TANDBERG
Television

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Issue 1

INSTRUCTION MANUAL

Voyager Lite System

DRAFT

Software Version 2.0 (and later)

ENGLISH UK

Remember to turn the "Fit to Page" option off when printing from the Acrobat files otherwise the active page area will be undersize.

ENGLISH (UK)

READ THIS FIRST!

If you do not understand the contents of this manual
DO NOT OPERATE THIS EQUIPMENT**.**

Also, translation into any EC official language of this manual can be made available, at your cost.

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Se non si capisce il contenuto del presente manuale
NON UTILIZZARE L'APPARECCHIATURA**.**

È anche disponibile la versione italiana di questo manuale, ma il costo è a carico dell'utente.

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Om Ni inte förstår informationen i denna handbok
ARBETA DÅ INTE MED DENNA UTRUSTNING**.**

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Podemos asimismo suministrarle una traducción de este manual al (idioma) previo pago de una cantidad adicional que deberá abonar usted mismo.

Issue 1 first published in 2002 by:

TANDBERG Television Ltd
REGISTERED ADDRESS:
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COMINES WAY,
HEDGE END, SOUTHAMPTON,
HAMPSHIRE, SO30 4DA

Registered Company Number 03695535

List of Contents

About this Manual

This manual provides instructions and information for the operation of the Voyager Lite Digital ENG System.

This manual should be kept in a safe place for reference for the life of the equipment. It is not intended that this manual will be amended by the issue of individual pages. Any revision will be by a complete reissue. Further copies of this manual can be ordered from the addresses shown on *page ix*. If passing the equipment to a third party, also pass the relevant documentation.

Issues of this manual are listed below:

Issue	Date	Software Version	Comments
1	May 2002	2.0 (S12424)	Initial release. Linear + Musicam Audio. (B Model)

Warnings, Cautions and Notes

Heed Warnings

All warnings on the product and in the operating instructions should be adhered to. The manufacturer can not be held responsible for injuries or damage where warnings and cautions have been ignored or taken lightly.

Read Instructions

All the safety and operating instructions should be read before this product is operated.

Follow Instructions

All operating and use instructions should be followed.

Retain Instructions

The safety and operating instructions should be retained for future reference.

WARNINGS...

WARNINGS GIVE INFORMATION WHICH, IF STRICTLY OBSERVED, WILL PREVENT PERSONAL INJURY OR DEATH, OR DAMAGE TO PERSONAL PROPERTY OR THE ENVIRONMENT. THEY ARE BOXED AND SHADED FOR EMPHASIS, AS IN THIS EXAMPLE, AND ARE PLACED IMMEDIATELY PRECEDING THE POINT AT WHICH THE READER REQUIRES THEM.

CAUTIONS...

Cautions give information which, if strictly followed, will prevent damage to equipment or other goods. They are boxed for emphasis, as in this example, and are placed immediately preceding the point at which the reader requires them.

NOTES...

Notes provide supplementary information. They are highlighted for emphasis, as in this example, and are placed immediately after the relevant text.

Acknowledgements

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Where to Find Us

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	+ 852 2899 7000 (Hong Kong) fieldservice-asia@tandbergtv.com
Australia/NZ:	+ 61 2 9356 8599 fieldservice-australia@tandbergtv.com
Germany:	+49 6124 72390 (TANDBERG AVS)
Poland:	+48 58 3000 940
Internet Address:	http://www.tandbergtv.com

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TANDBERG Television provides a wide range of training courses on the operation and maintenance of our products and on their supporting technologies. TANDBERG can provide both regularly scheduled courses and training tailored to individual needs. Courses can be run either at your premises or at one of our dedicated training facilities.

Where to Find Us

For further information on TANDBERG Television's training programme please contact us:

International Telephone:	+44 23 8048 4229
International Facsimile	+44 23 8048 4467
E-mail Address:	training@tandbergtv.com
Internet Address	http://www.tandbergtv.com

Return of Equipment

If you need to return equipment for repair, please contact the TANDBERG Television AVS, Germany on +49 6124 72390 in the first instance. A Returns Authorisation Number (RAN) will be issued and full details of the unit will be logged. Please ensure the RAN number is clearly marked on the packaging of the unit. The unit should then be sent to the following address:

TANDBERG Television AVS

Schwalbacher Straße 12
D-65321 Heidenrod / Kemel
Germany

Customer Services and Technical Training Postal Address

TANDBERG Television
Unit 2
Strategic Park
Comines Way
Hedge End
Southampton
Hampshire
SO30 4DA
United Kingdom

Technical Publications

If you need to contact TANDBERG Television Technical Publications regarding this publication, e-mail: techpubs@tandbergtv.com.

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Chapter 1

Introduction

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Scope of This Manual

Who Should Use This Manual

This manual is written for operators/users of the Voyager Lite Digital Electronic News Gathering (ENG) System.

This chapter is written to assist in the installation, operation and day-to-day care of the unit.

WARNING...

DO NOT REMOVE THE COVERS OF THIS EQUIPMENT. HAZARDOUS VOLTAGES ARE PRESENT WITHIN THIS EQUIPMENT AND MAY BE EXPOSED IF THE COVERS ARE REMOVED. ONLY TANDBERG TELEVISION TRAINED AND APPROVED SERVICE ENGINEERS ARE PERMITTED TO SERVICE THIS EQUIPMENT.

CAUTION...

Unauthorised maintenance or the use of non-approved replacements may affect the equipment specification and invalidate any warranties.

This manual does not include any maintenance information or procedures that would require the removal of covers.

Software Versions

This manual has been written to cover software version **2.0** and later for the Host Processor of the Motherboard **S12424**.

This manual continues to be relevant to subsequent software issues where the function of the equipment has not changed. Where a new issue of software changes the functionality, a new issue of this manual is provided.

Brief Description

> NOTE...
>
> The illustrations of the Voyager Lite and the Backpack contained within this instruction manual are of a typical unit. The location of certain controls and the outward appearance may vary slightly. Functionality of the unit will remain unchanged, however.

Figure 1.1: Voyager Lite – Typical Backpack/Portable Arrangement

The TANDBERG Voyager Lite System is designed for use as a portable transmitter for a wireless camera, particularly suitable for the news and sports broadcaster and security services. The system comprises the following components:

- Small low-powered Transmitter Unit with battery attachment including an Encoder, integrated DVB-T OFDM Modulator and Up-converter providing RF output from 2.1 – 2.5 GHz.
- Purpose built Backpack with integrated diversity antennas. The antennas are located within the webbing straps of the Backpack.

Figure 1.2: Voyager Lite (Minus Battery) – Disconnected from Backpack

The Voyager Lite provides:

- Audio and video interfaces
- Audio processing
- MPEG-2 video compression
- DVB-T compliant COFDM modulation
- RF radio output from 2.1 – 2.5 GHz, via an RF Up-converter and radio amplifier.

All these features are contained within a single, dc battery powered, robust, portable housing.

The fourth generation Encoder is a field-proven product that contains the required signal processing capability to digitally encode programme material using MPEG-2 compression techniques.

The integrated DVB-T compliant, COFDM Modulator, Up-converter (2.1 – 2.5 GHz) and Power Amplifier (up to 200 mW) enable transmission to the terrestrial network.

The various Marketing Codes used to identify the unit are shown in
Table 1.1.

Table 1.1: Equipment Model Numbering

Model Name	Marketing Codes	Description
Voyager Lite System	M2/VLSYS/B8M	Voyager Lite complete Transmit and Receive System with M2/PTRE/948CVL.
Receiver	M2/PTRE/948CVL	Alteia Plus PTRE948C for Voyager Lite
Down-converter	M2/VLRX/DWNCNVIF	IF Down-converter for Voyager Lite
Combined Battery and Charger package	M2/VLTX/IDXBAT02	Voyager Lite Battery Pack and Charger Options (combined)
Microphone Adaptor for Sennheiser, EK3041 RF Wireless Microphone/Receiver	M2/VLTX/WMRA	Wireless Microphone Receiver Adaptor
DENG Portable Receiver	M2/CPTRX/8M	Compact Receiver for Voyager Lite
2404 Omnidirectional Antenna	M2/VLA/2404OM	VLA2404 LP Omnidirectional Antenna
2404 Omnidirectional Antenna with SMA	M2/VLA/2404OMC	VLA2404 LP Omnidirectional Antenna with SMA Connector
2405 Omnidirectional Antenna	M2/VLA/2405OM	VLA2405 LP Omnidirectional Antenna
2408 Omnidirectional Antenna	M2/VLA/2408OM	VLA2408 LP Omnidirectional Antenna
2409 Directional Antenna	M2/VLA/2409DIR	VLA2409 CP-R Directional Antenna
2417 Directional Antenna	M2/VLA/2417DIR	VLA2417 CP-R Directional Antenna
2417 Sectional Antenna	M2/VLA/2417S	VLA2417 LP Sectional Antenna
2418 Directional Antenna	M2/VLA/2418DIR	VLA2418 CP-R Directional Antenna
2417 CP-R Antenna Bracket	M2/VLMB/2417	Mounting Bracket for VLA2417 CP-R Directional Antenna
2417 LP Antenna Bracket	M2/VLMB/2417LP	Mounting Bracket for VLA2417 LP Sectional Antenna
2418 CP-R Antenna Bracket	M2/VLMB/2418	Mounting Bracket for VLA2418 CP-R Directional Antenna
Tripod Bracket	M2/VLLB/MDT	L-Bracket for use with Medium Duty Tripod
Low Noise Amplifier	M2/VLRX/LNA2420F	Low Noise Amplifier 2.3 - 2.5 GHz

NOTE..

It is also possible to use an external RF Amplifier and Transmit Antenna but these are not offered as part of a standard system option.

Role of the Voyager Lite

Typical System

Description

The Voyager Lite is a portable unit, specifically designed for mobile contribution applications. It is compact, fully MPEG-2 and DVB-T compliant and has high performance for the transmission of studio-quality programme material. The equipment is designed to be suitable for full portable and mobile use on Outside Broadcast productions.

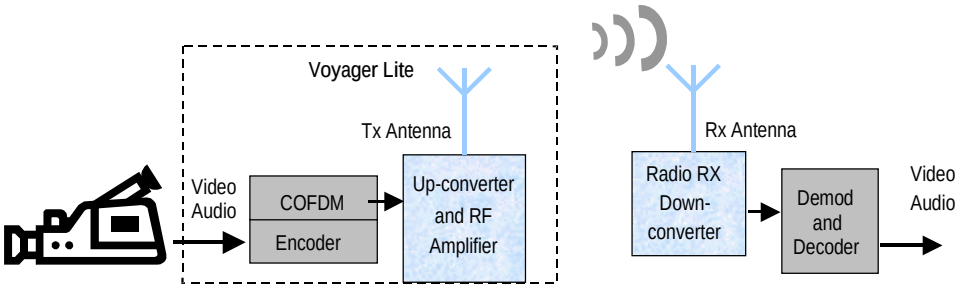


Figure 1.3: Typical System Configuration

Local control of the Encoder is implemented through ten user-defined configurations (0 through 9) selectable from a switch on the front panel.

Remote control is available via an RS-232 interface.

The RF output frequency of the unit can be set within the range 2.1 to 2.5 GHz. The power output level can also be adjusted up to 200 mW. However, both RF output frequency and output level may be fixed and/or password protected dependent upon application specific regulatory requirements.

> CAUTION...
>
> Certain broadcast applications and operational jurisdictions may restrict the output frequency and power levels that are allowed. In this instance the manufacturer usually sets these parameters.

Encoder Features

High quality video encoding is ensured by the inclusion of many proprietary algorithms as well as standard MPEG compression techniques. The Encoder uses hierarchical motion estimation.

Video input to the unit is in either analogue composite video (PAL B/D/G/H/I/M/N/N(Jamaica) or NTSC-M) or serial digital (SDI).

The audio function supports multiple sampling frequencies, bit-rates and coding modes. Audio can be input as balanced analogue via the left and right XLR connectors, digital (AES/EBU) via the left XLR connector or as SDI embedded audio.

The encoded video and audio is multiplexed within the Encoder. The resulting multiplexed transport stream in DVB format is fed directly to the internal COFDM Modulator. Once COFDM coding has taken place, the signal is fed to the internal IF Modulator (70 MHz IF Output) for conversion to 2.1 - 2.5 GHz RF output, ready for onward transmission using internal Up-converter and RF amplifier.

COFDM Explanation

DVB-T compliant, Coded Orthogonal Frequency Division Multiplexing (COFDM) is used to spread the transport stream data over 1705 carriers (2k mode). This means that relatively low data rates can be used on each carrier frequency, and any multipath effects (ghosting) which occur affects only a small amount of data.

The carriers are closely spaced so that their sidebands overlap, but due to the orthogonal relationship between carrier frequencies they do not interfere with each other. This makes the system spectrally efficient.

Noise, multipath effects, co-channel interference and other impairments can cause some bits to be received in error. Therefore, Forward Error Correction (FEC) consisting of Reed-Solomon (RS) coding followed by convolutional coding is used to add extra bits to the transmitted signal. This allows a large number of errors at the receive end to be corrected by convolutional (Viterbi) decoding followed by RS decoding.

Five convolutional code rates are available: 1/2, 2/3, 3/4, 5/6 and 7/8. These provide different compromises between bit-rate and ruggedness.

The modulation scheme used in the Modulator on each of its multiple data carriers is either Quadrature Amplitude Modulation (16QAM) or Quadrature Phase Shift Keying (QPSK). QAM is a mixture of amplitude and phase modulation. QPSK uses phase modulation at constant amplitude. Both schemes are supported, to allow the system to provide different compromises between bit-rate and ruggedness.

Four guard intervals are available: 1/32, 1/16, 1/8, and 1/4. These are used to reduce the effects of intersymbol interference at the receive end caused by multipath propagation. A guard interval of 1/4 offers a robust transmission with the highest level of protection.

> NOTE...
>
> The guard interval on the Voyager Lite must be set to the same value as the Receiver.

COFDM Modes and their Effect on Bit-rate

> NOTE...
>
> At time of publication the Alteia Receiver for use with Voyager Lite (M2/PTRE/948CVL) is currently only designed for use at 8 MHz channel spacing within the system. The tables for 7 MHz and 6 MHz operation are, therefore, provided for information only, should an alternative Receiver be used.

Typical bit-rate outputs for 8 MHz, 7 MHz and 6 MHz channel spacing are given in *Table 1.2, Table 1.3* and *Table 1.4* respectively. These illustrate how output bit-rate is affected by modulation scheme, FEC (convolutional code) rate and guard interval.

Table 1.2: 8 MHz Channel Spacing

			Guard interval			
			¼	1/8	1/16	1/32
Input	Mod	FEC	Bit-rate	Bit-rate	Bit-rate	Bit-rate
188-byte	QPSK	1/2	4.976471	5.529412	5.854671	6.032086
188-byte	QPSK	2/3	6.635294	7.372549	7.806228	8.042781
188-byte	QPSK	3/4	7.464706	8.294118	8.782007	9.048128
188-byte	QPSK	5/6	8.294118	9.215686	9.757785	10.053476
188-byte	QPSK	7/8	8.708824	9.676471	10.245675	10.556150
188-byte	16QAM	1/2	9.952941	11.058824	11.709343	12.064171
188-byte	16QAM	2/3	13.270588	14.745098	15.612457	16.085561
188-byte	16QAM	3/4	14.929412	16.588235	17.564014	18.096257
188-byte	16QAM	5/6	16.588235	18.431373	19.515571	20.106952
188-byte	16QAM	7/8	17.417647	19.352941	20.491349	21.112299
			Bit-rate	Bit-rate	Bit-rate	Bit-rate
204-byte	QPSK	1/2	5.400000	6.000000	6.352941	6.545455
204-byte	QPSK	2/3	7.200000	8.000000	8.470588	8.727273
204-byte	QPSK	3/4	8.100000	9.000000	9.529412	9.818182
204-byte	QPSK	5/6	9.000000	10.000000	10.588235	10.909091
204-byte	QPSK	7/8	9.450000	10.500000	11.117647	11.454545
204-byte	16QAM	1/2	10.800000	12.000000	12.705882	13.090909
204-byte	16QAM	2/3	14.400000	16.000000	16.941176	17.454545
204-byte	16QAM	3/4	16.200000	18.000000	19.058824	19.636364
204-byte	16QAM	5/6	18.000000	20.000000	21.176471	21.818182
204-byte	16QAM	7/8	18.900000	21.000000	22.235294	22.909091

Table 1.3: 7 MHz Channel Spacing (For Information Only)

			Guard interval			
			1/4	1/8	1/16	1/32
Input	Mod	FEC	Bit-rate	Bit-rate	Bit-rate	Bit-rate
188-byte	QPSK	1/2	4.354412	4.838235	5.122837	5.278075
188-byte	QPSK	2/3	5.805882	6.450980	6.830450	7.037433
188-byte	QPSK	3/4	6.531618	7.257353	7.684256	7.917112
188-byte	QPSK	5/6	7.257353	8.063725	8.538062	8.796791
188-byte	QPSK	7/8	7.620221	8.466912	8.964965	9.236631
188-byte	16QAM	1/2	8.708824	9.676471	10.245675	10.556150
188-byte	16QAM	2/3	11.611765	12.901961	13.660900	14.074866
188-byte	16QAM	3/4	13.063235	14.514706	15.368512	15.834225
188-byte	16QAM	5/6	14.514706	16.127451	17.076125	17.593583
188-byte	16QAM	7/8	15.240441	16.933824	17.929931	18.473262
			Bit-rate	Bit-rate	Bit-rate	Bit-rate
204-byte	QPSK	1/2	4.725000	5.250000	5.558824	5.727273
204-byte	QPSK	2/3	6.300000	7.000000	7.411765	7.636364
204-byte	QPSK	3/4	7.087500	7.875000	8.338235	8.590909
204-byte	QPSK	5/6	7.875000	8.750000	9.264706	9.545455
204-byte	QPSK	7/8	8.268750	9.187500	9.727941	10.022727
204-byte	16QAM	1/2	9.450000	10.500000	11.117647	11.454545
204-byte	16QAM	2/3	12.600000	14.000000	14.823529	15.272727
204-byte	16QAM	3/4	14.175000	15.750000	16.676471	17.181818
204-byte	16QAM	5/6	15.750000	17.500000	18.529412	19.090909
204-byte	16QAM	7/8	16.537500	18.375000	19.455882	20.045455

Table 1.4: 6 MHz Channel Spacing (For Information Only)

			Guard interval			
			1/4	1/8	1/16	1/32
Input	Mod	FEC	Bit-rate	Bit-rate	Bit-rate	Bit-rate
188-byte	QPSK	1/2	3.732353	4.147059	4.391003	4.524064
188-byte	QPSK	2/3	4.976471	5.529412	5.854671	6.032086
188-byte	QPSK	3/4	5.598529	6.220588	6.586505	6.786096
188-byte	QPSK	5/6	6.220588	6.911765	7.318339	7.540107
188-byte	QPSK	7/8	6.531618	7.257353	7.684256	7.917112
188-byte	16QAM	1/2	7.464706	8.294118	8.782007	9.048128
188-byte	16QAM	2/3	9.952941	11.058824	11.709343	12.064171
188-byte	16QAM	3/4	11.197059	12.441176	13.173010	13.572193
188-byte	16QAM	5/6	12.441176	13.823529	14.636678	15.080214
188-byte	16QAM	7/8	13.063235	14.514706	15.368512	15.834225
			Bit-rate	Bit-rate	Bit-rate	Bit-rate
204-byte	QPSK	1/2	4.050000	4.500000	4.764706	4.909091
204-byte	QPSK	2/3	5.400000	6.000000	6.352941	6.545455
204-byte	QPSK	3/4	6.075000	6.750000	7.147059	7.363636
204-byte	QPSK	5/6	6.750000	7.500000	7.941176	8.181818
204-byte	QPSK	7/8	7.087500	7.875000	8.338235	8.590909
204-byte	16QAM	1/2	8.100000	9.000000	9.529412	9.818182
204-byte	16QAM	2/3	10.800000	12.000000	12.705882	13.090909
204-byte	16QAM	3/4	12.150000	13.500000	14.294118	14.727273
204-byte	16QAM	5/6	13.500000	15.000000	15.882353	16.363636
204-byte	16QAM	7/8	14.175000	15.750000	16.676471	17.181818

Summary of Features

Video Encoding

MPEG-2 Encoding

The Encoder processes a broadcast-standard video signal into a compressed encoded bit-stream in accordance with:

- The MPEG-2 Main profile @ Main level (MP@ML) specification (ISO/IEC 13818) and
- The MPEG-2 4:2:2 profile @ Main Level (422P@ML) specification (ISO/IEC 13818)

Video Encoding Modes

Two video-encoding modes are available; they are 4:2:0 and 4:2:2, either of which can be selected. The coding mode selected affects the compression techniques, Encoder delay and rate control.

Table 1.5 and *Table 1.6* contain more information on modes and compression uses.

Table 1.5: 4:2:2 Mode

Compression Mode	Description	Use
Standard	Normal delay. No special techniques or fixed settings used to reduce encoding delay.	
Low Delay	Delay lowered by reducing the video rate buffer. Can compromise video quality in some circumstances.	
Ultra Low Delay	Various special techniques used to reduce the delay mode. May not work with all Decoders, especially older models or third-party Decoders.	Mixture of fixed and wireless cameras used. Two-way transmission (e.g. an interview).

Table 1.6: 4:2:0 Mode

Compression Mode	Description	Use
Standard	Normal delay. No special techniques or fixed settings used to reduce encoding delay.	
Low Delay	Various special techniques used to reduce the delay mode. May not work with all Decoders, especially older models or third-party Decoders. GOP structure: B-frames cannot be used in this mode.	Mixture of fixed and wireless cameras used. Two-way transmission (e.g. an interview).
Ultra Low Delay	The same techniques used as in Low Delay Mode, but with the delay further reduced at lower bit-rates.	As for Low Delay.

Video Inputs

The video input connections are:

- SDI
- VBS Composite

The supported video input types are:

- Serial digital
  (ITU-R BT.656-4) input (D1 serial format) – ANSI/SMPTE 259M
- 625-line composite PAL-B, -D, -G, -H, -I, -N, -N (Jamaica)
  (ITU-R BT. 624-4)
- 525-line composite NTSC-M (with and without pedestal) or PAL-M (ITU-R BT. 624-4)
- Internal test pattern function
- Monochrome

Video Encoding Functions

The standard video encoding functions include:

- Support for all MP@ML and 422P@ML standard coding modes
- Selectable bit-rate operation, 1.5 Mbit/s - 21 Mbit/s (depending upon Encoder mode and modulation used, see *Table 1.7*)
- Support for the standard set of video picture resolutions (720, 704, 640, 544, 480 and 352) in both 625 and 525 line operation

- Hierarchical motion estimation
- Support for a variety of Group of Pictures (GOP) structures with a variable number of B frames
- The ability to generate internal video test patterns

Video Variable Bit-rate

The MPEG-2 compression algorithm uses adaptive field/frame coding, forward and backward predictive processing with motion estimation and compensation to reduce the bit-rate to the range shown in *Table 1.7*.

Table 1.7: Video Bit-rate Range

Video Encoding Mode	
4:2:0	4:2:2
1.5 Mbit/s - 15 Mbit/s	1.5 Mbit/s – 21 Mbit/s

Coding Resolutions

To provide optimum picture quality over the full range of supported bit-rates; the encoded picture resolution can be varied according to the video bit-rate. Typical settings are shown in *Table 1.8*.

Table 1.8: Video Coding Resolutions and Typical Bit-rates

625 Line Modes	525 Line Modes	Typical Bit-rate 4:2:0 (Mbit/s)	Typical Bit-rate 4:2:2 (Mbit/s)
720 pixels x 576 lines	720 pixels x 480 lines	6.0 – 15.0	6.0 – 21.0
704 pixels x 576 lines	704 pixels x 480 lines	6.0 – 15.0	6.0 – 21.0
640 pixels x 576 lines	640 pixels x 680 lines	5.0 – 15.0	5.0 – 21.0
544 pixels x 576 lines	544 pixels x 480 lines	4.0 – 15.0	4.0 – 21.0
480 pixels x 576 lines	480 pixels x 480 lines	2.5 – 15.0	2.5 – 21.0
352 pixels x 576 lines	352 pixels x 480 lines	1.5 – 15.0	1.5 – 21.0

System configuration can be stored in Flash, for restoration of configured state at power-on.

Output on Video Loss

If video input is lost, the Encoder can be software-configured to show either a test pattern (colour bars and red) or black. There is also an option to switch the caption showing the **service name** ON or OFF.

Audio Encoding

General

Audio can be encoded to any of the following:

- MPEG-1 Audio Layer 2 (Musicam) standard (sampling rate 32 kHz or 48 kHz) or
- Dolby Digital (sampling rate of 32 kHz or 48 kHz). Output bit-rate is selectable in the range 64 kbit/s to 384 kbit/s (dependent on configuration) for MPEG-1 Audio (layer 2) and 96 kbit/s to 640 kbit/s (dependent upon configuration) for Dolby Digital.
- Pre-compressed (or pre-encoded – IEC 61937) audio in pass-through mode is also available. This is where an audio stream has already been encoded externally, prior to entering the Encoder and is passed through to the output. This type of audio is supported in Dolby Digital and can be embedded with the incoming SDI video information.
- Linear PCM (SMPTE 302M).
- Dolby E Pass Through.

Audio Inputs

The standard audio input is:

- **AUDIO IN** – Two female XLR connectors – selectable via the **Audio Menu** (see *Chapter 2, Set-up, Configuration and Operation*) - balanced analogue or digital AES/EBU, with AES/EBU on the left connector only.
- Alternatively, audio can be input embedded as AES/EBU on the serial digital input (**SDI**). In this mode, two of four stereo pairs can be extracted. Audio may be converted to either of the standard output frequencies, 32 kHz or 48 kHz, by use of the built-in asynchronous sample rate converters.

Audio Channels

The Encoder supports two channels of audio, which may be configured as one of the following:

- Two analogue mono channels, 600 Ω or 20 kΩ
- One analogue stereo pair, 600 Ω or 20 kΩ
- One digital channel, AES/EBU or embedded SDI

MPEG Encoding Modes

The two stereo pairs may be configured in various encoding modes:

- **Single mono:** the left channel is encoded – the signal is output to Left and Right connectors at the receiving end.
- **Dual mono:** the left and right signals are encoded and carried in the transport stream as a single Packetised Elementary Stream (PES) data stream. The way that the left and right signals are output from the Receiver is dependent on how the routing is set-up in the Receiver. Both the left and the right may be output, or the left only, or the right only. This is typically used for multilingual services.
- **Stereo:** A stereo pair is coded as two mono signals - the two signals are output as stereo at the receiving end.
- **Joint/intensity stereo:** A stereo pair is coded taking advantage of the stereo nature of the channels – the two signals are output as stereo at the receiving end.

Test Tone

An internally generated test tone is available for alignment purposes. Refer to *Annex B, Technical Specification* for level and frequency.

Audio Variable Bit-rate

MPEG-2 audio output bit-rate (see *Table 1.9*) is selectable in the range 32 kbit/s - 384 kbit/s (dependent on configuration).

Table 1.9: MPEG-2 Audio Encoding Bit-rates

Bit-rate (kbit/s)	Single Channel Mono	Dual Channel Mono	Dual Channel Stereo	Dual Channel Joint Stereo
32	✓	-	-	-
48	✓	-	-	-
56	✓	-	-	-
64	✓	✓	✓	✓
80	✓	-	-	-
96	✓	✓	✓	✓
112	✓	✓	✓	✓
128	✓	✓	✓	✓
160	✓	✓	✓	✓
192	✓	✓	✓	✓
224	-	✓	✓	✓
256	-	✓	✓	✓
320	-	✓	✓	✓
384	-	✓	✓	✓

Test Patterns

Internally generated test patterns can be accessed via the **Video Source Menu** (see *Chapter 2, Set-up, Configuration and Operation*). The patterns available are:

- Colour Bars and Red (625 lines)
- Colour Bars and Red (525 lines)
- Black Screen

Configuration and Control

There are ten selectable configurations (0 through 9), stored in Flash memory and selected by an external switch. This enables quick set-up of the Voyager Lite.

An additional RS-232 interface is provided, allowing control and configuration from a remote terminal (HyperTerminal).

> NOTE...
>
> Any terminal emulator may be used. For purposes of this manual the remote emulator will be referenced as HyperTerminal which is a commonly used Hilgraeve application.

Guided Tour

Right Side Panel

> NOTE...
> The unit described in this section, is a typical configuration for the Voyager Lite. Some controls and connectors may differ from those shown and vary in their location.

The right side panel of the unit is shown in *Figure 1.4* without the battery fitted.

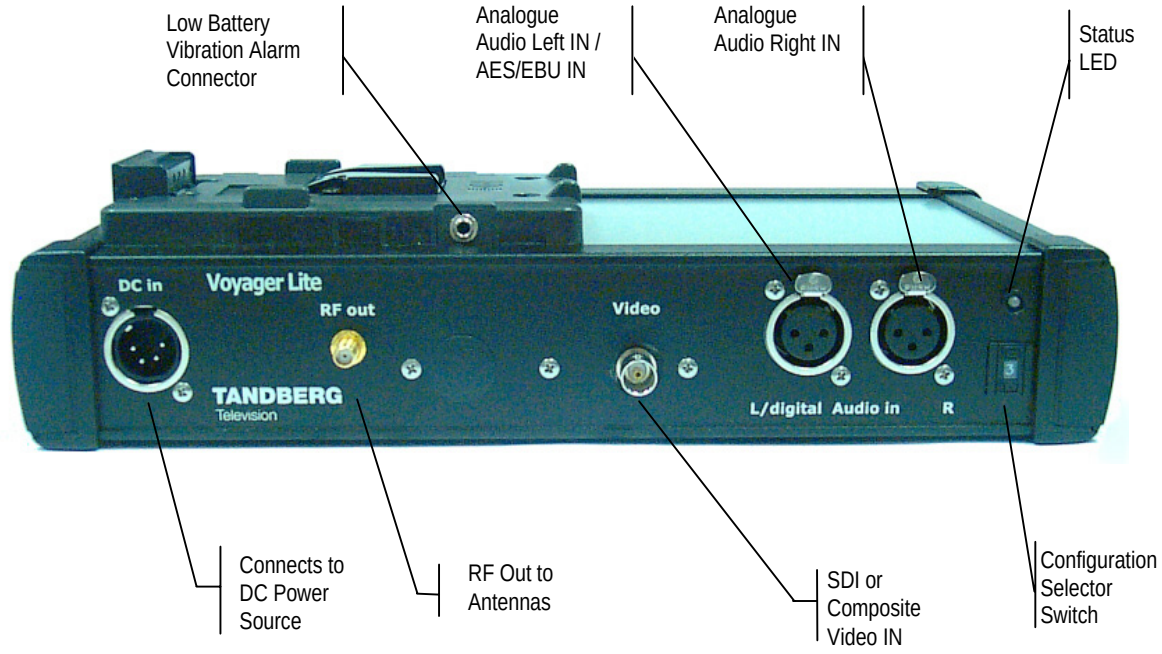


Figure 1.4: Right Side View (Without Battery Fitted)

Top Panel

The top panel has exhaust fans as shown in *Figure 1.5*.

Figure 1.5: View Showing Exhaust Fans in Top Panel

The fans are used to exhaust the warm air from the unit and help with cooling. Fans are located on the bottom panel of the unit, for drawing in air for cooling, see *Figure 1.7*.

Left Side Panel

The left side panel has a 3.5 mm PC Jack for connection to HyperTerminal equipment.

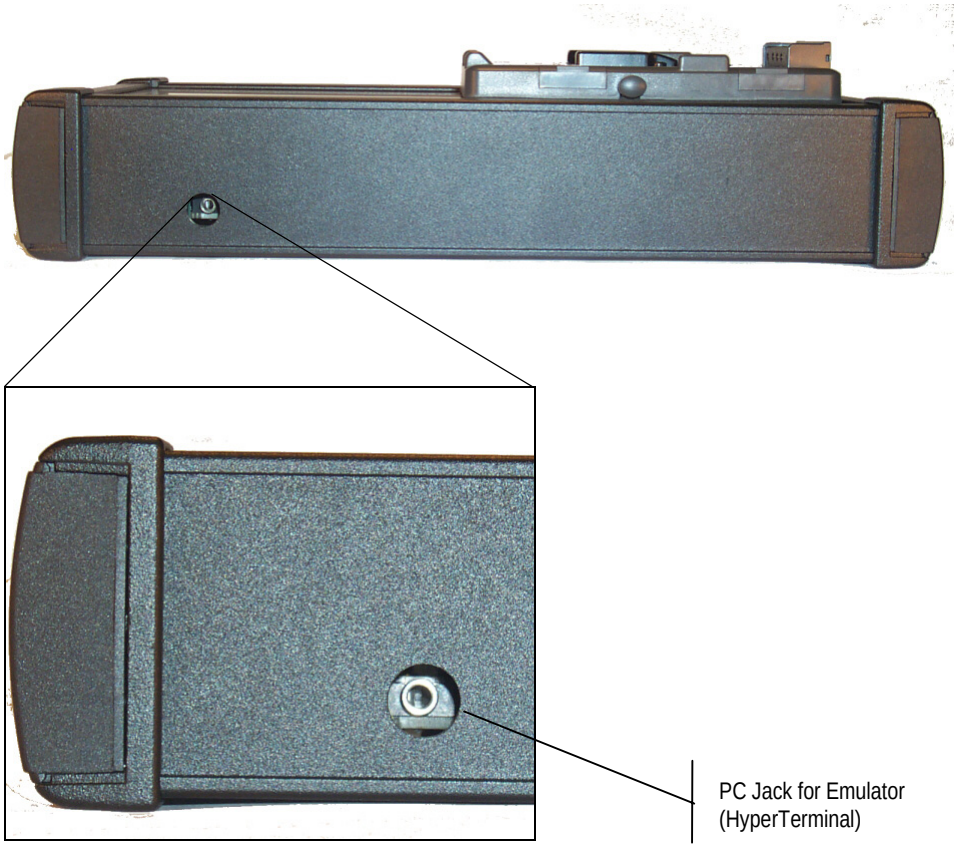


Figure 1.6: View Showing RS-232 Jack Plug

Bottom Panel

The bottom panel has inlet fans for drawing in cooling air from the environment.

Figure 1.7: View Showing Inlet Fans in Bottom Panel

Audio and Video Signal Connections

The majority of external connections appear on the right panel. The programme signal connections are as follows:

- Analogue audio on left and right XLR inputs or digital audio on the left XLR input only
- Combined SDI/Composite video input
- 2.1 to 2.50 GHz RF output

The various connector identities are shown in *Figure 1.4.*

For pin-out information, see *Chapter 2, Set-up, Configuration and Operation*. For specifications of the connector interfaces, see *Annex B, Technical Specification*.

> NOTE...
> Disconnect all cables before removing the Voyager Lite from the Backpack.

Ensure appropriate ESD precautions are observed when making connections between equipment.

Control/Configuration Connections

The Voyager Lite is fitted with the following additional controls and connectors:

- RS-232 jack-plug, for HyperTerminal menu access/engineering use and upgrades (located on left panel)
- 10-way Switch for selection of configuration (located on right panel)

Status LED

A bi-colour LED is visible on the front panel to provide an indication of the powered unit's status:

- Green – OFDM output OK
- Red – OFDM output fail (also during start-up)

> NOTE...
> The LED will flash RED if no video source is connected.

Construction / Design

The Voyager Lite is of robust construction and consists of one shielded, self-ventilated enclosure. All external connections are via connectors on the enclosure.

The equipment, being both lightweight (2.1 kg) and compact, is designed primarily for mobile use using dc voltage power from the rechargeable Batteries. The power input range is 10.2 to 19.0 Vdc, consumption of up to 50 W.

The equipment is intended to operate in ambient air temperature conditions in the range –10°C to +40°C (14°F to 104°F).

Mounting the Encoder

Mobile

The Voyager Lite Encoder is at present only designed for use with its associated backpack. This allows full portability of the unit within a secure enclosure.

Bespoke mobile options are available via TANDBERG Television AVS, please contact Customer Services for further information.

In a Rack / Mobile Enclosure

The Voyager Lite is not currently available with a mounting option as standard, such as within a vehicle.

Please contact Customer Services for further information and advice.

Baseband Functionality

The Voyager Lite motherboard (S12424) is responsible for all functions of the Encoder including audio encoding.

The audio function supports multiple coding modes. Audio can be input as balanced analogue via both XLR connectors, digital audio via the left XLR connector or as SDI embedded audio (via the **Video** connector).

High quality video encoding is ensured by the inclusion of many proprietary algorithms as well as standard MPEG compression techniques. The Encoder uses hierarchical motion estimation.

Video input to the unit is in either analogue composite video (PAL B/D/G/H/I/M/N/N(Jamaica) or NTSC-M) or serial digital (SDI).

The Voyager Lite can accept high-quality digital and analogue video inputs via a combined BNC **Video** connector. These are identified as **SDI** and **VBS**. For specifications of these interfaces see *Annex B, Technical Specification*.

The internal modulator receives the MPEG-2 Transport Stream from the encoding section of the motherboard and provides the signal conversion to DVB-T compliant COFDM.

RF Functionality

An internal IF 70 MHz signal is generated from the COFDM baseband signal. The IF 70 MHz signal is fed into the internal RF frequency agile up-converter (2.1 to 2.5 GHz) where the signal is synthesised and filtered before passing in to an internal RF low-power amplifier (up to 200 mW).

Battery Pack and Charger

TANDBERG Television can supply a Battery Pack (IDX Endura 80S Lithium Ion) including the Charger (IDX VL-2 plus) as shown in *Figure 1.8*. These are optional third-party items of equipment suitable for use with the Voyager Lite. Marketing number is M2/VLTX/IDXBAT02. The battery voltage should be around 14.5 Vdc when fully charged.

An LED on the charger casing illuminates orange (yellow) to indicate powered status.

A pair of bi-colour LEDs on the charger casing indicates charging of the batteries. The LED colours indicate:

- Red – Charging
- Green – Charged

CAUTION...

Battery charging is not achieved in parallel. The first battery connected to the charger is charged initially followed by the other battery.

Battery charge is indicated by a three-LED bar graph on the side of the Battery Pack. The LEDs illuminate green to indicate the remaining charge level when the adjacent button is pressed. The battery should provide around one hour of operation under optimum environmental and operational conditions. The Charger can house two Battery Packs at one time.

CAUTION...

Lithium Batteries should be disposed of in a safe manner, in accordance with the manufacturer's instructions.

NOTES...

1. At present the Voyager Lite can only be powered with a dc Battery Pack or dc Power Belt.
2. Any IDX battery pack may be used with the Voyager Lite, dependent upon customer preference.
3. Sony BPL90/60 Batteries are also supported as standard (Not BPL40).

For further information regarding handling/charging/disposal of Battery equipment, refer to manufacturer's documentation.

Figure 1.8: Typical Battery Charger and Battery Pack(s)

Low Voltage Vibration Alarm

In order for the operator to avoid loss of transmission due to empty batteries TANDBERG Television supplies a low battery vibration alarm for the Voyager Lite backpack transmitter.

A 3.5 mm Stereo jack-plug, located on the battery interface plate, provides a battery capacity monitoring output for the external vibration alarm. The vibration alarm itself can be carried for instance in the backpack or in the clothing. The vibration alarm will not disturb the production environment (e.g. during an interview) and is a reliable warning even in a noisy environment (e.g. in a sports stadium).

Figure 1.9: Low Voltage Vibration Alarm

> NOTE...
>
> The low battery vibration alarm is only available with the capacity monitoring function of IDX Endura 80 Li-ion batteries.

PA2406D-12V Power Amplifier

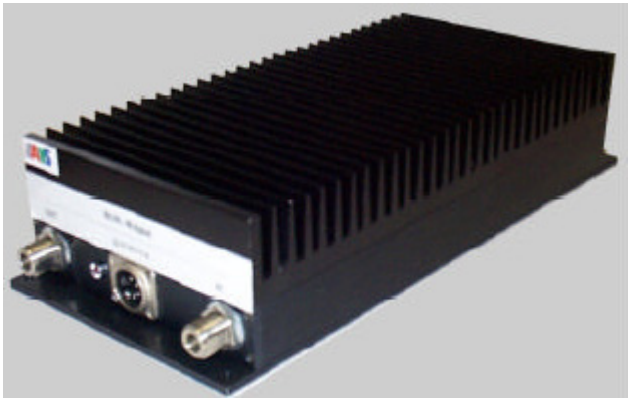


Figure 1.10: Power Amplifier

Designed for use with DENG applications. It provides an alternative to using the internal up-converter and antennas in the backpack if the Voyager Lite is used remotely with an external transmit antenna. The amplifier incorporates automatic gain control, a high bandwidth of operation and low distortion products. It has a rugged design and is weatherproofed for external use.

> NOTE...
>
> The Voyager Lite Encoder is at present only designed for use with its associated backpack. This allows full portability of the unit within a secure enclosure. Bespoke mobile options are available via TANDBERG Television AVS, please contact Customer Services for further information.

Key Features

- High IP3
- Designed for DENG/COFDM applications
- Fully weather proofed casing for outdoor applications
- Automatic gain control
- Low distortion products
- Wide band operation
- Rugged construction
- Isolator protected RF-output.

Receive System

General

The equipment for the reception system is described in this section.

The receive system will comprise the following major elements:

- Receive Antenna
- Down-converter
- Digital ENG Receiver

A full list of the options available can be found in *Table 1.1.*

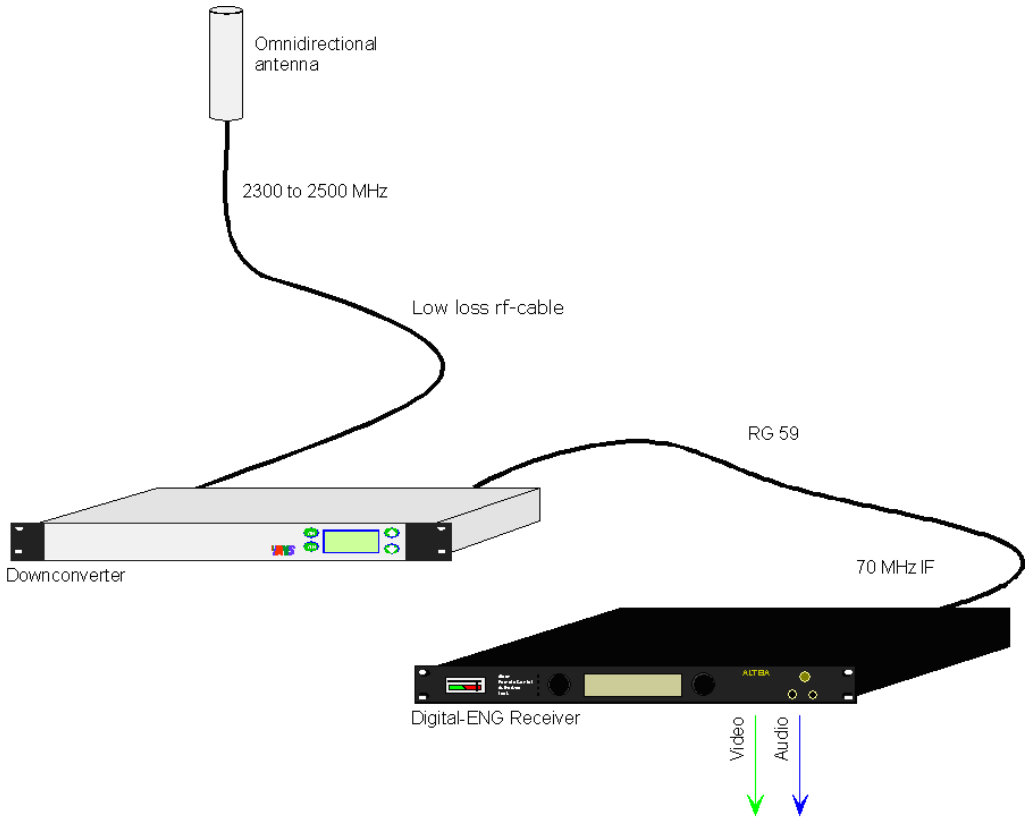


Figure 1.11: Typical Voyager Lite Receive System

Receive Antennas

General

Several models of Receive Antenna are available for use with the Voyager Lite system:

- VLA 2404 LP, Omni-Directional Antenna with Linear Polarization
- VLA 2405 LP, Omni-Directional Antenna with Linear Polarization
- VLA 2408 LP, Omni-Directional Antenna with Linear Polarization
- VLA 2409 CP-R, Planar Antenna with Circular Polarization
- VLA 2417 LP, Directional Antenna with Linear Polarization
- VLA 2417 CP-R, Planar Antenna with Circular Polarization
- VLA 2418 CP-R, Planar Antenna with Circular Polarization

Further technical information is available in *Annex B, Technical Specification*.

Directional and Omni-directional Antennas

An Omni-directional Antenna is one where energy is directed evenly across the whole beam width.

A Linear/Planar Antenna is one where the beam width is either focussed horizontally or vertically.

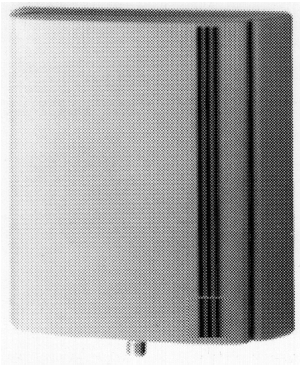
A Circularly Polarized Antenna is one where the signal is rotated like a corkscrew, to either the right or left.

The reasoning between the use of either a Directional or Omni-directional Antenna is relatively straightforward. If the system is stationary and line of sight is achievable between the Transmitter and Receiver Antenna, a Directional Antenna will give the best performance. If several other wireless video systems are operating in the same area, directional antennas will prove to be more robust against interference between the systems. If the transmitter or Receiver is mobile, or there are numerous objects along the transmission path, an Omni-directional Antenna should yield better results.

VLA 2404 LP

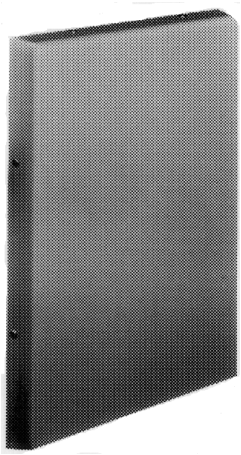
VLA 2405 LP

VLA 2408 LP



VLA 2409 CP-R

VLA 2417 LP



VLA 2417 CP-R
VLA 2418 CP-R

Figure 1.12: Receive Antennas for use with Voyager Lite System

Antenna Range

Choice of Receive Antenna will determine range of the system. In theory it is possible to calculate exactly what the range can be achieved using a transmitter rated at a known power output, with a certain type of Receive Antenna of a known gain. In practice, however, conditions change over time due to some of the following factors:

- Ambient noise levels rise and fall, based on time of day and other factors
- Multi-path conditions change, e.g. passing vehicles
- Weather conditions, particularly snow and ice
- Vegetation/Foliage may be present at a location in summer but not in winter, thus absorbing signals
- Other transmitters may be operating in the area, which are unknown to the operator

A critical specification of antennas is gain, choosing the correct gain Antenna is largely performance (range, robustness of signal) and cost driven. The beam width of the signal decreases as gain increases, therefore, positioning of antennas in relation to one another becomes more critical as higher gain is used.

Antenna Positioning and Mounting

Maximum transmission range is achieved with clear line of sight between transmit and receive antennas. Best reception will occur if there are no moving objects between the antennas and they are placed at least eight to ten feet above such objects and ground level.

Where the Receive Antenna is separate from the Receiver itself, a 5m cable is provided for interconnection. If a greater cable length is required only a suitably high quality, low loss 50 Ω cable (RG-223 or better) should be used. It is wise to position the Receive Antenna so the front is directly facing the transmitter and is not obstructed by any metallic objects.

Consideration must be given to the distance of the Receiver from the Antenna. Increasing the cable length may result in signal losses that more than offset any advantage in locating the antenna higher or with a better line of sight to the transmitter. As an alternative to mounting the antenna remotely a short cable can be used with a TANDBERG Television LNA2420-06Fw Low Noise Pre-amplifier.

Down-converter

The TANDBERG Television Down-converter (M2/VLRX/DWNCNVIF) is a 1U, 19-inch, rack mountable unit for designed for use as part of a Digital ENG receive solution. It has a low phase noise specification and incorporates DENG optimised mixers, which guarantee maximum achievable performance for COFDM based systems. A highly selective RF input design excludes distortions from adjacent channels.

Figure 1.13: Down-converter

The Down-converter features:

- RF Input, 2.1 to 2.6 GHz, tuneable in 500 kHz steps
- Highly selective RF channel tuning
- Automatic gain control

Further technical information is available in *Annex B, Technical Specification.*

DENG Portable Receiver

Introduction

The Digital ENG Portable Receiver (M2/CPTRX/8M) integrates both a down-converter and receiver within a single unit and is designed for rapid deployment on-location. It has a specific DENG/COFDM optimised RF input design, with a highly selective input that reduces interference from adjacent channels. It is light enough to be hand carried (7.1 kg) or tripod mounted.

Local control is via the front panel and channel selector switch with monitoring provided by a front panel LED bar graph field strength indicator.

Remote control is via an RS-232 interface providing full control of frequency configurations.

Key Features

- Integrated Down-converter/Receiver
- Highly sensitive, 2.1 to 2.6 GHz front-end
- Open MPEG-2, DVB-T COFDM decoding
- Received Signal Strength Indicator (RSSI)
- Analogue composite video and audio outputs
- Quick-mount antenna – supports TANDBERG Television planar antenna range
- Tripod mount
- Quick, simple set-up and operation
- Rugged, compact and portable outdoor design

Figure 1.14: DENG Portable Receiver

Alteia*plus* Receiver

The TANDBERG Television Alteia*plus* (M2/PTRE/948CVL) is the standard professional Receiver designed for use with the Voyager Lite System.

Figure 1.15: Front View of an Alteia plus Receiver

The Digital ENG Receiver has a 70 MHz COFDM interface that operates between 4.98 and 31.67 MSymbol/s.

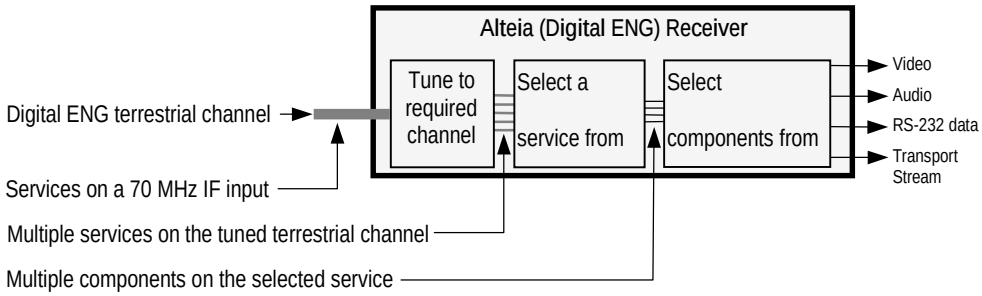


Figure 1.16: What the Digital ENG Receiver Does

For further information regarding this product and its operation refer to the equipment instruction manual, *ST.TM.E9200*.

LNA2420-06Fw Low Noise Pre-Amplifier

Figure 1.17: Low Noise Pre-Amplifier

The low noise pre-amplifier is designed for use with DENG applications. It provides an alternative to mounting the antenna remotely with a long cable to improve line of sight which may cause signal losses. A shorter cable may be used with a TANDBERG Television LNA2420-06Fw Low Noise Pre-amplifier.

Key Features

- Designed for DENG/COFDM applications
- Low noise figure
- Compact design
- Weatherproofed
- High IP3

Bespoke Options

Bespoke options e.g. Anton Bauer, Wireless Camera Control, are available via TANDBERG Television AVS, please contact Customer Services for further information.

Chapter 2

Set-up, Configuration and Operation

Contents

List of Figures

List of Tables

Introduction

Read This First!

Ensure the personnel designated to set-up and operate the unit have the appropriate skills and knowledge. If in any doubt, contact TANDBERG Television Customer Services.

General

This chapter provides configuration, connection and basic operating information. If problems are experienced, please contact TANDBERG Television Customer Services.

> NOTE...
>
> Each Voyager Lite will be provided with a configuration suitable for use within the jurisdiction of its intended operation.

Requirements

Power Supply

The Voyager Lite operates from a Battery power supply in the range 10.2 to 19.0 Vdc, up to 50 W or from a DC **power belt**. There is a Battery Charger and Battery Pack (M2/VLTX/IDXBAT02) available as an optional extra. See *Annex B, Technical Specification* for a full specification.

Environment

The Encoder is designed for use in ambient air temperature conditions in the range -10°C to +40°C (14°F to 104°F) and humidity 0% to 90% (non-condensing). See *Annex B, Technical Specification* for a full specification.

Do not use the Voyager Lite:

- In areas of high humidity
- Where there is a risk of water ingress

Lightning Protection

WARNING...

IF THE VOYAGER LITE HAS BEEN SUBJECT TO A LIGHTNING STRIKE OR POWER SURGE, WHICH HAS STOPPED IT WORKING, DISCONNECT THE POWER IMMEDIATELY. DO NOT REAPPLY POWER UNTIL IT HAS BEEN CHECKED FOR SAFETY. IF IN DOUBT, CONTACT TANDBERG TELEVISION CUSTOMER SERVICES.

Where appropriate, ensure this product has an adequate level of lightning protection. Alternatively, during a lightning storm or when left unattended and unused for long periods, disconnect it from the power supply and the input/output equipment.

Preliminary Checks

Mechanical Inspection

When taking delivery of a Voyager Lite, check the equipment items delivered against the enclosed delivery note. Inspect the equipment for damage in transit. If in doubt, contact Customer Services (see *Preliminary Pages*).

NOTE...

Do not remove the covers of this equipment as doing so may invalidate any warranties, cause a safety hazard and/or affect the EMC performance. It may also invalidate any safety tests.

Moving the Equipment Safely

Do not place the equipment on an unstable cart, stand, bracket, or table. The unit may fall, causing serious injury and serious damage to the product. Use only when housed within the Backpack supplied with the unit.

Cable Routing

Connection Cables should be routed to avoid damage from other equipment. Pay particular attention to cables at all connection points and edges or corners of equipment where chafing may occur.

Ventilation

WARNING...

NEVER PUSH OBJECTS OF ANY KIND INTO THIS EQUIPMENT THROUGH OPENINGS AS THEY MAY TOUCH DANGEROUS VOLTAGE POINTS OR SHORT-OUT PARTS THAT COULD RESULT IN A FIRE OR ELECTRIC SHOCK. NEVER SPILL LIQUID OF ANY KIND ONTO THE PRODUCT.

CAUTIONS...

1. Openings in the casing are provided for ventilation to protect it from overheating ensuring reliable operation of the product. These openings must not be blocked or covered. The Voyager Lite should never be placed near or over a radiator or heat register. It should not be placed in a built-in installation such as a rack.
2. The fans contained within this unit are not fitted with a dust/insect filter. Pay particular attention to the environment in which it is to be used.

Ensure that the Voyager Lite is firmly and safely located within the Backpack, and has adequate airflow to and from the top and bottom air vents/fans. Allow adequate airspace at each side of the air vents/fans and exhaust route for the expelled air from the unit. Correct mounting of the unit within the Backpack will conform to these requirements. See *Chapter 1* for Location of Fans

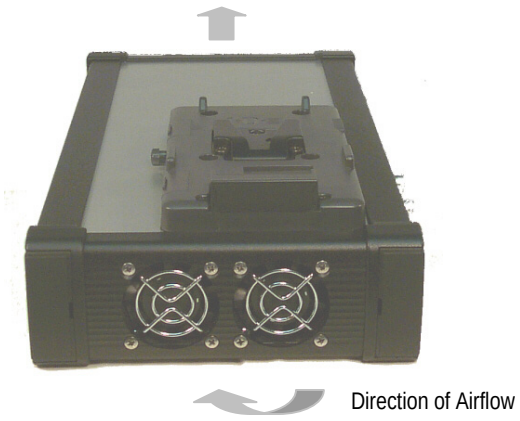


Figure 2.1: Unit Airflow

Connecting the Voyager Lite

General

Once the unit has been located in its intended operating position, it is ready to be connected up to other equipment. Ensure that other equipment to be used with the Voyager Lite has been correctly installed.
Always use the specified cables for signal integrity and compliance with EMC requirements.

Ensure that ESD precautions are observed when making connections between equipment.

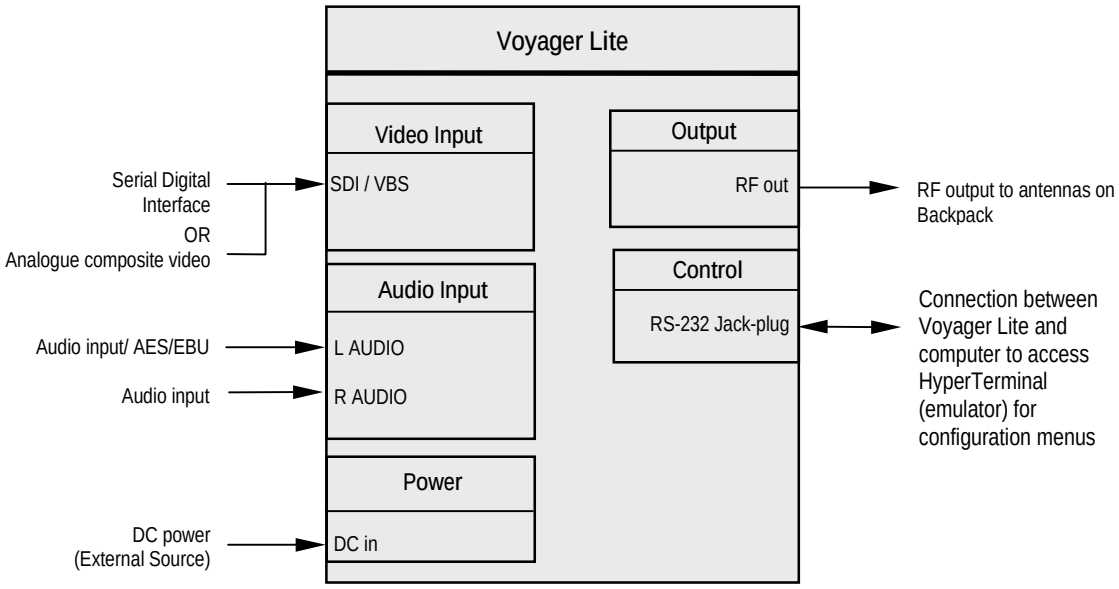


Figure 2.2: Signal Connections – Graphical

See the section, *Signal Connections* starting on *Page 2-11,* for pin-out details of the connectors.

Overview

Voyager Lite is designed for use within a mobile contribution system, similar in arrangement to *Figure 2.3.*

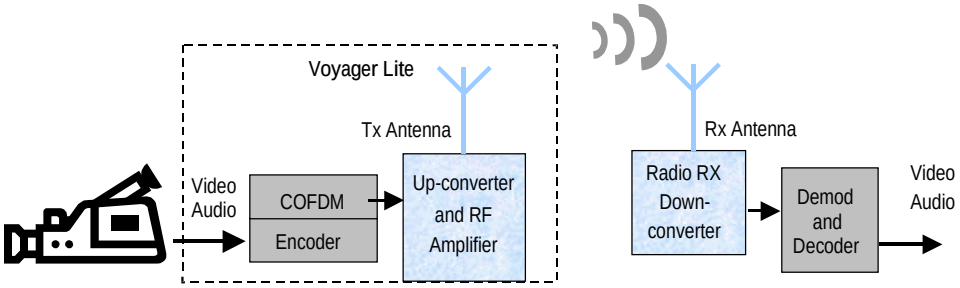


Figure 2.3: System Overview

Audio Inputs

The Voyager Lite Encoder accepts two channels of stereo audio in analogue or AES/EBU digital formats. Connect analogue audio sources to the **AUDIO IN L** and **R** connectors and digital audio to the **AUDIO IN L** connector.

Audio can also be embedded in the SDI datastream.

Video Input

The Encoder accepts video in serial digital or analogue composite formats. Connect the video source to the combined **Video** BNC connector.

RF Output

A 50 Ω SMA connector provides an OFDM signal output from the internal power amplifier.

Configuration

Up to ten operational configurations (0 through 9) may be stored by the unit using internal Flash memory. These are accessed via the selector switch on the Voyager Lite casing. The default configurations are shown in *Table 2.8*.

HyperTerminal

Remote control is achieved by connecting a control workstation to the **RS-232** interface connector. This is a non-standard connector on the unit, but an Adaptor lead is provided. Contact Customer Services (see *Preliminary Pages*) for further information if the remote control facilities are required.

Power Supply

The following section*, DC Operating Voltage and Earthing,* provides details of power supply connection and safety. Take time to read the instructions carefully and take note of all warnings and cautions.

DC Operating Voltage and Earthing

DC Power Supply

CAUTIONS...

1. This product should be operated only from the type of power source indicated within this manual (Battery Pack or Power Belt). If you are not sure of the type of power supply to be used by the Voyager Lite, consult a qualified electrical engineer, the manufacturer or their agents.
2. The Voyager Lite can be connected to a positive or negative earth system but you must ensure that correct polarity to the dc input connections are maintained.

The internal dc power supply module used in this equipment is designed for use on dc supplies (nominally 12 Vdc) ranging from 10.2 to 19 Vdc. A version for 19 to 36 Vdc is available on request. (See *Annex B, Technical Specification* for a full power supply specification).
The dc connections within the Voyager Lite are floating (both are isolated from the case and earth connection).
Please refer to the above caution regarding voltage polarity.

The recommended types of dc power sources are as follows:

- Battery with suitable fuse protection
- DC Power Belt with suitable fuse protection

CAUTIONS...

1. The Voyager Lite requires a minimum of 12 volts to power-up and has a low voltage shutdown facility that will operate at approximately 11 volts.
   This is part of the power units design. The Internal Power Supply, however, ranges from 10.2 to 19.0 Vdc.
2. Failure to observe the equipment voltage requirements may result in power cycling of the unit if the battery is unable to maintain its terminal voltage.
   Damage may result if this condition is allowed to continue.

NOTE...

Power is supplied to the unit as soon as the Battery Pack is connected to the interface plate on the Voyager Lite front or Power Belt is connected to the DC **in** socket. There is no ON/OFF switch. An LED on the unit casing will illuminate to indicate that power is connected.

Voltage Indicators

A bi-colour LED (red/green) on the unit casing will illuminate when power is connected to the Voyager Lite.

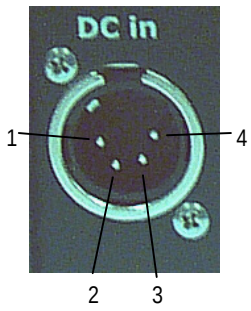
- Green indicates correct operation of the unit. During normal operation, the green LED illuminates continuously.
- Red indicates a fault condition (e.g. missing input signal). During normal operation, the red LED should be off, although it may illuminate during the power-up phase.

DC Connection

DC In Connector

Table 2.1: DC Input Connector and Cable details

Plug/Socket	Voltage Condition
XLR, Male (4-pin)	
Pin 1:	Ground
Pin 2:	Not Connected
Pin 3:	DC Monitoring (max. current 200 mA)
Pin 4:	DC Power (10.2 to 19.0 Vdc)



The illustration shows a view on the pins of the **DC in** plug as seen from the face of the panel.

Connecting the Voyager Lite to a DC Power Supply

WARNINGS...

1. DO NOT OVERLOAD CONNECTIONS AND CABLES AS THIS CAN RESULT IN A RISK OF FIRE OR ELECTRIC SHOCK.
2. ENSURE THAT:
   (A) THE LOCAL DC SUPPLY IS ISOLATED BEFORE CONNECTING THE DC SUPPLY
   (B) THE DC CONNECTION ISOLATION SWITCH IS EASILY ACCESSIBLE AT ALL TIMES.
3. FAILURE TO PROVIDE ADEQUATE ISOLATION FOR THE EQUIPMENT MAY CAUSE A SAFETY HAZARD.

To connect the Voyager Lite to an external dc power supply:

1. Ensure that you comply with the warnings given.
2. Ensure that the correct fuse type and rating has been fitted in the dc supply to the Voyager Lite.
3. Connect the dc power lead to the Voyager Lite dc input connector and then to the dc supply.
4. Power up the dc connection (the status LED should now be on).

Battery Interface Plate

WARNING...

BEFORE CONNECTING THE EQUIPMENT TO THE SUPPLY, CHECK THE SUPPLY REQUIREMENTS IN ANNEX B.

The Battery Pack Interface Plate for the Voyager Lite is suitably fused. Ensure that the Battery Pack and associated equipment used to provide power to the Voyager Lite also has suitable fuse/earthing arrangements.

Signal Connections

Inputs

Audio In

Two XLR female connectors provide one stereo channel. Each connector carries a single channel of an analogue stereo pair.
Digital audio is carried on the left connector.

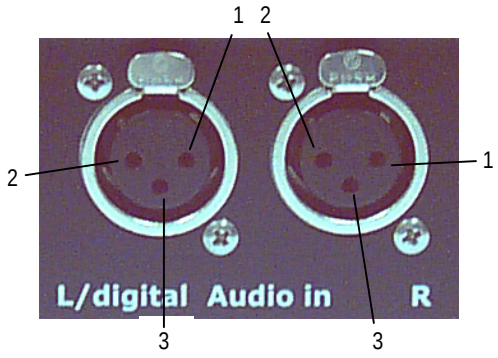


Table 2.2: Audio Connectors

Item	Specification: Analogue	Specification: Digital
Connector type	XLR, Female	XLR, Female
Connector designation	AUDIO IN: LEFT, RIGHT	AUDIO IN: LEFT/DIGITAL
Connector	Left and Right	Left only
Pin Connections	Pin 1 Xternal of cable (shield/ground) Pin 2 Live Pin 3 Return	Pin 1 Xternal of cable (shield/ground) Pin 2 Live Pin 3 Return
Nominal input impedance	600 Ω or 20 kΩ (customisable by links only)	110 Ω

Video

A 75 Ω BNC connector provides the unit with either:

- SDI serial digital video input.
- 625/525 line composite PAL, or 525 line composite NTSC input.

Table 2.3: Video input Connector

Pin	Signal
Centre	Video Input
Screen	Ground

RF Output

A 50 Ω SMA connector provides an OFDM signal output from the internal Power Amplifier.

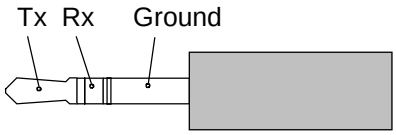
Table 2.4: RF Out Connector

Pin	Signal
Centre	Signal
Screen	Ground

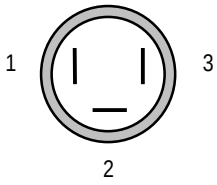
Control

Remote Control – Jack Plug

This Connector, (see *Figure 1.6*) is currently a standard 3.5 mm Stereo Jack-Plug requiring a standard RS-232 Adaptor. A 1 m Adaptor cable for a 9-way, D-type connector is supplied with the unit. Should a replacement cable require manufacture/purchase, the wiring information below may be of use; or contact Customer Services at the address shown in the *Preliminary Pages*.



(Side view)



(Rear view)

Table 2.5: Jack Plug Connector (For Information Only)

Pin (rear)	Signal	Wire colour (standard)
1	Tx	Red
2	Earth/Gnd	Yellow/Green
3	Rx	Blue

9-Way, D-type (For Information Only)

A 9-way, D-type male connector is fitted to one end of the Adaptor cable that provides an RS-232 port for remote control of the equipment.

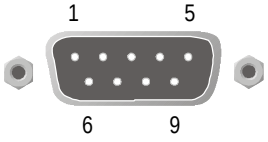


Table 2.6: D-type Connector (For Information Only)

Pin	Signal	Wire colour (Std)	Pin	Signal	Wire colour (Std)
1	N/C	—	6	N/C	—
2	RS-232 Rx	Blue	7	N/C	—
3	RS-232 Tx	Red	8	N/C	—
4	N/C	—	9	N/C	—
5	Earth/Gnd	Yellow/Green			

RS-232 Interface Specification

The RS-232 interface has the following specification:

- Baud Rate – 115200 (customisable to 19200 using link settings)
- Configuration – DCE
- Standard – EIA RS-232/E, ITU-T V.24/V.28
- Control Mechanism – Xon/Xoff

Table 2.7: RS-232 cable wiring (For Information Only)

3.5mm Jack Plug End	9-way, D-type	Wire colour (standard)
Tx	Pin 2	Red
Ground	Pin 5	Yellow/Green
Rx	Pin 3	Blue

Configuration Switch

There is a 10-way selector switch on the unit, for access to the ten preset configurations (0 through 9) of the Voyager Lite. The default configurations are described in *Table 2.8*.

Powering Up/Down

Before Power-up

> CAUTION...
>
> Do not run the Voyager Lite unit for long periods whilst it is disconnected from the antennas. i.e. The unit should always be run under load where possible.

Before powering up the Voyager Lite check that:

1. The unit has been correctly installed in the Backpack.
2. The unit has been connected to external equipment.
3. The power supply has been checked and a good earth provided.
4. Fuses of the correct type and rating have been fitted where applicable.
5. Power cables are in good condition and properly connected.

Powering Up From a DC Battery Pack

To power-up the Voyager Lite:

1. Connect a fully charged Battery Pack to the Interface Plate. Power is available immediately (LED on the casing should now be lit).
2. Ensure that all cooling fans are rotating. If they are not, power-down the equipment (by removing the battery pack or disconnecting the dc input) immediately and contact TANDBERG Television Customer Services (see Preliminary Pages).
3. Stable operation, within specification, is available after a boot period of approximately seven seconds.

Powering Down From a DC Battery Pack

To power down the Voyager Lite, remove/disconnect the Battery Pack from the Interface Plate on the unit.

Configuration Selection

Settings

> NOTE...
>
> Initially, the default factory configurations are the same for all ten settings (see *Default Configurations*).

There are ten configuration settings available. The unit powers up in the configuration preset by the selector switch.

There are various methods for selecting the required configurations:

- Selector Switch - Push-button channel switch, located adjacent to the connectors.
- RS-232 link – from the **Main Menu select <a> Stored Configuration**, **<b> Load Configuration from Flash**.
- RS-232 link – select the required options from the various menus (See *Setting Up the Equipment*). Once the parameters are set, save them to a configuration (see *Configuration Set-up*) or the settings will be lost when the unit is powered down.

Factory Default Configurations

Factory default configurations for all options are shown in *Table 2.8*, and the transmission settings for each configuration are shown in *Table 2.9* unless otherwise indicated.

Table 2.8: Factory Default Configurations

	Service Name	" Service x "
Service	Network Name	" Tandberg Mobile "
	Network ID	65535
	PMT PID	32
	PCR PID	8190
OFDM	Bandwidth	8 MHz
	FEC Rate	See *Table 2.9*
	Modulation Mode	See *Table 2.9*
	Guard Interval	¼
	Centre Frequency	70 MHz
	Spectral Polarity	Normal
Video source	Video Input	PAL-B/G/H/I
	Audio DID	767 (0x2ff)
Video Encoding	Encode	On
	Profile/Level	See *Table 2.9*
	Compression Mode	Standard
	Horizontal Res.	See *Table 2.9*
	Aspect Ratio	4:3
	GOP structure	IBBP
	GOP length	12
	Video PID	308 (0x134)
Audio	Coding Standard	Off
	Coding Mode	Stereo
	Source	Analogue
	Language	English
	Audio PID	256 (0x100)

Where **x** = configuration option 0 to 9

Table 2.9: Factory Transmission Parameter Settings

Config.	Frequency	FEC Rate	Modulation Mode	Profile/Level	Horizontal Res.
1	2405	1/2	16QAM	422P@ML	720
2	2405	1/2	QPSK	420	544
3	2414	1/2	QPSK	420	544
4	2423	1/2	QPSK	420	544
5	2432	1/2	QPSK	420	544
6	2441	1/2	QPSK	420	544
7	2450	1/2	QPSK	420	544
8	2459	1/2	QPSK	420	544
9	2468	1/2	QPSK	420	544
0	2477	1/2	QPSK	420	544

NOTE...

If the Default settings are restored via the RS-232 HyperTerminal Main Menu, <i> Test Functions Menu, <I> Restore Defaults the settings in *Table 2.11: Restored Default Configurations* will be set to those in *Table 2.8: Factory Default Configurations*. This option is password protected.

Setting Up the Equipment

HyperTerminal Settings

The menus are accessed via a HyperTerminal (or VT100 emulator).

1. Connect a Computer (PC) to the Voyager Lite via the RS-232 connector (jack-plug).
2. On the PC, from **Start**, click **Programs**, **Accessories**, **HyperTerminal**.
3. Ensure that the settings are as follows:

- Bit/s 115 200
- Data Bits 8
- Parity None
- Stop Bits 1
- Flow Control Xon/Xoff

4. The program starts automatically and the menu is displayed.

Configuration Set-up

The **Stored Configuration Menu** gives the option of storing and loading configurations.

1. From the **Main Menu** select **<a> Stored Configuration**.
2. From the **Stored Configuration Menu** the following options are selectable:

- **<a> List Configuration Set** – gives the locations for the ten configuration settings.
- **<b> Load Configuration from Flash** – loads the saved configuration from Flash memory.
- **<c> Save Configuration to Flash** – saves the user defined configuration to Flash memory.

Video Source Set-up

1. From the **Main Menu** select **<d> Video Source, <a> Video Input**.
2. Select a suitable input source.
3. Configure the other options as necessary.

Video Encoder Set-up

1. From the **Main Menu** select **<e> Video Encoder, <b> Profile/Level**.
2. Select from:

   `<a> 422P@ML`

   `<b> 420`
3. From the **Main Menu** select **<e> Video Encoder**, **<a> Encode**.

   Set to `<b> On`.
4. Configure the other options, as necessary.

Audio Set-up

1. From the **Main Menu** select **<f> Audio 1**, **<a> Coding Standard**.
2. Select from:

   `<a> Off`

   `<b> Linear PCM`

   `<c> MPEG Layer 2`
3. From the **Main Menu** select **<f> Audio 1**, and then the following:
4. **<b> Input Source** – select the required audio source. Embedded inputs are via SDI.
5. **<c> Coding Mode** - select the required coding mode.
6. Configure the other options, as necessary.

OFDM Modulator Set-up

1. From the **Main Menu** select **<c> OFDM Modulator, <a> Guard Interval**.
2. If Voyager Lite is being used with an Alteia Receiver/Decoder:
   a) Ensure that the Guard Intervals in both units are set to the same value or the Alteia will not lock to the signal. Check Channel Spacing Setting on Alteia matches Guard Interval.
   b) **<e> Tx Bandwidth** (6/7/8 MHz) must also match.
3. Configure the other options, as necessary.

Service Info Set-up

From the **Main Menu** select **<b> Service Info**, and configure the options, as necessary.

Menu Structure

Main Menu

The overall menu structure, accessed via HyperTerminal, is shown in *Figure 2.4*. Some Menus are password protected for TANDBERG Television use only. The structures of the sub-menus are described in the following paragraphs.

The section *Setting Up the Equipment* details the use of these menus for that purpose.

Status Menu

Pressing **<Esc>** from the **Main Menu** will toggle between this and the **Status Menu**. The **Status Menu** is shown in *Figure 2.4*.

Menu Option Keys

In General, the menu options are operated by the following keystrokes:

- **<option letter>** to choose/activate option. (e.g. **<a> QPSK**).
- **<Esc>** to exit or cancel an option (return to previous).
- **<↵/Enter>** to accept an entered value/confirm a setting. Also leaves a setting unaltered.
- **<->** Indicates a display only menu item.

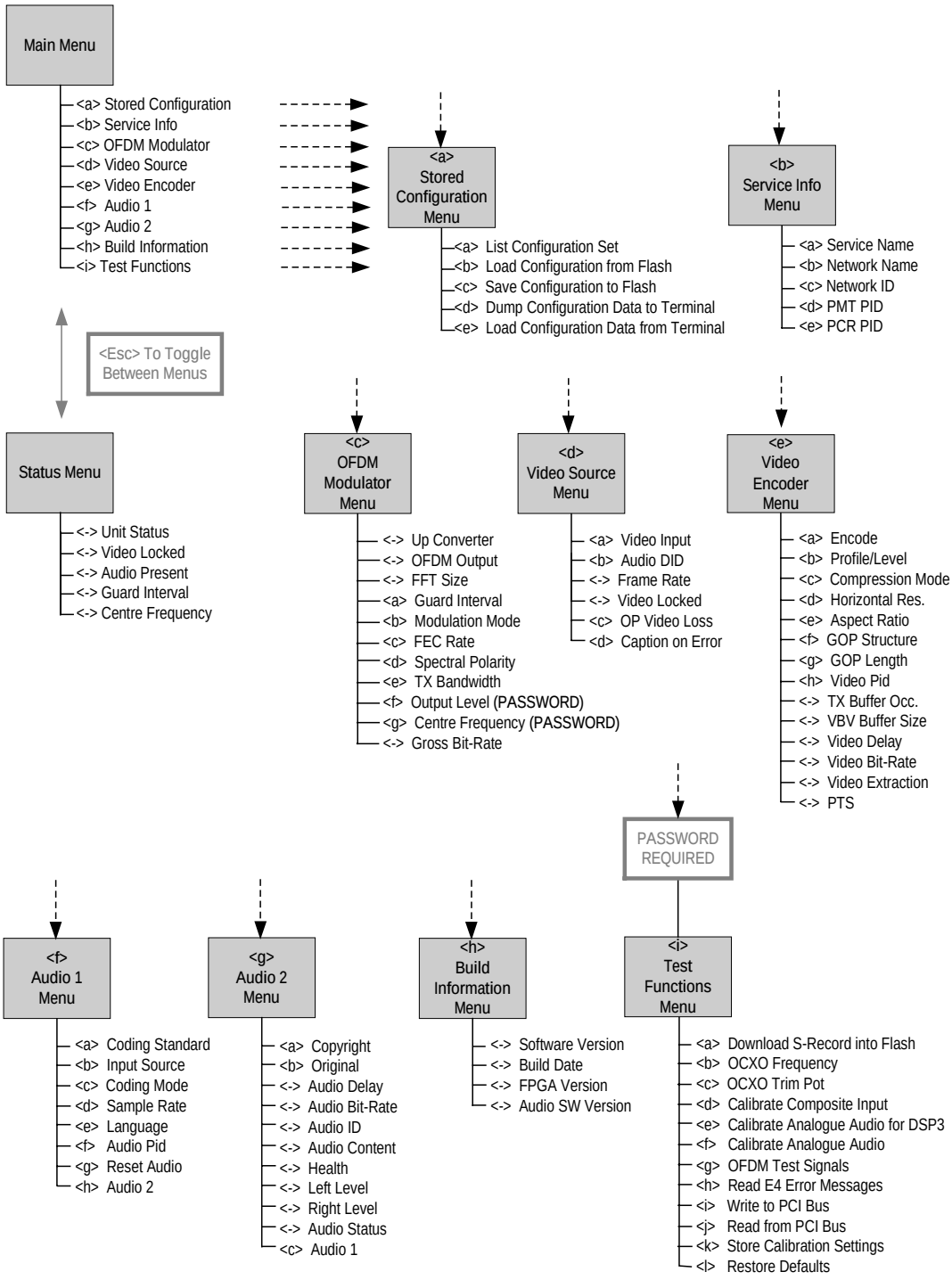


Figure 2.4: Overall Menu Structure

Stored Configuration Menu

The **Stored Configuration Menu** is accessed from **Main Menu** option **<a>**.

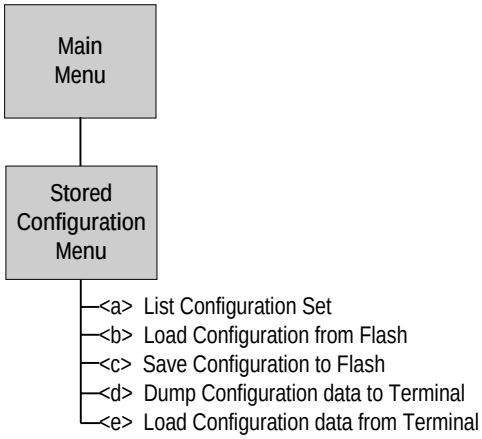


Figure 2.5: Stored Configuration Menu Structure

Option **<a> List Configuration Set**, displays Configurations <0> through <9> with their Service Names.

Option **<b> Load Configuration from Flash**, displays the prompt `Which Configuration (0-9)?`

Selecting a value one through ten displays the message `Loading….`

Option **<c> Save Configuration to Flash**, displays the prompt `Which Configuration (0-9)?`

Selecting a value one through ten displays the message `Saving….`

Option **<d> Dump Configuration data to Terminal**, displays the prompt `Press <Return> to begin transfer, and any key to finish.`

Option **<e> Load Configuration data from Terminal**, displays the prompt, `Please download S-Record File (Ctrl ^D to end)`. A file for download is usually accessed via Windows Explorer.

Service Info Menu

The **Service Info Menu** is accessed from **Main Menu** option **<b>**.

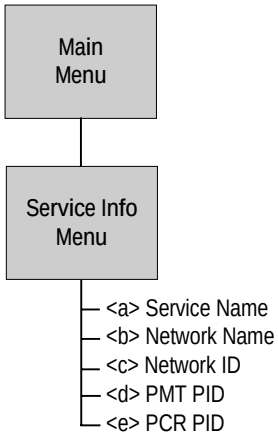


Figure 2.6: Service Info Menu Structure

Option **<a> Service Name**, displays the prompt `Enter Service Name?` The field can then be updated as required.

Option **<b> Network Name**, displays the prompt `Enter Network Name?` The field can then be updated as required.

Option **<c> Network ID**, displays the prompt `Enter Network ID?` The field can then be updated as required.

Option **<d> PMT PID**, displays the prompt `Enter PMT Pid?` The field can then be updated as required.

Option **<e> PCR PID**, displays the prompt `Enter PCR Pid?` The field can then be updated as required.

OFDM Modulator Menu

The **OFDM Modulator Menu** is accessed from **Main Menu** option **<c>**.

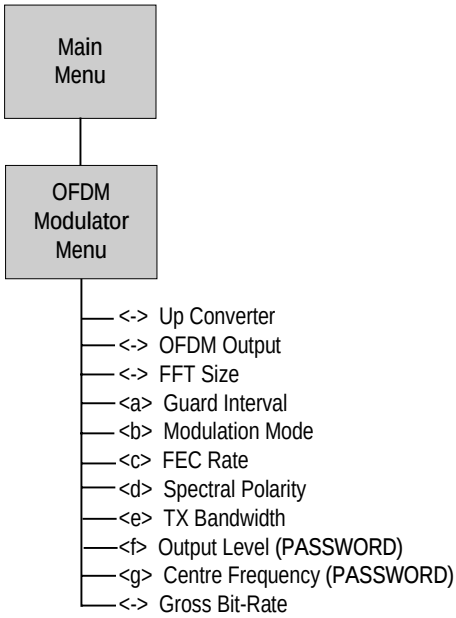


Figure 2.7: OFDM Modulator Menu Structure

OFDM Modulator Menu option **<a> Guard Interval** can be set to the following sub-menu options:

- <a> 1/32
- <b> 1/16
- <c> 1/8
- <d> 1/4

> NOTE...
>
> If using a TANDBERG Television Alteia Receiver the Guard Interval must match the settings on the Alteia.

OFDM Modulator Menu option **<b> Modulator Mode** can be set to the following sub-menu options:

- <a> QPSK
- <b> 16-QAM

OFDM Modulator Menu option **<c> FEC Rate** can be set to the following sub-menu options:

- <a> 1/2
- <b> 2/3
- <c> 3/4
- <d> 5/6
- <e> 7/8

OFDM Modulator Menu option **<d> Spectral Polarity** can be set to the following sub-menu options:

- <a> Normal
- <b> Inverse

OFDM Modulator Menu option **<e> Tx Bandwidth** can be set to the following sub-menu options:

- <a> 6 MHz
- <b> 7 MHz
- <c> 8 MHz

> NOTE...
>
> If using a TANDBERG Television Alteia Receiver the Tx Bandwidth must match the setting on the Alteia Receiver as the Receiver will not auto sense this option.

OFDM Modulator Menu option **<f> Output Level** is password protected for use by TANDBERG Television only.

OFDM Modulator Menu options **<g> Centre Frequency** is password protected for use by TANDBERG Television only.

Video Source Menu

The **Video Source Menu** is accessed from **Main Menu** option **<d>**.

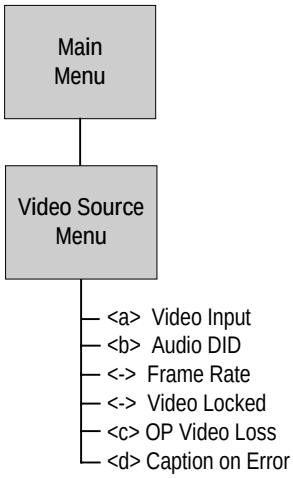


Figure 2.8: Video Source Menu Structure

Video Source Menu option **<a> Video Input** can be set to the following sub-menu options:

- <a> Bars and Red (625 lines)
- <b> Bars and Red (525 lines)
- <c> Serial Digital (625 lines)
- <d> Serial Digital (525 lines)
- <e> PAL-B/G/H/I
- <f> PAL-M
- <g> PAL-N
- <h> PAL-N (Jamaica)
- <i> PAL-D
- <j> NTSC with Pedestal
- <k> NTSC No Pedestal
- <l> Mono (625 lines)
- <m> Mono (525 lines)

Video Source Menu option **<b> Audio DID** can be set by the user after the prompt, `Enter Audio DID?`

Video Source Menu option **<c> OP Video Loss** can be set to the following sub-menu options:

- <a> Bars & Red
- <b> Black

Video Source Menu option **<d> Caption on Error** can be set to the following sub-menu options:

- <a> Off
- <b> On

Video Encoder Menu

The **Video Encoder Menu** is accessed from **Main Menu** option **<e>**.

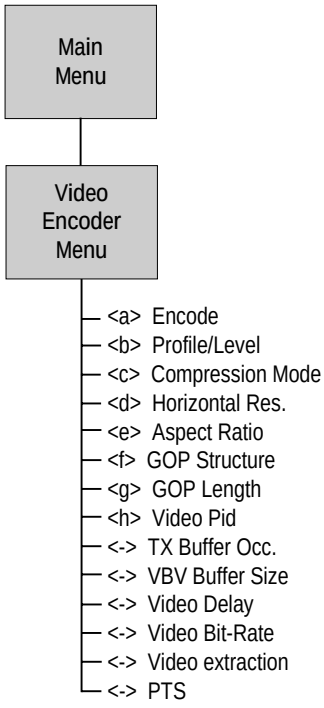


Figure 2.9: Video Encoder Menu Structure

Video Encoder Menu option **<a> Encode** can be set to the following sub-menu options:

- <a> Off
- <b> On

Video Encoder Menu option **<b> Profile/Level** can be set to the following sub-menu options:

- <a> 422P@ML
- <b> 420

Video Encoder Menu option **<c> Compression Mode** can be set to the following sub-menu options:

- <a> Standard
- <b> Low Delay
- <c> Ultra Low Delay

Video Encoder Menu option **<d> Horizontal Resolution** can be set to the following sub-menu options:

- <a> 352
- <b> 480
- <c> 544
- <d> 640
- <e> 704
- <f> 720

Video Encoder Menu option **<e> Aspect Ratio** can be set to the following sub-menu options:

- <a> 4:3
- <b> 16:9

Video Encoder Menu option **<f> GOP Structure** can be set to the following sub-menu options (depending on **<c> Compression Mode**):

- <a> I-Frame
- <b> IP
- <c> IBP
- <d> IBBP
- <e> IB
- <f> IBB

Video Encoder Menu option **<g> GOP Length** can be set to different values at the prompt, `Enter GOP Length?`

The value ranges are dependent upon the **GOP Structure** in use, See *Table 2.10* for permissible range values.

Table 2.10: GOP Structure Vs GOP Length Setting

GOP Structure	GOP Length Setting
<a> I-Frame	1 (fixed)
<b> IP	2 through 12
<c> IBP	4, 6, 8, 10, 12
<d> IBBP	6, 9, 12
<e> IB	2 (fixed)
<f> IBB	3 (fixed)

Video Encoder Menu option **<h> Video Pid** can be set at the prompt, `Enter Video Pid?`

Audio 1 Menu

The **Audio 1 Menu** is accessed from **Main Menu** option **<f>**.

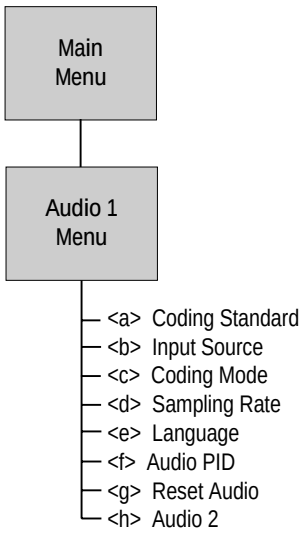


Figure 2.10: Audio 1 Menu Structure

Audio 1 Menu option **<a> Coding Standard** can be set to the following sub-menu options:

- <a> Off
- <b> Linear PCM
- <c> MPEG Layer 2

Audio 1 Menu option **<b> Input Source** can be set to the following sub-menu options:

- <a> Test Tone
- <b> Analogue
- <c> Digital AES
- <d> SDI Embedded 1
- <e> SDI Embedded 2

> NOTE...
> Menu options <d> SDI Embedded 1 refer to Audio Channels 1 and 2 and <e> SDI Embedded 2 refer to Audio Channels 3 and 4.

Audio 1 Menu option **<c> Coding Mode** can be set to the following sub-menu options:

- <a> Stereo
- <b> Joint Stereo
- <c> Dual Mono
- <d> Mono

Audio 1 Menu option **<d> Sample Rate** can be set to the following sub-menu options:

- <a> 32 kHz
- <b> 48 kHz

Audio 1 Menu option **<e> Language** can be set at the prompt,
`Enter Language?`

Audio 1 Menu option **<f> Audio Pid** can be set at the prompt,
`Enter Audio Pid?`

Audio 1 Menu option **<g> Reset Audio** can be set to the following sub-menu options:

- <a> Off
- <b> On

Audio 1 Menu option **<h> Audio 2** will access the **Audio 2** menu options.

Audio 2 Menu

The **Audio 2 Menu** is accessed from **Main Menu** option **<g>**.

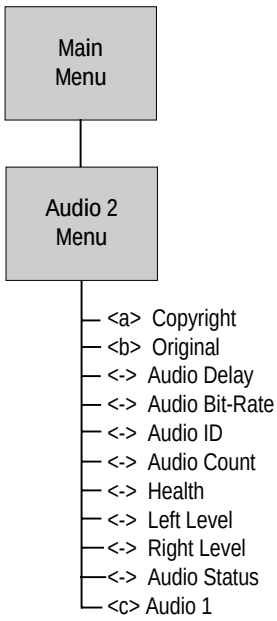


Figure 2.11: Audio 2 Menu Structure

Audio 2 Menu option **<a> Copyright** can be set to the following sub-menu options:

- <a> Off
- <b> On

Audio 2 Menu option **<b> Original** can be set to the following sub-menu options:

- <a> Off
- <b> On

Audio 2 Menu option **<c> Audio 1** will access the **Audio 1** menu options.

Build Information Menu

The **Build Information Menu**is **Main Menu** option **<h>**. This menu displays information on the build status of the unit.

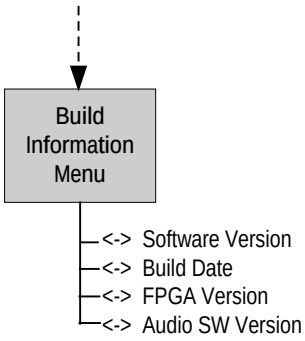


Figure 2.12: Build Information Menu Structure

Test Functions Menu (Password Protected)

The **Test Functions Menu** is **Main Menu** option **<i>**. This menu is password protected for use by TANDBERG Television only.

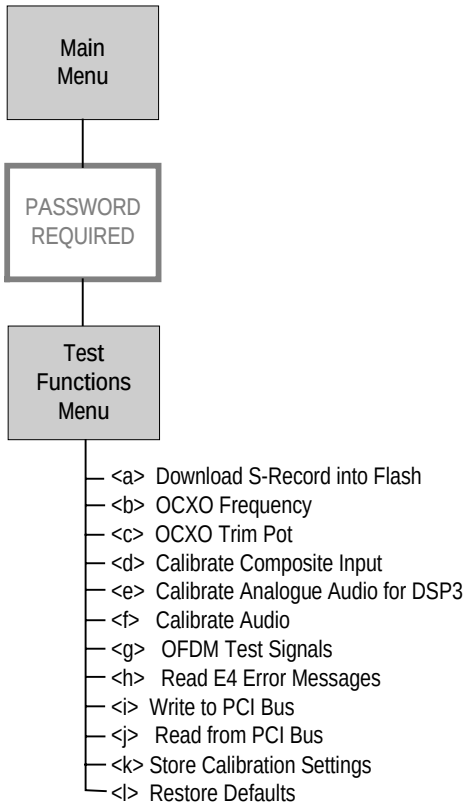


Figure 2.13: Test Functions Menu Structure (Password Protected)

> NOTE...
>
> The defaults will be reset to the values shown in *Table 2.11* as opposed to those in *Table 2.9: Factory Transmission Parameter Settings*.

Option **<l> Restore Defaults**, displays the prompt, `Are you sure you want to Restore Defaults (y/n)?` selecting **<y>** displays `Restoring defaults….` and the restoration process is activated.

Restored Default Configurations

The restored default configuration for all options are shown in *Table 2.11*, unless otherwise indicated.

Table 2.11: Restored Default Configurations

	Service Name	" Service x "
Service	Network Name	" Tandberg Mobile "
	Network ID	65535
	PMT PID	32
	PCR PID	8190
OFDM	Bandwidth	8 MHz
	FEC Rate	2/3
	Modulation Mode	16QAM
	Guard Interval	1/32
	Centre Frequency	70 MHz
	Output Level	-10 dBm
	Spectral Polarity	Normal
Video source	Test Pattern	Bars and Red (625) for options 0 to 4
		Bars and Red (525) for options 5 to 9
	Audio DID	767 (0x2ff)
Video Encoding	Encode	On
	Profile/Level	422P@ML
	Horizontal Res.	720
	GOP structure	IBBP
	GOP length	12
	Video PID	308 (0x134)
Audio	Coding Standard	Off
	Coding Mode	Stereo
	Source	Test tone
	Language	English
	Audio PID	256 (0x100)

Where **x** = configuration option 0 to 9

Operation

Once the Voyager Lite is connected to a suitable input source (i.e. Camera), dc power supply (i.e. Battery or Power Belt) and an appropriate operational configuration has been selected, the unit is ready for use.

Battery power (operational time remaining) can be monitored via the LED Voltage indicator located on the IDX Battery. A Low Voltage Vibration Alarm may also be used.

Chapter 3

Preventive Maintenance and Fault-finding

Contents

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Introduction

This chapter provides the schedules and instructions, where applicable, for routine inspection, cleaning and maintenance of the equipment, which should be performed by an operator. There are also some basic fault-finding procedures to follow in the event of a suspected failure.

Preventive Maintenance

Cooling Fans

> CAUTION...
>
> If the Cooling Fans fail to operate at any time, disconnect the Battery Pack (Power down) and discontinue use of the unit immediately. Failure to do so may cause damage to the unit. Contact TANDBERG Television Customer Services for advice.

Cooling Fans should be operational as soon as power is applied to the unit, i.e. when the Battery Pack is attached. The fans are designed to rotate constantly whilst the equipment is in use.

Cleaning

Disconnect the power supply (Battery Pack) before cleaning the exterior with a moist cloth. Do not use liquid cleaners or aerosol cleaners.

> NOTES...
>
> 1. Only the exterior of the case should be cleaned.
> 2. Ensure that no fluids enter the case.

Servicing

Damage Requiring Service

WARNING...

DO NOT ATTEMPT TO SERVICE THIS PRODUCT AS OPENING OR REMOVING COVERS MAY EXPOSE DANGEROUS VOLTAGES OR OTHER HAZARDS. REFER ALL SERVICING TO SERVICE PERSONNEL WHO HAVE BEEN AUTHORISED BY TANDBERG TELEVISION.

Unplug the equipment from the wall outlet and refer servicing to qualified service personnel under the following conditions:

1. When the power supply is damaged.
2. If liquid has been spilled or objects have fallen, into the product.
3. The product has been immersed in liquid.
4. If the product has been exposed to excessive rain or moisture.
5. If the product does not operate normally by following the operating instructions.
6. If the product has been dropped heavily or the case has been damaged.
7. When the product exhibits a distinct change in performance.

Replacement Parts

When replacement parts are required, be sure the service technician has used parts specified by the manufacturer or which have the same characteristics as the original part. Unauthorised substitutions may result in fire, electric shock or other hazards.

Checks on Completion of Servicing

Upon completion of any service or repairs to this product, ask the service technician to perform safety checks to determine that the product is in a safe operating condition. Also, performance and EMC checks may be required.

Maintenance and Support Services

Introduction

TANDBERG Television is a leader in the design, integration and implementation of digital broadcasting products and systems. It has a large team dedicated to keeping our customers on-air 24 hours a day, 365 days a year.

With regional offices worldwide, and ultra-modern specialist service facilities in the US, UK, Hong Kong and Australia, TANDBERG Television covers the world. There is a customer service centre open round the clock, every day of the year, in your time zone.

TANDBERG's years of design and support experience enable it to offer a range of service options that will meet your needs at a price that makes sense.

It's called the **TANDBERG Advantage**.

Warranty

All TANDBERG Products and Systems are designed and built to the highest standards and are covered under a comprehensive 12 month warranty.

Levels of Continuing TANDBERG Television Service Support

For stand-alone equipment, then TANDBERG Television **BASIC Advantage** is the value for money choice for you.
BASIC provides you with year-by-year Service long after the warranty has
expired.

VOYAGER Advantage is the truly mobile service solution. This provides a service specifically designed to keep you mobile and operational.

More information can be obtained from TANDBERG Television Customer Services; contact information is given in the *Preliminary Pages* of this manual.

Fault-finding

Fault-finding Philosophy

It is the objective of this chapter to provide sufficient information to enable you to rectify apparent faults or to identify the suspect item, where possible. Some basic procedures are provide to follow in the case of a suspected failure.

WARNING...

DO NOT REMOVE THE COVERS OF THIS EQUIPMENT. HAZARDOUS VOLTAGES ARE PRESENT WITHIN THIS EQUIPMENT AND MAY BE EXPOSED IF THE COVERS ARE REMOVED. ONLY SUITABLY QUALIFIED, TRAINED AND APPROVED SERVICE ENGINEERS ARE PERMITTED TO SERVICE THIS EQUIPMENT.

CAUTION...

Do not remove the covers of this equipment. Unauthorised maintenance or the use of non-approved replacements may affect the equipment specification and invalidate any warranties.

This manual does not include any maintenance information or procedures, which would require the removal of covers.

If the following information fails to clear the abnormal condition, call a Service Engineer or contact Customer Services using the information given in the *Preliminary Pages* of this manual.

Preliminary Checks

Always investigate the failure symptoms fully, prior to taking remedial action. Fault diagnosis for the equipment operator is limited to the following tasks, since the operator should **NOT** remove the covers of the equipment:

1. Check the Status LED. If it is not lit:
   a) Check that the dc Battery Pack is in good condition and properly connected.
   b) Check that the dc supply is available at the correct voltage.
2. If the Status LED is green but flashes red, this indicates a video input error and the video set-up should be checked.

3. If the Status LED is red the output has failed. This may be due to a processor error or a failure during booting. It is recommended that the unit is rebooted whilst monitoring for errors using the RS-232 link.
4. Check the Cooling fans are operational. If not, disconnect power and contact TANDBERG Television Customer Services.

Output Frequencies

For operational reasons of the Up-converter board, the following output frequencies should be avoided:

- 2357.8 MHz
- 2358.0 MHz
- 2358.2 MHz
- 2358.4 MHz
- 2358.6 MHz
- 2358.8 MHz
- 2360.0 MHz
- 2360.2 MHz
- 2360.4 MHz
- 2360.6 MHz
- 2360.8 MHz

Modulation Modes

There are some settings that result in a video bit-rate below 3.2 Mbit/s, at which the audio may not function. *Table 3.1* gives examples of settings to avoid. All examples are set in 422P@ML compression mode with standard delay and QPSK Modulation.

Table 3.1: Parameter Settings to Avoid

Guard Interval	FEC Rate	GOP Structure	Video Bit-Rate (Mbit/s)
1/4	1/2	I	2.0904
1/4	1/2	IBBP	2.3689
1/8	1/2	IBBP	2.9100
1/16	1/2	I	2.9400
1/16	1/2	IB	3.1168
1/32	1/2	I	3.1237
1/32	1/2	IBB	3.1725

Incorrect Video Standard

If the applied video source is different to that selected in the configuration (e.g. PAL-B/G/H/I selected but an NTSC source feed is connected) the output will not be properly locked.

The unit will re-lock once the correct source has been selected or the correct feed is connected.

If there is a difference between what is selected and what is connected at initial power on, there may not be a valid output (e.g the display will be either colour bars and red or black, depending on which option is selected under the **Video Source Menu**). Again, when the correct settings are applied, the unit will lock correctly.

Down-converter Models

Depending upon the Down-converter being used in the system the user must choose the correct input settings on the Alteia Receiver (Menu 4, 12/14).

The display on the Down-converter shows different unit types in the first line:

```
AVS Digital ENG RX
Freq. 2400000 kHz
Status: locked
```

This is the original Down-converter model.

The user must therefore select **IF 70 MHz Normal** as the input selection on the Alteia Receiver.

If the Display on the Down-converter shows:

```
AVS DCL 2400 RX
Freq. 2400000 kHz
```

This is the latest Down-converter model.

The user must therefore select **IF 70 MHz Inverted** as the input selection on the Alteia Receiver.

Video Fault-finding

Breaks in Transmission

If a transitory break in transmission occurs then check the encoding mode option of the Unit (see *Chapter 2*).

In the standard and low delay encoding modes, bit-rate and GOP changes are not seamless. This is because the Voyager Lite tries to maintain minimal end-to-end delay (latency) and that means buffer sizes must be as small as possible. In the standard and low delay encoding modes, the buffer size is selected by the video bit-rate. Changing the bit-rate changes the buffer size, requiring a reset of the coding process.

Error Messages

These are accessed using an RS-232 Hyperterminal link, the **Test Functions Menu** is password protected for use by TANDBERG Television only. During boot a number of self-tests are performed. If any of these fail, an error message will be recorded.

Voyager Lite Video System Testing

It is recommended that the Voyager Lite wireless system is first tested with the Transmitter and Receiver in close proximity (3m), to ensure proper interconnection of the Camera and Monitor to the Transmitter and Receiver, respectively. If all interconnections are made correctly, a clear picture should be available on the Monitor. If there is no picture at all, perform the following steps:

1. Check the system performance, minus the wireless video Transmitter and Receiver by directly connecting the Monitor to the Camera with the same cables. This should verify the performance of the Camera and Monitor, as well as verifying that the interconnecting cables are sound.
2. If the verification test detailed in (1.) has been performed, the system is fully reconnected but there is still no picture, check the power supply voltage. If the voltage output of the supply is less than the manufacturer's required voltage, the power supply needs replacement.
3. Check the guard interval and frequency settings. It is recommended that a robust mode is selected:

- QPSK
- FEC 1/2
- Guard Interval ¼

4. Ensure that the Transmitter is using the same channel as the Receiver as is not too close to the receive Antenna.
5. If the system is still not operating after attempting the above steps, the fault must lie within the wireless link. See the Return of Equipment section in the *Preliminary Pages* to contact the manufacturer.

If the Transmitter and Receiver are now placed in the required locations and there is poor picture quality (break-ups, blocking or artefacts) there are several possible reasons and remedies:

- **Exceeding Maximum Range**. Obstructions between the Transmitter and Receiver Antennas will reduce the maximum range quoted by the manufacturer. The distance will vary depending on the nature and number of obstructions encountered. If the operating distance is close to the manufacturer's maximum limit and quality is unacceptably poor, consider using an upgraded Antenna.
- **Interference**. Most other wireless video systems also operate in the ISM bands. It is possible that other wireless devices are operating in the same area. In the majority of cases interference will be temporary. If interference persists, it is recommended that the operating channel be changed. A spectrum analyser may be used to Monitor the interference before the picture breaks.
- **Multipath Reception**. Systems using COFDM modulation are generally less susceptible to multipath interference than conventional broadcast systems that use FM modulation. It can occur however and is dependent on Antenna location and configuration. If unacceptable levels of multipath interference occur, causing signal loss or break-up, higher gain Antennas will often solve the problem.

- **Multi-System Configurations**. In multiple transmission channel systems, simultaneous operation of up to eight systems is possible within the same area of operation. Each system must operate on a separate frequency and the set-up of the complete system should aim for the following:
  - ✧ Low power output (100 mW max)
  - ✧ Directional Antennas if necessary
  - ✧ No interference from other sources (e.g. microwave oven)

Multi System Configuration (Example)

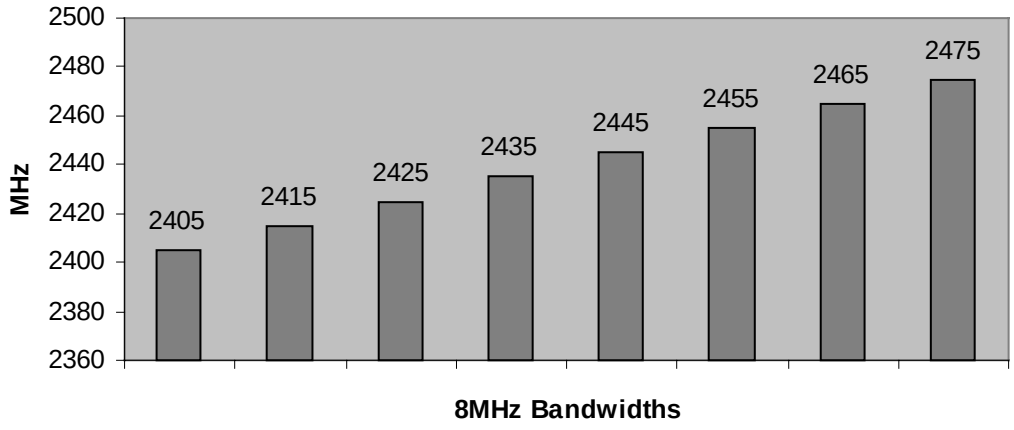

Figure 3.1: Multi System Operation Different Frequencies Within the Same Area (Example)

The potential for interference can be further minimised if directive Antennas are used, such as the TANDBERG Television high gain models. With the Receiver Antenna pointing at the corresponding Transmitter with at least 30 degrees horizontal separation of the transmission paths, the potential interference from adjacent channels will be greatly diminished.

> NOTE...
>
> Due to the difficulty of predicting the susceptibility of any one application to the transmission limitations described above, it is recommended that site testing occur prior to actual installation.

Disposing of the Equipment

Dispose of this and any associated third-party equipment (e.g. Battery Packs) safely at the end of their life. Local codes and/or environmental restrictions may affect disposal. Regulations, policies and/or environmental restrictions differ throughout the world. Contact your local jurisdiction or local authority for specific advice on disposal.

Annex A

Glossary

The following list covers most of the abbreviations, acronyms and terms used in TANDBERG Television Limited Manuals. All terms may not be included in this manual.

4:2:0	Digital video coding method in which the colour difference signals are sampled on alternate lines at half the luminance rate.
4:2:2	Digital video coding method in which the colour difference signals are sampled on all lines at half the luminance rate.
422P@ML	422 Profile at Main Level: A subset of the MPEG-2 standard, which supports digital video storage (DVD etc.) and transmissions up to 50 Mbit/s over various mediums. Used for Contribution and Distribution applications.
Async	Asynchronous.
ATSC	Advanced Television Standards Committee: An organisation founded in 1983 to research and develop a digital TV standard for the U.S.A. In late 1996, the FCC adopted the ATSC standard, the digital counterpart of the NTSC standard.
baud rate	The rate of transfer of digital data when the data comprises information symbols that may consist of a number of possible states. Equivalent to bit-rate when the symbols only have two states (1 and 0). Measured in Baud.
Bit-rate	The rate of transfer of digital data when the data comprises two logic states, 1 and 0. Measured in bit/s.
B-Picture; B-Frame	Bidirectionally Predictive Coded Picture/Frame: A picture that is coded using motion-compensated prediction from previous I or P frames (forward prediction) and/or future I or P frames (backward prediction). B frames are not used in any prediction.
Channel	A narrow range of frequencies, part of a frequency band, for the transmission of radio and television signals without interference from other channels. In the case of OFDM, a large number of carriers spaced apart at precise frequencies are allocated to a channel.
COFDM	Coded OFDM: COFDM adds forward error correction to the OFDM transmission consisting of Reed-Solomon (RS) coding followed by convolutional coding to add extra bits to the transmitted signal. This allows a large number of errors at the receive end to be corrected by convolutional (Viterbi) decoding followed by RS decoding.

Compression	Reduction in the number of bits used to represent the same information. For the purposes of a broadcast system, it is the process of reducing digital picture information by discarding redundant portions of information that are not required when reconstituting the picture to produce viewing clarity. Compression allows a higher bite-rate to betransmitted through a given bandwidth.
Compression System	Responsible for compressing and multiplexing the video / audio / data bit-streams, together with the authorisation stream. The multiplexed data stream is then ready for transmission.
dB	Decibels: A ratio of one quantity to another using logarithmic scales to give results related to human aural or visual perception. dB is a ratio whereas dBm, for example, is an absolute value, quoted as a ratio to a fixed point of 0 dBm. 0 dBm is 1 mW at 1 kHz terminated in 600Ω. 0 dBmV is 1 mV terminated in 75Ω.
Decoder	The unit containing the electronic circuitry necessary to decode encrypted signals. Some Decoders are separate from the Receiver but in satellite TV broadcasting, the term is often used interchangeably as a name for an Integrated Receiver Decoder (IRD). The term IRD, or IRD / Decoder, is usually associated with satellite TV broadcasting while Cable systems are based on Converters or on Set-Top Boxes / Converters.
DID	Data Identifier.
Down-convert	The process by which the frequency of a broadcast transport stream is shifted to a lower frequency range.
DVB	Digital Video Broadcasting: A European project which has defined transmission standards for digital broadcasting systems using satellite (DVB-S), cable (DVB-C) and terrestrial (DVB-T) medium, created by the EP-DVB group and approved by the ITU. Specifies modulation, error correction, etc. (see EN 300 421 for satellite, EN 300 429 for cable and EN 300 744 for terrestrial).
Earth	Technical Earth: Ensures that all equipment chassis within a rack are at the same potential, usually by connecting a wire between the Technical earth terminal and a suitable point on the rack. This is sometimes known as a Functional earth. Protective Earth: Used for electric shock protection. This is sometimes known as a safety earth.
EBU	European Broadcast Union.
EMC	Electromagnetic Compatibility.
ENG	Electronic News Gathering
ERM	Electromagnetic compatibility and Radio spectrum Matters
ETS	European Telecommunications Standard.
ETSI	European Telecommunications Standards Institute.
FCC	Federal Communications Commission.
FDM	Frequency Division Multiplex: A common communication channel for a number of signals, each with its own allotted frequency.
FEC	Forward Error Correction: A method of catching errors in a transmission. The data is processed through an algorithm that adds extra bits and sends these with the transmitted data. The extra bits are then used at the receiving end to check the accuracy of the transmission and correct any errors.
FFT	Fast Fourier Transformation: A fast algorithm for performing a discrete Fourier transform.
FTP	File Transfer Protocol: A protocol used to transfer files over a TCP/IP network (Internet, UNIX, etc.). For example, after developing the HTML pages for a Web site on a local machine, they are typically uploaded to the Web server, using FTP. Unlike e-mail programs in which graphics and program files have to be attached, FTP is designed to handle binary files directly and does not add the overhead of encoding and decoding the data.
GOP	Group of Pictures: MPEG video compression works more effectively by processing a number of video frames as a block. The TANDBERG Television Encoder normally uses a 12 frame GOP; every twelfth frame is an I frame.

IEC	International Electrotechnical Committee.
IF	Intermediate Frequency: Usually refers to the 70 MHz or 140 MHz output of the Modulator in cable, satellite and terrestrial transmission applications.
Interframe Coding	Compression coding involving consecutive frames. When consecutive frames are compared, temporal redundancy is used to remove common elements (information) and arrive at difference information. MPEG-2 uses B and P frames, but since they are individually incomplete and relate to other adjacent frames, they cannot be edited independently.
Intraframe Coding	Compression coding involving a single frame. Redundant information is removed on a per frame basis. All other frames are ignored. Coding of a macroblock or picture that uses information only from that macroblock or picture. Exploits spatial redundancy by using DCT to produce I frames; these are independent frames and can be edited.
I-picture; I-frame	Intracoded Picture/Frame: A picture / frame, which is coded using purely intracoding with reference to no other field or frame information. The I frame is used as a reference for other compression methods.
IRD	Integrated Receiver Decoder: The Receiver with an internal MPEG Decoder, which is connected to the subscriber's TV. The IRD is responsible for receiving and de-multiplexing all signals. The unit receives the incoming signal and if CA is active, decodes the signal when provided with a control word by the viewing card. Domestic IRDs are also known as Set-Top Units or Set-Top Boxes.
ISO	International Standards Organisation.
kbit/s	1000 bits per second.
Kbit	1024 bits, usually refers to memory capacity or allocation.
LED	Light Emitting Diode.
LNB	Low Noise Block Down-Converter: The component of a subscriber satellite transmission receiving dish which amplifies the incoming signal and down-converts it to a suitable frequency to input to the IRD (typically 950 MHz - 1600 MHz).
Mbit/s	Million bits per second.
Motion Estimation	The process of estimating motion vectors in the encoding process.
Motion Vector	A two-dimensional vector used for motion compensation that provides an offset from the co-ordinate position in the current picture or field to the co-ordinates in a reference frame or field.
MP@ML	Main Profile at Main Level: A subset of the MPEG-2 standard, which supports digital video storage (DVD etc.) and transmissions up to 15 Mbit/s over various mediums.
MPEG	Moving Pictures Experts Group: The name of the ISO/IEC working group which sets up the international standards for digital television source coding.
MPEG-2	Industry standard for video and audio source coding using compression and multiplexing techniques to minimise video signal bit-rate in preparation for broadcasting. Specified in ISO/IEC 13818. The standard is split into layers and profiles defining bit-rates and picture resolutions.
NTSC	National Television Systems Committee: The group, which developed analogue standards used in television broadcast systems in the United States. Also adopted in other countries (e.g. Mexico, Canada, Japan). This system uses 525 picture lines and a 59.97 Hz field frequency.
OFDM	Orthogonal FDM: A modulation technique used for digital TV transmission in Europe, Japan and Australia; more spectrally efficient than FDM. In OFDM, data is distributed over a large number of carriers spaced apart at precise frequencies. The carriers are arranged with overlapping sidebands in such a way that the signals can be received without adjacent channel interference.

Packet	A unit of data transmitted over a packet-switching network. A packet consists of a header followed by a number of contiguous bytes from an elementary data stream.
PAL	Phase Alternating Line: A colour TV broadcasting system that uses 625 picture lines and a 50 Hz field frequency. The phase of the colour-difference is inverted on every alternate line to provide consistent colour reproduction.
PCR	Program Clock Reference: A time-stamp in the transport stream from which the Decoder timing is derived.
PES	Packetised Elementary Stream: A sequential stream of data bytes that has been converted from original elementary streams of audio and video access units and transported as packets. Each PES packet consists of a header and a payload of variable length and subject to a maximum of 64 kbytes. A time-stamp is provided by the MPEG-2 systems layer to ensure correct synchronisation between related elementary streams at the Decoder.
PID	Packet Identifier: The header on a packet in an elementary data stream, which identifies that data stream. An MPEG-2 / DVB standard.
P-picture/P-frame	A picture / frame produced using forward prediction. It contains predictions from either previous I frames or previous P frames. The P frame is used as a reference for future P or B frames.
Program	PC - A sequence of instructions for a computer. TV - A concept having a precise definition within ISO 13818-1 (MPEG-2). For a transport stream, the timebase is defined by the PCR. The use of the PCR for timing information creates a virtual channel within the stream.
Programme	A linking of one or more events under the control of a broadcaster. For example, football match, news, film show. In the MPEG-2 concept, the collection of elementary streams comprising the programme, have a common start and end time. A series of programmes are referred to as events.
PSK	Phase Shift Keying: A method of modulating digital signals particularly suited to satellite transmission.
PSU	Power Supply Unit.
QAM	Quadrature Amplitude Modulation: A method of modulating digital signals, which uses combined techniques of phase modulation and amplitude modulation. It is particularly suited to cable networks.
QPSK	Quadrature Phase Shift Keying: A form of phase shift keying modulation using four states.
RF	Radio Frequency.
RS	Reed-Solomon coding: An error detection and correction, coding system. 16 bytes of Reed-Solomon Forward Error Correction code are appended to the packet before transmission bringing the packet length to 204 bytes. The 16 bytes are used at the receiving end to correct any errors. Up to eight corrupted bytes can be corrected.
SAR	Spectral Absorption Ratio
SDI	Serial Digital Interface
SELV	Safety Extra Low Voltage (EN 60950).
Transport Stream	A set of packetised elementary data streams and SI streams, which may comprise more than one programme, but with common synchronisation and error protection. The data structure is defined in ISO/IEC 13818-1 [1] and is the basis of the ETSI Digital Video Broadcasting standards.
Upconvert	The process by which the frequency of a broadcast transport stream is shifted to a higher frequency range.
VBS	Video Broadcast Signal
XILINX	A type of programmable Integrated Circuit.

Annex B

Technical Specification

Contents

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Inputs

Audio

Analogue and Digital Audio

Table B.1: Audio Specification

Item	Specification
Safety status:	SELV
Connector designation:	AUDIO IN
Connector type:	XLR, 3 pin male
Encoding standard:	MPEG-2 ISO/IEC 13818-3 (layer 2)
Analogue Input	Balanced analogue
Clip level:	12 dB or 18 dB (selectable by customisation of link settings)
Input impedance:	600 Ω or 20 kΩ (selectable by customisation of link settings). 600 Ω = default
Digital Input	AES/EBU digital
Sampling rate:	32 kHz or 48 kHz
Input rate:	32 kHz or 48 kHz
Supported Coding modes:	Dual channel, normal stereo, Single Channel, Joint Stereo
Termination:	110 Ω
Coding standard(1):	MPEG-1 (Layer 2) – Musicam
Coded data rate:	32 kbit/s – 384 kbit/s
Coding standard(2):	Linear Audio (SMPTE 302M)

Highly accurate lipsync (<5ms accuracy) – 30ms < +10ms.

Embedded Audio

Two groups are specified 1 and 2. Each group contains two stereo pairs, hence the SDI can carry a maximum of eight stereo pairs (4 groups x 2 stereo pairs) or 16 mono channels (4 x 2 x 2).

Table B.2: SDI Embedded Audio Specification

Item	Specification
Safety status:	SELV
Connector designation:	SDI IN
Connector type:	75 Ω BNC socket
Input standard:	SMPTE 272M-A

Video

SDI

Table B.3: Serial Digital Video Specification

Item	Specification
Safety status:	SELV
Connector designation:	SDI IN
Connector type;	75 Ω BNC socket
Input standard (UK/EC):	ITU-R BT.656.4 Part 3, Bit Serial Interface 4:2:2 YC_RC_B
Input standard (USA):	ANSI / SMPTE 259M Level C - 270 Mbit/s, 525/625 component
Cable length:	250 m, maximum
Input level:	800 mV pk-pk nominal ±10%
Return loss:	Better than –12 dB, 10-270 MHz

Composite

Table B.4: Composite Video Input Specification

Item	Specification
Safety status:	SELV
Connector designation:	COMPOSITE IN
Connector type:	75 Ω BNC socket
Analogue input:	PAL B/D/G/H/I/M or NTSC-M (with or without pedestal)
Input impedance:	75 Ω
Input level:	1 V pk-pk nominal ±5%
Return loss:	Better than -25 dB up to 6 MHz

Output

Table B.5: RF OUT (2.1 – 2.5 GHz) Connector Specification

Item	Specification
Safety status:	SELV
Connector type:	50 Ω SMA (female)
Connector designation:	RF OUT

Table B.6: RF OUT (2.1 – 2.5 GHz) Signal Information

Bandwidth (manual band plan)	6 MHz, 7 MHz, 8 MHz OFDM Modulation ETS 300 744. (See NOTE…)
Max. Output Power	200 mW with 10 dB gain control
Modulation Mode	QPSK, 16QAM
Guard Interval	1/32, 1/16, 1/8 or1/4
FEC Rate	1/2, 2/3, 3/4, 5/6, or 7/8
Transmission	2k Mode
Spectral Polarity	Normal or Inverse

NOTE...
Early Receiver models do not support 6 MHz or 7 MHz Bandwidth.

Control and Monitoring

Local Control

Local control is by means of the 10-way Selector Switch.

RS-232

Table B.7: RS-232 Specification

Item	Specification
Safety status	SELV
Connector designation	-
Connector type:	3.5 mm Jack Plug
Baud rate:	19200, 115200 Baud asynchronous (selectable by customisation of link settings)
Configuration:	DCE
Specification:	Complies with TIA/EIA-232E (RS-232)/ITU-T V.24/V.28

Test Tone

Table B.8: Test Tone Specification

Item	Specification
Level:	- 3.3 dB (internal digital source)
Frequency:	1 kHz at 48 kHz sampling frequency

Test Patterns

Table B.9: Test Patterns

Pattern	Manual Selection	Auto on Loss of Video
Bars and Red (525 line)	Yes	Yes
Bars and Red (625 line)	Yes	Yes

DC Power Supply

The only power unit currently used by the Voyager Lite Encoder is a rechargeable dc Battery Pack with voltage supply in the range 10.2 to 19.0 Vdc.

Table B.10: DC Power Supply Specification

Item	Specification
Rated Voltage:	10.2 – 19.0 Vdc supplies only. Nominal 14.5 Vdc.
Connector:	4 pin Jaeger plug
Power Consumption:	Up to 50 W

Physical Details

The specification of the outer casing may vary, but will always fit within the Backpack designed for use with the Voyager Lite.

Table B.11: Physical Details

Item	Specification
Height:	55 mm
Width:	305 mm
Depth:	156 mm
Approximate weight:	2.1 kg

Environmental Conditions

Table B.12: Environmental Specification

Item	Specification
Operational	
Temperature:	-10 °C to + 40 °C (14 °F to 104 °F) Ambient, with free air-flow
Relative Humidity:	0% to 90% (non-condensing)
Cooling requirements:	Cool air is drawn in through vents in the bottom panel and exhausted through vents in the top panel.
Handling/movement:	Designed for mobile use with Backpack
Ventilation:	Fans are located with the unit utilising bottom air intakes and top exhaust vents
Storage/Shipment	
Temperature:	- 20°C to +60 °C
Relative Humidity:	0% to 90% (non-condensing)

Receive System

VLA 2404 LP Omni-directional Antenna (Linear Polarization)

Table B.13: VLA 2404 LP Specification

Item	Specification
Electrical	
Frequency Range:	2300 – 2500 MHz
Impedance:	50 Ω
VSWR	1.5
Polarization:	linear
Gain:	4 dBi
3 dB beamwidth vertical:	25°
3 dB beamwidth horizontal:	360°
Permitted power on entrance:	75 W (CW) at 25°
Standard Connector:	SMA (female)
Mechanical	
Dimensions:	43 x 95 mm
Weight:	0.3 kg
Housing material:	ASA
Antenna colour:	RAL 7035 (grey)
Operating Temperature range:	- 40°C to +80 °C

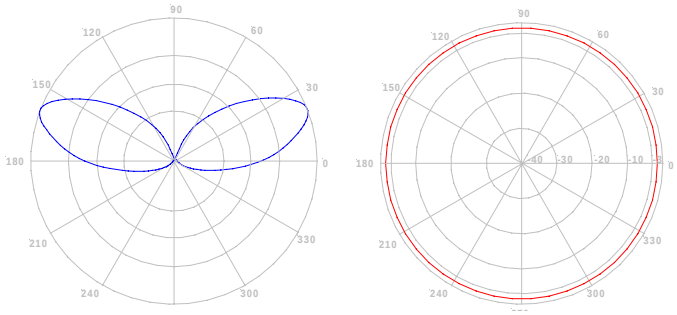


Figure B.1: VLA 2404 LP Antenna Polarization

VLA 2405 LP Omni-directional Antenna (Linear Polarization)

Table B.14: VLA 2405 LP Specification

Item	Specification
Electrical	
Frequency Range:	2300 – 2500 MHz
Impedance:	50 Ω
VSWR	1.5
Polarization:	linear
Gain:	5.15 dBi
3 dB beamwidth vertical:	38°
3 dB beamwidth horizontal:	360°
Permitted power on entrance:	50 W (CW) at 25°
Standard Connector:	N (female)
Mechanical	
Dimensions:	300 x 35 mm
Weight:	0.3 kg
Housing material:	Polycarbonate
Antenna colour:	White
Operating Temperature range:	- 40°C to +80 °C

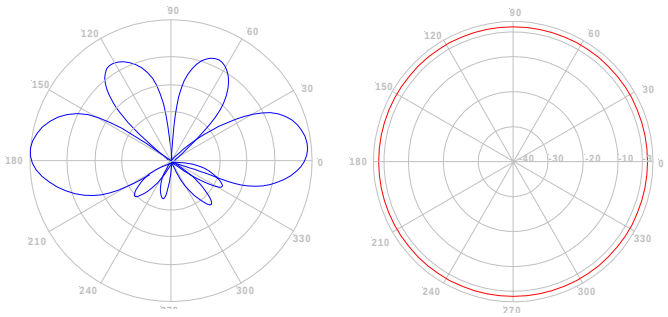


Figure B.2: VLA 2405 LP Antenna Polarization

VLA 2408 LP Omni-directional Antenna (Linear Polarization)

Table B.15: VLA 2408 LP Specification

Item	Specification
Electrical	
Frequency Range:	2300 – 2500 MHz
Impedance:	50 Ω
VSWR	1.5
Polarization:	linear
Gain:	8.15 dBi
3 dB beamwidth vertical:	10°
3 dB beamwidth horizontal:	360°
Permitted power on entrance:	100 W (CW) at 25°
Standard Connector:	N (female)
Mechanical	
Dimensions:	1000 x 80 mm
Weight:	0.8 kg
Housing material:	Fibreglass
Antenna colour:	White
Operating Temperature range:	- 40°C to +80 °C
Wind load:	36 N at 150 km/h (kph)

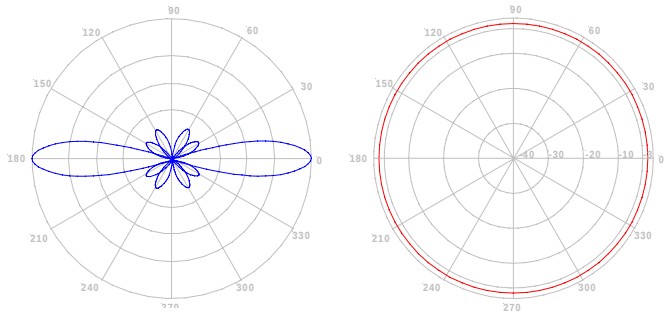


Figure B.3: VLA 2408 LP Antenna Polarization

VLA 2409 CP-R Planar Antenna (Circular Polarization)

Table B.16: VLA 2409 CP-R Specification

Item	Specification
Electrical	
Frequency Range:	2300 – 2500 MHz
Impedance:	50 Ω
VSWR	1.5
Polarization:	Circular, right
Gain:	8 dBi
3 dB beamwidth vertical:	65°
3 dB beamwidth horizontal:	70°
Front to back ratio:	20 dB
Permitted power on entrance:	75 W (CW) at 25°
Standard Connector:	SMA (female)
Mechanical	
Dimensions:	101 x 95 x 32 mm
Weight:	115 g
Housing material:	ASA
Antenna colour:	RAL 7035 (grey)
Mounting bracket colour:	RAL 7042 (dark grey)
Operating Temperature range:	- 40°C to +80 °C
Wind load:	24 N at 200 km/h (kph)

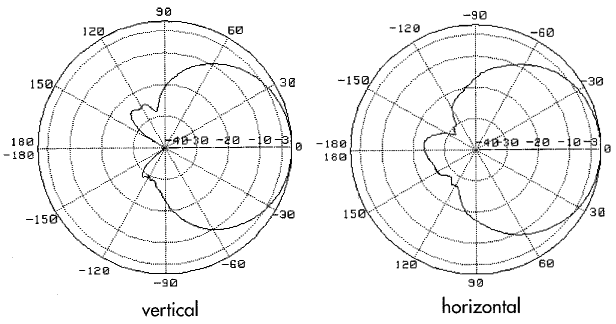
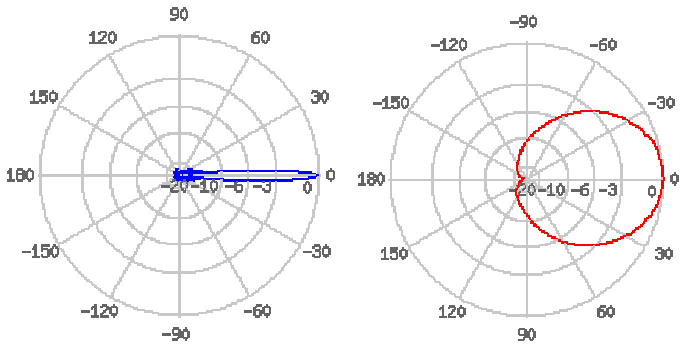


Figure B.4: VLA 2409 CP-R Antenna Polarization

VLA 2417 LP Directional Antenna (Linear Polarization)

Table B.17: VLA 2417 LP Specification

Item	Specification
Electrical	
Frequency Range:	2300 – 2500 MHz
Impedance:	50 Ω
VSWR	1.5
Polarization:	Linear, vertical
Gain:	16.5 dBi
3 dB beamwidth vertical:	6°
3 dB beamwidth horizontal:	85°
Permitted power on entrance:	100 W (CW) at 25°
Standard Connector:	N (female)
Mechanical	
Dimensions:	1220 x 85 x 35 mm
Weight:	2.1 kg
Housing material:	ASA
Antenna colour:	RAL 7035 (grey)
Operating Temperature range:	- 40°C to +80 °C
Wind load:	75 N at 160 km/h (kph)



Vertical Horizontal

Figure B.5: VLA 2417 LP Antenna Polarization

VLA 2417 CP-R Planar Antenna (Circular Polarization)

Table B.18: VLA 2417 CP-R Specification

Item	Specification
Electrical	
Frequency Range:	2300 – 2500 MHz
Impedance:	50 Ω
VSWR	1.5
Polarization:	Circular, right
Gain:	16.5 dBi
3 dB beamwidth vertical:	25°
3 dB beamwidth horizontal:	27°
Axial ratio:	3 dB
Front to back ratio:	30 dB
Permitted power on entrance:	50 W (CW) at 25°
Standard Connector:	SMA (female)
Mechanical	
Dimensions:	340 x 273 x 20 mm
Weight:	1 kg
Housing material:	ASA
Antenna colour:	RAL 7035 (grey)
Operating Temperature range:	- 40°C to +80 °C
Wind load:	288 N at 200 km/h (kph)

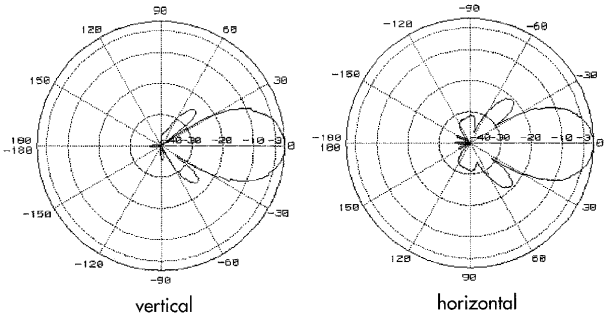


Figure B.6: VLA 2417 CP-R Antenna Polarization

VLA 2418 CP-R Planar Antenna (Circular Polarization)

Table B.19: VLA 2417 CP-R Specification

Item	Specification
Electrical	
Frequency Range:	2300 – 2500 MHz
Impedance:	50 Ω
VSWR	1.5
Polarization:	Circular, right
Gain:	18 dBi
3 dB beamwidth vertical:	20°
3 dB beamwidth horizontal:	20°
Axial ratio:	1.5 dB
Front to back ratio:	30 dB
Permitted power on entrance:	50 W (CW) at 25°
Standard Connector:	SMA (female)
Mechanical	
Dimensions:	453 x 386 x 20 mm
Weight:	1.5 kg
Housing material:	ASA
Antenna colour:	RAL 7035 (grey)
Operating Temperature range:	- 40°C to +80 °C
Wind load:	543 N at 200 km/h (kph)

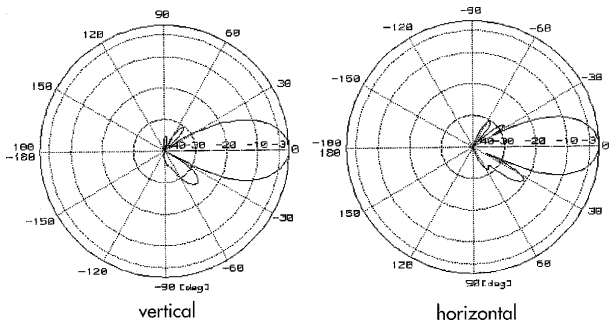


Figure B.7: VLA 2418 CP-R Antenna Polarization

LNA2420-06Fw Low Noise Pre-amplifier

Table B.20: LNA2420-06Fw Low Noise Pre-amplifier Specification

Item	Specification
Electrical Properties	
Frequency Range:	2.3 to 2.5 GHz
Noise Figure:	0.9 dB (typical)
Gain:	> 20 dB
Operating Conditions	
Operating Temperature range:	- 5°C to +55 °C (23°F to 131 °F)
Storage Temperature range:	- 40°C to +60 °C (-40°F to 140 °F)
Relative humidity:	0 % - 90 % (non condensing)
Physical and Power	
Dimensions (W x D x H):	175 x 100 x 60 mm
Approximate Weight:	0.8 kg
Power:	12 Vdc 250 mA (typical)

PA2406D-12V Power Amplifier

Table B.21: PA2406D-12V Power Amplifier Specification

Item	Specification
Input	
Power Level:	+15 dB or 0 dB (AGC)
Connector:	N - SMA
Output	
Power Level:	+36 dBm (typical) – Actual is bandwidth dependant
Connector:	N - Female
IP3:	+56 dBm
Bandwidth:	Bandwidth on request (up to 500 MHz)
Frequency:	2.1 GHz to 2.6 GHz
Impedance:	50 Ω
Operating Conditions	
Operating Temperature range:	- 20°C to +45 °C (-4 °F to 113 °F)
Storage Temperature range:	- 30°C to +70 °C (-22°F to 158 °F)
Relative humidity:	0 % - 95 % (non condensing)
Physical and Power	
Dimensions (W x D x H):	340 x 150 x 80 mm
Approximate Weight:	4.5 kg
Power:	12 Vdc 4.4 A (typical)
Connector:	3-pin cannon (single coaxial option available)

DENG Down-converter

Table B.22: DENG Down-converter Specification

Item	Specification
Input	
RF Input:	2.1 to 2.6 GHz tuneable in 500 kHz steps (other frequencies available)
Max. RF-Level:	+5 dBm
Sensitivity:	-105 dBm (QPSK mode) with Alteia *plus* DENG Receiver
RF Bandwidth:	10 MHz
VSWR:	1.25:1 max
Impedance:	50 Ω
Connector:	N-female (with power supply for LNA)
Output	
IF Output:	70 MHz
Max IF-Level:	+15 dBm
VSWR:	1.25:1 max
Impedance:	75 Ω
Connector:	BNC-female
Phase Noise	-80 dBc/Hz at 5 kHz from carrier
Monitoring and Control	LCD Display RS-232 Interface
Operating Conditions	
Operating Temperature range:	0°C to +40 °C (32 °F to 104 °F)
Storage Temperature range:	0°C to +70 °C (32°F to 158 °F)
Relative humidity:	90 % (non condensing)
Physical and Power	
Dimensions (W x D x H):	490 x 440 x 89 mm (1U, 19-inch rack mountable case)
Approximate Weight:	4.0 kg
Power Supply:	220 to 240 Vac (50 – 60 Hz) 70W

DENG Portable Receiver

Table B.23: DENG Portable Receiver Specification

Item	Specification
Input	
Frequency:	2.1 to 2.6 GHz
Max. RF-Level:	+5 dBm
RF Bandwidth:	8 MHz
Impedance:	50 Ω
Output	
Analogue Video:	Composite PAL/NTSC
Analogue Audio:	(3XLR, balanced (male))
Features:	MPEG-2 4:2:0MP@ML Bit-rate Range 1.5- 15 Mbit/s MPEG Layer II audio encoding standard, encoding rates 32 kbit/s to 384 kbit/s (Musicam)
Modulation	8 MHz COFDM de-modulation to ETS 300744
Features:	Selectable Guard Interval and FEC Bit-rate range 5 to 21 Mbit/s for 8 MHz DVB-T transmission
Monitoring and Control	
Local Control:	Front Panel and channel selector switch
Remote Control:	Remote Control via RS-232 full control of frequency configurations
Monitoring:	Front LED bar graph field strength indicator
Operating Conditions	
Operating Temperature range:	0°C to +40 °C (32 °F to 104 °F)
Relative humidity:	5 – 95 %
Physical and Power	
Dimensions (W x D x H):	210 x 430 x 20 mm
Approximate Weight:	7.1 kg
Power Input:	10 to 15 Vdc; 50 VA

Compliance[1]

Safety

This equipment meets the requirements of the following:

EN 60950	European	Safety of information technology equipment including business equipment.
IEC 60950	International	Safety of information technology equipment including business equipment.

In addition, the equipment has been designed to meet the following:

UL 1950	USA	Safety of information technology equipment including business equipment.

SAR Testing

The equipment has been tested to Federal Communications Commission (FCC) standards for Spectral Absorption Ratio (SAR) effects on the body. Test specifications:

Supplement C (Edition 01-01) to OET Bulletin 65 (Edition 97-01)

Draft IEEE Std 1528-200X: Version 6.4: July 2001

> NOTE...
>
> The Cetecom logo applies only if the Voyager Lite is used with the Backpack and the integrated antennas remain unchanged from the form in which they were supplied

[1] The version of the standards shown is that applicable at the time of manufacture.

Statement of SAR Compliance

> NOTE...
>
> Important: this applies only when used with the Voyager Lite Backpack and the integrated Backpack diversity antennas.

The SAR values achieved by the video transmitter Voyager Lite, are below the maximum recommended levels of 1.6W/kg as averaged over any 1g tissue according the FCC rule §2.1093, the ANSI/IEEE C 95.1:1999 and the NCRP Report Number 86 for uncontrolled environment.

EMC[2]

The equipment meets the requirements of the following:

EN 301 489-3 Part 3	Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 3: Specific conditions for Short-Range Devices (SRD) operating on frequencies between 9 kHz and 40 GHz.

Use of Spectrum

Two variants of the unit may be shipped. The first variant complies with the following standard:

EN 300 440-2	Electromagnetic compatibility and Radio spectrum Matters (ERM); Short range devices; Radio equipment to be used in the 1 GHz to 40 GHz frequency range; Part 2: Harmonized EN under article 3.2 of the R&TTE Directive

The second variant will be supplied with documentation detailing a configuration, which will apply a standard relevant to the unit's jurisdiction of use.

[2] The EMC information was correct at the time of manufacture.

CE Marking

The CE mark is affixed to indicate compliance with the following directive:

1999/5/EC of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity.

Units with the CE and Alert Marks are Class 2 devices under the RTTE Directive and have restrictions on the areas in which they may be operated. See the model specific information sheet for details.

Units with the CE Mark, but without the Alert Mark, conform to EN 300 440-2 and are limited to operation within the 2.4 GHz harmonised frequency band. There are no restrictions on the areas within the EU in which they may be operated.

> NOTE...
> The CE mark was first affixed to this product in 2001.

RTTE Directive

Hereby, TANDBERG Television, declares that Voyager Lite is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.

Shock and Vibration

Voyager Lite meets the requirements of ETS 300 019-2-5 for shock and vibration.

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The following conventions are used in this manual: a page number entry in **bold** indicates a reference to a heading; a page number entry in *italic* is a reference to a table or figure; otherwise the page number indicates a reference to an entry on that page.

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