IPD Vision Appliances

VA50 & VA51

Dual CameraLink™

User Reference Manual

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1. INTRODUCTION

Congratulations on your purchase of the VA5x Vision Appliance! You now own a powerful, integrated system that can be applied to a diverse range of industrial vision applications. As a valued DALSA customer, you can now look forward to easily implementing robust solutions, *the Vision Appliance way.*

Overview

The Vision Appliance is an integrated platform that includes processing, display, image capture, networking, communication and industrial I/O. THese standard hardware components, encased within an aluminum chassis, provide the basis for a powerful industrial vision system.

The inclusion of the optional Sherlock software, a tried and tested machine vision interface, completes this system. The VA5x supports 2 "base mode" Camera Link™ digital cameras.

About this Manual

This manual will assist you with the installation and setup of your VA5x Vision Appliance. It describes what the product supports and how to connect the external interfaces.

- In most instances, VA5x or "Vision Appliance" will mean all similar members of the Vision Appliance product line, including the VA50 and VA51.
- When a description applies to only one or more specific models, the names will be in Bold: **VA50**, or **VA51** only.

If your questions are not answered in this reference, please contact your local DALSA IPD representative who will be happy to answer or direct your question to the appropriate factory resource.

In the unlikely event of failure, the warranty and return information is included in the next section.

The vertical bars are "change bars" and mark additions or changes from the previous version of this manual.

2. BEFORE YOU BEGIN

Product Verification

Before getting started, please take a few minutes to verify that your shipment is complete and in good condition. If your product has been visibly damaged during shipment or is missing parts, please contact your local DALSA IPD representative immediately.

Handling and Operating Precautions

Care should always be exercised when handling and operating your vision appliance. Even though the system is encased within a rugged, industrial enclosure, incorrect use or handling can result in damage to your investment. To prevent this, we recommend you ***avoid the following***:

- "Hot-plugging" cables and devices. Be sure to shut the system down and remove power before connecting or disconnecting anything to it.
- "Free-standing" operation. Whenever possible, we advise mounting the system to prevent it from falling accidentally. Mounting holes are provided at the base of the unit. DIN mounting hardware is optionally available.
- "Pulling power while operating". Whenever possible, gracefully shutdown the system if at any time you need to remove power.
- "Operating the system in a hazardous environment". The system is not NEMA rated.

ElectroStatic Discharge

Avoid the damage that ESD can cause. Never expose the internal electronics to a potentially hazardous environment by opening the enclosure. Doing so may cause serious damage.

User Service Warning

This product has no field-replaceable components. Tampering with the unit will void the product warranty.

Environmental Requirements

For reliable operation, this product should be operated within the following environmental conditions:

- Stable ambient temperature from 10°C to 45°C
- Relative humidity to 90% non-condensing
- Stable ambient lighting
- No excessive vibration or mechanical shock
- No contact with corrosive agents
- No liquid splash
- Dust and dirt controlled (regular maintenance checks)

CAUTION: *The enclosure includes air intake holes at the rear of the unit and a small exhaust fan on the front. For the continued reliability of the system, it is important that these areas are not obstructed when the unit is mounted.*

3. SUPPORT AND MAINTENANCE

Warranty

DALSA warrants the VA5x against defects in materials and workmanship for a period of one year from the date of delivery. DALSA and its representatives expressly disclaim any and all other warranties.

Your sole remedy shall be, repair or replacement of the Vision Appliance product and associated optional components, provided that the defective product is returned within the warranty period.

If you need to return the system, you must contact the DALSA IPD representative who sold you the system. Do not return your product to DALSA without authorization.

Support and Authorized Return Information

DALSA provides the following support resources:

Documentation

In addition to this manual, the follwoing information ships with the product:

On-line help – If you ordered the software development platform, the library help files are installed on your system. A shortcut to the software manual is in your Widnwos Start menu.

On–line help – If you ordered the Vision Appliance, with optional Sherlock software, fingertip help is available on every screen of the user interface.

PDF documents – a copy of this manual, the Sherlock manual (optional) is located on the hard drive, in directory "PDF Manuals".

IPD Website

Our www.goipd.com website is updated regularly with the latest information.

Factory Support

Call, fax, or email your local representative, or the DALSA IPD Headquarters, for product support.

DALSA IPD
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Billerica, MA 01821

Main Number: +1.978.670.2002
FAX: +1.978.670.2010
Email: support@goipd.com
Internet: http://www.goipd.com

To assist our staff in supporting you better, please have the following information available:

1. Name of DALSA IPD representative who sold you the product.
2. Serial number of the unit.
3. Description of how the product is being used (application and environment).
4. Description of the problem and what you were doing when the problem occurred.
5. Exact wording of any error or warning messages that the product displayed.
6. What you have done to try and solve it.

Maintenance

For continued product health and reliable results, DALSA recommends regular maintenance checks to keep the equipment free of dust and dirt. Use anti-static compressed air to blow dust off the Lens and use a lens cloth or cleaner to wipe away grease, oil, or fingerprints.

Regulatory Compliance

FCC Compliance Statement

This product has been tested and found to comply with the limits for a class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and may cause harmful interference to radio communication.

Declaration of Conformity of a Class B Digital Device According to the FCC Rules

We, the responsible party, DALSA Corporation, hereby declare that the product supported by this manual complies with Part 15 of the FCC Rules.

European Declaration of Conformity

This product has been tested to comply with the EC Directive for a class B digital device. It has been tested and found to comply with EN55022/CISPR22.

4. PRODUCT OVERVIEW

Product Description

The VA5x is an optical inspection appliance designed for high-speed applications requiring line scan applications.The VA5x is an ideal choice for manufacturers who need to ensure the best possible quality in their product.

The VA5x is a stand-alone product that does not require interfacing to a PC for setup. Remote connections are available for control and monitoring. All required software, user interfaces and communication controls are resident in the product.

Pre-inspection setup requires adjusting the sensor trigger-to-image delay, focusing the camera lens and adjusting the light source to optimize image picture quality (highlight features of interest). This is an important step to assure accurate and repeatable results.

Typical Applications

The VA5x can be applied to solve a diverse range of manufacturing problems across a multitude of industries. The Camera Link inteface makes this product especially suited for:

- cylindrical unwrapping of rotating or spinning objects
- large format imaging of moving surfaces or continuous web inspection

Components

Figure 1 illustrates the physical components associated with a typical VA5x installation. Information on connector pinouts and electrical characteristics can be found in this section. The rear panel of the **VA50** is pictured in Figure 1. The arrangement of connectors is slightly different on the **VA51**.

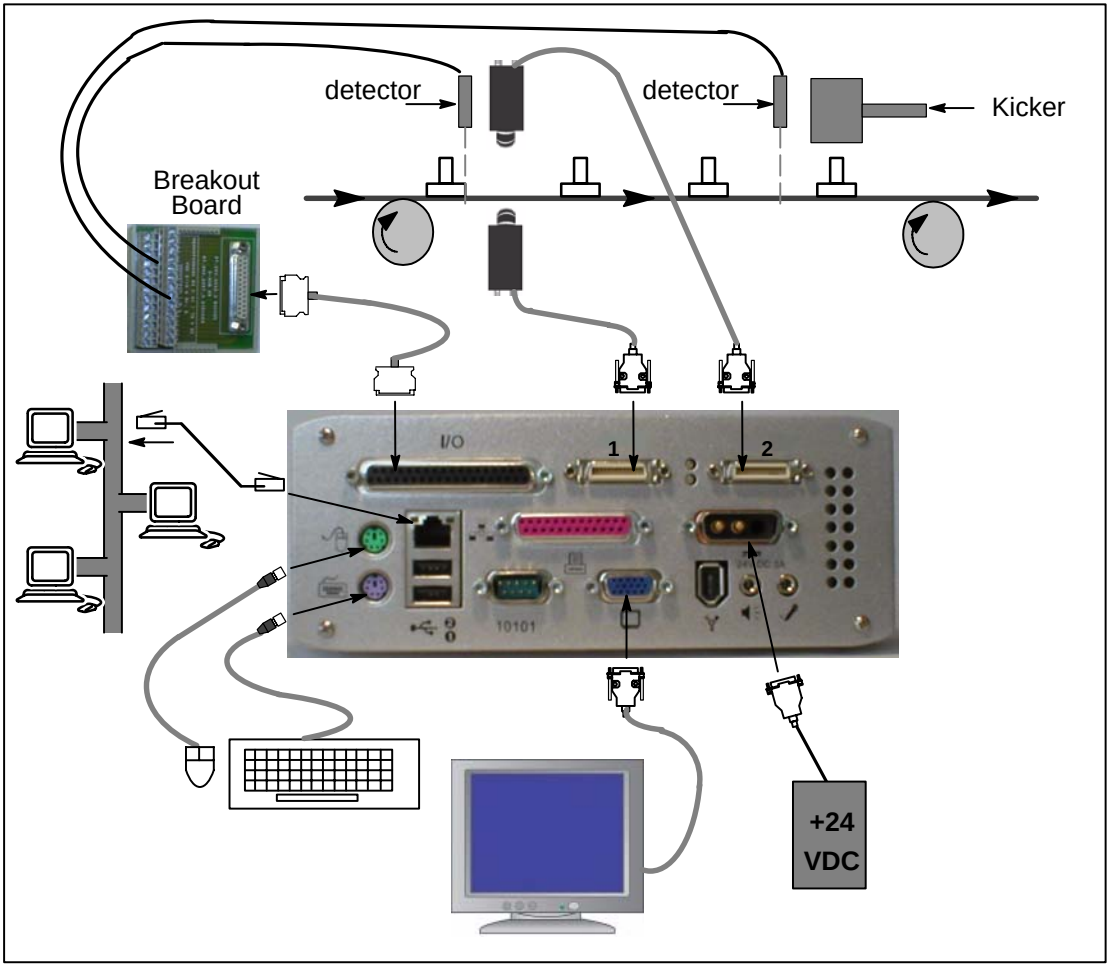

Figure 1. Typical VA5x Installation

NOTE: *Not all of the physical interfaces are used by the Appliance software. They are, however, available to the user for interfacing with third party products, if required.*

CAUTION: *The enclosure includes air intake holes at the rear of the unit and a small exhaust fan on the front. For the continued reliability of the system, it is important that these areas are not obstructed when the unit is mounted.*

5. INSTALLATION

Pre-Installation Checks

1. Read the handling and operating precautions in Section 2.
2. Check that all essential components are present:
   a. The VA5x unit
   b. Display, keyboard and mouse
   c. Camera(s) and associated cables
   d. Lens for each camera
   e. 24VDC power supply with 3.3 A output
   f. Light Source, cable and power supply if necessary
   g. Sensor trigger and cable (if required)
   h. I/O breakout hardware

Interface Specifications

Before attempting installation, familiarize yourself with the various hardware interfaces detailed in this section. The VA5x provides many standard connections, shown in Figure 2.

Operator Connections

Your vision appliance is equipped with standard display, keyboard and mouse connections for user interfacing.

- Connect a standard VGA monitor to the 15-pin D-Sub VGA output connector.
- You can connect a standard PS/2 mouse and keyboard or a USB compliant mouse and keyboard to the specified connectors.
- You may also connect additional USB compliant devices to the USB connectors.

Networking Connection

If your system is to be connected to a LAN (Local Area Network), connect a network cable to the RJ45 Ethernet jack. The VA5x supports Fast Ethernet (100BaseT) and Twisted Pair Ethernet (10BaseT). If you plan to use Fast Ethernet, use a Category 5 (UTP5) cable. If the unit is part of a peer-to-peer configuration, you will need to use a special crossover cable to connect to the second device (optionally provided by DALSA).

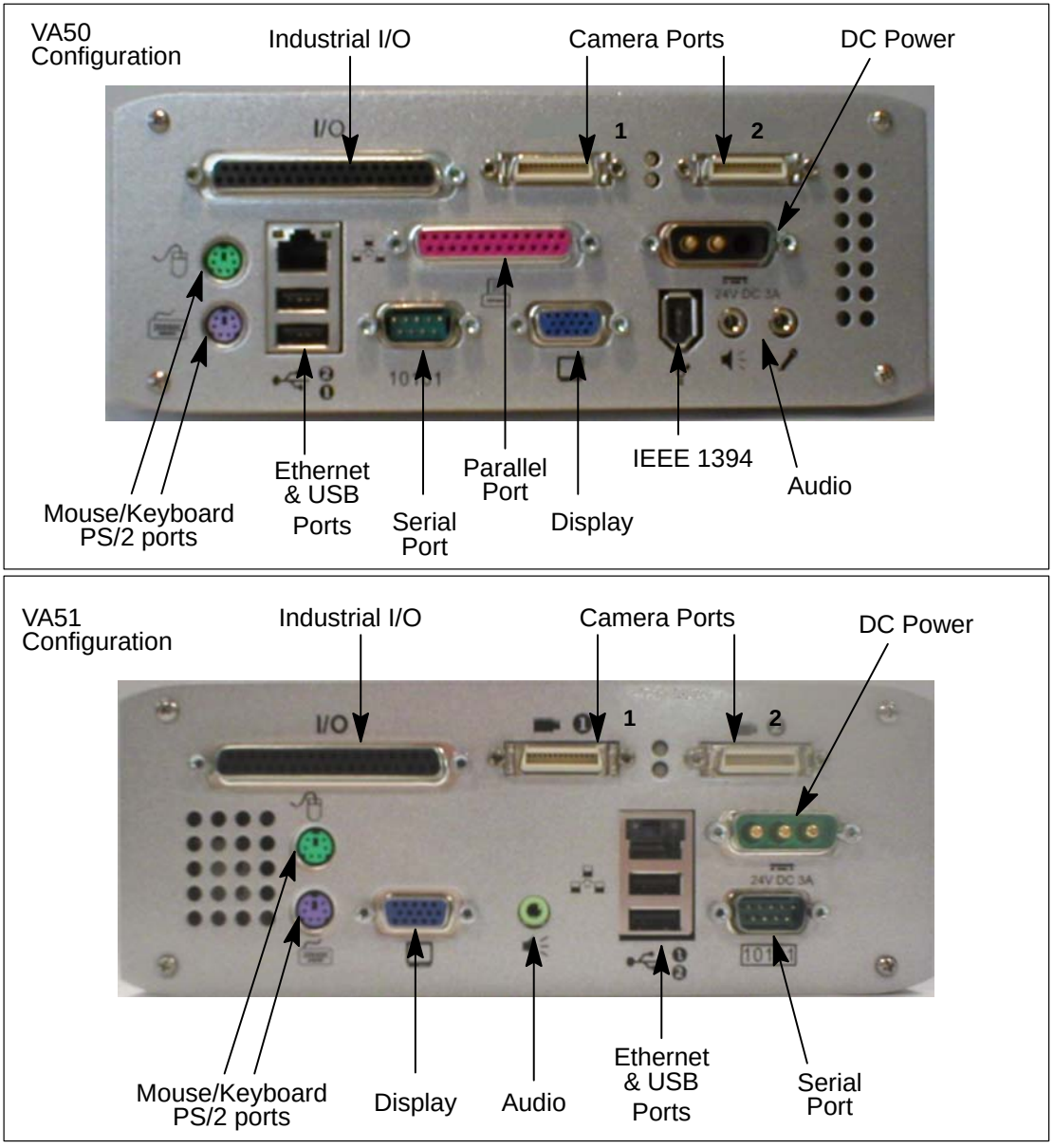

Figure 2. Rear Panel

Camera (Video) Connections

The VA5x supports two "base mode" Camera Link cameras. The Camera Link "Base Mode" supports:

- one single tap 8, 10, 12, 14, 16 or 24-bit camera,
- dual tap 8, 10, and 12-bits,
- Three tap 8-bits
- 24-bit RGB

DALSA offers and recommends cameras for use with our vision systems, some of which are referenced below. See Also directory: D:\PDF Manuals (or C:\PDF Manuals) for camera manuals.

NOTE *When you source the camera from* DALSA IPD*, it will be tested with the cables and vision appliance that are being shipped to you. Furthermore, Sherlock will have the appropriate configuration file loaded, making for a smooth out-of-the-box experience.*

Recommended Camera List

The following cameras are recommended by DALSA IPD, but many other camera types can be interfaced. Please reference our web site for an up-to-date list of supported components.

Manufacturer	*Model*	*Resolution*	*Type*
Basler	A202K	K x 8-bits, dual tap	mono – base mode
	A402K	2K x 8-bits, dual tap	mono – base mode
	L101K	1K x 8-bits, dual tap	mono – base mode
	L104K	2K x 8-bits, dual tap	mono – base mode
Dalsa	Pantera	1K x 8-bits, dual tap	mono – base mode
	Piranha2	1K,2K,4K,8K x 8-bits	mono – base mode
JAI	CV-A33	x 8-bits	mono – base mode
	CV-M2	x 8-bits, dual tap	mono – base mode
	CV-M4CL	x 8-bits	mono – base mode

Camera configuration files are selected in the Hardware Options menu in Sherlock. The Sapera CamExpert utility allows you to edit and save a configuration file.

Camera Cables

The Camera Link connectors are compatible with standard Camera Link cables.

Part Number	*Cable Length*
A-CAB-NSII-CL0	3 meters
A-CAB-NSII-CL1	5 meters
A-CAB-NSII-CL2	10 meters

Camera Connectors and Indicators

Cameras interface through two 26-pin MDR connectors accessible on the back panel (labeled Video 1 and 2). Each connector supports the Camera Link "base mode" configuration.

The pinout for the D-Sub connectors are shown below. The location for the Camera Connectors is shown in Figure 3. The Camera Link connector and cable do not supply power to the camera.

Figure 3. Camera Connectors

The Status LED for Camera 1 is on top, and the Status LED for Camera 2 is below it. The LEDs give the following infomation:

- Steady Red: means there is no pixel clock received from the Camera.
- Flashing Green: means the pixel clock is active and "free running"
- Steady Green: means waiting for trigger input

Serial Port Connection

The vision appliance has one RS-232/485 compliant serial port. The serial port is typically used for passing control back and forth to a host application when the network is not available.

Parallel Port Connection

The standard **VA50** has one standard parallel port that can be used to interface parallel devices, such as printers. The **VA51** does not have a parallel port.

I/O Connections

The VA5x provides industrial I/O capabilities that are used to interface the vision system with the factory environment. This interface includes:

- 8 Single-ended, general-purpose inputs that can be configured as triggers, job codes or control lines to initiate starting or stopping of processing events.
- 4 Opto-isolated inputs for 2 trigger inputs and 2 shaft encoder inputs.
- 8 Single-ended, general-purpose outputs that can be configured as light strobes, status codes or control lines to signal downstream events such as rejection of failed parts.

The Inputs and Outputs are fully programmable, meaning, for example, that you have the flexibility to configure any Input as a trigger or any Output as a resultant action. Critical Inputs and Outputs are defined for you in, as shown in the table on page 17.

Input Definitions

For inputs, VA5x supports the following signal types:

- Triggers (part-in-place to inspect and inspected part-in-place to decide)
- Actions (Events from external devices or processes)
- Timing (Shaft Encoder)

The trigger input assignments are defined in the CamExpert Camera Configuration file as the External Trigger Source, where : "From Trigin1" or "From Trigin2" = use Opto Trigger Inputs, "From General Input" = use single-ended inputs IN0 & IN1, **Automatic** = use Opto Trigger Inputs. If you do not change the default values, the Opto triggers are used when external trigger is enabled in Sherlock.

In *Sherlock*, external triggering is enabled by checking the "external trigger" box in the Stakeout Options menu. If this is not checked, Sherlock defaults to software triggering.

Single-Ended Input Electrical Specifications

The 8 general purpose inputs GPI(7–0) are single-ended with the following specification. The threshold Voltage is selectable: 2 Volts (for TTL) or 16Volts (for 24–30 Volt range). The input divider in Figure 4 changes to accept the higher voltage input.

Signal state	*Min*	*Max*
Low (Inactive)	0 V	0.8 V
High (Active)	2.4 V or 16 V	30 V
Turn ON current	1 mA	

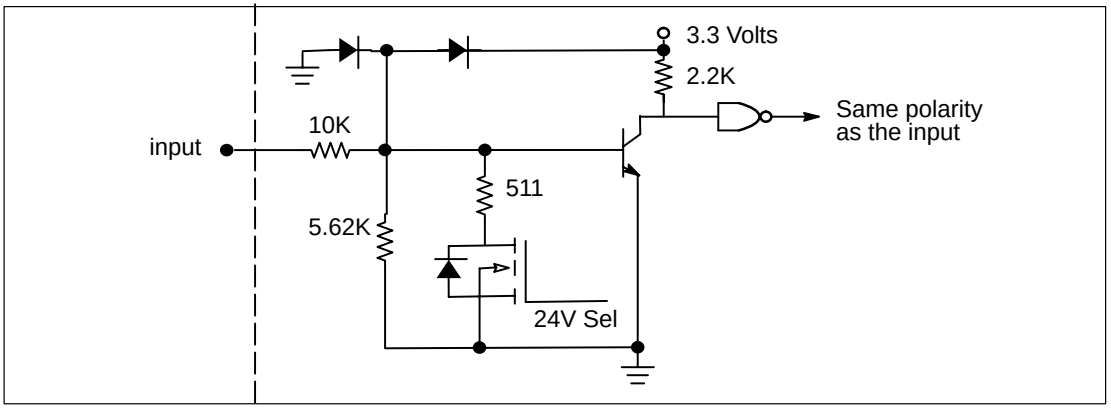

Figure 4. Single-Ended Inputs

In Sherlock, the 8 inputs are defined as Digital Input channels 14 through 21. The switching point for the inputs (TTL or 24 V) is defined by the "inputlevel0" argument in the "imager.ini" file (Sherlock 6x) or SaperaLTDrv.ini file (Sherlock7x), where: **1**=TTL, and **8**=24 Volt.

In Sapera, the switch point of the single-ended inputs is set with the CorGIOSetPrm function, with the following parameter values:
CORGIO_VAL_INPUT_LEVEL_TTL, or CORGIO_VAL_INPUT_LEVEL_24VOLTS.

Opto-Isolated Input Electrical Specifications

The Opto-isolated inputs (Opto trigger 0 & 1, Shaft Encoder 0 & 1) have the following specification. These inputs are compatible with 3.3 Volt Opto-isolators and RS422 differential (and TTL with protection resistors).

Parameter	*Min*	*Max*
Low (Inactive)	0 V	1.7 V
High (Active)	2.0 V	3.3 V
Turn ON current	16 mA	
Switching Frequency		200 KHz

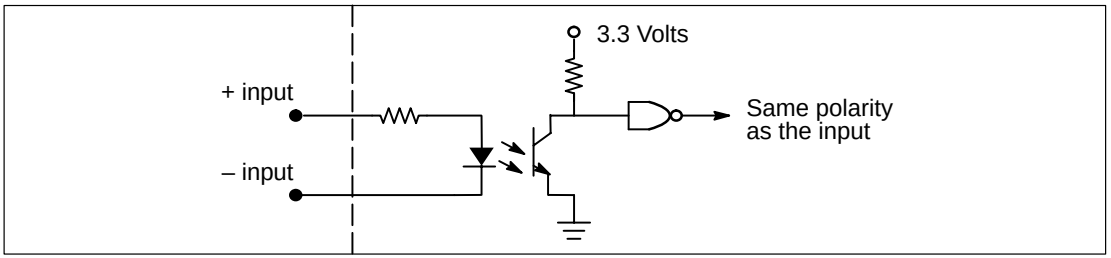

Figure 5. Opto-Isolated Inputs

Output Definitions

The VA5x supports the following output types:

- Soft Action (general-purpose software controlled output)
- Strobe (triggered event to drive a pulse to a strobe light)
- Hard Action (queued result from an inspection process)

The outputs are pre-defined, as shown in the table on page 17.

Output Electrical Specifications

All outputs are Single-ended, selectable current sinking (NPN) or current sourcing (PNP).

In Sherlock the output type is specified in the "imager.ini" file by the argument Outputtype0: 1=PNP, 2=NPN.

In Sapera, the output type is specified using the CorIOSetPrm function with the following parameter values:
CORGIO_VAL_OUTPUT_TYPE_NPN, or CORGIO_VAL_OUTPUT_TYPE_PNP.

When reading the Output Type for capabilities; 1=PNP, 2=NPN, 4=LED.

Current Sourcing PNP Output

Current Sourcing (PNP) outputs are driven high when active. The specifications are as follows. Output Voltage is determined by the User supplied power 7–35 Volts on the USERPOWER input.

Parameter	*Max*
Output Voltage	UserPower (7–35 V)
Output Source Current	350 mA
Over Current Protection	500 ma

Figure 6 illustrates driving an active-high sinking input with the PNP outputs.

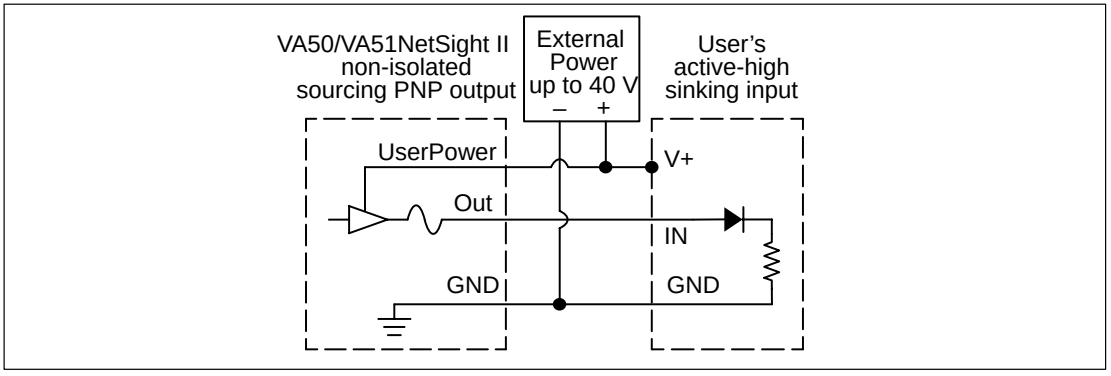

Figure 6. PNP Sourcing Outputs

Current Sinking NPN Outputs

Current Sinking (NPN) Output specifications are as follows:

Parameter	*Max*
Output Voltage	40 V
Output Sink Current	500 mA
Short Circuit Protection	25 V

Figure 7 illustrates two ways of driving an active-low sourcing input with the NPN outputs.

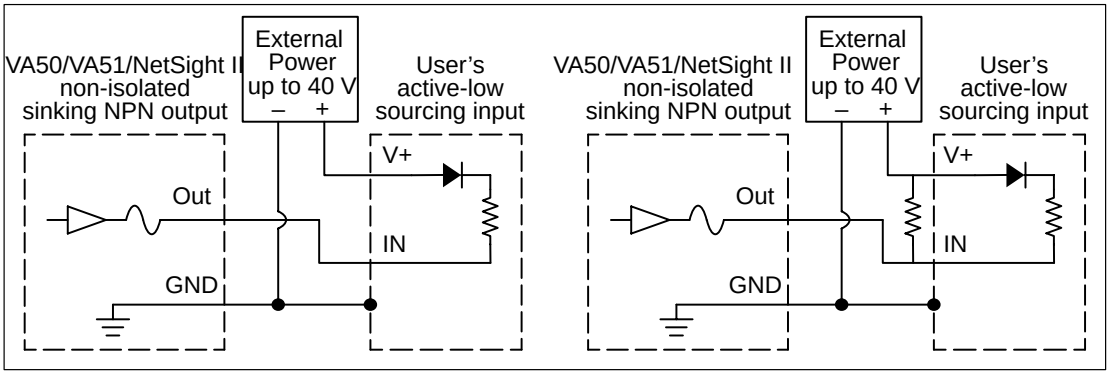

Figure 7. NPN Sinking Outputs

To use NPN outputs with a PLC Sinking input, a Pull-up resistor is required. Example Load Resistance (based on 10 mA load) refer to Figure 8.

Voltage Source	*Load* **R**
12 V	2.4 K ohms
24 V	4.8 K ohms
30 V	6 K ohms

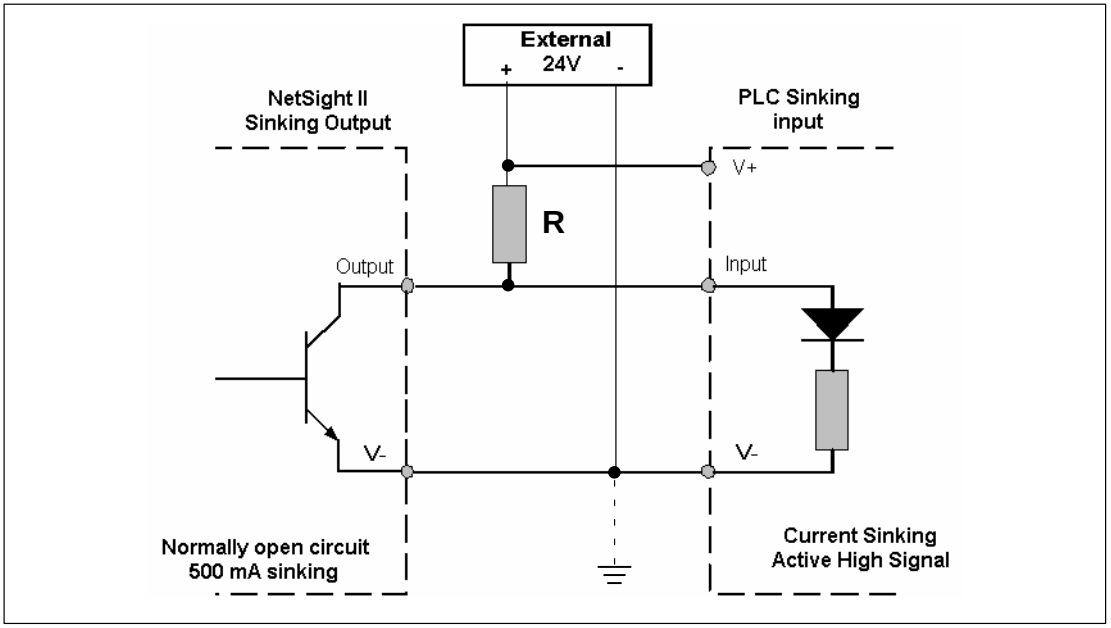

Figure 8. Typical Output Wiring Diagram

I/O Connector

The general purpose I/O is available through the female 37-pin D-Sub connector.

Figure 9. I/O Connector

If you do not change the default settings in CamExpert (External Trigger = Disabled, External Trigger Source = Automatic), OptoTrigger0 is the Camera0 trigger, and OptoTrigger1 is the Camera1 trigger, if you enable external trigger in Sherlock. This allows you to use all 8 inputs IN0–IN7. If you wish to use the TTL trigger inputs on IN0 and IN1, change the External Trigger Source to "From General Inputs". The default settings in CamExpert also disable the Strobe output (Strobe Method = None) , allowing you to use all 8 outputs OUT0–OUT7.

I/O Connector Pinout Definitions

Pin	*Name*	*Direction*	Sapera / CamExpert	*Sherlock / Vision System*
1	Trigger_0+	Opto In+	Opto Trigger 0+	*defined in CamExpert – Triggin1*
20	Trigger_0–	Opto In–	Opto Trigger 0–	*defined in CamExpert*
2	Trigger_1+	Opto In+	Opto Trigger 1+	*defined in CamExpert – Triggin2*
21	Trigger_1–	Opto In–	Opto Trigger 1–	*defined in CamExpert*
3	Encoder_0+	Opto In+	Shaft Encoder 0+	*defined in CamExpert*
22	Encoder_0–	Opto In–	Shaft Encoder 0–	*defined in CamExpert*
4	Encoder_1+	Opto In+	Shaft Encoder 1+	*defined in CamExpert*
23	Encoder_1–	Opto In–	Shaft Encoder 1–	*defined in CamExpert*
5, 24	GND	–	ground	ground
6	IN0	In	General Purpose In 0	Channel 14 / Trigger 0
25	IN1	In	General Purpose In 1	Channel 15 / Trigger 1
7	IN2	In	General Purpose In 2	Channel 16
26	IN3	In	General Purpose In 3	Channel 17
8	IN4	In	General Purpose In 4	Channel 18
27	IN5	In	General Purpose In 5	Channel 19
9	IN6	In	General Purpose In 6	Channel 20
28	IN7	In	General Purpose In 7	Channel 21
10,29	GND	–	ground	ground
11	OUT0	Out	General Purpose Out 0	Channel 0 / Strobe 0
30	OUT1	Out	General Purpose Out 1	Channel 1 / Strobe 1
12	OUT2	Out	General Purpose Out 2	Channel 2
31	OUT3	Out	General Purpose Out 3	Channel 3
13,32	GND	–	ground	ground
14	OUT4	Out	General Purpose Out 4	Channel 4
33	OUT5	Out	General Purpose Out 5	Channel 5
15	OUT6	Out	General Purpose Out 6	Channel 6
34	OUT7	Out	General Purpose Out 7	Channel 7
16	GND	–	ground	ground
35	USERPOWER	In	Power for PNP outputs	Power for PNP outputs
17	POWER5	Out	+5 Volt 0.75 A fused	+5 Volt 0.75 A fused
36	POWER12	Out	+12 Volt 0.75 A fused	+12 Volt 0.75 A fused
18	PGOOD	Out	Power Good Status	Power Good Status
37,19	GND	–	ground	ground

Sherlock Digital Output channels 8–13 are the front panel LEDs

I/O Breakout Options

Two choices of breakout modules are available, for standard terminal block and opto-isolated connections. Both modules provide standard DIN rail mounting. The terminal breakout option ships with theVA-40 bundle, while the isolation board is available as an optional accessory.

Standard Terminal Breakout

The terminal breakout module (Figure 10) ships as part of the standard product bundle. It provides a simple means to wire inputs and outputs to the VA5x. The pinout is a direct 1:1 correlation with the 37-pin connector on the rear panel.

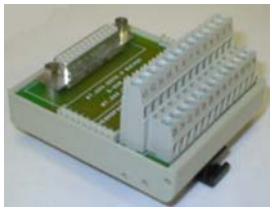

Figure 10. Terminal Breakout Module

Optional Opto-Isolation Breakout

The opto-isolation breakout module (Figure 11) provides opto-isolation for all of the Vision Appliance I/O. It supports standard "Openline" modules from Grayhill. The breakout provides easy wiring to industrial controls, while providing protection from potentially harmful power sources. Each module supports either 2 inputs or 2 outputs. Output modules are fused and provide status LED indicators. Modules M0 to M3 are inputs, modules M4 to M7 are outputs (see following table).

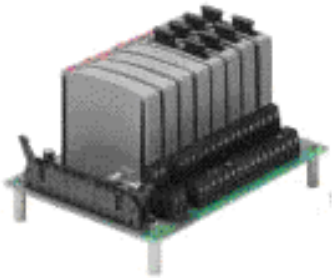

Figure 11. Isolation Breakout Module with I/O Modules

Part Number	*Description*
A–IOB–111	Isolation Breakout & DIN mount, and 37-pin cable
A–IOB–112	Isolation Breakout & DIN mount, 37-pin cable and 24V I/O modules

Terminal Block Definitions for Opto-Isloation Breakout

Pin #	Function	Pin #	Function	Pin #	Function	Pin #	Function
1	IN0	9	IN4	17	OUT0+	25	OUT4+
2	GND	10	GND	18	OUT0–	26	OUT4–
3	IN1	11	IN5	19	OUT1+	27	OUT5+
4	GND	12	GND	20	OUT1–	28	OUT5–
5	IN2	13	IN6	21	OUT2+	29	OUT6+
6	GND	14	GND	22	OUT2–	30	OUT6–
7	IN3	15	IN7	23	OUT3+	31	OUT7+
8	GND	16	GND	24	OUT3–	32	OUT7–

Status LEDs and RESET Switch

The VA5x provides 7 LEDs on the front panel as visual health and status indicators. The RESET button, when depressed, will initiate a system reset/reboot. The button is recessed in the front panel to prevent accidental contact.

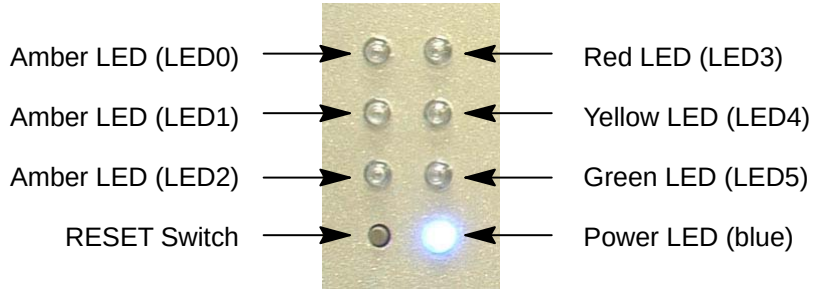

Figure 12. Front Panel Status indicators and Reset Switch

The 6 LEDs above the blue power LED are user-definable. If you are using the VA5x Vision Appliance, the LEDs appear as programmable outputs that can be enabled (as part of a Sherlock investigation) at anytime during the inspection. These LEDs are available in Sherlock as Digital I/O output channels 8 through 13.

LED	*Sherlock Digital Output*	*LED*	*Sherlock Digital Output*
LED0	Channel 8	LED3	Channel 11
LED1	Channel 9	LED4	Channel 12
LED2	Channel 10	LED5	Channel 13

In Sherlock, the Digital Output instructions are available to control the LEDs.

In Sapera, the LEDs are controlled using the CorIOSetPrm function with the output type parameter value: CORGIO_VAL_OUTPUT_TYPE_LEDS

Mounting Options

The VA5x cabinet provides the means to mount to a standard DIN rail or custom assembly. The mounting holes are located on the base plate of the unit. Location and size of the mounting holes are shown in Figure 13 (dimensions are in inches).

- Cabinet dimensions: W 20 cm x L 47.5 cm x H 7.5 cm; W 8 inches x L l 9 inches x H 3 inches.
- Weight: 2.62 kg; 5.75 lb.

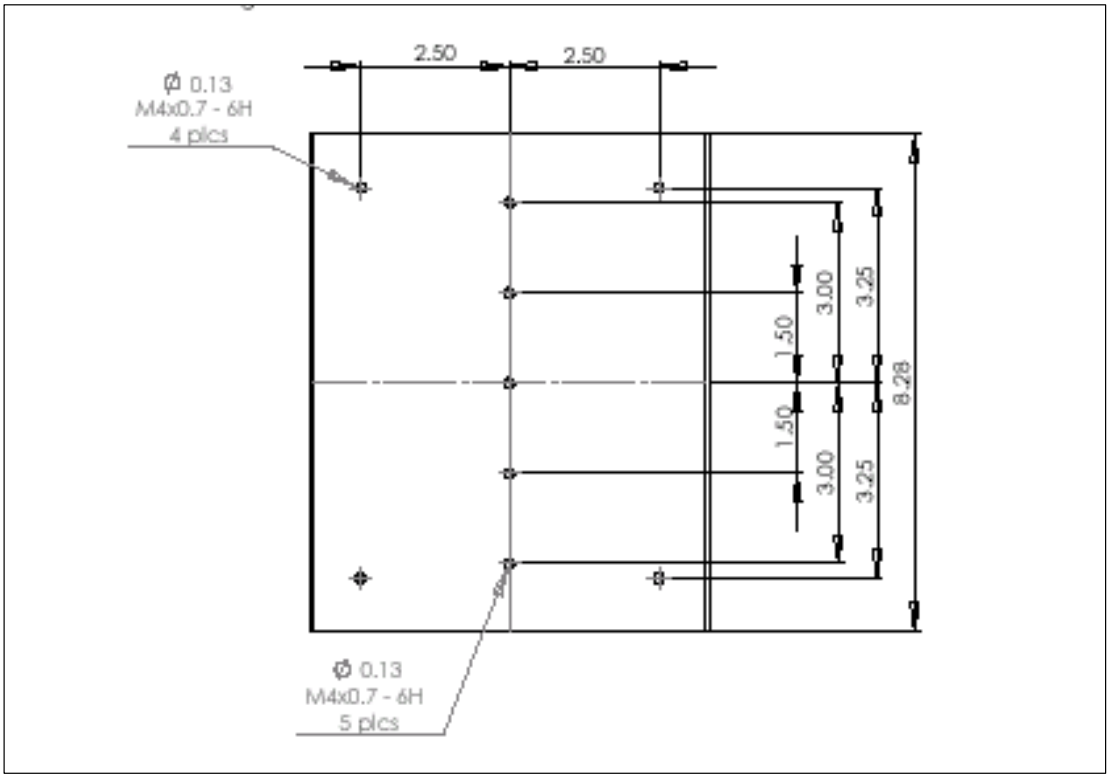

Figure 13. Mounting Holes

The Power Supply and Breakout Boards are supplied with DIN mounting brackets.

Installation

1. Mount the Camera(s) and VA5x in a location free from excessive shock, moisture, and vibration. The VA5x can be used with a standard DIN rail mount. Mounting holes are located on the base plate.
2. Connect a standard VGA Monitor to the Display connector.
3. Connect a mouse and keyboard, using either the PS/2 or USB connectors.
4. Thread the lens onto each camera lens mount.
5. Attach camera cables to each camera and connect them to the camera ports on the VA5x.
6. Connect the sensor trigger and decision trigger inputs to the I/O breakout board.
7. Mount the light source. Connect the strobe controller (if required) to the strobe output of the I/O breakout board.
8. Wire the required outputs from the I/O breakout board to the PLC or pass/reject mechanisms.
9. Connect network as required.
10. Connect Serial connections as required.

Before powering on the unit, take a couple of minutes to verify your hardware installation:

11. Verify all cable connections
12. Verify all electrical connections
13. Verify all components are securely mounted.

Complete the installation by applying power to the unit. The VA5x Vision Appliance is powered from an external supply (option A-PWR-NSII) that connects to the 3-pin D-Sub connector. The power requirements for the unit are:

- +24 Volts at +/– 3 Amperes

The hardware installation is now complete.

6. SOFTWARE

Sherlock

The VA5x Vision Appliance come complete with Sherlock, a flexible vision application built upon a robust suite of tools developed over the last 10 years. Sherlock has been deployed in thousands of installations worldwide and is well suited to meet your most demanding requirements.

Included in your shipment is the Sherlock manual that provides a step-by-step and in-depth guide to configuring applications. The file D:\Sherlock\Drivers\imager.ini defines some hardware settings, and points to the CamExpert camera configuration file(s).

NOTE *Compilers for C, C++ or VisualBasic are not included.*

Sapera

If you are using the VA5x as a custom vision system with your own software, we provide a software applications interface called Sapera to program the acquisition hardware.

CamExpert

The CamExpert allows the user to interface with a multitude of industrial cameras available from manufactures worldwide. Many widely used camera files, including our recommended cameras, are included with the software. The user can create their own files with the configurator or contact DALSA IPD (**support@goipd.com**) for assistance.

NOTE *You should have a good understanding of the camera and* VA5x *capabilities before attempting to interface the two.*

Other Software and Support Files

Additional PDF manuals are located in a directory: D:\PDF Manuals

Installation files, and addional support files are located in a directory: D:\IPD Install Files (or C:\IPD Install Files on a system shipped with one hard drive partition).

APPENDIX A
CONNECTORS AND PINOUTS

This section provides the connector pinout information for each of the external interfaces, along with associated electrical specifications and usage information.

Camera Connectors

Camera Connector Pinout

Camera Link	*Signal name*	*Description*
1	SHIELD	Inner cable shield
14	SHIELD	Inner cable shield
25	X0–	Data Channel 0 neg.
12	X0+	Data Channel 0 pos.
24	X1–	Data Channel 1 neg.
11	X1+	Data Channel 1 pos.
23	X2–	Data Channel 2 neg.
10	X2+	Data Channel 2 pos.
22	XCLK–	Data Clock neg.
9	XCLK+	Data Clock pos.
21	X3–	Data Channel 3 neg.
8	X3+	Data Channel 3 pos.
20	SerTC+	Camera Serial Transmit pos. (Cam Tx)
7	SerTC–	Camera Serial Transmit neg.
19	SerTFG–	Frame Grabber Serial Transmit neg. (Cam Rx)
6	SerTFG+	Frame Grabber Serial Transmit pos.
18	CC1–	Camera Control 1 neg. (CTL0)
5	CC1+	Camera Control 1 pos.
17	CC2+	Camera Control 2 pos. (CTL1)
4	CC2–	Camera Control 2 neg.
16	CC3–	Camera Control 3 neg. (CTL2)
3	CC3+	Camera Control 3 pos.
15	CC4+	Camera Control 4 pos. (CTL4)
2	CC4–	Camera Control 4 neg.
13	SHIELD	Inner cable shield
26	SHIELD	Inner cable shield

Power Connector

TheVA5x is powered from an external supply (option A-PWR-NSII) that connects to the 3-pin male D-Sub connector on the back panel. The power requirements for the VA5x are as follows:

+24 V +/–10% @ 2.5 A maximum

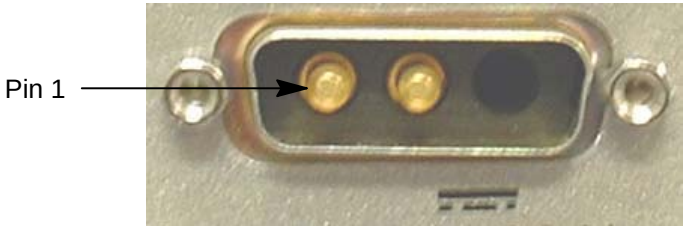

Figure 14. Power Connector

Power Connector Pinout

Pin	*Name*	*Direction*	*Description*
1	GND	–	Ground
2	+24V	Input	DC Power
3	NC	–	not connected

A power cable (A-CAB-NSII-P), with open leads on one end and a mating connector plug on the other, is shipped standard with the product.

Ethernet and USB Connectors

The Ethernet RJ-45 connector is an 8-pin male connector. The two USB connectors reside below the Ethernet connector. They are identical, rectangular type-A, 4-pin sockets.

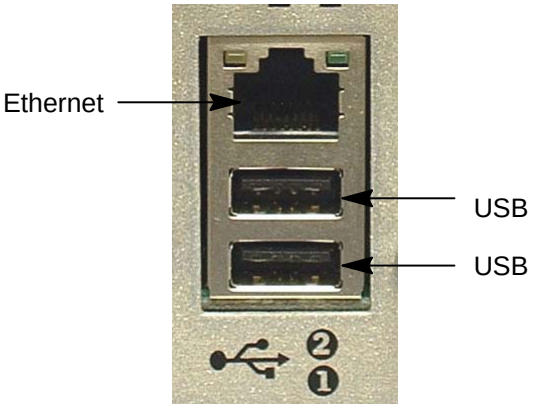

Figure 15. Ethernet and USB Connectors

Ethernet Pinout

Pin	Name	Direction	Description
1	TD+	Out	Transmit Data+
2	TD–	Out	Transmit Data–
3	RD+	In	Receive Data+
4–5	NC	–	not connects
6	RD–	In	Receive Data–
7–8	NC	–	not connects

USB Pinout

Pin	Name	Direction	Description
1	VCC	Out	Power, +5 V (1 A max)
2	DATA–	I/O	Data–
3	DATA+	I/O	Data+
4	GND	–	Ground

Display Connector

The VA5x provides standard monitor connection for Display (15-pin female D-Sub).

Display Pinout

Pin	*Name*	*Direction*	*Description*
1	RED	Out	Red
2	GREEN	Out	Green
3	BLUE	Out	Blue
4	NC	–	not connected
5–8	GND	–	Ground
9	+5V	Out	+5 V
10	GND	–	Ground
11	NC	–	not connected
12	SDA	I/O	Serial data
13	HS	Out	Horizontal Sync
14	VS	Out	Vertical Sync
15	SCL	I/O	Serial data clock

Serial Connector

The VA5x provides standard connection for serial (9-pin male D-Sub) data communication.

Serial Pinout

Pin	*Name*	*Direction*	*Description*
1	DCD	In	Data Carrier Detect
2	RXD	In	Receive Data
3	TXD	Out	Transmit Data
4	DTR	In	Data Terminal Ready
5	GND	–	Ground
6	DSR	Out	Data Set Ready
7	RTS	Out	Request to Send
8	CTS	In	Clear to send
9	RI	In	Ring Indicator

IEEE 1394 Connector

The **VA50** has one IEEE port. The **VA51** does not provide an IEEE port.

The IEEE 1394 interface is a fast external bus that supports isochronous (real-time) digital data transfer between peripherals and the **VA50** at rates up to 400 Mbps.

IEEE 1394 Pinout

Pin	*Name*	*Direction*	*Description*
1	PWR	Out	Power, +12V
2	GND	–	Ground
3	/TPB	In/Out	Data and strobe
4	TPB	In/Out	Data and strobe
5	/TPA	In/Out	Data and strobe
6	TPA	In/Out	Data and strobe

Parallel Connector

The **VA50** provides a standard parallel port (25-pin female D-Sub). The **VA51** does not provide a parallel port.

Parallel Pinout

Pin	*Name*	*Direction*	*Description*
1	/STROBE	I/O	Strobe
2	D0	I/O	Data Bit 0
3	D1	I/O	Data Bit 1
4	D2	I/O	Data Bit 2
5	D3	I/O	Data Bit 3
6	D4	I/O	Data Bit 4
7	D5	I/O	Data Bit 5
8	D6	I/O	Data Bit 6
9	D7	I/O	Data Bit 7
10	/ACK	I	Acknowledge
11	BUSY	I	Busy
12	PE	I	Paper End
13	SEL	I	Select
14	/AUTOFD	I/O	Autofeed
15	/ERROR	I	Error
16	/INIT	I/O	Initialize
17	/SELIN	I/O	Select In
18–25	GND	–	Ground

APPENDIX B
STAGING AND PRESENTATION

To measure or inspect a part or object, it must be positioned so the camera can see it. Positioning, sometimes called *staging*, *presentation*, or *fixturing*, puts the part in the camera's field of view (FOV), signals the Vision Appliance that a part is available, and helps hold the part steady while an image is being taken.

The camera is responsible for generating an electronic image of the part for processing by the Vision Appliance. The camera and lighting help with the part positioning because they are used to "freeze" or "stop" the motion of a moving part.

An Example

Figure 16 illustrates a bottle inspection line, seen from above. The bottles move along a conveyer belt, past the camera. The conveyer belt positions the bottle in front of the camera, so that the camera can capture an image of the threading on top of the bottle's neck.

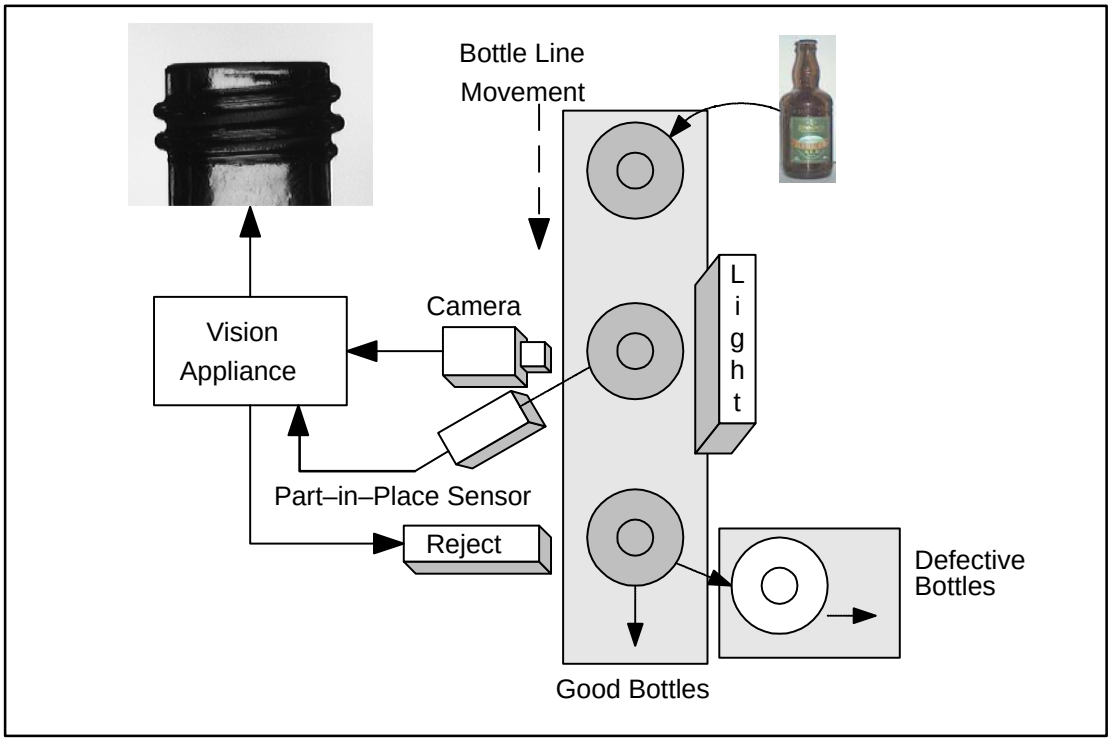

Figure 16. Bottle Inspection Line

A diffuse, uniform light behind the threads gives a sharp, high-contrast image of the threads. The Vision Appliance inspects this image and signals a rejection "kicker" to move defective product off the production line.

Part-in-Place Sensor

In this example we have two problems because the parts (bottles) move. We first have to know when a bottle is in front of the camera so it can "see" the threads. One solution is to have the Vision Appliance look for the threads, and only take an inspection image when the thread is centered in the field of view. A simpler approach is to have a separate Part-in-Place (PiP) sensor that detects when the bottle is in the correct position. A PiP sensor allows the Appliance to work at higher part speeds. We have used inexpensive, PiP sensors from HTM Electronics Industries (http://www.htm–sensors.com) and from Banner Engineering (www.bannerengineering.com).

Reducing Blurring Caused by Part Motion

The second problem is blurring caused by motion of the part. When the part is in place, the motion of the part must be "frozen" so that the image of the part is not blurred by the motion. Sometimes the part is stopped while a picture is taken. This is ideal for the best measurement accuracy. With continuous motion, as on a conveyer belt, we rely on the camera and lighting to "freeze" the motion.

The camera used with the Vision Appliance has a programmable exposure time so you can set the part viewing time. Selecting the viewing time depends on the part speed, the amount of blurring due to motion that can be tolerated, and the amount of available light. The shorter the viewing time, the more light is needed to see the part. The camera also has an electronic shutter, but this is automatically adjusted for you.

Assuming that only one part is in the field of view at a time, an estimate of the viewing time can be derived from the following equation:

View Time in seconds = B/(P*I)

where:

B is the amount of blur you can tolerate (in pixels),

P is the number of pixels per image (image size) in the direction of motion,

I is the number of images taken per second, or the number of parts per second.

For example, if the motion is horizontal with respect to the camera, and the picture size is 640 pixels per horizontal line, then P=640. If you are inspecting 5 parts per second (I=5), and can tolerate one pixel of blurring (B=1) then:

View Time = 1/(640*5) = 315 microseconds

This is within the camera exposure range (and shutter speeds) but will require good illumination, perhaps by an LED strobe, because the exposure time is brief.

You adjust the camera's exposure time using the Exposure Control slider on the Vision Appliance's Sensor Setup screen. This slider can range from 0 (no exposure – black screen) to 1023 (longest exposure) in steps of roughly 64 microseconds, starting at 1 = 32 microseconds. The exact times on this control are in increments of the RS-170 horizontal line time of 63.556 microseconds. In practice, you will adjust the exposure to balance good image contrast against visible blur due to part motion.

Blurring of the image caused by the motion of the part (*motion blur*), even when not visible to the human eye looking at the camera image, will reduce the accuracy of measurements. Ideally, measurements should be performed on a part that is not moving, so there is no motion blur and so that a longer exposure (and smaller lens aperture) can be used.

Progressive Scan Cameras

In addition to programmable exposure, the camera is non-interlaced (usually called *progressive scan*). If you intend to use a different camera with your Vision Appliance, call DALSA IPD for supported cameras. Make sure that it is progressive scan, has an electronic shutter, and is compatible with the control signals, power, and cabling.

Strobe Lighting

A strobe light provides a brief, high-intensity pulse of light that can help reduce motion blur and still provide adequate illumination to the part being inspected. Traditional xenon strobe lights are bright and can be very short in duration, less than 100 microseconds, to "freeze" the part motion. Xenon strobes have substantial variability in intensity. This can create variations in the image quality, which could be mistaken for variation in the part quality. Xenon strobe lights are used only when there is no easier way to get short, high-intensity light. LEDs (Light Emitting Diodes) can also be used as a strobe, and over-driven to give a short, bright pulse of light.

Even with a strobe illumination source, you need a camera with an electronic shutter and exposure time to prevent ambient light from contaminating the image. The Vision Appliance has a dedicated I/O line for firing a fast strobe, because this must be done at a certain time after the exposure has been triggered. Longer duration light, for example LEDs again, can be controlled using a standard I/O line, and are turned on before the camera's exposure is triggered and turned off after the exposure is done. This minimizes the intensity variation on different exposures.

Using Contact Closures

Mechanical contacts, such as switches or relays, typically exhibit "bounce." The moving contact makes the electrical circuit by touching a fixed contact, but then bounces off this fixed contact. The result is a series of rapid closing and openings of the contact until the moving contact stops bouncing. Bouncing typically continues for less than 10 milliseconds, but the duration depends on mechanical factors of the switch. This oscilloscope trace shows about 5 ms (milliseconds) of bounce when a switch is closed:

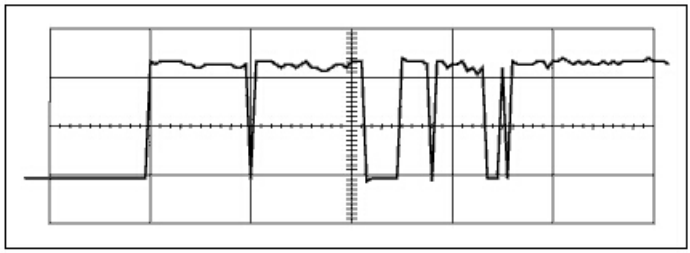

Figure 17. Example of switch "bounce" during a contact closure

From *Switch Bounce and Other Dirty Secrets*, Maxim Integrated Products, Inc., Sept. 2000

The problem is, the Vision Appliance "sees" the bouncing as multiple, rapid input signals. For example, if your "part in place" sensor is a mechanical switch (say, a photocell running a relay), the contact bounce will make it appear as if many parts were being presented to the Vision Appliance in a few milliseconds.

Here are three ways to deal with bounce. (1) Use a signal that does not bounce; for example, from a photoelectric sensor. (2) Use the built-in de-bouncing circuits. The de-bounce circuit delays the Appliance from responding to the input for some number of microseconds (us) to allow time for the contact to settle. The de-bounce time can be programmed through the camera configuration file. (3) Externally de-bounce the switch closure using commercial de-bounce chips (for example, the Maxim MAX6816), or a low-pass filter and Schmitt trigger.

Both the Vision Appliance and external de-bounce circuits delay the input signal by the de-bounce period. This delay is rarely long enough to be a problem, but might have to be considered in very high-speed applications where any delay might mean the parts being inspected move partially out of the field of view.

Using Photo-Sensors

HTM Electronics Industries (http://www.htm–sensors.com) and Banner Engineering Corp. (http://www.bannerengineering.com) and several other manufacturers make photoelectric sensors that do not require de-bouncing. The HTM Electronics MP-D0380D-CX9Q4UE infrared sensor, and the Banner Engineering R55F series photoelectric sensors and the SM312 LVAGMHSQD photoelectric sensor have been used successfully with the Vision Appliance. These sensors are rated to operate on 10 to 30 VDC; but *do not exceed* 24 VDC or you will damage the Vision Appliance.

The following diagram shows how to connect these photoelectric sensors. The wiring is:

Brown - Power (+16 to +24 Volts DC)

Blue - Ground

Black - Signal from photoelectric sensor. Goes high (to about the power voltage) when triggered.

The other two wires are *not needed* for using the sensor with the Breakout Board. These two wires are:

White - Signal from photoelectric sensor – connects a small load to ground (see sensor specification)

Gray - Can be connected to a switch to ground; when closed, enables Remote Teach

The photoelectric sensor draws power from the brown and blue leads. When the photoelectric sensor is triggered the output (black lead) goes high (to about the power supply voltage).

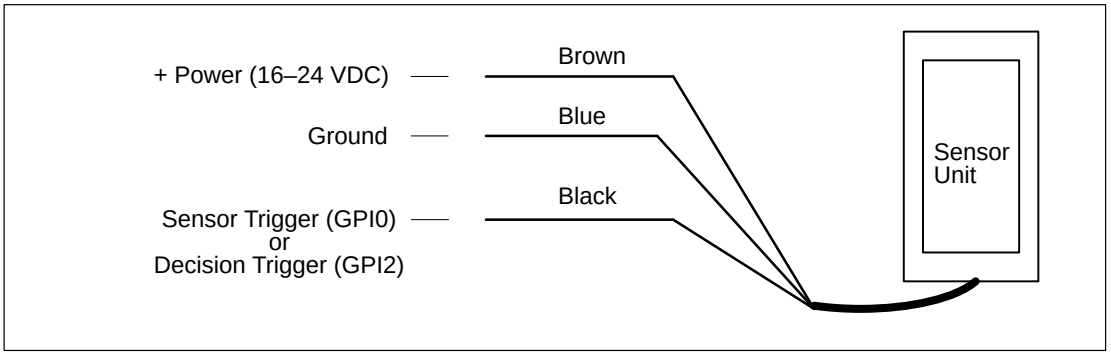

Figure 18. Photosensor Connections

APPENDIX C
SOFTWARE CONFIGURATIONS

Settings for Sherlock Users

Sherlock 7 settings for the VA5x are contained in three files: Drivers.ini, SaperaLTDrv.ini, and the camera configuration file(s).

drivers.ini File

The Drivers.ini file is edited by selecting Options|Acquisition in the Sherlock menu bar.

(several lines ommitted)

[DRIVER0]
NAME= SaperaLT
FILE = SaperaLTDrv.dll (use this driver)
CONFIG = SaperaLTDrv.ini (driver init. file)
ENABLED = 1 (this is the selected/active driver)

SaperaLTDrv.ini File

The SaperaLTDrv.ini file is edited by clicking on the "Driver Configuration" button in the Acquisition Options or Configure Hardware dialog.

(several lines ommitted)

[IoDevices]
Input Level 0=1
Input Level 1=1
Input Level2=1
Ouput Type 0=2
Output Type 1=0
Output Type 2=0

[GENERAL]
NumDevices=1 (one camera only)
Internal Buffers=2

[Device_0] (first camera)
Server=NetSightII–CL_1 (what frame grabber)
Device=CameraLink Base Mono #1 (what type of camera: mono or RGB)
ConfigFile=d:\DALSA Coreco\Sapera\CamFiles\User\MyCamera.ccf (full path to file)

Camera Configuration Files

The CamExpert camera configuration file specifies:

- the type of camera and its timing format.
- if triggers are enabled, what triggers are used, and which pins are used for trigger inputs.
- if strobe output is enabled. If enabled, strobes are output on OUT0 & OUT1 (GPO0 & GPO1).

External Trigger Source: 1=Opto triggers, 6=single-ended inputs, Automatic=Opto triggers.

Settings for Sapera Users

Sapera uses the CamExpert camera configuration files and settings. Sapera can also use function calls within a program to directly set parameters controlling some hardware.

The following parameters are available for the CorGIOSetPrm function:

CORGIO_VAL_INPUT_LEVEL_TTL, CORGIO_VAL_INPUT_LEVEL_24VOLTS

CORGIO_VAL_OUTPUT_TYPE_NPN, CORGIO_VAL_OUTPUT_TYPE_PNP

CORGIO_VAL_OUTPUT_TYPE_LED

Refer to the example program and source code at C:\Coreco\GPIO or D:\Coreco\GPIO