SightLine APPLICATIONS

EAN-GPIO

PN: EAN-GPIO

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Alerts

The following notifications are used throughout the document to help identify important safety and setup information to the user:

△ **CAUTION:** Alerts to a potential hazard that may result in personal injury, or an unsafe practice that causes damage to the equipment if not avoided.

ⓘ **IMPORTANT:** Identifies specific information that will assist with setup and configuration procedures and/or prevents damage to the hardware components.

Contents

Overview

This document will cover creating a customer application to run on the 1500-OEM ARM processor that will read GPIO state and send commands to the VideoTrack1500 application also running on the ARM processor. A customer application can also be created to run on the 3000-OEM ARM processor that will read GPIO state and send commands to the VT3000_Release application also running on the ARM processor. The user can then create an application that triggers the 1500-OEM or 3000-OEM to take a snap shot, or start a video recording using a button.

Background

GPIO	General Purpose Input/Output lines found on the J4 connector of the 1500-OEM
1500-OEM	Main processor board which has an ARM processor that can support customer developed applications.
3000-OEM	Main processor board which has an ARM processor that can support customer developed applications.
VideoTrack 1500	A custom application for the ARM developed by SightLine that handles primary command and control for the 1500-OEM.
SightLine Command and Control	Primary API for communicating with the 1500-OEM either through Serial Port 0 or Ethernet.
SLA-1500-AB	A bench-top interface board for working with the 1500-OEM that exposes the GPIO through a 0.1” header (J10).
SLA-3000-USB	Interface board for working with the 3000-OEM that exposes the GPIO through pins 0.1” headers (J3 and J5).
SLA-3000-IO	IO board for working with the 3000-OEM board.

NOTE: The GPIO pins are available on the J4 (50 pin) connector on the 1500-OEM. This connector is also used to attach to a variety of digital camera input boards (Tau, Sony, Hitachi). If an external camera interface board is attached, then the GPIO pins will not be available.

NOTE: The examples below will often refer to connector J10 of the SLA-1500-AB board. This is functionally equivalent to the J4 connector of the 1500-OEM.

NOTE: The GPIO pins are available on the J2 (60 pin) connector on the 3000-OEM. The examples below will often refer to the J3 and J5 connectors of the SLA-3000-USB board.

VIOSEL - Powering the 1500-OEM I/O

The 1500-OEM requires that the voltage level on all the GPIO be set using VIOSEL. You must supply 3.3V to J10:46 (VIOSEL) in order to use these GPIO.

J10 Pin #	Signal Name	Values	Purpose
46	VIOSEL	**1.8V, 2.5V, 3.3V**	Sets voltage level for some GPIO (see below)
18	TAUDET	GND, NC, 1.8V	Enables or disables some GPIO (see below)
5	GND	Ground	
17	GND	Ground	
27	GND	Ground	
37	GND	Ground	
41	GND	Ground	
45	GND	Ground	
47	GND	Ground	
49	GND	Ground	

You can supply 3.3V and ground from an external source, or use the 3.3V power and GND are available through the following points on the SLA-1500-AB:

- J9 Pin 10 (3.3V) and J9 Pin 12 (GND) [REV A and above]
- The test points labeled 3.3V and GND [Rev D].

GPIO

1500-OEM

Using the 50 pin header pins on the SLA-1500-AB board, users have access to four (4) GPIO.

J10 Pin #	Signal Name	Voltage Level	Default Direction	*TAUDET*	
				ENABLE	DISABLE
9	**GPIO175**	VIOSEL	Input	NC (PULLUP)	GND
13	**GPIO174**	VIOSEL	Input		
14	**GPIO173**	VIOSEL	Input		
40	**GPIO172***	VIOSEL	Input		
19	**GPIO178**	3.3V	Input	NA	NA

*GPIO172 is used as a receiver enable signal for some camera adapter boards. These include the SLA-1500-Sony board and the SLA-1500-CL board.

EAN-GPIO

For the 1500-OEM (REV E) board – the following GPIOs are available on J5. This will be accessible when J10 (50 pin) is connected to a digital camera.

J5 Pin #	Signal Name	Voltage Level	Default Direction	*TAUDET*	
				ENABLE	DISABLE
9	**GPIO145**	1.8V	Input	NA	NA
12	**GPIO144**	1.8V	Input	NA	NA

1500-OEM (REV E) J5 Pinout

3000-OEM

Using the 3 pin header pins (J3 and J5) on the SLA-3000-USB board, users have access to six (6) GPIO.

J3 Pin #	Signal Name	Voltage Level	Default Direction	*TAUDET*	
				ENABLE	DISABLE
1	**GPIO16**	3.3V	Input	NC (PULLUP)	GND
2	**GPIO22**	3.3V	Input		
3	**GPIO24**	3.3V	Input		

J5 Pin #	Signal Name	Voltage Level	Default Direction	*TAUDET*	
				ENABLE	DISABLE
1	**GPIO17**	3.3V	Input	NC (PULLUP)	GND
2	**GPIO23**	3.3V	Input		
3	**GPIO28**	3.3V	Input		

The GPIO above default as Inputs. These can be changed in your software application (below).

SLA-1500-AB Setup

Illustration 1: SLA-1500-AB setup example

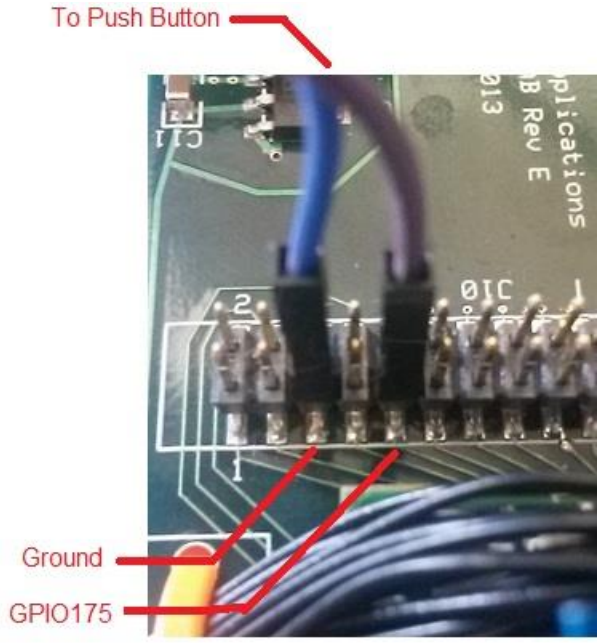

Illustration 2: Wired GPIO

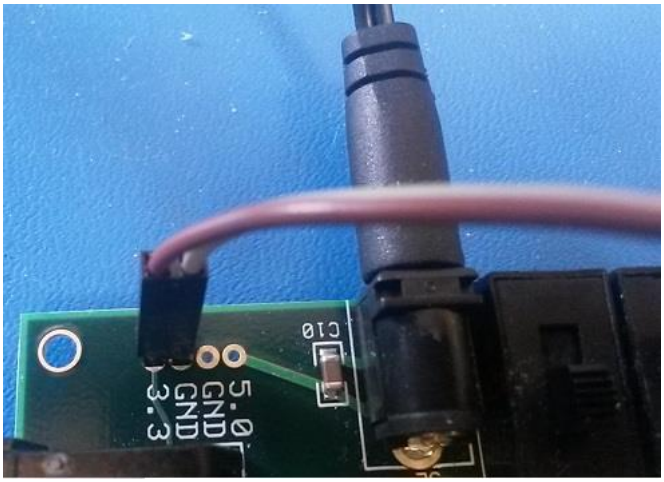

Illustration 3: 3.3VDC for VIOSEL

SLA-3000-USB Setup

Connect SLA-3000-USB board to 3000-OEM board.

GPIO Circuitry

GPIO Input

Button closure. Requires an external pullup resistor.
VCC = VIOSEL (or 3.3V for GPIO178)

R1 ~= 1 K ohm

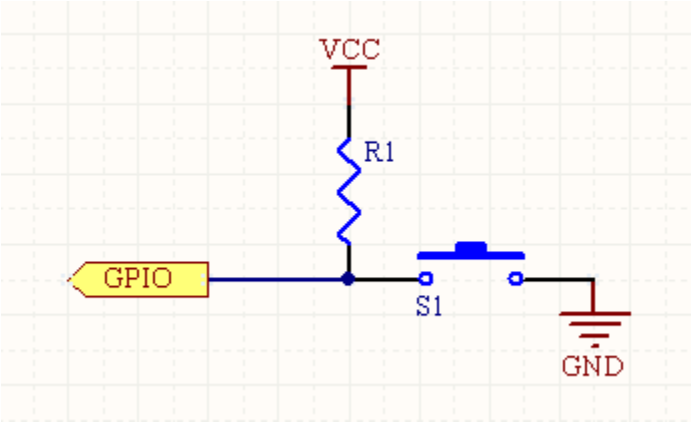

Illustration 4: Push Button GPIO

GPIO Output

Drive an LED. Requires an external circuit as well.
VCC = VIOSEL (or 3.3V for GPIO178)

R1 ~= 500 ohm (depends on LED)

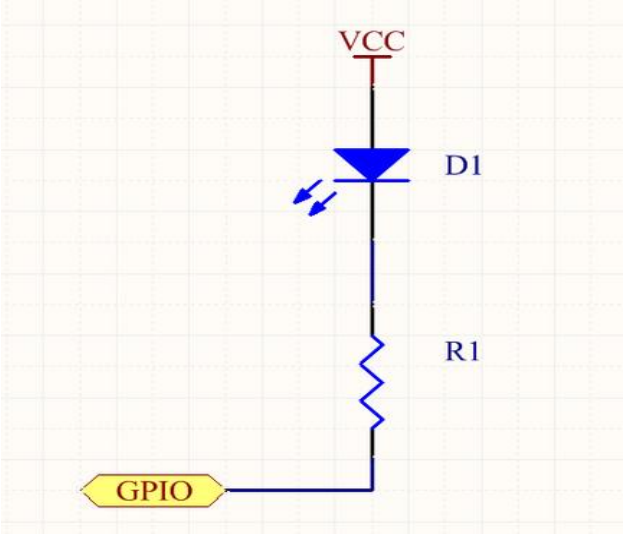

Illustration 5: GPIO Drives an LED

Testing GPIO

GPIO can be exercised from the Linux command line. This is useful when testing the GPIO circuit.

Configure GPIO for Output:

```
echo 175 > /sys/class/gpio/export
cat /sys/class/gpio/gpio175/direction
echo out > /sys/class/gpio/gpio175/direction
echo "0" > /sys/class/gpio/gpio175/active_low
echo "0" > /sys/class/gpio/gpio175/value
echo "1" > /sys/class/gpio/gpio175/value
```

Configure GPIO for Input:

```
echo 175 > /sys/class/gpio/export
cat /sys/class/gpio/gpio175/direction
echo "in" > /sys/class/gpio/gpio175/direction
echo "0" > /sys/class/gpio/gpio175/active_low
echo "both" > /sys/class/gpio/gpio175/edge
for (( ; ; ))
do
  cat /sys/class/gpio/gpio175/value
done
```

GPIO Example Application

An example Linux application is available in the **SLAArmExamplesInstaller** project.

This installer creates compilable example in the "C:\SightLine Applications" directory of the users PC. Includes:

SLAGPIO\gpioMain2013 - A Visual Studio 2013 project which generates a PC console application (*gpioMain*) that does the following:

- Communicates with 1500-OEM or 3000-OEM hardware using the FIP protocol.
- Reads and reports current SD Card video record status.
- Toggles SD Card video record on/off with the F1 function key.
- Intended as an easy way of understanding and debugging interface with FIP and connection to 1500/3000. Uses the same main code/threads/objects as the Linux application.
- Application requires changing the IP address *#define IPADDR_VIDEOTRACK "192.168.1.107"* to match the IP address of the 1500/3000 hardware. This can be read by connecting Panel Plus to the S1500/3000 and reading the IP address from the lower left corner of the application.

GPIO Linux application:

- Code Composer Studio 5 project.
- Details of installation and compiling are in the document EAN-Application-Development-Guide.
- GPIO requires Ubuntu Linux image "UbuntuSLA_2_21.7z" or higher to enable GPIO pins. Requires installation of VideoTrack1500 application 2.21 or higher on the 1500-OEM board. For VT3000_Release application 2.22 or higher required for 3000-OEM board.
- Code is common with the PC application, with the exception of the implementation of the GPIOCtrl class which uses Linux GPIO pins as opposed to the 'F1' key.
- Application uses the following GPIO pins by default (1500-OEM).
  - GPIO178 – Input - SD Card video record toggle.
  - GPIO174 – Input - Initiate an SD card snapshot – snapshot settings must be setup and persisted using the Panel Plus application.
  - GPIO175 – Output – display SD Card video record status on an LED.
- Application uses the following GPIO pins by default (3000-OEM).
  - GPIO16 – Input - SD Card video record toggle.
  - GPIO22 – Input - Initiate an SD card snapshot – snapshot settings must be setup and persisted using the Panel Plus application.
  - GPIO24 - Output – display SD Card video record status on an LED.

Linux hardware configuration

Once the GPIO Linux application has been modified to meet the user's needs, it must be setup to run in parallel with the VideoTrack1500 application on the 1500-OEM hardware.

This requires modifying the **/etc/rc.d/rc.local file** on the 1500-OEM.

The code section that reads:

```
if [ -f slStabTrackOMAP.out ]; then
    #./VideoTrack1500 -S0 0 -Q -CAPTURE sony_720p &
    #sleep 10
    #./SLAGimbal &
    ./VideoTrack1500 -Q &
```

Should be modified to:

```
if [ -f slStabTrackOMAP.out ]; then
    ./VideoTrack1500 -Q &
    sleep 20
    ./SLAGPIO1500 &
```

NOTE: – The **-Q** option runs VideoTrack1500 in *quiet mode*, the sleep command is to let the FIP command processing begin.

NOTE: A similar change should be made to the **/home/root/sla3000_init.sh** file on the 3000-OEM.

Additional References

Related documentation:

ICD-1500-OEM: Describes power requirements, thermal management, interface specifications, and connector pin-outs for the 1500-OEM and 1500-AB accessory board.

ICD-3000-OEM: Describes power requirements, thermal management, interface specifications, and connector pin-outs for the 3000-OEM, and the 3000-IO with associated camera interface boards.

EAN-Application Development Guide: Describes how to setup a PC to be used to develop applications that can be run on the ARM processor of the 1500-OEM or the 3000-OEM video processing boards.

EAN-Startup Guide 1500-OEM: Describes steps for connecting, configuring, and testing the 1500-OEM video processing board on the 1500-AB accessory board.

EAN-Startup Guide 3000-OEM: Describes steps for connecting, configuring, and testing the 3000-OEM video processing board on the 3000-IO interface board.