



SAM (Stand Alone Module) DVI to A818, or A818 to DVI With SAM view USB Interface User Manual

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Contact Information

Telephone	1 (866) 478-4491
Company Fax	(505) 883-1375
Email	grt@greatrivertech.com
Web Address	www.greatrivertech.com

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8/1/2008	REV -	INITIAL RELEASE	INITIAL RELEASE	J. STAHOVIK
5/8/2009	REV A		Added Image Controls to Load Image Menu Added XGA 1024x768 format support	J. STAHOVIK

1 Introduction

The Great River Technology (GRT) Stand Alone Module (SAM) is a convenient way to deliver A818 functionality to any environment. The compact enclosure makes the GRT SAM a good solution for most A818 applications. The optional USB interface with user-friendly software enhances the base functions of the GRT SAM.

This guide provides instructions for setup and operation of a GRT SAM. The SAM is delivered in one of two configurations:

- DVI to A818 converter
- A818 to DVI converter

A variety of video formats are available, but each GRT SAM is pre-configured for a specific speed and resolution:

- SAM 1Gb 1400x1050 MONO 60Hz
- SAM 1Gb 1600x1024 MONO 60Hz
- SAM 2Gb 1024x768 RGB 60Hz
- SAM 3Gb 1400x1050 RGB 60Hz
- SAM 2Gb 1024x768 RGB 60Hz

Additional formats and protocols may be available upon request.

The optional USB interface with SAMview software provide a user friendly way to control all aspects of the GRT SAM card, allowing the user to change header data, and control A818 timing.

2 SAM Configuration and Options

2.1 DVI to A818 Converter

The DVI to A818 Converter is ideal for providing real time streaming video to the A818 interface. Using a standard PC DVI output the power and flexibility of a PC as video source is transformed into a powerful and flexible A818 video source.

Any DVI output source can be used as the DVI input to the GRT SAM, but a PC offers a wide range of static and dynamic video options. The DVI output must conform to the resolution and frame rate of the desired FC protocol. Not all PC video cards provide the programmability to meet the required video resolution and timing. In the case where the DVI timing and resolution do not match the A818 protocol the SAM module will adjust to provide the best possible A818 output. There are four possibilities for adjustment:

- The DVI Frame rate is less than the desired A818 frame rate. In this case the A818 frame rate will be set to match the DVI input frame rate.
- The DVI horizontal resolution is less than the desired A818 horizontal resolution. The GRT SAM will repeat line data until the desired A818 horizontal resolution is achieved. This will result in reduced frame rate as it may take more than one frame to build a complete A818 image.
- The DVI horizontal resolution is greater than the desired A818 horizontal resolution. The GRT SAM will truncate the image to the upper left corner to match the desired A818 image size.
- The DVI frame rate is greater that the desired A818 frame rate. The GRT SAM will skip every other incoming DVI frame and the resulting A818 output will equal half the DVI input frame rate.

The GRT SAM will capture digital images from the DVI input then format, and output A818 compliant containers. A818 header data is automatically added to the A818 stream.

The GRT SAM will power up to a known state ready to convert DVI to A818. In this mode default header data and FC timing are used to generate the A818 format. The optional USB interface with SAMview software provide a user friendly way to control all aspects of the GRT SAM card, allowing the user to change header data, and control FC timing.

2.2 A818 to DVI Converter

The DVI to A818 Converter is ideal for viewing real time streaming video from an A818 interface to a standard DVI monitor.

The GRT SAM DVI output can be connected to any compatible DVI monitor and used to view the video stream from a compliant A818. This configuration is ideal for verifying connectivity, and image quality.

The GRT SAM will power up to a known state ready to convert A818 to DVI output.

In this configuration the SAM A818 Optical Tx port will echo the A818 Rx data, and in this way can be used as a line spy for A818 video.

2.3 Status LED's

The Status LED's provide a quick means to validate the operation of the GRT SAM, and verify that the input source is valid. The LED's status names do not change for each configuration, but the interpretation of the LED's is slightly different for each configuration.

The LED's for the DVI to FC when 'ON' are defined to be:

- Power : The GRT SAM box is powered up and configured.
- Rx Present : The DVI input source is present.
- Rx Valid : The DVI input is the correct resolution defined by the SAM part number.
- Tx Valid : The FC output stream is active. If this LED is flickering then the DVI input Frame rate is faster than the FC output frame rate. Adjust the DVI source to get the correct DVI output frame rate and the LED will be a solid green.
- Test Pattern : The FC test pattern output option is selected. The FC output test patten consists of vertical color or monochrome bars, with the image borders highlighted, and an active scroll bar.
- Fault : A GRT SAM system fault has occurred. Contact GRT for assistance.

Te LED's for the FC to DVI when 'ON' are defined to be:

- Power : The GRT SAM box is powered up and configured.
- Rx Present : The FC optical power is present.
- Rx Valid : The FC input contains SOFi characters.
- Tx Valid : The DVI output is active.
- Test Pattern : The FC test pattern output option is selected. The DVI output test pattern is a static image of vertical color or monochrome bars
- Fault : A GRT SAM system fault has occurred. Contact GRT for assistance.

2.4 Power Connection

The GRT SAM is shipped with 100-240VAC to 24V 0.83A DC power adapter. The Power port is located on the side of the SAM enclosure illustrated in figure 2.4.1



Figure 2.4.1 GRT SAM DC power connection and Toggle Switch

2.5 Toggle Switch Functions

The toggle switch provides two functions. It can reset the GRT SAM to default settings, and it can enable the output of a test pattern. When the toggle switch is in the reset position all of the LED's on the top of the GRT SAM will light. When the toggle switch is in the Test Pattern position a test pattern will be output from the SAM either on A818 or DVI depending on the SAM configuration. In the "Run" position the GRT SAM is ready to convert A818 to DVI or DVI to A818 depending on the SAM configuration. Figure 2.4.1 illustrates the toggle switch.

2.6 DVI Port and optional VGA Port

2.6.1 DVI to A818 Configuration

In the DVI to A818 configuration the DVI port is an input port only. Typically the GRT SAM DVI port is connected to the output of a standard PC. The PC graphics card is configured to the appropriate resolution, and timing. The GRT SAM will format and output the video to the A818 connection. For this configuration there is an optional VGA output port that can be used to display data captured from the DVI input. This feature requires the optional USB interface with SAMview software. Figure 2.6.1 illustrates the DVI and optional VGA port locations.

2.6.2 A818 to DVI Configuration

In the FC to DVI configuration the DVI port is an output port only. Typically the GRT SAM DVI port is connected to a standard PC monitor. The A818 input will be converted to standard DVI output at the default resolution, per the SAM configuration option. Figure 2.6.1 illustrates the DVI and optional VGA port locations.



Figure 2.6.1 DVI and optional VGA port locations

3 SAMview USB Application

3.1 SAM USB Interface Software

The SAMview software allows real time control of the GRT SAM. The software provides a user-friendly interface to the GRT SAM control registers and memory. The SAMview GUI allows for quick configuration of the GRT SAM as well as low-level register control for advanced users.

The splash screen for the SAMview application is shown in figure 3.0. Select the appropriate Comm Port from the Drop down list and click the Start Application Button. This will bring up the main menu of the SAMview application.



Figure 3.0 SAMview Splash Screen

3.2 Main Menu

The Main menu provides controls for all of the SAM box features. In addition there are additional buttons that will invoke separate screens to perform additional functions and diagnostics. The Main Menu is shown in Figure 3.1

The Main menu consists of an information section describing the configuration of the SAM box, with Control options below. The configuration information consists Data Path of the SAM box, the firmware version, and the communications parameters. The Data Path is either Fibre Channel (FC) to DVI or DVI to Fibre Channel. The DVI data direction is set in hardware and is not controllable via the SAMview software. However, the FC port can be programmed to be a receiver or transmitter. Images can be loaded to the SAM memory and transmitted on the FC. The FC protocol is set in firmware and is not controllable via software. The FC Header and FC video timing is adjustable via the SAMview software.



Figure 3.1 Main Menu

3.3 Flow Control

The Flow Control Section allows the user to configure the A818 block as a transmitter or a receiver. When in transmitter mode the Image data will come from either the SAM internal SDRAM memory, or if the DVI capture check box is selected the Image data will come from the DVI source. Remember the DVI function is set in hardware. If the SAM box is configured for DVI output then this check box has no effect, and FC data comes from the internal SDRAM memory. Figure 3.2 shows the Flow Control Option Box.

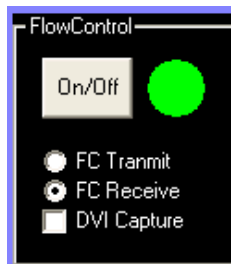


Figure 3.2 Flow Control Options

It is important to turn the Flow Control Off before making changes to the SAM configuration.

3.4 Video Memory

Video memory refers to the two 16Mbyte SDRAM memory storage locations inside the SAM. These two areas are referred to as PING and PONG. The A818 transmitter block will transmit images that have been written into these memory stores. If the DVI interface is configured for DVI capture and the DVI capture check box is enabled, then images from the DVI source are automatically placed into the PING and PONG memory locations and the A818 transmitter when enabled will transmit the images out of this memory space.

The Image control includes a button to load images into the PING and PONG memory locations. Two radio buttons to select which of the two memory store areas the A818 receiver and transmitter will be accessing or the Auto Check box which automatically switches from PING to PONG to allow real time capture and transmitting of DVI images. The Auto check box should be selected for normal operation of the SAM.



Figure 3.3 Video Memory Control

3.4.1 Load Image

The Load image button allows the user to select a bitmap file to load into the PING or PONG memory buffers. The image can be loaded with X and Y offsets to allow the user to load smaller images into the “center” of the displayed video. Multiple images can be loaded sequentially. When the Load Image button is selected a separate window appears that assists the user in selecting the bitmap image and displaying the progress as the image is loaded into the SAM box. Images are loaded as is and not scaled.

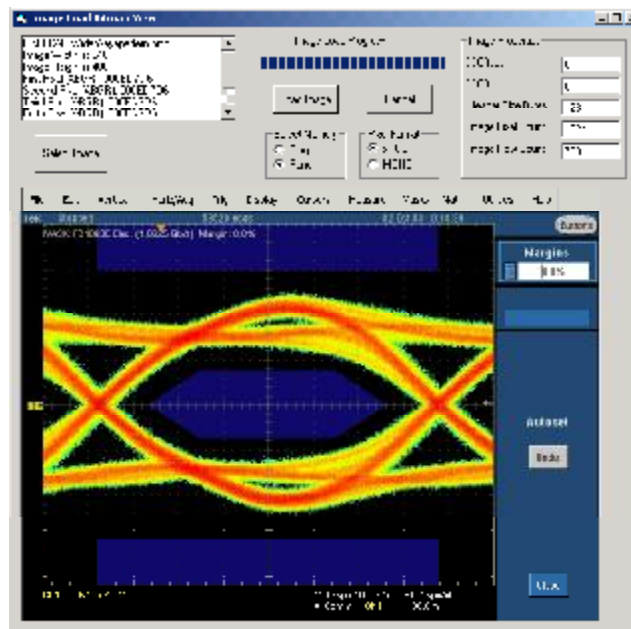


Figure 3.4 Load Image Window

3.4.2 Select Image, X-Y Offsets, and Memory Buffer

The “Select Image” button brings up a standard Windows File Selection window. Select the bitmap to load and choose the “Open” button. The Load Image screen will display statistics about the bitmap that was selected, and display the bitmap in the lower half of the Load Image Window.

The “X Offset” and “Y Offset” allow the user to control the location in the video image where the bit map will be loaded. The default is the upper right hand corner or coordinates (0,0).

The “Header Offset Bytes” is the size of the Obj0 Header size. This is ICD dependent. Please refer to the ICD for the video protocol the SAM was design to meet. This value is the total of the FCF Header, Container Header and Ancillary data that make up Obj0.

The “Image Pixel Count” is the Horizontal Image Resolution the SAM was design to support. This is ICD dependent. Please refer to the ICD for the video protocol the SAM was design to meet.

The “Image Row Count” is the Vertical Image Resolution the SAM was design to support. This is ICD dependent. Please refer to the ICD for the video protocol the SAM was design to meet.

The “Select Memory’ Radio Buttons determine which memory buffer will be loaded with the image.

Once the bitmap is selected, the offsets and memory are set; the “Load Image” button will initiate the process of transferring the image to the SAM box. This can take some time, and the progress bar will reflect the current status of the download. When the progress bar is full and the mouse pointer changes from an hour glass to a pointer the image load process is complete.

3.5 Video Port

The video port section controls the DVI and optional VDAC video ports. Depending on the configurations of the SAM box the DVI port may be an output port. In this case the VDAC port is not installed. In the case of the SAM box with DVI capture the VDAC port may be installed and used to display images in PING and PONG memory, either captured from the DVI port of from the FC RX port. The “En DVI Out” and “En VDAC Out” check boxes enable or disable the video output from the DVI and VDAC ports.

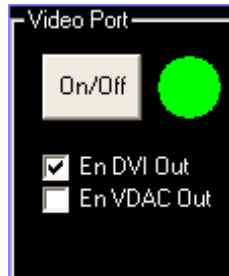


Figure 3.4 Video Port Controls

3.6 Test Pattern Selection

The Test Pattern Controls allow the user to output a canned test pattern on the FC transmitter or on the DVI and VDAC output ports if so equipped. The canned test pattern is typically vertical color bars. There are additional options to test the video output. The “Mark Corners” check box is used to set the corner pixels to all white. The “Mark Sides” check box is used to set the sides to all white. The “Scroll” check box is used to turn on a vertical scroll bar on the FC transmitter. The scroll bar does not appear on the DVI or VDAC output. This helps to identify the source of “live” FC video.

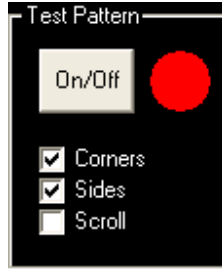


Figure 3.4 Test Pattern Control

3.7 PLD Registers, and Status Registers

The PLD register button will bring up a separate window that allows the user to directly access the registers in the SAM firmware. Care must be taken when changing the register values and the operations of the SAM box can be adversely effected. If changes to the SAM control registers render the SMA box inoperable, simple reset or power cycle the SAM box to restore the power on reset conditions. The USBview application will need to be closed and restarted to reestablish communication with the SAM box.

For more information on the control register functions refer to section 4.2 Register Map.

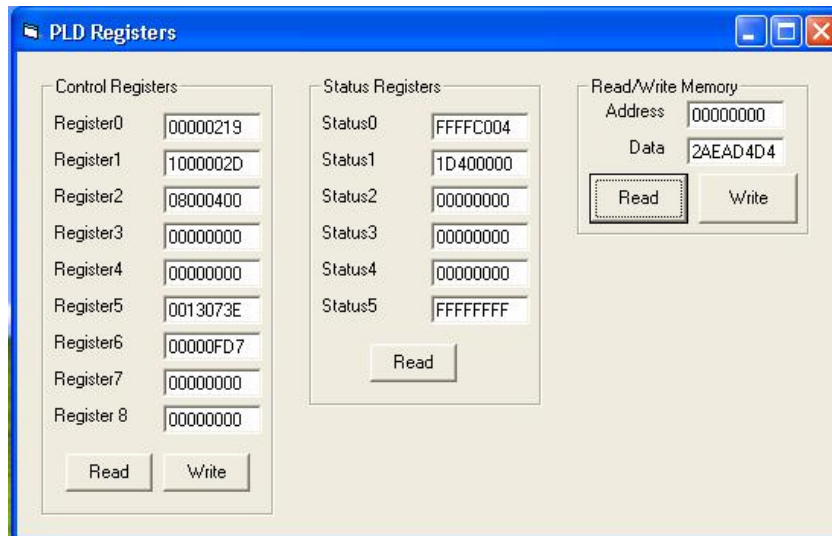


Figure 3.5 PLD Register Control

3.8 Select and Display Headers

The A818 headers for the transmit data and receive data can be displayed using the SAMview software. The header formats are defined in a text file and loaded using the “Select Header Format” button. Depending on the FC mode either Receive or Transmit the corresponding header will be displayed. The receive header information cannot be written as it is read only. The Tx header data can be read or written. Predefined header formats are provided with the SAMView software. For additional header format please contact Great River Technology. The default directory for Header data and formats is typically “C:\EFCapi\HEADERS”.



Figure 3.6 Header Button Options

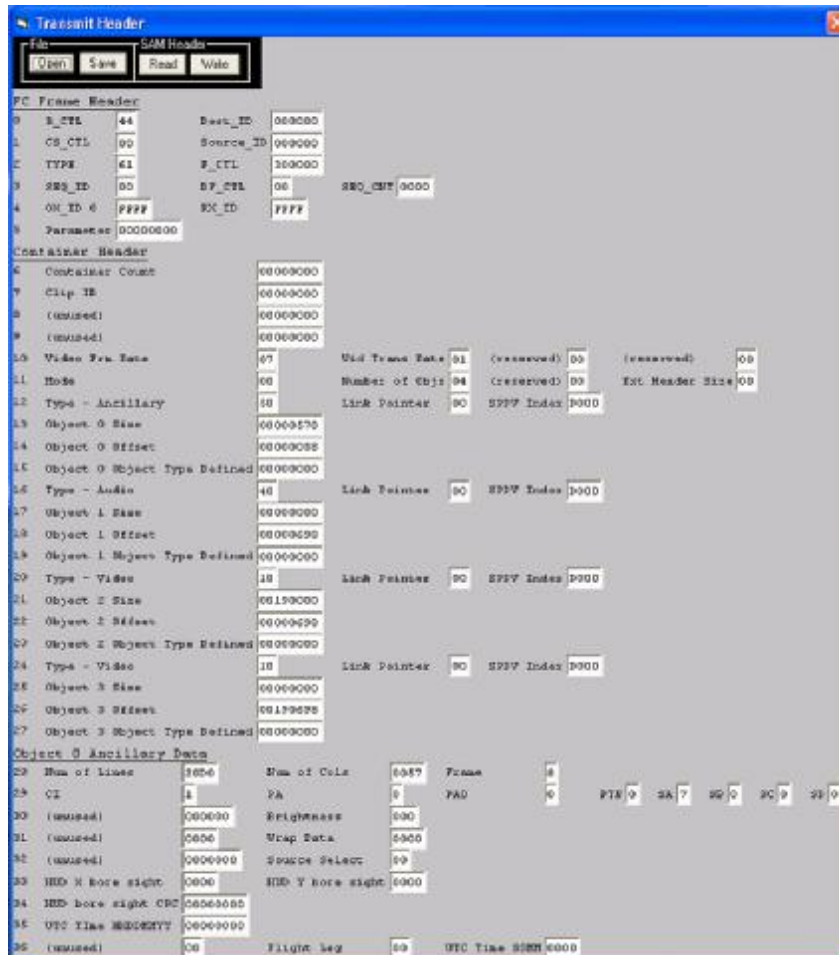


Figure 3.7 Examples of Header Format and Data

3.9 USB Messages

The USB Message button opens up a status window that will display the Serial data being sent to and received from the SAM box USB Hardware

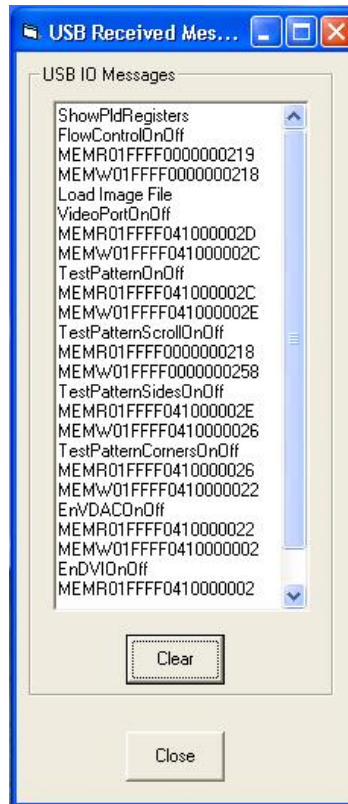


Figure 3.7 SAM USB Interface commands

3.10 SAM Hardware Register Map

Address	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Name	
0x00000000	128 BYTE VIDEO HEADER FOR COLOR FORMATS																															PING SDRAM		
0x00000000	COLOR IMAGE DATA STORED AS 32 BIT TRUE COLOR																															PING SDRAM		
0x00000000	128 BYTE VIDEO HEADER FOR MONO FORMATS																															PING SDRAM		
0x00000000	MONO IMAGE DATA STORED AS 8 BIT MONOCHROME																															PING SDRAM		
0x01000000	128 BYTE VIDEO HEADER FOR COLOR FORMATS																															PONG SDRAM		
0x01000000	COLOR IMAGE DATA STORED AS 32 BIT TRUE COLOR																															PONG SDRAM		
0x01000000	128 BYTE VIDEO HEADER FOR MONO FORMATS																															PONG SDRAM		
0x01000000	MONO IMAGE DATA STORED AS 8 BIT MONOCHROME																															PONG SDRAM		
0x01FFFF00	DVI_PIXEL_CLK	VDAC_RST						FC_TX_PROTECT	FORCE_CRC_ERROR		DATA_IN_PROGRESS									DVI_SELECT	DVI_SYNC_FLIP												CONTROL REG0	
0x01FFFF04	SD_INT									FC_AV_POR_FROM_READSTERS										DVI_3v3v_Financ_Cover													VIDEO CONTROL REG0	
0x01FFFF08																																	MODE REG0	
0x01FFFF0C	VIDEO HLINE PARAMETERS																															VIDEO HLINE REG3		
0x01FFFF10	VIDEO VLINE PARAMETERS																															VIDEO VLINE REG4		
0x01FFFF14	FC INTER LINE IDE COUNT																															FC INTER LINE IDE COUNT REG5		
0x01FFFF18	FC INTER FRAME IDE COUNT																															FC INTER FRAME IDE COUNT REG6		
0x01FFFF1C																				HEADER_ADDRESS_AUTO_INC	HEADER_DATA_TA_RWA	HEADER_DATA_LATCH												FC HEADER CONTROL REG0
0x01FFFF20	FC HEADER WRITE DATA																															FC HEADER WRITE DATA REG8		
0x01FFFF24																					CR_LF_Enable	Selec_Enable											USB IO CONTROL REG9	
0x01FFFF28																																	STATUS	
0x01FFFF34	STATUS																															STAT1		
0x01FFFF38	DVI_HOR_RES															DVI_VER_RES															STAT2			
0x01FFFF3C	FC HEADER READ DATA																															STAT3		