GV 400

Vision System

Installation Manual

405-00083-00

Notice

GV 400 Installation Manual
Document Number 405-00083-00

Certifications

Declaration of Conformity	
Manufacturer	Teledyne Digital Imaging US, Inc. 700 Technology Park Drive Billerica MA 01821 USA
CE	We declare that this product has been tested to comply with the EC Directive for a class A digital device in accordance with EN55022/CISPR22
FCC	We declare that this product has been tested and found to comply with the limits for a class A 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.
Other	
CFR 21 Part 11	This product provides tools needed for users to implement an auditing program that could be in compliance with CFR 21 Part 11. These tools include: • System or software backup and restore • System software security (password login and access limits) • Protection of system backup files from modification. • Record of actions by users with time stamp information • Time stamp information on data output.

Handling Precautions

Care should always be exercised when handling and operating your GV 400 System. 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 the following precautions:

- Avoid "hot-plugging" cables and devices. Be sure to shut the system down and remove power before connecting or disconnecting anything to it.

- Do not use in a "Free-standing" operation. Mount the system properly to prevent it from falling accidentally. Mounting hardware is provided with the system.

- Always use system in an environment within the recommended operating conditions. Refer to the complete specifications on page 23.

- Do not install the system in a location that will expose it to excessive heat, humidity, vibration, impact, corrosive substances, or flammable substances.

- Do not attempt to service or modify the GEVA system by opening the enclosure.

Electro Static 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.

Warranty

Teledyne Imaging warrants the GV 400 Vision System against defects in materials and workmanship for a period of Twelve (12) months from the date of delivery. Teledyne Imaging and its representatives expressly disclaim any and all other warranties.

Your sole remedy shall be repair or replacement of the GV 400 Vision System product and associated optional components, provided that the defective product is returned within the warranty period.

If you need to return the GV 400 Vision System, you must contact the Teledyne Imaging representative who sold you the product. Do not return your product to Teledyne Digital Imaging US without prior authorization.

Teledyne Imaging assumes no liability for damages resulting from the use of this manual.

Table Of Contents

GV 400 Vision System Overview

The GV 400 is a compact vision system that supports image acquisition, processing, display and communications. The system is equipped with 4 PoE compliant Ethernet ports for interfacing GigE style cameras and 2 standard Ethernet ports for interfacing complementary devices and the factory network. The low power GV 400 uses industrial grade components encased within a fanless aluminum enclosure. It is offered with either panel or DIN mountable hardware.

Product Support

This manual will assist you with the installation and setup of your GV 400 product and the embedded inspection software. It describes what the product supports and how to connect the external interfaces. If your questions are not answered in this reference, please contact your local Teledyne Imaging representative.

In addition to this installation manual, support is available as follows:

1. Fingertip help is available on every screen (panel) of the iNspect Express or Sherlock User Interface.
2. The software User Manual is included on the system hard drive.
3. Email factory support at TDI_Support.ipd@Teledyne.com
4. Call or email your local representative who sold you the product.

GV 400 Vision System Components

GV 400 vision systems are shipped with the components listed below. Take a few moments to verify that everything has arrived in good condition. If your product has been visibly damaged during shipment or is missing parts, please contact your Teledyne Imaging representative immediately.

Standard components (ship with every GV 400 Vision System):

Component	Description
<u>GV 400 Vision System</u> GV400-03 or GV400-04	Fully integrated vision system with iNspect Express (-03) or Sherlock (-04) embedded software, and DIN mounting hardware.

Optional components (sold separately):

Component	Description
A-CAM-G3-XXXX-XX	Genie Nano Series GigE cameras.
A-CAB-GE-X	GigE CAT5e camera cables (video data, network communication).
A-PL-USB	USB breakout module for camera interfacing and additional I/O.
A-DCI-101	Breakout module for camera interfacing.
A-CAB-G3-IO-X	Genie Nano IO/Power/Trigger cable (for free wire, PL-USB or DCI-101).

Note: The PL-USB uses camera Input2 as the trigger and Output2 as the strobe.

Connecting the GV 400 Vision System

This section details the physical connections on the GV 400 vision system. The GV 400 provides connectors on both the rear and front and surfaces.

Rear Connections
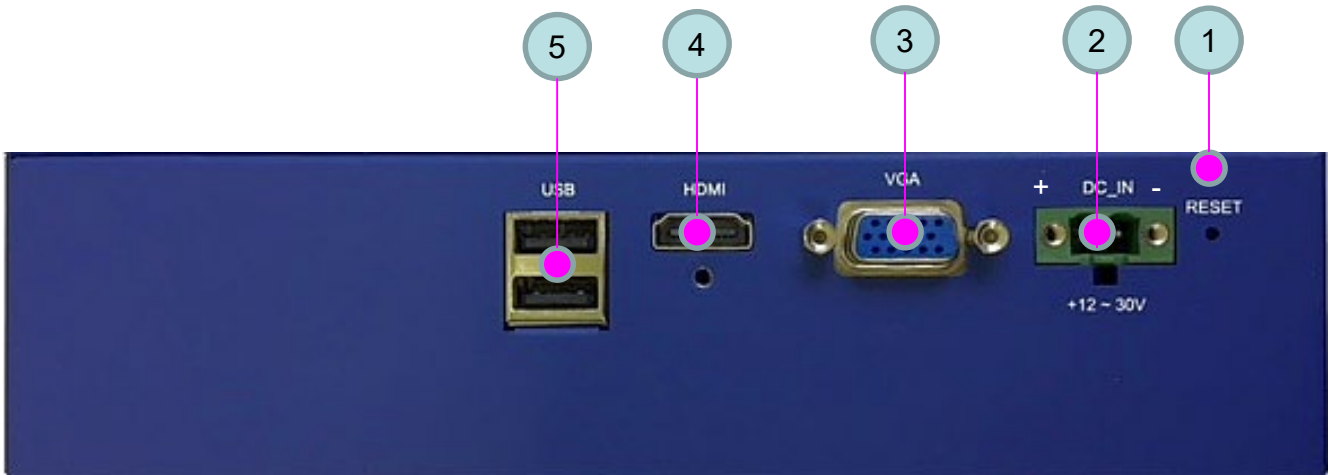
1. Reset button – recessed behind the front plate. Use blunt pointed object and hold for 5 seconds to reset the unit.

2. Power connector – Supports 12-36 VDC @ 60W.

3. VGA display port

4. HDMI display port (preferred)

5. Two USB 2.0 ports. Typically used to connect Keyboard/Mouse or flash drive.

Front Connections
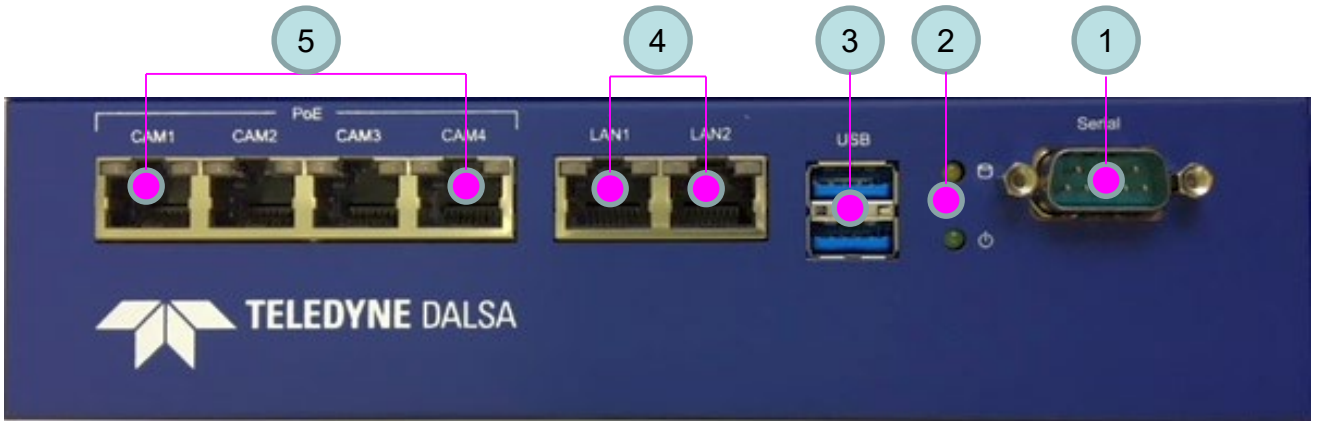
1. Serial Port – Configured as COM1 device at 11520,8,0,1,0.

2. LEDs: Power/HDD

3. Two USB 2.0 ports. Typically used to connect PL-USB I/O module.

4. Two Gigabit Ethernet ports for network and 3rd party device connections. Default IP settings as follows:

Marking			Connection
LAN1	Dynamic IP Address	DHCP enabled	LAN network 1
LAN2	Static IP Address	192.168.15.1	LAN network 2

5. Four Gigabit PoE compliant Ethernet camera ports. Note: POE cannot be disabled. Default IP settings are as follows (these can optionally be changed through the Windows network "change adapter settings" interface):

Marking			Connection
CAM1	Static IP Address	192.168.11.1	Camera port 1
CAM2	Static IP Address	192.168.12.1	Camera port 2
CAM3	Static IP Address	192.168.13.1	Camera port 3
CAM4	Static IP Address	192.168.14.1	Camera port 4

LAN left LED: Off = 10 Mbits/s; GREEN = 100 Mbits/s; ORANGE = 1000 Mbits/s
LAN right LED: ON = port active; BLINK = port traffic

Note: Camera Ethernet cables must be type Cat5e. Use A-CAB-GE-X.

GigE Cameras

The GV 400 supports Teledyne Imaging's family of Genie Nano cameras and the PIC-2592 camera for image acquisition. The Linea GigE line scan series is technically compatible, but not recommended for this platform.

The following should be noted when matching your application camera needs to the GV 400:

1. The GV 400 has 4 camera ports.

2. Sherlock has no limit on the number of cameras supported.

3. iNspect Express "Extended" license on the GV 400 supports up to 8 cameras.

4. The GV 400 hardware design does not limit how multiple cameras are connected. In theory, multiple cameras could be connected through Ethernet switches to each of the GV 400 camera ports. However, in practice, the effective throughput of the system will decrease as you add more cameras, or cameras with higher resolution or color formatting. Consult your Teledyne Imaging representative on applications requiring more than 4 cameras or high inspection speeds.

iNspect Express and Sherlock use different software drivers to interface to Genie Nano cameras. iNspect Express uses a driver called IFC, whereas Sherlock uses one called Sapera LT. The setups associated with each will be described later in the manual. Generally, Sapera offers additional flexibility over IFC, but requires additional steps to setup. The PIC2592 camera uses IFC in both Sherlock and iNspect Express.

Two cables are needed in the setup of each camera. The data cable (A-CAB-GE-X) connects the camera's Ethernet port to one of the GV 400 camera ports. The I/O cable provides power to the camera and access to the camera's I/O, including trigger.

Note: By default, iNspect Express and Sherlock assume Genie camera Input2 is the trigger input and Genie camera Output2 is the strobe output.

Typical Configuration using the PL-USB module

NOTES:

1. Camera ports 1-4 provide POE (Power Over Ethernet). Do not connect the Genie Nano camera's power and ground to the PL-USB.

2. Power connections to the PL-USB and GV 400 are not shown.

3. Use **A-CAB-GE-X** for camera Ethernet connections.

4. Use **A-CAB-G3-IO-X** for I/O connections between Genie Nano and PL-USB. Camera Input2 is the expected trigger, Output2 is the strobe. Cable wiring diagrams appear in the PL-USB Quick Start Guide and PL-USB Install Manual.

GV 400

Genie Nano

USB link

PL-USB module
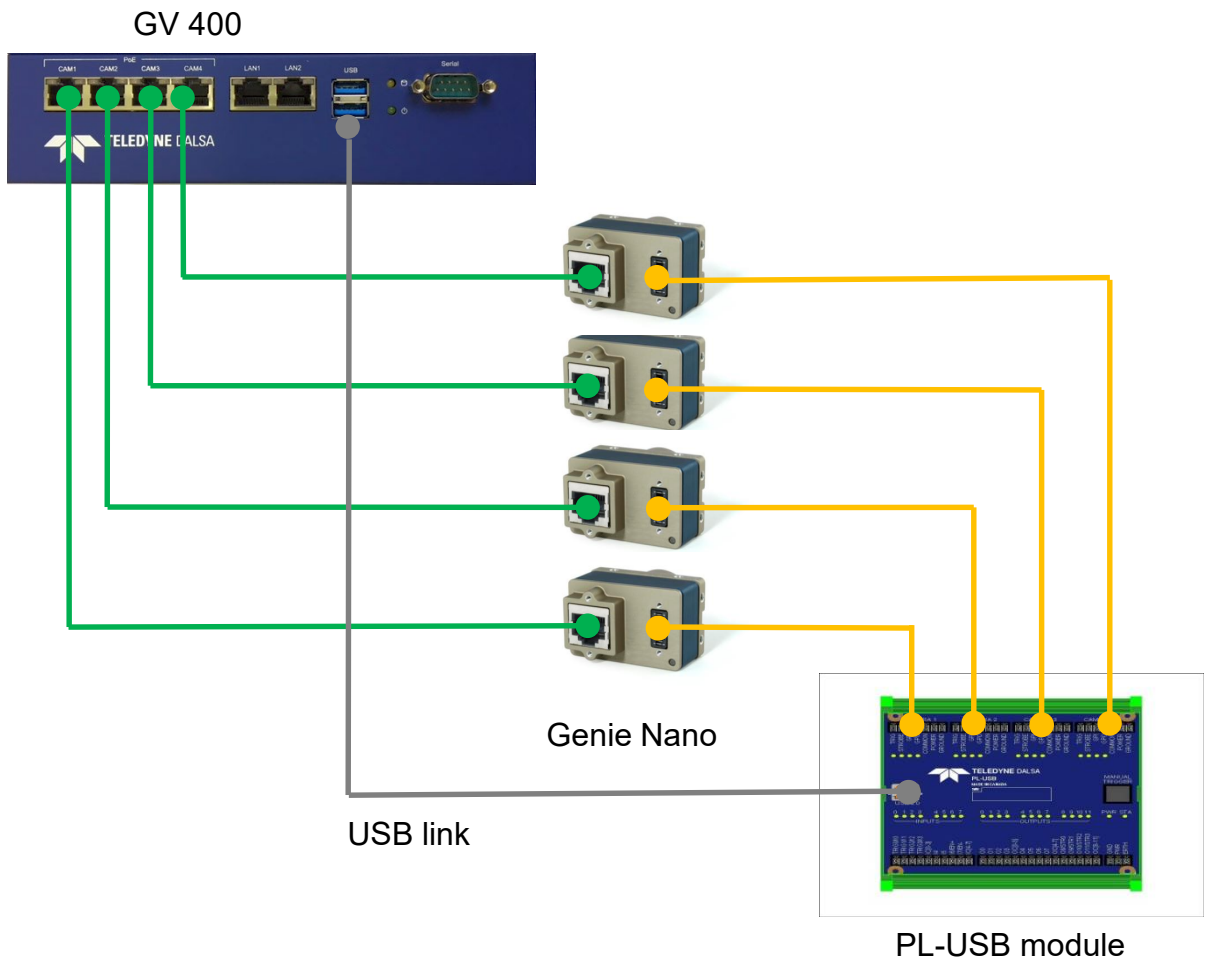
# Typical Configuration using the DCI-101 module

NOTES:

1. Camera ports 1-4 provide POE (Power Over Ethernet). Do not connect the Genie Nano camera's power and ground to the DCI-101.

2. Power connections to the DCI-101 and GV 400 are not shown.

3. Use **A-CAB-GE-X** for camera Ethernet connections.

4. Use **A-CAB-G3-IO-X** cables for Genie Nano I/O. Camera Input1 is the expected trigger. Cable wiring diagrams appear in the DCI-101 Quick Start Guide.

5. Use one **A-DCI-101** for every 2 cameras.

GV 400

Genie Nano

DCI-101 modules

Software Interface
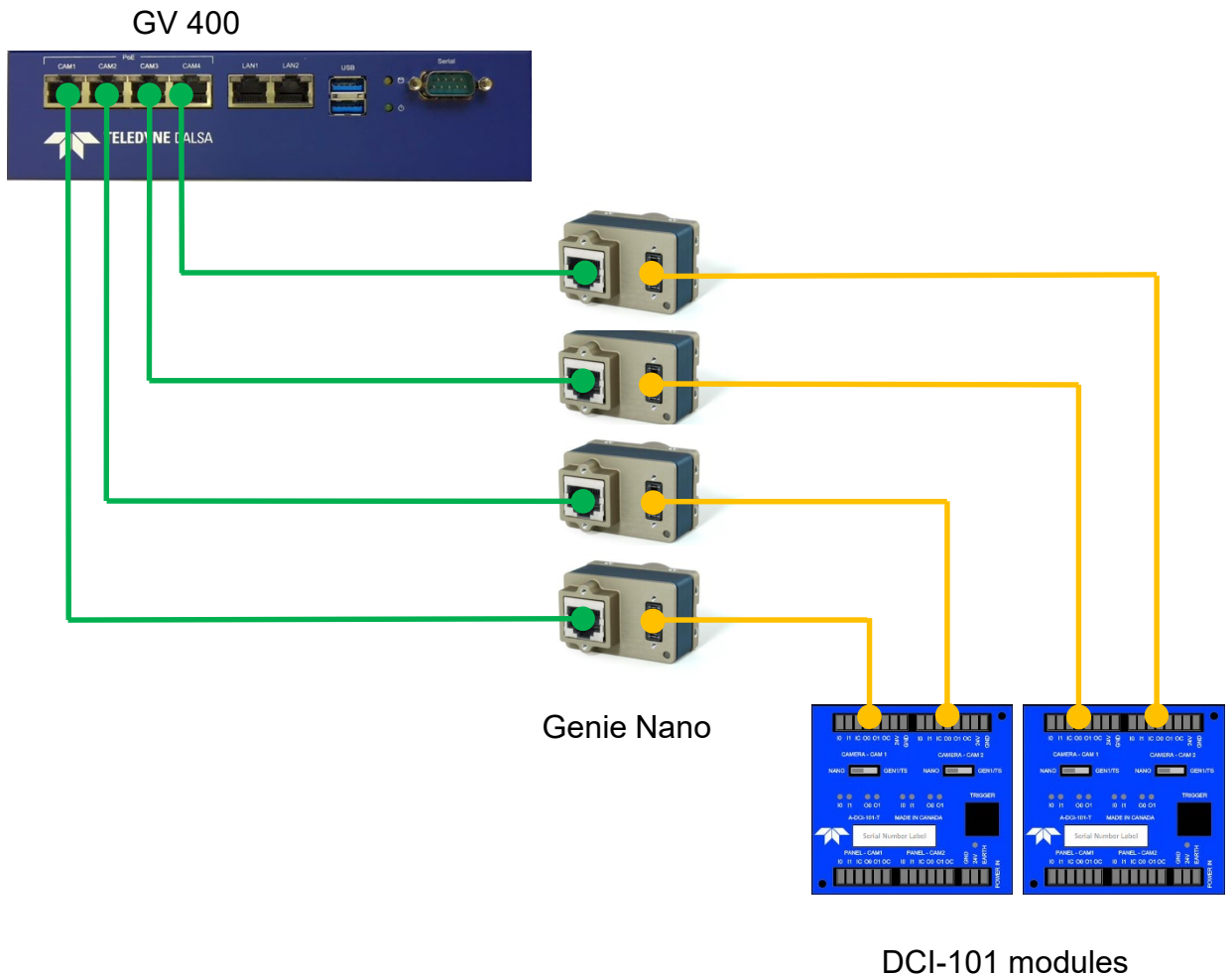
Getting Started

The GV 400 vision system is supplied with 64-bit Windows 10 IoT operating system and either iNspect Express or Sherlock vision software licensed for use. These applications offer a suite of vision capabilities that satisfy a diverse range of automated inspection needs. The following shows how to configure the GV 400 to work with either interface. Refer to the respective software user manual for more information.

Note: The -03 models ship with iNspect Express licensed. The -04 models ship with Sherlock licensed.

Software Directory Structure

iNspect Express, Sherlock and associated software applications are installed in various directories on the GV 400. For reference, the following table lists the location and association of core programs and data directories that are referenced in this manual:

iNspect Express Program Files and Directories	
iNpsect Express Configurator	C:\Program Files\Teledyne Dalsa\iNspectExpress x64\iNspectExpressConfig.exe
iNspect Express	C:\Program Files\Teledyne Dalsa\iNspectExpress x64\Express.bat
Solution Files*	C:\ProgramData\Teledyne Dalsa\iNspectExpressVA\Solutions
Emulator Images*	C:\ProgramData\Teledyne Dalsa\iNspectExpressVA\Images
iDiscover	C:\Program Files\Teledyne Dalsa\iNspectExpress x64\iDiscoverGenie.exe
License Manager	C:\Program Files\Teledyne Dalsa\iNspectExpress x64\IdpLicMgr.exe
Sherlock Program Files and Directories	
Sherlock	C:\Program Files\Teledyne Dalsa\Sherlockx64\bin\IpeStudio.exe
Sherlock Drivers*	C:\ProgramData\Teledyne Dalsa\Sherlockx64\Drivers
Sherlock Programs*	C:\ProgramData\Teledyne Dalsa\Sherlockx64\Programs
Sherlock Emulator Images*	C:\ProgramData\Teledyne Dalsa\Sherlockx64\Images
Sapera Acquisition Wizard	C:\Program Files\Teledyne Dalsa\Sherlockx64\bin\IpeSaqAcqWiz.exe
Sapera CamExpert	C:\Program Files\Teledyne Dalsa\Sapera LT\CamExpert\CamExpert.exe
iDiscover	C:\IPD Install Files\Utilites\iDiscoverGenie.exe
License Manager	C:\Program Files\Teledyne Dalsa\Sherlockx64\bin\IpdLicMgr.exe

- The "ProgramData" paths apply when iNspect Express is installed with the (default) option "for all users". The path becomes "Users\Teledyne\AppData\Local" when installed for the "current user only".
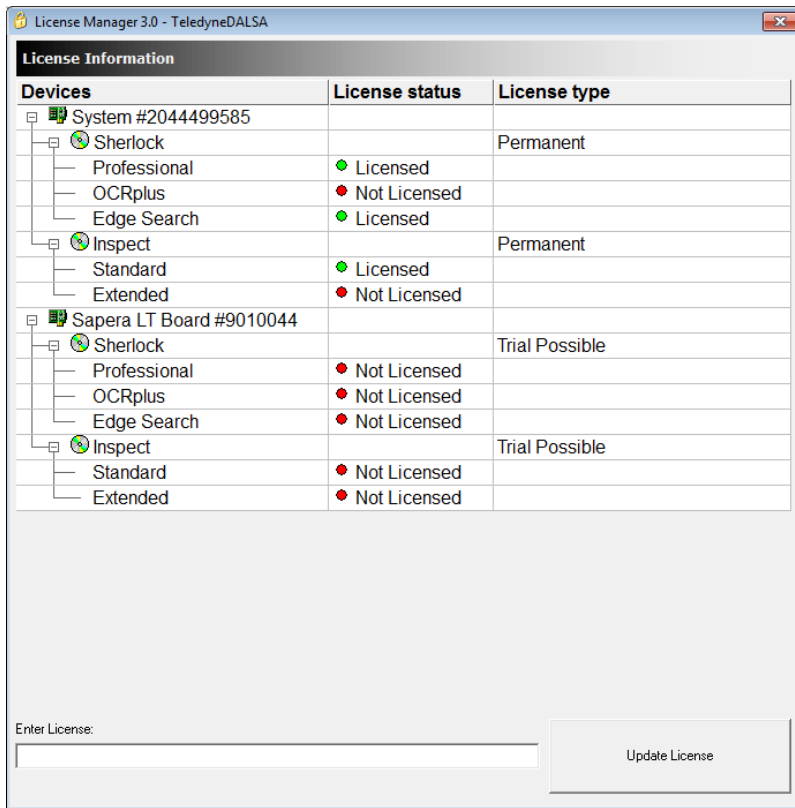
Note: iNspect Express and Sherlock have a Start Menu shortcut to the User Files directory, which includes \Drivers, \Programs and \Images. The directory C:\ProgramData or C:\Users\Teledyne\AppData (and everything below it) is normally hidden per Windows rules. You can change permissions and hidden folder views.

The License Manager

The software installed on the GV 400 is license protected. The license is applied to the unit system number before it ships from the factory. Make sure that the product license matches what you ordered before going any further. Open the license manager from the "start menu" as follows:

Start➔All Programs➔Teledyne DALSA➔iNspect Express➔License Manager

Start➔All Programs➔Teledyne DALSA➔Sherlock➔License Manager

Devices	License status	License type
System #2044499585		
Sherlock		Permanent
Professional	Licensed	
OCRplus	Not Licensed	
Edge Search	Licensed	
Inspect		Permanent
Standard	Licensed	
Extended	Not Licensed	
Sapera LT Board #9010044		
Sherlock		Trial Possible
Professional	Not Licensed	
OCRplus	Not Licensed	
Edge Search	Not Licensed	
Inspect		Trial Possible
Standard	Not Licensed	
Extended	Not Licensed	

Enter License: _____ Update License

In this example, "System #2044499585" is the system drive and "Sapera LT Board #9010044" is a Genie Nano Camera. Both Sherlock and iNspect Express are licensed on the System drive. Your system may have only one of these licenses.

If the license does not reflect what you purchased, consult your Teledyne Imaging sales representative. The license is field upgradable by entering a new string in the "Enter License" box.

iNspect Express Setup

Follow these steps to configure the system to run iNspect Express:

1. Connect cameras as shown in the hardware installation.

2. Verify a valid license is installed (run License Manager).

3. Open the **iNspect Express Configurator** and configure preferences; Select "GigE" in the camera menu.

4. Click on the **iDiscover** button to detect and configure cameras connected to the system.

5. Save Camera set (select which connected cameras you want to use).

6. Close iDiscover and launch iNspect Express (run panel shown below).
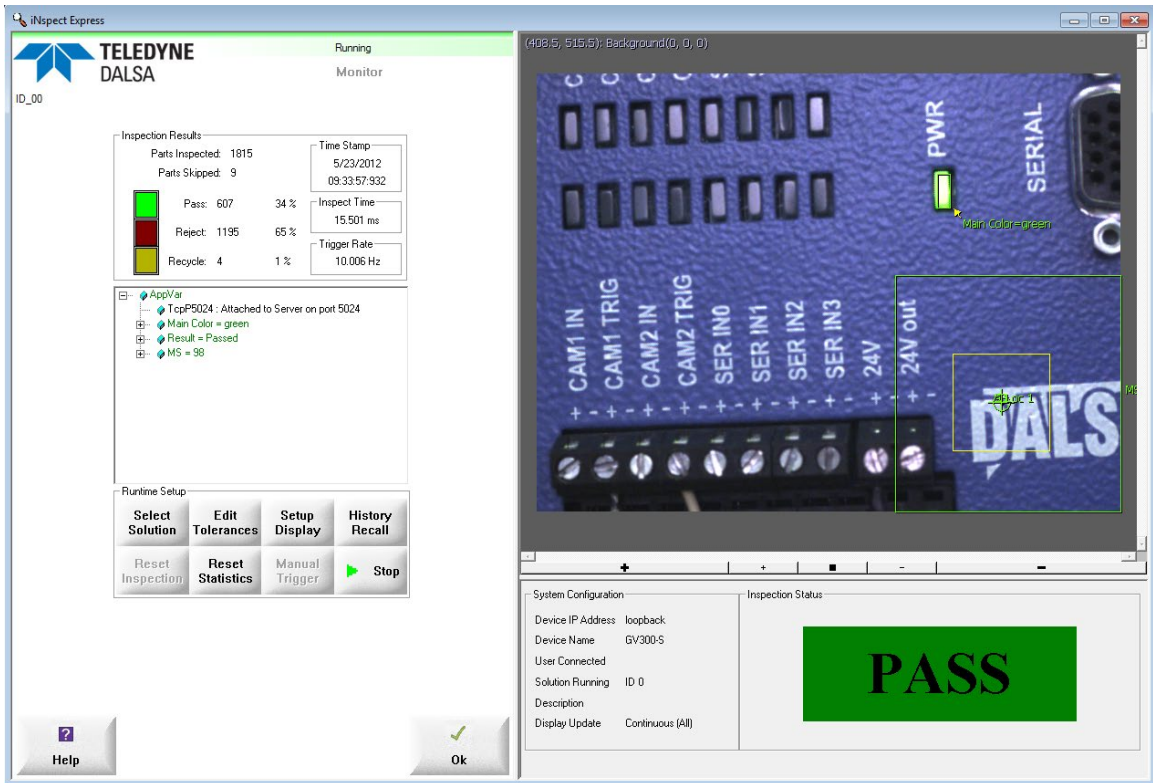
The iNspect Express Configurator

This program is a front-end configuration tool for iNspect Express. Launch from the icon on the GV 400 desktop. Select the language, camera type (always GigE for GV 400) and custom features for your application. These features are peculiar to the iNspect Express software and are detailed in the software users manual.

From the camera selector tool you can launch both iDiscover and iNspect Express as shown below. To launch the emulator simply select the "Emulator" and launch iNspect Express.

Click to launch iNspect Express →

Click to launch iDiscover Genie ←
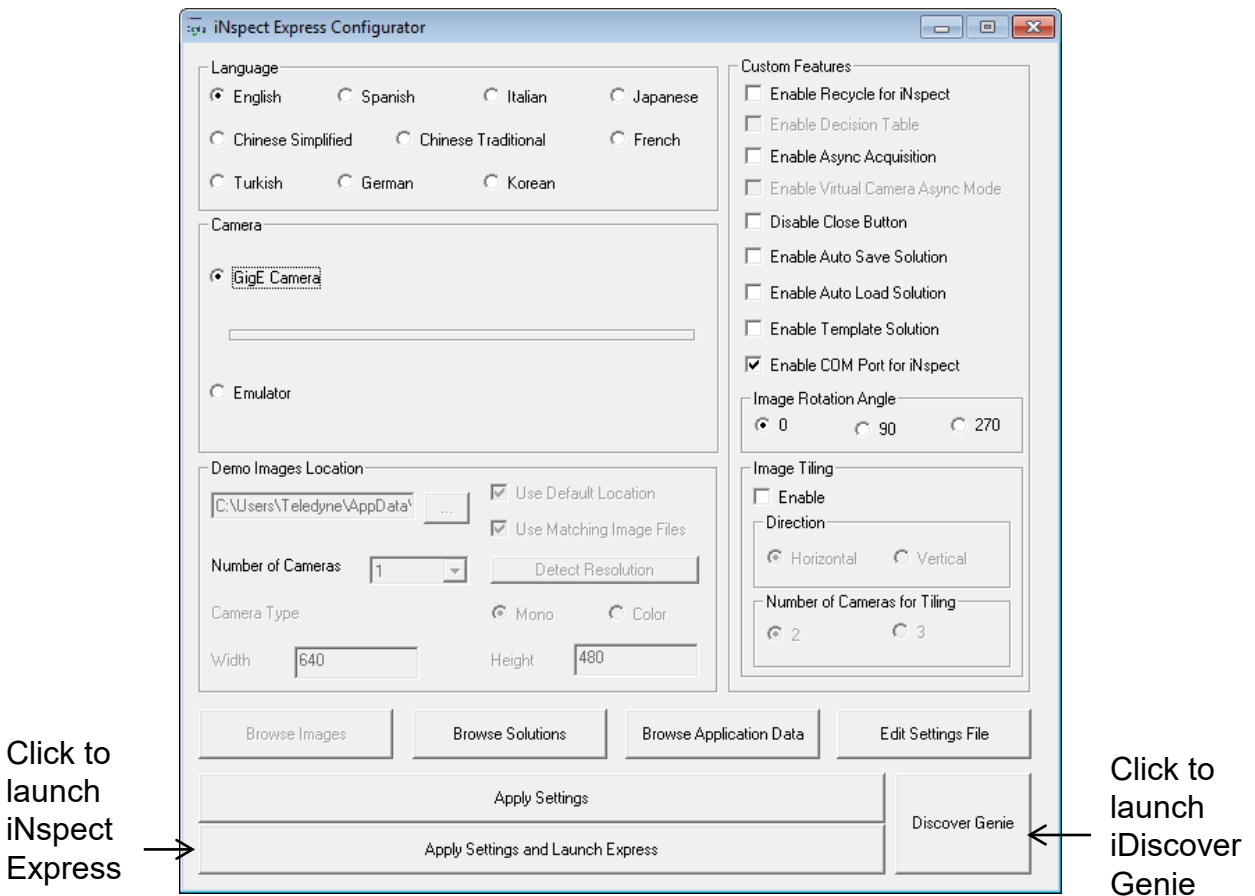
The iDiscoverGenie Utility

The iDiscoverGenie utility is provided for discovering GigE cameras connected to the GV 400 camera ports. Use the iDiscoverGenie interface to change the camera IP settings to match the IP setting of the camera port. A shortcut to the iDiscoverGenie program is available on the GV 400 desktop. This utility applies to both Genie Nano and PIC-2592 cameras.

Click on one of the detected cameras to populate the associated network configuration on the right. You can then modify the camera IP address to match the camera port IP segment at the top. Note: Conflicting IP addresses will be designated by a red camera icon in the detected camera menu.

Click the "Apply" button to save changes. The Genie and PIC-2592 cameras will reappear configured at the new address.

Select cameras to use in your iNspect Express configuration by clicking and moving them to the left panel using the arrow buttons. You can change the camera order by using the up/down arrow buttons on the left control bar. Save the corrected camera list.
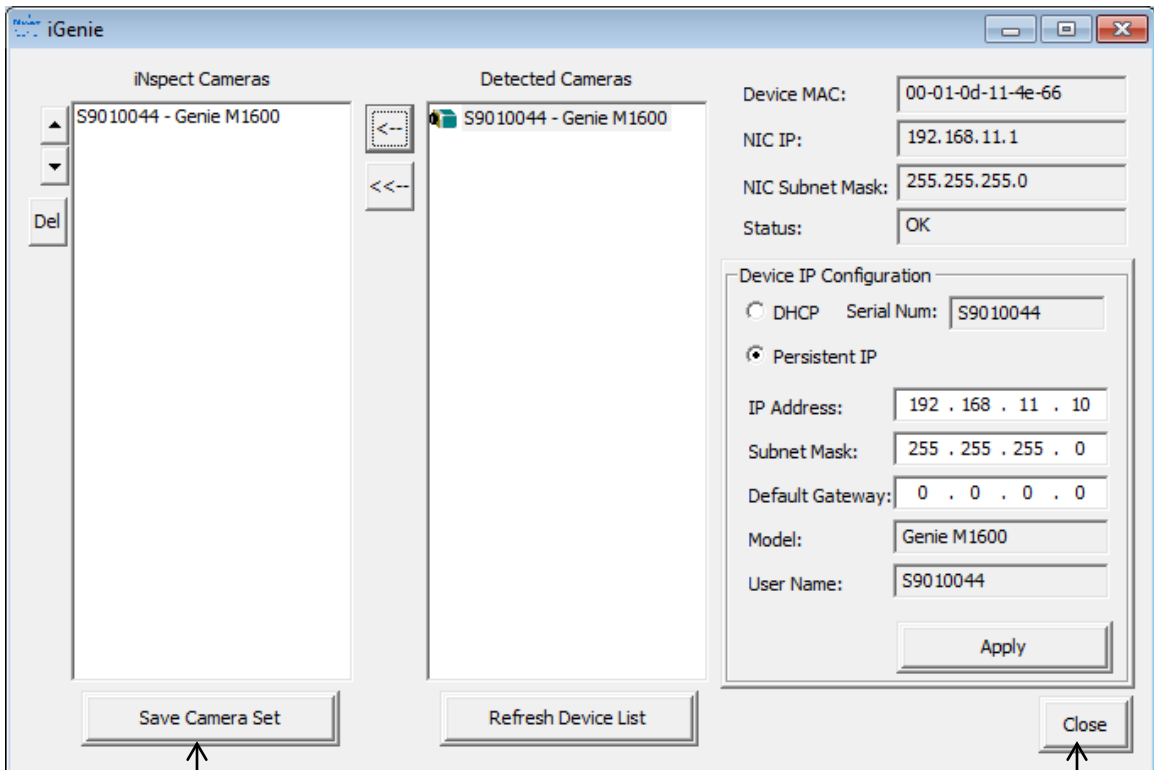

Click to save configuration

Click to return to the Configurator

Sherlock Setup

Follow these steps to configure the system to run Sherlock:

1. Connect cameras as shown in the hardware installation.
2. Verify a valid license is installed (run License Manager).
3. Run the **iDiscover** program to detect and configure cameras connected to the system (icon shortcut on the desktop).
4. Run the **Sapera CamExpert** utility if you want to change settings in any of the Genie Nano cameras such as exposure, strobe or white balance. (does not apply to PIC-2592.)
5. Run the **Sapera Acquisition Wizard** to verify Genie Nano cameras are shown as expected and save the configuration file SaperaLTDrv.ini by clicking the "save" button. (does not apply to PIC-2592)
6. Launch Sherlock using the shortcut on the desktop (Sherlock GUI shown below).
7. Go to the Options menu and select Acquisition. In the "Configure Driver Loading" section enable "Sapera LT" for Genie cameras.
8. Enable "Ifc" for the PL-USB or PIC-2592 cameras. Edit the "IfcDrv.ini" file to point to a valid PL-USB or PIC2592 configuration file. A full path is required. Refer to the PL-USB Installation Manual, or the PIC2592 Quick Start Guide. Note: Sherlock will fail to run if you enable Ifc but fail to point to a valid configuration file!
9. Close and reopen Sherlock. Driver changes only take effect when Sherlock opens.
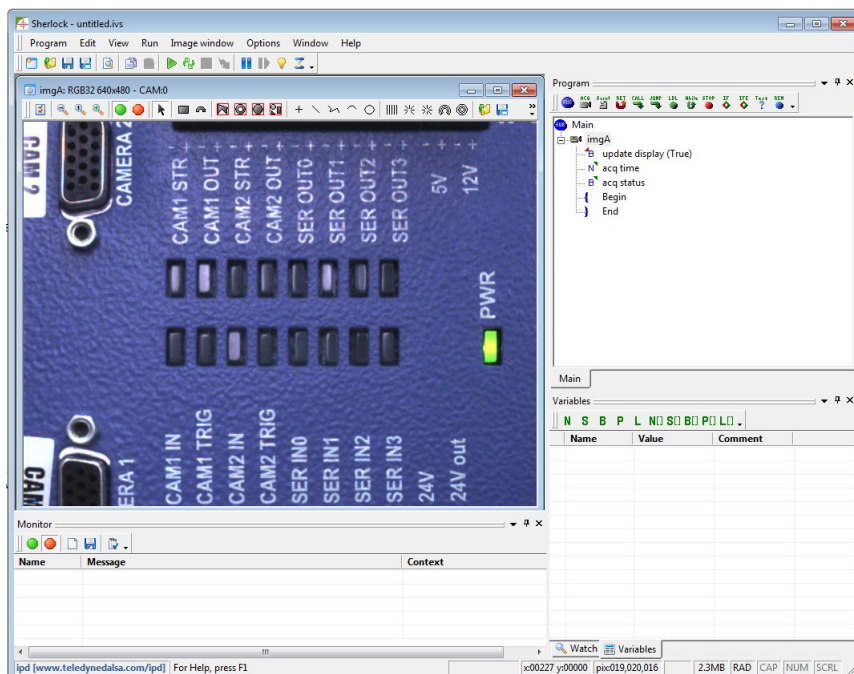
The Sapera CamExpert Utility

Genie Nano cameras store their configuration settings (I/O, shutter speed, white balance) in memory (EEPROM). iNspect Express overrides these settings according to the solution file, whereas Sherlock loads them from the camera <u>or</u> a stored configuration file during program initialization. You can change these parameters and save them on the camera and/or a configuration file using the Sapera CamExpert utility. This does not apply to the PIC-2592 camera. Refer to the PIC-2592 Quick Start Guide.

You can configure the camera to load either your saved settings, or the factory settings, at power up. The preferred method is to save your settings to both the camera and a configuration file. Sherlock can load a configuration file at startup. If multiple configurations are needed, you can save them to different camera configuration files. Some example configuration files are included on the GV 400.

Note: Changes to the camera settings are temporary, unless saved to the camera memory or to a configuration file.
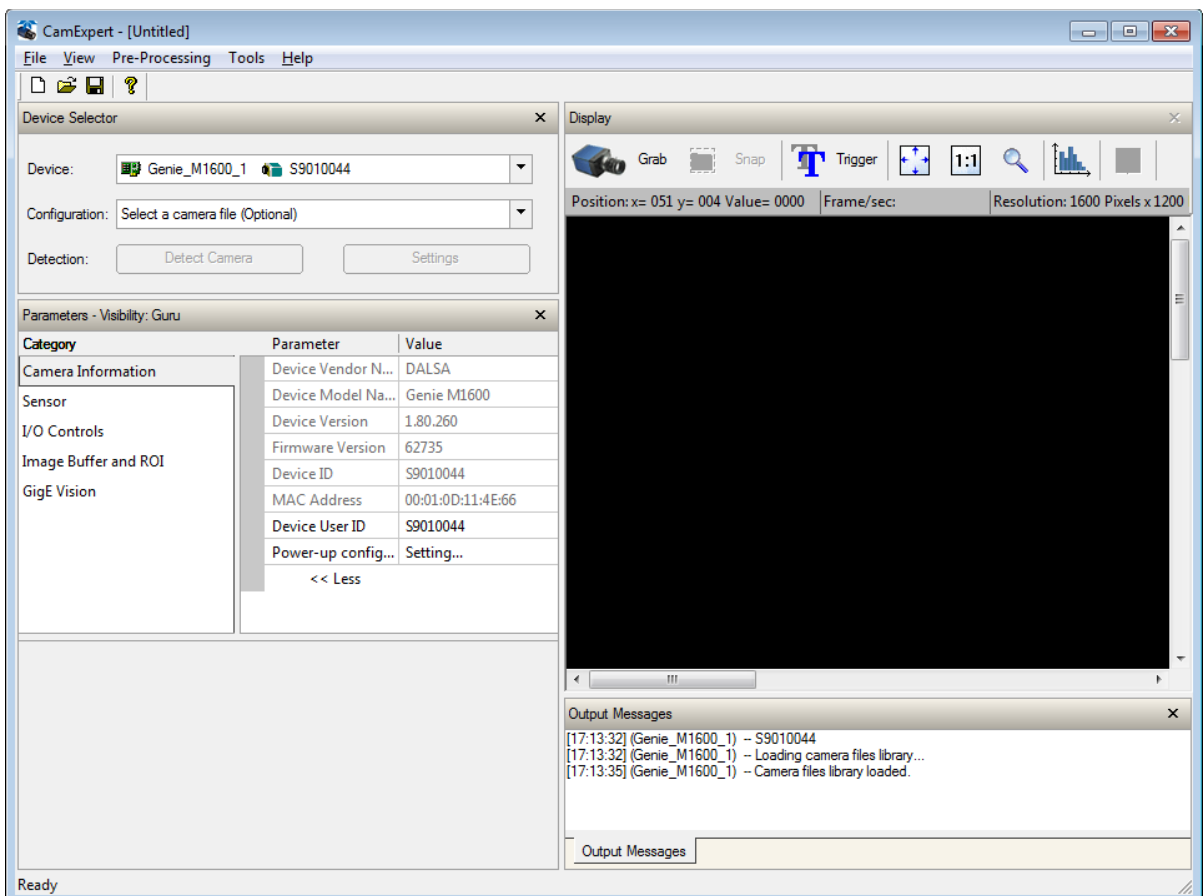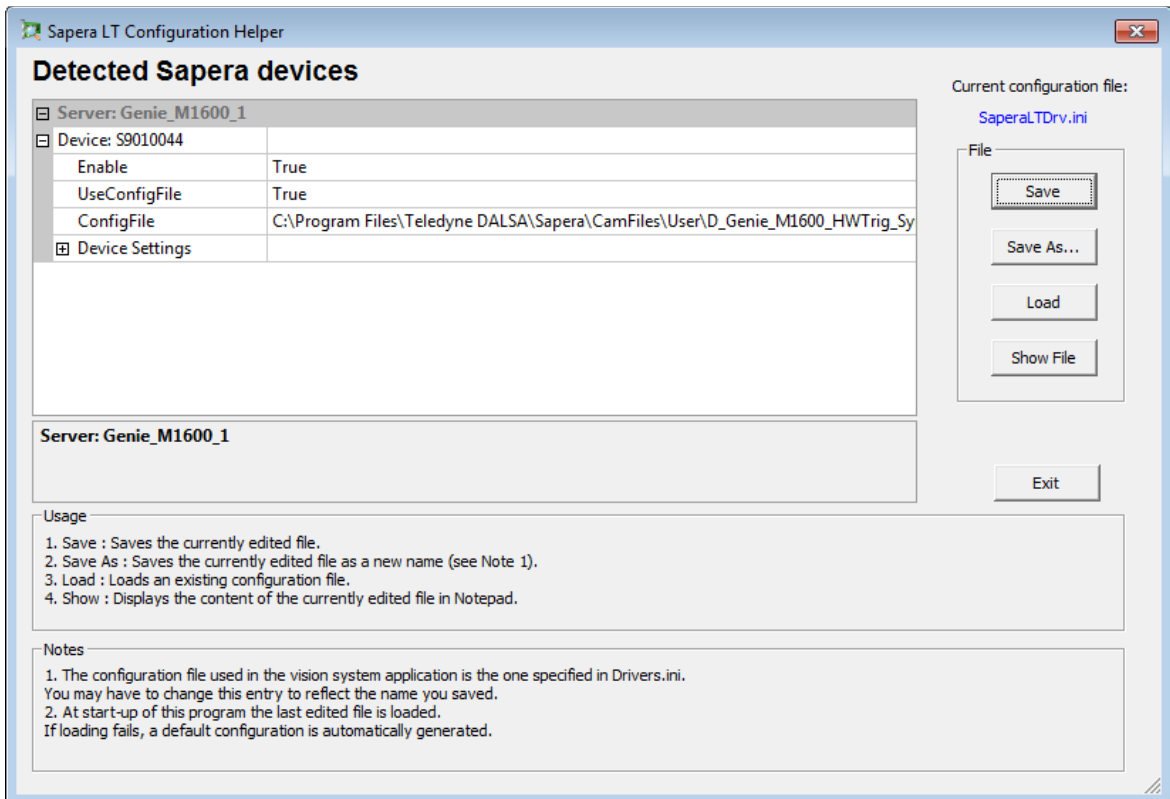
The Sapera Acquisition Wizard

The Sapera Acquisition Wizard detects all available Genie Nano Cameras, and creates a file "SaperaLTDrv.ini" that identifies them in Sherlock. You can enable or disable camera ports, and select camera configuration files using this utility. Note: If a configuration file does not match the number of cameras, the Sapera LT and Genie drivers will not load and Sherlock will not run saved programs. Instead, Sherlock will open a new investigation (solution) file. This does not apply to the PIC-2592 camera. Please refer to the PIC-2592 Quick Start Guide.

The Sherlock application uses the settings stored in the camera, or in camera configuration files. You can also use Sherlock instructions to change Gain, Exposure (shutter time) or Strobe pulse width (IO:Camera:SetNumberFeature) programmatically.

When you launch the wizard you will see the dialog below. All cameras connected to the GV 400 should be listed in the device window. Click the "save" button to store the configuration in the SaperaLTDrv.ini file.

The example below shows one Genie camera. This example is already set up to use the Genie camera configuration file located in the default location for Sapera LT.

Changing the Camera Order

Genie Series Cameras

The Genie cameras will be seen in Sherlock in the same order as they appear in the SaperaLTDrv.ini file, created by the Sapera Acquisition Wizard. If the order is not to your liking, there are two ways you can correct this.

1. Exit the wizard, disconnect the cameras, and reconnect them in the order you desire. Use the SHOW Status Dialog Box (located in the windows tray at the bottom of your display) to monitor when the cameras are recognized. Open the Sapera Acquisition Wizard and create a new file following the steps above.

2. Save the configuration file from the Acquisition Wizard, and Exit. You can edit the SaperaLTDrv.ini file (found in the Sherlock\Drivers directory) using Notepad. If all cameras are the same type, you can copy and paste the camera names in the correct order. Or, correct the references to "Server0" and "Server1" to match the order you want your cameras to follow. Notice that each "Server#" appears twice in the configuration file. For example, "Server0", "Server0_Device0", "Server1" and "Server1_Device0".

Each time you run Sherlock it will use the order saved in the SaperaLTDrv.ini file, that is created by the wizard. The order does not change every time the GV 400 is rebooted.

Note: Each time you open the Sapera Acquisition Wizard, the order will change to the order of discovery (or power-on order). If you Click "Save File" the new order will overwrite the saved one, causing the order to change in Sherlock.

PIC2592 Cameras

The order of the PIC-2592 cameras is saved in the gevtest.txt file, created by the Discover Genie utility. You can edit this file using Notepad. Please refer to the PIC-2592 Quick Start Guide.

Windows Unified Write Filter

The Windows 10 IoT operating system supports a Unified Write Filter (UWF) that provides the ability to write-protect a run-time image. By redirecting all write requests to an overlay disk or RAM partition, UWF allows the run-time image to maintain the appearance of a writeable run-time image. The UWF prevents accidental file corruption when accessing the system or when the system suddenly loses power.

The default state of the UWF is disabled allowing full access to files on the unit. When you have completed development of your application, we recommended enabling the filter to prevent accidental data corruption. When the filter is enabled, only writes to the \ProgramData\Teledyne DALSA and \Program Files\Teledyne DALSA\Sherlock directories will be allowed, all other system and program directories will be blocked.

The UWF is located in the C:\IPD Install Files directory. The utility has a GUI (graphic user interface) for displaying status and setting the filter. Changes take effect on the next system reboot.

Note: If you have run the filter and not yet rebooted, it is still showing the current status from when you booted, not what you have set for the next reboot!

Acronis True Image Software

A "registration form" with an "activation code" was shipped with your unit. Registration is free. You should register with Acronis to obtain a key to unlock this software. Once unlocked, you can create your own backup files on removable media (a USB thumb drive) or a network resource. We suggest you make your own full backup on a bootable thumb drive.

Create a Backup

1. Use Windows to make a bootable thumb drive.

2. Use Acronis tools to create a "bootable backup" (you must register first) which deposits the Acronis restore executable onto the drive.

3. Run Acronis to create a full backup on the thumb drive.

Restore the Factory Image

A backup image was created using the Acronis® True Image Software before your unit was shipped. Restoring the factory image will all files and configuration changes. Back up your files before restoring the factory image.

1. Reboot the GV400 system.

2. When the Teledyne logo is displayed tap the Delete key continuously to enter BIOS.

3. Use the right arrow key to select the "Save and Exit" tab.

4. Use the down arrow key to select "Acronis loader" under the "Boot Override" options and press the Enter key.
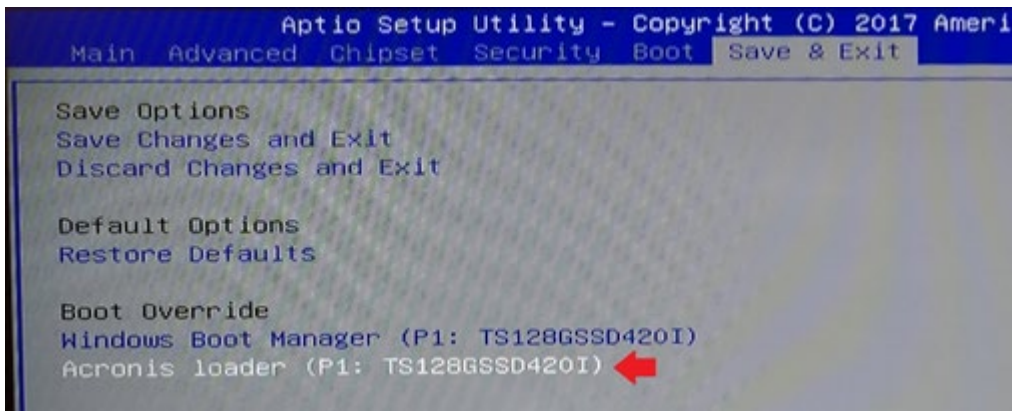
5. A loader menu is displayed. Press 1 on your keyboard for the Recover option.

6. Press the Y key to confirm the restore.

Specifications

General Specifications

This following table lists the specifications of the GV 400 vision system:

Specification		Definition
Platform	Processor	Quad Core x7-E3950 @ 1.6GHz
	OS	Windows10 IoT 64-bit
Memory	Storage	256GB Solid State
	Program	8GB @ 1600MHz non-expandable
Camera Ports	Gigabit	4 with PoE
Communications	Ethernet	2 x Gigabit direct
	Serial	RS-232 via adapter cable; Set as COM1 with default parameters 11520 baud, 8 data stop bits, no parity, 1 stop bit, no flow control
	USB	4 x USB 2.0 (2 front and 2 rear)
	I/O	External via PL-USB module
	LED status	2 indicators for Power and HDD
Display	VGA & HDMI	VGA: DS-15-pin female; supports up to 1600x1200 HDMI: 3840x2160/30Hz
Power	24V @ 60W	2 pin connector
		Recessed Reset button. Use pointed object to push and hold for 5 seconds.
Cooling	Fanless	Passive heatsink
Mechanical	Material	Machined Aluminum with paint finish
	Mounting	Panel or DIN option specified at time of order
	Size	198mm x 57mm x 143.8mm
	Weight	1.6 Kg
Environment	Temp	0°C to 55°C Operating -20°C to 70°C Storage
	Humidity	5 to 95% non-condensing
Certification		CE, FCC Class A, RoHS

GV 400 Mechanical Dimensions

198 mm

57 mm

Top View

143.8 mm

Side View

Front View

198

100

143.8 100

4X M3
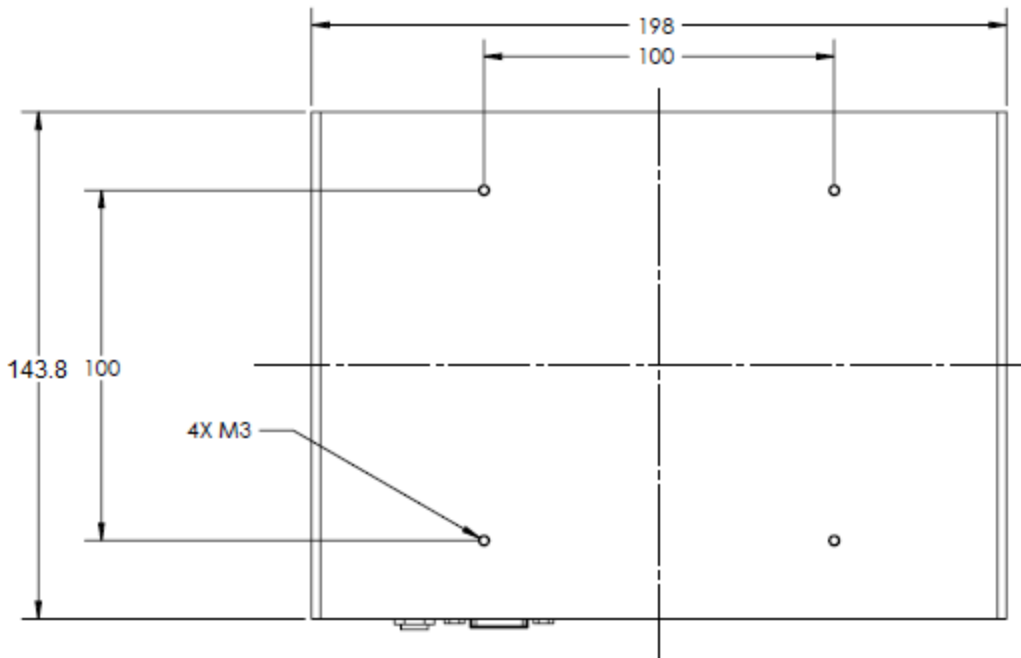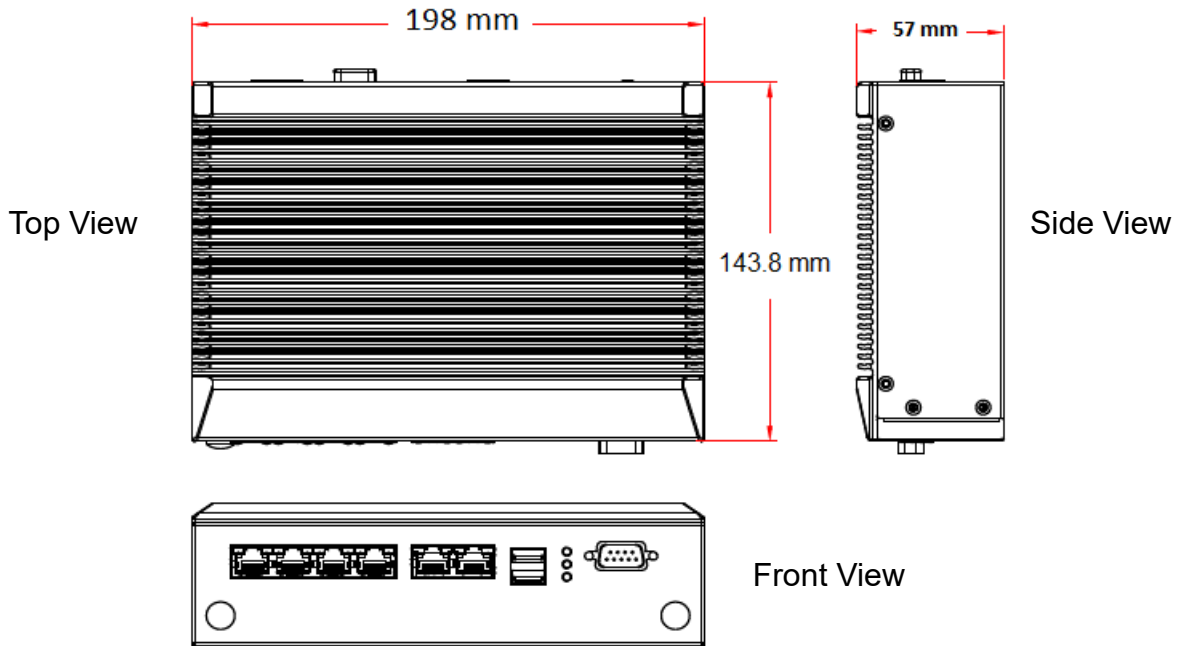
PL-USB Overview

The PL-USB is an external I/O module for the GV 400. It provides trigger and power to up to 4 cameras as well as I/O for discrete application control. The PL-USB module simplifies hardware setup and provides a consistent I/O solution for iNspect Express and Sherlock. The product is DIN mountable and connects to the GV 400 through a single USB cable.

Refer to the **PL-USB Installation Manual** for details and camera wiring diagrams. A copy is provided on the GV 400 system drive. Note: The PL-USB driver is already installed on all GV 400 systems. PL-USB Configuration files are also included on all GV 400 systems at C:\VAGenieX64\Config.
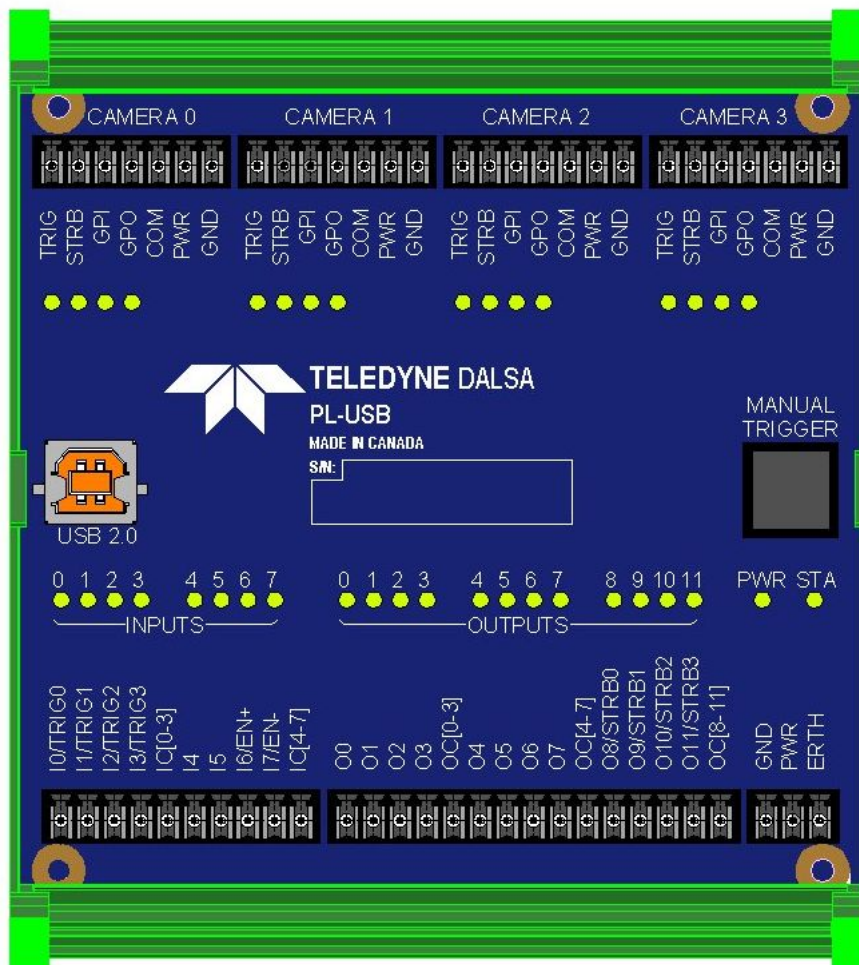
DCI-101 Overview

The DCI-101 is a breakout module that simplifies wiring between 2 cameras and the industrial environment. The module mounts inside a control panel alongside the vision controller and related system components.

The DCI-101 offers an isolation barrier for the cameras, a push-button manual trigger and provides convenient LEDs showing the state of camera inputs, outputs and control signals. The module can interface all 3 generations of Genie cameras (24V models).

Note: The DCI-101 does not add conditioning (i.e. noise filtering) to the input signals, this is done inside the camera. All inputs and outputs are passed between camera and panel connectors through the isolation barrier.

Refer to the **DCI-101 Quick Start Guide** for details and camera wiring diagrams. A copy is provided on the GV 400 system drive. Note: There is no software driver required for the DCI-101.

Camera Connection Headers

Camera Model Switches

Camera I/O Status LEDs (only light when connected)

Manual Trigger Button

Panel Connection Headers   Power Header