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L1700

User Manual

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Conventions

NOTE: Notes are used to convey additional information.

⚠ CAUTION: Cautionary notes are given where potential equipment damage could occur.

⚠ WARNING: Warnings are shown where there is potential for personal danger or death. This warning should be read and understood before attempting to carry out any work on any equipment attached or related to the equipment in use. The danger is real and not understanding the warning could lead to injury, harm or potential death.

Service/Support Contacts:

Region	Contact Details
Worldwide	UKsupport@vislink.com +44 (0) 1442 431410 +44 (0) 1787 226227
Americas	USsupport@vislink.com +1 978 671 5929 888 777 9221

When contacting Technical Support, please include the following information:

- Model number and serial number of the unit (located on a label on the bottom of each unit).

    ………………………………………….

- Approximate date of purchase.

    ………………………………………….

Document History

Document Version	Issue	Date	Firmware Release	Change Description
002.002	2	10/02/14	002.002	First Manual Release
002.002	3	14/02/14	002.002	Detailed licensing description added.
003.000	1	10/03/14	003.000	Minor edits and corrections.
003.000	2	11/03/14	003.000	Note added regarding web browser compatibility.
004.000	1	28/03/14	004.000	IP output streaming added Screen lock function added. Note on removal of web browser incompatibilities added.
005.000	1	28/03/14	005.000	Deep Interleaver added.
005.002	1	01/05/14	005.002	Tally control added.
005.002	1	01/05/14	005.002	Presets saved to file added.
005.002	1	01/05/14	005.002	Hitachi camera control added.
005.002	2	28/05/14	005.002	Manual incorrectly stated that HDMI was "not yet supported".
005.003	1	14/08/14	005.003	Ikegami camera control added.
006.000	1	19/08/14	006.000	Remux operation added. (4.4.2.4)
006.000	1	19/08/14	006.000	3GHz added to compliance table.
006.000	1	19/08/14	006.000	Channel plan description added. (4.4.1.6)
006.000	1	19/08/14	006.000	Cable part numbers added (7)
006.000	1	19/08/14	006.000	General updates to manual.
006.000	1	19/08/14	006.000	Favorites description added. (4.6)
006.000	1	19/08/14	006.000	Restore defaults description added. (4.3.3)
006.000	1	19/08/14	006.000	Read-Only indicator description added. (4.6)
006.001	1	19/08/14	006.001	Default indicated for screen timeout. (4.3.4)
006.002	1	19/08/14	006.002	Added support for SMPTE 424M Level B 3G-SDI. (4.10.1, 4.11.3). Required for Sony 3G-SDI cameras.
007.000	1	17/10/14	007.000	AES encryption added.
007.000	2	26/01/15	007.000	Mechanical Dimensions changed.
007.000	3	06/03/15	007.000	Audio routing diagram added.
007.000	4	30/03/15	007.000	Correction to L1730 video format table. Removed 720P60 which is not currently supported (4.10.1).
007.000	5	20/04/15	007.000	SAR safety recommendations & Commands tables added.
007.000	6	29/04/15	007.000	Link Control protocol added.
007.010	6	02/06/15	007.010	7-pin lemo option added as input for Link Control protocol.
007.010	7	23/06/15	007.010	Removed statement in 5.9 incorrectly stating that HDMI was not supported.
007010	8	25/05/16	007.010	Added note stating max cable length to ASI input is 10 meters for Section 4.4.2.4, Table in Section 4.9 and Section 4.11.8.
007010	9	04/10/2016	007.010	Non-technical updates using new template. Added explanation and note under heading 4.3.2 for the Modulation menu.

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1. General Information

1.1. General Safety Information

The information that follows, together with local site regulations, must be studied by personnel concerned with the operation or maintenance of the equipment, to ensure awareness of potential hazards.

⚠ WARNING- RF Power Hazard: Please see Section 1.6.

⚠ WARNING- GaAs / BeO Hazard: Certain components inside the equipment contain Gallium Arsenide and Beryllium Oxide that are toxic substances. Whilst safe to handle under normal circumstances, individual components must not be cut, broken apart, incinerated or chemically processed. In the case of Beryllium Oxide, a white ceramic material, the principal hazard is from the dust or fumes, which are carcinogenic if ingested, inhaled or entering damaged skin.

Please consult your local authority before disposing of these components.

⚠ CAUTION: This system contains MOS devices. Electro-Static Discharge (ESD) precautions should be employed to prevent accidental damage.

1.2. Environmental

The L1700 is IPX0 rated and it should not be exposed to dripping or splashing water/liquid. When used outdoors, the unit should be protected by the rain cover.

1.3. External Battery

⚠ CAUTION: The external battery must only be replaced with the same or equivalent type.

⚠ WARNING: Do not expose the battery to sources of excessive heat, such as fire as it may explode causing personal injury or death and equipment damage.

⚠ WARNING: Danger of explosion if battery is incorrectly replaced.

1.4. Disposal Instructions

All equipment, including batteries where applicable, should NOT be disposed of with household waste as they are not bio-degradable in landfill sites.

⚠ WARNING: Do not incinerate batteries.

NOTE: See warnings in Section 1.3 for further information.

For batteries bought from Vislink International Ltd, the company upon customer request offers a disposal service.

The following rules have to be considered:

1. The return has to be advised prior to shipment to the sales department of Vislink Hemel Hempstead UK via phone on: +44 1442 431 300.
2. Batteries have to be returned properly packed, if possible in the original package; minimum demand: protection against short circuit.
3. Batteries for disposal should not be transported by air.

1.5. CE Compliance

The L1700 is compliant under the ETSI R&TTE directive.

The unit is compliant to CE. The unit is an intentional radiator and the operating frequency may not be authorized in some territories.

It is the operator's responsibility to ensure that he has in his possession valid licenses and site clearances, as may be required by local authorities, for the intended operating frequencies, geographical location and times of operation of the equipment.

1.6. Health & Safety

1.6.1. Exposure to Non Ionizing (RF) Radiation/Safe Working Distances

The L1700 may be used without specific SAR according to the standards EN62311 / EN62479 Annex B.

1.6.1.1. Minimum Safety Information

⚠ WARNING: There should be a minimum separation of 15mm between Operator and the radiating element according to the calculation below:

- Determination of far field, ref. EN62311:

  – The largest dimension of the radiating element (37mm) is shorter than ¼ wavelength, 37.4mm at 2.0GHz, hence the radiating near field region is inside the reactive near field region.
  – Far field calculation will only be valid >>2 λ, i.e. >> 30cm.

- Determination of exclusion level, ref. EN 62479:

  – Declared 7 dB bandwidth of antenna: 2.0 - 2.7 GHz
  – Declared distance: Not specified
  – Declared output power: 100mW.

Whilst Annex B of the above standard is used to determine the low-power exclusion level (power below which the EUT need to be physically tested for SAR effects) we can use the same calculation in reverse to determine the required minimum distance for said exclusion. Annex B is applicable over the 300-6000MHz frequency range for devices that are located within 25mm of the body. The levels are based on the basic restriction localized to head and truck of 2W/kg averaged over 10g of tissue.

Frequency of operation: 2350MHz
7dB bandwidth: 700MHz
Pmax: 100mW
The distance (to the nearest whole mm) is therefore 15mm.

⚠ WARNING: Do not touch the radiating element when the unit is switched on.

⚠ WARNING: Operators should not operate any RF transmitter or power amplifier with any of its covers removed, nor should they allow anyone else to do so.

⚠ WARNING: There should be a minimum separation recommended below between Operator and the radiating element for the frequency range 1.5 – 7.5 GHz and the transmit power 100, 200mW.

Frequency (GHz)	Transmit Power	
	100mW	200mW
	Distance in mm	
1.5	12	35
2	14	38
2.5	16	40
3	17	42
3.5	19	43
4	20	45
4.5	21	46
5	22	47
5.5	23	48
6	24	49
6.5	25	50
7	26	51
7.5	27	52

Table 1-1   Minimum Safe Working Distances form a Radiating Element

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2. Safety and Compliance

2.1. Restrictions on Operation

When operated as a radio transmitter this equipment has the following restrictions on its use in the European Union:

With module L1510-	L1750-1927	L1750-3239	With module L1510-	L1750-1927	L1750-3239
Austria (AT)	✓	X	Italy (IT)	✓(8)	TBA
Belgium (BE)	✓(1)	X	Lithuania (LT)	✓	X
Bulgaria (BG)	✓(2)	X	Luxembourg (LU)	✓(10)	X
Switz/Liecht. (CH)	✓	✓(17)	Latvia (LV)	✓	✓(17)
Cyprus (CY)	✓	✓(17)	Malta (MT)	✓	X
Czech Republic (CZ)	✓	✓(17)	Netherlands (NL)	✓	✓(17)
Germany (DE)	✓(4)	✓(17)	Norway (NO)	✓	✓(17)
Denmark (DK)	✓	✓(17)	Poland (PL)	✓	TBA
Estonia (EE)	✓	X	Portugal (PT)	✓	X
Finland (FI)	✓	✓(17)	Romania (RO)	✓	✓(17)
France (FR)	✓(6)	✓(6)	Spain (ES)	✓(14)	TBA
Greece (GR)	✓	✓(17)	Sweden (SE)	✓	✓(17)
Hungary (HU)	X	X	Slovenia (SI)	✓(15)	X
Ireland (IE)	✓	✓(17)	Slovak Republic (SK)	✓(16)	X
Iceland (IS)	✓	✓(17)	United Kingdom (UK)	✓	✓(17)

Table 2-1   European Country Radio Restrictions

KEY: X – operation not permitted.
✓ - operation may be permitted. Do not assume the whole band is available ⓘ.
✓ (n) – operation permitted with restrictions (see note 'n').

Operators are advised to always check that their application complies with the requirements of the relevant frequency authority. Frequency allocations vary from time to time. All known restrictions are indicated in the notes below, however Vislink International Ltd. cannot be held liable for any errors.

Unless noted below all countries require individual licenses for operation. Contact details for all EU spectrum authorities can be found at http://ec.europa.eu/enterprise/rtte/spectr.htm.

L1700 Notes

Country	Notes	Country	Notes
(BE)	It may operate in the frequency bands 1980 – 2110 MHz; 2170 – 2400 or 2.500 – 2.700 MHz (P.S. in Belgium this band is allocated for mobile services (LTE 4G) and therefore only 2 specific channels are available).	(LT)	-

(BG)	The use of this equipment is subject to license (www.crc.bg) Can only use the band 2300 – 2400 MHz	(LU)	Can only use the band 2335-2395MHz
(CH)	-	(LV)	-
(DE)	The use of this equipment is subject to license. Contact your local BNetzA office for individual frequency assignment.	(NO)	-
(FI)	-	(PT)	-
(FR)	These frequency bands are partly reserved in France for activities concerning public security, or national defense. French authorities are intensifying monitoring of the use made of these frequencies bands in order to avoid any harmful interference and you may be liable in case of harmful interference caused by a device you are operating. Consequently, you are recommended to contact the French telecommunications regulatory authority (ARCEP) (http://www.arcep.fr) in order to get the latest information on what operations are permitted.	(ES)	Can only use the band 2300.0 - 2483.5MHz
(GR)	-	(SI)	The use of this equipment is subject to license. Can only use bands 2070-2110 & 2300-2500MHz
(IT)	Can only use the following bands: 2040-2110, 2215-2450, 2450-2500 MHz	(SK)	Can only use the band 2300 – 2383MHz
No objections have been received from these spectrum authorities. Check for licensing with the relevant authority.			

Any mains power equipment must be earthed. Operate the equipment within environmental limits and ensure as much ventilation as possible (Normally Temp 0C-40C <99% humidity). Only authorized personnel should open the product and any repair or warranty will be invalidated if the seals are broken. The equipment has been designed to be CE compliant and an EC Declaration of Conformity and Technical files are available on request.

Please contact Link SUPPORT any issues.

Please ensure that normal anti-static precautions are taken when removing the L1700 modules from the main unit.

NOTE: This product is not approved for permanent mounting in commercial vehicles.

2.2. Declaration of Conformity

RADIO & TELECOMMUNICATIONS TERMINAL EQUIPMENT DIRECTIVE 1999/5/EC

Certificate No.   S131312   Issue 1
Date   13 Dec 2013

Equipment Covered:

Link L1790 encoder fitted with any of the following....

    L1750-1927
    L3211-2027

L2174, L2074 Receiver/Decoders with any of the following...

    L30x0 Downconverters
    L3025 Downconverters

This equipment complies with the essential requirements of the above directive, as applied by the following harmonised standards:

ETSI EN 301 489-1   EMC standard for radio equipment and services;
                     Part 1: Common technical requirements

ETSI EN 301 489-29   EMC standard for radio equipment and services;
                     Part 2: Specific conditions for wireless digital video links

ETSI EN 302 064   Harmonised EN for Wireless Video Links (WVL) operating in the 1,3
                     GHz to 50 GHz frequency band

EN60950   Safety of Information Technology equipment

Manufacturer/Agent

        Vislink International Ltd.
        Vislink House
        Maylands Avenue
        Hemel Hempstead
        Herts
        HP2 7DE
        United Kingdom

Certified by

M. Kingston
Vislink International Ltd.

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3. System Description
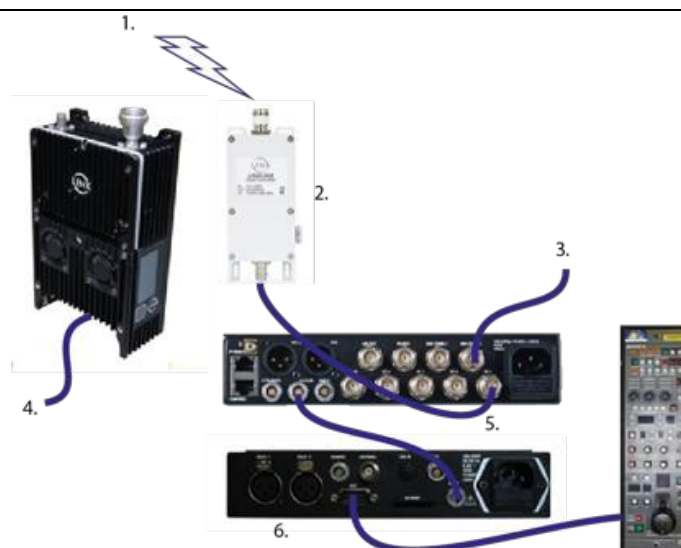
Figure 3-1   System Description

ID	Explanation
1	L1700 Encoder/Transmitter
2	2-to-4 L3025 Downconvers
3	HD-SDI Video Out
4	HD-SDI Video In
5	L2174 Receiver
6	L1255 Interfacing into OCP (option)

Table 3-1   System Description ID Table

The Link L1700 wireless radio camera system comprises of three main components:

- Link Transmitter: L1730 (H.264 encoder) + L1750 (modulator/transmitter)
- Link RF Down Converter: (2 off) - L3025
- Link HD Receiver: L2174 (licensed for H.264)

NOTE: In this manual L1750 is used to denote any of the optional modulator/transmitter modules.

Optional components for camera control:

- Link Wireless CCU Interface: -   L1255
- Link L1700 camera control license

A full list of supported camera manufacturers' models will shortly be placed on the Vislink web site. Currently Sony, Thomson, Hitachi and Ikegami cameras are supported. More will be added shortly, via a software upgrade.

The basic system will include 3dBi Omni vertically polarized antenna for the transmitter and down converters; a range of alternative antennas can be supplied to meet different operational requirements. These will provide the basic operation of the Link system, although other configurations are possible including diversity operation, through Triax and fiber etc.

Please contact Vislink International Ltd. for details.

For basic operation, connections to the L1700 Transmitter unit are HD/SD video, analogue audio and if required an RS232 data link. Power is supplied via a LEMO connector on the lower connector panel of the L1730.

The L1700 does not support standby mode or have a power switch. This is by design, to make the unit simple and easy to use.

The L1700 can be supplied with various mounting options. These will shortly be added to the manual.

Adaptor brackets are also available to allow mounting of the L1700 to the rear of Thompson, Sony, Hitachi and Ikegami professional broadcast cameras. These can provide a 'quick release' to remove the transmitter from the camera.

A full list of accessories and cables is given at the end of this document.

4.   L1700 Encoder Transmitter

The L1700 Series Encoder/Transmitter is a compact HD/SD H.264 Encoder, DVB-T and LMS-T modulator with a 100mW output power amplifier (250mW FCC only). LMS-T is a unique, robust modulation scheme developed specifically for wireless camera use.

Figure 4-1   L1700 Encoder Transmitter

ID	Explanation
1	UHF receiver antenna connector
2	H.264 encoder
3	OFDM Transmit Antenna Connector
4	Modulator / Up Converter Module L1750
5	Control Panel

Table 4-1   L1700 Encoder Transmitter ID Table

4.1. Operation

The L1700 can be configured by the operator using the menu structure displayed on the OLED display and an optical finger mouse to navigate through these menus and to set the required control parameters. Please see 4.3 below for details of the L1700 menu structure.
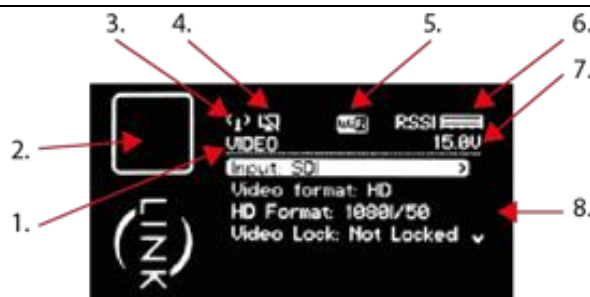
Figure 4-2   L1700 Display Example

ID	Explanation
1	Menu name
2	Optical finger mouse
3	Transmit icon
4	Video lock error
5	WI-FI icon
6	UHF Rx signal strength indicator (RSSI)
7	Battery voltage
8	Multi-line parameter display

Table 4-2   L1700 Display Example ID Table

Movement of your finger over the finger mouse area in the left / right and up / down directions is used to navigate through to the required menu and to edit parameter values. Pressing the finger mouse can also be used to enter and exit menus.

Table 4-3 explains the editing parameters available for the finger mouse.

Action	Function
Up and down	Modifies alphanumeric values
Left and right	Changes the alphanumeric character being edited
Long press	Accepts the newly edited value (or enters menus)
Short press	Cancels the edit (or exits menus)

Table 4-3   Optical Mouse Overview

When you are not editing parameters, a short cut function is available to toggle the transmitter on/off using a five-second, long press of the finger mouse button. The transmit icon on the OLED display changes state when this occurs, so it is easy to determine the state of the transmitter.

When power is applied to the L1700, it will revert to the condition when the power was removed.

4.2. L1700 Display

4.2.1. Main Display

The L1700 encoder has an integrated OLED display. As with most OLED devices, the brightness of the display reduces with usage. Consequently, the display time-out should be enabled where possible to maximize the life of the display. Reducing the brightness also extends the display life. Operating the optical finger mouse will reactivate the display after it has timed-out. The timeout is enabled and set to 30 seconds when restored to defaults.

The L1700 display provides a tree like menu structure of control parameters and status indicators. In addition, at the top level of the menu structure, there are 2 summary pages that may be accessed by scrolling left, using the finger mouse. Continuing to scroll left takes you back to the top level menu. The summary pages, along with the display icons, give quick access to important parameters.

Figure 4-3   Example Menu Page

Figure 4-4   Summary Page One

Figure 4-5   Summary Page Two

The first summary page details the OFDM transmit frequency and power level. The second provides details for the unit IP addresses.

4.2.2. Icons

Icon	Condition	Format
Tx Icon	RF on	(Animated antenna icon)
	RF off	(Antenna icon with cross)
Video Icon	Video locked	(Screen icon)
	Video unlocked	(Screen icon with strike out)
Wi-Fi Off	Wi-Fi turned off	
Wi-Fi Starting up	Wi-Fi turned on but still configuring. Wi-Fi cannot be used in this condition.	
Wi-Fi	Wi-Fi operating and showing the number of connections (typically 1 or 0 but can be up to 5).	
Battery Voltage	Indicates the input battery voltage.	
Camera Control RSSI Icon	5-bar signal strength symbol for received UHF	

Table 4-4　　　Icons Table

4.3. L1700 Menus

The greyed out parameters not available with the current version of firmware.

The table below is split into 5 sections corresponding to the major functions of the L1700.

4.3.1. Encoder Menu

Encoder Sub Menu	Options	Function	Comment
Video	Input	SDI (default) HDMI Composite (SD only)	Options dependent on either SD or HD and licensing
	Off/HD/SD	Off, HD (default if licensed) SD	Available modes depend on licensed features. An SD-only licensed system will only make the SD option available.
	HD Format (L1730)	720p/50 720p/59 1080i/50 (default) 1080i/59 1080p/23 1080p/24	Only present when HD is selected.
	HD Format (L1731)	720p/50 720p/59 720p/60 1080i/50 (default) 1080i/59 1080i/60 1080p/50 1080p/59 1080p/60	Only present when HD is selected.
	SD Format	PAL, (default) NTSC	Only present when SD is selected
	Resolution	1/1 (default) 1/2 3/4	Horizontal down-sampling ratio. Can improve overall perceived picture quality at lower bitrates at the expense of horizontal resolution.
	Video Lock	Not Locked Locked	Indicates that the video input has found and locked to the video format that has been selected. This parameter is the driver for the video lock icon.
	Video PID	Video PID 32 to 8190	Allows the transport stream video PID to modified if required.
	Bars On Loss	Bars Bars and Overlay Black Black and Overlay	Defines what happens on video input loss.
	Test Pattern	Off Overlay Only Bars and Overlay Bars	A manual bars or overlay combination that can be used when there is no video input to the encoder.
	Bars Type	Black 75% 100%	Gives the option of 75% or 100% color bars or force to black.

	Overlay Type	Basic Advanced	There are currently 2 overlays available. Basic is minimal in size and only contains the Service name. The advanced menu contains the settings for additional parameters such as audio source selection.
AUDIO/ AUDIO A	Input	Test tone Analogue Headset Mic SDI Gp1 Ch 1/2, (SDI i/p) SDI Gp2 Ch 5/6, (SDI i/p) HDMI Ch1/2 (HDMI i/p)	Selects source of audio pair A
AUDIO/ AUDIO B	Input	Test tone Analogue Headset SDI Gp1 Ch 3/4, (SDI i/p) SDI Gp2 Ch 7/8, (SDI i/p) HDMI Ch 3/4 (HDMI i/p)	Selects source of audio pair B
AUDIO/ AUDIO A and Audio B	Bitrate	128kbps 256kbps 384kbps	Selects audio compressed bitrate. The A setting applies to both Audio A & B. (read-only for audio B)
	Locked	Unlocked Locked	Reports audio lock status. Always reports locked for analogue and test sources. NOT YET IMPLEMENTED.
	Standard	Off MPEG1-L1 MPEG1-L2	Selects the Audio compression standard.
	Language	Eng Spa Ger Fre	Language specified in audio descriptor.
	PID	32-8010	Allows audio PID to be specified.
AUDIO/ ANALOG AUDIO	Mic / Line	Line	Selecting mic adds an additional 25dB of gain
		Mic	
	Mic Power	Off	When in mic mode, controls phantom power (automatically off in Line mode). Hidden when in line mode.
		On	
	Left Mic Gain	-24db to 48 dB gain	Gain adjust over nominal
	Right Mic Gain	-24db to 48 dB gain	Gain adjust over nominal
	Left Line Gain	66.5dB to -5.5dB gain	Gain adjust over nominal
	Right Line Gain	66.5dB to -5.5dB gain	Gain adjust over nominal
AUDIO/ HEADSET	Headphone Input	Headset Mic Test Tone	Allows a test tone to be generated in place of the headset mic for testing.
	Mic Gain	0dB	Gain of headset mic
		20dB	
		30dB	
		40dB	
	Headphone vol	+12dB to -51.5dB	Gain to headset speakers
ENCODER SETUP	Delay Mode	20ms 1 Frame (Default) 100ms	Sets the delay mode of the encoder. Normal delay mode is GOP structured and typically 734ms (59) or 760ms (50).

		Normal Long	Long delay mode, intended for low bitrates, and typically is 1235ms (59) or 1480ms (50). 20ms, 1 frame and 100ms modes are not GOP structured so the GOP settings have no effect. Generally speaking, larger delays result in better video quality.
	Profile	Baseline 4:2:0 Main 4:2:0 High 4:2:0, (Default) High 4:2:2	Sets the profile of the encoder according to the H.264 profile definitions. This setting allows the profile to be reduced in the case where lower a profile decoder is used.
	Enc Bitrate Auto	Off On (Default)	When disabled, the video encoder bitrate and the mux rate can both be set manually. When on, the mux rate is set according to the modulator settings and the video rate is maximized.
	Enc Bitrate	Value in Mb/s	Shows the bitrate used. Can be set in auto mode.
	Mux Bitrate	Value in Mb/s	Shows the bitrate used. Can be set in auto mode.
	Service Name	Service Name string (Default = "Service 01")	
	Enc GOP Struct	I IP IBP IBBP	Sets the GOP structure i.e. the sequence of I, B and P frames used in the video encoder. This setting is NOT USED in 20ms, 1 Frame or 100ms low delay modes.
	GOP length	0-30 (Default = 15)	Sets the length of the GOP, i.e. the number of frames in an I frame cycle. NOT USED in 20ms, 1 Frame or 100ms modes.
	Send VBI Data	Off, On	In SD mode, an addition 16 lines per field, prior to the first line of the picture is encoded in order to pass through Vertical Blanking Interval data.
	Refresh Width	2-15 (Default = 2)	Sets the width of the stripe refresh used in the low delay modes. Increasing the number can reduce the video quality, but will increase the speed of the picture refresh at start up.
	PCR PID	32-8190	Allow the PCR PID value to be set if required. This is not normally necessary.
	PMT PID	32-8190	Allow the PMT PID value to be set if required. This is not normally necessary.
REMUX	Enable	Off	Enables re-multiplexing of the transport stream services present on the ASI input, into the encoder output transport stream.
		On	
	Local Service	Off	Enables the multiplexing of the local encoder service into the transport

		On	stream multiplex. Turning this off when enabling remux, allows the unit to be used as a modulator for the incoming ASI stream.
	Max Input Mb/s	xx.xxxx	Specify the maximum expected input transport rate. This is the allowance made for the remixed service in the output transport stream. Note that this is not automatically calculated. The reason for this is to provide support for non-constant bitrate encoding.
	Services Timeout	Off	When the services timeout is enabled, any services that are removed from the ASI input with timeout, after which the service is removed from the PAT. When Off, the service will remain in the PAT after it has been removed.
		On (Default)	
DATA	Data Enable	Off Normal Low Latency	Enables the transfer of RS232 data from the 3-pin. Low latency mode reduces the transit delay of the data.
	Data Baud	1200, (Default) 2400 4800 9600 19200 38400	Baud rate of the data interface.
	Data PID	32-8190 Default = 100	Sets the PID used to carry RS232 data.
	Tally Enable	Off (Default) OCP Mode Tally1 On Tally 2 On Tally 1/2 On Traffic Status	Enables tally out in place of RS232 data. OCP mode is the normal operating setting when using camera control. The tally outputs duplicate the tally sent to the camera. For testing, the tallies can be forced on. In traffic mode, also included for testing, the tally outs are used to indicate camera control traffic, the tallies being activated when data is transferred.
IDENTIFIERS/ PIDS	Audio A PID	PID 32 to 8190	Summary menu of all PIDs
	Audio B PID	PID 32 to 8190	
	Video PID	PID 32 to 8190	
	Data PID	PID 32 to 8190	
	PCR PID	PID 32 to 8190	
	PMT PID	PID 32 to 8190	
IDENTIFIERS/ NAMES & IDs	Program ID	1 (Default)	Summary menu of all Names and IDs
	Service Name	"Service 01" (Default)	
	Network Name	"W-Cam" (Default)	
	Network ID	1 (Default)	
	Transport ID	6400 (Default)	
IP SETUP/ IP Out	TS Per IP	Off, (Default)	
		1	

		2	Acts as IP out on/off. Also sets the number of MPEG-2 transport stream packets in each of the output IP packets.
		3	
		4	
		5	
		6	
		7	
	Destination	192.168.0.100 (Default)	The Destination IP4 IP address for the A/V stream. This also supports IP multicast by simply entering a multicast IP address. This automatically switches the IP output into multicast operation.
	Dest. Port	2000 (Default)	The destination IP port number.
	Src. Port	1000 (Default)	The source port number.
	UDP/RTP	UDP, (Default) RTP	Switches the IP output into UDP or RTP mode as required.
SCRAMBLING	Scrambling Type	Off (Default) AES128 AES256	Enable control for scrambling, allowing 128 or 256-bit encryption to be enabled. Conforms to Vislink AES standard, supported by the L2174 descrambler.
	AES Key (bits 256-193)	Top 64-bits of key	Top 64-bit word of key in hexadecimal format. 256-bit encryption only. Available on web page only.
	AES Key (bits 192-129)	Top 64-bits of key	Top 64-bit word of key in hexadecimal format. 256-bit encryption only. Available on web page only.
	AES Key (bits 128-65)	Top 64-bits of key	Top 64-bit word of key in hexadecimal format. Available on web page only.
	AES Key (bits 64-1)	Top 64-bits of key	Top 64-bit word of key in hexadecimal format. Available on web page only.
	Set AES Key	No, Yes	Set Yes to activate entered key. Available on web page only.

Table 4-5   Encoder Menu

4.3.2.   Modulator Menu

This menu sets the Modulator Type.

NOTE: The unit must be power cycled after any changes.

Sub Menu	Options	Function	Comment
-	Frequency	1.95000-2.70000GHz	Transmission center frequency
	Channel	1-10	Channel number (for US operation). Conforms to US channel plan.
	Channel Offset	Minus Centre (Default) Plus	Channel Offset (for US operation), allowing half width transmissions to be placed in the upper or lower half of the channel.
	Off/On	Off On Carrier Only	Turns the transmitter on or off. Note : A long press on the front panel mouse button will have the same effect as toggling this.
	Tx Power (mW)	10mW, 50mW, 100mW, 250mW	Provides a selection of transmit power levels, specified in mW. |IF this display indicates'---' this indicates that the following menu item has been used to set an intermediate power level not in the list.
	Tx Power (dBm)	0dBm - 24dBm	An alternative means of setting the transmit power level, specified in dBm.
	Mode	QPSK, 16-QAM, (Default) 64-QAM (DVB-T only)	Sets the modulation mode.
	Bandwidth	3MHz, 4MHz, 5MHz, 6MHz, 7MHz, 8MHz, 10MHz, 12MHz, 6MHz Dual, 8MHz Dual, 10MHz Dual, 12Hz Dual, 14MHz Dual, 16MHz Dual, 20Hz Dual, 24MHz Dual	Transmission bandwidth. Only 6/7/8MHz are relevant to DVB-T modulation. Dual operation, indicates dual pedestal mode. In this mode the number of COFDM carriers is doubled. This leads to enhanced performance and in highly reflective environments and greater tolerance to different transmit path lengths, at the expense of reduced tolerance to Doppler shifts and therefore reduced high speed / mobile performance.
	Type	LMS-T, (Default) DVB-T	Sets the modulator type.
	Guard Interval	1/32, (DVB-T only) 1/16, (Default) 1/8, 1/4 (DVB-T only)	Sets the guard interval and therefore the tolerance to transmission reflections. 1/16 is a good default figure.

	FEC	1/2, 2/3, (Default) 3/4, 5/6 7/8	Sets the modulation forward error correction. 2/3 is a good default to use. LMS-T only supports 2/3.
	Pre Distortion	Off, (Default) On	Enables pre-distortion. This reduces the power transmitted into the adjacent channel and so is useful when multiple transmitters are operating in adjacent channels. The penalty is increased power consumption.
	External Amp Power	Off, (Default) On	Enables phantom power onto the transmit BNC antenna connector. Used for powering an external Link Barrel Booster.
DEEP INTERLEAVER	FEC	OFF, (Default) 1/2, 2/3, 3/4, 5/6, 7/8, 9/10, 14,15	Enables modulator Deep Interleaving and sets the amount of forward error correction. This represents the maximum rate at which bursts of errors can be repeated. E.g. 2/3 with 100ms can correct for a 100ms burst error followed by 200ms of no burst errors.
	Burst	0 - Max	Sets the error burst length, in milliseconds, that can be corrected by the Deep Interleaver. The maximum value depends on the interleaver FEC setting above.
	Delay	0 – Max (read only)	Indicates the additional delay, in milliseconds, that will be introduced into the video/audio as a result of applying Deep Interleaving.
ADVANCED	Carriers Offset	-1, 0, +1	An engineering setting used to offset the spectrum by one carrier.
	Polarity	Normal, Inverted	Allow the transmit spectrum to be frequency inverted.
	Carrier Disable		An Engineering setting used to debug transmitter operation.
	Freq Hi	2.7GHz (read only)	Highest frequency of operation of the transmitter.
	Freq Lo	1.95GHz (read only)	Lowest frequency of operation of the transmitter.
	Freq SS	125kHz (read only)	Step size of the modulator. Defines the minimum change in frequency.
	Power Hi		Not Used
	Power Lo	-	Not Used
	Cal bins		Not Used

4.3.3. Preset Functions

System Sub Menu	Options	Function	Comment
RECALL	Recall Preset	1-16	The preset number. 16 sets of presets are available.
	Preset Name	String	Name assigned to this preset when it was saved.
	Recall	No/Yes	Set to Yes and select to recall the selected preset. Note that when the L1700 is power cycled, it powers up in the same state in which it last powered down.
STORE	Store Preset	1-16	The preset number. 16 sets of presets are available.
	Preset Name	String	Name assigned to this preset. Enter a relevant text string. The test string must be 12 characters or shorter.
	Store	No/Yes	Set to Yes and select to store the selected preset.
DEFAULT	Restore Default	Off, Normal, Full (reboot)	A 'Normal' restore defaults, sets most parameters to their factory default setting. Full restore defaults in addition resets the network settings, restore the factory default favorites and reboots the unit software. The stored presets are never reset by this control. Note that when the L1700 is power cycled, it powers up in the same state in which it last powered down.
DOWNLOAD / UPLOAD (Webserver only. Not on front panel)	Download Presets	-	Allows saving of all presets to a single file at the browser. Select the filename and path. The file is saved in tar format.
	Upload Presets		Allows a saved preset tar file to be uploaded into the L1700. Use ftp mode when using Android or IOS.
	Delete All Presets		Deletes all of the presets stored in the L1700.

4.3.4. System Functions

System Sub Menu	Options	Function	Comment
STATUS	Alarms	Alarm list	Presents a list of the active alarms. Note that not all alarm conditions are supported in the current firmware release.
	Temperature	Temperature	Reports the internal temperature of the L1700.
	Battery Voltage	Batt Voltage	Reports the measured battery voltage.
ENCODER LICENSING / MODULE LICENSING	Init ESN	(Read Only)	Gives the ESN (Electronic Serial Number) of the unit. This is used for the purpose of unit licensing
	License Line 1	First 14 Hex digits	Used for entry of the license code. This is best performed using the web page rather than the front panel.
	License Line 2	Last 14 Hex digits	
	Submit License	No, Yes	Enter yes to submit a newly entered license code.
	License list		A list of the license options is provided stating if those license features are available.
DATE AND TIME	Date and Time Format	Mm/dd/yy, Dd/mm/yy,	Selects the preferred date format. The time and date feature is currently unused.
	Date		States the current date. This is currently unsupported.
	Time		States the current time. This is currently unsupported.
VERSIONS	Unit Type	L1730/L1731	Details the Unit type
	Unit ESN	-	Encoder ESN
	Mod ESN	-	Module (modulator) ESN
	Unit Version	-	Max.min encoder version
	Mod Version	-	Max.min module version
ETHERNET	Addr	xxx.xxx.xxx.xxx	IP4 IP address of the unit used for webserver access.
	Mask	xxx.xxx.xxx.xxx	Corresponding subnet mask.
	Gateway	xxx.xxx.xxx.xxx	The Gateway IP address
	MAC Address	xx:xx:xx:xx:xx:xx	Unit MAC address of the RJ45 port
WI-FI	Enable	Off, On	Turns on Wi-Fi operation.
	Status	-	Indicates the status of the Wi-Fi
	Country Code	-	Select the country of operation. This is important to ensure that the correct frequency channels are used.
	SSID	L1700 CAM01	Sets the SSID used by the Wi-Fi interface. This operates as a Wi-Fi access point.
	Password	12345678 (Default)	Wi-Fi password. This must be entered into the connecting device.

	Wi-Fi IP	xxx.xxx.xxx.xxx	This is the IP address of the unit when access over Wi-Fi. Enter this address into your Browser when accessing the web pages over Wi-Fi.
	Reset Wi-Fi	Off, On	Resets the Wi-Fi interface.
SCREEN	Screen	Always On, Timeout 5min, Timeout 2min, Timeout 1min, Timeout 30s, (Default) Timeout 15s, Timeout 5s	Enables a display screen timeout that turns off the display after a selected time. Operating the finger mouse will reactivate the display.
	Rotate	Normal, 180deg	Rotates the screen display by 180 degrees for use when the unit is mounted with the display upside down. This setting is not affected by restore defaults.
	Auto Summary	Off, On (Default)	Allows the summary screen that is activated after a period of inactivity to be disabled. This may be used if the user requires a particular menu screen to be permanently displayed.
	Auto Lock	Off, On	When 'Off' this function is disabled. When 'On' the menu lock function described below will turn on automatically after about 8 seconds of menu inactivity. If you want to change a parameter when auto lock is on, just turn off the lock parameter below and make the edit. The lock will automatically go to on after the timeout period when auto lock is enabled.
	Lock	Off, On	When 'Off' menu parameter editing behaves as normal. When 'On' prevents any settings being changed from the menu.
SERIAL CONTROL	Link Control Baud	9600, 115200	Sets up the baud rate of the Link Control interface, available over the RS232 DATA connector.
	Link Control Source	3-pin Lemo, UHF (not supported), 7-pin Lemo	Sets the link control source.
ASI OUTPUT	ASI Mode	Off, 188, (Default) 204	Controls the nature of the ASI output, allowing 204-byte mode to be selected if required. 204 byte mode is not normally used.
FAN CONTROL	Speed	Off, Low, Full, Auto (Default)	Sets the mode of operation of the unit fan.

	Temperature	-	Internal temperature of the encoder.
DEBUG (Front Panel only)	ASI Output	Enc Mux, (Default) Encoder, Mod Out, SI Out, Data/CC	Engineering setting allowing the transport stream from various internal locations to be output. Enc Out
	Enc Video Delay	-	An internally used encoder delay indication, used for debug purposes.
	Enc Fw	-	For engineering use.
	Enc Sw	-	For engineering use.

4.3.5. UHF Receiver

System Sub Menu	Options	Function	Comment
-	Off/Mode	Off, (Default) Camera Control	Sets the mode of operation of the UHF receiver. Use Normal mode for camera control. Raw mode is used for passing through raw data where there is no camera type.
	Freq	410.0000 – 490.0000MHz	UHF transmit center frequency.
	RSSI	dBm	Display the Received Signal Strength Indication in dBm.
	Camera Type	Sony, (Default) Thomson, Ikegami, Hitachi	Allows the camera type to be selected.
	Return CC Data PID	32 – 8190 (Default = 400)	Sets the PID that is used to transport camera control data back to the receiver.
	Tally Enable	Off (Default), OCP Mode, Tally1 On, Tally 2 On, Tally 1/2 On, Traffic Status	Enables tally out in place of RS232 data. OCP mode is the normal operating setting when using camera control. The tally outputs duplicate the tally sent to the camera. For testing, the tallies can be forced on. In traffic mode, also included for testing, the tally outs are used to indicate camera control traffic, the tallies being activated when data is transferred.

4.4. L1700 Setup

4.4.1. Modulator

When changing between modes of operation it is necessary to check and re-select certain operating parameters. This is due to the interaction of some of these parameters.

For example, when changing from DVB-T to LMS-T mode it will be necessary to reset the required modulation scheme.

NOTE: THERE SHOULD ALWAYS BE AN ANTENNA CONNECTED TO THE N-TYPE CONNECTOR WHEN THE UNIT IS POWERED.

4.4.1.1. DVB-T Operation

The following sequence defines the changes and sequence required when changing to DVB-T operation

Step	Menu	Option	Setting
1	MODULATOR	Type	DVB-T
2		Guard Interval	Must match receiver
3		QPSK/16QAM/64QAM	As Required
4		FEC	
5		Polarity	Must match receiver
6		Bandwidth	As Required
7		TxPower (mW) or TXPower (dBm)	
8		Centre Frequency	
9		On/Off	On

Table 4-6 DVB-T Operation Procedure

The H.264 encoder will set the data rate appropriately to match the modulation scheme settings.

Table 4-7 defines the corresponding transport stream bit rates for DVB-T operation.

Modulation	GI CR	1/4	1/8	1/16	1/32
QPSK	1/2	4.97	5.52	5.85	6.03
QPSK	2/3	6.63	7.37	7.80	8.04
QPSK	3/4	7.46	8.29	8.78	9.04
QPSK	5/6	8.29	9.21	9.75	10.05
QPSK	7/8	8.70	9.67	10.24	10.55
16QAM	1/2	9.95	11.05	11.70	12.06
16QAM	2/3	13.27	14.74	15.61	16.08
16QAM	3/4	14.92	16.58	17.56	18.09
16QAM	5/6	16.58	18.43	19.51	20.10
16QAM	7/8	17.41	19.35	20.49	21.11
64QAM	1/2	14.92	16.58	17.56	18.09
64QAM	2/3	19.90	22.11	23.41	24.12
64QAM	3/4	22.39	24.88	26.34	27.14
64QAM	5/6	24.88	27.64	29.27	30.16
64QAM	7/8	26.12	29.02	30.73	31.66

Table 4-7 DVB-T Bit Rate Settings

These rates can be confirmed by checking the ENCODER/ENCODER SETUP menu.

It should be noted that this corresponds to the total data rate from the multiplexer which includes the video, audio and any user data.

4.4.1.2. LMS-T Operation

LMS-T operation is possible in Single (S) and Dual (D) pedestal modes. LMS-T operation can be licensed in 10MHz, 20MHz and variable channel bandwidth modes, the latter supporting 3, 4, 5, 6, 7, 8, 10 & 12MHz in Single mode and 6, 8, 10, 12, 14, 16, 20 & 24MHz in Dual mode. This allows much greater flexibility in tailoring the RF link performance to the channel and environment available, e.g. use a wider pedestal to allow use of QPSK instead of 16QAM while still achieving acceptable bitrate; use a narrower pedestal to allow multiple cameras to use the same RF channel.

The following sequence defines the changes and sequence required when changing to LMS-T operation.

Step	Sub Menu	Option	Setting
1	MODULATOR	Type	LMS-T (S) or LMS-T (D)
2		Guard Interval	As Required. 1/8 or 1/16. Must match receiver
3		QPSK/16QAM	As Required 16QAM or QPSK
4		FEC	2/3 Only
5	MODULATOR/ ADVANCED	Polarity	Normal
6	MODULATOR	Bandwidth	3, 4, 5, 6, 7, 8, 10, 12, 4 Dual, 8 Dual, 10 Dual, 12 Dual, 14 Dual, 16 Dual, 20 Dual, 24 Dual
7		TxPower (mW) or TXPower (dBm)	As Required
8		Centre Frequency	
9		On/Off	On

Table 4-8   LMS-T Operation Procedure

The encoder will set the data rate appropriately to match the modulation scheme settings.

The Table below defines the corresponding bit rates for LMS-T operation.

SINGLE PEDESTAL, 1/16 GI								
Bandwidth	**3**	**4**	**5**	**6**	**7**	**8**	**10**	**12**
QPSK	2.93	3.90	4.88	5.85	6.83	7.81	9.76	11.71
16QAM	5.85	7.81	9.76	11.71	13.66	15.61	19.52	23.42
SINGLE PEDESTAL, 1/8 GI								
Bandwidth	**3**	**4**	**5**	**6**	**7**	**8**	**10**	**12**
QPSK	2.76	3.69	4.61	5.53	6.45	7.37	9.22	11.06
16QAM	5.53	7.37	9.22	11.06	12.90	14.75	18.43	22.12

Table 4-9   LMS-T Bit Rate Settings

NOTE: Dual pedestal rates are double the equivalent Single pedestal values

These rates can be confirmed by checking the ENCODER/ENCODER SETUP menu.

It should be noted that this corresponds to the total data rate which includes the video, audio and any user data.

Due to the improvement that LMS-T has over DVB-T these settings give approximately 50% improvement of bit rates for the same level of ruggedness of the RF link.

4.4.1.3. Deep Interleaving Operation

The L1700 has a licensable interleaving option. This option adds an extra layer of error correction to the transport stream, allowing the correction of longer breaks in RF reception. An example for the intended use for this, could be a situation where RF breaks are expected, for example:

- A motorbike mounted camera passing behind a tree or road gantry, while covering a road marathon or cycle race.

The user can select the amount of FEC used and the duration of RF break that can be corrected.

Adding interleaving to a transport stream reduces the bit rate available for video/audio etc. and adds a delay to the signal. The additional delay is shown in the menu and the effect on the bit rate can be seen in ENCODER/ENCODER SETUP/Mux Bitrate.

The L2174 receiver can support all interleaving modes that the L1700 does, however the L1700 is capable of deeper interleaving than the older L2134 supports. Interleaving depths that are not supported are shown as 0 ms on the L2134 front panel for either burst or delay.

Step	Menu	Sub Menu	Option	Setting
1	MODULATOR	DEEP INTERLEAVER	FEC	Off, 1/2, 2/3 ... 7/8
2			Burst	1 ... max ms

Table 4-10 FEC or Burst Menu Selection

L1700's interleaving scheme does not touch the encoded bit stream from the transmitter other than to add extra forward error correction data. It is this extra data that is interleaved. The effect of this is; that when an RF break occurs, longer than the set burst length, then the break in signal, seen at the receiver, is the same as the original RF break.

A significant feature of the Deep Interleaver design is at the receiver; if the maximum burst length is exceeded, the de-interleaver never makes the error worse. In the worst case scenario, the stream would only ever be as poor as the received signal.

The maximum burst correction length supported depends on the transport bitrate. The limit is derived from the amount of time that corresponds to 32768 MPEG-2 transport packets. The limits applied by the user interface are derived from this. When the L1700 interleaver is configured via the web page, the maximum burst correction length is reported on the web page.

4.4.1.4. Pre-distortion (LDPD) Operation

The L1750-1927 module contain proprietary Digital Pre-Distortion technology (LDPD). This uses sophisticated digital signal processing hardware to optimize the output signal in real time, providing unrivalled adjacent channel performance and the cleanest possible spectrum. For more details on how the system operates please refer to the White Paper on the Vislink website.

LDPD is disabled by default to minimize power consumption, you must enable this feature from the MODULATOR menu.

4.4.1.5. Operation with external L3211 Barrel Booster

The L3211 is an external amplifier, designed to attach directly to the N-type connector on the L1750. This usually requires an external power supply, however when used with the L1750 range of transmitter modules this is not necessary, as they supply the power directly

via the N-type connector. This can be turned on using the MODULATOR/Ext Amp Power enable setting in the menus.

The actual voltage is only applied when the RF is turned on. With Ext Amp Enabled. A short delay (~3s) occurs between the voltage turning on and the RF/modulation being applied. This is to reduce in-rush and allow the pre-distortion in the barrel booster to initialize. The phantom power output includes an over-current protection load switch, which when activated, will disable the phantom power and give a warning symbol on the L1700 front panel (Ext Amp Err). Cycle the RF to clear this error.

4.4.1.6. Modulator Frequency Channel Plan

US channel plans are supported in the modulator.

Table 4-11 shows the frequency allocation in the 2GHz 12MHz BAS channel plan.

Frequency Band	Channel	Channel Offset Switch Position		
		(-) Offset (MHz)	(0) Offset (MHz)	(+) Offset (MHz)
2GHz	1	2028.50	2031.50	2034.50
	2	2040.50	2043.50	2046.50
	3	2052.50	2055.50	2058.50
	4	2064.50	2067.50	2070.50
	5	2076.50	2079.50	2082.50
	6	2088.50	2091.50	2094.50
	7	2100.50	2103.50	2106.50
	8	2454.25	2458.50	2462.75
	9	2471.25	2475.50	2479.75
	10	2487.75	2492.00	2496.25

Table 4-11　　　Modulator Frequency Channel Plan

Selecting a combination of the channel number and the offset, results in the frequency shown in Table 4-11.

NOTE: The offset applies a 3MHz offset to the frequency (up or down). This facilitates the use of 2 x 6MHz OFDM pedestals in a single 12MHz channel.

4.4.2. Encoders

4.4.2.1. Video

It is important that the encoder is configured to match the incoming video format. The rates MUST match, otherwise the encoder may appear to operate correctly, then subsequently fail with changing video images.

Menu	Sub Menu	Option	Setting
ENCODER	Video	Off/HD/SD	As required
		HD Format	
		SD Format	

Table 4-12　　　Video Menu

4.4.2.2. Audio

Step	Menu	Sub Menu	Option	Setting
1	ENCODER	AUDIO/ Audio A or B	Input	As Required
2			Bitrate	
3			Locked	Status
4			Standard	As required
5			Language	
6			Audio A/B PID	

Table 4-13   Audio Menu

4.4.2.3. IP Output

The L1700 has an optional licensed feature called **IP Out**. With this option, the encoder can stream its encoder output to the 10/100Mb/s Ethernet RJ45 connector. The streamed output is not available over Wi-Fi.

Currently only the IP4 protocol is supported (IP6 is not supported).

Both Unicast (normal A/V streaming) and Mulitcast operation is supported automatically without any additional settings required. The L1700 does this by detecting the fact that the destination address is of the multicast type (because multicast addresses only exist in a particular range). Using multicast, the same stream can be sent to multiple decoders simultaneously. This allows local monitoring of the output stream on a PC or a local IP decoder, and so is a useful test function, even if there is no specific multicast requirement.

UDP and RTP protocols are both supported. This can be tested by playing into a PC running VLC or a similar software decoder. A menu control allows the required protocol to be selected.

The IP streamed output can be used simultaneously with RF transmission of the same transport stream.

4.4.2.4. Remux Operation

The L1700, from software version 006.000, supports remux operation for use with the ASI input. This feature allows a transport stream presented on the ASI input to be multiplexed into the output transport stream. The output stream will include all services present on the ASI input plus the local encoder service, if enabled.

NOTE: The maximum cable length for the ASI input is 10 meters.

When using remux, the first action that has to be performed is to determine what the bitrate allocation is to the ASI input. This allocation must be worked out manually. Enter the required value via the control menu. When the local service is enabled, and when auto encoder bitrate operation is enabled, the video bitrate allocated to the local service will be automatically reduced by the remux bitrate entered.

When the local service is off, the unit simply acts as a modulator for the ASI input.

An option also exists for controlling the 'Services Timeout'. This controls how long services seen at the ASI input are included in the output Program Allocation Table (PAT). When the Services Timeout is enabled, (which it is by default), after the ASI input has been removed, and after a timeout period, the ASI input services are removed from the PAT. When the Services Timeout is turned off, the ASI input services will remain present in the output PAT until the equipment is power cycled.

When the local service is enabled, if there is a clash of PIDs, IDs, service names etc. with the incoming services, the local service will avoid the clash by changing its own settings. Consequently, there is no need to manually set up the PIDs, service name etc.

NOTE: Remux is a licensed feature.

4.4.2.5. AES Encryption Operation (Scrambling)

The L1700 provides a licensable option for transport stream scrambling using the highly secure AES encryption algorithm. Both 128-bit and 256-bit key lengths are supported as individual options. Note that the scramble keys must be entered via the scrambling web page.

When activated, all of the elementary streams (video, data, audio) in the locally generated service is scrambled. This can be used in conjunction with the remux function, thereby allowing different services, generated by different encoders to have their own individual scrambling keys.

4.5. L1700 Link Control Protocol

The L1700 supports the Link RS232 serial control protocol. By default, this uses the 3-pin Lemo connector DATA port on the main encoder connector panel. The 7-pin Lemo may also be used.

4.6. L1700 Webserver Operation over RJ45 Network Port

The L1700 may be controlled and monitored using its integrated webserver. To connect to the webserver over the RJ45 network port, follow the procedure described below:

1. Power up the L1700.
2. Wait for approximately 5 minutes for the internal L1700 webserver to boot up.
3. Connect the L1700 to a computer running a web browser either directly using an RJ45 network cable (or via a router).
4. The L1700 currently does not auto switch the cable TX/RX direction so when used with a computer that does not auto-switch, a crossover RJ45 cable will be required. Note that most modern PCs and routers include auto-switching (Auto MDIX) so either type of RJ45 cable will work with these.
5. Next configure the IP addresses. The L1700 network port does not support dynamic IP address allocation (either via an internal or external DHCP server). So the L1700 only supports static IP addressing. The IP address and subnet mask of the L1700 can be changed from the front panel, but defaults to:

   − RJ45 IP address   :   192.168.0.10
   − RJ45 subnet mask   :   255.255.255.0

6. If you wish to use the default L1700 settings, modify the network settings of your PC to use the same subnet mask and an address from the same subnet e.g.:

   − PC subnet mask   :   192.168.0.100 (for example)
   − PC subnet mask   :   255.255.255.0

7. For windows 7, the procedure to do this involves opening the Windows 7 'Network and sharing Centre' (typically by right clicking on the network icon in the task bar). Click on the relevant port connection which will be named something like 'Local Network Connection'. Then click on 'Properties' and highlight, using the mouse, 'Internet Protocol Version 4', and again click 'Properties'. From here click on 'Use the

following IP address' and enter the above settings. The 'Default Gateway' address is not used so can be set to some address in the subnet range.

NOTE: If you want to use a particular subnet address, then you can edit the L1700 network parameters via the front panel menu as required.

8. Once the IP ports are configured and the cable connected, a yellow LED on the L1700 RJ45 connector will illuminate, indicating that a connection has been made.

9. From L1700 firmware version 004.000, all known browser incompatibilities have been removed. For versions prior to this, for web browsing the L1700 internal web server, you must use Internet Explorer v10 or above, Firefox v25.0.1 or above, or Chrome or Safari. You may see bad rendering of the L1700 web pages if you use an incompatible browser.

10. Go to your browser address bar on your PC and type in the IP address of the L1700, which by default is:

    – http://192.168.0.10

11. After a delay, a Vislink title screen will appear telling you to wait for the web content to be downloaded. Once this has happened, again, after a delay, the web page will automatically update with the page content as shown in
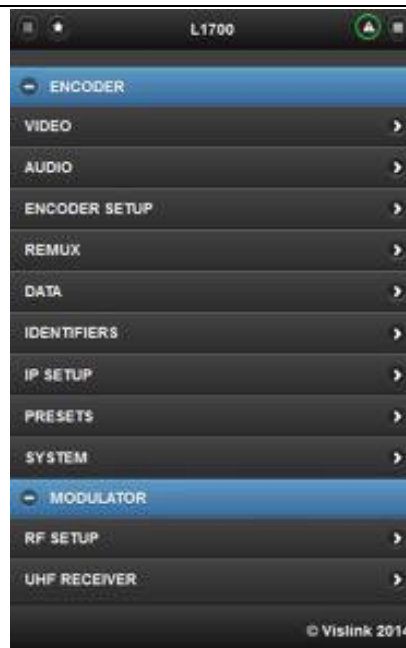
Figure 4-6   L1700 Menu Home Page

12. The delays experienced in rendering the web page only occur on the first occasion that the pages are accessed after power up. Thereafter access to the web pages is much quicker.

13. The content of the web pages closely follows the structure of the front panel menus so they are not described further here.

14. 2 icons appear at the top right hand corner of the webpage. The left hand status icon , when clicked, brings up a unit status summary. The right hand icon when clicked brings up a unit log which can be useful for fault finding. Note that the real time clock in the unit is not yet fully supported in the software and so currently it is

not possible to enter the correct time. The status icon flashes red and green when an alarm condition is present.

15. Depending on the page, this icon ▤ appears and when clicked brings up a unit log which can be useful for fault finding. Note that the real time clock in the unit is not yet fully supported

16. After entering a web page by clicking on one of the options, the resulting page has an icon in the top left hand corner ↩ . This is a 'back' button, returning you to the previous page.

17. The start icon ★ in the top left hand corner of the home page accesses the favorites page. Any parameter can be added to this page by selecting the star to the right of any parameter on the web pages. Parameters can be removed by clicking on the relevant star on the favorites web page. Adding or deleting favorites takes a little time so wait for 5 or 6 seconds for the new parameter to be processed.

18. Figure 4-7 shows a representative favorites menu.
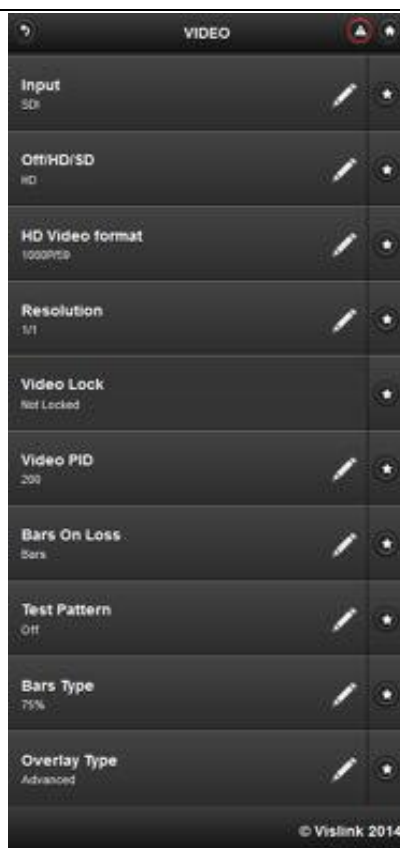
Figure 4-7   Favourites Menu Example

The pen icon ✎ indicates that the associated parameter is editable (read/write).

The star icon ★ when selected allows the associated parameter to be added to the favorites menu. This allows a custom set of parameters to be collated and accessed on the favorites web page.

Figure 4-8 shows a typical parameter being edited. After clicking on the **Select value** field (for a list type item) a pick list appears. Once the required setting is selected the ✔ Set

button must be clicked to accept the new selection. The button can be used to discard the parameter edit.

Figure 4-8   Parameter Edit Example

4.7. L1700 Licensing

When applying new license codes to the L1700 to enable specific features, the best approach is to use the web server in the L1700.

Firstly, ensure you have the 28-bit hex license code to enable the required features. This license code is tied to the L1700 Encoder Unit ESN / Module ESN and is not transferable. Some license upgrades have 2 license codes, one for the encoder and one for the module.

If using the webpage to enter the license code:

1. Connect the L1700 to a web browser device (PC/tablet etc.) via an RJ45 Ethernet cable or Wi-Fi (using IE v10 or above, Firefox v25.0.1 or above, Chrome or Safari).
2. Enter the IP address of the L1700 into the browser address bar and wait for the web browser to appear, this may take a few moments:

   – The default IP address via Ethernet: 192.168.0.10 and Wi-Fi: 192.168.1.1.

The following steps are required:

1. From the web home page, click **System** (under the **Encoder** menu).
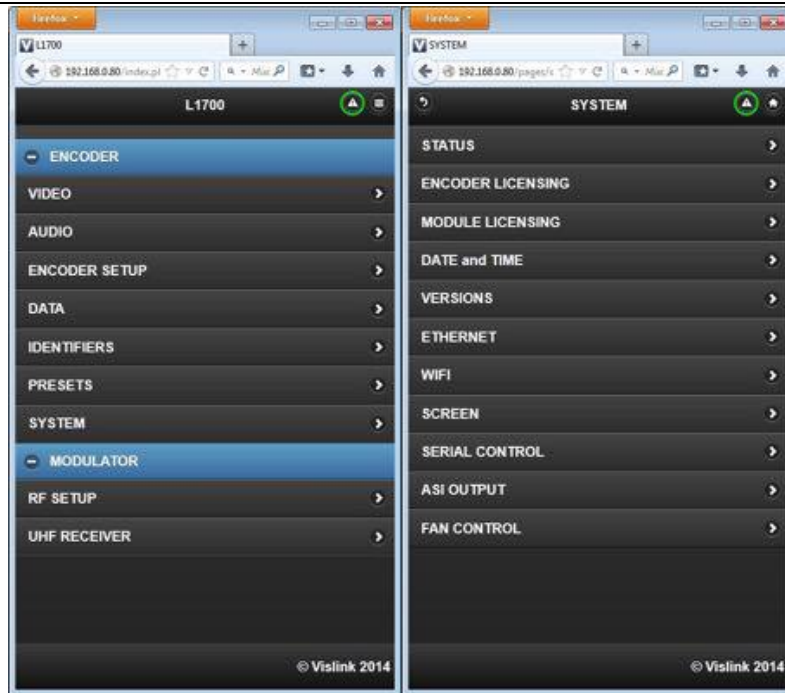
Figure 4-9   Web Home Page

2.   On the front panel: from the main home screen, select **System**.

Figure 4-10   Front Panel Home Screen

3.   To enter an encoder license code, on the webpage and front panel, click / select **Encoder Licensing**. To enter a module license code, click / select **Module Licensing**.
4.   The 28-bit hex license code given needs to be split in half into two 14-bit Hex strings and entered into **License Line 1** and **License Line 2**.

Figure 4-11   License Input Pages

5. On the open webpage, enter the first 14-bit Hex key into License Line 1, and then click **Set**.

6. From the L1700 front panel, enter the first 14-bit Hex key into License Line 1, and then hold the button to set this.

Figure 4-12   License Code Line One Input Example

7. On the open webpage, enter the second 14-bit Hex key into License Line 2, and then click **Set**.

8. On the L1700 front panel, enter the second 14-bit Hex key into License Line 2, and then hold the button to set this.

9. After entering the license code into Line 1 and Line 2, the license needs to be submitted.

Figure 4-13   Submit License Code Example

10. On the open webpage, click **Submit License**, change the option to **Yes**, then click on **Set**.

11. On the front: select **Submit License**, change the option to **Yes**, then hold the button to select this.

12. New features enabled by the new license, should now be loaded onto the encoder.

13. To enter a module license, repeat the above steps, selecting **Module Licensing** from the **System** page.

4.8. L1700 Webserver Operation over Wi-Fi

The L1700 supports Wi-Fi access for control purposes, in the 2.4GHz Wi-Fi band.

The unit acts as an access point so no external Wi-Fi router or access point is required.

To enable Wi-Fi operation, use the SYSTEM/WI-FI/ENABLE parameter. It will then take several minutes for the unit to self-calibrate and to configure itself for operation. When enabled and ready for use, the number 0 will appear to the right hand side of the Wi-Fi logo on the front panel. This number indicates the number of active Wi-Fi connections to the L1700.

When enabled, the L1700 Wi-Fi supports dynamic IP address allocation i.e. there is an internal DHCP server. The IP details over Wi-Fi are:

Wi-Fi Parameter	Default Value
L1700 Wi-Fi IP address	192.168.1.1
L1700 Wi-Fi subnet mask	255.255.255.0
L1700 default SSID	L1700 CAM01
L1700 default Password	12345678
L1700 default Country Code	GB

Table 4-14   Wi-Fi Defaults

NOTE: The Wi-Fi IP address is also detailed on one of the front panel summary screens for easy access.

IMPORTANT: The country code must be set up for the country of operation. This is because frequency channel allocations differ from country to country.

The L1700 supports up to five simultaneous Wi-Fi connections (so the maximum number you will see next to the front panel Wi-Fi symbol is five).

A reset operation is available in the Wi-Fi menu. There should be no need to use this, it is included in case issues arise with the Wi-Fi operation. When activated, the reset operation causes the Wi-Fi to recalibrate and restart. The Wi-Fi reset is equivalent to restarting the unit.

A status menu item is present in the menu, showing READY when the unit is ready for its first connection.

The Wi-Fi transmitter/receiver in the L1700 is intended for walk-up operation and operates over a limited distance, the typical range is around 20 meters.

4.9. L1700 Connector Interface
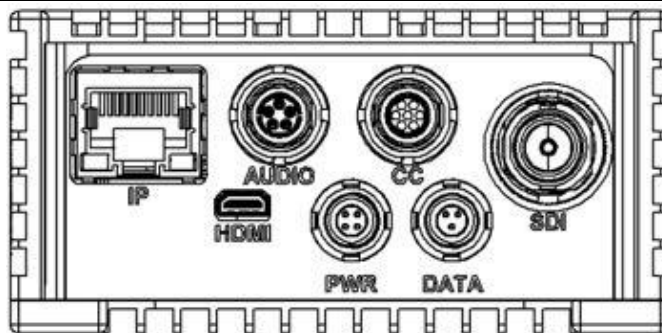
Figure 4-14   L1700 Main Connector Panel Interface

Panel	Connector type	Legend	Description
Top	RF Out	-	N Type Male 50 ohm connector
	UHF In	-	SMA 50 Ohm connector
Side	Headset	-	-
Lower	BNC 75Ω bayonet socket	SDI	SD/ HD-SDI (SMPTE 259M / SMPTE 292M)
	HDMI Type – D socket	HDMI	HDMI Input
	RJ45	IP	Network port currently used for access to internal webserver, used for control of the unit
	7-way Lemo	CC	SD Composite input supporting PAL or NTSC (625 / 525)
			DVB-ASI output
			DVB-ASI input for remux operation MAX cable length 10M
			Camera Control
	5-way Lemo	AUDIO	Analogue audio stereo pair input at Line or Mic levels
	3-way Lemo	DATA	RS232 connection for Link Control or Data input
			Tally
	4-way LEMO	PWR	External 12V battery supply

Table 4-15   L1700 Connector Overview

4.10. L1700 Transmitter Description and Specification

The complete transmitter unit consists of two assemblies (module A and module B shown in Table 4-16 and Table 4-17) or modules, which can provide a flexible and upgradeable transmitter system:

Module ID	Module Break Down
A	AV H.264 encoder
	Video inputs
	Video source selector
	Analogue audio pre-amps
	Audio source selector
	Headset interface
	Display and controller
	Webserver for control
	Wi-Fi for control
	Camera control interface

Table 4-16   Module A Breakdown

Module ID	Module Break Down
B	OFDM Modulator
	Link Digital Pre Distortion
	RF Up Converter
	Power amplifier up to 250mW
	UHF receiver and demodulator

Table 4-17   Module B Breakdown
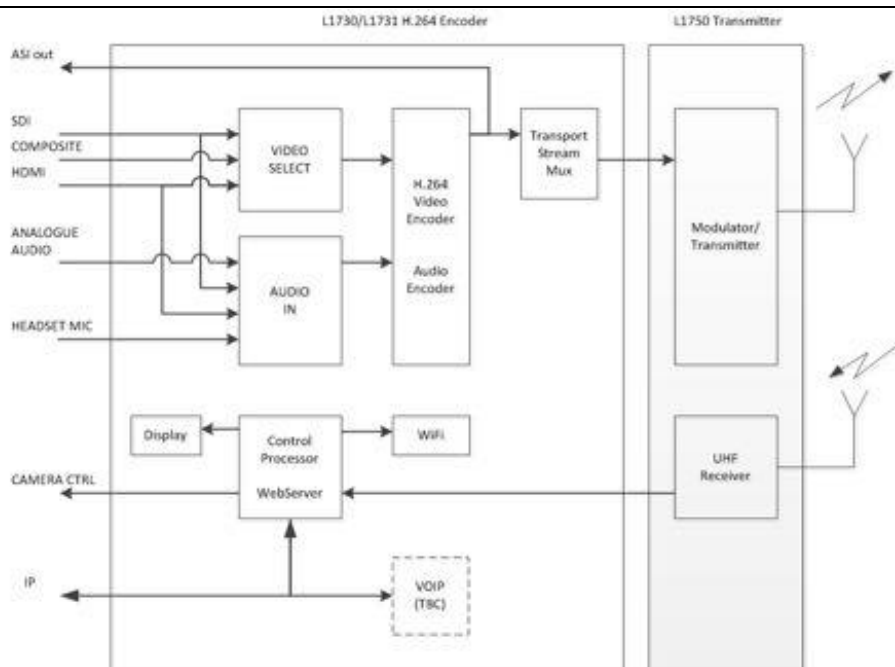
Figure 4-15   L1700 Modules

4.10.1. Video Formats

Table 4-18 shows the acceptable formats for the L1730 encoder with HD-SDI/HDMI inputs.

Standard	Total lines per frame	Total samples per line	Active lines per frame	Active samples per line	Interlace or Progressive	V Freq	H Freq
1080/59.9I	1125	2200	1080	1920	I	60/1.001	33.716 KHz
1080/50I	1125	2640	1080	1920	I	50 Hz	28.125 KHz
1080/24P	1125	2750	1080	1920	P	24 Hz	27.0 KHz
1080/23.9P	1125	2750	1080	1920	P	24/1.001	26.973 KHz
720/59P	750	1650	720	1280	P	60/1.001	44.955 KHz
720/50P	750	1980	720	1280	P	50 Hz	37.5 KHz

Table 4-18   L1730 Video Formats

Table 4-19 shows the acceptable formats for the L1731 encoder with HD-SDI/3G-SDI/HDMI inputs.

Standard	Total lines per frame	Total samples per line	Active lines per frame	Active samples per line	Interlace or Progressive	V Freq	H Freq
1080/60I	1125	2200	1080	1920	I	60 Hz	33.75 KHz
1080/59.9I	1125	2200	1080	1920	I	60/1.001	33.716 KHz
1080/50I	1125	2640	1080	1920	I	50 Hz	28.125 KHz
1080/60P (L1731 only)	1125	2200	1080	1920	P	60 Hz	67.5 KHz
1080/59P	1125	2200	1080	1920	P	60/1.001	67.432 KHz
1080/50P	1125	2640	1080	1920	P	50 Hz	56.25 KHz
720/60P	750	1650	720	1280	P	60 Hz	45 KHz
720/59P	750	1650	720	1280	P	60/1.001	44.955 KHz
720/50P	750	1980	720	1280	P	50 Hz	37.5 KHz

Table 4-19   L1731 Video Formats

The 3G-SDI interface supports SMPTE 424M Level-A and Level-B Dual Link (B-DL) automatically.

The L1730/31 will also accept SD inputs as either composite (CVBS), SDI or HMDI (when available) as shown in Table 4-20.

Standard	Input Connector
SDI 625	SDI
SDI 525	SDI
PAL	CV
NTSC	CV

Table 4-20   L1730/1731 SD Inputs

4.10.2. Audio Routing

The following diagram describes the audio selection and routing in the L1730. There are two stereo codecs, A and B. The input to each can be selected from the menu.
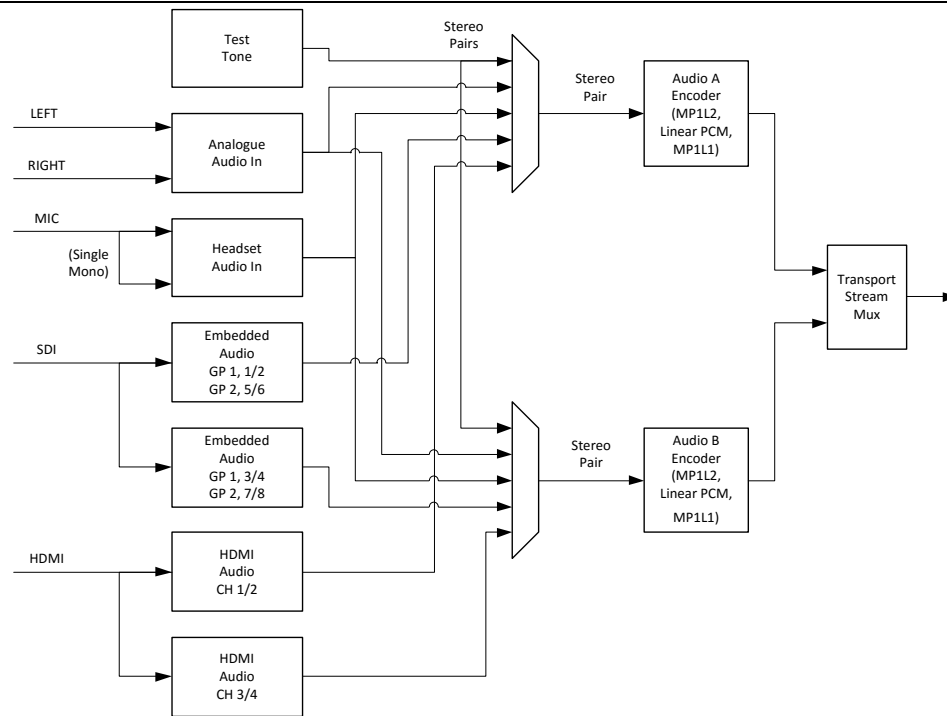
Figure 4-16   Audio Routing

4.11. Encoder Input / Output Connections

This following section details the connector types and pin-outs of the interface connectors on the L1730 Encoder module.

4.11.1. DC Power Connection

L1700 ~15W 12V DC nominal (10V minimum, 32.2V maximum)

Actual power consumption depends on the operating mode and video content.

Chassis Socket Connector: LEMO XBG00304HLN

Mating Cable Plug: LEMO FGG00304CLAD35

Link Cable Assembly: 9011128 (L1700 300mm Lemo to D-Tap Power cable)

LEMO Pin	Function
1	GND
2	GND
3	+12V DC nominal supply
4	+12V DC nominal supply

Table 4-21   L1700 DC Power Pinout

4.11.2. Network Connector

RJ45 connector for webserver access, streaming out, and streaming in to remux (not yet available).

4.11.3. SDI Video Input

75Ω chassis mounted BNC jack socket to take:

- 3G HD-SDI (SMPTE 424M Level A and Level B-DL) (L1731 only)
- HD-SDI (SMPTE 292M)
- SD-SDI (SMPTE 259M)

4.11.4. HDMI Video Input

Female (receptacle) Type-D HDMI 1.4 supporting video and embedded audio.

4.11.5. Composite Video Input

7-pin Lemo connector (shared with camera control) for input of composite (CV) SD video. The CV input and ASI input (when available) share a common Lemo connector pin and so cannot be used concurrently.

CC 7-pin LEMO Pin	Function
Pin 5	GND
Pin 6	Composite In

Table 4-22 Composite Video Input Pinout

Chassis Socket Connector: LEMO EEG0B307CLV

Mating Cable Plug: LEMO FGG0B307CLAD52Z

4.11.6. Framelock Out (Not yet available)

7-pin Lemo connector (shared with camera control) for output of framelock black and burst or tri-level sync. This pin is shared with the ASI-out function so this cannot be used concurrently with framelock.

A full description will be provided when this feature becomes available through a future firmware update.

CC 7-pin LEMO Pin	Function
Pin 5	GND
Pin 7	Framelock out

Table 4-23 Framelock Out Pinout

Chassis Socket Connector: LEMO EEG0B307CLV

Mating Cable Plug: LEMO FGG0B307CLAD52Z

4.11.7. Camera Control Out

7-pin Lemo connector for interfacing to the camera to provide a camera control function.

CC 7-pin LEMO Pin	Function	Description
Pin 1	Rx Data (input) RS485 B(-)	RS232 or RS485 camera control data receive
Pin 2	Rx Data (input) RS485 A(+) / RS232	
Pin 3	Tx Data (output) RS485 A(+)	RS232 or RS485 camera control data transmit
Pin 4	Tx Data (output) RS485 B(-) / RS232	
Pin 5	GND	GND

Table 4-24   Camera Control Out Pinout

Chassis Socket Connector:	LEMO EEG0B307CLV
Mating Cable Plug:	LEMO FGG0B307CLAD52Z
Sony Cable Assembly:	9011189 (300mm L1700 Sony Camera Control Cable)
Sony Cable Assembly:	9011273 (300mm L1700 Sony Camera Control Cable - Right Angle)
Thomson Cable Assembly:	9011280 (700mm L1700 Thomson/LDK Camera Control Cable)
Hitachi Cable Assembly:	9013032 (600mm L1700 Hitachi Camera Control Cable)
Ikegami Cable Assembly:	9013209 (400mm L1700 Ikegami Camera Control Cable)

4.11.8. ASI

Both ASI input and ASI output are connected to the encoder unit via two pins on a 7-pin Lemo connector, shared with camera control.

A usage restriction (already mentioned above) is that ASI input pin is shared with the composite input function, limiting the cable length to maximum of 10 meters. Similarly, the ASI output is shared with the framelock output function (when available).

CC 7-pin LEMO Pin	Function
Pin 5	GND
Pin 6	ASI In
Pin 7	ASI out

Table 4-25   ASI Pinout

Chassis Socket Connector:	LEMO EEG0B307CLV
Mating Cable Plug:	LEMO FGG0B307CLAD52Z

4.11.9. Analogue Audio Input

A single differential input stereo pair at Mic level (with or without phantom power) or Line Level is available. Selecting Mic Level adds an additional 25dB of gain. Variable gain of (+66 to -5.5dB) may be applied at Line Level and (+48 to -24dB) at mic level.

Phantom power is automatically disabled in line mode.

Input Impedance:	>20kΩ nominal input impedance
Frequency response:	20Hz to 20kHz nominally flat to <0.25dB
Clipping level:	+8dBu
Phantom power:	48V, 15mA through 6k8 per input to IEC268-15A
Chassis Socket Connector:	LEMO EEG0B305CLV
Mating Cable Plug:	LEMO FGG0B305CLAD52Z
Standard Cable Assembly:	L0001M (600mm)
Optional Cable Assembly:	L0001 (200mm) / L0001H (3000mm) / L0001S (1000mm)

AUDIO 5-pin LEMO Pin	Function
Pin 1	Left Line + (Line)
Pin 2	Left Line - (Return)
Pin 3	GND
Pin 4	Right Line + (Line)
Pin 5	Right Line - (Return)

Table 4-26   Analogue Audio Pinout

4.11.10. RS232 Data and Control Port

This 3-pin Lemo connector provides an RS232 input / output of both the User Data or for Remote Control of the transmitter unit. Note that either or both of the Tx or Rx pins of this connector can be alternatively be used for tally output.

Chassis Socket Connector:	LEMO XBG00303HLN
Mating Cable Plug:	LEMO FGG00303CLAD35
Standard Cable Assembly:	9011235 L1700 data Cable (600mm)

DATA LEMO Pin	Function
Pin 1	Tx Data (output)
Pin 2	Rx Data (input)
Pin 3	0v

Table 4-27   RS232 Data and Control Port Pinout

4.11.11. Tally Output

This 3-pin connector provides two tally out connections for use with camera control. Note that the Tally 2-pin can be alternatively be used for user RS232 data.

Chassis Socket Connector:	LEMO XBG00303HLN
Mating Cable Plug:	LEMO FGG00303CLAD35
Standard Cable Assembly:	N/A

DATA LEMO Pin	Function
Pin 1	Tally 1 out (+12V or GND)
Pin 2	Tally 2 out (+12V or GND)
Pin 3	0v

Table 4-28   Tally Output Pinout

4.12. Modulator Input / Output Connectors

This following section details the connector types L1750 Transmitter module unit.

4.12.1. COFDM TX RF

100mW into 50Ω – switchable. 10, 50 ,100 and 250mW fixed power settings, and a user-adjustable mode between 0 and 24dBm.

Note: 250mW is for use in FCC regulatory regions only.

50Ω chassis mounted 'N' type bulkhead socket.

Antenna:	L3421 TX Omni Spring 3 dBi 1.95-2.7GHZ
	L3423 TX Omni Spring 3 dBi 1.95-2.7GHZ (Extra Long)
	L3424 TX Omni Spring 3 dBi 3.0-3.7GHZ

⚠ WARNING: There should always be an antenna connected to the N-type connector when the unit is powered.

4.12.2. UHF RX RF

SMA connector for UHF receive antenna: 410-490MHz.

Antenna: L0018-4145 410-450MHz SMA(M) Red Cap

Antenna: L0018-4549 450-490MHz SMA(M) Blue Cap

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5. Mechanics

5.1. Module Docking

⚠ CAUTION: The L1700 is not hot-swappable. Do not dock or undock any module with the power applied.

⚠ CAUTION: Take necessary ESD precautions to avoid electrostatic damage to either a module or the L1700 transmitter unit. Avoid contact with the module connectors and store any electronic devices not in use in appropriate anti-static packaging.

The 'A' encoder module and 'B' transmitter module are docked as shown in Figure 5-1.

Ensure that the modules remain parallel during the docking procedure. Fasten the two and a quarter turn screws and the single, centrally placed retained locking screw once the two modules are mated. Firmly tightening the screws ensures that the modules make good thermal contact via the thermal gaskets on the encoder module mating face.
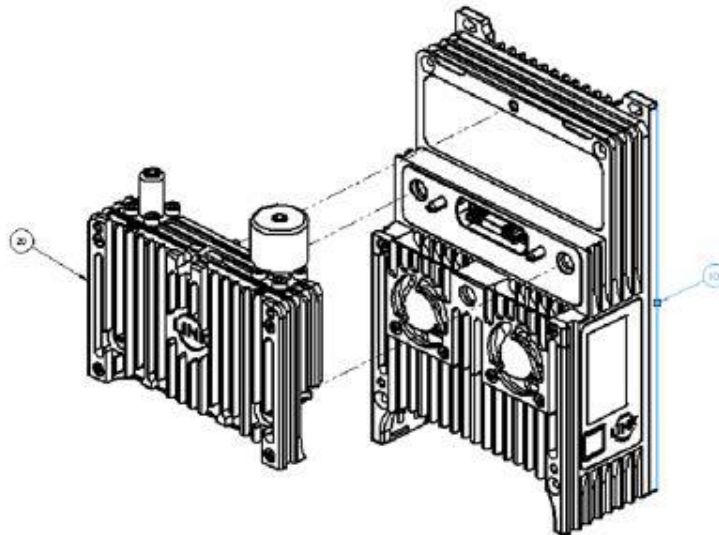
Figure 5-1   Module Docking

5.2. Mechanical Dimensions (Front View)
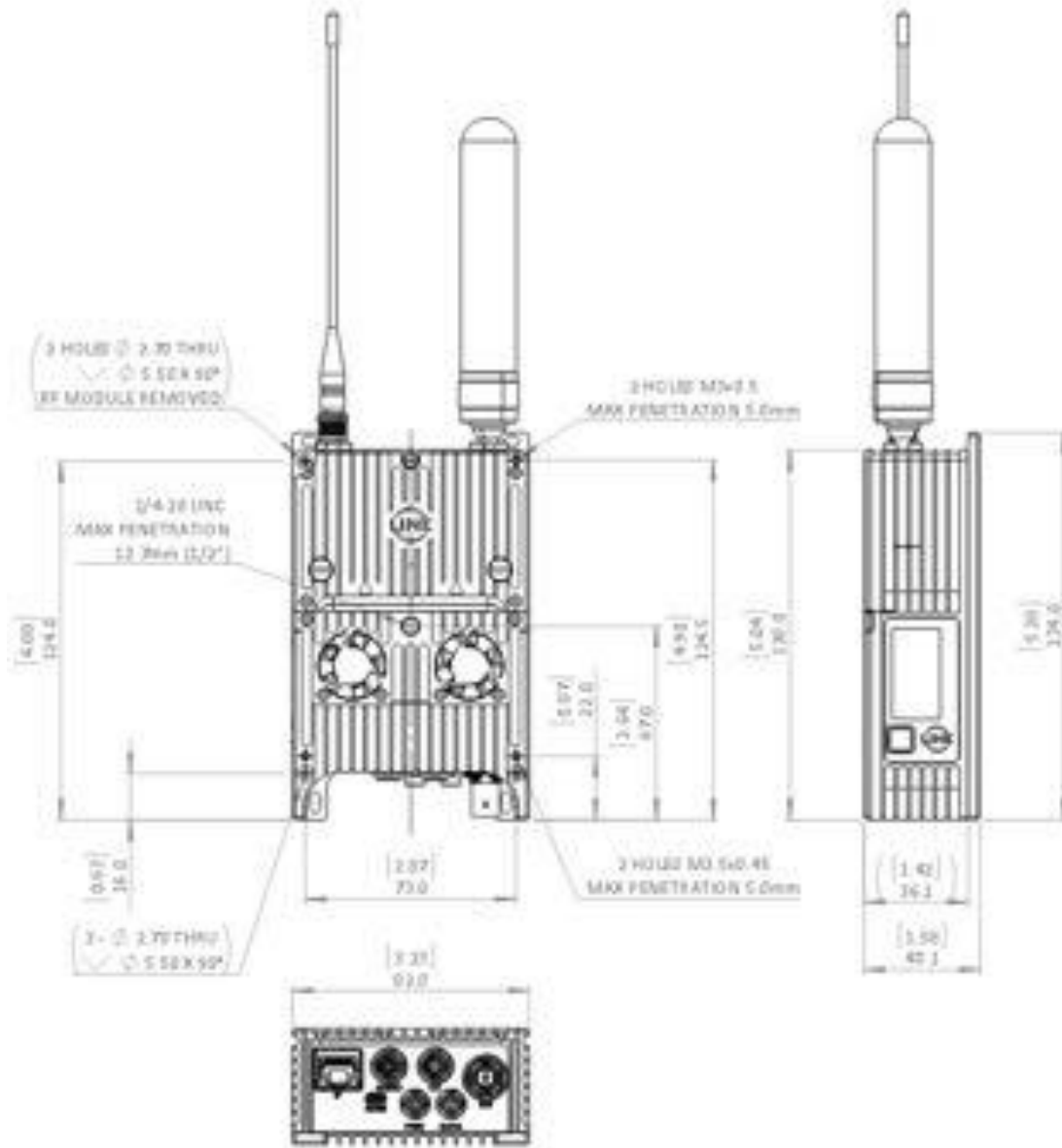
Figure 5-2   Mechanical Dimensions Front View

NOTE: Dimensions are in mm [inches].

NOTE: Dimensions with parentheses (*) refer to the thermal contact version (with outer finned plate removed).

5.3. Mechanical Dimensions (Rear View)
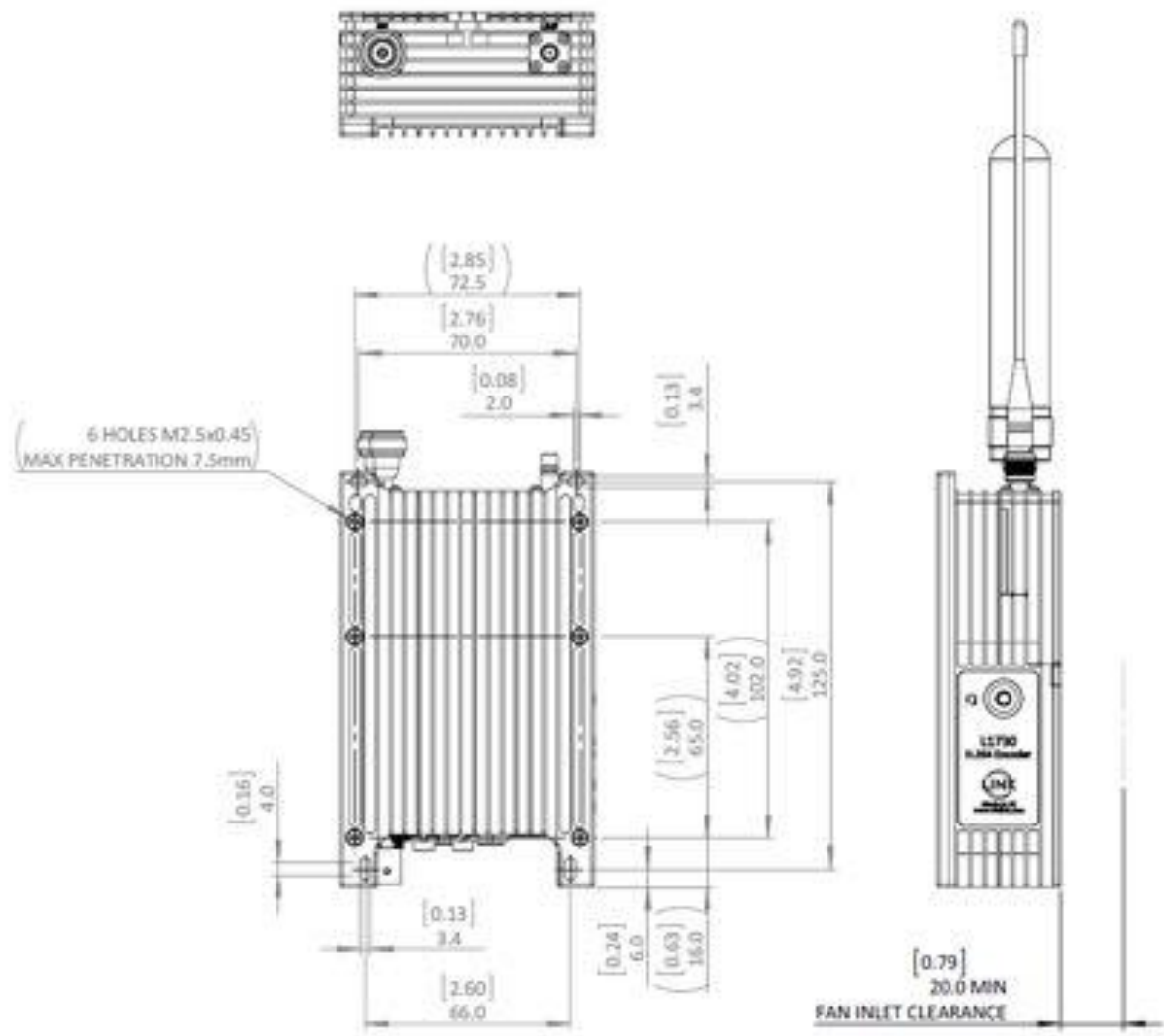
Figure 5-3   Mechanical Dimensions Rear View

NOTE: Dimensions are in mm [inches].

NOTE: Dimensions with parentheses (*) refer to the thermal contact version (with outer finned plate removed).

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6. Firmware Upgrades

See the firmware upgrade procedure supplied with the Firmware Release Notes.

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7. Remote Control Protocol

7.1. Introduction

This document describes the remote control protocol interface of L1700. The physical interface is RS232.

Normal operation involves sending a packet from the control device (normally a PC) to the Encoder. If the packet satisfies an address integrity check, then the Encoder will action the command and send a reply.

For compatibility with modems an ASCII style protocol is used.

7.1.1. Physical Interface

An external 3-pin Lemo connector is used to access the remote control port. See Section 4.11.10 (RS232 Data & Control Port) for the pinout information.

Ports are set for 8-bits, No parity, 1 stop bit. Baud rate is normally 9600 but 115,200 will also be allowed for manufacturers use.

7.1.2. Packet Structure

7.1.2.1. Sending (from PC)

ASCII		Value
STX	02h	Start byte
0-9	30h-39h	4-byte unit address. In range 0-9999
R	20h-7Eh	1-byte command type. R read, W write or M miscellaneous
I	20h-7E	1-byte indicator of internal data block. I,V-video, O-modulador, A-Audio a, B-Audio b channel, G, E, Z
ABC	20h-7Eh	Command –three-byte mnemonic
;	3Bh	Separator
PQR	20h-7Eh	Data –Optional, variable length
;	3Bh	Separator
X	20h-7Eh	Sum Check
ETX	03h	End byte

Table 7-1   Packet Structure - Sending

7.1.2.2. Reply (from Encoder)

ASCII	Value	Description
STX	02h	Start byte
0-9	30h-39h	4-byte unit address. In range 0-9999
Z	20h-7Eh	Status BYTE
PQR	20h-7Eh	Data –Optional, variable length
;	3Bh	Separator
X	20h-7Eh	Sum Check
ETX	03h	End byte

Table 7-2   Packet Structure - Reply

The Sum check byte is the summation of all bytes in the packet, not including the start and end bytes. Higher order bytes are ignored and the final byte result is modified to prevent ASCII control characters being sent. Bit 7 (highest) is forced high.

Status byte will indicate command performed OK, or indicate an error.

ASCII	Meaning
1	All OK
E	General error, Command could not be actioned

Table 7-3   Status Byte Indicator

NOTE: Typically, **E** will be returned if the message is formatted incorrectly (separators in wrong place) or if commands are in upper case, or if commands do not match against the allowed list of commands, or if the checksum is wrong.

Addresses in the range 0001 to 9998 are for general use. Address 0000 is reserved and 9999 is a broadcast address i.e. any Encoder will reply to this address. Any reply will contain its own specific address.

All data in the Encoder is stored as one of five data types:

- Double
- String
- List
- Integer
- HexInteger

The data type dictates the contents of the data section of the reply.

List – 1 byte for sending. Value is decimal coded as ASCII.

2-byte reply. Reply represents index into original choice list. E.g. Reply "12" indicates entry 12 in original list.

Double - variable length. Reply always contains decimal point and 4 decimal places. Can have 1 to 3 digits before decimal.

Integer - 6byte reply integer value with stuffed with preceding zeros. e.g. GOP reply 000012 = GOP length 12

String - Variable length. Reply is string excluding null terminator

HexInteger – 8byte Hex reply

7.2. L1730 Commands Table

Description	Type	Block	Command	Data Sent	Data Type
Audio A Bitrate	r/w	a	bit	1 byte, 0 = 128Kbs, 4= 256Kbs, 6= 384Kbs	List
Audio A Input	r/w	a	Not Yet Supported	1 byte, 0 = Test Tone, 1 = Analogue, 2 = Headset Mic, 3 = SDI Gp1 Ch 1/2, 4 = SDI Gp2 Ch 5/6, 7 = HDMI Ch 1/2	List
Audio A Language	r/w	a	lan	1 byte, 0= Eng, 1= Spa, 2= Ger, 3= Fre	List
Audio A Lock	ro	a	loc	1 byte, 0= Unlocked, 1= Locked	List
Audio A Mode	r/w	a	mod	1 byte, 0= Stereo, 1= Dual Mono	List
Audio A PID	r/w	a	pid	4 byte PID, 32 – 8190	Integer
Audio A Standard	r/w	a	sta	1 byte, 0= OFF, 1= MPEG1-L2, 3= MPEG1-L1	List
Audio Mic/Line	r/w	a	mic	1 byte, 0= Line, 1= Mic	List
Audio Phantom Power	r/w	a	pha	1 byte, 0=OFF, 1=ON	List
Audio Mic Gain Left	r/w	a	mil	48 to -24 dB	Double
Audio Mic Gain Right	r/w	a	mir	48 to -24 dB	Double
Audio Line Gain Left	r/w	a	lil	66.5 to -5.5dB	Double
Audio Line Gain Right	r/w	a	lir	66.5 to -5.5dB	Double

Audio B Bitrate	r/w	b	bit	1 byte, 0 = 128Kbs, 4= 256Kbs, 6= 384Kbs	List
Audio B Input	r/w	b	Not Yet Supported	1 byte, 0 = Test Tone, 1 = Analogue, 2 = Headset Mic, 3 = SDI Gp1 Ch 1/2 4 = SDI Gp2 Ch 5/6 7 = HDMI Ch 1/2	List
Audio B Language	r/w	b	lan	1 byte, 0= Eng, 1= Spa, 2= Ger, 3= Fre	List
Audio B Lock	ro	b	loc	0= Unlocked, 1= Locked	List
Audio B Mode	r/w	b	mod	1 byte, 0= Stereo, 1= Dual Mono	List
Audio B PID	r/w	b	pid	4 byte PID, 32 – 8190	Integer
Audio B Standard	r/w	b	sta	1 byte, 0= OFF, 1= MPEG1-L2, 3= MPEG1-L1	List
Download	r/w	c	cal	1 byte, 0= NO, 1= YES	List
Restore Defaults	r/w	d	def	1 byte,	Restore Defaults
Encoder Bitrate	r/w	e	bit	0 – 100. Bitrate in Mb/s include decimal point.	Double
Encoder Auto Bitrate	r/w	e	aut	1 byte, 0= OFF, 1= ON	List
Encoder GOP Length	r/w	e	gop	0 – 30	Integer
Encoder GOP Structure	r/w	e	str	1 byte, 0= I, 1= IP, 2= IBP, 3= IBBP.	List
Encoder Horizontal Resolution	r/w	e	hor	1 byte, 0= 1/1, 1= 3/4, 2= 1/2	List

Encoder Delay Mode	r/w	e	mod	1 byte, 0= Normal, 1= 100ms, 2= 1 Frame, 3= 20ms, 4= Long	List
Encoder Profile	r/w	e	pro	1 byte, 0= Baseline 4:2:0, 1= Main 4:2:0, 2= High 4:2:0, 3= High 4:2:2	List
Encoder VBI in Picture	r/w	e	vbi	1 byte, 0= OFF, 1= ON	List
Encoder Video PID	r/w	e	pid	4 byte, Decimal 32 - 8190	Integer
Encoder Type	r/w	e	end	1 byte, 0 = Off, 1= HD, 2= SD	List
Unit ESN	ro	g	ser	8 Hex Digits	Hex Integer
Unit Identifier	ro	g	Not Yet Supported		
Unit Temperature	ro	g	tem	-55 – 150	Integer
Unit Voltage	ro	g	vol	Voltage in Volts	Double
Battery Voltage	ro	g	bat	Voltage in Volts	Double
Module Voltage	ro	h	vol	Voltage in Volts	Double
Module Version	ro	h	sof	8 Hex Digits	HexInt
Module Temperature	ro	h	tem	-128 - 127	Double
Module Serial Number	ro	h	ser	8 Hex Digits	HexInt
ASI Bitrate (Mbit/s)	r/w	m	bit	Bitrate in Mb/s decimal point included	Double
ASI Mode	r/w	m	asi	1 byte, 0= OFF, 1= 188 byte, 2 = 204 byte	List

Local Service	r/w	m	loc	1 byte, 0= OFF, 1= ON	List
Network ID	r/w	m	nid	Any integer value from 0 – 65535.	Integer
PCR PID	r/w	m	pcr	4 byte decimal PID 32 – 8190.	Integer
PMT PID	r/w	m	pmt	4 byte decimal PID 32 – 8190.	Integer
Program ID	r/w	m	pro	Any integer value from 1 – 65535.	Integer
Network Name	r/w	m	net	Network Name String	String
Service Name	r/w	m	ser	Service Name String	String
Transport ID	r/w	m	tid	Any integer value from 0 – 65535.	Integer
Data Baud	r/w	t	bau	1 byte, 0= 1200, 1= 2400, 2= 4800, 3= 9600, 4= 19200, 5= 38400	List
Data Enable	r/w	t	dat	1 byte, 0= OFF, 2= Normal, 3= Low Latency	List
Data PID	r/w	t	pid	4 byte decimal PID 32 – 8190.	Integer
Auto Line Detect	r/w	v	aut	1 byte, 0= OFF, 1= ON	List
Bars on Loss	r/w	v	bar	1 byte, 0= Bars, 1= Bars and Overlay, 2= Black, 3= Black and Overlay	List

HD Video Format	r/w	v	hdf	1 byte, 0= 720p/50, 1= 720p/59, 2= 720p/60, 3= 1080i/50, 4= 1080i/59, 5= 1080i/60, 6= 1080p/23, 7= 1080p/24	List
Video Frame Rate	ro	v	fra	1 byte, 0= 25Hz, 1= 29.97Hz, 2= 30Hz, 3= 23.97Hz, 4= 24Hz	List
Encoder Video Lock	ro	v	loc	1 byte,	Encoder Video Lock
Bars Type	r/w	v	hdb	1 byte, 0= Black 1= 75% 2= 100%	List
Remux Enable	r/w	x	act	1 byte, 0= OFF, 1= ON	List
Link Control Source	r/w	g	lcs	1 byte, 0= 3-pin Lemo, 1= UHF (not supported) 2= 7-pin Lemo	List

Table 7-4   L1730 Commands Table

7.3. L1750 Commands Table

Description	Type	Block	Command	Data Sent	Data Type
Frequency Hi	ro	c	fhi	Max Frequency	Double
Frequency Lo	ro	c	flo	Min Frequency	Double
Frequency Step Size	ro	c	fss	Frequency Step Size	Double
Calibration Bins	ro	c	bin	0 – 1024	Integer
Power Hi	ro	c	phi	-128 – 127	Integer
Power Lo	ro	c	plo	-128 - 127	Integer
UHF Camera Type	r/w	c	cam	1 byte, 0= Sony, 1= Thompson, 2= Ikegami, 3= Hitachi	List
UHF Frequency	r/w	c	fre	410 – 490 (In MHz)	Double
Modulation Type	r/w	g	Modulation Type	r/w	g
MUX FEC	r/w	m	fec	1 byte, 0= OFF, 1= 1/2, 2= 2/3, 3= 3/4, 4= 5/6, 5= 7/8	List
Deep Interleaver MUX Burst	r/w	m	bur	0 – 60000 Maximum burst error length in ms.	Integer
Deep Interleaver MUX Delay	ro	m	del	Delay in ms	Integer
Deep Interleaver MUX D	ro	m	din	0 – 15	Integer
Deep Interleaver MUX L	ro	m	lin	0 – 32767	Integer
Carrier Offset	r/w	o	4ko	1 byte, 0= 0, 1= -1, 2= +1	List
Modulation Mode	r/w	o	mod	1 byte 0= QPSK 1= 16-QAM 2= 64-QAM	List
Guard Interval	r/w	o	gua	1 byte 0= 1/32 1= 1/16 2= 1/8 3= 1/4	List
FEC	r/w	o	fec	1 byte 0= 1/2	List

				1= 2/3 2= 3/4 3= 5/6 4= 7/8	
Polarity	r/w	o	pol	1 byte 0= Normal 1= Inverted	List
Bandwidth	r/w	o	wid	1 byte 1= 3MHz 2= 4MHz 3= 5MHz 4= 6MHz 5= 7MHz 6= 8MHz 7= 10MHz 8= 12MHz 9= 4MHz Dual 10= 6MHz Dual 11= 8MHz Dual 12= 10MHz Dual 13= 12MHz Dual 14= 14MHz Dual 15= 16MHz Dual 16= 20MHz Dual 17= 24MHz Dual	
Frequency	r/w	u	fre	0 – 10000 Frequency in GHz (range determined by module type)	Double
Tx Power (dBm)	r/w	u	dbm	0 - 240	Double
Tx Power (mW)	r/w	u	lev	1 byte 0= 10mW 1= 50mW 2= 100mW 3= 250mW	List
RF On/Off	r/w	u	out	1 byte 0= OFF 1= ON 2= Carrier Only	List
External Amp Power	r/w	u	pwr	1 byte 0= OFF 1= ON	List
Pre Distortion	r/w	u	dpd	1 byte 0= OFF 1= ON	List

Table 7-5   L1750 Commands Table

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8. L1700 Part Numbers

Part Number	Description
9011128	L1700 Lemo D-tap 300mm Power Cable
9011235	L1700 600mm Data Cable
9011238	L1700 600mm Lemo to dual BNC Multifunction Cable
9011244	200mm HDMI Type-D male to Type-A female
L0001M	LinkXP Tx Audio Lead 600mm
9011189	L1700 Sony Camera Control Cable 300mm
9011273	L1700 Sony Camera Control Cable Right Angle 300mm
9011280	L1700 Thomson/LDK Camera Control Cable 700mm
9013209	L1700 Ikegami HD Camera Control Cable 400mm
9013032	L1700 Hitachi Camera Control Cable 600mm
L17XX-AES128	128-bit AES scrambling license
L17XX-AES256	256-bit AES scrambling license
L17XX-RMX	External ASI input and remux license
L17XX-IPRMX	IP output and remux license
L17XX-ASI-OUT	ASI output license
L17XX-DI	Deep interleaving license
L17XX-LDPD	Digital pre-distortion license
L17XX-DATA	Data input license

Table 8-1   L1700 Part Numbers

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