



T2V481 / T2V482
UHD SUHD
User Manual

Video Clips for
Testing and Optimisation of
Video Compression



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T2V481_482_UHD_SUHD User manual v1.0

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1. Overview of T2V481/T2V482 UHD SUHD

2-D / 3-D	2D
Compressed/ Uncompressed	T2V481: V210 in MOV T2V482: V210 in MOV and OpenEXR image sequences
Description of video	Scenes from New York, Las Vegas, Iceland and Bristol (UK)
Purpose	Test an encoder to deal with 'difficult' video, with aspects of global/local motion, slow/medium/fast motion, with panning, scrolling, zooming, smooth and erratic, high/low contrast, with limited colours/vivid colours and many common subject types
Number of clips	Total 52 scenes progressive: <ol style="list-style-type: none"> 1) 20 at UHD resolution (3840 x 2160) at 25 fps 2) 20 at UHD resolution (3840 x 2160) at 29.97 fps 3) 6 at SUHD resolution (7680 x 4320) at 25 fps 4) 6 at SUHD resolution (7680 x 4320) at 29.97 fps
Length of video	Total of approx. 20 minutes
Total size on disk	T2V481: approx. 1.3 TBytes T2V482: approx. 2.7 TBytes
Video format(s)	T2V481 has all clips provided in V210 in MOV format T2V482 has all clips provided in two formats: <ul style="list-style-type: none"> - V210 in MOV (same as T2V481) - OpenEXR image sequences (with associated audio file)

<u>File Nos.</u>	<u>Resolution **</u>	<u>Frame rate fps</u>
T2V48x_425_nn_title	UHD 3840 x 2160	25
T2V48x_429_nn_title	UHD 3840 x 2160	29.97
T2V48x_SUHD_825_nn_title	SUHD 7680 x 4320	25
T2V48x_SUHD_829_nn_title	SUHD 7680 x 4320	29.97

where:

- 'T2V48x' = T2V481 or T2V482 as the case may be
- '425' = 4k [UHD], 25fps
- '429' = 4k [UHD], 29.97fps
- '825' = 8k [SUHD], 25fps
- '829' = 8k [SUHD], 29.97fps
- 'nn' are the numbers of the individual streams)
- 'title' = title of scene

Audio format	WAV linear PCM uncompressed stereo 48KHz 16-bit
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2. Introduction

T2Vid and **T3Vid** are high definition (HD), UHD/4K, SUHD/8K video clips designed for testing video encoders and decoders.

The **T3Vid** clips are stereoscopic 3-dimensional (matched left and right images); the **T2Vid** clips are 2-D.

The prime purpose of the **T2Vid** and **T3Vid** clips is to test and stress video encoders: the scenes have been filmed particularly for this purpose. Therefore there is often random movement; grain; in/out of focus; 'difficult' subjects such as obscuration, water, reflections; many objects; large monochrome areas (to test codec efficiency). For the same reason, although some clips look 'good', some do not but nevertheless contain the relevant items to test/stress a video codec.

2.1 T2Vids and T3Vids for testing encoders

Each set of clips for testing encoders contains a diverse selection of clips designed to stress a video encoder in different ways. Typically this includes different movement types, different subjects, different lighting conditions, different camera movement - designed to encompass the majority of different types of difficult-to-encode items. In some cases the quality of filming is marginal - deliberately so, as this is often the hardest to encode. The majority of the filming was done hand-held, as is quite often the case with documentary and even film currently. However, in all cases there has been no video editing as such (unless otherwise stated for a specific clip) - all the separate video clips are direct decodes from the HD camera files, with no re-compression/re-encoding done. Where video editing has been done the re-encode is only at the transitions - the vast majority of these clips are also as per the original camera files.

As the video that results from encoding is often a lot more complex than 'standard' video, the encoded clips are also a good test of a decoder.

These clips are provided as sets of video clips, typically 30 - 50 in a set, lasting from 15 - 20 minutes total. These include:

- ❑ 'standard' HD of real-world subjects (1920x1080, 1280x720; e.g. in New York, San Francisco, London, Munich)
- ❑ as above but UHD (3840 x 2160) and SUHD (7680 x 4320) and D-cinema resolutions (2K and 4K)
- ❑ as above but 'low' resolutions such as NTSC, D1 PAL, CIF, mobile, web, etc.
- ❑ synthetically generated, which has features such as precisely defined motion - ideal for checking such items as encoder motion estimation

The formats/resolutions provided vary from by clip set; as an example all the HD sets are provided at 1920x1080 progressive, 1920x1080 interlaced and 1280x720 progressive formats, in uncompressed YUV format, 16:9 aspect ratio.

All filming was done native resolution (UHD, SUHD, HD, 2K, 4K etc.).

Most clip sets are provided in 8 bits per sample; some are available at 10-bit, 12-bit or 14-bits per sample.

The **T2Vid** clips are straightforward 2-D clips; the **T3Vid** clips comprise matched left and right video images. The **T3Vid** clips have the 'extra dimension' of varying 3-D depth: from shallow to deep 3-D effect, into or out of the picture, with additional artefacts and difficulties that can be encountered in 3-D.

2.1.1 Audio

Sound is provided for almost all clips: in some cases this is sound recorded which is directly associated with the clips, in other cases the sound comprises appropriate background or music.

In a few cases the associated audio is one of the main reasons for recording the clip so both should be viewed together (where this is the case the notes state this for the specific clip in the manual). However, note that in most cases the associated audio provided is just that which could easily be recorded at the same time as the video, typically comprising background sounds, and is often of low quality as the sound was not the primary consideration at the time of filming.

2.2 *TestVid* logo

The *TestVid* logo (or a variant of it) is placed in the lower left corner of the video. It is a condition of the license agreement for *TVids* that this logo is not removed or obscured.

The logo has been carefully sized and placed to coincide with the borders of a 16x16 macroblock (where this is possible) and is static throughout each sequence, in order to have minimal effect on encoders.

2.3 Safety

The *TVids* are almost invariably supplied on a USB hard drive unit. This unit may be mains powered or powered directly from the USB port.

In all cases it is imperative that you carefully read and understand the safety information provided with the unit.

2.4 Backup

As the *TVids* are almost invariably supplied on a USB hard drive unit it is highly recommended that you make an immediate backup of the whole unit, as hard drives can of course fail. (This backup copy is in addition to the 25 copies allowed by the license agreement.)

The warranty on the hard drive is 180 days, but if it does fail it would of course take some days at least to provide a replacement unit.

3. T2V481/T2V482 UHD SUHD Clip set description

3.1 Set content types

This set of video clips provides a basis set of video clips at 25 and 29.97 (drop frame) frame rates.

This set comprises a range of subjects, motion, colours, light levels designed to test and stress 3D video encoders by providing a varied set of conditions:

- ❑ subject types such as people, traffic, buildings, sky, water, trees, text..
- ❑ movement types such as panning, tracking, hand-held camera, zooming in/out
- ❑ subject motion such as into, out of or across the picture, in front of and partially behind objects, fast and slow
- ❑ lighting conditions, from bright sunlight, dull daylight, shaded areas, night-time..
- ❑ hard to encode items such as reflections, fine lines, patterns, round objects..
- ❑ varying camera properties such as depth of field, in/out-of-focus..
- ❑ and with sound associated with the clips

In many cases the video is harder to encode than might normally be expected, as the lighting conditions are not ideal or there is significant camera movement, or the focus varies. These features are deliberately used as they often cause the most difficulty to video encoders and represent the worst case that the encoder should encounter in 'normal / real' use.

3.1.1 Scene cuts / composite sequences

Although the sequences do not have fades/transitions within them, transitions and scene changes are easy to do simply by adding two or more of the clips together using a standard non-linear editor.

3.1.2 T2vid logo

The **T2vid** logo has been designed to have as little impact as possible on encoders.

The logo is aligned on a 16-bit macroblock boundary, is static throughout the sequence and is of a dark colour, designed to be unobtrusive: when viewing the video, in practice it can easily be ignored.

3.2 Individual clips provided

All the clips are:

- ❑ 3840 x 2160 resolution (UHD clips) or 7680 x 4320 resolution (SUHD clips)
- ❑ at native filmed 25 frames/second or 29.97 frames/second (with drop-frame timecode)
- ❑ progressive
- ❑ top picture row first
- ❑ 16:9 picture aspect ratio
- ❑ square pixels

The V210 in MOV clips are:

- ❑ 4:2:2 chroma
- ❑ 10-bits per sample
- ❑ interleaved YUV (i.e. the pixel data for Y is adjacent to the pixel data for U and V)
- ❑ in an MOV file wrapper with associated audio in WAV PCM format (see section 3.3)
- ❑ Y planes are unsigned nominally 64-940 but may go into the range 0-1023
- ❑ U and V planes are centred at 512 and are nominally 64-960 but may go into the range 0-1023

The OpenEXR image sequences are (T2V482 only):

- ❑ 4:4:4 chroma
- ❑ floating point
- ❑ one file per frame
- ❑ with separate WAV audio of the same filename

Both formats (V210 and OpenEXR) are supported by many video players and NLEs.

All of the clips were filmed at their respective frame rates (i.e. 25 or 29.97 fps).

It will be noted that the SUHD clips are identical to the UHD clips with the corresponding file name and number: the UHD clips have been generated from the SUHD.

3.3 Audio

The audio is provided for every video clip, matching the video length. This was the actual audio recorded with the video - so the audio is not good quality !

Clearly the main point of the *Tvids* is video testing, so the audio supplied is intended to be used to check timing/correlation during the encode process rather than to be particularly useful as standalone audio. Consequently, this audio has not been cleaned up or normalised and nor was any time spent in ensuring good audio recording during filming.

The audio format is:

- ❑ stereo WAV PCM, little endian, signed
- ❑ 48KHz 16-bit

4. Software to view & process the video clips

4.1 Viewing/playing the video

This section explains some of the technical requirements for playing the video (computer and software requirements).

4.1.1 Computer requirements of viewing the video

The **Tvids** files within this set require a high performance computer in order to play the video in real-time at full frame rates. The sustained continuous data rates required are:

- ❑ **UHD at 29.97 fps** 249 MBytes/sec
- ❑ **SUHD at 29.97 fps** 996 MBytes/sec

These data rates are much higher than achievable even with 'usual' high performance PCs: the result of trying to play the video on such a standard high performance PC is that it will play slowly (appear to be slow motion video).

To achieve the above data rates will likely require arrays of solid state disks or with the video loaded into RAM disk.

Useful references as starting points for system recommendations are given on the websites for Aja (www.aja.com) and BlackMagic Design (www.blackmagic-design.com) although various companies provide information about how this can be achieved / the configuration of system required to achieve this.

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4.1.2 Video viewers/players

There are many software programs for viewing the files including freeware players, commercial players and common NLEs.

Many players support playing of the V210 files (T2V481 and T2V482); not so many players support playing the OpenEXR image sequences in the T2V482 set only.

Common NLEs support importing and playing both V210 and OpenEXR formats.

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4.1.3 Convert the V210 video or OpenEXR image sequences (T2V482 only) to another format

There are a number of programs to do this:

- transcoders
- NLEs (where the video or image sequence is imported then rendered out in another format)
- command line programs

Of the command line programs probably the most widely used is a program called **FFMPEG** : it can easily be found using a search engine.

Example usage to convert to a V210 file to H.265/HEVC with AAC audio (must be all on same line with no line breaks/carriage returns):

```
ffmpeg -i <infile.mov> -vcodec -c:v libx265 -preset medium -crf 28
```

```
-c:a aac -b:a 128k <outfile.mp4>
```

where

- ❑ `-i <infile.mov>` is the input filename: assuming a V210 in MOV
- ❑ `-vcodec -c:v libx265` sets the video encoder to H.265/HEVC
- ❑ `-preset medium -crf 28` sets the video quality to medium
- ❑ `--c:a aac -b:a 128k` sets the audio encoder to AAC audio, 128kbits/sec
- ❑ `<outfile.mp4>` is the output MPEG4 wrapped filename

Note that the OpenEXR image sequences (T2V482 only) have a Gamma of 2.2.

Some software does not automatically recognise this, such as FFMPG (depending upon the version), in which case the Gamma of 2.2 must be explicitly stated in the command line parameters. (And other software such as DaVinci Resolve also requires the Gamma to be set up correctly in the Project Settings.)

4.2 Real-time play-out of the video

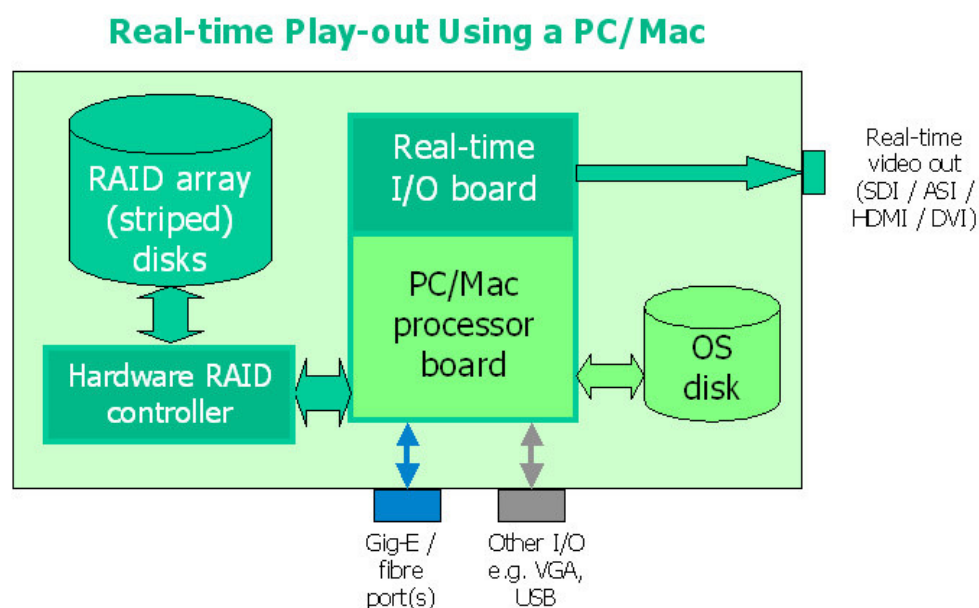
The files provided are suitable for direct use with video encoders, but in some circumstances it may be desirable to play-out the files in real-time on an SDI / ASI / DVI / HDMI link.

All video servers, many hardware encoders and a large proportion of other professional broadcast equipment have internal hard disks and Gig-E Ethernet interfaces. This allows the **Tvids** to be directly copied over the Ethernet network onto the hard disk, and play-out from there.

Where it is required to produce an SDI / ASI / DVI / HDMI stream as input to other equipment, this can be done relatively straightforwardly, using:

- ❑ a high performance PC / Mac
- ❑ with high speed RAID hard disks
- ❑ with an appropriate SDI etc. I/O board, e.g. from Aja, BlackMagic Design or Bluefish444
- ❑ and software to control moving the video from disk onto the I/O interface

A schematic of the required set-up is:










5. List of clips




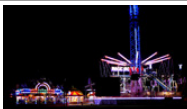
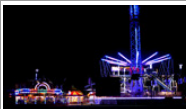


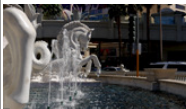
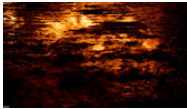

5.1 Clips summary

- Total time of sequences: **approx. 20 mins**
(all sequences added together)

Note that the clip numbers are only for ease of reference: where there are corresponding clips at 25fps and 29.97fps with very similar content then the corresponding clips have been given the same number for ease of reference.

5.2 UHD 25fps

Clip number	Title	Description; Day/Night, Camera movement Main codec purposes	Duration (secs: frames)	Begin	End
UHD (3840x2160) 25fps clips Numbers T2V48x_425_nn_<title>					
01	TS_people	Times Square, many people; == Dusk, Scroll == Highly complex scene with many people and background objects moving in different direction with obscuration; with text and high contrast but also flat areas (over-bright sky)	15:20		
02	Pharaoh	Pharaoh and goat statues w rack focus; == Day sunny, Pan & scroll == Bright images with large flat areas, texture and rack focus	35:01		
03	Traffic_cop	Policeman directing traffic; == Day cloudy, Hand-held == Obscuration of subject in background with foreground objects blurred; text	15:17		
04	Chandeliers	Glass chandeliers and chains; == Indoors, Pan & scroll == Codec nightmare of many identical objects with reflections and repeating patterns	21:24		
05	Roller_coaster	Following a roller coaster car; == Day sunny, Tracking == Very fast hand-held camera tracking fast-moving object (so much of image blurry)	8:09		







06	Golden_lion	Golden lion statue zoom in/out; == Day sunny, Zoom == Slow zoom with focus hunting on bright detailed object with linear pattern background (wall) and flat background (sky)	24:06		
07	Paris	Paris hotel, Las Vegas and pedxing; == Day sunny, Scroll == Bright detailed patterned images with global vertical camera movement and uniform background (sky)	43:06		
08	Night_fair	Fair rides at night; == Night, Static == High contrast efficiency test with large dark areas which have grain	23:00		
09	Geysir	Geysir eruption with people watching; == Day sunny, Static == Obscuration of people (after geysir eruption); encoding of flat areas (sky, steam) and detail areas (rocks) and reflections	11:00		
10	White_horses	Horse statues in fountain; == Day sunny, Static == Water and reflections with bright and dark areas with grain	20:09		
11	Out_of_focus	Out of focus lights on cars; and evening; == Evening, Hand-held == Out of focus slowly moving into focus	16:04		
12	TS_traffic	Evening traffic around Times Square; == Evening, Pan & scroll == Highly complex scene with many vehicles and people, lots of text, high contrast and controlled global motion (scroll and pan)	32:04		
13	Bonfire	Large bonfire with ground reflections; == Night, Scroll == Very grainy images with reflections; some obscuration; bright highlights with large contrast and fast random movement (flames)	30:01		

14	NY_walking	Walking towards people on New York street; == Day cloudy, Hand-held == Random motion with people towards camera and background text & patterns	13:16		
15	Black_beach	Beach rocks with heavy surf; == Day cloudy, Static == High speed random subject movement (sea): macroblocking test	23:07		
16	Travelator	Walking down a travelator towards a fountain; == Day sunny, Hand-held == Hand-held motion with strong patterns and water; some moire patterns	22:08		
17	Real_thing	Giant coke bottle and advertising signs; == Day sunny, Pan & scroll == Slow scroll and pan of reflective glass object with strong patterns; lots of text	30:08		
18	TS_neon	Pan around neon signs in Times Square; == Evening, Pan & scroll == Lots of text; patterns; high contrast; some motion blur; large screen pixelation and moire	39:14		
19	Posing	Woman posing for a photograph; == Night, Hand-held == Random global movement; some out of focus and large colour shift (due to neon signs)	9:03		
20	540deg_pan	Pan around area near Times Square; == Dusk, Pan == Rapid pan: much of sequence blurry	34:09		




5.3 UHD 29.97 fps

UHD (3840x2160) 29.97fps clips <i>Numbers T2V48x_429_nn_<title></i>					
01	TS_people	Times Square, many people; == Dusk, Scroll == Highly complex scene with many people and background objects moving in different direction with obscuration; with text and high contrast but also flat areas (over-bright sky)	18;28		
02	Pharaoh	Pharaoh and goat statues w rack focus; == Day sunny, Pan & scroll == Bright images with large flat areas, texture and rack focus	37;18		
04	Chandaliers	Glass chandaliers and chains; == Indoors, Pan & scroll == Codec nightmare of many identical objects with reflections and repeating patterns	16;16		
05	Roller_coaster	Following a roller coaster car; == Day sunny, Tracking == Very fast hand-held camera tracking fast-moving object (so much of image blurry)	8;29		
06	Golden_lion	Golden lion statue zoom in/out; == Day sunny, Zoom == Slow zoom with focus hunting on bright detailed object with linear pattern background (wall) and flat background (sky)	32;16		
07	Paris	Paris hotel, Las Vegas and pedxing; == Day sunny, Scroll == Bright detailed patterned images with global vertical camera movement and uniform background (sky)	28;21		
08	Night_fair	Fair rides at night; == Night, Static == High contrast efficiency test with large dark areas which have grain	18;26		
11	Out_of_focus	Out of focus lights on cars; and evening; == Evening, Hand-held ==	12;08		

		Out of focus slowly moving into focus			
16	Travelator	Walking down a travelator towards a fountain; == Day sunny, Hand-held == Hand-held motion with strong patterns and water; some moire patterns	23;08		
17	Real_thing	Giant coke bottle and advertising signs; == Day sunny, Pan & scroll == Slow scroll and pan of reflective glass object with strong patterns; lots of text	49;01		
18	TS_neon	Evening traffic around Times Square; == Evening, Pan & scroll == Lots of text; patterns; high contrast; some motion blur; large screen pixelation and moire	19;07		
21	Hat_man	Man in hat in foreground with background out of focus; == Evening, Static == Subject tracking	7;09		
22	Heat_haze	View of traffic with strong heat haze; == Day sunny, Static == Motion tracking with indistinct varying parts of the frame	23;24		
23	Passers_by	People walking on the sidewalk with background signs; == Day sunny, Static == Obscuration, in and out of focus	16;27		
24	Framework	Metal frame of high-rise building; == Dusk, Static == Patterns and tracking many similar parts of an image with high contrast	13;14		
25	Following	Walking following people near Times Square; == Day cloudy, Hand-held == Global motion and tracking in focus/out of focus subjects	15;26		
26	Thumbs_up	Looking down on a group of people standing by a sign; == Evening, Static == Codec efficiency with a scene with lots of grain	20;18		

27	Liberty_man	Walking towards person dressed as Statue of Liberty; == Evening, Hand-held == Global motion tracking with random motion	18;02		
28	Flamingo	Going down escalator tracking a road sign; == Day sunny, Tracking == Global motion tracking	28;18		
29	Posing	Woman posing for a photograph; == Evening, Tracking == Foreground/background obscuration	14;22		

5.4 SUHD 25fps

SUHD (7680x4320) 25fps clips <i>Numbers T2V48x_SUHD_825_nn_<title></i>				
02	Pharoah	Pharoah and goat statues w rack focus; == Day sunny, Pan & scroll == Bright images with large flat areas, texture and rack focus	35:01	
04	Chandaliers	Glass chandaliers and chains; == Indoors, Pan & scroll == Codec nightmare of many identical objects with reflections and repeating patterns	21:24	
06	Golden_lion	Golden lion statue zoom in/out; == Day sunny, Zoom == Slow zoom with focus hunting on bright detailed object with linear pattern background (wall) and flat background (sky)	24:06	
07	Paris	Paris hotel, Las Vegas and pedxing; == Day sunny, Scroll == Bright detailed patterned images with global vertical camera movement and uniform background (sky)	43:06	
08	Night_fair	Fair rides at night; == Night, Static == High contrast efficiency test with large dark areas which have grain	23:00	
12	TS_traffic	Evening traffic around Times Square; == Evening, Pan & scroll == Highly complex scene with many vehicles and people, lots of text, high contrast and controlled global motion (scroll and pan)	32:04	

5.5 SUHD 29.97 fps

SUHD (7680x4320) 29.97fps clips Numbers T2V48x_SUHD_825_nn_<title>					
02	Pharaoh	Pharoah and goat statues w rack focus; == Day sunny, Pan & scroll == Bright images with large flat areas, texture and rack focus	37;18		
04	Chandaliers	Glass chandaliers and chains; == Indoors, Pan & scroll == Codec nightmare of many identical objects with reflections and repeating patterns	16;16		
06	Golden_lion	Golden lion statue zoom in/out; == Day sunny, Zoom == Slow zoom with focus hunting on bright detailed object with linear pattern background (wall) and flat background (sky)	32;16		
08	Night_fair	Fair rides at night; == Night, Static == High contrast efficiency test with large dark areas which have grain	18;26		
18	TS_neon	Evening traffic around Times Square; == Evening, Pan & scroll == Lots of text; patterns; high contrast; some motion blur; large screen pixelation and moire	19;07		
21	Hat_man	Man in hat in foreground with background out of focus; == Evening, Static == Subject tracking	7;09		