Link L1500 Series Systems Manual

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Document   Link L1500 HD Series Systems Manual

1   Products Covered.

Link Part Number	Product Description	Details
L1500	L1500 Transmitter – Base Unit	
L1510-1927	L1500 RF Module / UpConverter	1.95 – 2.7 GHz
L1510-3236	L1500 RF Module / UpConverter	3.2 – 3.6 GHz
L1510-5859	L1500 RF Module / UpConverter	5.8-5.9 GHz
L1510-6471	L1500 RF Module / UpConverter	6.4 – 7.1GHz
L1510-6875	L1500 RF Module / UpConverter	6.8 – 7.5GHz
L3020/70	Downconverter Base Unit 2/7GHz	
L3014	Downconverter Filter 1.435- 1.525GHz	Use with L3070 base (Hi 1.84GHz)
L3030	Downconverter Filter 1.95-2.7GHz	Use with L3070 base (Lo 1.84GHz)
L3033	Downconverter Filter 2.2-2.3GHz	Use with L3070 base (Lo 1.83GHz)
L3034	Downconverter Filter 2.3-2.4GHz	Use with L3070 base (Lo 1.84GHz)
L3037	Downconverter Filter 2.5-2.7GHz	Use with L3070 base (Lo 1.84GHz)
L3080	Downconverter Filter 6.425-7.125GHz	Use with L3070 base (Lo 7.64GHz)
L3050	Downconverter Base Unit 3GHz	
L3060	Downconverter Filter 3.4-3.58GHz	Use with L3050 base (Lo 3.068GHz)
L2132/4	HD/SD IRD Receiver 2Ch/4Ch	UHF input 70-880MHz
L2140	HD/SD Decoder	ASI in only
L1255	Wireless CCU Interface	
L1520	Link L1500 Camera Control Module	

Issue	Date	Comments
A	July 07	Working draft – based on LinkHD (L1400) Manual
B	Oct 07	Initial release
C	Oct 07	Minor edits

Safety and Compliance

Any mains power equipment must be earthed. Operate the equipment within environmental limits and ensure as much ventilation as possible (Normally Temp 0C-50C <99% humidity). Only authorised 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 L1500 modules from the main unit.

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2   System Description

The Link L1500 HD wireless radio camera system comprises of three main components :-

Link HD Transmitter	-	L1500+L1510* Upconvertor
Link RF Down Converter (2 off)	-	L3070 (2/7GHz) or L3050 (3GHz)
Link HD Receiver	-	L2132/4

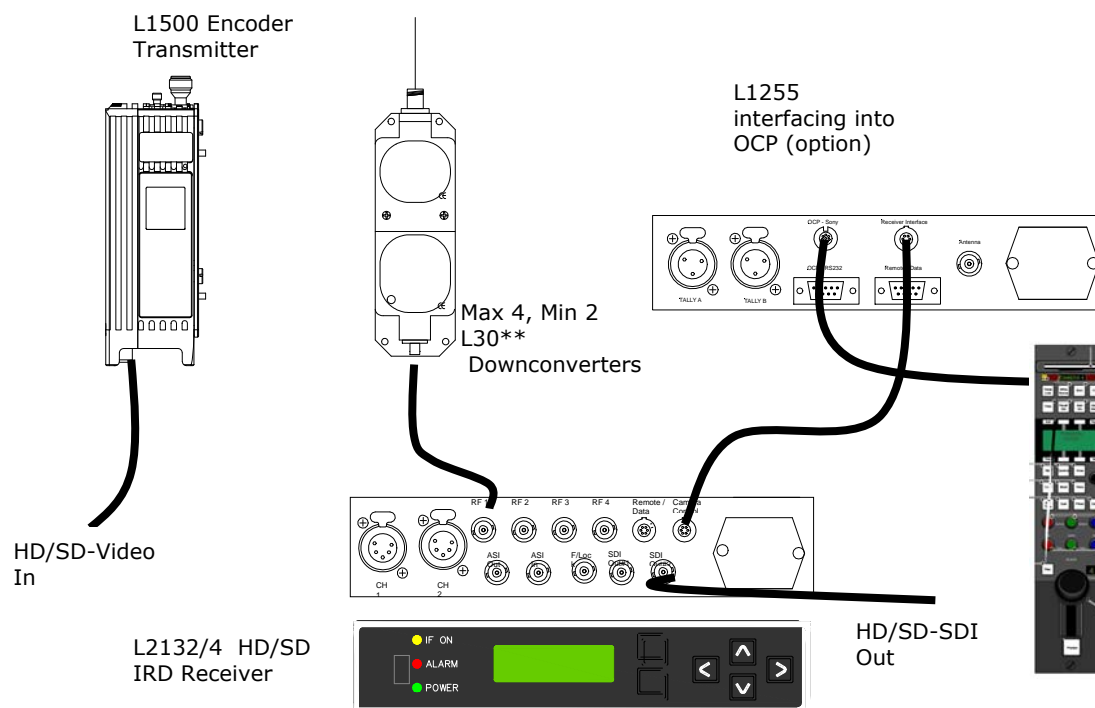*Note- In this manual L1510 is used to denote any of the optional RF / UpConverter modules.

Optional components for camera control :-

Link Wireless CCU Interface	-	L1255
Link HD Camera Controller	-	L1520

For Camera manufacturers OCP, Grass Valley OCP400; Sony 700 Series, and Link Generic (Ikegami HDK future)

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 HD system although other configurations are possible including diversity operation, through Triax and fibre etc.

Please contact Link Research Ltd for details.

L1500 Encoder
Transmitter

L1255
interfacing into
OCP (option)

Max 4, Min 2
L30**
Downconverters

HD/SD-Video
In

L2132/4 HD/SD
IRD Receiver

HD/SD-SDI
Out

For basic operation, connections to the L1500 HD Transmitter unit are HD/SD video, analogue audio and if required an RS232 data link. Power is supplied either via the attached battery plate or external LEMO connector.

The power switch on the side of the L1500 is provided to switch the L1500 / L1520. This switch **cannot** be used to control the supply to the forward camera interface plate which is always fed power from the battery or external Lemo connector.

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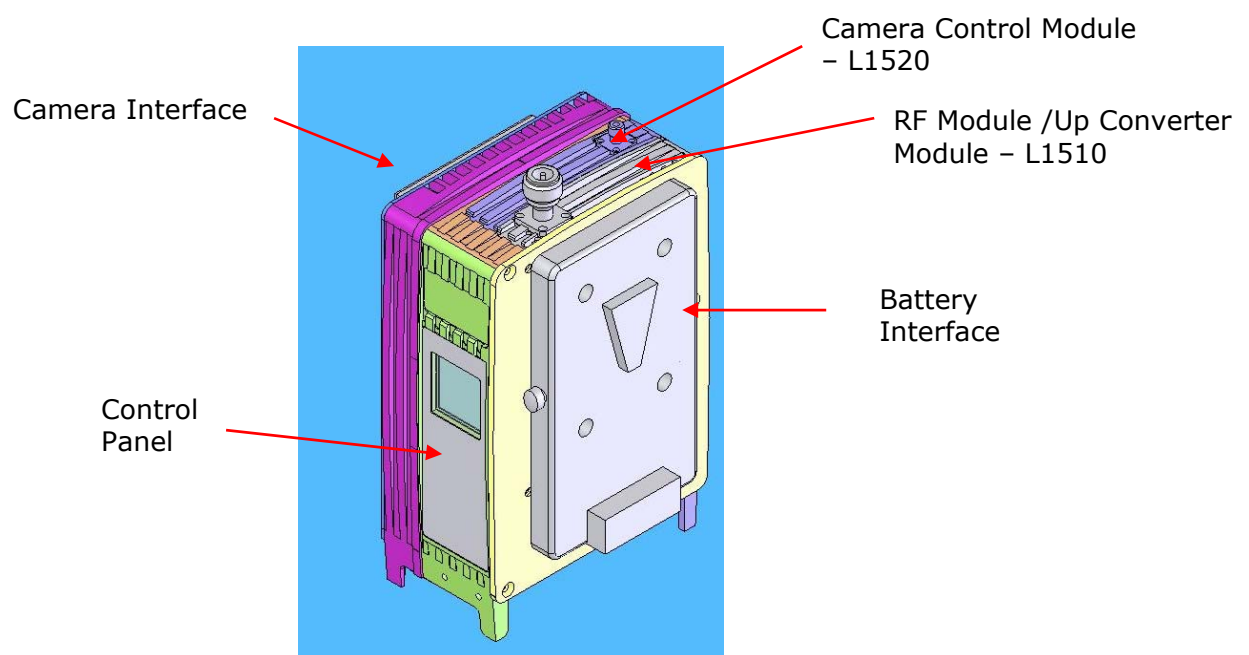
The L1500 can be supplied with various interface plates providing mounting of different batteries and to different camera mounts - either IDX / Sony 'V' , PAG Loc or Anton Bauer Gold Mount are available.

Adaptor brackets are also available to allow mounting of the L1500 to the rear of Thompson LDK6000 series of cameras and the Sony 1500 series. These interface plates provide a 'quick release' to remove the transmitter from the camera

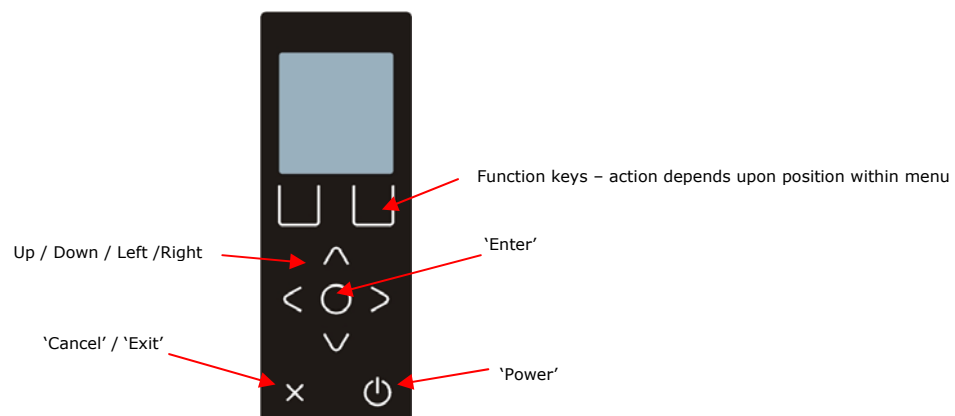A full list of accessories and cables is given at the end of this document

3   L1500 Series Encoder/Transmitter

The L1500 Series Encoder/Transmitter is a compact HD/SD MPEG2 Encoder, DVB-T and LMS-T modulator and 100mW output power amplifier (250mW FCC only). LMS-T is a unique robust modulation scheme developed specifically for wireless camera use.

Camera Interface

Camera Control Module – L1520

RF Module /Up Converter Module – L1510

Battery Interface

Control Panel

3.1   Operation

The L1500 is configured by the operator using the menu structure displayed on the colour LCD display, 9 membrane push buttons are used to navigate through these menus and select the required data. Please see 3.1.2 below for details of the L1500 menu structure.

Function keys – action depends upon position within menu

Up / Down / Left /Right

'Enter'

'Cancel' / 'Exit'

'Power'

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The **left / right** and **up / down** buttons are used to select the required menu, or sub-menu the **Enter** selects highlighted option which can then be modified with the **up / down** buttons. **Enter** will then select the option or **Cancel ('X')** will exit back to the level above without selecting or changing the settings..

Two **Function** keys are also available and can provide 'short cuts' into various functions without navigating through the menu structure.

The **'Status' display** can be used to display the battery voltage and current consumption of the L1500 unit.

A single 'soft' **Power** switch is also provided to control the L1500 unit.   This switch must be pressed for ~3secs to switch the L1500 on or off. This is to avoid accidental switching of the unit due to knocking the power switch.

When power is applied to the L1500 it will revert to the condition when the power was removed. E.g. If the L1500 was off when the power was removed; the power switch will need to be pressed to turn the unit on. If the L1500 was on when the power was removed the unit will automatically power on.


3.1.1   L1500 Display

Status Display

'Function' key definition
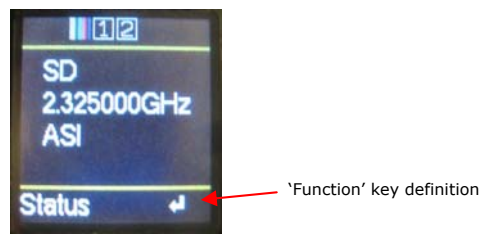
The 'normal' status display gives confirmation of the main operating configuration of the L1500 unit. The transmit frequency, RF , modulation mode or ASI operation.

Pressing the **Enter** button will enter the top level menu where either of the three sub menus can be selected.

Arrow indicating further options available by scrolling up / down through the menu
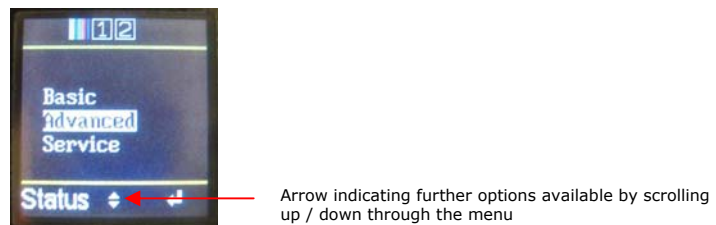
Example of a sub menu showing the use of highlighted options to show the currently selected item.

The arrows on the lower line of the display indication whether further items are available by scrolling up or down from the current position.

Icons are used to display the status of video input, bars, audio and remux on the top line of the status display.
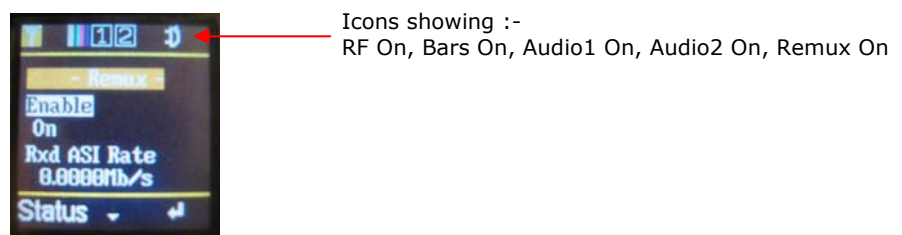
Icons showing :-
RF On, Bars On, Audio1 On, Audio2 On, Remux On

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3.1.2 L1500 Menus

The Greyed Out parameters not selectable with the current version of code.
The table below is splli into the three 'Levels' corresponding to BASIC, ADVANCED and SERVICE levels of operation.
The BASIC functions are also included in the ADVANCED level, this is to allow all functions of the unit to be configured by a competent operator; the normal operational functions can then be changed at the BASIC level.
The SERVICE functions are intended for diagnostics and servicing by a technician / engineer.

BASIC FUNCTIONS

	Options	Function	Comment
Modulator	Frequency	Range dependent on module fitted	Only if module detected and NOT in ASI mode
	RF Output Level	10,50,100,250mW	
	RF Output	On/Off	
	Mod. Mode	QPSK,16QAM,64QAM	
Video Source	Video Input	1080i/50,720p30 etc etc	Options dependent on either SD or HD
	Test Pattern	On/Off	
	Video Loss	Bars, Blank, Bars+Audio	If no video input detected sets Bars On
Audio Ch1	Enabled	On/Off	
	Input	Analogue, Test Tone, Embedded, Channel ID's	
	Mic/Line	Mic or Line level input	Mic adds +25dB gain & optional Phantom Power
	Phantom Power	On / Off	Only if Mic is selected
	Level Left	Sets required gain	
	Level Right		
Audio Ch2	As Ch1		
Status	Temperature	Display units internal temp	
	Service Name	Display / set units current Service Name	
	Serial Number	Display units serial number	Should be quoted in all enquiries with service department
	Licence Code	Display units licence code	Defines units enabled features
Camera Control	Camera Type	Selects camera type in use	
	Frequency	Sets UHF receiver frequency	

ADVANCED FUNCTIONS

	Options	Function	Comment
System	Auto Set Service	1…	Sets PID information for multiple camera operation
	Restore default	Yes / No	Sets unit configuration to Default values
	Save Profile	1…	Stores current configuration
	Load Profile	Yes / No	Loads saved configuration
	Last Profile	1…	
	Lock Panel	Locked / Unlocked	
	Unit Fans	Off/Auto	Control units fans
	Download		Allows download new unit firmware
Modulation	Frequency	Range dependent on module fitted	Only if module detected
	RF Output Level	10,50,100,250mW	
	RF Output	On/Off	
	Mod. Mode	QPSK,16QAM, 64QAM	LMS-T QPSK & 16QAM only
	Mod. Type	LMS-T, DVB-T	
	Guard Interval	1/32 ….	
	FEC	½ ……	
	Bandwidth	6,7,8,10 & 20MHz ….	LMS-T 10 & 20MHz; DVB-T 6,7,8MHz
	Mod. Polarity	Normal, Invert	
Multiplexer	ASI Packet	Off,188,204 bytes	
	ASI Bit Rate	10.000Mb/s	Display / set output bit rate
	Service Name		
	Network Name		
	PMT PID	Sets PID 0 - 9999	

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	PCR PID	Sets PID 0 - 9999	
	Local Service	On, Off	
	Program ID	Sets ID 0 - 9999	
	Network ID	Sets ID 0 - 9999	
	TS ID	Sets ID 0 - 9999	
Video Encoder	Video Input	1080i/50,720p30 etc etc	Options dependent on either SD or HD
	Test Pattern	On/Off	
	Video Loss	Bars	If no video input detected sets Bars On
	SD / HD	HD / SD	Selects either SD or HD video input formats
	Encoder	On / Off	Turns of local encoder
	Auto Bit Rate	On / Off	Encoder set to maximum rate for TS or modulation setting
	Enc Bit Rate	12.456Mb/s	Shows current bit rate. If NOT auto bit rate sets encoder bit rate setting.
	MPEG	4:2:0 / 4:2:2	
	GOP Length	8….	Sets required GOP Length
	Video PID	0-9999	Sets required Video PID
	Enc type	Std / Low Delay	Only if SD encoder
Audio Ch1	Enabled	On/Off	
	Input	Test Tone, Analogue, Embedded	
	Mic/Line	Mic or Line level input	Mic adds +25dB gain & optional Phantom Power
	Level Left	Sets required gain	
	Level Right		
	Type	MPEG L1,L2, Linear	
	Bit Rate	320Kbs	
	Mode	Dual Mono, Stereo	
	Language	Eng, Fre,Ger,Spa	
	Tone Level	-18dBFS	Sets output level of Test Tone
	PID	0-9999	
	DID	0-9999	
Audio Ch2	As Ch1		
Remux	Enable	On, Off	Turns the remux (external ASI input) on / off
	Input Rate	12.456Mb/s	
	Status	Not Active	Shows condition of remux input
RS232 Data	Data	On, Off, Low delay, TTV	
	Baud Rate	9600	
	Data PID	0-9999	

SERVICE FUNCTIONS

	Options	Function	Comment
Encoder	Serial Number	Display units serial number	Should be quoted in all enquiries with service department
	Licence Code	Allows Licence code changes	Defines units enabled features
	Software Revision	1a2	Displays Encoder firmware revision
Module1	Status	Fitted	
	Type	2.5GHz	
	Temperature		Module temperature
	Software Revision	1a2	Displays module firmware revision
Module2	Status	Not Fitted	
Versions	Code Version	1c3	Main unit firmware revision
			Shows versions of all programmable devices in the L1500
Cust. Support	Contact Details		
Debug	Debug Cmd		Used for detailed diagnostics
	Debug Parameter		Used for detailed diagnostics

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3.1.3   Transmitter Setup

It is important that when changing between modes of operation it is necessary to check and re-select certain operating parameters due to 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.

In the following examples the menus are described by :-- Level / Sub Menu / Function.

Some of the settings can be made from either the BASIC or the ADVANCED menus; the more 'complex' are only available from the BASIC level.

Following a 'Restore Factory Defaults' (Advance/System/Restore Defaults) it will be necessary to select the required operating mode and modulation configuration as the factory defaults will not currently give an operational setup and may result in 'garbage' characters on the display.

3.1.3.1   DVB-T Operation

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

Step	Menu	Sub Menu	Option	Setting
1	Advanced	Modulation	Modulation Type	DVB-T
2	Advanced	Modulation	Guard Interval	Must match receiver
3	Advanced,Basic	Modulation	Modulation Mode	As Required
4	Advanced	Modulation	FEC Rate	As Required
5	Advanced	Modulation	Polarity	Must Match Receiver
6	Advanced	Modulation	BandWidth	Fixed at 8MHz
7	Advanced,Basic	Modulation	Power	As Required
8	Advanced,Basic	Modulation	Frequency	As Required
9	Advanced,Basic	Modulation	RF Output	On

The MPEG2 encoder will set the data rate appropriately to match the modulation scheme settings.

The Table below defines the corresponding 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

The selections greyed out are available in the transmitter , but not in the current version of the receiver firmware. Check Support for updates.

These rates can be confirmed by checking the Advanced/Multiplexer/ Bit Rate 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.

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3.1.3.2   LMS-T Operation

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

Step	Menu	Sub Menu	Option	Setting
1	Advanced	Modulation	Modulation Type	LMS-T
2	Advanced	Modulation	Guard Interval	As Required. 1/8 or 1/16. Must match receiver
3	Advanced,Basic	Modulation	Modulation	As Required 16Q or QPSK
4	Advanced	Modulation	FEC Rate	2/3 Only
5	Advanced	Modulation	Polarity	Normal
6	Advanced	Modulation	Width	10MHz or 20MHz
7	Advanced,Basic	Modulation	Power	As Required
8	Advanced,Basic	Modulation	Frequency	As Required
9	Advanced,Basic	Modulation	RF Output	On

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 for both 10MHz and 20MHz operation.

Modulation	GI CR	1/8		1/16	
		10MHz	20MHz	10MHz	20MHz
QPSK	2/3	9.2	18.4	9.7	19.5
16QAM	2/3	18.4	36.8	19.5	39
64QAM	2/3	27.6	45.2	29.2	58.5

Note 64 QAM not available on current software.
These rates can be confirmed by checking the Advanced/Multiplexer/Bit Rate 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.

For example DVB-T 16QAM, 1/32 GI, 1/2 CR gives 12Mbits whereas LMS-T 16QAM gives 18Mbits

3.1.3.3   ASI Operation

The L1500 can be used as an MPEG2 HD encoder providing an ASI output. The modulator and RF Up converter are not required in this operating mode.
This provides ASI streams up to 90Mbits.

Step	Menu	Sub Menu	Option	Setting
1	Advanced	Modulation	Modulation Type	ASI
2	Advanced	Multiplexer	ASI Bit Rate	As Required
3	Advanced	Video Encoder	Bit Rate	As Required

The encoder bit rate cannot be set above the Mux bit rate, if an attempt is made to exceed the mux setting the encoder value will clamp to the highest allowed rate.

3.1.3.4   Remux Operation

The L1500 can be used to re-multiplex an additional service into the ASI data stream. This allows two services can be transmitted on one RF Channel.

Step	Menu	Sub Menu	Option	Setting
1	Advanced	Remux	Enable	On

It is important that the remultiplexed service multiplexer rate and the internal generated service multiplexer data rate are within the available RF modulated data rate.

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3.1.4 Video Input Format

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 but then fail with changing video images.

Menu	Sub Menu	Option	Setting
Advanced	Video	HD Input Unit	As required

3.1.5 Audio Input Format

Step	Menu	Sub Menu	Option	Setting
1	Advanced	Audio A or B	Type	Encoding as required
2	Advanced,Basic	Audio A or B	Input	As Required
3	Advanced	Audio A or B	Bit Rate	As Required
4	Advanced	Audio A or B	Mode	As Required
5	Advanced,Basic	Audio A or B	Line / Mic	As required
6	Advanced,Basic	Audio A or B	Phantom Pwr	If Mic selected
7	Advanced,Basic	Audio A or B	Mic or Line Level	Set required gain

3.2 L1500 Connector Interface

Top Panel Connector   RF out   N Type Male 50 ohm connector.

Side Panel Connectors   USB, serial interface used for firmware upgrades etc

**Lower Panel Connectors**   Position of panel connectors on the L1500 transmitter.
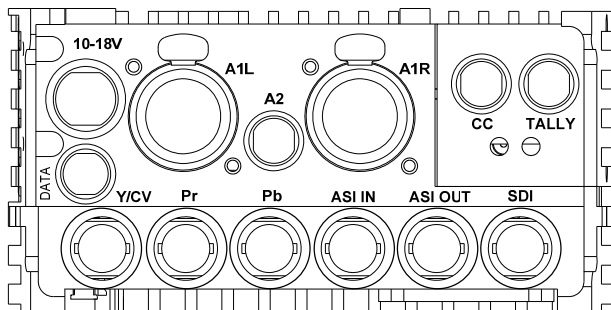
Connector type	Legend	Description
BNC 75Ω bayonet socket	SDI In	SD/ HD-SDI (SMPTE 259M / SMPTE 292M)
BNC 75Ω bayonet socket	ASI OUT	DVB-ASI – output from the MPEG2 encoder
BNC 75Ω bayonet socket	ASI IN	DVB-ASI – into the Remux for modulation
BNC 75Ω bayonet socket	Y/CV	PAL or NTSC (625 / 525) SD only, also Y for component
BNC 75Ω bayonet socket	Pr	Component SD only
BNC 75Ω bayonet socket	Pb	Component SD only
XLR3 Female	A1L / A1R	Ch1 Analogue audio inputs. Line or Mic level
6 way LEMO	A2	Ch2 Analogue audio inputs. Line or Mic level
6 way LEMO	DATA	RS232 connection for Link Control
4 way LEMO	PWR	External 12V battery supply if rear 'clip on' battery is not used. It is also possible to take power from the 'clip on' battery. Care must be taken to ensure that the 'clip on' battery on the rear of the L1500 is not 'back fed' by an external battery or power supply.

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3.3   L1500 HD Transmitter Description and Specification

The complete transmitter unit contains three main assemblies which can provide a flexible and upgradeable transmitter system:-

- Main unit, contains encoder, audio pre-amps, display and controller
- Modular RF Up Converter, available in various frequency bands
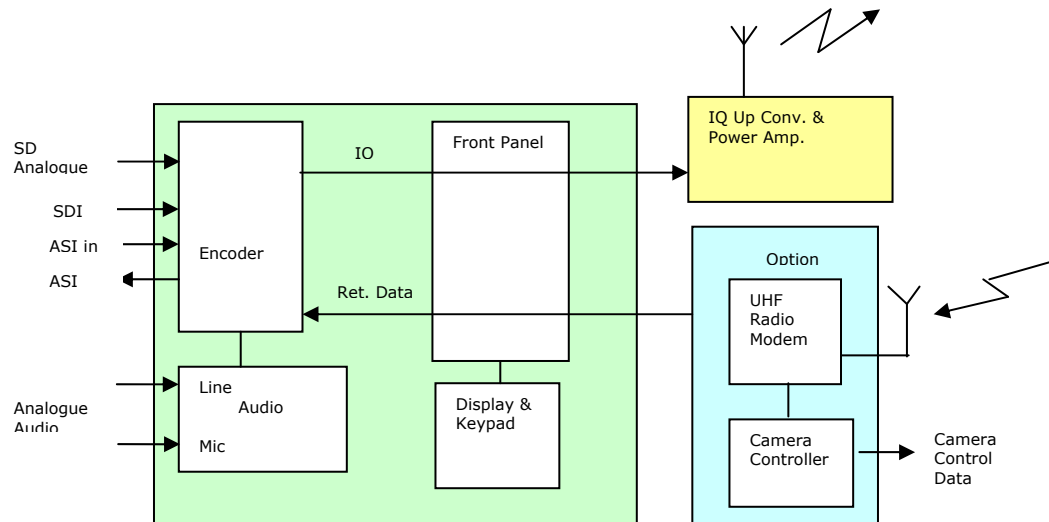
- Camera Controller (optional) or a 'dummy' unit must be fitted

3.3.1   Video Formats

The L1500 transmitter unit will accept HD-SDI inputs in any of the following HD formats :-

Standard	Total lines per frame	Total samples per line	Active lines per frame	Active samples per line	Interlace or Progressive	V freq	H freq
1080I/60	1125	2200	1080	1920	I	60 Hz	33.75 KHz
1080I/59.9	1125	2200	1080	1920	I	60/1.001	33.716 KHz
1080I/50	1125	2640	1080	1920	I	50 Hz	28.125 KHz
1080P/30	1125	2200	1080	1920	P	30 Hz	33.75 KHz
1080P/29.9	1125	2200	1080	1920	P	30/1.001	33.716 KHz
1080P/25	1125	2640	1080	1920	P	25 Hz	28.125 KHz
1080P/24	1125	2750	1080	1920	P	24 Hz	27.0 KHz
1080P/23.9	1125	2750	1080	1920	P	24/1.001	26.973 KHz
1080Psf/60	1125	2200	1080	1920	P	60 Hz	33.75 KHz
1080Psf/50	1125	2640	1080	1920	P	50 Hz	28.125 KHz
1080Psf/24	1125	2750	1080	1920	SF	48 Hz	27.0 KHz
1080Psf/23.9	1125	2750	1080	1920	SF	48/1.001	26.973 KHz
720P/60	750	1650	720	1280	P	60 Hz	45 KHz
720P/59	750	1650	720	1280	P	60/1.001	44.955 KHz
720P/50	750	1980	720	1280	P	50 Hz	37.5 KHz

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The L1500 will also accept SD inputs as either composite (CVBS), component (Y/Pr/Pb) or SDI in the following formats :-

Standard	Input Connector
SDI 625	SDI
SDI 525	SDI
PAL	CV
NTSC	CV
NTSC No Ped	CV
PAL-M	CV
PAL-N	CV
YPbPr 625	Y/Pr/Pb
YPbPr 525	Y/Pr/Pb
Betacam	Y/Pr/Pb

3.4 Input / Output Connections

This following section details the connector types and pin-outs of the interface connectors on the L1500 Transmitter unit.

3.4.1 SDI Video Input

75Ω chassis mounted BNC jack socket for input of HD-SDI (SMPTE 292M) or SD-SDI (SMPTE 259M) video.

3.4.2 SD Analogue Video Inputs

Three 75Ω chassis mounted insulated BNC jack sockets for input of composite (CV) or component analogue (YPrPb) SD video. The CV and Y inputs share a common connector.

3.4.3 ASI

Both ASI input and ASI output are connected to the transmitter unit via 75Ω chassis mounted BNC jack sockets.

3.4.4 Audio - Ch1

A stereo pair, differential inputs at Mic level (with or without phantom power) or Line Level. A switched 25dB gain and a variable (+31.5 to -95dB) level control.
Line / Mic and phantom power is independently switchable on Ch1 and Ch2.

>20kΩ input impedance
Frequency response 50Hz to 15kHz <0.1dB
Frequency response 20Hz to 20kHz <0.5dB
+18dB clipping level (+18db ≡ 0dBFS)

2 Chassis Socket Connectors:- XLR3

XLR Pin	Function
Pin 1	Gnd
Pin 2	Live / +ve
Pin 3	Ret / -ve

3.4.5 Audio - Ch2

A stereo pair, differential inputs at Mic level (with or without phantom power) or Line Level.
A switched 25dB gain and a variable (+31.5 to -95dB) level control.
Line / Mic and phantom power is independently switchable on Ch1 and Ch2.

>20kΩ input impedance
Frequency response 50Hz to 15kHz <0.1dB
Frequency response 20Hz to 20kHz <0.5dB
+18dB clipping level (+18db ≡ 0dBFS)

Chassis Socket Connector	:-	LEMO EEG0B305CLV
Mating Cable Plug	:-	LEMO FGG0B305CLAD52Z
Link Cable Assembly – 2 x XLR3	:-	L0001

LEMO Pin	Function
Pin 1	Left Line + (Line)

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Pin 2	Left Line - (Return)
Pin 3	GND
Pin 4	Right Line + (Line)
Pin 5	Right Line - (Return)

3.4.6   DC Power

L1500   ~28W   12V DC nominal (10V minimum, 18V maximum)

Power dependent upon frequency of L1510, RF output power and camera control options.

Performance is degraded below 11.0V.

Chassis Socket Connector   :-   LEMO ECG1B304CLV
Mating Cable Plug   :-   LEMO FGG1B304CLAD62Z
Link Cable Assembly– flying leads :-   L0003

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

3.4.7   RF

100mW into 50Ω – switchable. 10, 50 ,100 and 250mW.
Note:- 250mW is for FCC use only.
50Ω chassis mounted 'N' type bulkhead socket.

3.4.8   RS232 Data & Control Port

The six pin connector provides the RS232 input / output of both the User Data and also Remote Control of the transmitter unit.

Chassis Socket Connector   :-   LEMO EEF0B306CLV
Mating Cable Plug   :-   LEMO FGG0B306CLAD52Z

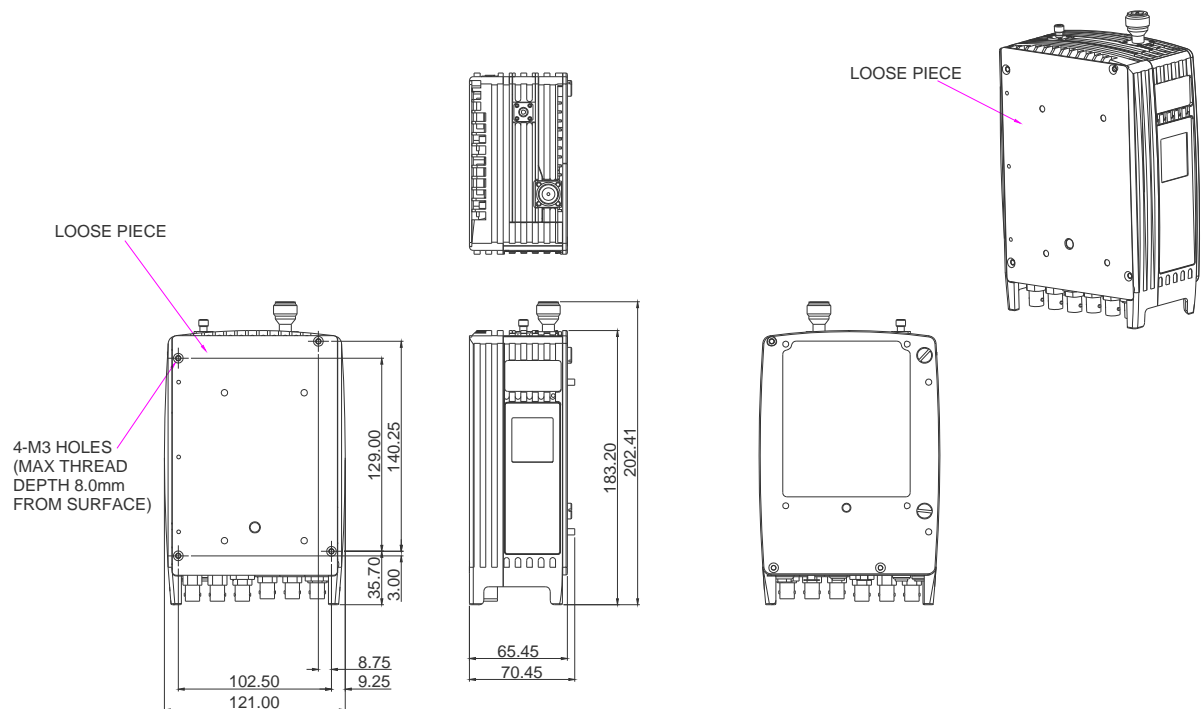| LEMO Pin	Function
Pin 1	Tx Data (output)
Pin 2	Rx Data (input)
Pin 3	0v
Pin 4	Tx Control (output)
Pin 5	Rx Control (input)
Pin 6	0v

3.4.9   USB Data Port

A USB2 'Mini B' style connector is to allow for serial communication with the unit.
Chassis Socket Connector   :-   Molex 67503-0020

USB Pin	Function
Pin 1	Vbus
Pin 2	D-
Pin 3	D+
Pin 4	
Pin 5	0V

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3.5   Mechanical

LOOSE PIECE

LOOSE PIECE

4-M3 HOLES
(MAX THREAD
DEPTH 8.0mm
FROM SURFACE)

129.00
140.25
35.70
3.00
8.75
9.25
102.50
121.00

183.20
202.41
65.45
70.45

Unit shown with no battery mount or camera interface mounts fitted.

4   L1520 Camera Controller / Data Receiver – Optional

All configuration of the camera controller is via the main L1500 LCD display and operators menu. :-
Setup/Camera Control/Cam Type.

The only functions that require to be configured are :-

Camera Type-   Thomson (LDK6000)
                Sony (HDC1500)
                Ikegami

Frequency-   Dependent upon the configuration of the UHF radio, please contact Support for
details.

The following leads are supplied for connection between the camera controller (**CC Data** connector)
and camera head.

Thompson- LDK6000   L0016
Sony   L0017

Connector type	Legend	Description
4 way LEMO	Tally	Connection to external Tally light – future design
6pin LEMO	CC Data	Serial control data to camera head.

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5   L2132/4 SD/HD Receiver

The L2132/4 is a compact DVB-T and LMS-T demodulator using Links Maximum Ration Combining diversity algorithm with a combined HD/SD decoder. It is an ultra low delay MPEG2 SD/HD Decoder which is speed optimised to operate with the L1400 & L1500 series Encoder, which utilises field encoding with no B Frames.

The diagram below shows the function of the front panel controls and displays necessary to operate the receiver.
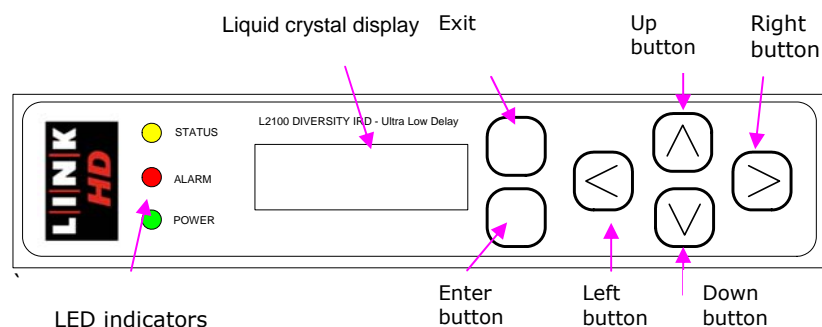
5.1   Controls

The operation of the receiver is through the six membrane buttons on the front panel of the receiver. These allow the operator to navigate through the various menus.

Control/Display	Function
Enter button	Selects the currently selected parameter.
Exit button	Cancels any parameter changes and Escapes to higher menu.
Up button	Allows upward navigation in a sub menu.
Down button	Allows downward navigation in a sub menu.
Left button	Allows movement to the left when changing parameters within a menu setting.
Right button	Allows movement to the right when changing parameters within a menu setting.
LCD window	Displays menu settings and system status. Tick boxes indicate individual channel RF lock, and ASI lock.
Status LED (yellow)	When lit, the receiver is locked to a signal.
Alarm LED (red)	When lit, an alarm has been detected.
Power LED (green)	When lit, power is applied to the receiver.

5.2   Operator Menus

The following table indicates the top level menu structure and gives the cross reference for the detailed explanation of each sub menus.

The '**Up/Down**' buttons are used to scroll through the menus,
'**Enter**' is then used to select and enter the sub-menu.
'**Enter**' selects the required parameter or **'Exit '** can be used to return to the level above without selecting the new paramenter..

Menu	Function	Reference
RF Status	Displays the RF quality on each input	
RF Level	Displays the RF level on each input	
Memory Menu	Used to select and store the configuration menus	
Demodulator Menu	Used to select and monitor operating frequency and demodulation settings	
Descrambling Menu	Used to select and configure required descrambling	

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Decoder Menu	Shows Service name and Decoder status, selects required audio configuration,	
RS232 Menu	Configure RS232 port	
Unit Menu	Configure Down Converter, Shows code versions, selects operating mode	
CCU Camera Control	If L1255 is connected, selects UHF frequency and OCP type	

Memory Menu

Sub menu	Options	Comments
Store –Config?	Config 1…9	Stores the current settings into selected memory location 1 to 9
Load – Config?	Config 1…9	Loads stored settings from the selected memory location 1 to 9
Default Restore No	No	Does not change the current active settings.
	Yes	Restores the current active settings to factory defaults. NB – If the receiver cannot be set up, it is worth using this option and then restarting the set-up again.
Last Config #	None	Shows the last configuration (memory) that was used.

Demodulator Menu

Sub menu	Options	Comments
IPFreq #.###GHz	Enter required frequency	The transmit frequency of the camera transmitter is entered here. Note that although tuning steps of 10kHz can be entered on the screen, when the enter key is pressed the receiver locks to the nearest 1MHz step. If the down converter settings in the Unit menu are set to L3010 or L3020 (Link), the frequency is automatically copied to the OFDM Demod 2 menu. If the down converter setting is set to Other, a frequency can be entered that does not have to be the same as in OFDM Demod 2.
DConvLO #.###GHz	Enter required frequency, if required.	The Downconverter local oscillator frequency is entered here. Where Link down converters are being used, the figure is automatically entered from a menu setting in the Unit menu. For down converters from other manufacturers, set the Downconverter type in the unit menu to OTHER and enter the local oscillator frequency here.
LoSide Low	High	Selects the local oscillator output mix for the Downconverter. Automatically entered for Link downconverters entered in the unit menu. But can be set. for other downconverters.
	Low	As above. Means that the downconverted frequency is higher
Polarity ???	None	**MUST** be matched to transmitter.
Width #MHz	20/10/8/7/6 MHz Indicator	Channel width indicator as set by the transmitter. 20Mhz and 10Mhz only is LMS-T mode
Guard ???	1/8,1/16,1/32	**MUST** be match to the transmitter Default 1/16
Lock Indicator	Yes/No	Indicates whether the Demodulator has locked onto the incoming signal
Modulation ???	None	Automatically detected from the incoming signal.
FEC Rate ???	None	Automatically detected from the incoming signal.
SNRA #.###dBm	None	A measure of signal quality measurement. The reading shown is an instantaneous measurement taken at the time the return key is pressed. To update the reading, the menu must be exited and then re-entered. Note value is not calibrated
SNRB #.###dBm		Display for RF2
SNRC #.###dBm		Display for RF3
SNRD #.###dBm		Display for RF4
InA Level ??? dB	None	Displays input level into RF1
InB Level ???dB	None	Displays input level into RF2
InCevel ??? dB	None	Displays input level into RF3
InDLevel ???dB	None	Displays input level into RF4
PreBER #####.####e	None	Pre viterbi error rate automatically detected from the incoming signal. The reading shown is an instantaneous measurement taken at the time the return key is pressed. To update the reading, the menu must be exited and then re-entered.
PostBER		Post viterbi error rate automatically detected from the incoming signal.

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####.####	None	The reading shown is an instantaneous measurement taken at the time the return key is pressed. To update the reading, the menu must be exited and then re-entered.
Pkt Errs #.####	None	Packet errors automatically detected from the error corrected data stream. The reading shown is an instantaneous measurement taken at the time the return key is pressed. To update the reading, the menu must be exited and then re-entered.
Squelch	No/Yes	Ensures that only valid packets of data are sent out in the ASI stream.

Descrambling Menu

Sub menu	Options	Comments
Descrambling ###	Off	An encrypted data stream will not be decrypted.
	EBS	Enables decryption of and EBS encrypted data stream.
	BISS-1	Enables decryption of and BISS-1 encrypted data stream. (option)
	BISS-E	Enables decryption of and BISS-E encrypted data stream. (option)
EBS Key ''	Value	Enables entry of an 8 digit key. The left and right arrows allow scrolling to the left or right in the number. The up and down arrows enable scrolling through the values 1 – 9 ,A – F. Must match transmitter setting
BISS-1 Key	Value	BISS-1 Key. Must match transmitter setting.
BISS-E Key	Value	BISS-E Key Must match transmitter setting.

Decoder Menu

Sub menu	Options	Comments
Input	Demodulator	Decodes ASI stream coming from internal demodulator
	ASI	Decodes ASI stream connected to rear panel ASI in connector
Mode	SD	Decodes SD ASI stream
	HD	Decodes HD ASI Stream
	AUTO	Looks at ASI stream and automatically sets option
Output	Video	Not used
	Bars	Not Used
Service ######	List of available services	Shows the service name of the service to which the decoder is currently locked. Pressing enter brings up a list of available services which can be scrolled through. Pressing enter selects the new service. If the receiver is not locked No Service is displayed and a DEC error warning flashes on the display.
Default '#####'	Enter Name	Name of the service the receiver will automatically lock onto.
Pwr Video xxxx	1080i25	Defines the video output standard before a stream is received & decoded. So that equipment down the production line knows what signal to expect.
	1080i29	
	1080i30	
	720p50	Addition formats added , check video HD format table.
	720p59	
	720p60	
	625	
	525	
Aaudio O/P ###	Ana	Sets Audio A output to analogue.
	Dig	Sets Audio A output to digital – AES3
Baudio O/P	Ana	Sets Audio B output to analogue.
	Dig	Sets Audio B output to digital – AES3
Aud DID Group ##	Off	Allows the audio data identifier for embedded audio to be selected
	Group 0	
	Group 1	
	Group 2	
	Group 3	
PSF Mode	ON/OFF	Determines whether out video is displayed as progressive or interlaced
Locked ###	None	Shows when the receiver is locked to a valid input signal. Yes or No will be displayed according to the status.
Fail mode ######	Freeze	If the input to the receiver is lost, the last good frame of video is displayed.
	Blue	If the input to the receiver is lost, a blue screen is displayed.
Line Std ###	None	Displays current received video standard
	Off	The unit is free running and not locked to any external source.

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Framelock ###	SD	The unit's video is frame locked to an external source and will be slightly delayed. If Framelock is set to on and no synchronising input is detected, an alarm, GEN, flashes on the display. NB – the colour sub carrier is not locked to the synchronising source. SD mode uses black and burst mode to lock the frame
	HD	HD uses the more accurate tri-level sync signal to lock the frame
Offset ##### pix	None	Allows delay or advance of the framelock in the range of 0 – 9999 pixels. 5000 is the centre of the range. 1 pixel = approx 74.63 nano seconds.

RS232 Menu

Sub menu	Options	Comments
Data ###	Off	Inhibits any RS232 data being output.
	On	Allows RS232 data to be output. See remote control protocol for details of data types and encoding settings.
Baud rate ####	None	Automatically detects the baud rate of the data stream. If no data is detected, (null) is displayed.
Parity	None	Automatically detects the baud rate of the data stream.

Unit Menu

Sub menu	Options	Comments
Address #	None	Allows the unit address to be set where multiple receivers are controlled from the same source. Used by the Link Control protocol. A value between 0001 and 9999 can be set.
LNB Power ###	Yes	Power is supplied via the down leads to the down converter. On the display LNB ON is shown in the bottom left corner.
	No	There is no low voltage power supplied to the down leads.
Soft version: ###	None	Displays the version of the currently installed firmware.
FPGA A version: ##	None	Displays the version of the currently installed FPGA code.
FPGA A version: ##	None	
HW Version	None	Currentrly displays two variants HW4000 or HW6000
SerNum ######	None	Displays the electronic serial number of the unit.
Lcod `//////////	None	Allows a unique hexadecimal string (licence code) to be entered so that the unit's features can be upgraded or downgraded. The hex string is issued by Link providing the correct conditions (payment) are satisfied.
Lock ###	Off	Allows full control of all settings on the receiver.
	On	Allows the User to scroll through the menus but will not allow any changes to be made to settings – other than Lock Off ! A padlock symbol is shown on the display when Lock is on.
LCD Contrast #	None	Allows the contrast of the display to be varied in 16 steps (0 to 16)
Mode ####	10MHzCOFDM	10MHz (Single) LMS-T modulation
	20MHzCOFDM	2 x 10MHz (Dual) LMS-T modulation
	None	Demodulator disabled
	DVBT	DVB_T Standard
ASI Lock	None	Displays whether the decoder is locked to an incoming ASI stream
Dconv Type #####	L3010	Use this setting for an older Link manufactured down converter. This setting automatically enters the correct local oscillator frequency in the Demod menus
	L3014	Link down converter with 1.435GHz to 1.525GHz filter
	L3030	Link down converter with 1.95GHz to 2.7GHz filter
	L3031	Link down converter with 2.00GHz to 2.11GHz filter
	L3032	Link down converter with 2.1GHz to 2.2GHz filter
	L3033	Link down converter with 2.2GHz to 2.3GHz filter
	L3034	Link down converter with 2.3GHz to 2.4GHz filter
	L3035	Link down converter with 2.4GHz to 2.5GHz filter
	L3037	Link down converter with 2.5GHz to 2.7GHz filter
	L3060	Link down converter with 3.4GHz to 3.58GHz filter
	L3080	Link down converter with 6.425GHz to 7.125GHz filter
	L3085	Link down converter with 6.80Ghz to 7.5GHz filter
		More Downconverter options on request.

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	Other	Use this setting for other manufacturers down converters. The local oscillator setting must be manually entered in the Demod menus. By entering a value of 0 for the down converter local oscillator, the receiver can be tuned in the range of 860MHz to 470MHz.
	None	With this setting, the receiver automatically tunes to 70MHz.
Unit PCB ######	None	Not supported in this version of code.
Features	None	List of include features (engineering use only)
Battery	None	Feeds back status of Camera battery if CCU fitted
Tuner Version	None	Indicates version of the tuner board
Command	None	Generic command entry (engineering use only)

CCU Menu - Camera Control

Only available if connected to the L1255 data transmitter.

Sub menu	Options	Comments
Camera Type	Select camera type	Philips, Sony, Ikegami (other options to be added)
Power	Set power output	Current L1255 CCU can be set between 0.1W to 2.0W
Frequency	Enter required frequency	Set UHF transmitter frequency 450-470MHz
Status	None	Confirms communication status of L1255 CCU unit
Modem (not Implemented yet)	Internal	Uses internal modem and local RF power output
	External	Disables local RF output and allows CC serial data to be transmitted down RS485 path to remotely situated L1255 Modem unit
Baudrate	None	Indicator of input baud rate. If set to 115200, it means that there is no return data being sent back from the camera. When correctly working should display 9600
Lock No		Indicates lock. Power Reset if necessary
CCU Opt		

5.3   Receiver Setup

The main functions that require configuration at the receiver are :-

- Type of down converter and operating frequency
- Demodulation scheme in operation; DVB-T, LMS-T or ASI input
- Frame Lock
- Audio Output

Down Converter Type

The following sequence defines the changes and sequence required when selecting the required down converter and receiver RF frequency :-

Step	Menu	Option	Setting
1	Unit	DConv Type	Select Type
2	Unit	LNB Power	On
3	Demodulator	IPFreq	As Required
4	Demodulator	Guard Inv	Match Transmitter
5	Demodulator	Polarity	Match Transmitter

The demodulator will then automatically detect code rate.
These received demodulation settings can be confirmed by checking the Demodulator menu.

Demodulation Options

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The demodulator in the L2132/4 receiver can operate in three main operating modes and can be disabled :-

1)   DVB-T; demodulator
2)   10MHz COFDM; (LMS-T) demodulator
3)   20 MHZ COFDM (LMS-T) demodulator
4)   None   (this will disable the Display TICK boxes)

Menu	Option	Setting
Unit	DEMOD	NONE, 10MHz, 20MHz, DVB-T

Decoder

The Decoder can be disabled , so that no error is displayed when only operating as a demodulator. It can be operated in HD or SD mode. It can also be switched to decode an ASI stream either from an external source via the rear panel ASI in socket, or be used to decode the ASI stream switched internally from the demodulator.

	Menu	Option	Setting
1	DECODER	INPUT	ASI in, Demodulator
2	DECODER	MODE	OFF, SD,HD

Note the decoder and the demodulator can be operated independently. Typically this can be used in cellular diversity applications, where the demodulated ASI signal is taken via the ASI out connector, to a Link Research Diversity Packet Switch L2014. The Packet diversity corrected output of the L2014 can then be fed back into the ASI in for decoding. Contac t Support for further information.

Frame Lock

The L2132 receiver can lock the decoder output to an external frame lock input. This can either be SD Black & Burst or HD Tri-Level input into the rear panel BNC connector.

| Menu	Option	Setting
Decoder	Framelock	OFF, SD or HD
Decoder	Offset	+/- 5000 pixel offset

Audio Output Format

The L2132 receiver can output either analogue or AES3 digital audio from the rear panel XLR5 connectors.

Menu	Option	Setting
Decoder	A Audio O/P	Analogue or Digital
Decoder	B Audio O/P	Analogue or Digital

5.4   Connectors

All connectors are mounted on the rear panel of the unit.
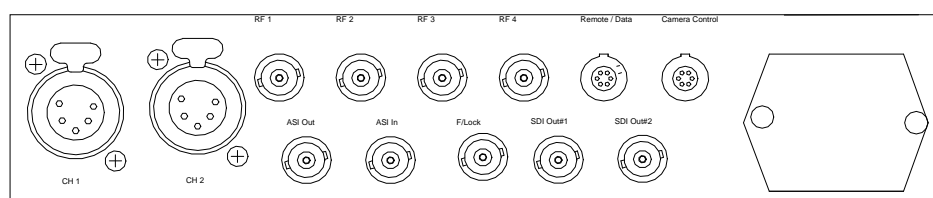
| Connector type	Legend	Description
BNC 75Ω bayonet socket	RF1 RF2 RF3 RF4	RF input, Power Out to the L3020. Max input level -20dB
6 pin Lemo	Remote/Data	RS232 remote control and User data port
BNC 75Ω bayonet socket	SDI Out #1 & #2	HD-SDI Video output (SMPTE 292M)

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BNC 75Ω bayonet socket	F'lock	Delays the output signal by up to 40ms to lock the video frames to an external reference. NB – colour sub carrier is not locked.
BNC 75Ω bayonet socket	ASI Output	ASI output from demodulator
BNC 75Ω bayonet socket	ASI Input	ASI input for decode operation
5-way XLR	Ch1 & Ch2	Each XLR can supply an analogue stereo pair or single digital AES-EBU outputs
6pin LEMO	Camera Control	Interface to L1255 CC Data Transmitter
IEC socket*	Mains 110 –220VAC	Mains power input
4-way XLR panel mounted plug*	DC in	DC power input 9VDC – 32VDC

* Standard configuration is for IEC mains input. The DC input is optional and replaces the IEC socket.

5.5   L2132/4 HD/SD Demodulator/Decoder Description and Specification

Block Diagram for L2134
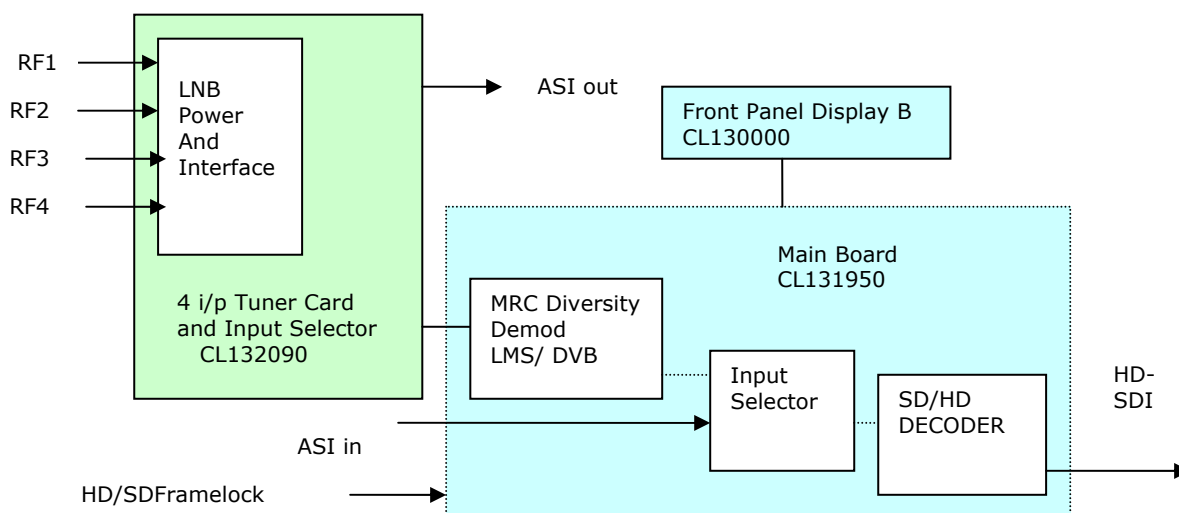
5.6   Input / Output Connections

RF1 RF2 RF3 RF4 inputs

Diversity input, antenna 1-4 to RF 1-4 respectively
UHF input when used with L3020 - 110Mhz to 860MHz.
Receiver sense limit –80dBm
Receiver overload limit –20dBm

+20VDC output to power up converter limited to 400mA per connector
Short circuit protected

75Ω BNC type chassis connector

Frame lock input

SD Mode :-   Composite Black and Burst input for timing reference.
HD Mode:-   Support HD tri-level sync reference input.
Delay increased by 0 – 40ms
75Ω BNC chassis mounted connector

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SDI Video out

SDI #1 and SDI#2. Two independent SDI outputs for HD and SD output.
75Ω BNC chassis mounted socket for HD-SDI (SMPTE 292M) video output.

ASI out

 ASI output from the demodulator for decoding by external Decoder.
75Ω BNC chassis mounted socket.

ASI Input

ASI input to the MPEG2 HD/SD decoder.
75Ω BNC chassis mounted socket.

Data/Remote/Alarm (L2132 Style units)

A 'D' Type sub connector that is used for RS232 data output, firmware download and alarm outputs.
9way 'D' Type Chassis mounted socket

'D' Type Conn	Function
Pin 1	Relay normally closed
Pin 2	Remote TX
Pin 3	Remote RX
Pin 4	Data in (diagnostic mode)
Pin 5	Data /Remote Gnd
Pin 6	Relay normally open
Pin 7	Remote TX enable
Pin 8	Data out
Pin 9	Relay common

Data/Remote (L2134 Style units)

The six pin connector provides the RS232 input / output of both the User Data and also Remote Control of the transmitter unit.

Chassis Socket Connector   :-   LEMO EEF0B306CLV
Mating Cable Plug   :-   LEMO FGG0B306CLAD52Z

LEMO Pin	Function
Pin 1	Tx Data (output)
Pin 2	Rx Data (input)
Pin 3	0v
Pin 4	Tx Control (output)
Pin 5	Rx Control (input)
Pin 6	0v

Audio

Two stereo pairs or 4 mono channels. A1 and A2. Two 5way XLR5 Male Chassis mounted plugs

These connectors are switched to provide either analogue or AES-EBU (digital) audio outputs. These are switched independently via the Decoder/A or B Audio o/p/ menu

48kHz sampling
Clip level 18dB
THD < 0.1%
20Hz to 18kHz ±0.25dB
Crosstalk >60dB minimum
Signal to noise ratio >66dB RMS

XLR5 Conn	Function - Analogue	Function - AES
Pin 1	Audio Gnd	Audio Gnd
Pin 2	Left +	AES +
Pin 3	Left -	AES -
Pin 4	Right +	
Pin 5	Right -	

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Camera Control

The return data from the camera is sent via the 'User data' and passed back to the the Data transmitter.

Connector   -   LEMO 6pin socket EEF.0B.306.CLL

'Lemo' Type	Function – RS232	Function – RS485
Pin 1	Rx Data (input)	RS485
Pin 2	Tx Data (output)	
Pin 3	0v	0v
Pin 4	Rx Remote (input)	RS485
Pin 5	Tx Remote (output)	
Pin 6	0v	0v

Mechanical

Height 44mm, Width 210mm, Depth 375mm - including rear panel connectors
Small form 1U, ½ width 19" rack mount
~1.7kg weight
Ambient 0ºC to +40ºC

Power
AC input option 100VAC to 240VAC 50Hz to 60Hz
DC input option 10VDC to 32VDC (-ve chassis earth)

20Watts excluding the downconverter requirements.
50Watts max allowing for downconverters and cables.

6   L3070/50 DownConverter (Base)

The Link Downconverter allows for the remote placement of the antenna from the receiver. It receives the signal at the transmit frequency and downcoverts to a UHF signal 110-860MHz. This UHF signal can then be fed, either through coax, triax or through a Link UHF Fibre system depending on the distance to the receiver.   Power is fed through the BNC coax from the receiver.
Note – the L3020 has been replaced by the L3070

The L3070/50 with filter is supplied with a +3dBi vertically polarised omni-directional antenna; alternatively 6dBi vertically polarised 180° directional antenna which is available from Link Research Ltd. Antennas should be co-located in pairs for optimised performance, allowing two areas of coverage using the 4 channel Diversity receiver L2134. Greater coverage can be obtained by using Link Research unique cellular diversity approach, contact support for information.

The down converter is supplied with a universal bracket for pole mounting. For temporary installations, tie wraps may be used; for permanent installation U-bolts should be used. Whichever method of mounting is used, it must be capable of supporting the weight of the unit and the coaxial down lead. The two downconverters should be co-located to cover a specific area, typically the are placed about 50cm apart, although this is not critical.
No other connections are required as the unit is powered from the receiver via the RF down lead.

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Changeable Filter block

Downconverter Base L3070/50

Filter Selection

The L3070/50 downcoverter base is supplied with an add-on passband filter rejecting all out-of-band unwanted signals. Alternative narrow band filters are available.

L3014	Downconverter Filter 1.435- 1.525GHz	Use with L3070 base (Hi 1.84GHz)
L3030	Downconverter Filter 1.95-2.7GHz	Use with L3070 base (Lo 1.84GHz)
L3033	Downconverter Filter 2.2-2.3GHz	Use with L3070 base (Lo 1.83GHz)
L3034	Downconverter Filter 2.3-2.4GHz	Use with L3070 base (Lo 1.84GHz)
L3037	Downconverter Filter 2.5-2.7GHz	Use with L3070 base (Lo 1.84GHz)
L3080	Downconverter Filter 6.425-7.125GHz	Use with L3070 base (Hi 7.64GHz)
L3060	Downconverter Filter 3.4-3.58GHz	Use with L3050 base (Lo 3.068GHz)

Changing the filter requires the removal of four screws.

Cable types

Ideally the receive antenna should be mounted directly on the down converter. Where this is not possible, the shortest length of cable should be used to minimise the losses. A low loss heliax such as Andrew type LDF450 should be used. This is a ½" thick cable using foam dielectric and solid copper outer. Other similar low loss thick cable can be used.

For the cable between the down converter and the receiver, a low loss foam dielectric such as Commscope RG59 or RG11 75 Ω cable should be used. In addition to being low loss, these cables have an extra layer of screening making them more robust and less susceptible to interference. The downconverter provides upto 20dbm of gain to compensate for cable loss of the 110-860MHz signal.
Note: It is important the chosen cable meets these parameters.
Typically with good quality cable >20dbm/100M at 1GHz, users can send the signal upto 100M.

For longer distance Link Research also offers a powered analogue fibre system, contact sales.

Controls and Monitoring

There are no operators controls fitted to the L30*0 Down Converter.
An LED on the front of the unit indicates the status.

Colour	Function
Red	Power OK No communications to the filter unit
Amber	Power OK Communications to the filter unit ok
Off	No power present.

6.1   DownConverter Description and Specification

Input / Output Connections

RF Antenna Input

The antenna can be directly mounted to the connector 50Ω chassis mounted N type bulkhead socket.

UHF Output / DC Input

UHF output to receiver and DC input from receiver. Frequency output 160-910MHz when used with the L3030 filter block.
75Ω chassis mounted BNC jack socket.

6.2   Mechanical

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Height 240mm including connectors, width 70mm, depth 55mm including base plate and pole bracket. Weight 0.8kg.
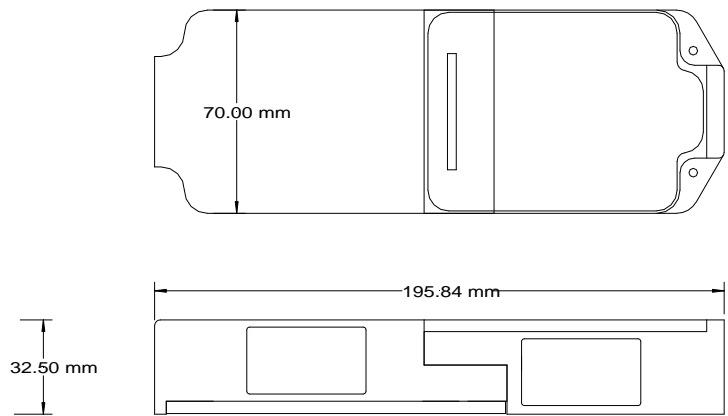
The unit is provided with a mounting plate that can be attached using four M3 fixings or alternatively using the pole mounting bracket provided.
Note: The 7GHz downconverters are larger and with connectors are 270mm.

Power
This is provided from the L2132/4 receiver at a nominal +20V via the UHF downlead and BNC connector.
Supply voltage range 12.5VDC to 22VDC.
Power dissipation 2.6W for 2GHz/3GHz range and 3.6W for 7GHz

Specification

| Parameter	Conditions	2GHz	3.5GHz	7GHz	Comments
Freq Range		1.95-2.7	3.4-3.58	6.425-7.125	
Lo		Lo 1.84	Lo 3.068	Hi 7.64	
Noise		3dB	3dB	3.5dB	
Gain	At Centre	34dB	31dB	38dB	
Phase Noise	Max at 1KHz	-65dBc/Hz	-65dBc/Hz	-65dBc/Hz	
Image Reject	Min	75dBc	50dBc	60dBc	
Output P1dB	Min	15dBm	12dBm	18dBm	
Input IP3	Min	0dBm	-5dBm	-10dBm	

7   L1255 Wireless Camera Control Unit (CCU) Interface

7.1   Controls and Setup

The L1255 has no operator controls as all configuration is from the L2132 Receiver. Check the receiver menu for the commands.
Three LEDs on the front panel indicate the status of the unit.

7.2   Connectors
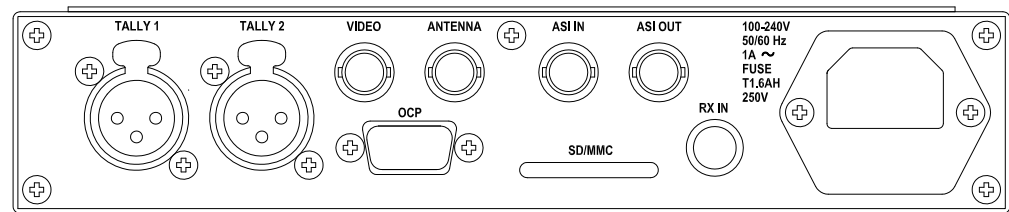
Connector type	Legend	Description
BNC 50Ω bayonet socket	Antenna	RF output to UHF antenna
9-way D-sub socket	OCP	RS232 connection to OCP

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BNC 75Ω bayonet socket	Video	Not Used
BNC 75Ω bayonet socket	Output	Used for Remote UHF Transmitter operation
BNC 75Ω bayonet socket	ASI Input	Not Used
3-way XLR	Tally 1 & Tally 2	Sony Red/Green Tally input
6pin LEMO	Rx In	Interface to L2132 Receiver
IEC socket*	Mains 110 –220VAC	Mains power input

7.3 Unit Description

7.3.1 Input / Output Connections

Tally 1 (Red)/ Tally 2 (Green)

Two independent Tally inputs
This is for Sony Tally support.
Connector - 3pin XLR Socket
Note;_+ Tally support for the Thomson Camera system requires a Tally Interface Box.

Pin	Function
Pin 1	
Pin 2	Closure Dry Contact
Pin 3	Closure Dry Contact

Remote Data

The five pin connector provides the RS422 comms for remote UHF transmitter operation.
(not implemented yet 07/07)

Chassis Socket Connector   :-   LEMO EEF0B305CLV
Mating Cable Plug   :-   LEMO FGG0B305CLAD52Z

LEMO Pin	Function
Pin 1	Left Line+
Pin 2	Left Line -
Pin 3	0v
Pin 4	Right Line +
Pin 5	Right Line -

Receiver Interface – RS232 / RS485

The return data from the camera is sent as user data in the ASI stream back to the OCP via the Data transmitter.
The device is remotely driven by the L2132/4 receiver through the remote port.

Connector   -   LEMO 6pin socketEEF.0B.306.CLL

'Lemo' Type	Function – RS232	Function – RS232
Pin 1	Tx Data (output)	
Pin 2	Rx Data (input)	Camera Ret data
Pin 3	0v	0v
Pin 4	Tx Remote (output)	RS232
Pin 5	Rx Remote (Input)	
Pin 6	0v	0v

OCP Interface – RS232

A 9 way 'D' Type socket provides the RS422 interfaces to the OCP.

'D' Type	Function
Pin 1	
Pin 2	Tx
Pin 3	Rx

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Pin 4	DSR
Pin 5	0V
Pin 6	DTR
Pin 7	CTS
Pin 8	RTS
Pin 9	Power

Antenna

50Ω BNC connector for connection to the UHF antenna.

Camera Control Data

Serial data interface to the camera head using appropriate lead. The function of the pins is automatically configured depending on the selected camera type.

Chassis Socket Connector   :-   LEMO EEG0B305CLV
Mating Cable Plug   :-   LEMO FGG0B305CLAD52Z

Lead Part Number	Camera Type
L0016	Philips LDK Series
L0017	Sony BVP Series
L0024	Ikegami

7.3.2   Mechanical

Height 44mm, Width 210mm, Depth 320mm - including rear panel connectors
Small form 1U, ½ width 19" rack mount

~1.7kg weight

Ambient 0ºC to +40ºC

7.3.3   Power

AC input option 100VAC to 240VAC 50Hz to 60Hz

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8 Maintenance & Firmware Upgrades

8.1 L1500 RF / Up Converter and Camera Control Module Removal

WARNING
Before removal of the L1500 modules ensure that the battery or external DC power supply is removed from the L1500.
**Also please take precautions to avoid static damage to both the removed modules and the main L1500 unit. Avoid contact with the module connectors and store in anti static packaging.**

Remove three M2 bolts

Remove two M3 bolts

Withdraw modules away from front panel
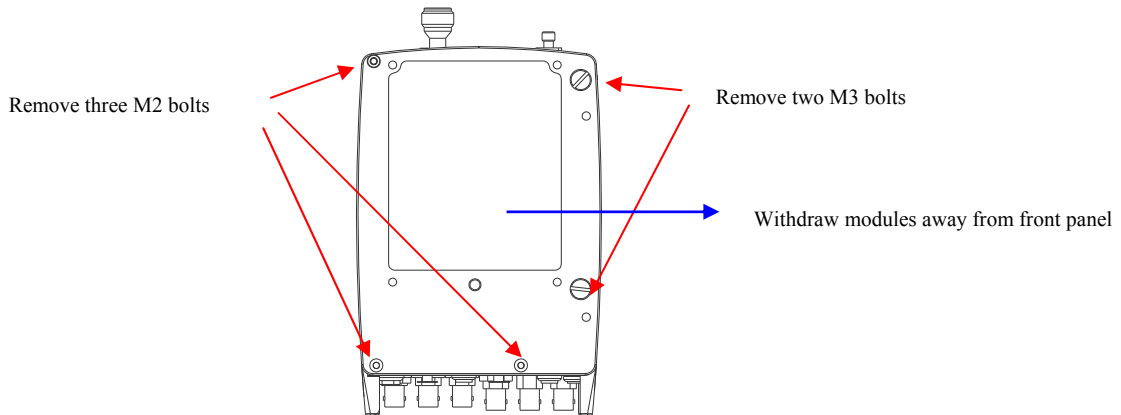
Removing the five fixing bolts from the battery side of the L1500 allows the plate to be removed from the main assembly. Care should be taken as the battery connector loom will need to be disconnected from the main interface board to allow complete removal of the battery plate.
The RF and Camera control module can then be withdrawn (as a pair) from the main unit by pulling away from the front panel. The RF module and Camera Control module can then be separated.

Before replacing the modules into the main housing ensure that they are both mated together and the dowel on the Camera Control module is inserted into the RF module. The pair can then be replaced into the main housing.
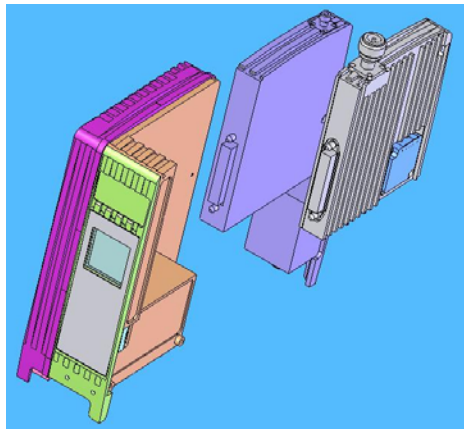
8.2 L1500 Firmware Upgrades

Link Research equipment is designed to allow for firmware upgrades providing new features and continual improvements during the life of the product.
Please consult the Link Research website for details of the latest firmware releases.
http://www.linkres.co.uk/support.php.

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The L1500 unit, including any modules; can be upgraded via the USB port. The required file can be downloaded from the Link Research website and copied onto a suitable USB memory stick after first deleting any previous builds from the memory stick.
First remove the power from the L1500 unit; either battery or external Lemo connector. Insert the USB memory stick and apply power to the unit. The upgrade process will then start automatically, the display will indicate the status of the upgrade process. When completed, remove the USB stick and cycle the power to the unit.

8.3   Link ½ 19" Rack Based Products

On rack based products, the firmware is upgraded through the RS232 Data port on the back of the unit.

For units which have a standard 9 way RS232 Connector on the rear panel, the RS232 Data Cable L0010 must be used in line, to give access to the Data port.
For units which use a Circular Lemo connector on the rear panel, the standard Link Data/Remote cable L0002 must be used and the cable connected to the Data Port

The firmware is loaded into the transmitter using a terminal emulation program connected to the data port. Teraterm is the recommended emulation program. It may be obtained free of charge via the Internet at:
http://hp.vector.co.jp/authors/VA002416/teraterm.html
The selected serial port in the terminal emulation program should be set to operate in serial mode at 115200 baud with no parity, 8-bit data and 1 stop bit, with XON/XOFF flow control.

Once the unit has been connected, press the Left < and Right> menu keys and simultaneously apply power to the unit. The terminal emulation program will display the current firmware version and a prompt message. In the Teraterm Program send the uncompressed .m0 data file directly without using any transfer protocol (Menu item File/Send File in Teraterm).
Do not interrupt operation once the programming stage has begun. When programming is complete, this will be verify and a completed message will be displayed on the terminal emulator. Power down the unit. Repower the unit, verify that the software version has correctly loaded, and immediately Restore Factory Default on the unit to ensure that new data is initialised correctly. (Menu Item Memory/Default Restore on the unit..

The unit can now be set up and used.
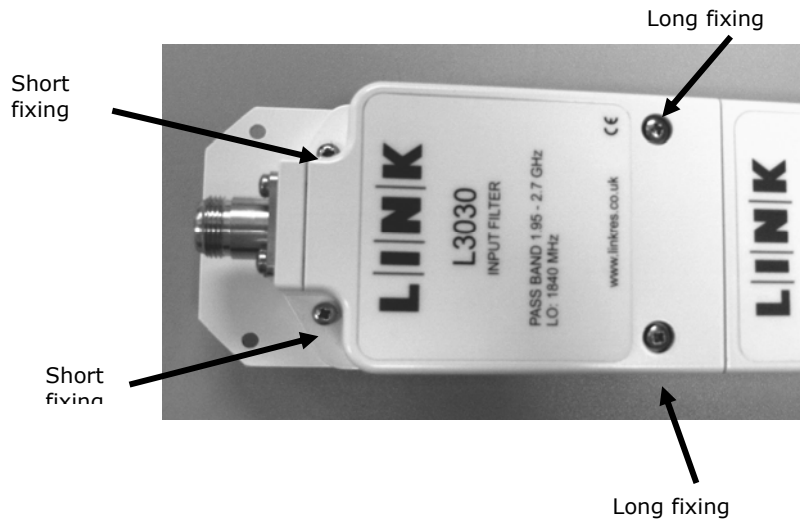
NOTE: for LINK HD users

On LINKHD receivers L2132/L2134 some additional checks and software upgrades must be done.
   1) If the previous version of code is less than ver 2.0. A software loader pack must be upgrade first. Download the Pre Ver2.0 boot loader and load this firmware as above. These units are Hardware version 4000, please note this fact and make sure you load the -4000 download code.
   2) If you are upgrading after ver 2.0, first check the hardware version menu item UNIT/HWARE. This will be 4000, 6000, etc. Download the correct code for upgrading

8.4   L30*0 Down Converter Filter Change

The optional filter unit can be changed very easily. It is only necessary to remove the four screws indicated in the figure below and then lift the filter unit straight up and off the down converter base. The four screws have captive washers on them to prevent them from being lost.

L3030   1.95GHz to 2.7GHz (supplied as standard)
L3033   2.2GHz to 2.3GHz
L3034   2.3GHz to 2.4GHz
L3037   2.5GHz to 2.7GHz

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Long fixing

Short fixing
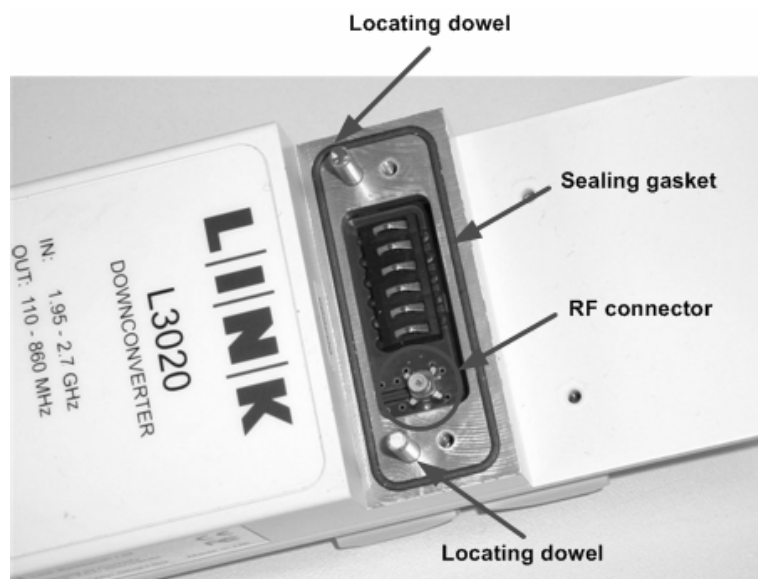
Short fixing

Long fixing

When replacing the filter unit, take care not to damage the mating coaxial connector: ensure it is fully upright before closing. Also take care not to damage the weather proof seal on the down converter unit.

Lift straight up
Do not twist

Down convertor unit
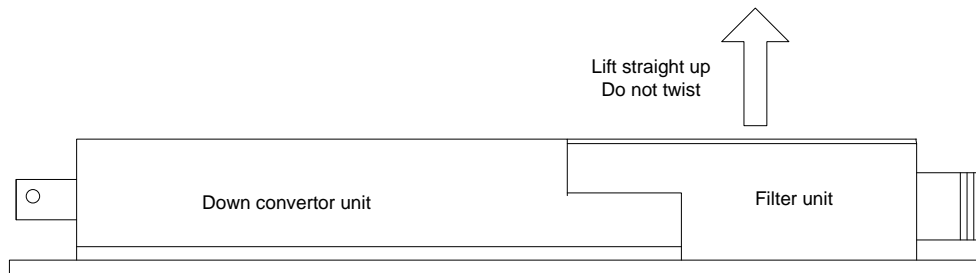
Filter unit

Lift the filter unit straight up from the down converter body.

View of a typical Downconverter unit with the filter block removed.

Locating dowel

Sealing gasket

RF connector

Locating dowel

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9 Part Numbers for Link Research Accessories

Link Part Number	Description	Details
L9965	IDX/Sony Battery Interface	
L9966	PAG Battery Interface	
L9967	Anton Bauer Battery Interface	
L9962	IDX /Sony Camera Interface	
L9963	PAG Camera Interface	
L9964	Anton Bauer Camera Interface	
L9938	IDX/Sony LDK6000 Bracket	
L9939	PAG LDK6000 Bracket	
L9940	Anton Bauer LDK6000 Bracket	
L0001	Lemo to XLR for line audio	I/P audio cable for Transmitter And CCU unit
L0002H	Lemo to RS232 Remote/Data	Cable for remote and data/prog
L0003	Lemo power cable for user	
L0014	10m BNC to BNC D/C cable	
L3421	Antenna TX Omni Spring 3 dBi 1.95-2.7GHZ	
L3423	Antenna TX Omni Spring 3 dBi 1.95-2.7GHZ	Extra Long version
L3430	Antenna TX Omni Spring 3 dBi 6.0-7.5GHZ	
L3435	Antenna TX Omni Spring 3 dBi 3.4-3.7GHZ	
		Contact Support for further antenna options
L3520	Antenna Omni Short 3dBi 1.95-2.7GHz	
L3530	Antenna Omni Short 3dBi 3.4- 3.7GHz	
L3535	Antenna Omni Short 3dBi 6.0-7.5GHz	
L1510-1927	L1500 RF Module / UpConverter	1.95 – 2.7 GHz
L1510-3236	L1500 RF Module / UpConverter	3.2 – 3.6 GHz
L1510-5859	L1500 RF Module / UpConverter	5.8-5.9 GHz
L1510-6471	L1500 RF Module / UpConverter	6.4 – 7.1GHz

Contact Link Support for more information

End of Document

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