacity, (100) 2.0-channel capacity. 1 Control IP Port, 5 Media IP Ports • LMNTS-2000 Transport Stream Loudness Processor – 2RU, (100) 5.1-channel capacity, (140) 2.0-channel capacity. 1 Control IP Port, 5 Media IP Ports
Installation/usage environment	Intended for installation and usage in environmentally controlled installation.
AC Line Input	120/240 VAC, 50/60 Hz (LMNTS-500): 350 Watts (maximum) (LMNTS-1000): 550 Watts (maximum) (LMNTS-2000): 750 Watts (maximum)
Physical	(LMNTS-500, LMNTS-1000): 1RU; 24 in. (61 cm) depth required (LMNTS-2000): 2RU; 24 in. (61 cm) depth required
Interface	
Transport (LMNTS-IP):	GigE (1000 Base-T) media ports via RJ-45
Transport (with option LMNTS-OPT-ASI-1X1):	ASI I/O, 75Ω BNCs with relay bypass; (1) GigE (1000 Base-T) media port via RJ-45
Control/Monitor:	(1) 10/100/1000 Base-T via RJ-45. GUI control via HTML5.
Capacity	
Data throughput:	(LMNTS-500): 3 Gbps I/O total (LMNTS-1000): 5 Gbps I/O total (LMNTS-2000): 5 Gbps I/O total
Channel capacity:	(LMNTS-500): (10) 5.1 HD channels, (20), 2.0 HD or SD channels (LMNTS-1000): (60) 5.1 HD channels, (100) 2.0 HD or SD channels (LMNTS-2000): (100) 5.1 HD channels, (140) 2.0 HD or SD channels
Processing latency delay:	500 msec **Note:** Channel capacities above are maximum capacities. Practical capacity is a function of licenses added.
Formats Supported	
Transport:	MPEG over IP or ASI, UDP, RTP,
Multicast:	Supports IPV4 multicast and IGMPV2/V3 multicast management
Audio Codecs:	Dolby® Digital, Digital Plus™ (AC-3, E-AC-3), MPEG 1 Layer 2, AAC
Video Codecs:	Supports all video codecs; video passed without alteration
Licenses	See Configuration Licensing (p. 1-7) **Note:** LMNTS 5.1-channel licenses are compatible with 2.0 (stereo) programming of same codec type with no loss in quality.

Warranty and Service Information

Cobalt Digital Inc. Limited Warranty

This product is warranted to be free from defects in material and workmanship for a period of three (3) years from the date of shipment to the original purchaser. This warranty coverage (extending to seven (7) years) can be purchased separately (see Optional Extended Limited Warranty below).

Cobalt Digital Inc.'s ("Cobalt") sole obligation under this warranty shall be limited to, at its option, (i) the repair or (ii) replacement of the product, and the determination of whether a defect is covered under this limited warranty shall be made at the sole discretion of Cobalt.

This limited warranty applies only to the original end-purchaser of the product, and is not assignable or transferrable therefrom. This warranty is limited to defects in material and workmanship, and shall not apply to acts of God, accidents, or negligence on behalf of the purchaser, and shall be voided upon the misuse, abuse, alteration, or modification of the product. Only Cobalt authorized factory representatives are authorized to make repairs to the product, and any unauthorized attempt to repair this product shall immediately void the warranty. Please contact Cobalt Technical Support for more information.

To facilitate the resolution of warranty related issues, Cobalt recommends registering the product by completing and returning a product registration form. In the event of a warrantable defect, the purchaser shall notify Cobalt with a description of the problem, and Cobalt shall provide the purchaser with a Return Material Authorization ("RMA"). For return, defective products should be double boxed, and sufficiently protected, in the original packaging, or equivalent, and shipped to the Cobalt Factory Service Center, postage prepaid and insured for the purchase price. The purchaser should include the RMA number, description of the problem encountered, date purchased, name of dealer purchased from, and serial number with the shipment.

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COBALT'S LIABILITY, WHETHER IN CONTRACT, TORT, WARRANTY, OR OTHERWISE, IS LIMITED TO THE REPAIR OR REPLACEMENT, AT ITS OPTION, OF ANY DEFECTIVE PRODUCT, AND SHALL IN NO EVENT INCLUDE SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES (INCLUDING LOST PROFITS), EVEN IF IT HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

Optional Extended Limited Warranty

Extended warranty coverage with same terms as above, and in yearly increments up to four (4) additional years is available as a purchased option (i.e., maximum is seven (7) years with three (3) years standard warranty as above, plus up to four (4) additional years). Please note that this is a warranty extension and not a Service Level Agreement (SLA) / service contract. On-site service/ field service is **not** included nor specified in the extended warranty.

Terms and Conditions

1. An Extended Warranty may be purchased at any time within the initial three (3) years of ownership in increments of twelve (12) months. (If purchased at the time of initial equipment purchase, a discount is available.)
2. A currently active Extended Limited Warranty may be extended assuming no lapse of coverage has occurred.
3. An Extended Limited Warranty may be purchased in cases where (a) the standard 3-Year Limited Warranty has expired without existing extended warranty coverage or (b) an extended warranty has lapsed, in conformance with the following conditions:
   a. A Cobalt support engineer or designee has performed an on-site visit and certified the equipment and installation as satisfactory for Extended Limited Warranty coverage.
   b. The above visit shall be billed to the end user at current field support rate including customary expenses. This fee is non-refundable and shall be applied regardless of whether or not the equipment is deemed satisfactory for an Extended Limited Warranty.

Please discuss Extended Limited Warranty with your Cobalt sales professional for fee schedule, options, and other details.

Contact Cobalt Digital Inc.

Feel free to contact our thorough and professional support representatives for any of the following:

- Name and address of your local dealer
- Product information and pricing
- Technical support
- Upcoming trade show information

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Chapter 2

Installation

Overview

This chapter contains the following information:

Installing LMNTS In Equipment Rack

Physical Considerations

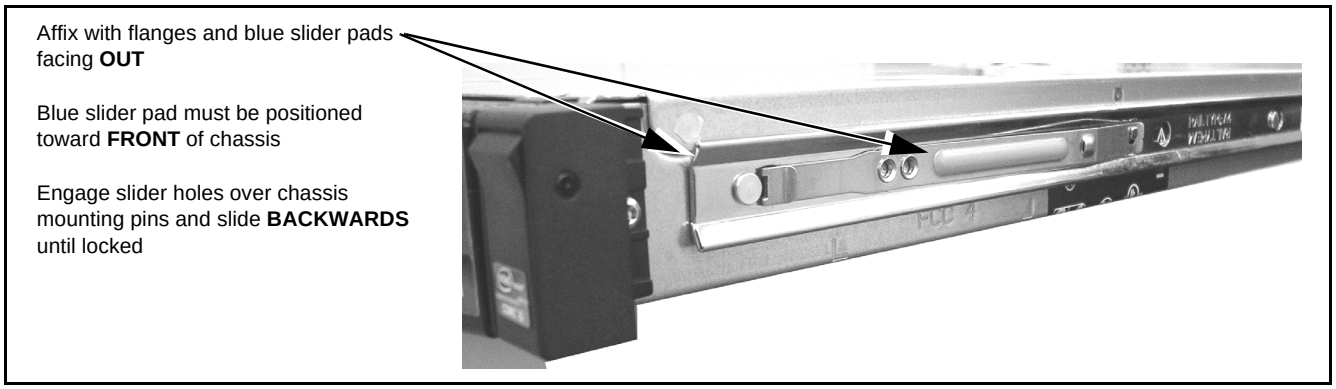
- LMNTS uses a commercial large-capacity 1RU or 2RU server as its hardware platform. As such, LMNTS ideally should be installed in a controlled area specifically designed for modern IT systems.
- The LMNTS chassis uses only front-to-rear ventilation, and does use top or bottom ventilation openings. As such, LMNTS can be rack-mounted with other front-to-rear ventilated equipment with no vertical free-air space required.
- LMNTS chassis **must** be supported using the provided frame rails kit as described in Installing LMNTS in Rack below.

Installing LMNTS in Rack

Note:
- The LMNTS chassis is installed in a 19-in. equipment rack using the mounting kit (PN 0C597M) supplied with LMNTS.

  Basically, the kit consists of two **rail assemblies** that are mounted to the rack, and two **slider assemblies** that are attached to the LMNTS chassis. Follow steps 1 thru 5 below for attaching these assemblies.
- The standard rail assembly setup is for the recommended rack depth of 24 in. (61 cm). For racks having less depth, an alternate setup allows for depths as small as 12 in. (30 cm).

1. (see below) On each side of the LMNTS chassis, attach slider assembly.

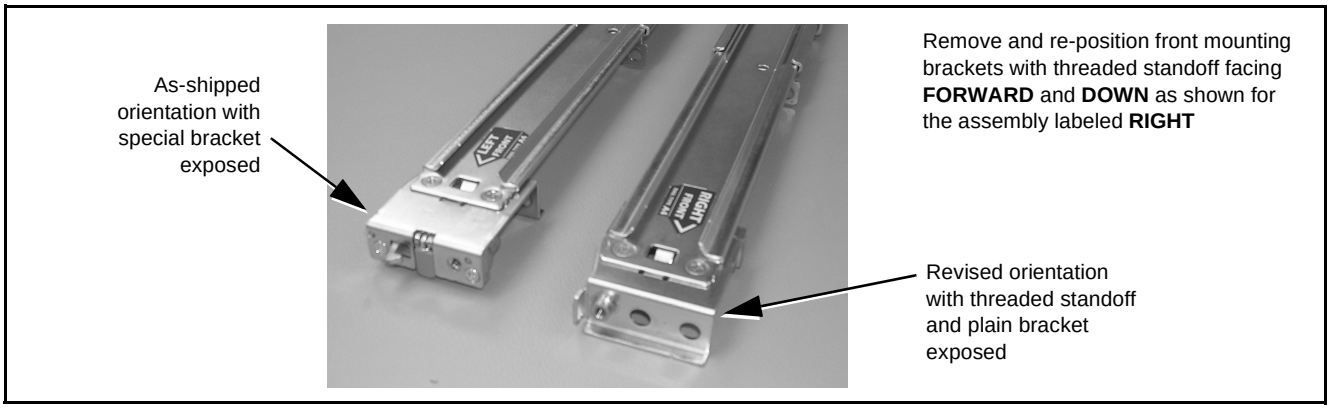


Note: Steps 2 thru 4 below are applicable **only** when installing frame rails in a rack using **threaded mounting holes**. For racks using square mounting holes, install the frame rails as is into the rack.

2. As shipped, the frame rail **front mounting brackets** require re-positioning. The frame rails (as shipped) are as shown for the **LEFT** assembly in illustration below.

Remove the two Phillips head screws and re-position/re-install the front mounting bracket as shown for the **RIGHT** assembly in illustration below. Make certain the standoff with the machined threads is positioned **down** as shown.

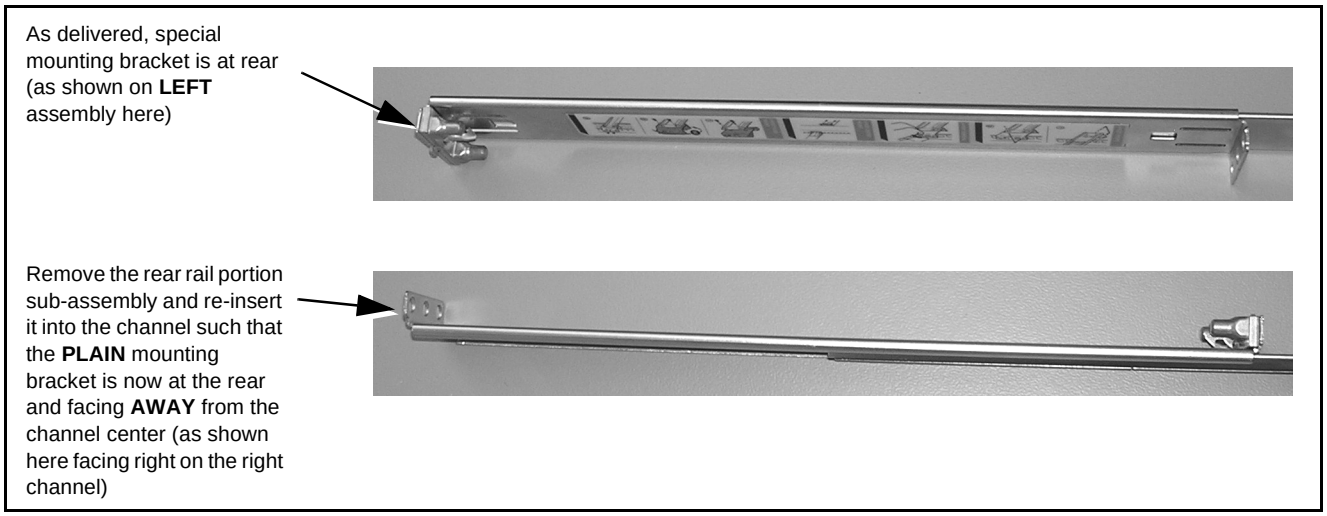
Repeat for **LEFT** frame rack rail.



3. As shipped, the frame rail rear tracks require re-positioning as described below.

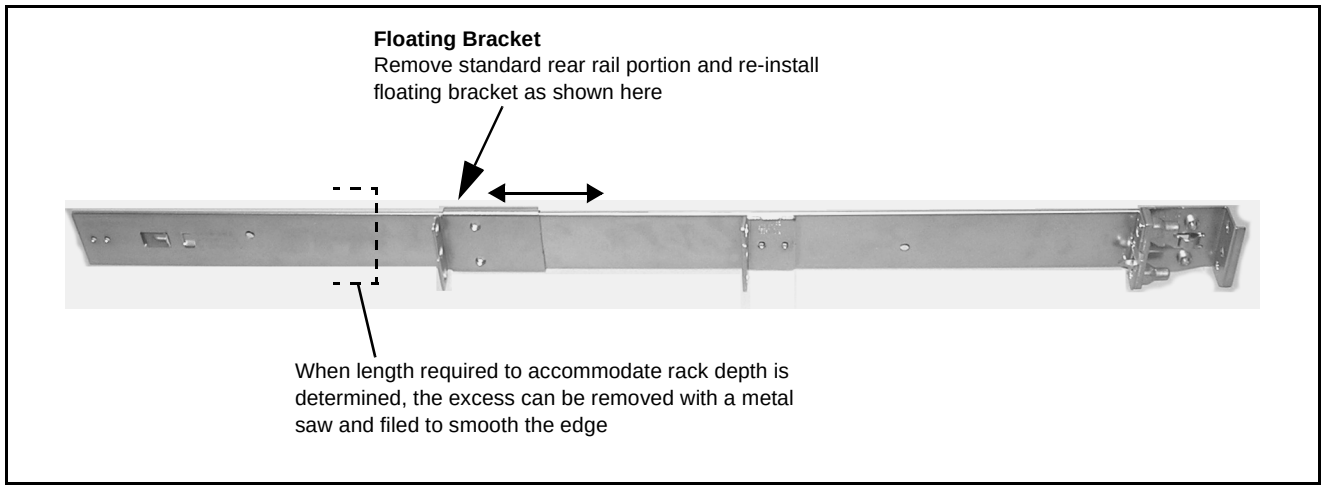
   - **For typical racks which accommodate the typical 24 in. (61 cm) rack rail depth**, press the release tab and remove the rear portion of the assembly. Re-install the rear portion by rotating it such that the plain mounting bracket is at rear and facing **away** from the center of the sliding channel.

     Repeat for **LEFT** frame rack rail rear track, then go to step 4.

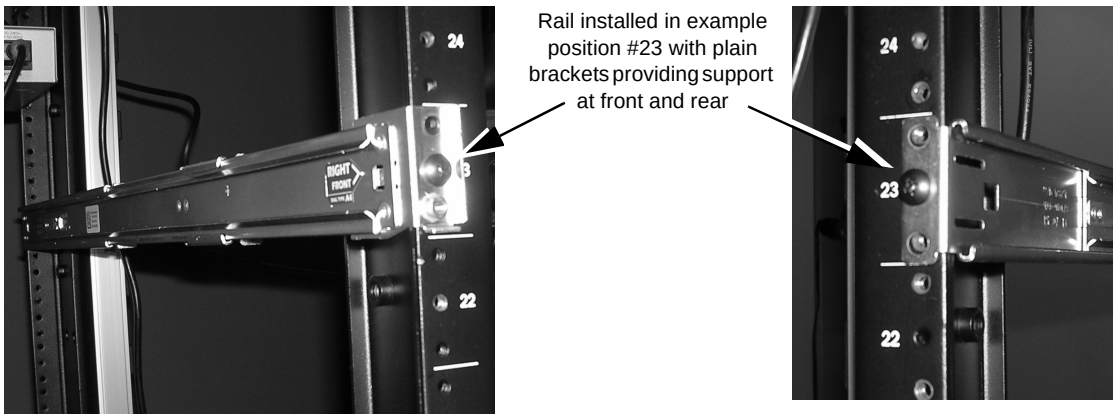


   - **For racks with less than 24 in. (61 cm) rack rail depth**, remove the rear rack rail portion entirely. As shown below, remove and re-install the floating bracket to serve as the rear bracket. This allows the rail to mounted in depths of as little as 12 in. (30 cm).

     Repeat for both rails, then go to step 4.



4. Select a mounting location in the rack for the LMNTS chassis. When properly configured as described above, the rails are as shown in the example below when in mounting position.

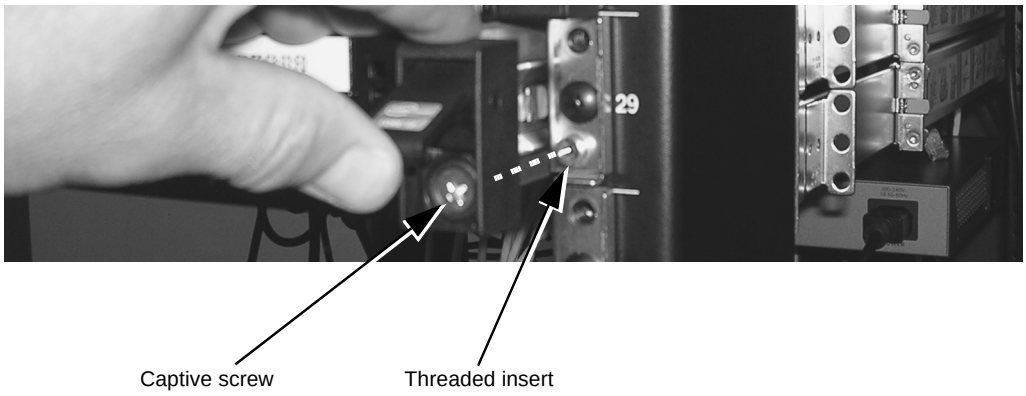


RAIL MOUNTING (FRONT VIEW) **RAIL MOUNTING (REAR VIEW)**

As shown, both front and rear of both left and right rails use the plain mounting brackets to affix to the frame support verticals. Also as shown, a single machine screw at each bracket is sufficient for support.

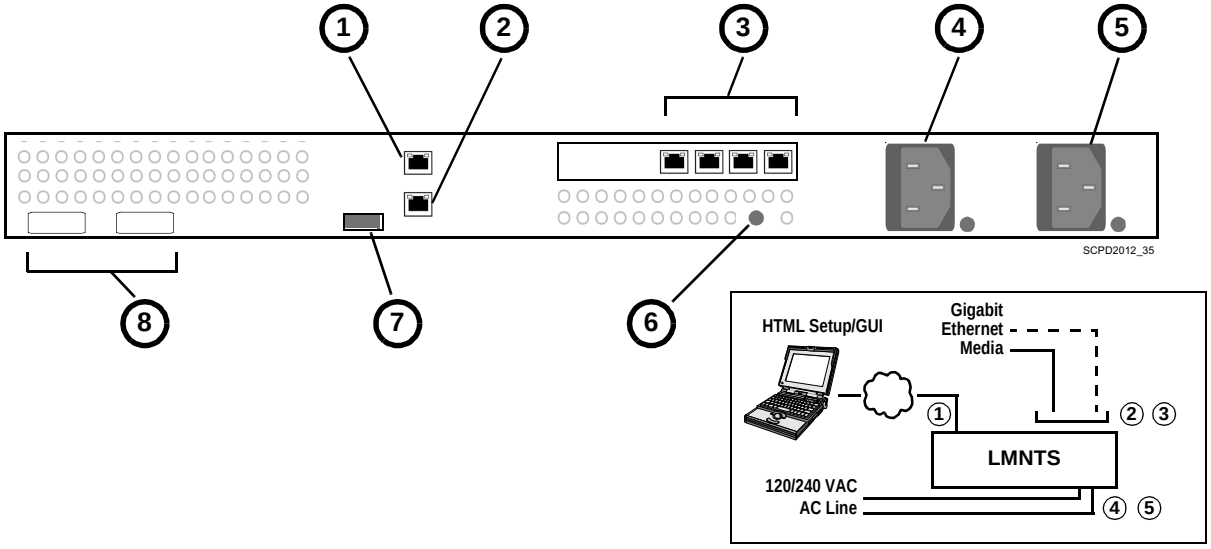
5. From the front of the equipment rack, carefully slide the LMNTS chassis sliders into the frame rails.

   The chassis can be secured to the equipment rack using the two captive screws inside of the chassis handles as shown below.



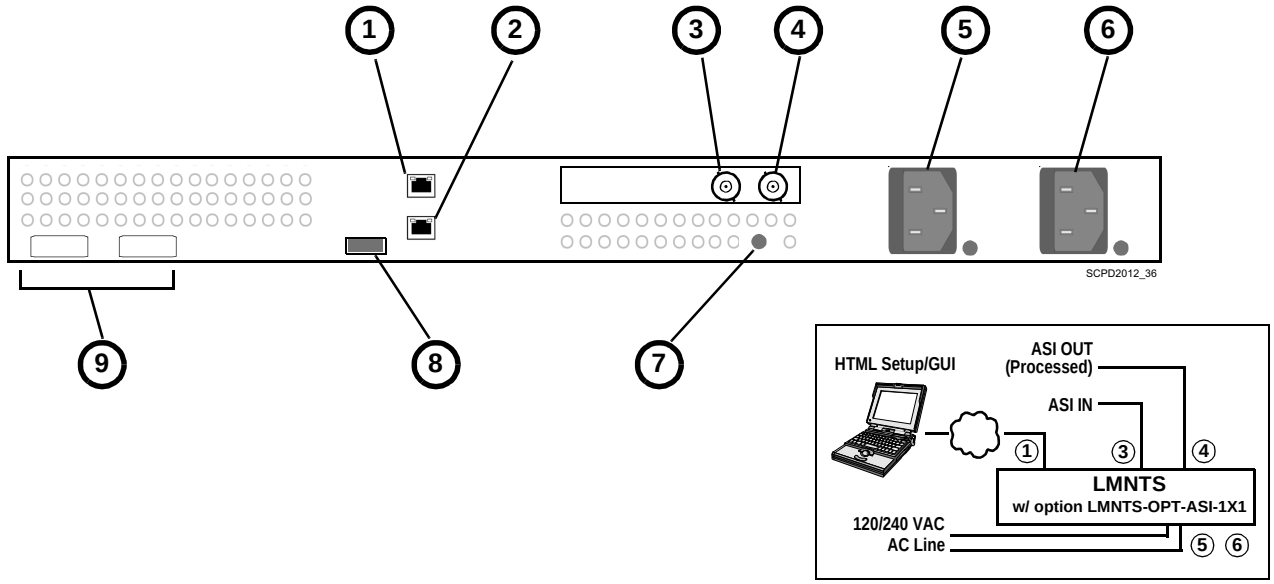
LMNTS Connections and Indicators

Figures 2-1 and 2-2 show and describe the LMNTS rear panel connections and indicators for LMNTS-IP and LMNTS with ASI option **LMNTS-OPT-ASI-1X1**, respectively.



Index	Item	Function
1	**Gb1 (CMD)** Port	Ethernet Command (Monitor/Control) port. Provides web browser connection for network monitor/control of LMNTS operating GUI. Communication activity status is shown by adjacent LED.
2	**Gb2 (Media 1)** Port	Gigabit Ethernet media connection, Media Port 1. Communication activity status is shown by adjacent LED.
3	**Media 2** thru **Media 5** Ports	Gigabit Ethernet media connections, Media Ports 2 thru 5 (left to right)
4	**PSU1** AC Input and Status LED	120/240 VAC IEC input for Power Supply Unit 1. Adjacent green indicator illuminates to indicate PSU is receiving power and is OK.
5	**PSU2** AC Input and Status LED	120/240 VAC IEC input for Power Supply Unit 2. Adjacent green indicator illuminates to indicate PSU is receiving power and is OK.
6	**OK** Indicator	When lit, blue LED indicates basic system is functional and no errors are detected. Flashing indicator means status info is being displayed on front-panel LCD readout.
7	USB port	Used for uploading initial configuration file to LMNTS (as part of setup/installation in accordance with Chapter 3. Setup/Installation Instructions).
8	Monitor, keyboard connectors	These are not used for normal operation. All user interface to LMNTS is via its HTML5 web browser and physically via the Gb1 (CMD) port.

Figure 2-1 LMNTS-IP Rear Panel Connectors and Indicators



Index	Item	Function
1	**Gb1 (CMD)** Port	Ethernet Command (Monitor/Control) port. Provides web browser connection for network monitor/control of LMNTS operating GUI. Communication activity status is shown by adjacent LED.
2	**Gb2 (Media 1)** Port	Gigabit Ethernet media connection, Media Port 1. Communication activity status is shown by adjacent LED.
3	**ASI 1 (IN)** Port	75Ω ASI BNC input port
4	**ASI 2 (OUT)** Port	75Ω ASI BNC output (processed) port
Note: Where additional ASI port pairs are present, each pair is oriented as Input/Output as shown, with added pairs to the left of those shown.		
Note: Option LMNTS-OPT-ASI-1X1 adds ASI I/O ports as follows: - LMNTS-500: Supports up to (2) ASI options (second ASI interface card installed deletes (2) IP media ports) - LMNTS-1000: Supports up to (2) ASI options (second ASI interface card installed deletes (2) IP media ports) - LMNTS-2000: Supports up to (7) ASI options (second ASI interface card installed deletes (2) IP media ports)		
5	**PSU1** AC Input and Status LED	120/240 VAC IEC input for Power Supply Unit 1. Adjacent green indicator illuminates to indicate PSU is receiving power and is OK.
6	**PSU2** AC Input and Status LED	120/240 VAC IEC input for Power Supply Unit 2. Adjacent green indicator illuminates to indicate PSU is receiving power and is OK.
7	**OK** Indicator	When lit, blue LED indicates basic system is functional and no errors are detected. Flashing indicator means status info is being displayed on front-panel LCD readout.
8	USB port	Used for uploading initial configuration file to LMNTS (as part of setup/installation in accordance with Chapter 3. Setup/Installation Instructions).
9	Monitor, keyboard connectors	These are not used for normal operation. All user interface to LMNTS is via its HTML5 web browser and physically via the Gb1 (CMD) port.

Figure 2-2 LMNTS With Option LMNTS-OPT-ASI-1X1 Rear Panel Connectors and Indicators

Cable Connections

Refer to Figure 2-1 or Figure 2-2 for LMNTS or LMNTS with option LMNTS-OPT-ASI-1X1 (respectively) rear panel connections referenced here.

Power Connections

Note:
- Do not connect to AC power until instructed to in Chapter 3. Setup/ Operating Instructions.
- It is recommended to use a facility AC receptacles that are on separate circuits for the two LMNTS power supplies. This can help ensure power source redundancy.

Each power supply is equipped with its own status indicator. When receiving power, status indicators should show OK (illuminated blue).

Control/Monitor (Command 1) Network Connection

Connect RJ-45 Ethernet network cable to rear panel Ethernet connector. When LMNTS is powered, connectivity is shown by illuminated indicator on Ethernet receptacle.

For basic setup, connection can be straight to laptop PC or network.

Media (Media 1 thru Media 5) Network Connections (LMNTS-IP)

Depending on number of PIDs (and indirectly) number of media IP addresses to be serviced, connect media RJ-45 Ethernet network cable to rear panel Media ports starting with **Media 1** port.

Media (ASI IN / ASI OUT) Connections (LMNTS with option LMNTS-OPT-ASI-1X1)

Connect coaxial ASI IN and ASI OUT connections to rear panel **ASI IN** and **ASI OUT** connectors.

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Chapter 3

Setup/Operating Instructions

Overview

This chapter contains the following information:

Connecting LMNTS to HTML Setup Browser

All initial, setup/maintenance, and control of LMNTS is performed on the built-in LMNTS web browser. Access to the web browser is via the **Command 1** port.

Note: All instructions here assume:

- LMNTS is connected to monitor/control and media network as described in Chapter 2. Installation.
- Network media connections are active and valid.

Note: LMNTS control/monitor web HTML5 GUI is usable only with the following web browsers:

- Internet Explorer 9+
- Google Chrome
- Mozilla Firefox
- Apple® Safari

Using Default LMNTS Setup/Control Address

The LMNTS 1RU engine unit is shipped with the IP address as follows:

IP: 192.168.2.3
Netmask: 255.255.255.0
Gateway: 192.168.2.1
Name Server/DNS: 8.8.8.8

- **To use the default address on the sheet**, set your control computer to the same subnet as the address on the sheet.
- **To set LMNTS to another address**, go to Using Custom LMNTS Setup/Control Address below.

Using Custom LMNTS Setup/Control Address

(See Figure 3-1.) A USB key is provided with LMNTS that has a setup .txt file you can edit to put LMNTS on the network you intend to use for control/monitoring of LMNTS. This allows the fixed initial address of LMNTS control (**command 1**) on the **command 1** Ethernet port to adapt to your network settings.

Edit the config file on the USB dongle supplied with your LMNTS unit. When the USB dongle is inserted in the LMNTS USB port, LMNTS will extract the entered address information and now use this address.

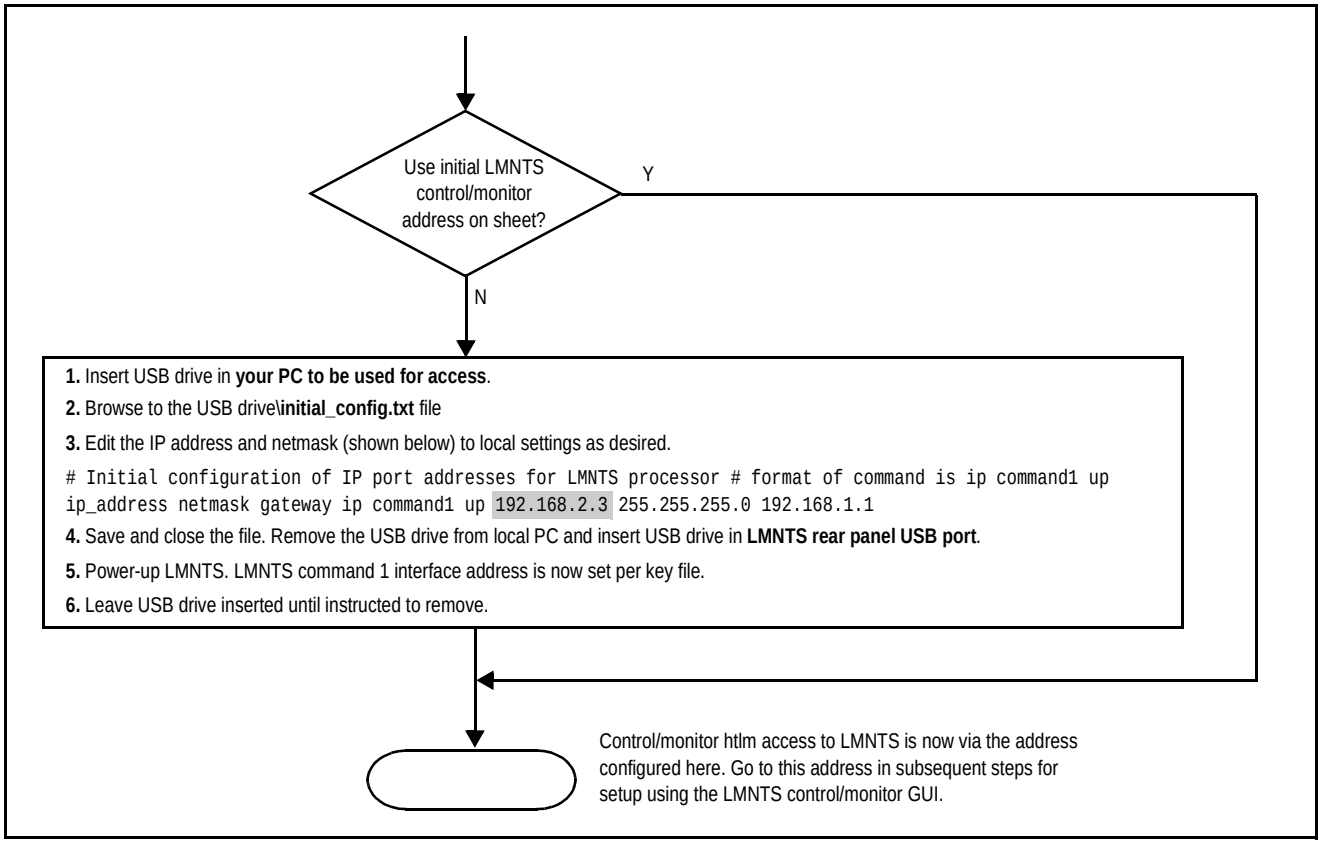


Figure 3-1 Setting Up LMNTS Initial Access Using USB Key File

Note: The initial address above is for basic access. It can be change later in the procedure.

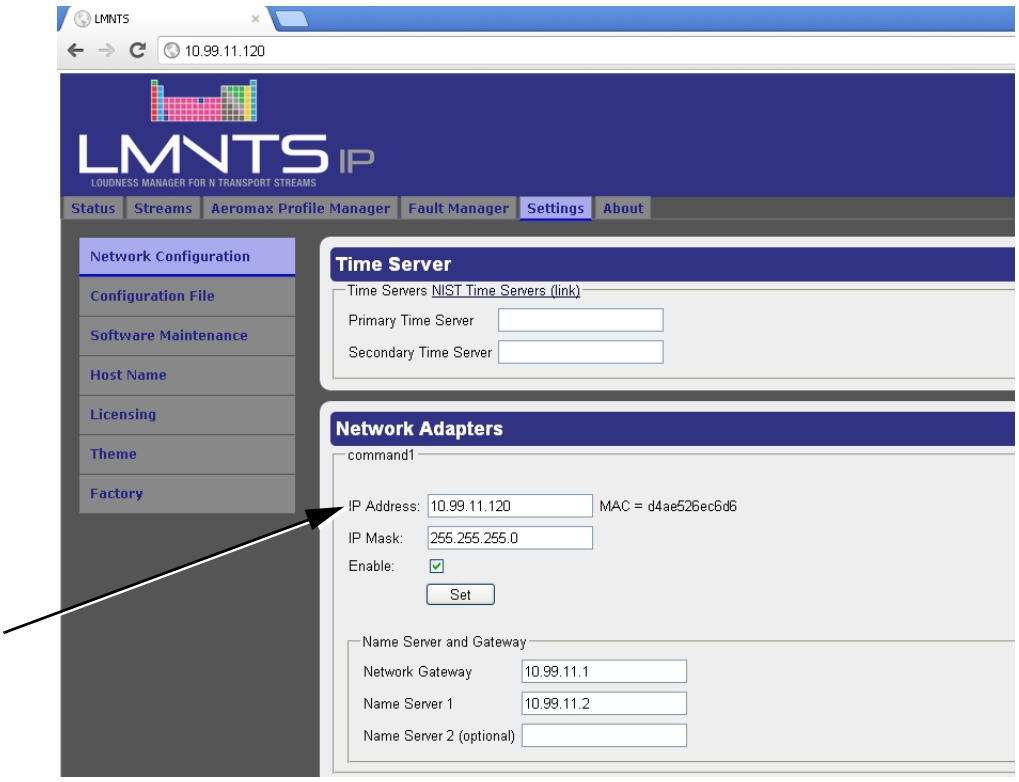
Note: If an additional LMNTS unit is to be installed on the same network, its address **must** be changed from the default address as shown in Figure 3-1.

Setting Up Command (Control) Port Address

1. On PC browser to be used for LMNTS web GUI access, enter the address set per Figure 3-1. LMNTS now appears in browser.

2. With LMNTS running and browser displayed, remove the USB drive from LMNTS USB port.

3. On the **Settings > Network Configuration** page (shown below), in **Network Adapters** section, note the default address shown for control/monitor interface **(command 1)**.



4. To change the **command 1** setup address to a different address, enter the desired alternate address in the dialog box and click **Set**.

Note: Browser does not automatically re-direct to new address as active browser. After clicking OK, default browser will only allow access to this function and not other LMNTS setup functions. After clicking OK, close browser and open new browser with the new address.

5. Enter the IP address and gateway for the DNS used by your facility in the **Name Server** and **Gateway** fields. (This is not required for LMNTS operation but is useful for communications between LMNTS and Cobalt support.)

– continued on next page –

Setting Up Command (Control) Port Address – continued

6. In **Time Server** fields, enter links for primary and secondary time servers.

7. The **Host Name** sub-tab on the **Setting** tab allows a DNS-derived name to be substituted for the web browser IP address. Enter desired name and click **Set**. The LMNTS web browser can now be accessed using the entered host name.

8. The **Theme** sub-tab on the Setting tab allows the GUI to be optimized for low and normal ambient light conditions. Toggle between setting and select the appropriate setting.

At this point, the LMNTS browser-based control/monitoring GUI is accessible at the address specified in Command 1. LMNTS is ready to connect to media streams via the GUI browser.

Note: • All further setup and control access is now via the LMNTS html5 web browser using the address set up here.

- LMNTS control/monitor web HTML5 GUI is usable only with the following web browsers:
  - Internet Explorer 9+
  - Google Chrome 17+
  - Mozilla Firefox 10+
  - Apple® Safari 5.1.3+

9. Proceed to **Connecting to Media** below.

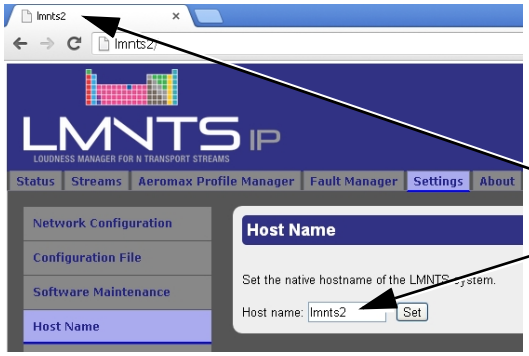
LMNTS Info and Attributes Settings

In addition to setups described in sections above, sub-tabs on the **Settings** page provide LMNTS naming, display control, and info display as described below.

Settings Sub-Tabs (Info and Attributes

Host Name sub-tab

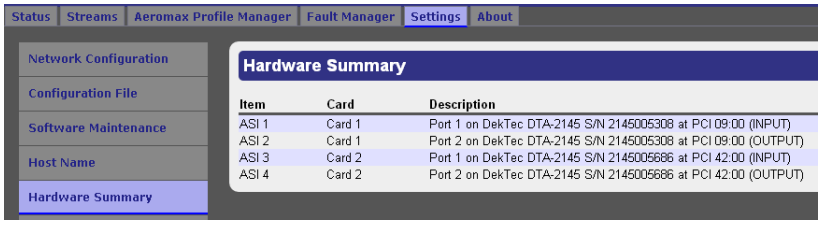
Where supported by host IT environment, allows a host name to be set for browser access to LMNTS (in addition to IP address).



Entering and setting a friendly name (in this example "lmnts2") allows LMNTS to also be accessed and displayed using the friendly name as well as IP address

Hardware Summary sub-tab

On LMNTS equipped with ASI interface (option **OPT-ASI-1X1**), shows details for ASI adapter cards installed and correlates screen names for I/O interfaces to hardware.

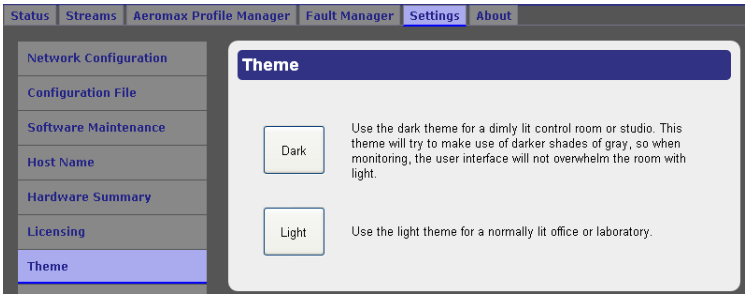


In example here, details for two bidirectional ASI adapter cards are displayed.

Note that ASI inputs are always odd-numbered (ASI 1, ASI 3...) and outputs are always even-numbered (ASI 2, ASI 4...)

Theme sub-tab

Changes LMNTS display attributes to suit normal and low-light viewing environments.



Dark – reversed background/characters suited for low-light environments.

Light – normal unreversed background/ characters suited for normal office environments.

Factory sub-tab

This tab is reserved, or to be used only as directed by Cobalt Support.

Connecting to Media

Note: The steps below apply **only** to LMNTS IP-based transport streams. For ASI-based transports (LMNTS with option LMNTS-OPT-ASI-1X1), proceed to Setting up Transport Streams (p. 3-7) to connect ASI-based transport streams to LMNTS processing.

Note: For any page displayed, presence of any detected fault is shown on the bottom of the page (as **Fault outstanding. Click here for fault management.**). Click on this text to directly go to the Fault Manager page.

Each physical IP port **Media 1** thru **Media 5** on the LMNTS-1000-IP rear panel has a corresponding dialog in the **Settings > Network Configuration** setup page for assigning these addresses in LMNTS as described below.

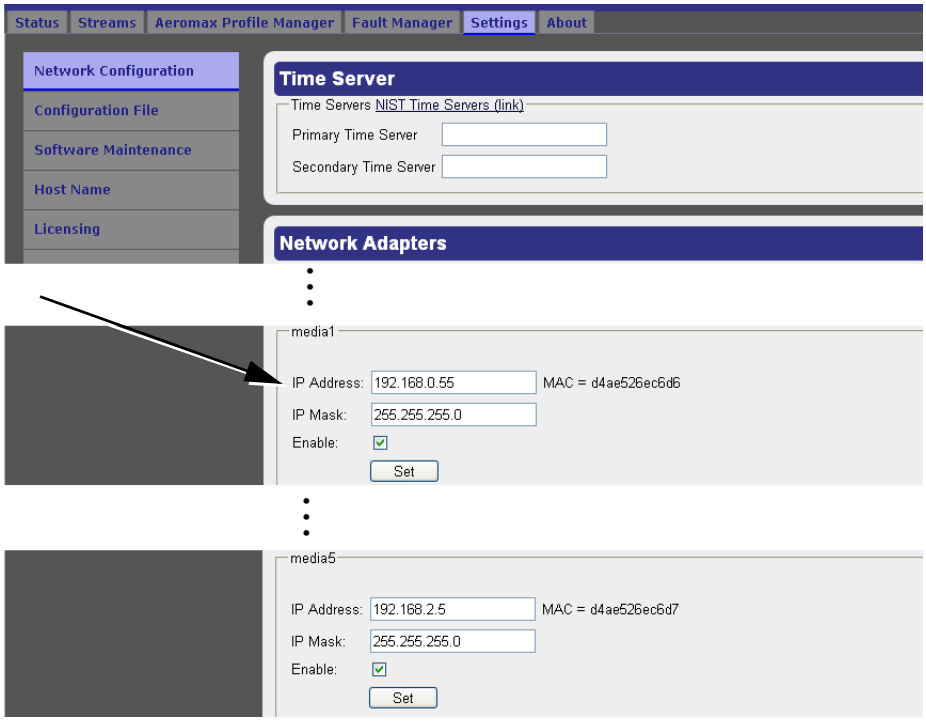
Connecting to Media (LMNTS-IP Only)

1. On the **Settings > Network Configuration** page (shown below), in **Network Adapters** section, enter the desired transport media address starting for port media 1 ("192.168.0.55" in the example below).

2. If equipped with additional physical Media ports, repeat for other media address connections in the media 2 thru media 5 fields as required.

3. Proceed to Setting up Transport Streams below.

Note: For LMNTS-1000-IP using IP Multicast, set the media IP address as described here. The Multicast Group addresses will be entered later in the procedure (in Setting up Transport Streams).



Setting up Transport Streams

The following steps describe how to add a transport stream, and then how to apply loudness processing profiles and show processing data for each stream.

Transport streams are recognized by the connection to media performed above. “Adding” a transport stream allows it to become visible to LMNTS for allowing user control of the following:

- Assigning input and destination addresses/ports for each transport stream
- Applying codecs for each audio program
- Adding new transport streams and/or deleting existing transport streams
- Observing and applying loudness processing parametric settings for individual audio programs and viewing running, near real-time plots of pre and post-processed loudness.

Figure 3-2 shows the basic Transport Streams controls.

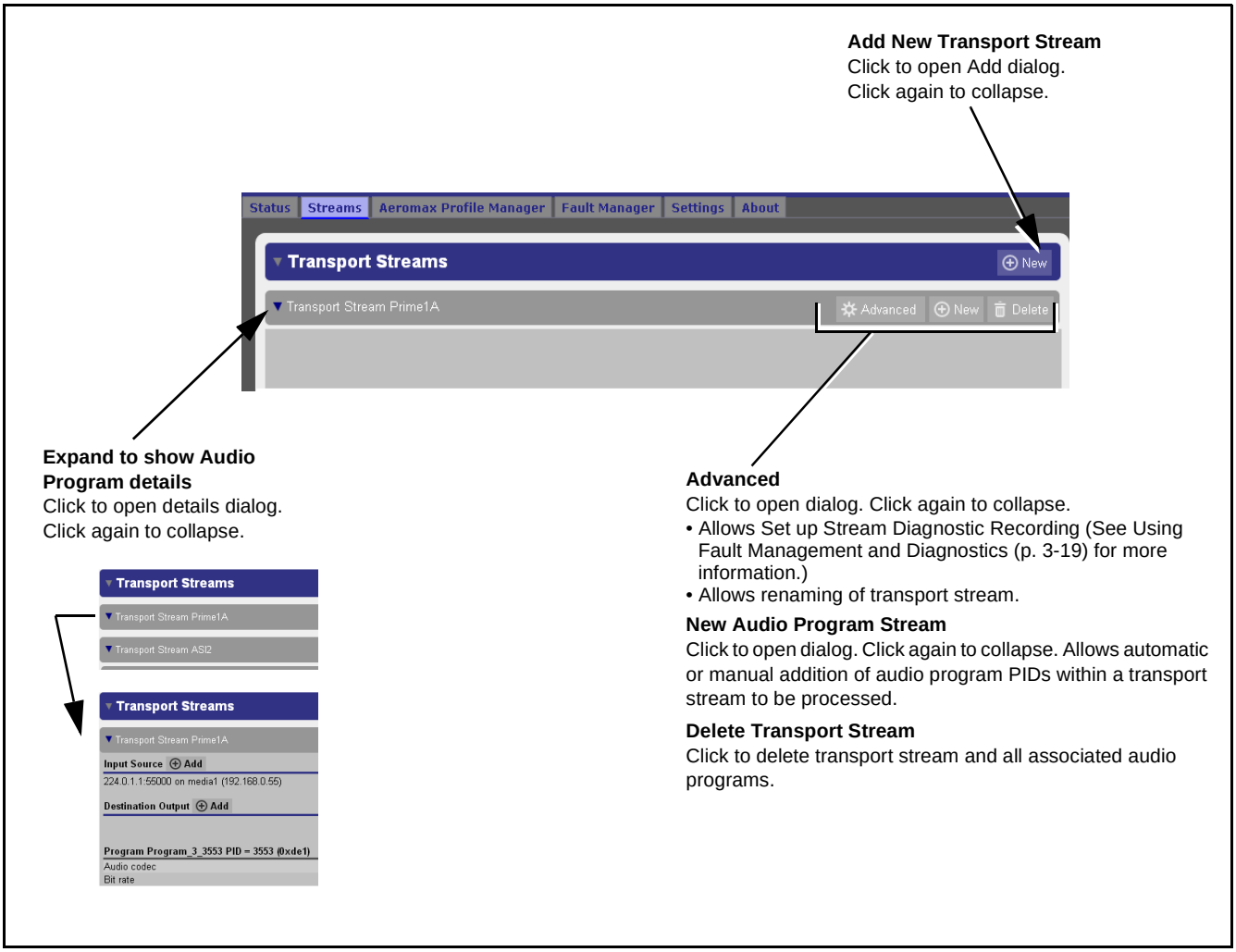


Figure 3-2 Transport Streams Basic Controls

Adding Transport Streams

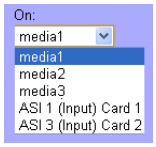
The **Add New Transport Stream** dialog allows assigning the source and destination addresses and ports for the stream, as well as other parameters related to the stream.

Adding Transport Streams

1. Click the **Streams** tab, then click New. A dialog opens allowing both input and output transport streams to be set up and added. (To uncommit from transport add, simply click the button again to collapse and exit the add dialog.)

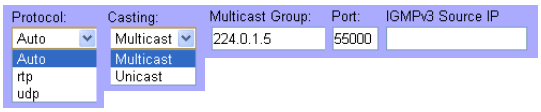
2. In **Stream Name** field, enter desired name to be used in GUI for identifying this stream.

3. In **Input** field, set up the input from which LMNTS will **receive** unprocessed transport audio as described below.



- Set **On:** drop-down to select the physical port from which input media is to be received.

  Note: • Drop-down choices are per LMNTS hardware configuration; different choices may appear.
  - On an ASI adapter card, inputs are always “ASI 1” and outputs are always “ASI 2”.



- (IP only) Set **Protocol:** **Casting:** **Multicast Group:** and **Port:** drop-downs as required.

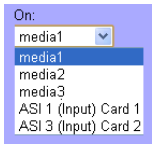
Note: • Because Multicast supports multiple transport streams within a single IP media connection, enter the Group address associated with the desired transport stream. The IP media address for this transport has already been set up as part of Connecting to Media (p. 3-6)).
Multicast addresses must fall within the range of 224.0.0.0 through 239.255.255.255. Refer to **http://www.iana.org/assignments/multicast-addresses/multicast-addresses.xml** for more information.

- **IGMPv3 Source IP** field allows downstream devices/systems to act only on addresses sent with this identifier, thereby allowing an IP address here to be the same as others (for example, the unprocessed native stream of the same address not processed by LMNTS).

– continued on next page –

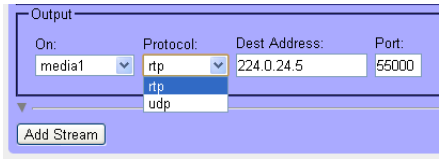
Adding Transport Streams – cont.

4. In **Output** field, set up the output to which LMNTS will **transmit** loudness-processed transport streams as described below.



- Set **On:** drop-down to select the physical port to which processed media is to be transmitted.

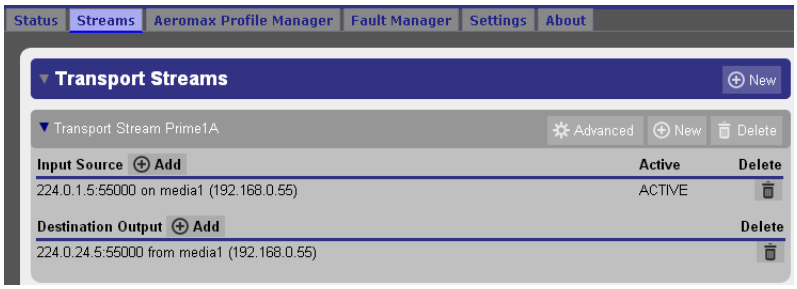
  Note: Drop-down choices are per LMNTS hardware configuration; different choices may appear.

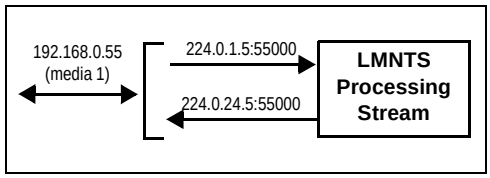


- (IP only) Set **Protocol:** **Destination Address:** and **Port:** drop-downs as required.

  Note: The IP and ASI interface choices on both the Input and Output controls provides a gateway in which transport streams can be converted to and from both ASI and Ethernet interfaces.

5. When done, click **Add Stream**. The stream is now added and present in LMNTS (as shown in the example below).





- To add another stream manually (with full control of all setup facets), repeat steps 1 thru 5 above.
- To add multiple streams using the bulk add tool, see Using Stream Bulk Add below.
- When done adding streams, proceed to Adding Audio Programs (p. 3-11).

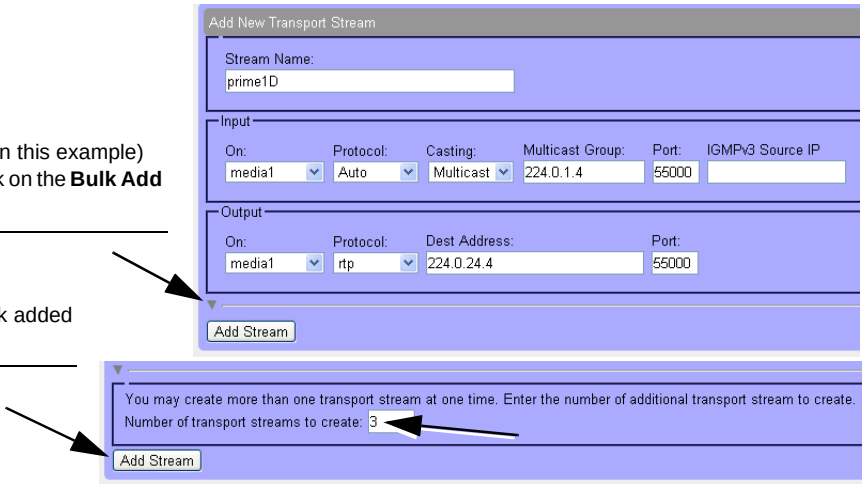
Using Stream Bulk Add

Multiple streams can be added in bulk using a single button when a single stream is set up as described above. The multiple streams are built from the attribute settings as set up for the originating stream.

1. With an originating stream ("prime1D in this example) already set up (but not yet added), click on the **Bulk Add** arrow.

2. Enter the amount of streams to be bulk added ("3" in this example).

3. Click **Add Stream**.



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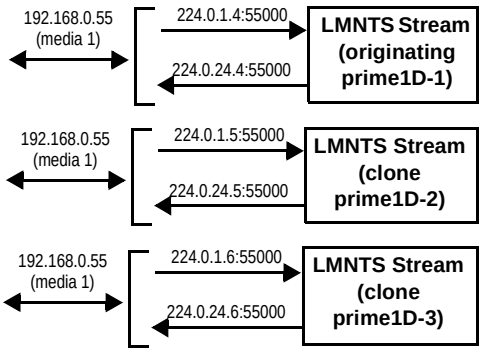
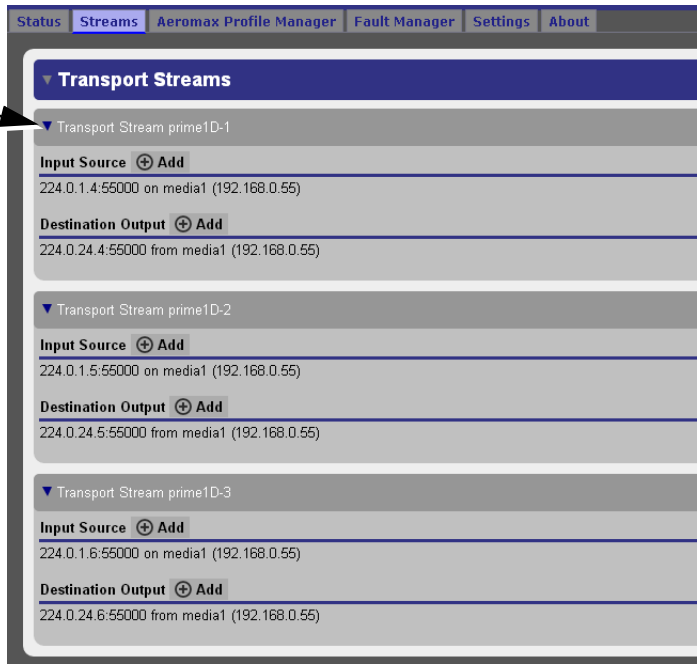
Adding Transport Streams – cont.

4. When the bulk add process is completed, the originating and bulk added streams are added as transport streams as shown in the example below.

Originating stream ("prime1D") is given suffix name of "-1", with cloned streams added using suffices "-2" and "-3")

Cloned streams are automatically assigned incremented source and destination addresses

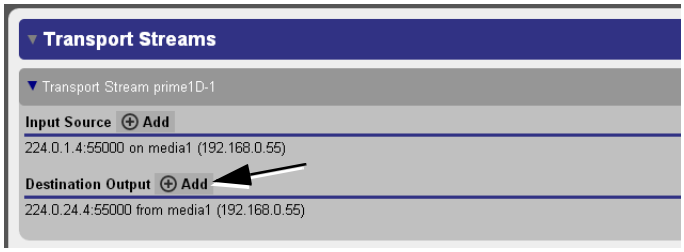




Adding Input Sources or Destination Outputs to Transport Streams

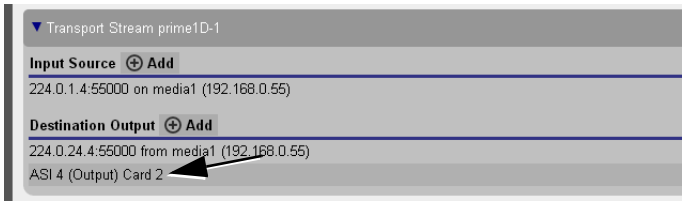
When a stream is set up, additional sources and destinations can be added. This allows taking in additional transport streams, and outputing loudness processed streams to additional transports. The ⊕ Add buttons also provide a gateway function, allowing streams to be transferred between IP and ASI physical ports.

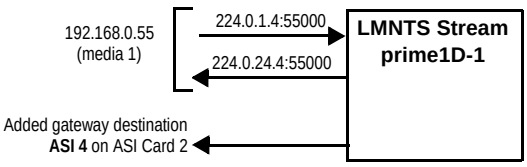
1. Click the ⊕ Add button to add another source or destination to a transport stream. (In this example, a gateway ASI destination output is being added to transport stream "prime1D-1".)



2. Apply settings for the source or destination being added (in this example, since the added destination is an ASI port, the IP-related fields appear grayed-out).
- Click **Add** to add the source or destination.
- To uncommit from an add, simply click the ⊕ Add button again to collapse and exit the add dialog.

3. When complete, the added source or destination appears in the transport stream header.





Adding Audio Programs

Overview of Optional Program Provisioning Using Licensing

Before adding audio program support, you need to be familiar with the LMNTS licenses that support various audio codecs.

To allow scalability to suit various capacity requirements, LMNTS uses licensing to support the desired amount of programs to be processed, as well as audio codec types. This convention allows LMNTS to be provisioned only as needed, without uneconomical unused capacity. It also provides scalability to add program licenses to the same hardware platform (and without disruption) should more capacity be needed in the future. The available licenses are listed below.

LMNTS-1000-IP	Transport Stream Loudness Processor, 1 Control IP Port, 5 Media IP Ports
Provisioning Options	
LMNTS-OPT-ASI-1X1	Adds one ASI input and output to LMNTS-1000
LMNTS-LICENSE-E-AC-3-SURROUND	Loudness processing license for one stream (one PID) of 5.1 (surround) Dolby Digital Plus (E-AC-3). Can also be used to process Dolby Digital (AC-3).
LMNTS-LICENSE-E-AC-3-STEREO	Loudness processing license for one stream (one PID) of 2.0 (stereo) Dolby Digital Plus (E-AC-3). Can also be used to process Dolby Digital (AC-3).
LMNTS-LICENSE-AC-3-SURROUND	Loudness processing license for one stream (one PID) of 5.1 (surround) Dolby Digital (AC-3)
LMNTS-LICENSE-AC-3-STEREO	Loudness processing license for one stream (one PID) of 2.0 (stereo) Dolby Digital (AC-3)
LMNTS-LICENSE-AAC-SURROUND	Loudness processing license for one stream (one PID) of 5.1 (surround) AAC-LC or HE-AACv1
LMNTS-LICENSE-ACC-STEREO	Loudness processing license for one stream (one PID) of 2.0 (stereo) AAC-LC or HE-AACv1
LMNTS-LICENSE-MP1L2	Loudness processing license for one stream (one PID) of MPEG 1 Layer II

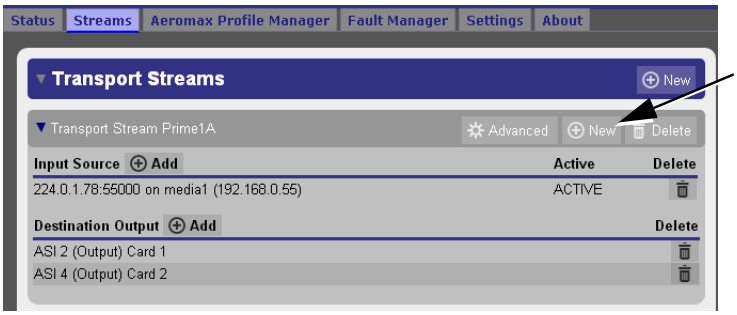
Note: A 5.1 (surround) license can be used to process a 2.0 (stereo) stream of the same codec type.

The **Add Audio Program Stream** dialog allows directing audio programs within the related transport stream through loudness processing. As such, the setup allows the addition or removal of audio programs to be processed. (When an audio program is “added” using the steps below, it means the audio program is extracted, decoded, loudness-processed, and then re-encoded into the transport stream.)

Adding Audio Programs

1. On the transport stream header for programs being added ("Transport Stream Prime1A" in this example), click the New button. (To uncommit from program add, simply click the button again to collapse and exit the add dialog.)

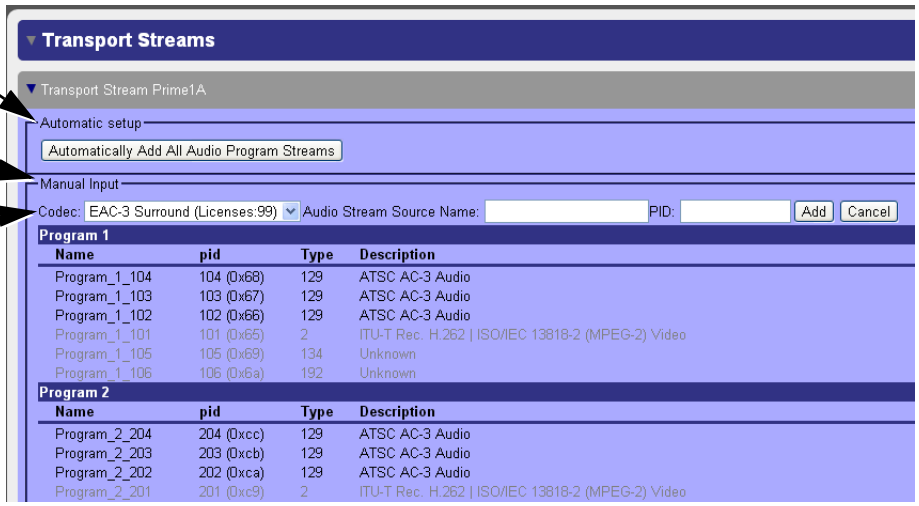
All audio and other PIDs associated with the transport stream are now displayed (non-audio PIDs are displayed grayed-out).



Automatic Setup adds all associated audio programs

Manual Input allows only desired programs to be added

Codec: field selects codec to be used for manually entered programs (field also displays available number of codec licenses)

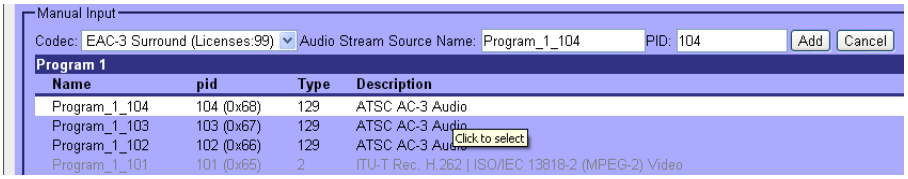


2. To add **all** programs, click **Automatically Add All**...

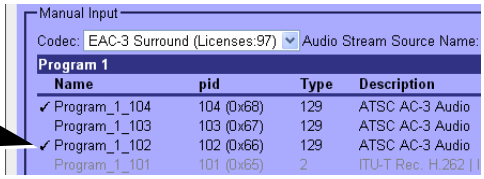
Note: It is typically easier to use Automatically Add All, even if not all programs will receive loudness processing (added programs can always be removed as desired).

3. To add **selected** programs:

- Click on the desired audio program ("Program_1_104" in this example). The program now appears in the entry/setup window.



- Apply the desired codec type for the program using the **Codec:** drop-down.
- Click **Add**. Repeat steps 1 thru 3 to add more programs. As programs are added, checkmarks indicate added programs.



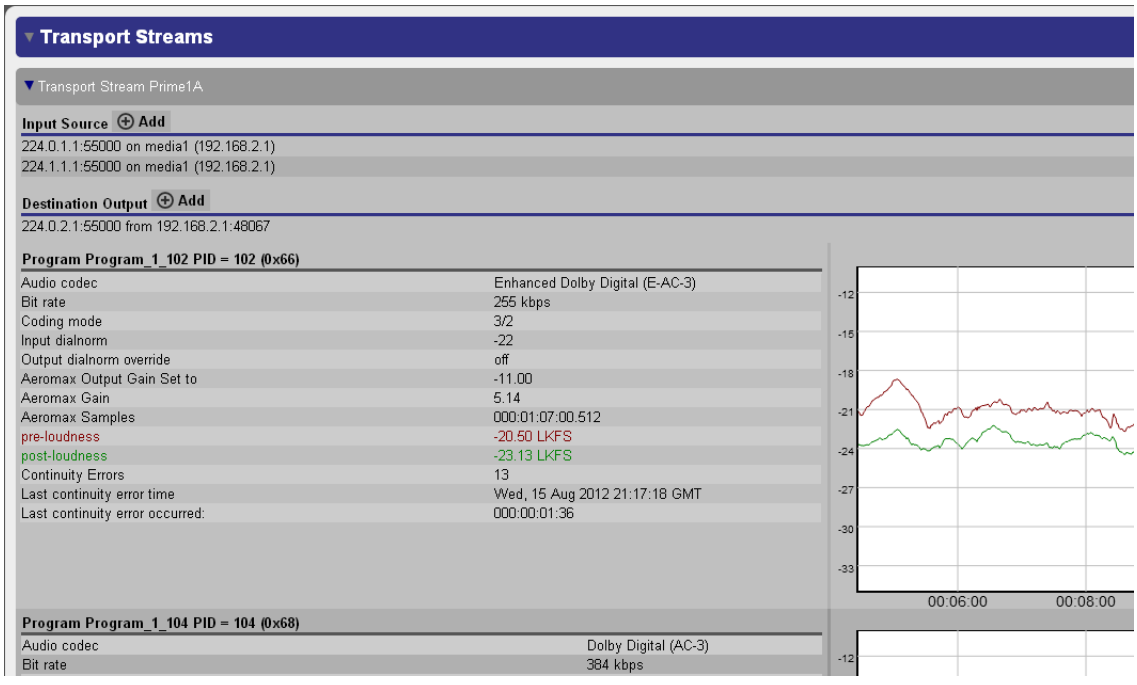
4. Click to remove an audio program.

5. Click **Advanced** to rename the audio program.

– continued on next page –

Adding Audio Programs – cont.

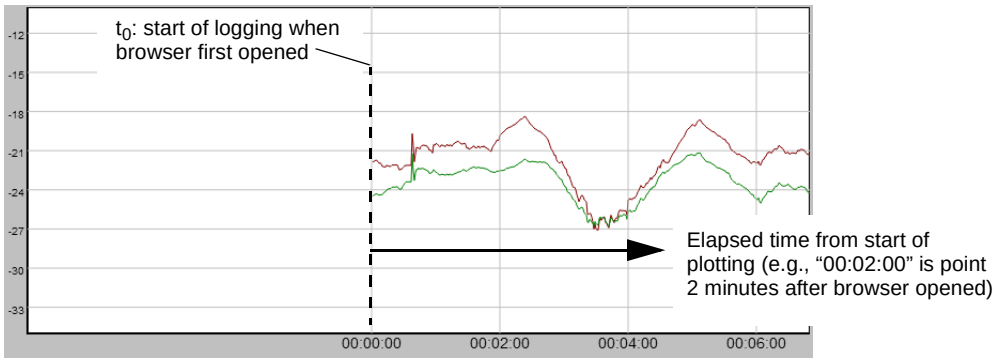
When audio programs are added, default loudness processing is applied. For each added program, all program details, as well as a near real-time graph of loudness processing is displayed.



Item	Description	Item	Description
Audio codec **Bit rate** **Coding mode**	Codec and bit rate detected on incoming audio program	**Pre-loudness** **Post-loudness**	30-second averaged LKFS value of pre- and post-loudness processed audio
Input dialnorm	Dialnorm value detected on incoming audio program (this unit is accordingly only displayed where an AC-3 codec is detected)	**Continuity errors**	Number of continuity errors logged since audio program stream was added and activated.
Output dialnorm override	Allows re-authored dialnorm to replace any incoming dialnorm. This is typically recommended. See Applying Audio Program Loudness Processing Profiles (p. 3-14).	**Last continuity error time**	Date and GMT time of last logged error
Aeromax output gain set to	Provides an output (post-processed) master fixed gain	**Last continuity error occurred**	Time of error log (with t_0 being when web browser was opened)
Aeromax samples	Shows loudness processing sampling time in days:hr:min:sec:µsec (for debug use)		

Red plot denotes pre-processed loudness

Green plot denotes post-processed loudness

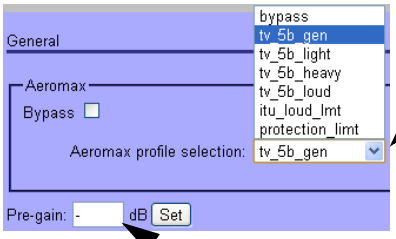


Applying Audio Program Loudness Processing Profiles

LMNTS allows any of several pre-defined (as well as user-defined) loudness processing profiles to be individually applied to each audio program.

Applying Audio Program Loudness Processing Profiles

1. Click the **Advanced** button above the loudness graph of the desired audio program to access the loudness processing module for the audio program. The dialog shown appears (**tv_5b_gen** is the default profile).



The **Aeromax profile selection** drop-down allows alternate profile selections other than recommended default **tv_5b_gen**.

Pre gain allows an attenuation trim to be applied to the audio program in front of the loudness processor

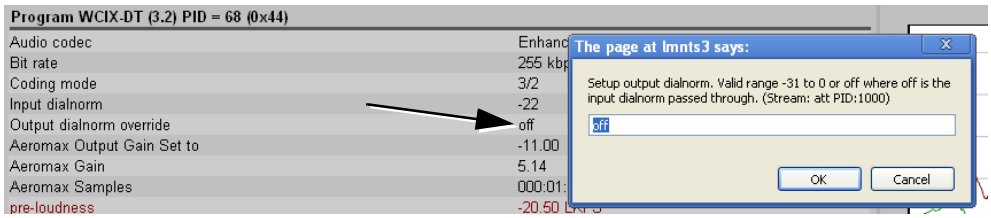
Note: • (USA only) If content on an audio program can be certified as conforming to "safe harbor" in accordance with FCC 11-182 "MB Docket No. 11-93 Report & Order", loudness processing can be bypassed (by checking the **Bypass** box) if desired. Bypassing loudness processing for programs already in compliance can free-up processing bandwidth and simplify overall management.

• Read and understand Loudness Processing Profile Descriptions (p. 3-14) before applying profiles other than tv_5b_gen. Modifications can have profound effects on perceived and measured loudness and may not comply with loudness regulations.

2. Select the desired profile using the **Aeromax profile selection** drop-down. Refer to Loudness Processing Profile Descriptions (p. 3-14) for descriptions of default tv_5b_gen and other modes.

3. To collapse the dialog, click **Advanced** again.

4. When loudness processing by LMNTS is applied to an audio program, it is typically required to re-author the output dialnorm to conform with the loudness processing target. (See below) For default profile tv_5b_gen (Television; 5-band; general), set output dialnorm to -24 to conform with the target loudness of -24 LKFS for ATSC A/85 usage.



Clicking **Output dialnorm override** value on the Transports > Transport Streams page opens a dialog for re-authoring the output dialnorm value

Loudness Processing Profile Descriptions

Note: Detailed information about all available loudness processing profiles is provided in Loudness Processing Profile Descriptions below. Profile **tv_5b_gen** (Television; 5-band; general) has been carefully designed and tested to provide appropriate loudness processing fully conforming to all promulgated standards without negative impacts. Read and understand this information before applying an alternate profile.

The Aeromax™ loudness processing used in LMNTS has six pre-defined profiles which, in general terms, provide the following characteristics which define the profiles:

- **TV 5B General** – This is the general, recommended preset for all types of content. It provides moderate dynamic range compression and is calibrated to produce audio having an average dialog loudness of -24 LKFS with no additional output level trim. Use of this preset as an initial setting is recommended.
- **TV 5B Light** – Similar to TV 5B General, this preset varies in that multi-band compression is reduced closer to 2:1, thereby providing a more gentle action.

  Note: This preset sacrifices agility in loudness control in favor of a more gentle compression profile; this preset may not be suitable for some material.
- **TV 5B Heavy** – Similar to TV 5B General, this preset varies in that multi-band compression is increased for greater level density/adherence to target at the expense of dynamic range.
- **TV 5B Loud** – Similar to TV 5B Heavy, but with a louder, more punchy perception.
- **ITU Loud Limit** – Utilizes a specially tuned input AGC plus multi-band and a final limiter to gradually adjust the average program loudness to an internally set AGC value, with the multi-band and final limiters acting until the AGC gains control of the level. This preset is most appropriate for ingest or live program material.

  Note: This preset bypasses the multi-band AGC. As such, it has less ability to manage spectral balance.
- **Protection Limit** – Bypasses all processing except for final output limiter, which is set only to prevent overload.

  Note: Unless the audio received has already been loudness processed, this setting is typically not recommended.

Figure 3-3 shows a functional block diagram of the Aeromax™ loudness processing function, along with correlation of parametric controls used by this function.

View the parametric settings for the various profiles by selecting the **Aeromax Profile Manager** tab.

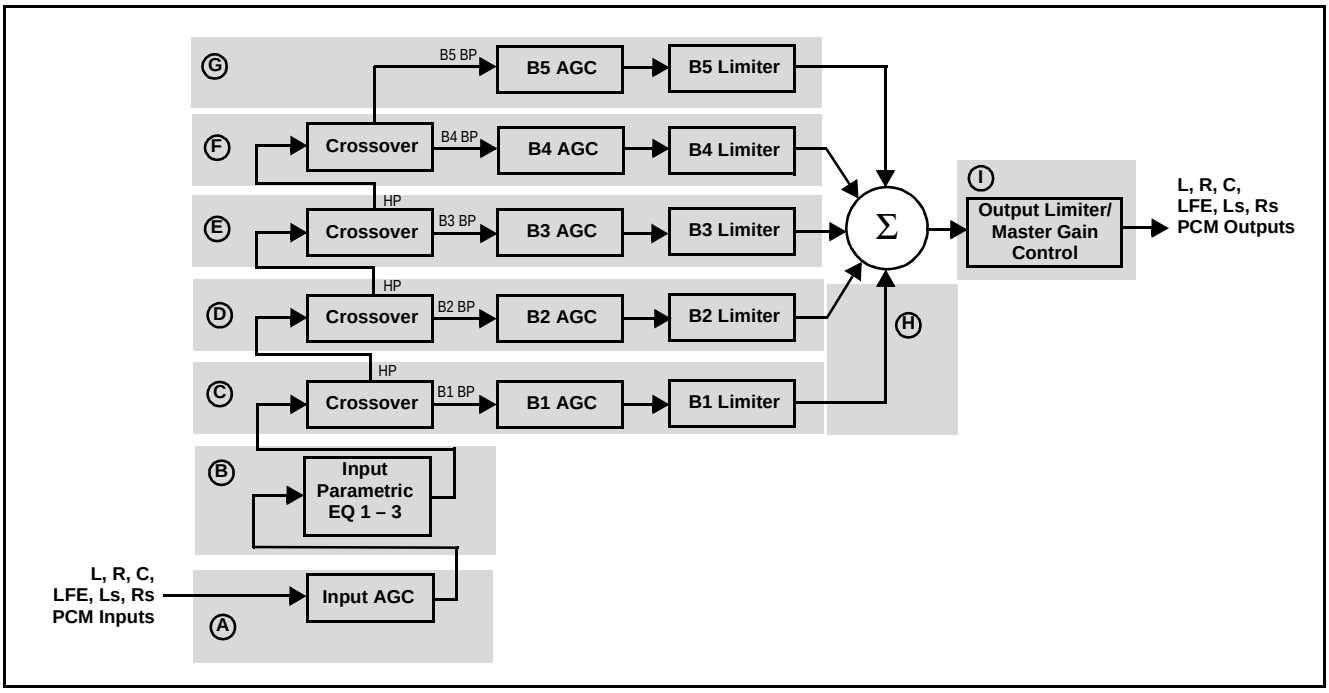
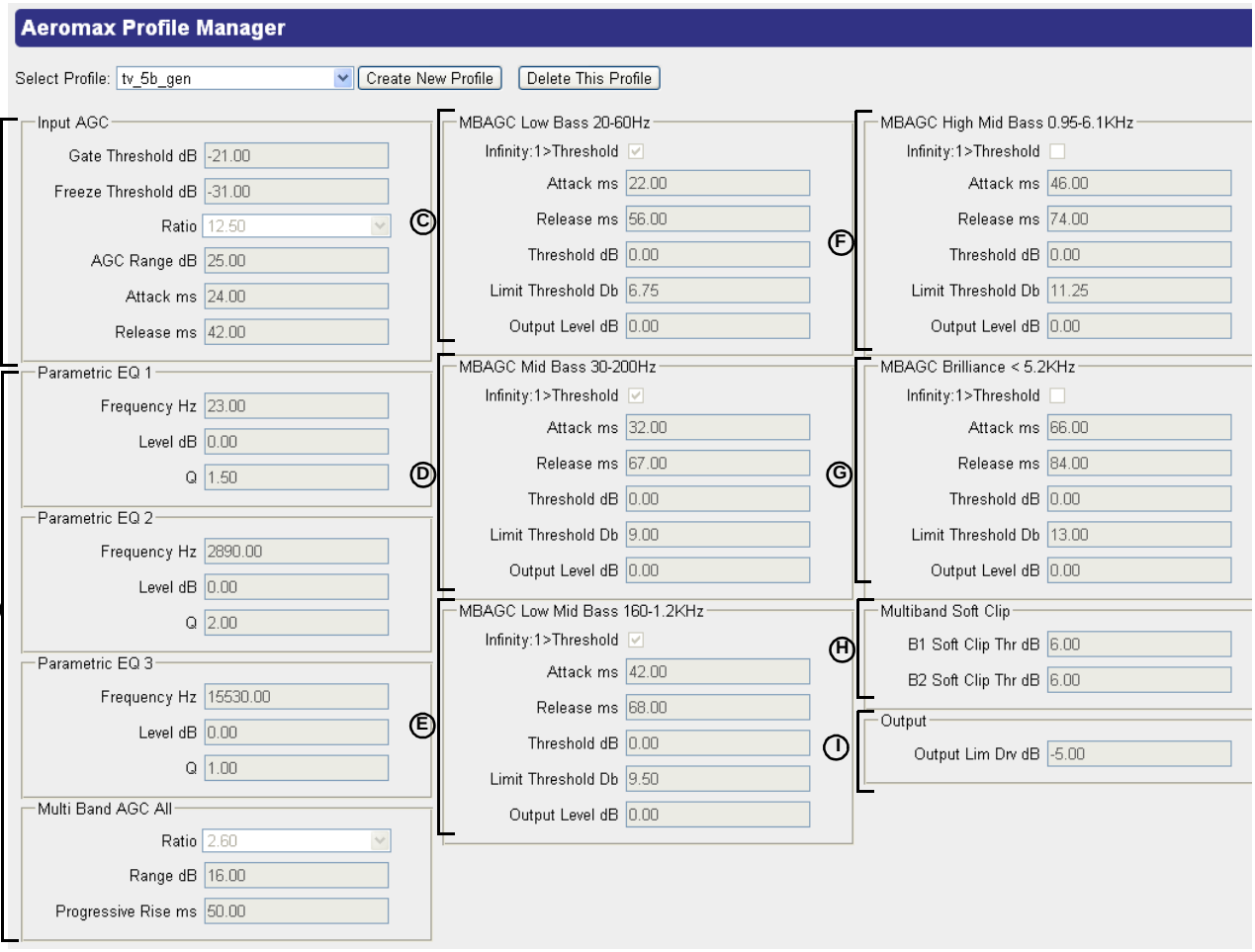


Figure 3-3 Aeromax™ Loudness Processing Functional Diagram and Related Parametric Controls (Sheet 1 of 2)



- **Parametric EQ 1 thru 3:** Provides 3 bands to provide notch filters. Default set to 0 dB (no effect). Each filter has a ±12 dB gain control, and selectable center frequencies from 20 Hz – 22.05 kHz.
- **Inf:>1Thr checkboxes:** When enabled, automatically increases AGC ratio to Infinity:1 once a signal exceeds the AGC threshold, allowing for expansion below the threshold and limiting above the threshold. Useful for bass frequency control.
- **Soft Clip controls:** For low-frequency bands 1 and 2, sets the point above in which band 1 (low bass) and band 2 (mid bass) are very quickly limited, acting more like a clipper without the artifacts. This helps maintain a “tight” bass sound.

Figure 3-3 Aeromax™ Loudness Processing Functional Diagram and Related Parametric Controls (Sheet 2 of 2)

Creating Custom Loudness Profiles

Note:
- Modification of default presets settings using the Custom Preset page can have a profound effect on program material technical and aesthetic aspects. Setup should only be performed by authorized personnel, and should be fully assessed before being used for on-air programming. Refer to Appendix A. "Linear Acoustic® AEROMAX® Detailed Description" for detailed descriptions of these parametric controls and their interaction.
- Custom settings may result in loudness processing that is no longer compliant with ITU BS.1770 – ATSC A/85.

Custom loudness profiles can be created and saved in the profile manager as described below. When a custom profile is created, and can then be selected and applied to any audio program using the audio program **Advanced** button and profile drop-down as described in Applying Audio Program Loudness Processing Profiles (p. 3-14).

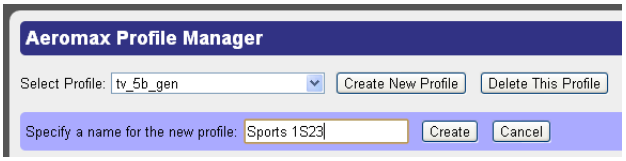
Note: Up to 4 custom profiles can be saved.

Creating Custom Loudness Profiles

1. Select the **Aeromax Profile Manager** tab. The page shown in Figure 3-3 on page 3-15 appears.

2. Using the **Select Profile** drop-down, select a profile to "build" from that most closely reflects that required in the new profile.

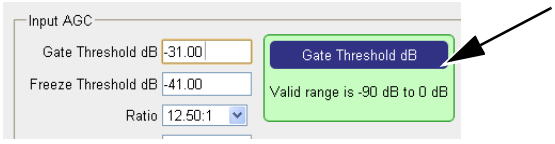
3. Click **Create New Profile**. Enter a name for the new profile ("Sports 1S23" as shown in the example below).



4. Set the various fields as desired by entering values or using drop-downs as applicable.

Custom settings are saved as soon as they are entered; when the page is exited, all custom settings will be saved under the custom preset name.

Note: For numerical entry dialog boxes, the available range is shown when the cursor is placed in the entry box (as shown in the example below)



Example LMNTS Setup

Figure 3-4 shows a network connection diagram of an example LMNTS setup.

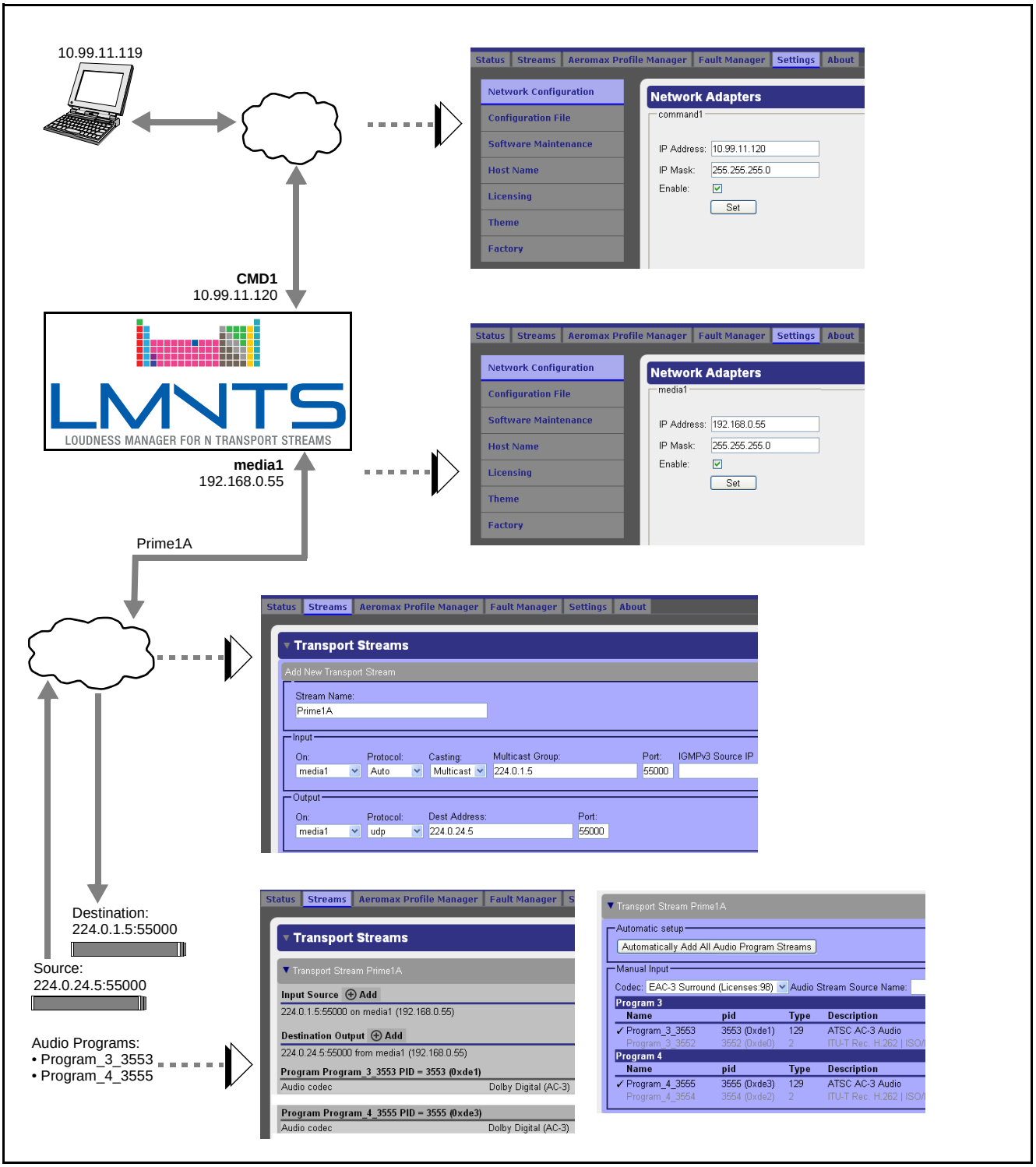


Figure 3-4 LMNTS Example Network Connections Setup

Using Fault Management and Diagnostics

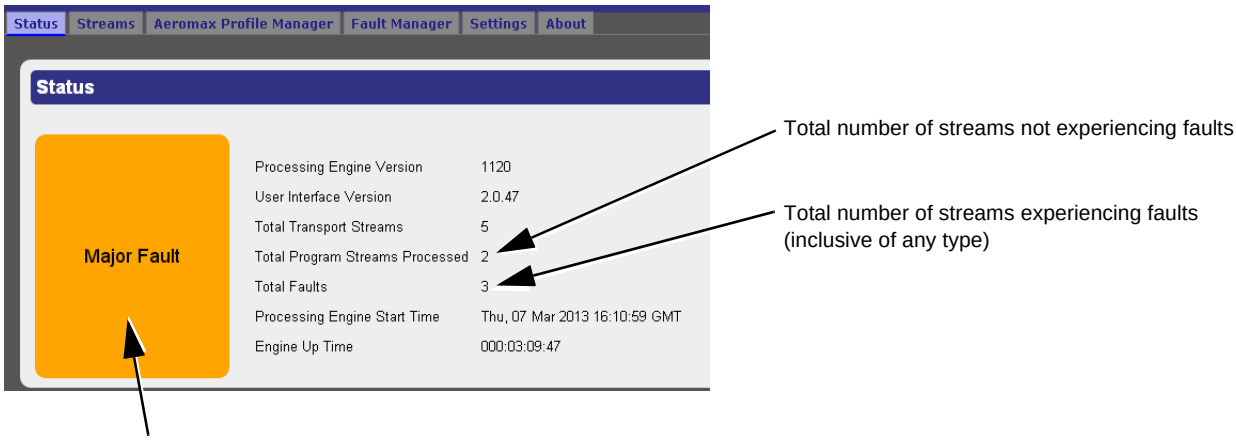
Viewing Status Display and Fault Log

Whenever a fault is occurring, presence of any faults is displayed at the bottom of the LMNTS page (regardless of page currently displayed). Access detailed fault information as described below.

Viewing Status Display and Fault Log

1. Whenever a fault(s) is occuring, the red alert bar appears at the bottom of all LMNTS pages.

2. Click the **Status** tab to see overall LMNTS status. Overall status is displayed as shown in example here.

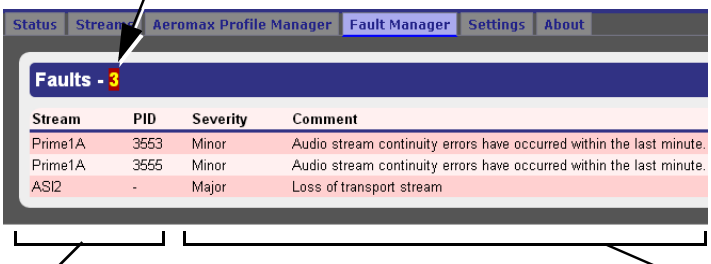


Fault Severity Level display
Most-severe type of fault occuring is propagated here. Severity levels are:

- **No Faults** (green) – shows that no detected system or transport faults are occuring.
- **Minor** (yellow) – shows that a fault occurred but is not continually affecting service; fault is limited certain transport streams only.
- **Major** (orange) – shows that a fault occurred and some audio streams are experiencing defects (including loss of entire transport.
- **Critical** (red) – shows that a fault occurred such that entire system has failed.

3. Click on the red bar at the bottom of the page to go to the **Fault Manager** page. (The fault log can also be viewed by selecting the **Fault Manager** tab.)

Faults - count shows total number of faults detected and currently logged



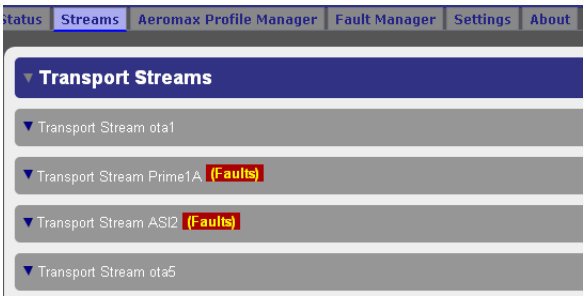
Stream and **PID** columns show where fault is occurring. Faults can be directly correlated to transport stream by going to the **Transport Streams** page.

Severity and **Comment** columns show severity level and specific detected error.

– continued on next page –

Viewing Status Display and Fault Log – cont.

4. When occuring, presence of faults is also visible on the **Streams** page to immediately correlate the fault(s) to affected streams.



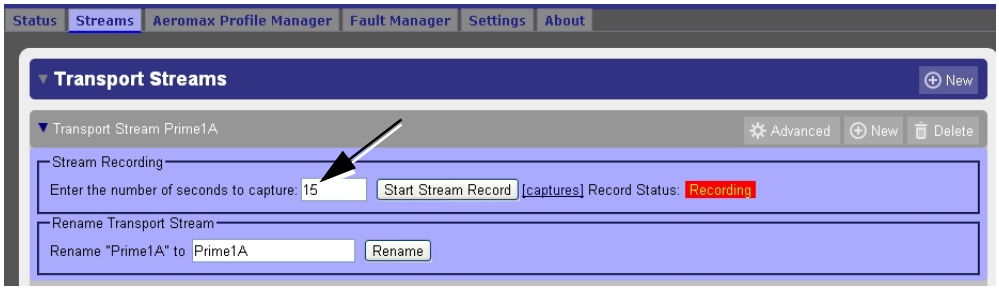
Using Stream Diagnostic Recording

For each transport stream, LMNTS provides a packet recorder that can record up to a 50,000-count packet stream. This recording is useful as a diagnostic tool which can be forwarded to Cobalt Digital Inc. for fault analysis and possible remedy. Make a stream recording as described below.

Using Stream Diagnostic Recording

1. Go to the **Transport Streams** page. On the transport stream to be diagnostically recorded, click the Advanced button .

2. In the s**econds to capture** field, enter capture time and click **Start Stream Record**. Wait while **Recording** is displayed.



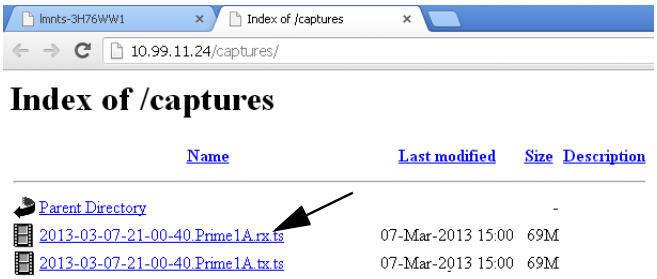
– continued on next page –

Using Stream Diagnostic Recording – cont.

3. Click **[captures]** to open a browser. Click the desired *.ts* file (...Prime1A.tx.ts in this example) to download the file to the host computer local drive (typically directed to C:/My Documents/Downloads).

Notice in the example companion rx.ts and tx.ts files are captured. These files provide a bit-accurate record of received incoming packets (rx) and outputted packets (tx) to and from LMNTS.

Typically where a problem is noted on a particular transport stream, an rx/tx companion set of captures can provide Cobalt Support with the data to pinpoint the problem and provide resolution.



4. Select a companion set of rx/tx files that were recorded during a interval where an error(s) was observed for a particular transport stream or one of its programs.

5. Contact Cobalt Support (see the About tab on LMNTS or see Contact Cobalt Digital Inc. in Chapter 1, Introduction) to arrange to have the file set analyzed.

Cobalt Support can setup a SFTP account for receiving these files. Alternately, LMNTS control can be connected to the internet which in turn creates a secure VPN connection to a Cobalt support server for directly downloading the recording clips.

6. Click the Advanced button to collapse the stream record dialog.

Using Configuration, Licensing, and Software Maintenance Tools

These tools allow transferring user configuration and uploading LMNTS upgrade software to the LMNTS unit from files received from Cobalt and stored on your computer. Licensing tool shows a list of licensing consumed for current stream processing, and allows for additional licenses to be uploaded to the LMNTS unit.

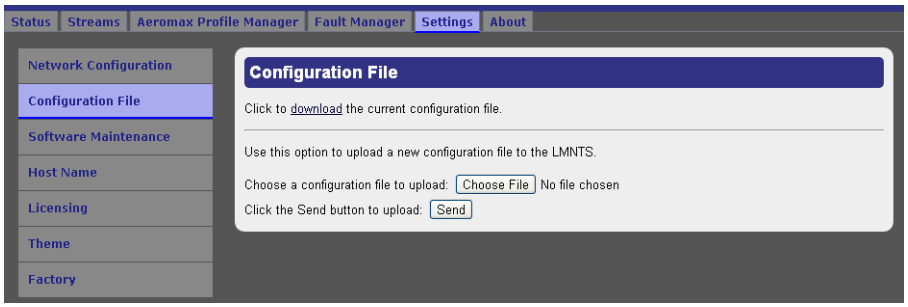
Note: Some of the functions described here specify files obtained from Cobalt for product upgrades. Only upload upgrade files received from Cobalt and specified for use in your LMNTS product.

Configuration File Upload/Download

Configuration files save the local setup settings you have performed for the LMNTS unit.

Uploading and Downloading Configuration Files

1. Download (save) configuration file to a computer by going to **Settings > Configuration File** and clicking **download**. The current configuration is saved to your computer as Downloads\lmnts-config.txt.



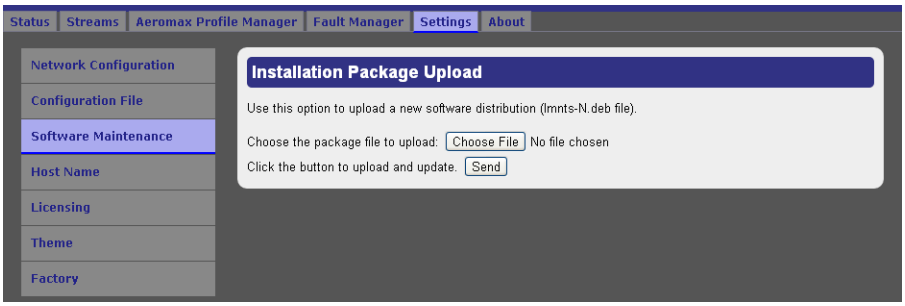
2. Upload a new configuration file to LMNTS by clicking **Choose File**. Browse to and select the new file in the dialog that appears, then click **Send**.

Software Maintenance (Upgrade) Upload

Software upgrades to LMNTS (when available) are via a new software distribution (*lmnts-N.deb*) file.

Uploading and Downloading Configuration Files

Go to **Settings > Software Maintenance**. Upload an upgrade file to LMNTS by clicking **Choose File**. Browse to and select the new file in the dialog that appears, then click **Send**.



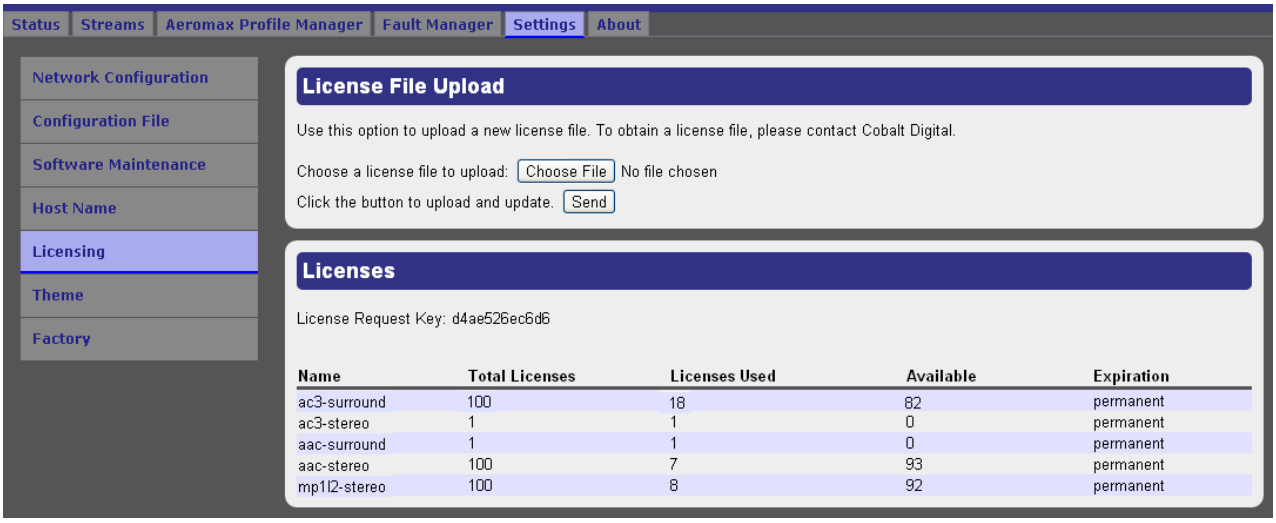
Licensing Management and Upgrades

The Licensing utility allows economically flexible LMNTS scaling to process only the amount of channels needed, while allowing for the addition of licenses only as needed and with minimum disruption.

Uploading a License File

1. Access licensing by going to **Settings > Licensing**.

2. Assess licenses used by observing the **Available** column in the table (as shown in the example below).



3. A license file will need to be obtained from Cobalt in advance of performing the upload steps here. Obtain license as follows:

- Note the **License Request Key** string displayed on the Licensing page ("d4ae526ec6d6" in the example above).
- Copy and paste this string in any communication to Cobalt support in obtaining additional license key(s).
- Contact Cobalt support (see the About tab on LMNTS or see Contact Cobalt Digital Inc. in Chapter 1, Introduction). Support personnel will be able to provide options regarding various purchasable licenses.
- The additional licensing will be provided in a file. Store the file in a known location to a computer accessible from the LMNTS web browser GUI.

Note: Each LMNTS unit has a licensing Request Key string that is unique to a particular unit; licenses obtained using the string are valid only for the corresponding unit.

4. With received license key accessible, upload the additional licensing to LMNTS as follows:

- Go to **Settings > Licensing**.
- Upload the license file to LMNTS by clicking **Choose File**. Browse to and select the license file in the dialog that appears, then click **Send**.
- Refresh the GUI display. The **Total Licenses** and **Available** columns of the Licensing page will now re-account for the added licensing.

Troubleshooting

This section provides general troubleshooting information and specific symptom/corrective action for LMNTS. The LMNTS unit requires no periodic maintenance in its normal operation; if any error indication (as described in this section) occurs, use this section to correct the condition.

(See Table 3-1.) In the majority of cases, most errors are caused by simple errors where LMNTS is not appropriately set for the type of media being processed, or a setup entry has not been fully entered as required. Faults at the transport level are typically displayed by a **Fault outstanding** banner at the bottom of the screen. See Viewing Status Display and Fault Log (p. 3-19) for more information.

Table 3-1 Troubleshooting Processing Errors by Symptom

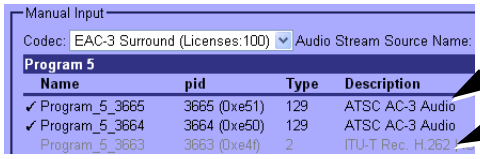
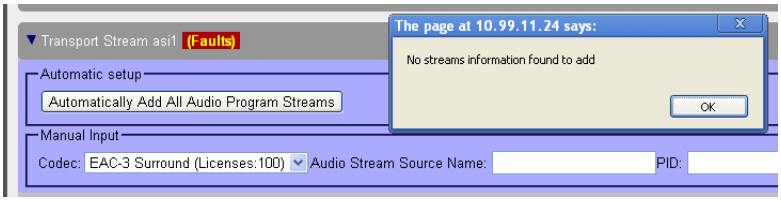
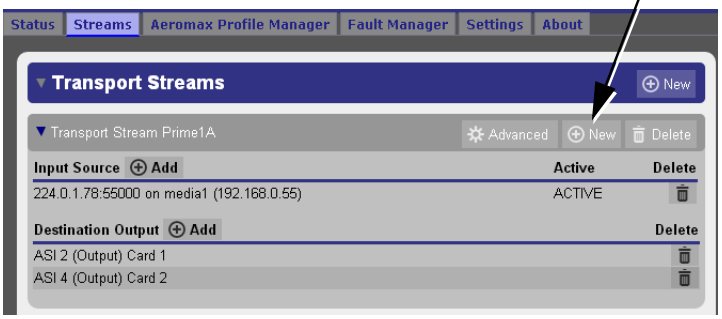
Symptom	Error/Condition	Corrective Action
LMNTS GUI controls seem unresponsive.	LMNTS web GUI has timed out	Refresh the browser page.
After adding audio program, program does not show loudness data plot. Bit rate displayed fluctuates, or “null” is displayed.	• Wrong codec type applied to audio stream.	If adding programs manually, make certain selected codec type is appropriate for added audio stream. Mismatched codec can be applied in the **Manual Input > Codec:** field without an error message being displayed (received codec type for each audio PID is always displayed for received streams).
	• Video or other PID inadvertently selected as audio PID	Video and non-audio PIDs are always displayed grayed-out. These PIDs do not require any selection or manipulation when setting up loudness-processed streams.
 Only select PIDs marked as “Audio” for loudness processing (in this example “3665 ... ATSC AC-3 Audio”) Grayed-out PID (3663) is a non-audio PID and should not be selected or manipulated; these PIDs will pass through and automatically be re-correlated to related audio PIDs after processing.		
(see below) When attempting to add audio programs (either automatically or manually), **no streams** pop-up displayed.	• Transport does not contain recognizable audio streams	Make certain intended transport stream has been added.
	• Transport failure	The overall fault log may have shown the transport, in its entirety, to become unavailable.
		

Table 3-1 Troubleshooting Processing Errors by Symptom — continued

Symptom	Error/Condition	Corrective Action
LMNTS will not accommodate an added audio program.	• Available licensing exhausted	See Configuration Licensing (p. 1-7) and Licensing Management and Upgrades (p. 3-23) to see the amount and type of licenses currently available on your LMNTS unit. Additional licenses may be required is the current complement has been exhausted.
	• License for codec type to be processed not installed	A license(s) must be present on LMNTS corresponding to the type of audio codec to be processed. **Note:** A 5.1 (surround) license can be used to process a 2.0 (stereo) stream of the same codec type.
LMNTS will not accommodate intended number of added transports.	Transports have erroneously been added for each program added.	For all media types, a transport stream accommodates multiple programs. When a program is added that is contained in an already set-up transport stream, it should be added while working within the particular transport stream. **Do not add another transport stream to accommodate a program already contained within a transport stream that has already been set up.** Refer to Structure Overview of Media, Transport Streams and Programs (p. 1-6) in Chapter 1, Introduction for more information.
Multicast transport not propagated as expected, or cannot be connected to on downstream devices.	Multicast address not properly set up	• Multicast addresses must fall within the range of 224.0.0.0 through 239.255.255.255. Refer to http://www.iana.org/assignments/multicast-addresses/multicast-addresses.xml for more information. • Typically, destination multicast address will use alternate third octet to relate to the source address (e.g.: 224.0.1.5 source 224.0.24.5 destination)

While within a transport setup (in this example, transport “prime1A”), add audio programs within this transport using the dialog here.

For programs belonging to a particular transport, add programs using the New button while within the transport’s program display overview.



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Appendix A

Linear Acoustic® AEROMAX® Detailed Description

Note: The following is provided by written permission of Linear Acoustic Inc. ©2012 Linear Acoustic Inc. All Rights Reserved.

The following describes the functional audio processing blocks of the AEROMAX® loudness processing used by this product.

Processing Structure

Figure A-1 shows the general signal flow of the processing core and also shows what part of the chain is being adjusted by each parameter. Note that this signal flow is also shown in Figure A-2 ("Menus for User-Adjustable Parameters"), with the top of the list being the input, and the bottom of the list being the output.

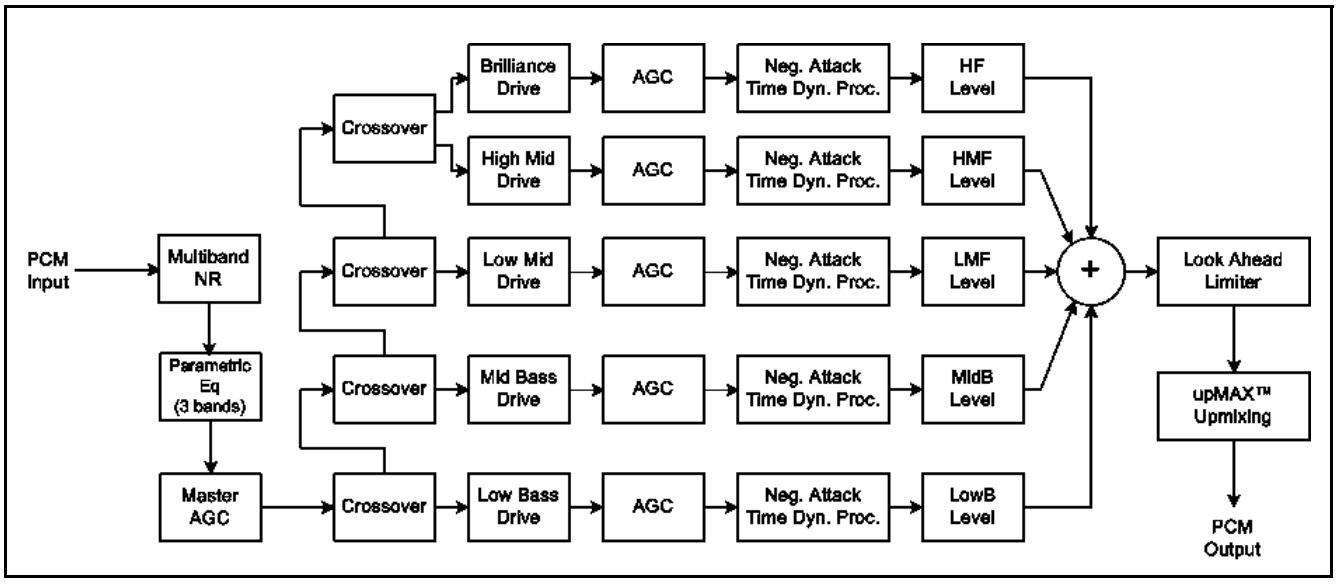

Figure A-1 AEROMAX® General Signal Flow

User-Adjustable Parameters

Figure A-2 shows the user-adjustable parameters, organized into major functional groups and each group's subordinate parameters. Defaults are shown for the **TV 5B Gen** preset; other profile presets will vary some or all of these parameters.

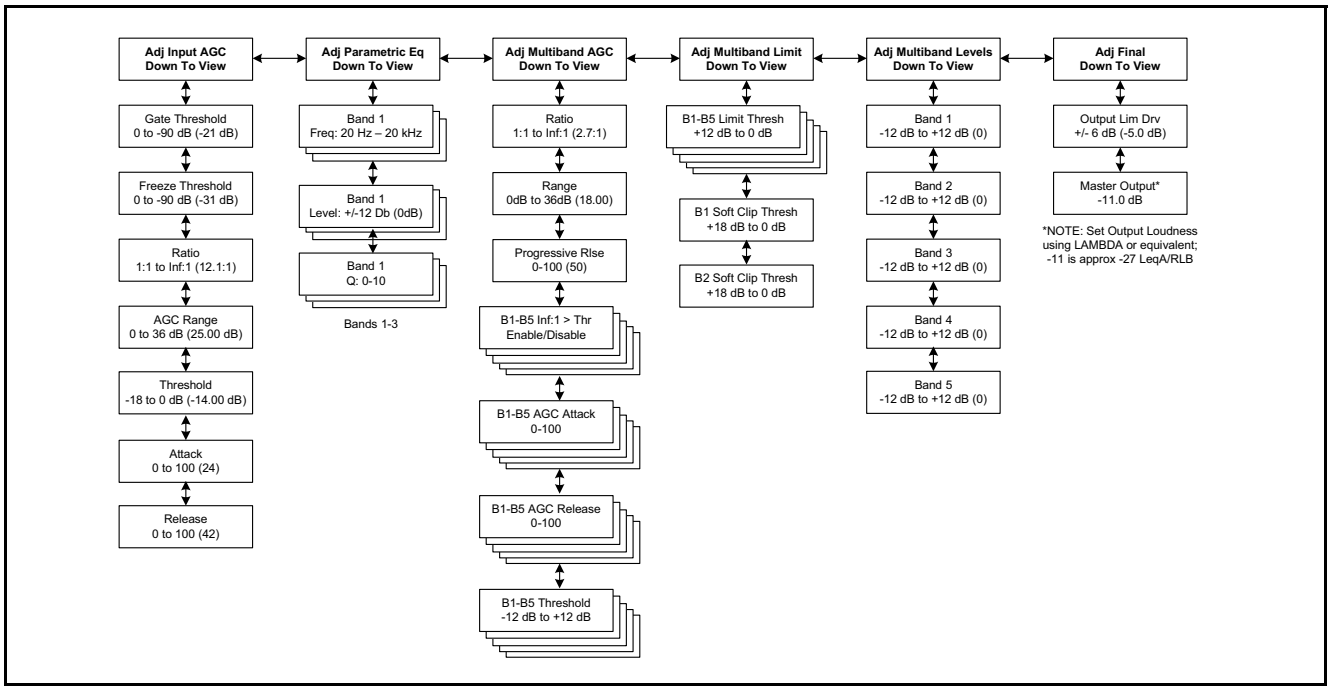

Figure A-2 Menus for User-Adjustable Parameters

The TV profiles used by this product's AEROMAX® loudness processing utilize second-order Linkwitz-Reilly style filters that are hard coded to specific frequencies. As the processing required for television applications is not as aggressive as other mediums, little advantage can be gained from changing these values, and the remainder of the processing relies on these characteristics remaining constant. Therefore, non-configurable crossover frequencies are used here.

For reference, the crossover frequencies are:

- Band 1 (Low Bass): 20 Hz - 60 Hz
- Band 2 (Mid Bass): 30 Hz - 200 Hz
- Band 3 (Low Mid): 170 Hz - 1.15 kHz
- Band 4 (High Mid): 950 Hz - 6.1 kHz
- Band 5 (Brilliance): 5.2 kHz - 24 kHz

Parametric Eq(ualization)

Three bands of parametric equalization are provided for fine tuning if necessary. None of the factory-supplied presets use the parametric equalizers, but they are provided to create notch filters or other effects if necessary. Each filter has a gain control with a ±12dB range, a center frequency control that varies from 20 Hz to 22.050 kHz, and a bandwidth or "Q" control that varies between 0 and 10. Normal default settings for all bands are Gain = 0dB (i.e., bypassed).

Input AGC

The input AGC is a very slow acting front-end gain control with a 36dB gain range whose only purpose is to make sure that the following processing stages are fed with the correct average audio levels. It is basically the automatic equivalent of an operator slowly riding a gain control on a console to keep the audio close to reference level. Wideband in nature, the AGC is not meant to perform rapid gain reduction or expansion as its actions will be more audible, as with all wideband gain processors. As a slow gain rider, its actions are nearly inaudible thanks to the multiband processing that follows it. The AGC has two stages of gating where the gain expansion is slowed or stopped to prevent background noise increasing.

Adjustable parameters are:

- **Gating Thresh(old):** 0 dBFS to -90 dBFS (default: -21 dBFS)

  Gating sets the point at which the AGC release time is made extremely slow to prevent increasing background noise and allow the AGC to return to unity gain.

- **Freeze Thresh(old):** 0 dBFS to -90 dBFS (default: -31 dBFS)

  Freeze stops all gain change (i.e. when the audio drops to silence), and remains frozen at its current gain value until the threshold is exceeded.

Note: Very quiet audio (such as a golf match) benefits from having processing frozen when input audio drops below a given level to prevent "boosting the cricket" sounds.

- **Ratio:** 1:1 to Inf:1 (default: 12.0:1)
- **Range:** 0 dB to 36 dB (default: 24dB)

  Range sets how much gain expansion above unity is performed, and this amount is subtracted from the total AGC gain range of 36dB, so the default value allows for 24dB of expansion and 12dB of compression. This adjustment is reflected in real time by changing the AGC meter scale.

- **Threshold:** -18 dBFS to 0 dBFS (default: -16dBFS)
- **Attack:** 0 - 150, slowest - fastest (default: 21)
- **Release:** 0 - 150, slowest - fastest (default: 47)

- **Progressive Release:** 0 - 100, slowest - fastest (default: 50)

  Sets the speed at which the release time is increased faster at very low gain values. This feature approximates a logarithmic release to help recovery from dramatic gain reduction more quickly.

Multiband AGC

This section is the heart of the dynamics processing engine. A multiband AGC (i.e., compressor) that allows for medium ratio (3:1 is default) adjustment of audio band. Adjustable parameters are:

- **Ratio:** 1.0:1 to Inf: 1 (default: 3.0:1)

- **B1-B5 Inf: 1 Above Thresh:** Enabled / Disabled
  default:
  B1: Enabled
  B2: Enabled
  B3: Disabled
  B4: Disabled
  B5: Disabled

  AGC automatically increases ratio to Infinity:1 once a signal exceeds the threshold (set below), allowing for expansion below the threshold and limiting above the threshold. Useful for bass frequency control.

- **Range:** 0 dB to 24 dB (default: 24 dB)

  Range sets how much gain expansion above unity is able to be performed. This adjustment is reflected in real time by changing the AGC meter scale.

- **Progressive Release:** 0 - 100, slowest - fastest (default: 50)

  Sets the speed at which the release time is increased faster at very low gain values. This feature approximates a logarithmic release to help recovery from dramatic gain reduction more quickly.

- **B1 - B5 AGC Attack:** 0 - 150, slowest - fastest
  default:
  B1: 46
  B2: 88
  B3: 88
  B4: 88
  B5: 92

  Sets how fast an input signal is acted upon once is crosses the set threshold.

- **B1 - B5 AGC Release:** 0 - 150, slowest - fastest
  default:
  B1: 50
  B2: 60
  B3: 86
  B4: 88
  B5: 92

  Sets how fast an input signal recovers from a gain change once that signal falls below the set threshold.

- **B1 - B5 AGC Drive:** -12.00 dB to +12.00 dB (default: -3.00 dB all)

  Provides a gain control at the input of each compressor band which determines how much signal level is applied to each.

- **B1 - B5 AGC Thresh(old):** -12.00 dB to +12.00 dB (default: 0.00 dB all)

  Sets the reference point for the attack and release parameters to act on the audio signal present in each band.

Multiband Limiters

Performs multiband limiting of the signals coming from the multiband compressor.

- **B1 - B5 Lim(it) Thresh(old):** +12.00 dB to 0.00 dB
  default:
  B1: +4.25dB
  B2: +4.25dB
  B3: +6.50dB
  B4: +9.00dB
  B5: +9.00dB

  Sets the point above which limiting action takes place at an Infinity:1 ratio.

- **B1 Soft Clip Thresh(old):** +12.00 dB to 0.00 dB (default: +3.00 dB)
- **B2 Soft Clip Thresh(old):** +12.00 dB to 0.00 dB (default: +6.00 dB)

  For Band 1 (**B1** – low bass), sets the point above where low bass is very quickly limited, acting more like a clipper without the artifacts. This helps maintain a “tight” bass sound.

Multiband EQ

This is the section where each of the processing bands is summed and where overall frequency response can be tailored.

- **B1 - B5 Out(put) Mix:** -12 dB to + 12 dB (defaults: 0 dB, all bands)

  Sets the mix level for each band summing all bands back together. These controls are prior to the final look-ahead limiter and increasing gain may cause more final limiting (possibly more than desired).

Final Stage

This final section of the processor is where the final look-ahead peak limiter and bass soft clipper are adjusted. The look-ahead limiters are wideband, limited to 6dB of gain reduction, are extremely fast, and due to their look-ahead nature are virtually transparent even at full gain reduction. Their purpose is to control any peaks that make it through the multiband section.

Adjustable parameters are:

- **Final Limiter Drive:** -6 dB to +6 dB (default: -5 dB)

  Sets the level at which the wideband sum of all bands is fed to the final limiter.

- **Output Level:** -36 dB to 0 dB (default: -11 dB)

  Sets the output level for the current preset. Can be used to match the measured loudness of one preset to another. This is useful as more aggressive presets will measure differently from less aggressive versions.

Note: With TV 5B Gen selected and normal dialog-based programming applied, loudness will measure approximately -24 LKFS.

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