



Viewlock II Product Specification

Groupe Arck Ingénierie

- **Highly Secure** - full line cut & rotate video scrambling with user programmable encryption keys
- **PAL and NTSC compatible** (auto detect)
- **Excellent level of picture concealment**
- **Ideal for covert installations** - small, rugged and weatherproof encoders / decoders
- **Low current consumption** - less than 55 mA from 12 Volts DC
- **Excellent decoded picture quality** - exceeds ITC outside broadcast specifications.
- **Optimised for use with video surveillance links** - Very robust, operates well in poor reception conditions



1.0 Introduction

The Viewlock II video encryption system has been specifically designed to protect microwave surveillance links from interception where sensitive information is being transmitted.

Viewlock II utilises line cut and rotate scrambling, offering a very high level of picture concealment coupled with excellent security. The encryption has been designed to be very robust and is tolerant to the problems associated with microwave links in marginal reception conditions such as multipath and noise. These features, coupled with its small size and low DC power consumption, make Viewlock II the ideal system for protecting covert security links without a significant loss in range or operability even in difficult environments.

The system consists of an encoder and decoder housed in small, fully weatherproofed cases, operating from a DC supply of 6 to 32 Volts. Current consumption is less than 55 mA at 12 volts, so the units may be battery operated if required. Viewlock II offers excellent decoded picture quality and incorporates full 8 bit digital processing in both the encoders and decoders and the system exceeds ITC outside broadcast specifications.

Viewlock II incorporates a dedicated chip (ASIC) which has been developed by Ovation Systems to perform all the encoding / decoding functions in one unit. The use of an ASIC allows the system to be highly integrated improving size, current consumption and security.

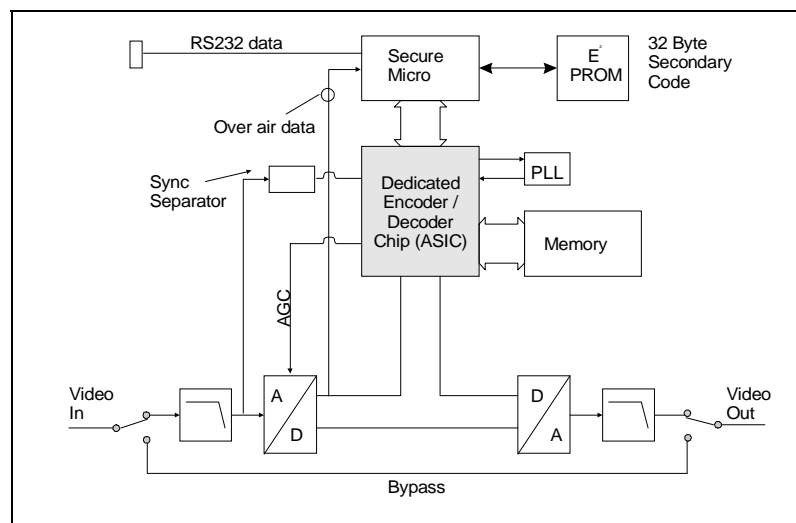


Figure 1: Block Diagram of the Viewlock II Encoder / decoder

The Viewlock II system has been designed so both the encoder and decoder are of the same basic architecture. Indeed, it is possible to configure any Viewlock II unit to be either an encoder or decoder simply by adjusting an internal DIP switch. Please refer to Figure 1 above showing an outline block diagram of the Viewlock II encoder / decoder.

2.1 Video Scrambling

Video enters the encoder and is digitised using an 8 bit A to D converter. The video is then manipulated in the digital domain to produce a random cut and rotate of each video line. This is achieved by choosing a cut point during the active video line and then presenting the last segment of the line to the output first, followed by the first segment. Proprietary techniques are used to help the system reconstitute the original line information within the decoder which improves the robustness of the scrambling. Viewlock II is able to automatically detect a 625 line or 525 input and configure itself accordingly, without the need of intervention by the user.

The line cut rotate scrambling method has the advantage of keeping all the horizontal and vertical video sync information in its original position whilst completely obscuring the source video. This ensures the scrambled signal is compatible with PAL or NTSC standards, especially important with transmission systems that employ black level clamping.

To ensure the decoder is always operating at its optimum performance, it is able to automatically compensate for up to a $\pm 15\%$ variation in video input level, through an AGC system. Even if the video input outside this range, the decoder will still function from levels of 0.5 to 1.5 Vpp, again showing the robustness of the system.

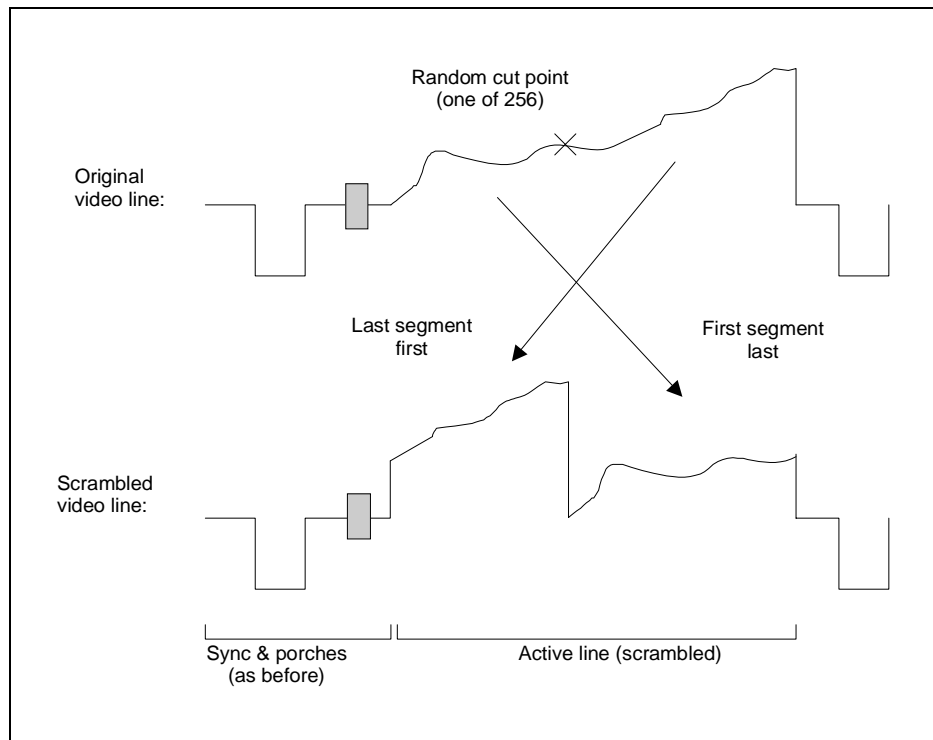


Figure 2: Line cut and rotate scrambling



Decoded Picture



Scrambled Picture

2.2 Security

Viewlock II uses proprietary algorithms held in a secure microcontroller to manipulate the video lines. The algorithm, seeded by a private key set buried within the microcontroller, produces a random sequence of line cut positions. Viewlock II uses a 32 bit primary key, so there are a minimum of 2^{32} , or over 4.3 billion, possible combinations before a cut sequence is repeated. It is therefore very difficult (impossible) to predict which cut point and sequence will be used next, as there are so many possible combinations. Furthermore, at power up, Viewlock II starts a completely random point within the sequence by generating a random 32 bit word by taking the least significant bit of 32 video samples.

The encoder and decoder are synchronised by an encrypted over-the-air data channel, sent over one of the video's unused vertical blanking interval (VBI) lines. Both the encoder and decoder must have the same private key sets to allow the system to decode. Key sets are programmed at the factory and may be allocated to single encoder / decoder pairs or to groups of units as required.

To improve the security even further it is possible for the user to download a secondary key (or code set) of 32 bytes held in E²PROM, over the RS232 port. This code set is then used to randomise the cut sequences by a further 2^{256} possibilities, resulting in a possible 2^{288} combinations ($\sim 4.7 * 10^{86}$). This facility has the advantage of ensuring that even in the unlikely event of a decoder lost or stolen, a fundamental part of the sequence generation can be easily reprogrammed to a new code set, which will only be known by legitimate users.

3.0 Installation and Operation

The Viewlock II system is very easy to set up and install. Video input and output is via standard BNC connectors, DC power via a professional Lemo connector. The units are fully weatherproofed to IP65 and therefore are suitable for long term outdoor operation if required. The video interface is standard 1 Vpp 75Ω and system will automatically configure itself for 525 line NTSC or 625 line PAL operation.

The DC power requirement is from 6 to 32 Volts, with a current consumption of around 55 mA at 12 Volts. The current consumption reduces with increasing input voltage as Viewlock II incorporates a DC to DC converter to offer the widest possible DC operating voltage range.

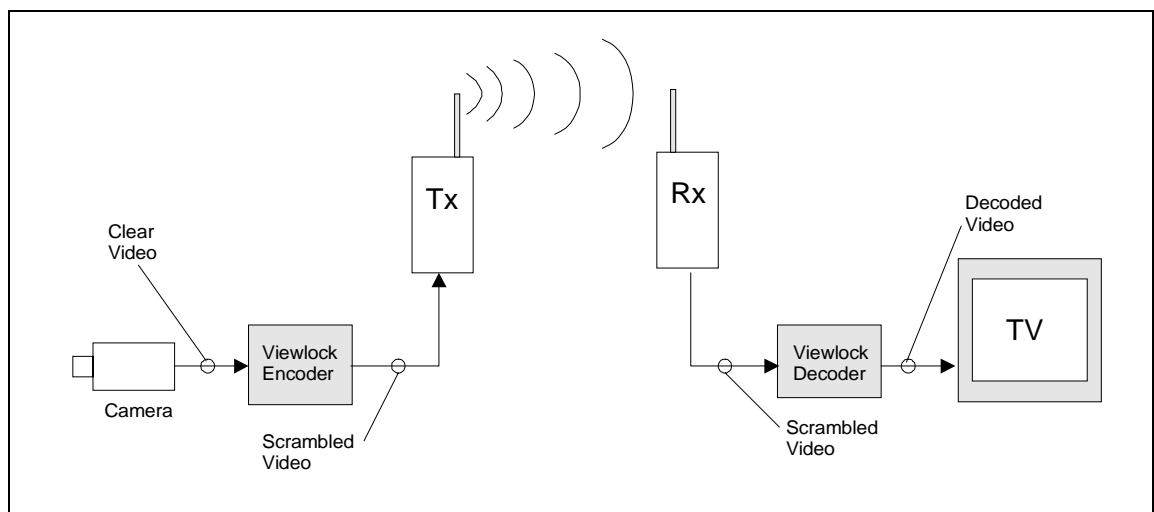
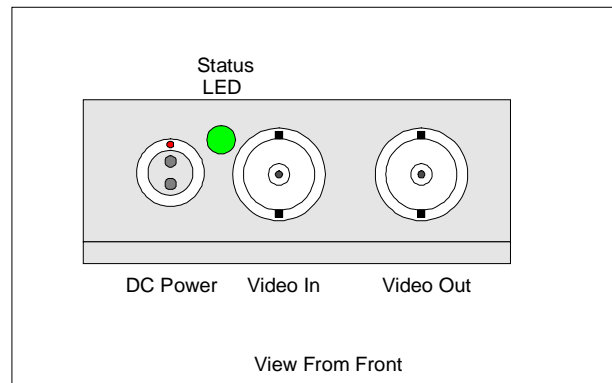


Figure 3 : Typical Viewlock II Installation



A single flashing indicator on the front panel shows the status of the unit:-

- Flashing green: Encoding or decoding is Ok
- Flashing red: Video connected but unable to encode / decode
- Static red: Unit is a decoder with no video input.
- Static green: Unit is an encoder with no video input.

As standard Viewlock II has an onscreen display which displays "SECURE" when decoding correctly and "INSECURE" when the video is either clear or not decodable. To aid fault finding, Viewlock will display a "NO VIDEO" message if video is not present at the encoder's input and display "NO LINK" if there is video input to the decoder.

If either the encoder or decoder is unable to process the video, or if the power fails, the video input is bypassed directly to the output. This is achieved by an internal low power relay, so the bypass operation is fail safe. In some situations it is not desirable to transmit video that is not scrambled under any circumstances, in these cases it is possible to disable the bypass function.

4.0 Options

There are a number of options available for the Viewlock II system that enhance its functionality when used in microwave surveillance applications.

4.1 Audiolock II

In the same package size, Viewlock II may be upgraded to carry two scrambled audio channels along side the scrambled video. Audiolock II digitises the incoming audio and scrambles the resulting bit stream. The digital audio is then transported from the encoder to the decoder by adding data to unused video lines within the vertical blanking interval, resulting in a very secure audio transmission. Audiolock II may be configured to carry one audio channel of 15 kHz bandwidth or two channels of 7.5 kHz. To improve the signal to noise performance of the system, adaptive differential pulse code modulation (ADPCM) is used, providing an excellent S/N specification of > 60 dB (weighted).

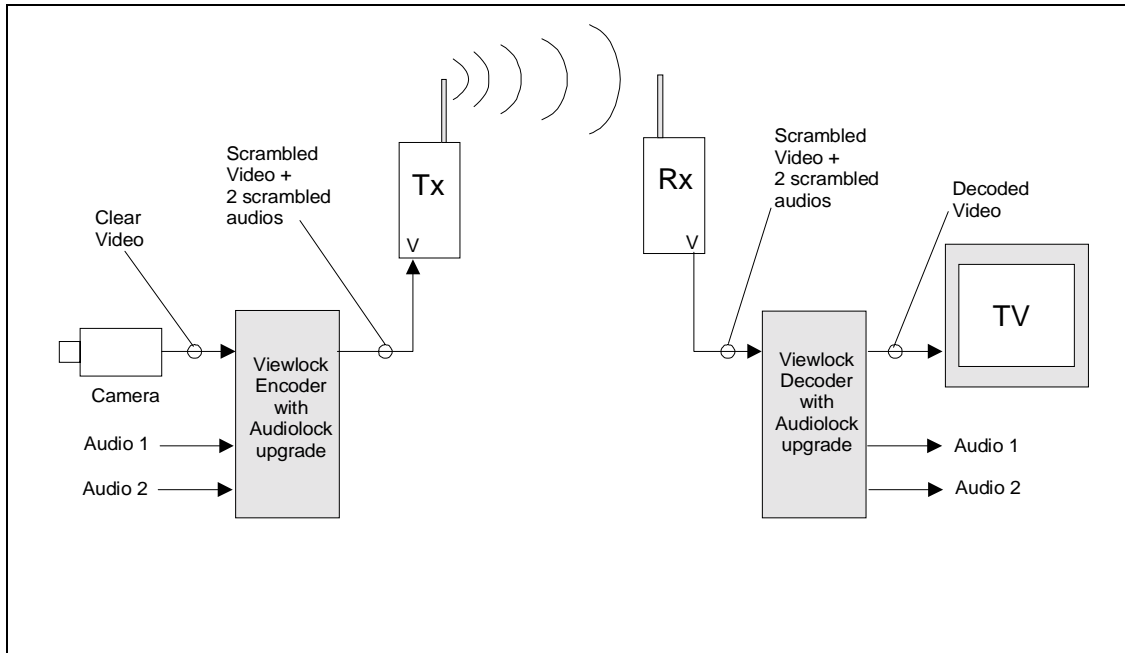


Figure 4: Typical Audiolock II Installation

4.2 IBM PC Control / Configuration Software

Viewlock II has an RS232 port which can be used to configure / control the system. In the case of the standard (video only) unit, the RS232 connector is exposed by removing the cover of the unit.

The software allows the user to configure the following main parameters, for example:

- Re-program the secondary code set (32 bytes)
- Program the on-screen display (OSD)
- Reset Viewlock II to the default settings
- Change the VBI line used for the over-the-air data channel

5.0 Specifications

Encoder to decoder connected back to back

General:

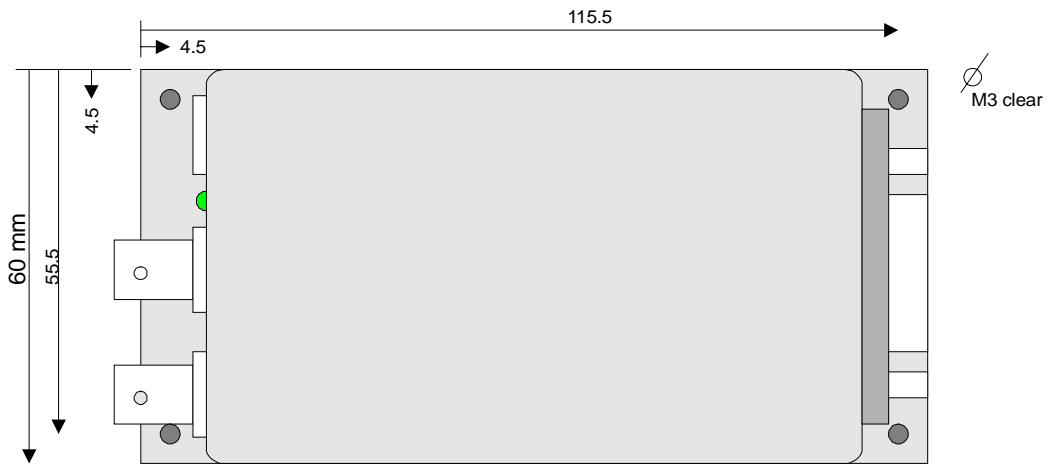
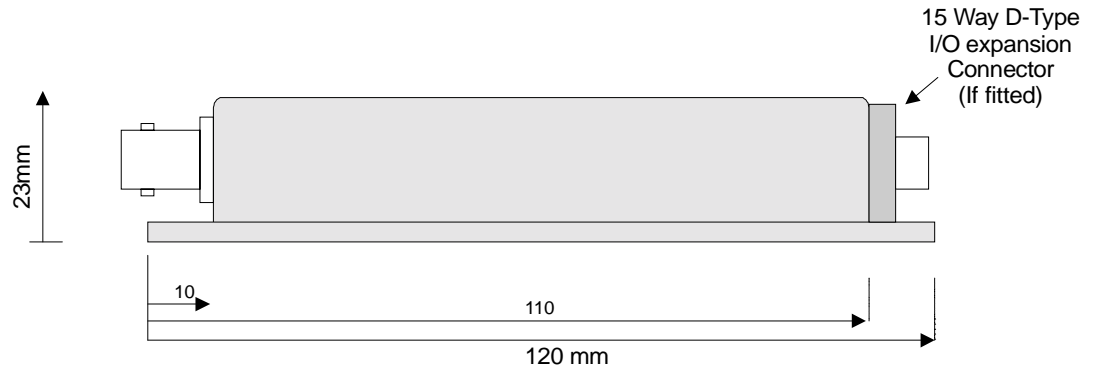
Operating temperature range	-10 to +70°C
Mechanical size	130 x 60 x 22 mm
Finish	Hard black anodised aluminium
Weight	220g (approx.)
Video input / output connectors	BNC
DC power connector	2 pin Lemo
DC power requirements	6 to 32 V DC
Current consumption	< 55 mA at 12 volts
EMC compliance	European: EN55022:1994 class A EN50082-1:1992 US: FCC part 15B class A
Standard accessories	User guide, power leads, carrying case

Video:

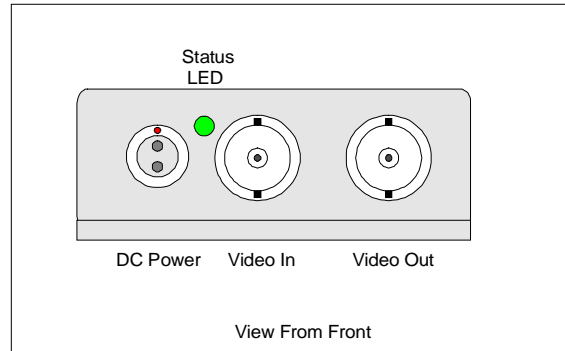
Scrambling method	Line cut and rotate
Number of cut points	256
Video standard supported	PAL, SECAM & NTSC 625 & 525 lines
Video standards switching	Auto sense
Video input / output	1 Vpp into 75 Ω , \pm 10 %
Digital sampling	8 bits @ 19.75 MHz
Video bandwidth	6Mhz @ -1dB, 8 MHz @ -3dB
Signal to noise	> 55 dB (60dB typ) weighted
Differential gain	< \pm 4%
Differential phase	< \pm 5degrees
Luminance non-linearity (5 step)	< \pm 4%
Chrominance / luminance delay	< 40nS
Lock up time	< 0.5 second
Data line	22/334 (others programmable)
VBI	Remains unscrambled

Audio:

Scrambling method	Digital audio sent over video
Audio input /output level (nominal)	0 dBU i.e. 2.2 V peak to peak (unbalanced)
Max audio input / output level (onset of clipping)	+5 dBU (approximately 4 V peak to peak)
Audio input impedance	10 k Ω
Audio output impedance	100 Ω
Number of audio channels	1 or 2
Audio bandwidth (single channel mode)	100 Hz to 15 kHz (+1, -3 dB)
Audio bandwidth (dual channel mode)	100 Hz to 7.5 kHz (+1, -3 dB)
Signal to noise (wrt 2 Vpp input)	>60 dB (weighted)
Distortion @ 0 dBU , 1 kHz	< 2%
Video data lines used	Lines 6 to 20 inclusive
Audio Compression	Equivalent to 16 bit audio via adaptive differential pulse code modulation (ADPCM) giving 4 to 1 compression.



Finish: hard black anodize



Viewlock II Outline Dimensions

Figure 4: Viewlock II Outline Dimensions