Summary

Tektronix

Vclips VC015A
Video Clips for Testing and Optimization of Video Compression

Encoder Series – VC015A, E-Synthetic

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- Worldwide, visit www.tektronix.com to find contacts in your area.

General Safety Summary

Use this product only as specified.

While using this product, you may need to access other parts of a larger system. Read the safety sections of the other product manuals for warnings and cautions related to their operation.

Summary: VC-015-A E-Synthetic

Encoder Test Series	VC-015-A E-Synthetic
Purpose	Test encoders with precisely defined motion, colours, shapes (e.g. to check motion estimation) where expected result of encoding is already known.
Content	Synthetic scenes with defined frame-to-frame motion, with movement across the picture, zoom, pan, colours, moiré patterns, text and monochromatic areas.
Number of clips	40 scenes all provided at • 720p 1280x720 progressive (numbered V15nn**1**) • 1080i 1920x1088 interlace (numbered V15nn**2**) i.e. total 80 clips
Total disk size	50 GBytes
Video format	YUV 4:2:0 planar, 8 bits per sample
How supplied	On hard disk drive unit (with USB 2.0 and Firewire/1394 interfaces)
Software supplied	YUV sequence viewer YUV field splitter in folder: `\Software`
Documentation	PDF of this manual in folder: `\Documentation`

1. Introduction

This set of video sequences contains synthetic video images. It is designed to test and stress a video encoder by providing a diverse set of video clips all of which have precisely defined and known parameters of movement and content. Items covered include:

- movement in different directions, pre-determined amounts frame-to-frame
- subject types text, patterns
- colours - bright to dark, high/low contrast, monochromatic areas
- details such as fine lines, moiré patterns,
- challenging 'subjects', such as wholly black or mono-coloured scenes; noise (monochromatic and coloured); scene changes.

The colours, movements and subjects have all been specifically chosen either to be challenging to an encoder, or to allow the function of an encoder to be precisely checked (for example, to check that the motion estimation is working correctly).

2. Installation, Backup

2.1 Backup

These video files are provided on a hard disk unit. Although the unit has been extensively tested prior to delivery, like all hard disks it *could* fail.

Therefore we strongly advise you to back up all the data on this hard disk unit.

(If the drive does fail, we can provide a replacement unit at low cost, but it could still be highly inconvenient for you.)

2.2 Installation

The hard disk unit has both USB 2.0 and 1394/Firewire interfaces (cables for both are provided). Both these interfaces provide a data transfer speed of over 400 Mbits/sec. Providing you have the correct hardware interface on your computer, the hard disk unit should be recognised automatically, simply by plugging in the cable from the unit to your computer. (The driver disk supplied should not be required.)

3. Description of Clip Set / YUV format

40 video scenes are provided: each of these is provided at 720p (1280x720) progressive and 1080i (1920x1088) interlace resolutions (that is 80 clips in all).

All clips are provided in YUV 4:2:0 format with no header

- planar YUV 4:2:0 sub-sampled i.e. 4 bytes of Y data for each byte of U data and each byte of Y data;
- no headers of any kind (no file or frame headers);
- one byte per sample;
- Y plane values are 0-255 unsigned;
- U and V plane values are unsigned with a DC offset of 128;
- progressive scan clips:
  - row raster order (top frame row first);
- interlace scan clips:
  - interleaved field rows
  - top field first row, followed by bottom field first row

The 1080i sequences are supplied as complete frames with the field lines intermixed. In order to separate the two fields, a utility 'yuvFieldSplit' is supplied which allows you to do this (see section 3.2 below).
Note that for 1080i the bottom field is the first field temporally (as is standard in broadcast systems).

4. Software supplied

The following software is supplied:

- YUV sequence viewer
- YUV field splitter

4.1 YUV viewer

This program is called: `YUVviewer.exe`
and is located in the folder: `\Software`

To run it, double-click on it – it does not need to be installed.

Once it has been run once, it associates files with an extension of .yuv so that after this double-clicking on a file with this extension will automatically open the YUV file in the sequence viewer.

Note that in order for the sequence to be displayed properly, the size must firstly be set in YUVviewer, using the 'Custom' selection.

4.2 YUV field splitter

This program is called: `yuvFieldSplit.exe`
and is located in the folder: `\Software`

The purpose is to separate the two fields of the 1080i sequences.

This is a command-line (batch mode) program only: it can only be run from a command prompt/MS-DOS window.

To run it the format for commands is:

```
yuvfieldsplit –i <input file> -t <top field out> -b <bottom field out>
```

NOTE: there is a <space> between each – option and the file name.

To see a list of options enter `yuvFieldSplit.exe` at the command line (with no arguments.

As an example, to split the file: V15011_Static_lines_1920x1088.yuv
into two fields, the following command line would be used (this would be entered as one line):

```
yuvfieldsplit –i V15011_Static_lines_1920x1088.yuv –t
      V15011_top.yuv –b V15011_bot.yuv
```

To separate some of the frames, not all, two additional command line flags may be used:
-f <first frame>
-l <last frame>
Again, there must be a space between the option and the frame number.

5. Information supplied

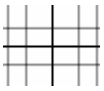
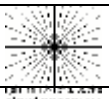
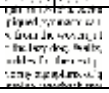
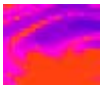
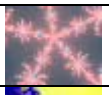
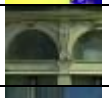
The following pages describe in considerable detail each video sequence (source data, contents of the scene).

6. Synthetic motion clips

Clips V1509x to V1540x are designed to provide video having interframe motion with known parameters. Each video sequence is derived by applying a motion transform to an underlying static testcard.

6.1. Testcard definitions

The following testcards are defined and referred to later in the clip specifications.

Title	Source description	Purpose	Thumbnail
Grid	Black grid on white background with 16 pixels pitch	Simple motion estimation tests.	
Checkerboard	Checkerboard pattern with 16 pixels pitch	Simple motion estimation tests.	
Radial bars	Solid bars, radiating from centre, alternating black and white, 8 per quadrant	Rotation estimation tests.	
Radial lines	Lines, radiating from centre, 8 per quadrant	Rotation estimation tests.	
Text	Text in serif typeface at 16pt height	Regular high-contrast pattern.	
Fractal1	Barnsley 3 fractal set	Saturated colour with fine detail and colour graduations.	
Fractal2	Barnsley 3 fractal set	Saturated colour with fine detail and colour graduations.	
Fractal3	“Man’o’war” fractal	Saturated colour with fine detail and colour graduations.	
Fractal4	Julia set fractal	Saturated colour with fine detail and colour texture.	
Fractal5	Julia set fractal	Saturated colour with fine detail and colour texture.	
Natural1	Still frame of Piccadilly Circus (London, UK)	Real world image. Near field, buildings, vehicles.	
Natural2	Still frame of Canary Wharf (London, UK)	Real world image. Far field, geometric structures.	
Natural3	Still frame of street scene (London, UK)	Real world image. Near field, large foreground object.	

6.2. Motion model

Interframe motion is modelled using a co-ordinate transform. The model parameters provide for:

- translation

- zoom (scaling)
- rotation

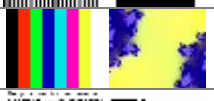
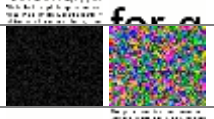
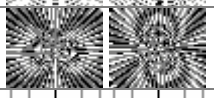
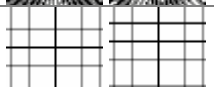
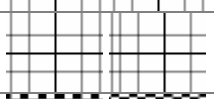
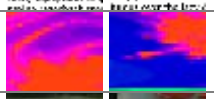
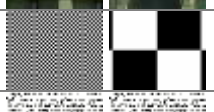
In all motion clips, the origin for zoom and rotation is the image centre point. Each motion clip is created with a specific set of motion parameters. The parameters are fixed for the duration of each clip, so that the interframe motion between any pair of consecutive frames obeys the specified parameters.

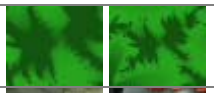
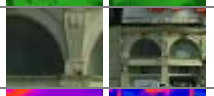
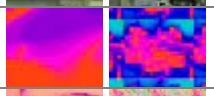
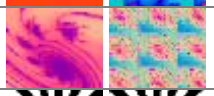
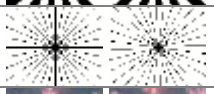
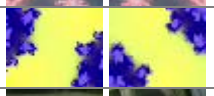
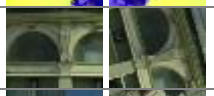
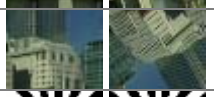
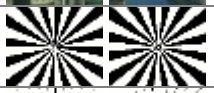
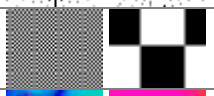
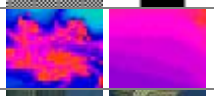
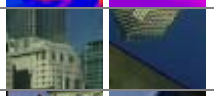
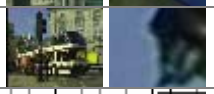
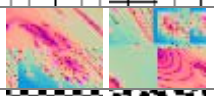
Translation is specified as a displacement vector in pixel units. A positive displacement in the *x*-direction means that the image moves to the left. A positive displacement in the *y*-direction means that the image moves upwards.

Zoom is specified as a scaling or magnification factor. A factor of 1 implies no zoom, a factor greater than 1 implies a zoom away from the image, a factor less than one implies a zoom towards the image.

Rotation is specified as an angle in degrees. A positive rotation means that the image rotates anti-clockwise. A negative rotation means that the image rotates clockwise.

7. Brief clip details

Clip Number(s)	Title	Description	Duration (frames)	1080i file size (MB)	Begin-End
V15011,2	Static lines	20 x 15 frame static testcards with various line patterns	300	918	
V15021,2	Static bars	20 x 15 frame static testcards with various solid bar patterns	300	918	
V15031,2	Static colours	20 x 15 frame static testcards with various colour patterns	300	918	
V15041,2	Static text	20 x 15 frame static testcards with various text patterns	300	918	
V15051,2	Noise	Noise at various amplitudes, luma and chroma	240	734	
V15061,2	Teleprint	Teleprinter style text animation, one new character per frame	300	918	
V15071,2	Moiré circles	Moiré interference patterns caused by overlapping concentric circles	300	918	
V15081,2	Moiré fans	Moiré interference patterns caused by overlapping radial bars	300	918	
V15091,2	Translate 1	Translation with vector (0, 1) on grid testcard	300	918	
V15101,2	Translate 2	Translation with vector (1, 0) on grid testcard	300	918	
V15111,2	Translate 3	Translation with vector (0, -1) on grid testcard	300	918	
V15121,2	Translate 4	Translation with vector (-1, 0) on grid testcard	300	918	
V15131,2	Translate 5	Translation with vector (2, 3) on checkerboard testcard	300	918	
V15141,2	Translate 6	Translation with vector (-5, -7) on text testcard	300	918	
V15151,2	Translate 7	Translation with vector (16, -32) on fractal1 testcard	300	918	
V15161,2	Translate 8	Translation with vector (-99, 100) on natural1 testcard	300	918	
V15171,2	Zoom 1	Zoom with factor 0.990 on checkerboard testcard	300	918	
V15181,2	Zoom 2	Zoom with factor 0.992 on text testcard	300	918	
V15191,2	Zoom 3	Zoom with factor 0.994 on natural2 testcard	300	918	
V15201,2	Zoom 4	Zoom with factor 0.998 on natural3 testcard	300	918	

Clip Number(s)	Title	Description	Duration (frames)	1080i file size (MB)	Begin-End
V15211,2	Zoom 5	Zoom with factor 1.002 on fractal3 testcard	300	918	
V15221,2	Zoom 6	Zoom with factor 1.004 on natural1 testcard	300	918	
V15231,2	Zoom 7	Zoom with factor 1.008 on fractal1 testcard	300	918	
V15241,2	Zoom 8	Zoom with factor 1.010 on fractal2 testcard	300	918	
V15251,2	Rotate 1	Rotation with angle 0.25° on radial bars testcard	300	918	
V15261,2	Rotate 2	Rotation with angle 0.50° on radial lines testcard	300	918	
V15271,2	Rotate 3	Rotation with angle 1.00° on fractal4 testcard	300	918	
V15281,2	Rotate 4	Rotation with angle 2.00° on fractal5 testcard	300	918	
V15291,2	Rotate 5	Rotation with angle -0.25° on natural1 testcard	300	918	
V15301,2	Rotate 6	Rotation with angle -0.50° on natural2 testcard	300	918	
V15311,2	Rotate 7	Rotation with angle -1.00° on radial bars testcard	300	918	
V15321,2	Rotate 8	Rotation with angle -2.00° on radial lines testcard	300	918	
V15331,2	Complex 1	Combined translation (2,3) and zoom 0.990 on checkerboard testcard	300	918	
V15341,2	Complex 2	Combined zoom 0.990 and rotation 0.50° on fractal1 testcard	300	918	
V15351,2	Complex 3	Combined translation (2,3) and rotation 0.50° on natural2 testcard	300	918	
V15361,2	Complex 4	Combined translation (2,3), zoom 0.990, and rotation 0.50° on natural3 testcard	300	918	
V15371,2	Complex 5	Four quadrants, four different translations on grid testcard	300	918	
V15381,2	Complex 6	Four quadrants, four different zooms on fractal2 testcard	300	918	
V15391,2	Complex 7	Four quadrants, four different rotations on checkerboard testcard	300	918	
V15401,2	Complex 8	Four quadrants, two translations, one zoom, and one rotate on natural1 testcard	300	918