#### Chapter 44

Using the KAD/VID/106 TEC/NOT/073

CURTISS -WRIGHT

This paper discusses the following topics:

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- "44.2 Setting up the KAD/VID/106" on page 2
- "44.3 Viewing KAD/VID/106 data" on page 15
- "44.4 Troubleshooting" on page 17

## 44.1 Overview

The KAD/VID/106 module is a video encoder module that converts one of three composite video (CVBS) inputs or one S-Video input into digital video and compresses it. Compressed video bit-rate is kept constant using multi-pass encoding and padding of the transport stream. Optional audio encoding produces a digital audio data stream. The left and right audio channels can be individually turned on or off. Selection of PAL or NTSC input format is a configurable setting.



Figure 44-1: KAD/VID/106 block diagram

The KAD/VID/106 compresses video using the baseline profile H264.1 technique. This method encodes each received frame as either an I(ntra coded) frame or a P(redicted) frame depending on the module settings.

I frames take all the information in the received picture and encodes this information using a lossy compression scheme to create a reference frame. This reference frame can be thought of as a *stand alone* frame—it does not need any information from other frames in the video stream to be viewed. This means that each I frame is an accurate representation of the received analog picture.

P frames encode only the changes from the previous frame. This means that P frames need information from previous frames to be viewed. This results in a reduction of bandwidth needed to encode a moving picture—however, if the picture were to change quickly, an accurate representation would not be displayed until the next I frame was processed.

I frames and P frames are grouped together in a Group Of Pictures (GOP). The setting used for GOP determines the image quality and bandwidth.



Figure 44-2: GOP with P frame to I frame ratio of 5:1

For more information, refer to http://en.wikipedia.org/wiki/H.264/MPEG-4\_AVC#Profiles.



The KAD/VID/106 compresses (optional) audio using Advanced Audio Codec (AAC). The bit-rate for audio is fixed at 64 kbps per channel.

The video and audio are then encoded in an MPEG-2 transport stream. An MPEG-2 transport stream is a fixed length (188 bytes) packet.



Figure 44-3: Conversion of video and audio to MPEG-2

These packets are then fragmented into 16-bit words, which are put out onto the Acra KAM-500 backplane on a FIFO basis. From there they can be inserted in a PCM frame, a UDP packet, logged to a memory module (such as a KAM/MEM/113), or a combination of all three.

# 44.2 Setting up the KAD/VID/106

## 44.2.1 Pinout connections

Pinout connections are described in the following table.

#### Table 44-1: Pinout connections

Connection	Description
CVBS_0_IN CVBS_1_IN CVBS_2_IN	These input connections allow up to three independent composite video sources to be connected.
	Note: The KAD/VID/106 can only process one video input at a time.
Y_IN C_IN	These two input connections are used for component (S-Video) inputs. Y_IN corresponds to luminance; C_IN corresponds to chrominance.
CAM_2_GENLOCK_OUT CAM_3_GENLOCK_OUT	Composite video waveforms output a regular sync pulse (every 64 $\mu$ s for PAL, every 63.5 $\mu$ s for NTSC) that can be used to synchronize multiple video inputs. When a video source is connected to CVBS_0_IN, its output waveform is available on both GENLOCK outputs. This allows up to two other composite video sources connected to CVBS_1_IN and CVBS_2_IN to be synchronized with the CVBS_0_IN input.
AUDIO_RIGHT_IN AUDIO_LEFT_IN	These are the inputs for audio.
CAM_SEL_BIT_0 CAM_SEL_BIT_1 CAM_SEL_BIT_2	If the Input Source option is set to Camera, then these three inputs can be used to select the input video source.
	<b>NOTE:</b> These connections are internally pulled high; they must be tied to ground as shown in the following table to select the various inputs.



#### Table 44-2: Camera Select pins (NC – Not Connected)

	CAM_SEL_BIT [2:0]		Selected Input
NC	NC	NC	Outputs a simple test pattern
NC	NC	GND	CVBS_0_IN
NC	GND	NC	CVBS_1_IN
NC	GND	GND	CVBS_2_IN
GND	NC	NC	Y_IN, C_IN

### 44.2.2 Software setup

The KAD/VID/106 can be configured using kSetup or DAS Studio 3.

#### 44.2.2.1 KSM-500 Parameters tab settings

😯 kSetup 1.18	
File Tools Help	
1 🖆 🚅 🛛 🛃 🤰 🗟 🦠	1 Acquisition Cyde: 25000 µs ▼ Rate: 40.000000 Hz ▼
■ Task 22 ■ KAM/CHS/13U ■ KAD/BCU/140 ■ J2 KAD/BCU/140 ■ J3 KAD/ABM/103 ■ J3 KAD/VID/106 ■ J3 ■ J3 ■ J3 ■ J3 ■ J3 ■ J3 ■ J3 ■ J10	Parameter Name     #Words     Mode     Serial Number       *     *     *     *     *     *       VID106_0_J6_REPORT     REPORT     None     VIDE0     None

Figure 44-4: Parameters tab in kSetup

The Parameters tab has only two options: Report word and Video words.

#### Report word

The Report word relates the status of the module. Refer to the KAD/VID/106 data sheet for bit definitions.

#### Video words

It is possible to specify more than one data word from the KAD/VID/106. The amount of video words specified should be chosen so as to optimize the available bandwidth. For example, 10 video words placed at 10:1 commutation in the frame is equivalent to 1 video word placed at 100:1 commutation. The advantage lies in the fact that 10:1 commutation is usually easier to achieve than 100:1 commutation.



## 44.2.2.2 KSM-500 Setup tab settings

Module Setup	
Chassis Slot Module KAM/CHS/13U 6 KAD/VID	Serial Number
Parameters Setup	
Input Source: Composite 1	🔽 Turn on timer overlay
Video Format: PAL 💌	Horizontal Placement: 40 pixel
Video Resolution: CIF	Vertical Placement: 40 pixel
Video compression GOP: 1:15	Text Color: White
Input Video Bitrate: 1	Background: Solid
Temporal Decimation: 25 💽 tps	
Audio Channel: Stereo	Time Server: Slave
C Packetization	
Video TS blocks per packet: 7	
Timeout (msec) for video packets: 40	]
Thread threshold:	
<ul> <li>FIFO (snarfer)</li> </ul>	
Video Parameters' Prefix Name:	
🗆 Enable	e 12 bits video

Figure 44-5: Setup tab in kSetup

The Setup tab covers video, audio, video source, and timer settings.

Setting	Description
Input Source	If Input Source is set to EEPROM, then this option specifies the video source. The following Input Source options are available.
Camera	There are up to three camera inputs. The module acts as a multiplexer allowing you to switch between cameras. The active channel can be pre-set in the EEPROM during configuration, or it can be read from the configuration of several pins on the connector (see Table 44-1 on page 2). Use this option to select which method the module uses to select the camera input.
TEST	Outputs a simple test pattern
Composite 1	Channel 1 composite
Composite 2	Channel 2 composite
Composite 3	Channel 3 composite
S-Video	YC input (S-video)
Video Format	Determines the output format: PAL (Europe and Asia) or NTSC (The Americas). This setting must match the video source.



Setting		Description			
Video Resolution	Determines the resolution of the di	splayed image. The following reso	olutions are available (pixel x pixel).		
CIF	352 x 288 (PAL) 352 x 240 (NTSC)				
2CIF	704 x 288 (PAL) 704 x 240 (NTSC)				
D1	704 x 576 (PAL) 704 x 480 (NTSC)				
Video compression GOP	Determines the amount of P fran (all I frames) to 60 (1 I frame eve A higher P:I frame ratio reduces However, the video stream takes	nes to I frames in the output vide ery 60 P frames). the amount of bandwidth neede s longer to recover should any b	eo. Allowed values range from All d for a given video application. it errors occur.		
Input Video Bitrate	H.264 encoding produces a bit s setting. The video words that you must have a value higher than th	tream with an average bit-rate c u want to transmit (later referred ne value set in this field.	lose to the value specified in this to as Sampling Video Rate),		
	Video input rate (kbps)	Sampling Video Rate with audio (kbps)	Sampling Video Rate without audio (kbps)		
	250 (KAD/VID/106/B only)	Not supported	380 (KAD/VID/106/B only)		
	512	700	560		
	750	960	820		
	900	1150	990		
	1000	1230	1090		
Temporal Decimation	Determines the number of frame be used as a crude method to re half the bandwidth needed to dis	Determines the number of frames per second (fps) displayed in the video output. This setting can be used as a crude method to reduce bandwidth. For example, displaying 12.5fps uses just over half the bandwidth needed to display 25fps.			
Audio Channel	Determines which audio channels (if any) are to be used.				
Turn on timer overlay	The KAD/VID/106 can display BCD time in the video output. Select this check box to enable this option.				
Horizontal Placement/ Vertical Placement	Determines the location of the timer in x y co-ordinates in pixels from the top-left corner of the screen.				
Text Color	Determines the timer text color.				
Background	Determines the background share	ding of the timer.			
Time Server	This determines the time source of the KAD/VID/106. If Time-Slave is selected, the KAD/VID/106 gets its time from an IRIG source (such as a KAD/BCU/XXX or KAM/TCG/XXX module). If Free-Running is selected, then the KAD/VID/106 counts its own time from power on without reference to an outside time source.				
Packetization	Packetization can only be used with aperiodic Ethernet transmission modules such as the KAD/BCU/140. DAS Studio 3 is recommended to be used for such a setting. Refer to the DAS Studio 3 User Manual for more information.				
FIFO (snarfer) Video Parameters' Prefix Name	See "44.2.3.2 DAS Studio 3 - U	See "44.2.3.2 DAS Studio 3 - Using video over PCM" on page 11.			
Enable 12 bits video	This setting is reserved for future	e use.			



# 44.2.2.3 DAS Studio 3 Settings tab

Settings 💌	Processe	s Pac	ages	Algorit	hms [	Docum	entation		
Parameter Type	P	arameter Jame	7						*
MPEG2TS	•	P_MyKAD	_VID_106_	MPEG2	TS				
Report	•	P_MyKAD	_VID_106_	Report					
Encapsulation Mode	7								
FIFO 🔻									
Source V Str	eam Id 🏹	7 Packeti Enabled	zation 7						
MPEG2TSIn FFF	FFFFF								
Video Input				-					
Video Format 🗑	Video	Source 🍸							
PAL -	CVBS	S_IN(0) 🔻							
Time Overlay									
Video Timer On	7 Tex	t Color 🍸	Backgrou Style	und T	Horizont Placemer	al nt 7	Vertical Placement	Y	
	Bla	ack 🔻	Solid	•	40		40		
Compression									
Video Resolution ♥	Video Bi	t Rate 🍸	GOP Mod	e 7	Frame Rate	Y	Audio Setting	97	
CIF 🔹	1 Mbps	-	1:15	•	25	•	Stereo	•	
4								Þ	*

Figure 44-6: Settings	tab in DA	S Studio 3
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Setting	Description
Parameter Type/Name	The parameter type MPEG2TS is the MPEG2 transport stream of H.264 encoded video data and AAC encoded audio data used for FIFO. The Report provides a status of the KAD/VID/106. Refer to the <i>KAD/VID/106</i> data sheet for details.
Encapsulation Mode	There are two encapsulation modes: FIFO or Packetizer. Packetization can only be used with aperiodic Ethernet transmission modules such as the KAD/BCU/140. When using Packetizer mode, the Packetization Enabled check box must be selected and the Stream ID field must be filled in.
Source Name	Name of the iNET-X packetizer channel for the audio and video MPEG-2 transport stream.
Stream ID	Type in a stream ID when Encapsulation Mode is enabled.
Packetization Enabled	Packetization can only be used with aperiodic Ethernet transmission modules such as the KAD/BCU/140.
Video Format	Determines the output format: PAL (Europe and Asia) or NTSC (The Americas). This setting must match the video source.
Video Source	If Input Source is set to EEPROM, then this option specifies the video source. The following Input Source options are available.
CVBS_IN(0) CVBS_IN(1) CVBS_IN(2)	Single ended composite video inputs.
Y/C_IN	YC input (S-video)



Setting	Description				
Test	Outputs a simple test pattern				
CameraSelect(2:0)	There are up to three camera inputs. The module acts as a multiplexer allowing you to switch between cameras. The active channel can be pre-set in the EEPROM during configuration, or it can be read from the configuration of several pins on the connector (see Table 44-1 on page 2). Use this option to select which method the module uses to select the camera input.				
None	No video source is selected. Use	e when only audio is required to l	be captured on the KAD/VID/106.		
Video Timer On	The KAD/VID/106 can display BCD time in the video output. Select this check box to enable this option.				
Text Color	Determines the timer text color.				
Background Style	Determines the background sha	ding of the timer.			
Horizontal Placement/ Vertical Placement	Determines the location of the ti screen.	mer in x y co-ordinates in pixels	from the top-left corner of the		
Video Resolution	Determines the resolution of the pixel).	displayed image. The following	resolutions are available (pixel x		
CIF	352 x 288 (PAL) 352 x 240 (NTSC)				
2CIF	704 x 288 (PAL) 704 x 240 (NTSC)	704 x 288 (PAL) 704 x 240 (NTSC)			
D1	704 x 576 (PAL) 704 x 480 (NTSC)				
Input Video Bitrate	H.264 encoding produces a bit s setting. The video words that yo must have a value higher than t	stream with an average bit-rate c u want to transmit (later referred he value set in this field.	lose to the value specified in this to as Sampling Video Rate),		
	Video input rate (kbps)	Sampling Video Rate with audio (kbps)	Sampling Video Rate without audio (kbps)		
	250 (KAD/VID/106/B only)	Not supported	380 (KAD/VID/106/B only)		
	512	700	560		
	750	960	820		
	900	1150	990		
	1000	1230	1090		
	2000 2320 2180				
GOP Mode	Determines the amount of P frames to I frames in the output video. Allowed values range from All (all I frames) to 60 (1 I frame every 60 P frames). A higher P:I frame ratio reduces the amount of bandwidth needed for a given video application. However, the video stream takes longer to recover should any bit errors occur.				
Frame Rate	Determines the number of frames per second (fps) displayed in the video output. This setting can be used as a crude method to reduce bandwidth. For example, displaying 12.5fps uses just over half the bandwidth needed to display 25fps.				
Audio Setting	Determines which audio channels (if any) are to be used.				



## 44.2.3 Using Video

There are no inherent differences between video data and other types of Acra KAM-500 data, except that video data generally uses a far greater bandwidth.

Sampling video bandwidth for a PCM stream can be calculated as follows:

Sampling video bit rate = number of video words × number of bits per video word × video sampling rate

A similar approach can be used to calculate the bandwidth for placement in a UDP packet or logging to a memory module.

The video bit rate needed depends on the application. The following table provides optimal settings for outputs of various quality.

Table 44-3: KAD/VID/106 optimal video settings

Bit-rate (Mbps)	Resolution	Frame rate (fps)	GOP			
Optimal PAL video settings						
0.512	CIF	12.5	5			
0.512	2CIF	25	15			
0.512	D1	12.5	5			
0.75	CIF	25	15			
0.75	D1	25	5			
0.9	CIF	25	5			
0.9	D1	25	15			
1	2CIF	25	15			
1	D1	25	15			
2	2CIF	25	5			
2	D1	25	15			
5	2CIF	25	5			
5	D1	25	5			
10	2CIF	25	5			
10	D1	25	5			
Optimal NTSC video settings						
0.75	CIF	30	5			
0.75	2CIF	30	15			
0.75	D1	1	5			
0.9	CIF	30	5			
0.9	2CIF	30	15			
0.9	D1	1	5			
0.9	D1	15	15			
1	2CIF	30	5			
1	D1	30	15			
2	2CIF	30	5			



#### Table 44-3: KAD/VID/106 optimal video settings (continued)

Bit-rate (Mbps)	Resolution	Frame rate (fps)	GOP
2	D1	30	5
5	2CIF	30	5
5	D1	30	5
10	2CIF	30	5
10	D1	30	5

The KAD/VID/106 is unique amongst Acra KAM-500 modules in that it does not support different sample rates. If video data is being sent to more than one destination in the system (such as a PCM frame, UDP packet, or memory module) it must be sampled at exactly the same rate by the destination modules. kProgram will not flag this as an error.

#### 44.2.3.1 KSM-500 - Using video over PCM

In order to ease placement and save bandwidth for PCM transmission, we recommended using multiples video words. To demonstrate this, refer to the settings in the following figure.

Module Setup	
Information Chassis Slot Module KAM/CHS/13U 6 KAD/VID	Serial Number
Parameters Setup	
Input Source: Composite 1 💌 Video Format: PAL 💌	Turn on timer overlay Horizontal Placement: 40 pixel
Video Resolution: CIF	Vertical Placement: 40 pixel
Video compression GOP: 1:15	Text Color: White
Input Video Bitrate: 0.9 🗾 Mbps	Background: Solid
Temporal Decimation: 25 🗾 fps	
Audio Channel: None 💌	Time Server. Slave
C Packetization	
Video TS blocks per packet: 7	2
Timeout (msec) for video packets: 40	
Thread threshold:	
Video Parameters' Prefix Name:	
🗖 Enabl	e 12 bits video

Figure 44-7: Using multiple video words (KSM-500)

The Input Video Bitrate is set to 0.9 Mbps. This provides the optimal video as shown in the *KAD/VID/106* data sheet and Table 44-3 on page 8.

With audio off, we require a sampling video bit rate at least 10% higher than 0.9 Mbps, that is at least 0.99 Mbps.

The following figure shows a PCM shape, which illustrates a sampling video rate.



Frame Wizard						×
Words/Minor Frame	100	9	Synchronization Patter	m F	E6B2840h	•
Minor Frames/Major Frame	32		Auto Barker Code	V	ī	
Bits Per Word	16	5	Synchronization Mask	FI	FFFFFFh	
Parity	NONE	5	Synchronization bits	3	2	
Fill Pattern	AAAAh	F	PCM Code	N	IRZ-L	•
Bit Rate	1638400	1	nvert DCLK	N	10	•
Bits Per Minor	1600	1	nvert PCM		10	•
Justification						
• Left	C Right			Synchroni	ization Strateg	зy
Major Frame Frequency	32.000000		< Back	Finish	Cancel	

Figure 44-8: Sampling video rate PCM shape

Because we need to achieve 0.99 Mbps where the PCM bit-rate is 1.6384 Mbps, we need to cover at least 61% (0.99/1.6384) of the PCM with video words. Therefore, we set 64 video words commutated at 1:1.

To know the exact sampling video bit rate used, the video words being commutated 1:1 within this PCM gives 1024 Hz. Therefore,  $1024 \text{ Hz} \times 64 \text{ Video Words} \times 16 \text{ bits} = 1048576 \text{ bps}$ , which is 10% higher than the Input Video Bitrate (0.9 Mbps).

File Edit View	Frame	-				_	_	_						_
🏠 🛛 🖬 🔰 👂	9 🤋 🤀	- <u>-</u>	୍ %	Ø 🗙										
0	1	2	3	4	5	6	7		8	9	10	11	12	13
) <mark>SFID</mark>	VID106_0	VID106_0	VID106_0	VID106_0	VID106_I	0, VID106	_0_VID1	06_0	VID106_0	VID106_0	VID106_0	0_VID106_0	VID106_0	VID
SFID	VID106_0	VID106_0	VID106_0	VID106_0	VID106_0	0.VID106	_0_VID1	06_0	VID106_0	VID106_0	VID106_0	UD106_0	VID106_0	VID
SFID	VID106_0	VID106_0	VID106_0	VID106_0	VID106_	0.VID106	_0_VID1	06_0	VID106_0	VID106_0	VID106_0	VID106_0	VID106_0	VID
B SFID	VID106 0	VID106 0	VID106 0	VID106 0	VID106		0 VID1	06 0	VID106 0	VID106 0	VID106 (	VID106 0	VID106 0	VID
I SFID	VID106 0	VID106_0	VID106_0	VID106 0	VID106		0 VID1	06 0	VID106 0	MD106_0	VID106 (	1 VID106 0	MD106 0	
SFID	VID106_0	VID106_0	VID106_0	VID106_0	VID106			06 0	VID106 0	VID106_0	VID106 (	1 VID106_0	VID106 0	VD
SEID								06.0		VID106_0				
SEID								06.0						IVID
SEID		VID106_0						0.60						
SEID		VID106_0	VID106_0					0.60		MD106_0				
	VID106_0	VID106_0						0 30		MD106_0				
	VID106_0	MD106_0						06_0		MD106_0				
	VID106_0	VID106_0	VID106_0	VID106_0			0.VID1	00_0		MD106_0				
	VID100_0	VID100_0	VID100_0	VID100_0				00_0		VID100_0				
	VID100_0	VID100_0	VID100_0	VID100_0				00_0		VID100_0				
4 SHD	VID106_0		VID106_0					06_0		VID106_0			VID106_0	
5 SHD	VID106_0	VID106_0	VID106_0					06_0	VID106_0	VID106_0		J_VID106_0	VID106_0	VIL
6 SFID	VID106_0	VID106_0	MD106_0	VID106_0	MD106_			06_0	VID106_0	MD106_0	VID106_0	J_VID106_0	MD106_0	. VIC
7 SFID	VID106_0	VID106_0	MD106_0	VID106_0	VID106_I			06_0	VID106_0	MD106_0	VID106_0	J_VID106_0	MD106_0	. VIC
	VID106_0			MID106_0				0 00	MD106_0					
Chassis	Mo	odule	P	arameter Name	E	nabled	Placed	I Wi	ord Min dex Fra	nor De me R	sired ate	Real Rate	Commute	atior
KAM/CHS/13	U KAD/V	ID/106	VID106_0	_J3_VIDE	D_0_44 😽	'es	Yes	45	0	100	1	024.000	1:1	
KAM/CHS/13	U KAD/V	ID/106	VID106_0	_J3_VIDE	D_0_45 Y	'es	Yes	46	0	100	1	024.000	1:1	
(AM/CHS/13	U KAD/V	ID/106	VID106_0	_J3_VIDE	D_0_46 Y	'es	Yes	47	0	100	1	024.000	1:1	
AM/CHS/13	U KAD/V	ID/106	VID106_0	_J3_VIDE	D_0_47 Y	'es	Yes	48	0	100	1	024.000	1:1	
AM/CHS/13	U KAD/V	ID/106	VID106_0	_J3_VIDE	D_0_48 Y	es	Yes	49	0	100	1	024.000	1:1	
AM/CHS/13	U KAD/V	ID/106	VID106_0	_J3_VIDEO	D_0_49 Y	'es	Yes	50	0	100	1	024.000	10	
AM/CHS/13	U KAD/V	ID/106			J_0_50 Y	'es	Yes	51	U	100	1	024.000	101	
AM/CHS/13	U KAD/V	ID/106			J_0_51 Y	es /	Yes	52	U	100	1	024.000	101	
	U KADAZ	ID/106	VID106_0		D_0_02 1	'es 'es	Yes	53	0	100	1	024.000	1.1	
AM/CHS/13		ID/106			D 0 54 V	60 /ac	Yee	55	0	100	1	024.000	1:1	
AM/CHS/13	U KAD/V	ID/106		.13 VIDE	D 0 55 Y	'es	Yes	56	0	100	1	024.000	11	
AM/CHS/13	U KAD/V	ID/106	VID106_0	J3_VIDE	D_0_56_	'es	Yes	57	0	100	1	024.000	1:1	
AM/CHS/13	U KAD/V	ID/106	VID106_0	_J3_VIDE	D_0_57 Y	'es	Yes	58	0	100	1	024.000	1:1	
AM/CHS/13	U KAD/V	ID/106	VID106_0	_J3_VIDE	D_0_58 Y	'es	Yes	59	0	100	1	024.000	1:1	
AM/CHS/13	U KAD/V	ID/106	VID106_0	_J3_VIDE	D_0_59 Y	'es	Yes	60	0	100	1	024.000	1:1	
AM/CHS/13	U KAD/V	ID/106	VID106_0	_J3_VIDE	D_0_60 Y	'es	Yes	61	0	100	1	024.000	1:1	
KAM/CHS/13	U KAD/V	ID/106	VID106_0	_J3_VIDE	D_0_61 Y	'es	Yes	62	0	100	1	024.000	1:1	
KAM/CHS/13	U KAD/V	ID/106	VID106_0	_J3_VIDE	D_0_62 Y	'es	Yes	63	0	100	1	024.000	1:1	
KAM/CHS/13	U KAD/V	ID/106	VID106_0	_J3_VIDE	D_0_63 Y	'es	Yes	64	0	100	1	024.000	1:1	

Figure 44-9: Frame Builder showing video words at 1024Hz



#### 44.2.3.2 DAS Studio 3 - Using video over PCM

In order to ease placement and save bandwidth for PCM transmission, we recommended using multiples video words. To demonstrate this, refer to the following.

1. With a KAD/VID/106 module in context, click the **Settings** tab to show the following screen.

•	Settings 💌	Processes	Packages	Algorithms	Documenta	tion
VID106PCM.xidml	Parameter Type	Parame Name	eter 7			*
KAM/CHS/03F MyKAM_CHS_03F 2 2 KAD/BCU/101/F MyKAD BCU 101	MPEG2TS	▼ P_M	yKAD_VID_106_I	MPEG2TS		
3	Report	▼ P_M	yKAD_VID_106_H	Report		
✓ 4 KAD/VID/106 MyKAD_VID_106 5	Encapsulation Mode	7			_	
	FIFO	•				
	Source 7 St	ream Id 🍸 🗜	acketization $\nabla$			
	MPEG2TSIn FFF	FFFFF				
	Video Input					_
	Video Format 🦷	7 Video Sour	ce 🏹			
	PAL	<ul> <li>CVBS_IN(0</li> </ul>	) 🔹			
	Time Overlay					
	Video Timer On		r V Backgroun Style	nd V Horizo	ntal Ve nent Ve Pla	rtical acement V
	✓	Black	▼ Solid	<b>→</b> 40	40	
	Compression					
	Video Resolution ♥	Video Bit Rate	了 GOP Mode	T Frame R	ate 🍸 Aud	lio Setting 🍸
	CIF 🔻	900 kbps	▼ 1:15	▼ 25	▼ No	ne 🔻
< III	4					

2. Set Video Bit Rate to 900 kbps.

This provides the optimal video as shown in the KAD/VID/106 data sheet and Table 44-3 on page 8.

#### 3. Set Audio Setting to None.

This requires a sampling video bit rate at least 10% higher than 900 kbps, that is at least 990 kbps.

- 4. Now select a controller module (such as KAD/BCU/101) in the Navigator and then click the Packages tab.
- 5. Add a package with the following PCM shape, which illustrates a sampling video rate.

	Settings 🔻	Processes	Packages	Algorithms	Documentation										
	∧ Channels														
CM.xidml*	<b>+</b> *														
I/CHS/03F MyKAM_CHS_03F KAD/BCU/101/E MyKAD_BCU_101_E	Instrument V Name	Channel Name	Bit Rate 🖓	Connection Name	ηΔ	Connecte Instrumer	d nt Ƴ	Connected T Channel	Package Count						
✓ Inputs A ⇒ Outputs	MyKAD_BCU_101	E PCM-OUT(	) 1638400	Link_MyKA	D_BCU_101_E_PCM-OUT(0)				1						
PCM-OUT(0) Link_MyKAD_BCU_															
PCM-OUT(1)	Package Prope	Properties													
PCM-OUT(2) PCM-OUT(3)															
✓ ↔ Bi-directional	Name 🍸	F	ate (Hz) 🍸	Format 🍸	Sync Word 🍸		Data B	Bits Per Word 🍸	Parity 🍸	Words Per Minor Frame 🍸	Minor Frames Per Major				
KAD/VID/106 MyKAD_VID_106	MyIRIG-106-CI	h-4Package 3	2		111111100110101100101000	001000000	16		None	100	32				
-					m						×				

Because we need to achieve 990 kbps where the PCM bit-rate is 1638.4 kbps, we need to cover at least 61% (990 / 1638.4) of the PCM with video words. Therefore, we need 64 video words commutated at 1:1, which is 64 × 32 video burst words.



6. In the Content pane, click Default Occurrences.

^	Content																										
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	2
1 .																											
3																											
4 :																											
<u>6</u> ·																											
8																											-
9 -	4																										
							_						(	Defeu	It One		1	E			-	009/					A
_														Delau	n occ	urren	ces: 1			-		.00 /6	0	~			Ð
		0														- Vi											-
P	laced Data	•																									
-	= 🖕 Ox																										
_		_	_																							_	

7. The Placement Preferences dialog box opens.

Placement Preferer	nces 🗵
Standard I Default Occurren 1	Placement ces
Placement Orie Horizontal Vertical	ntation
E Force Contigu	ous Placement
<ul> <li>Burst Place</li> <li>Burst Size</li> <li>64</li> <li>Repeat Burst</li> <li>32</li> </ul>	ement
	Save Cancel

Select the **Burst Placement** radio button, set **Burst Size** to **64**, select the **Repeat Burst** check box, set **Repeat Burst** to **32**, and then click **Save**. (This results in 64 × 32 video words.)

8. Now drag the video parameter P\_MyKAD\_VID\_106\_MPEG2TS from the Placed Data pane to the Content pane.



To know the exact sampling video bit rate used, video words is showing 65536 Hz for the **Actual Rate**. Therefore, 65536 × 16 bits = 1048576 bps, which is 10% higher than the Video Bit Rate (900 kbps).

#### 44.2.3.3 KSM-500 - Using video over Ethernet

Video data can be placed in a UDP packet. However, due to the different transmission mechanisms between Ethernet packets and PCM frames, care has to be taken when using video over Ethernet.

The KAD/VID/106 places the Video words out onto the backplane in an order which is transparent to the user. This poses no problem when using PCM—each parameter is always read at a specific time by the controller module and then placed in a specific location in the PCM frame. However, when sampling using Ethernet, the UDP packet is not transmitted until it is full. This means that video parameters can appear out of order. Consequently, the MPEG-2 transport stream makes no sense to a decoding device.

There are three methods to get around this constraint:

• Use only one video word and transmit it as many times as necessary in the UDP packet. The disadvantage with this method is that the task may not compile due to timing considerations.



	P	arameters	Setup							
		P	arameter Name	#Words	Мо	de	Packag	es		
	*		•	*	*	•	*	•		
	N	/ID106_	_0_J4_REPORT		REP	ORT	None			
	N	/ID106_	_0_J4_VIDEO_0	1	VIDE	0	None			
Chassis	Module		Parameter Name	Enabledf	Placed	Word Index	d Minor k Frame	Desired Rate	Real Rate	Commutation
KAM/CHS/09U	KAD/VID/106	VID10	)6_0_J4_REPORT	Yes	No	N/A	N/A	100	50.000	1:1
KAM/CHS/09U	KAD/VID/106		)6 0 J4 VIDEO 0	Yes	No	N/A	N/A	100	50 000	1:1

Figure 44-10: Transmitting one video word many times in a UDP packet

- Place the video parameters in a PCM frame to force the ordering in the UDP packet (even if the PCM frame is not going to be used). If this method is to be used, ensure the video parameters do not occur more than 188 times in a single packet. The disadvantage with this method is that it uses up PCM bandwidth.
- Use Video Parameters' Prefix Name field on the KAD/VID/106 module Setup tab and set the video parameter name as shown in the following figure.

IFIFO (snarfer)

Video Parameters' Prefix Name: VID106\_0\_J6\_VIDEO\_0

Figure 44-11: Setting the video parameter name

This setting allows the software to thread all the video words, that is, force the order on the backplane.

Sampling video bit rate is the acquisition cycle × packets per acquisition cycle × occurrences × number of video words × 16.

#### 44.2.3.4 DAS Studio 3 - Using video over Ethernet

Video data can be placed in a UDP packet. Video parameters can be transmitted as a FIFO parameter or as a packetizer.

The following figure shows a KAD/VID/106 module in context with the **Settings** tab selected. **Encapsulation Mode** is set to FIFO.

	Settings 💌	Processe	25	Packages	Algorithms	0
✔ VID106ETH.xidml ▲ KAM/CH5/03F MyKAM_CH5_03F ★ 24 KAD/BCU/140/D MyKAD_BCU_140_D 31	Parameter Type MPEG2TS Report	P N	Parame Name P_M P M	<sup>ter</sup> YKAD_VID_100 YKAD VID 100	5_MPEG2TS 5 Report	
✓ 4 KAD/VID/106 MyKAD_VID_106 5 ↓	Encapsulation Mode	7		<u>.</u>	-	

Figure 44-12: Encapsulation Mode set to FIFO

In the following figure, the KAD/BCU/140 is in context. The **Packages** tab is selected and we can see a KAD/BCU/140 package transmitting video.



	Settings 🔻	Processes	Packages .	Algorithms De	ocumentation							
	▲ Channels											
VID106ETH.xidml	P *											
KAM/CHS/03F MyKAM_CHS_03F 2 KAD/BCU/140/D MyKAD_BCU_140_D	Instrument V Name	Channel Name	𝖓 Bit Rate 𝑘	$_{\rm Name}^{\rm Connection}  {\bf V}$		$_{\rm Instrument}^{\rm Connected} \bigtriangledown$	Connected Channel	Package Count				
✓ 4 KAD/VID/106 MyKAD_VID_106	MyKAD_BCU_140 MyKAD_BCU_140	D Ethernet(	)) n/a L) n/a	Link_MyKAD_BCU	J_140_D_Ethernet(0)			1 0				
	<ul> <li>De alua e Des au</li> </ul>											
		ues										
	Name 🍸		Rate (Hz) 🍸	Туре 🍸	Sub Type 🍸	Stream ID 🍸		Source IPA 🍸	Source			
	MyPlacediNET-	XPackage	56	INet-X	Placed	100	C	000.000.000	1024			
	•	۲ ۱۱۱ ۲۰۰۰ ۲۰۰۰ ۲۰۰۰ ۲۰۰۰ ۲۰۰۰ ۲۰۰۰ ۲۰۰۰ ۲۰۰۰ ۲۰۰۰ ۲۰۰۰ ۲۰۰										
	<ul> <li>Content</li> </ul>											
	0 1 2	3 4	5 6 7 8	9 10 11	12 13 14 15	16 17 18	19 20 21	22 23 24	25 26			
	<								•			
						Bur	rst Size: 64   10	0% 😑 💛	(+)			
	Placed Data											
	Name 🍸	,	Value 🍸	Offset Bytes 🍸	Actual Rate (Hz) 🍸	Occurrences 7	Bits 🍸 S	Source Chassis 🍸	Source I			
	P_MyKAD	VID_106_MI	EG2TS n/a	28	65536	256	16 M	IyKAM_CHS_03F	MyKAD_\			
	4								Þ			

Figure 44-13: KAD/BCU/140 package transmitting video

The sampling video bit rate is the rate of the packet × occurrences × 16. Therefore, in the previous example:  $256 \times 256 \times 16 = 1048576$  bps.

Now we change Encapsulation Mode to Packetizer as shown in the following screen. A Stream ID must be defined and the Packetization Enabled check box must be selected.

	Settings 💌	Process	ses	Packages	Algorithms	Doc
VID106ETH.xidml*	Parameter Type	,	Paramet Name	ter T		
KAM/CHS/03F MyKAM_CHS_03F 2 KAD/BCU/140/D MyKAD BCU 140 D	MPEG2TS	(	▼ P_My	KAD_VID_10	5_MPEG2TS	
3	Report		▼ P_My	KAD_VID_10	5_Report	
✓ 4. KAD/VID/106 MyKAD_VID_106 5.	Encapsulation Mode	Y				
	Source V	Stream Id	Pa En	cketization 🍸		
	MPEG2TSIn 1	1212		V		
	Video Input			2	_	

Figure 44-14: Encapsulation Mode set to Packetizer

NOTE: This mode requires an aperiodic Ethernet transmitter module such as a KAD/BCU/140.

During Verify/Program, the iNET-X block packet is automatically created by DAS Studio 3.

Settings 🔻	Processes	Packages	Algorithms	Documentation							
▲ Channels											
<b>₩</b> *											
Instrument Name	Channel Name	Bit Rate 🍸	Connection Name		Connected Instrument	マ Connected マ Channel マ	Package Count				
MyKAD_BCU_140	D Ethernet(0)	n/a	Link_MyKAD_B	CU_140_D_Etherne	t(0)		1				
MyKAD_BCU_140	D Ethernet(1)	n/a					0				
Package Prope	rties										
Name 🍸	Rate (Hz	∀ Type ∀	Sub Type 🍸	Stream ID 🍸	Source IPA 🍸	Source UDP Port 🍸	Destination MA	AC 🝸 Destination IPA 🦷	Destination UDP Port *	DataType 🍸	Size
KADVID106_12	12 99	INet-X	Block	1212	000.000.000.000	0	01-00-5E-00-00	0-01 235.0.0.1	8010	MPEG2 Transport Stre	n\a
•											Þ





#### 44.2.3.5 Using video with a memory module

Video data can be logged to a memory module the same way as any other type of data is logged. However, two constraints apply:

- Video parameter names must follow the syntax <optional label>VIDEO< optional label>
- Video words must be sampled at the same rate in the memory module as in the PCM frame

Sampling video bit rate is: video sample rate × number of video words × 16.

## 44.3 Viewing KAD/VID/106 data

The data from the KAD/VID/106 can be viewed either in real-time (using GS Works 8) or at a later date using a memory module.

#### 44.3.1 Using GS Works 8

Video data is treated the same as other types of Acra KAM-500 data by GS Works 8. That is, any data source such as PCM, UDP, or CompactFlash<sup>™</sup> is supported by the KAD/VID/106. However, the ffdshow codec must be installed to view video using GS Works 8.

The KAD/VID/106 video is supported from GS Works 8.1.1. Refer to the GS Works 8 release notes. For example, in GS Works 8.1.1, audio is not available.

Video from the KAD/VID/106 module as displayed in the GS Works 8 video player is supported via the ffdshow\_rev4513\_20130525.exe video codec package. You can download ffdshow codec from source forge:

http://sourceforge.net/projects/ffdshow

**NOTE:** You can only have one codec installed at a time. This means mixing KAD/VID/103 and KAD/VID/106 video in GS Works 8 is not supported.

After installing the codec, do the following to view video in GS Works 8.

- 1. Open GS Works 8 and follow the Start Wizard to load the data you want to view.
- 2. Click the Display Builder button on the dashboard to open the Display Builder window.
- 3. On the Data Displays tab, drag the Analysis Window icon to the desktop.
- 4. On the ActiveX Controls tab, drag the VideoPlayer icon to the Analysis window.



- 5. Right-click the VideoPlayer window and select Properties.
- 6. In the **Properties** window, scroll to the **VideoChannel** field and select the channel corresponding to the KAD/VID/106 output from the drop-down menu.



Properties - VideoPlayer1 🛛 🗵				
VideoPlayer1 VideoPlayer				
Alphabetic Categorized				
MultipleVideoList	=			
MultipleVideoLi	=			
Name	=	VideoPlayer1		
OnKeyPress	=			
OnLeftClick	=	True		
OnRightClick	=	False		
SmartMode	=	True		
Тор	=	112		
UpdateRate	=	0		
VideoChannel	=	Off 💽		
VideoLength	=	Channel 1 🔺		
Visible	=	Channel 2		
Volume	=	Channel 3		
VolumeBalance	=	Channel 5 🖵		
VolumeMute	=	False		
Width	=	194 🗾		
VideoChannel				
Connect to video channel. Will intelligently switch between live source and video file if SmartMode=True				

The video stream displays in the VideoPlayer.

## 44.3.2 Using kFlashCardXID and memory modules

As with other types of data, video data can be logged to a memory module for later viewing. Ensure that the KAD/VID/106 parameters are named <label>VIDEO<label> for correct operation.

Once the video data has been logged to the CompactFlash card, it can be extracted using kFlashCardXID. The output format must be Video (MPEG-2 Transport Stream) as shown in the following figure.

Output Format	Video (MPEG-2 Transport Stream file)	
Output Directory	C:\ACRA\kFlashCardXID\Output	

Figure 44-16: Selecting Video output format in kFlashCardXID

The video is extracted as a transport stream (<filename>.ts) file to the specified output directory. This transport stream file can then be viewed by MPEG viewing software such as VLC2.0 (http://www.videolan.org/vlc/).

**NOTE:** Contrary to the KAD/VID/103, audio is replayed by VLC because the KAD/VID/106 uses the MPEG Audio standard (AAC) in the audio stream.

#### 44.3.3 Using UDP

An internal tool based on VLC can also be provided by Curtiss-Wright support (acra-support@curtisswright.com) to replay in real time KAD/VID/106 IENA/iNET-x placed or iNET-x packetizer video packets. Sound can also be replayed.

**NOTE:** This utility is an internal tool, therefore, no support is provided. When requesting this tool from Curtiss-Wright support, ask for TSD-AA-014 vlc to replay KAD/VID/106.



# 44.4 Troubleshooting

## 44.4.1 Only a black screen is displayed

If the Turn on timer overlay check box is selected on the Module Setup tab, and you see the time overlaid on a black screen, this means that the KAD/VID/106 is operating correctly, however, it is just not receiving a video stream. If the Turn on timer overlay check box is not selected, then select it now. This allows you to verify that the KAD/VID/106 is operating correctly before trying to troubleshoot video input problems.

- If camera selection is through the connector, ensure the correct pins are grounded. (See Table 44-1 on page 2.)
- If camera selection is through EEPROM, ensure that the camera is connected to the correct input. (See "Input Source" under "44.2.2.2 KSM-500 Setup tab settings" on page 4.)
- · Verify the camera is working correctly.

## 44.4.2 GS Works 8 is in PCM lock but no video is displayed

This usually means that there is either a problem with the KAD/VID/106 video data, or destination modules.

- Ensure the correct output format is selected (PAL or NTSC). (See "Video Format" under "44.2.2.2 KSM-500 Setup tab settings" on page 4.)
- Ensure the MPEG bit-rate is adequate for the application. (See section "44.2.3 Using Video" on page 8.)
- If more than one destination module is being used in the system, ensure the KAD/VID/106 data is sampled at the same rate in each destination module. (See section "44.2.3 Using Video" on page 8.)



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