MICROSCAN

AutoVISION Software User Manual

P/N 84-100000-02 Rev K

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GS1 Solution Partner

Disclaimer

The information and specifications described in this manual are subject to change without notice.

Latest Manual Version

For the latest version of this manual, see the Download Center on our web site at:
www.microscan.com.

Technical Support

For technical support, e-mail: **helpdesk@microscan.com**.

Warranty

For current warranty information, see: **www.microscan.com/warranty**.

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About AutoVISION Software

Microscan's **AutoVISION** is the easiest-to-use machine vision software available for vision applications of basic to moderate complexity. Process and manufacturing engineers no longer need to become experts in machine vision to successfully deploy a system that meets their traceability, inspection, and quality control needs.

Intuitive User Interface

AutoVISION features an intuitive user interface that guides users through the steps of connecting to a device, programming a job, and monitoring results. At startup, AutoVISION automatically detects all compatible devices and allows the user immediately to begin configuration. AutoVISION can also be used in an Emulator mode with stored images from a PC. As a device is being configured or while a user is programming a job, AutoVISION provides real-time feedback and results. Because the runtime interface is built into AutoVISION's user interface, at any point in the process a user can try out a job and determine if the device is configured to meet the application's needs.

Complete Tool Set

AutoVISION's capabilities start with a **Locate Tool** that is based on pattern matching. The Locate Tool can be used to orient other inspection tools or to detect the absence or presence of complex objects. AutoVISION also includes Microscan's powerful **X-Mode** decode algorithm for **1D and 2D symbol reading** along with fixed font and fully teachable **OCR** for track and trace applications. For inspection and control applications, AutoVISION includes simple yet powerful **Count**, **Presence/Absence**, **Measure**, **Match Strings**, **String Format**, **Logic**, **OCV**, and **Symbol Quality Verification** tools.

Scalable with Visionscape

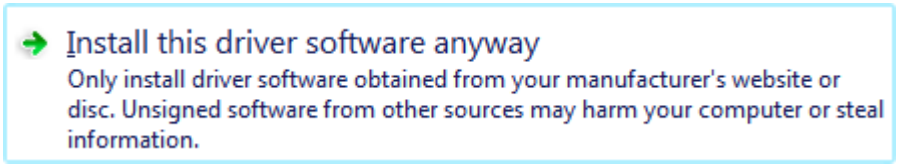
For applications demanding more flexibility or configuration options, AutoVISION allows users to upgrade to full **Visionscape** functionality while continuing to work with the same camera hardware. AutoVISION jobs (**.avp**) can be opened with Visionscape, which enables scripting and other advanced programming capabilities. Visionscape can be deployed on both smart camera and PC-based systems.

After AutoVISION is installed, all Visionscape user documentation is located on your local drive in this folder:

\Microscan\Vscape\Documentation

Note: You must have Administrator privileges to install and run AutoVISION and Visionscape.

Note: You may see the Windows Security dialog shown below during AutoVISION/Visionscape installation. Click **Install this driver software anyway** to continue installation.



System Requirements

Minimum PC Requirements

- Intel® Core™ 2 Duo Processor
- Internet Explorer 7 or higher
- 2GB RAM/128MB Video RAM (Windows 7); 1GB/128MB Video RAM (Windows XP)
- 750MB hard drive space
- 16-bit color display
- 3.0 Windows Experience Index
- 1 USB port and 1 Network port

Recommended PC Requirements

- Intel® Core™ i3 Duo Processor
- Internet Explorer 7 or higher
- 2GB RAM/128MB Video RAM (Windows 7); 1GB/128MB Video RAM (Windows XP)
- 1GB hard drive space
- 32-bit color display
- 4.0 Windows Experience Index
- 1 USB port and 1 Network port

1 Quick Start

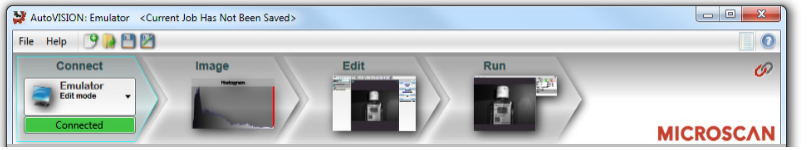
Contents

This section provides an overview of **AutoVISION** and describes how to set up a simple vision job quickly so you can get a sense of the software's capabilities.

Detailed setup information is available in subsequent sections.

AutoVISION Overview

Navigator Bar



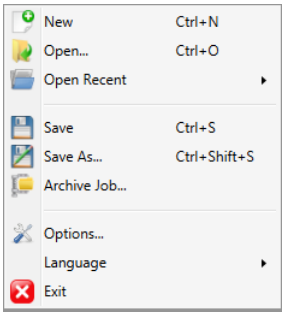
The **Navigator Bar** allows for quick switching between views.

There are four main views within AutoVISION:

- **Connect:** Select a device
- **Image:** Adjust image settings such as Focus, Gain, and Shutter
- **Edit:** Build an inspection using machine vision tools and adjust job settings
- **Run:** Monitor the status of a running job

File Menu

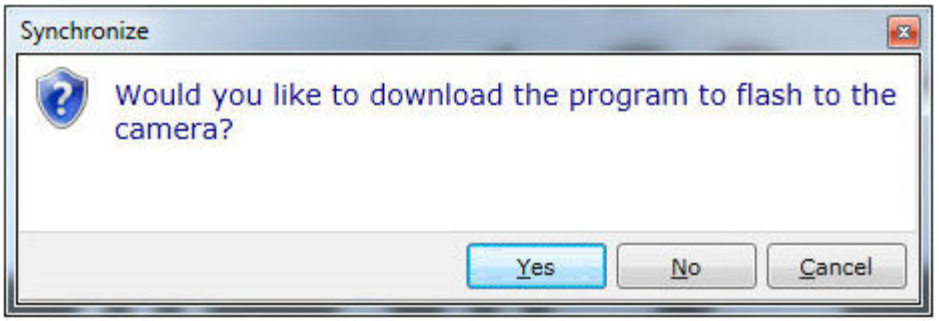
The file menu allows you to create a new job or open an existing job, open a recent job, save a job (.avp), archive a job (**.avz**), open the **AutoVISION Options** dialog, or exit AutoVISION. The **New**, **Open**, **Save**, and **Save As** options are also available on the toolbar as icons that match the icons shown in the dropdown menu.



- **New:** Start a new job.
- **Open:** Open a saved job.
- **Open Recent:** Open a recent job.
- **Save:** Save current job (.avp file).
- **Save As:** Rename and save current job (.avp file).
- **Archive Job:** Compress a job and its supporting files in an .avz archive (also saves the job as an .avp file).
- **Options:** Open **AutoVISION Options** dialog.
- **Language:** Select the preferred language for the AutoVISION user interface (English, German, Chinese).
- **Exit:** Exit current job or close AutoVISION.

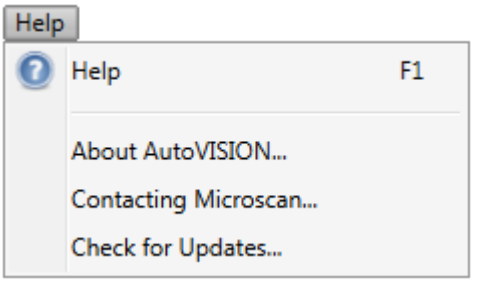
File Menu Toolbar

The available commands in the file menu toolbar include **Create a New Job**, **Open an Existing Job**, **Save Job to Disk**, **Save Job with a New Filename**, and **Save Job to Flash**. If the user selects the flash option, AutoVISION will ask if they want to download the job to the camera before saving the job to flash.



Help Menu

The Help dropdown menu allows you to see **AutoVISION Help**, the **About AutoVISION** dialog, a **Contacting Microscan** dialog, and a **Check for Updates** dialog.



The help documentation can be opened from the **Help** dropdown menu, the **F1** key, or the help icon on the right side of the application:

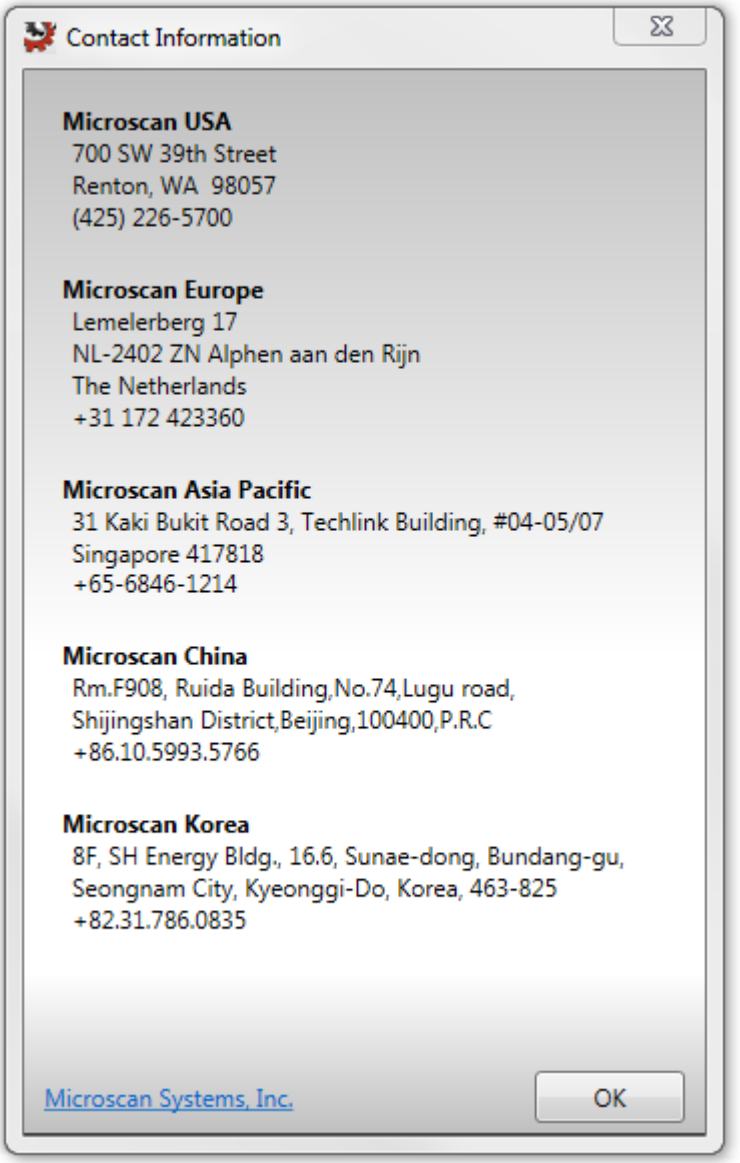
The help file will be closed when the application is closed or when the user closes the help file.

About AutoVISION

The **About AutoVISION** dialog shows the name and version of the software, as well as the part number and copyright information. Clicking **More Info** takes the user to an AutoVISION support page on the Microscan website.

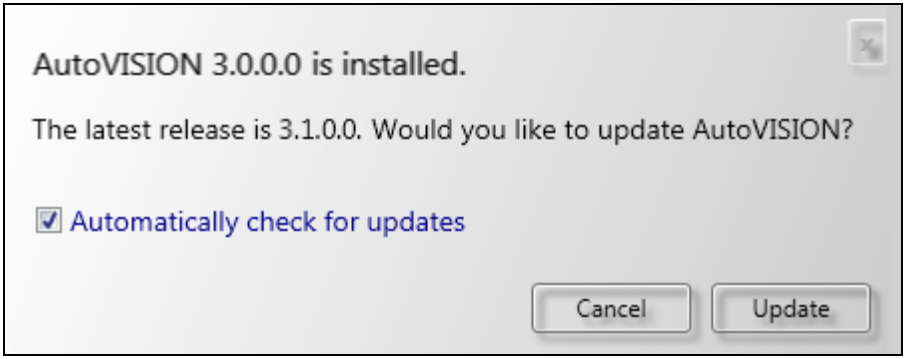
Contacting Microscan

The **Contact Information** dialog shows the primary addresses of Microscan's global headquarters. There is also a link to the Microscan website.

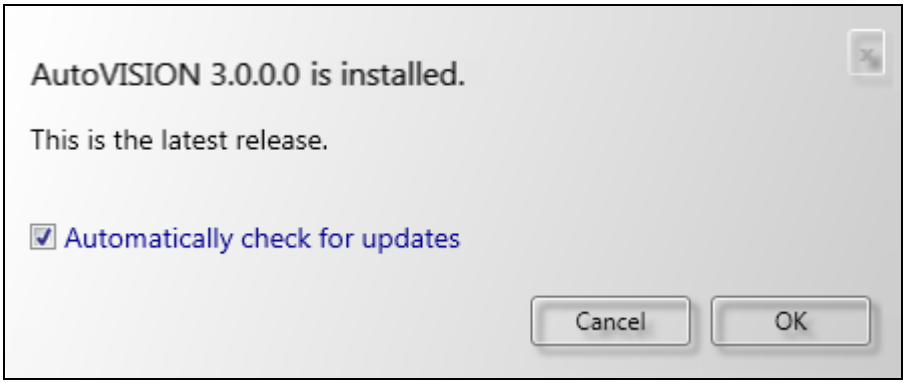


Check for Updates

When you select **Check for Updates** from the Help dropdown, AutoVISION determines whether or not you are running the most current version of the software. If your version of AutoVISION is not current, the dialog below will appear.



If your version of AutoVISION is current, this dialog will be displayed:

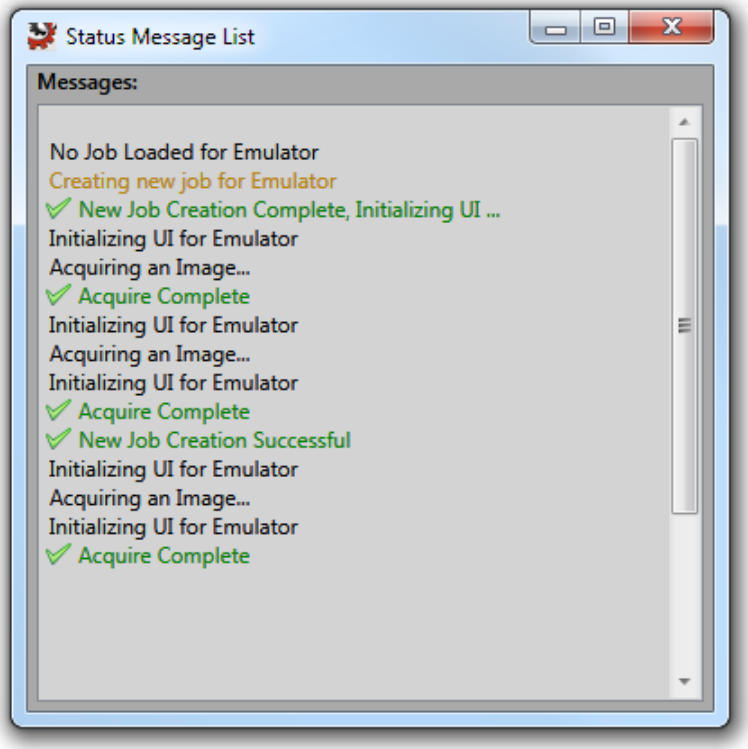


If you check the **Automatically check for updates** box, AutoVISION will check for newer versions of the software once a week. Every time you check for a newer version yourself, AutoVISION's "check for updates" timer is reset.

Status Message List

The **Status Message List** can be opened by clicking the Status Message List icon to the left of the help icon in the upper right of the screen:

The Status Message List allows you to view a history of all status messages shown by AutoVISION during the current session.



Status Bar

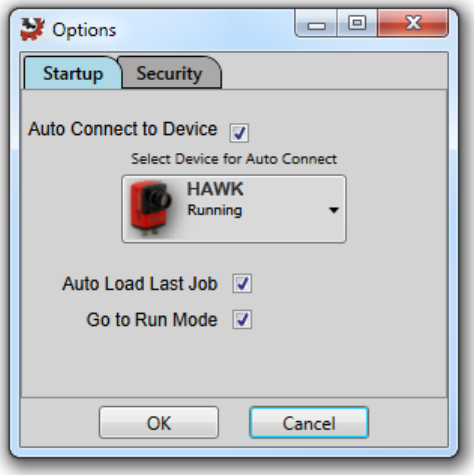
The status bar appears at the bottom of the main window and contains the following information:

- The currently selected device;
- Device IP address;
- The grayscale value under the cursor (when hovering over the image);
- The X,Y position of the cursor in pixel coordinates.

AutoVISION Options

The **AutoVISION Options** dialog allows you to control AutoVISION's startup behavior and security settings. On the **Startup** tab, you can set the software to Auto Connect to a smart camera that you select from the dropdown menu, to Auto Load the most recent job, and to go directly to Run mode at startup. You can also password protect the user interface from the **Security** tab.

Startup

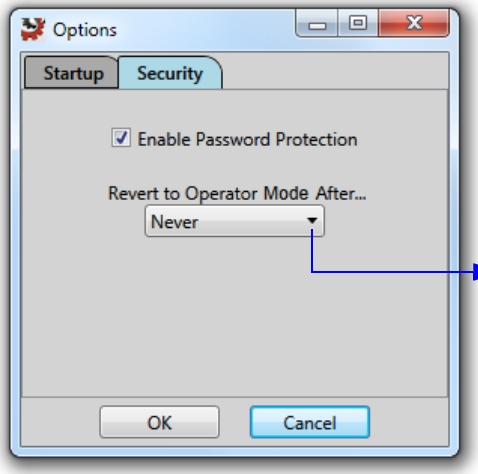


Auto Connect to Device: When this option is selected, AutoVISION will connect to the current device automatically the next time the software is opened.

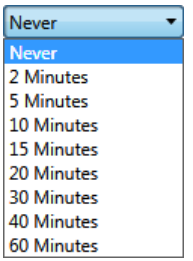
Auto Load Last Job: When this option is selected, AutoVISION will automatically load the most recent job the next time the software is opened.

Go to Run Mode: When this option is selected, AutoVISION will skip the Connect, Image, and Edit steps and open in Run mode.

Security



Enable Password Protection: Password protection is disabled by default. Selecting this option imposes four separate AutoVISION access levels: Operator, Supervisor, Engineer, and Administrator. Passwords can only be changed by an Administrator, and only an Administrator can return to the Security tab.



Revert to Operator Mode After...: When password protection is enabled, you can use this dropdown menu to specify a period of inactivity after which AutoVISION will revert to Operator mode, which limits access to the Run view.

User Access Levels

When password protection is enabled, AutoVISION provides four levels of access:

Operator:

An Operator can monitor the **Run** view of AutoVISION, but cannot access other screens or change settings.

Supervisor:

A Supervisor can switch to **Edit** mode and adjust ROI (region of interest) positions, retrain tools, change the selected device, save the current job, or load a different job. A Supervisor cannot modify the parameters of the current job or add or remove tools.

Engineer:

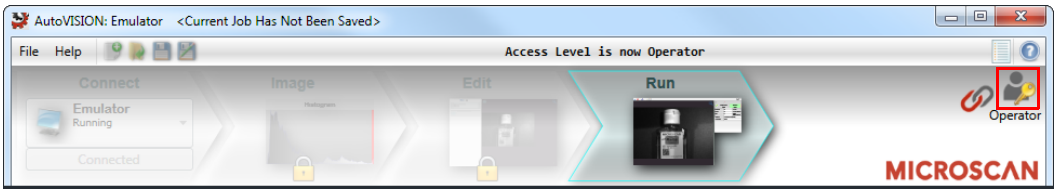
An Engineer has full access to all settings and is only restricted from changing passwords.

Administrator:

An Administrator has full access to all settings, and can change the passwords for all access levels.

Changing the Access Level

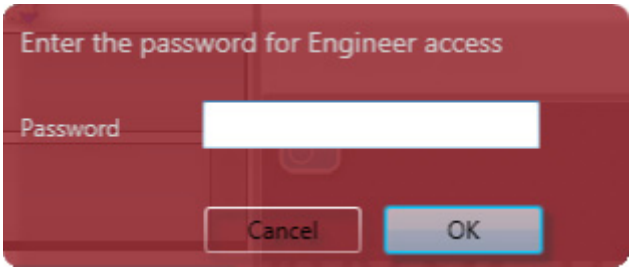
When password protection is enabled, AutoVISION will always start with the access level set to **Operator**, which blocks access to the **Connect**, **Image**, and **Edit** views. You can change the access level by clicking the icon shown below and entering as an **Administrator**.



Your current access level is always displayed in text below the icon. Click the icon to display the following dialog:

This dialog provides a button for each of the four access levels. The highlighted button shows the current access level. In the example above, the current access level is **Administrator**.

To switch to any of the other three access levels, click the button of the desired access level and you will be asked for the that access level's password. To switch to Engineer, for example, click the **Engineer…** button. You will then see the password field:



Enter the password and click **OK**. If the password is correct, the access level is changed. If the password is incorrect, an error message is displayed and the access level remains unchanged.

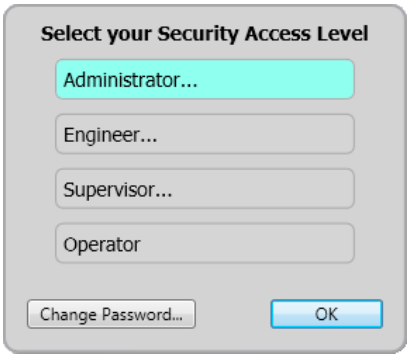
The default passwords for the four access levels are:

- **Operator:** No password required.
- **Supervisor:** supervisor
- **Engineer:** engineer
- **Administrator:** administrator

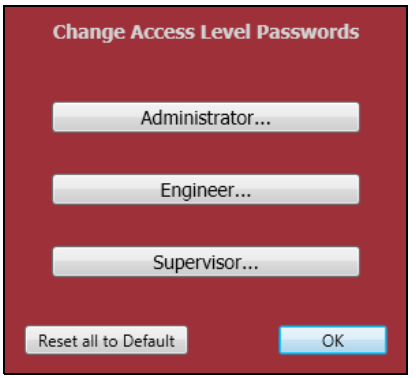
Once you have entered the password for a particular level, you don't need to enter a password to reduce your access level. For example, if you currently have Administrator access, you can click on the Engineer or Supervisor buttons and your access level will be reduced instantly. You only need to enter a password when you are increasing your access level.

Changing Passwords

You must be an Administrator to change the password of any access level. If you change your access level to Administrator, the **Change Password…** button at the bottom of the **Select Your Security Access Level** dialog will be enabled:



Clicking **Change Password…** brings up the **Change Access Level Passwords** dialog:



Click the button that corresponds to the access level whose password you wish to modify, and the **Change the Password** dialog will appear:

Click the **Reset All to Default** button on the **Change Access Level Passwords** dialog to return all passwords to default.

Minimum Access Levels

AutoVISION defines the minimum access level for the various regions of the user interface and for several features of the software. The following tables show the securable areas of AutoVISION and the minimum access level required for each.

Edit View

UI Region/Feature	Minimum Access Level
Edit View	Supervisor
Parameter Page	Engineer
Delete Tool button	Engineer
Toolbox (ability to Add a Tool)	Engineer

Image View

UI Region/Feature	Minimum Access Level
Image View	Engineer

Connect View (Device Selection View)

UI Region/Feature	Minimum Access Level
Connect View	Supervisor
Change job in Flash	Supervisor
Delete a job in Flash	Administrator
Modify Device Settings	Supervisor

Application-Wide Options

UI Region/Feature	Minimum Access Level
Job Save	Supervisor
Job Load	Supervisor
Options dialog	Engineer
Exit the application	Supervisor
Flash a job on the camera	Engineer
Access the Data Navigator	Engineer

If You Forget the Administrator Password

If are the Administrator but have forgotten the password, you can reset it to default by deleting the **UserSettings.xml** file in this folder:

C:\Users\[your user name]\AppData\Roaming\Microscan\AutoVISION

Note: The **AppData** folder in Windows is hidden by default. To make the AppData folder visible, click **Tools** in the Windows Explorer toolbar and select **Folder options...** from the dropdown menu. In the Folder Options dialog, click the **View** tab. Under **Files and Folders > Hidden files and folders**, select **Show hidden files, folders, and drives** and then click the **Apply** and **OK** buttons. The AppData folder will now be visible in **C:\Users\[your user name]**.

Vision HAWK Hardware

There are six basic steps required to set up a Vision HAWK Smart Camera:

1. **Configure hardware.** Set up the camera, cabling, power supply, and I/O.
2. **Select a device and create a new job.** Use the **Connect** view to select a device and create a new job or load an existing job.
3. **Adjust camera settings.** Use the **Connect** and **Image** views to adjust parameters specific to the connected smart camera.
4. **Edit the job.** Add and configure **AutoVISION tools** that are useful for your application. Use **Inspection Outputs** parameters to configure job outputs.
5. **Run the job.** Jobs are downloaded to the camera when entering the **Run** view, but are not saved yet.
6. **Save the job.** Stop the job and click the **Save** icon to save the current job on the camera, but don't forget to start the job again.

The following sections discuss these steps in greater detail.

The Vision HAWK is designed for industrial applications. It features a rugged enclosure and a focal distance up to 800 mm and beyond. It is capable of high line speeds and can run multiple AutoVISION tools simultaneously.

- **Package:** Rugged, industrial
- **Power Input:** High-immunity 5-28V
- **I/O:** 1-28V optoisolated
- **Optics:** 20 mm to 800+ mm working distance; 12, 15, 30, 45 degree interchangeable lenses; liquid lens autofocus
- **Machine Vision Capabilities:** Can run multiple AutoVISION tools at high speed
- **Motion Capabilities:** Indexed, static to high speed
- **Sensor:** WVGA CMOS monochrome, SXGA CCD monochrome, SXGA CCD color, WUXGA CMOS monochrome
- **Communications:** Ethernet, Serial
- **Accessories:** Direct connect; accessories available

Vision HAWK Characteristics

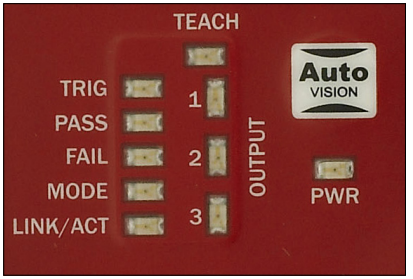
IP67 connectors
- **Supports M12 connectors**
- **Standard M12 Ethernet Connector**

Rugged IP67 enclosure

Software-adjustable focus

Interchangeable lenses

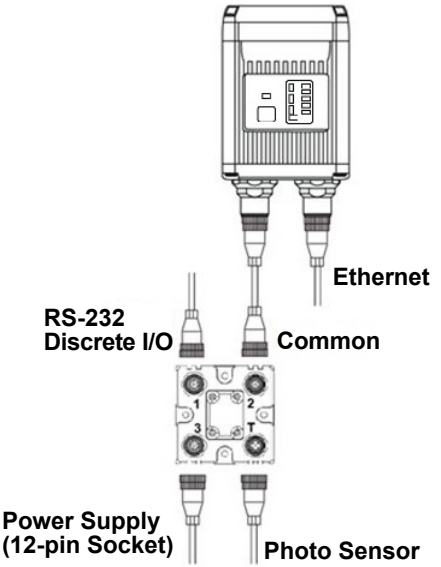
Built-in LED illumination

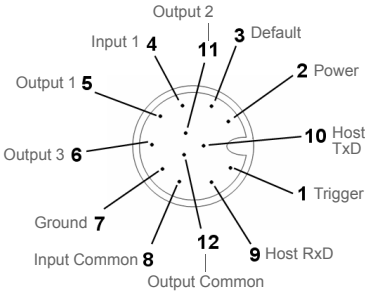


Status indicators
- **Trigger activity**
- **Inspection results: Pass/Fail**
- **Device and connection status**

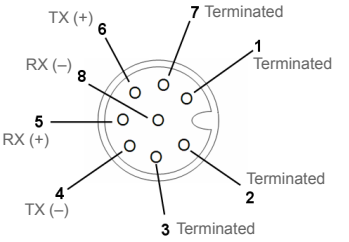
Vision HAWK Hardware Configuration

1. Mount the camera as required by the application.
2. Connect the Ethernet cable from "B" on the camera to the network.
3. Connect the power supply to "3" on the QX-1.
4. Connect the photo sensor to "T" on the QX-1.
5. Connect the "Common" cable to "2" on the QX-1 and "A" on the camera.
6. Plug in the power supply.





Connector A: M12 12-Pin Plug



Connector B: M12 8-Pin

Note: Connector A contains all I/O.

Vision HAWK C-Mount Hardware

There are six basic steps required to set up a Vision HAWK C-Mount Smart Camera:

1. **Configure hardware.** Set up the camera, cabling, power supply, and I/O.
2. **Select a device and create a new job.** Use the **Connect** view to select a device and create a new job or load an existing job.
3. **Adjust camera settings.** Use the **Connect** and **Image** views to adjust parameters specific to the connected smart camera.
4. **Edit the job.** Add and configure **AutoVISION tools** that are useful for your application. Use **Inspection Outputs** parameters to configure job outputs.
5. **Run the job.** Jobs are downloaded to the camera when entering the **Run** view, but are not saved yet.
6. **Save the job.** Stop the job and click the **Save** icon to save the current job on the camera, but don't forget to start the job again.

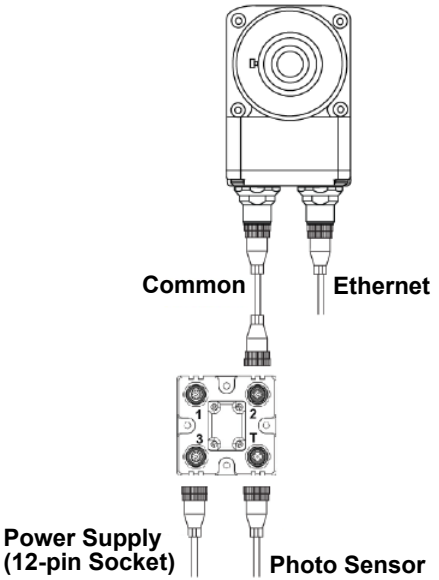
The following sections discuss these steps in greater detail.

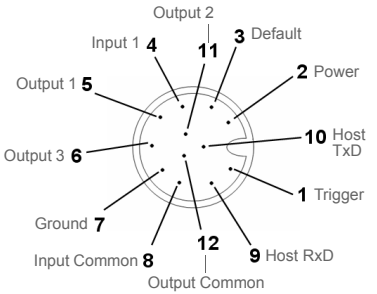
The Vision HAWK C-Mount is designed for industrial applications. It features a rugged enclosure and multiple lens options. It is capable of higher line speeds and can run multiple AutoVISION tools simultaneously.

- **Package:** Rugged, industrial
- **Power Input:** High-immunity 5-28V
- **I/O:** 1-28V optoisolated
- **Optics:** Depends on lens (liquid lens only available for standard Vision HAWK)
- **Machine Vision Capabilities:** Can run multiple AutoVISION tools at high speed
- **Motion Capabilities:** Indexed, static to high speed
- **Sensor:** SXGA CCD monochrome , SXGA CCD color, WVGA CMOS monochrome, WUXGA CMOS monochrome
- **Communications:** Ethernet, Serial
- **Accessories:** Direct connect; accessories available

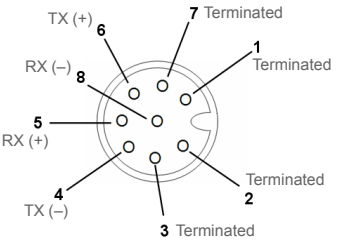
Vision HAWK C-Mount Hardware Configuration

1. Select lens as required by the application.
2. Mount the camera as required by the application.
3. Connect the Ethernet cable from "B" on the camera to the network.
4. Connect the power supply to "3" on the QX-1.
5. Connect the photo sensor to "T" on the QX-1.
6. Connect the "Common" cable to "2" on the QX-1 and "A" on the camera.
7. Plug in the power supply.





Connector A: M12 12-Pin Plug



Connector B: M12 8-Pin

Note: Connector A contains all I/O.

Vision MINI Hardware

There are six basic steps required to set up a Vision MINI Smart Camera:

1. **Configure hardware.** Set up the camera, cabling, power supply, and I/O.
2. **Select a device and create a new job.** Use the **Connect** view to select a device and create a new job or load an existing job.
3. **Adjust camera settings.** Use the **Connect** and **Image** views to adjust parameters specific to the connected smart camera.
4. **Edit the job.** Add and configure **AutoVISION tools** that are useful for your application. Use **Inspection Outputs** parameters to configure job outputs.
5. **Run the job.** Jobs are downloaded to the camera when entering the **Run** view, but are not saved yet.
6. **Save the job.** Stop the job and click the **Save** icon to save the current job on the camera, but don't forget to start the job again.

The following sections discuss these steps in greater detail.

The Vision MINI is designed for embedded applications. It features a small enclosure and low power requirements. It is capable of running a couple AutoVISION tools simultaneously. The SXGA MINI is a good choice for lower line speeds, while the WVGA MINI can handle higher line speeds.

- **Package:** Compact, lightweight, IP54
- **Power Input:** Lower power 5V
- **I/O:** 5V TTL compatible
- **Optics:** 2-6" mechanical focus, fixed lens
- **Machine Vision Capabilities:** Can run a limited number of simple tools
- **Motion Capabilities:** Indexed, static to low speed (SXGA); Indexed, static, low, high speed (WVGA)
- **Sensor:** SXGA CMOS monochrome, WVGA CMOS monochrome, QXGA CMOS color
- **Communications:** Virtual Ethernet over USB

  Important: If the PC enters "sleep mode", the USB ports will shut down and the camera will be disconnected. See the *Vision MINI Smart Camera Guide* for information on how to disable sleep mode or other low-power modes.
- **Accessories:** Accessories required (IB-131 and IC-332)

Vision MINI Characteristics

Integrated cable
- **Low power consumption**
- **Common HD15 and USB-B connectors**

Compact, lightweight vision sensor

Built-in LED illumination

Software-adjustable focus

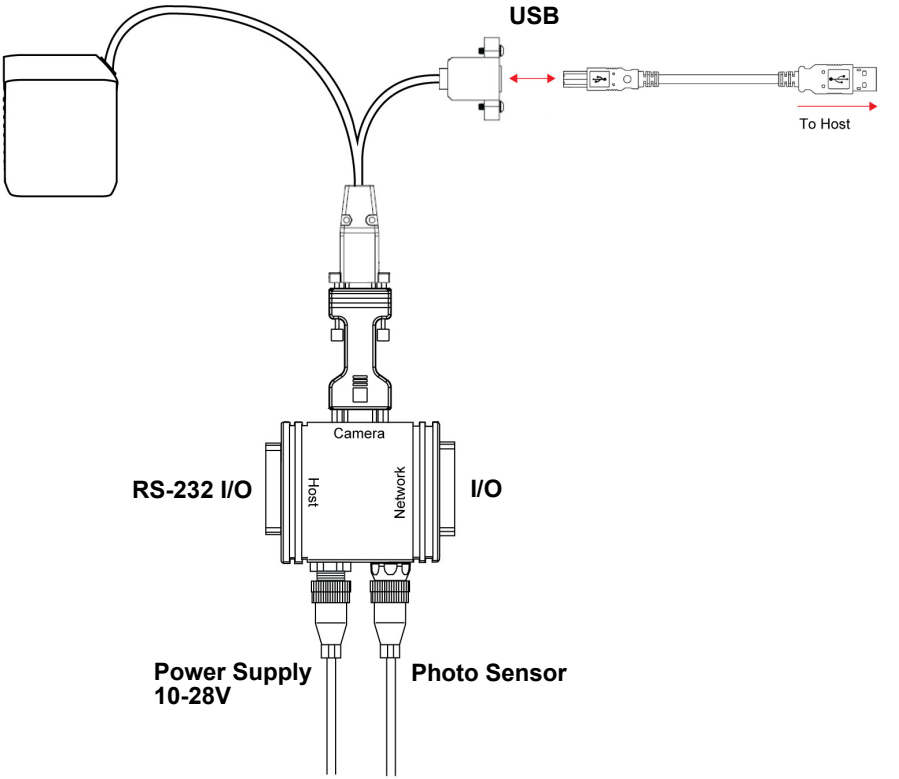
Integrated beeper reports inspection results

AutoVISION button
- **Image calibration**
- **Virtual trigger**

Status indicators
- **Trigger activity**
- **Inspection Results: Pass/Fail**
- **Device and connection status**

Vision MINI Hardware Configuration

1. Mount the camera as required by the application.
2. Connect the USB side of the camera cable to the USB host cable.
3. Connect the IC-332 to the IB-131.
4. Connect the D-sub side of the camera cable to the IC-332.
5. Connect the photo sensor to the IB-131.
6. Connect the power supply to the IB-131.
7. Plug in the power supply.



D-sub I/O Connector Pin Assignments

Pin	Host RS-232	In/Out
1	Power +5VDC	In
2	TxD	Out
3	RxD	In
4	Power/Signal Ground	
5	NC	
6	NC	
7	Output 1 TTL (Can sink 10mA and souce 10mA)	Out
8	Default configuration (activated by connecting pin 8 to ground pin 4)	In
9	Trigger	In
10	NC	In
11	Output 3 TTL (Can sink 10mA and souce 10mA)	Out
12	Input 1 (NPN)	In
13	Chassis ground (Connects chassis body to earth ground only. Do not use as power or signal return.)	
14	Output 2 TTL (Can sink 10mA and souce 10mA)	Out
15	NC	

USB Type B Connector Pin Assignments

Pin	Function
1	Vbus (5V)
2	D–
3	D+
4	Ground

Vision MINI Xi Hardware

There are six basic steps required to set up a Vision MINI Xi Smart Camera:

1. **Configure hardware.** Set up the camera, cabling, power supply, and I/O.
2. **Select a device and create a new job.** Use the **Connect** view to select a device and create a new job or load an existing job.
3. **Adjust camera settings.** Use the **Connect** and **Image** views to adjust parameters specific to the connected smart camera.
4. **Edit the job.** Add and configure **AutoVISION tools** that are useful for your application. Use **Inspection Outputs** parameters to configure job outputs.
5. **Run the job.** Jobs are downloaded to the camera when entering the **Run** view, but are not saved yet.
6. **Save the job.** Stop the job and click the **Save** icon to save the current job on the camera, but don't forget to start the job again.

The following sections discuss these steps in greater detail.

The Vision MINI Xi is designed for embedded applications. It features a small enclosure, industrial connectivity, and embedded Ethernet. It is capable of running a few AutoVISION tools simultaneously. The SXGA model is a good choice for lower line speeds, while the WVGA model can handle higher line speeds.

- **Package:** Compact, lightweight, IP54
- **Power Input:** 10 to 30 VDC
- **I/O:** 1-28V optoisolated
- **Optics:** 2-6" mechanical focus, fixed lens
- **Machine Vision Capabilities:** Can run a few simple tools
- **Motion Capabilities:** Indexed, static to low speed (SXGA); Indexed, static, low, high speed (WVGA)
- **Sensor:** SXGA CMOS monochrome, WVGA CMOS monochrome, QXGA CMOS color
- **Communications:** Ethernet, Serial

Vision MINI Xi Characteristics

Integrated cable
- **Low power consumption**
- **M12 and RJ45 connectors**

Compact, lightweight vision sensor

Built-in LED illumination

Software-adjustable focus

Integrated beeper reports inspection results

AutoVISION button
- **Image calibration**
- **Virtual trigger**

Status indicators
- **Trigger activity**
- **Inspection Results: Pass/Fail**
- **Device and connection status**

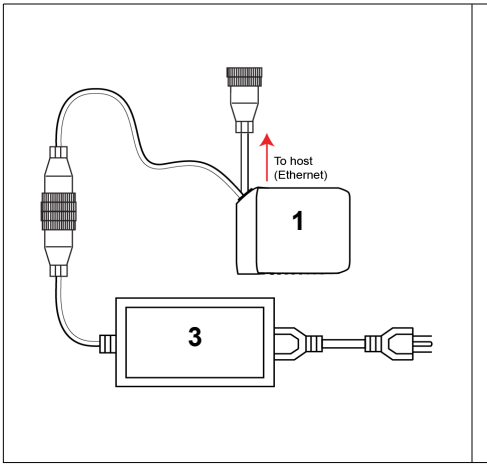
Vision MINI Xi Hardware Configuration

Ethernet Standalone without QX-1

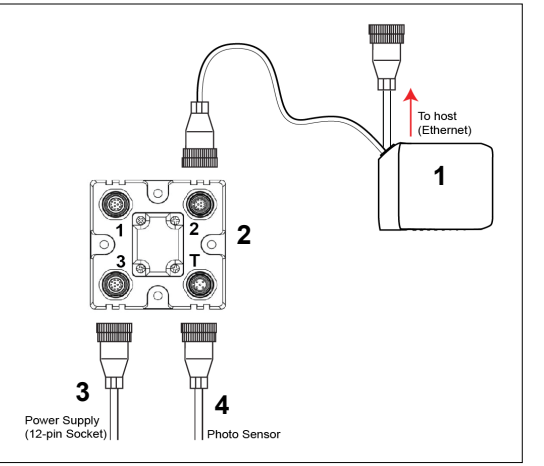
- Mount the camera (**1**) as required by the application.
- Ensure that the camera (**1**) is the optimal distance of 2” to 6” from the inspection area.
- Connect the M12 (power and I/O) end of the camera’s cable to the power supply (**3**).
- Connect the RJ45 (Ethernet) end of the camera’s cable to the host.
- Plug in the power supply (**3**) and apply power to the camera (**1**).

Ethernet Standalone with QX-1

- Mount the camera (**1**) as required by the application.
- Ensure that the camera (**1**) is the optimal distance of 2” to 6” from the inspection area.
- Connect the M12 (power and I/O) end of the camera’s cable to “2” on the QX-1 (**2**).
- Connect the RJ45 (Ethernet) end of the camera’s cable to the host.
- Connect the power supply (**3**) to “3” on the QX-1.
- Connect the photo sensor (**4**) to “T” on the QX-1.
- Plug in the power supply (**3**) and apply power to the camera (**1**).

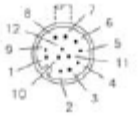


Ethernet Standalone without QX-1



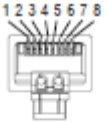
Ethernet Standalone with QX-1

M12 12-Pin Plug Pin Assignments



9	Host RxD
10	Host TxD
2	Power
7	Ground
1	Trigger
8	Input Common
3	Default
4	Learn
5	Output 1
11	Output 2
6	Output 3
12	Output Common

RJ45 Plug Pin Assignments



1	TX (+)
2	TX (–)
3	RX (+)
4	NC
5	NC
6	RX (–)
7	NC
8	NC

Select a Device

AutoVISION's **Connect** view allows you to select your device and configure its settings, and to create a new job.

Cameras: Vision HAWK (standard or C-Mount), Vision MINI, or Vision MINI Xi.

Emulator: The software emulator allows you to work from saved images without hardware.

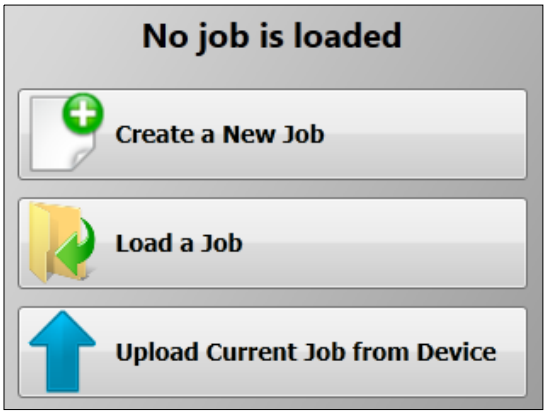
The Connect menu provides a list of available devices.

Hover the mouse over a device to see its details.

Once a device is selected, you can **Create a New Job**, **Load a Job** from a saved .avp file on your PC, or **Upload Current Job From Device** (your camera).

- **Job:** A completed program, including image acquisition, tools, and reporting.
- **Tool:** A self-contained set of steps used to perform a specific task.

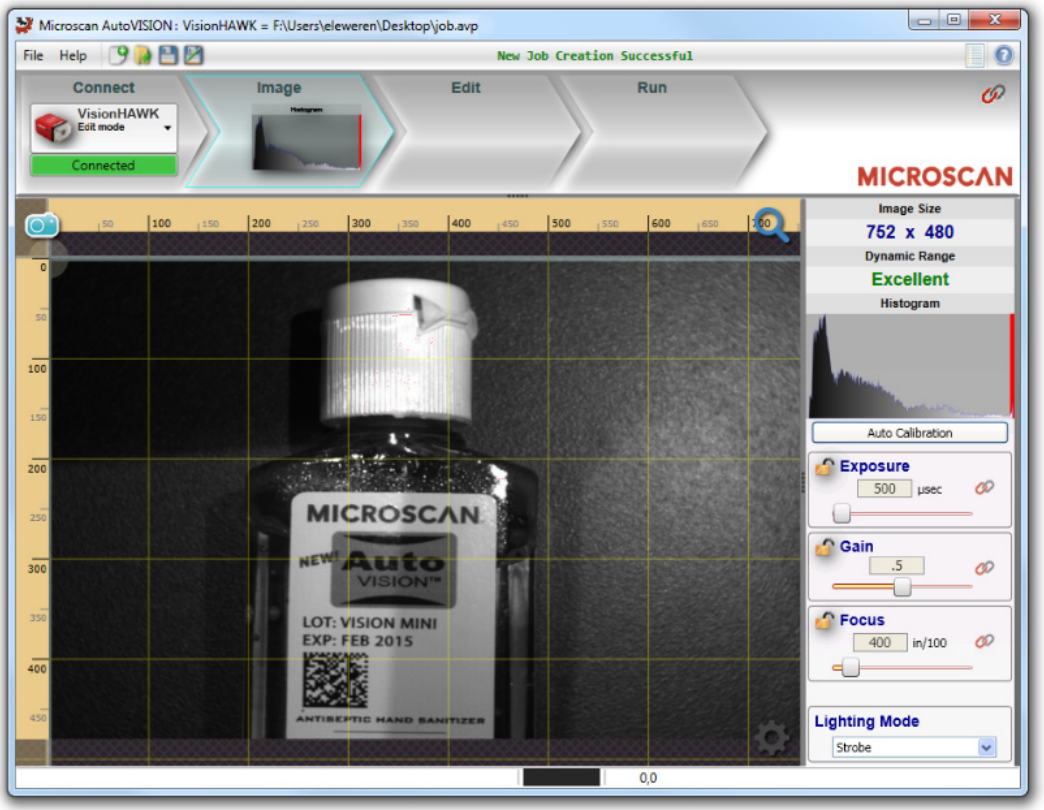
Note: When selecting the Emulator, there is no option to upload a job.



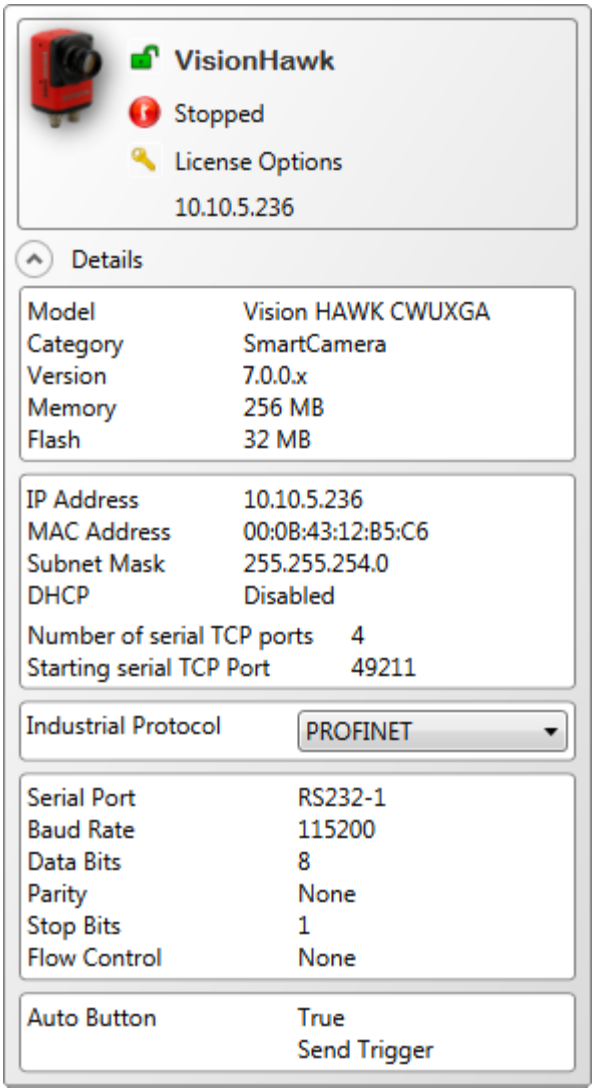
Adjust Camera Settings

Once you have selected your camera or the Emulator and created a new job, you will move to the **Image** view. This view allows you to **Auto Calibrate** the camera, and to manually adjust the camera's **Exposure**, **Gain**, and **Focus**, and also to set the **Lighting Mode** (**On**, **Off**, or **Strobe**).

Note: If you load a job from your PC or upload a job from the camera, you will automatically move to the **Edit** view.



You can return to the **Connect** view and click the **Modify** button to adjust additional camera settings, such as **TCP/IP** settings, **RS-232** settings, **Ethernet** settings, and **AutoVISION button** settings. You can also rename your camera (alphanumeric characters only - [0-9], [a-z], and [A-Z]). Click the **Apply** button when you have adjusted the camera's settings as needed.



Edit the Job

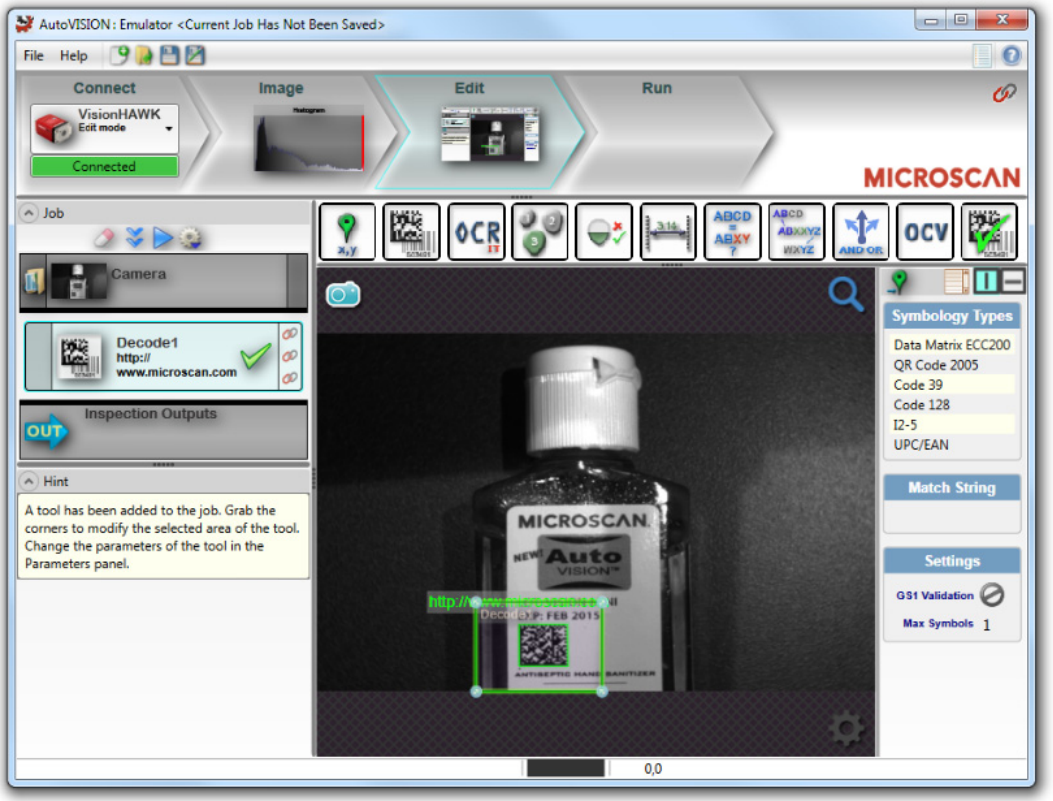
After you have created a new job, loaded a job from your PC, or uploaded a job from the camera, you will proceed to the **Edit** view to refine your machine vision job.

The **Camera** parameters allow you to set **Gain**, **Exposure**, **Focus**, **Trigger**, and **Lighting**.

Inspection Outputs options and **Microscan Link** functionality allow you to connect your job to the outside world.

This is also the view where you can add multiple tools to the job. The tool icons are located above the main view area.

When a tool is selected, it appears in the tool list area to the left of the main view.



Run the Job

Going to the **Run** view will automatically download your job to the camera and start it running.

The Run view provides the following feedback:

- **Image Display:** Displays runtime images with Tool graphics;
- **Inspection Counts:** Displays the number of parts inspected, passed and rejected;
- **Inspection Timing Statistics:** Displays statistics on the speed of your inspection;
- **Tool Results:** Shows the Pass/Fail status and inspection data from each of your tools.

The following options are provided:

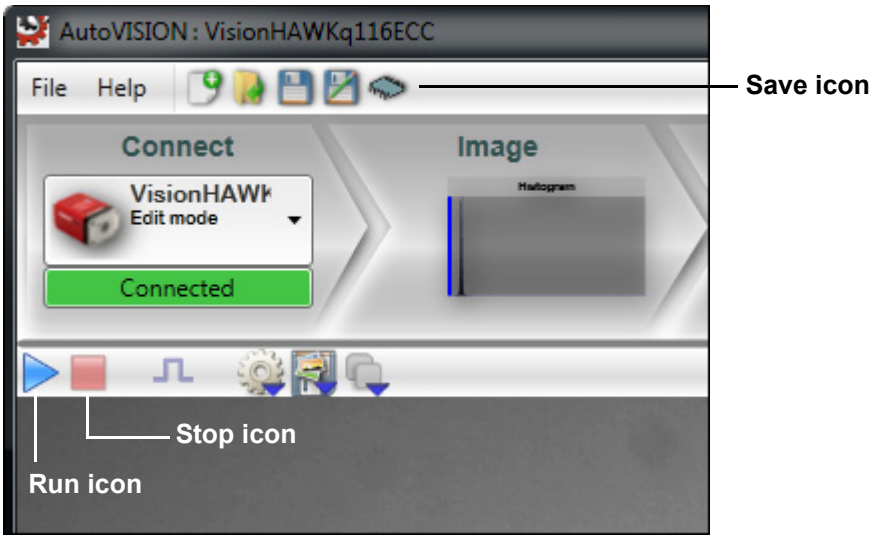
- Adjust the speed of the image display;
- Enable/disable graphics display;
- Save uploaded images to the PC;
- Clear the inspection counts.

Save the Job

Click the **Save** icon to save the job to the camera's flash memory.

Note: The Save icon shows a popup menu of jobs, allowing you to overwrite existing jobs or to create a new job.

1. Click the **Stop** icon.
2. Click the **Save** icon.
3. Click the **Run** icon to start again.



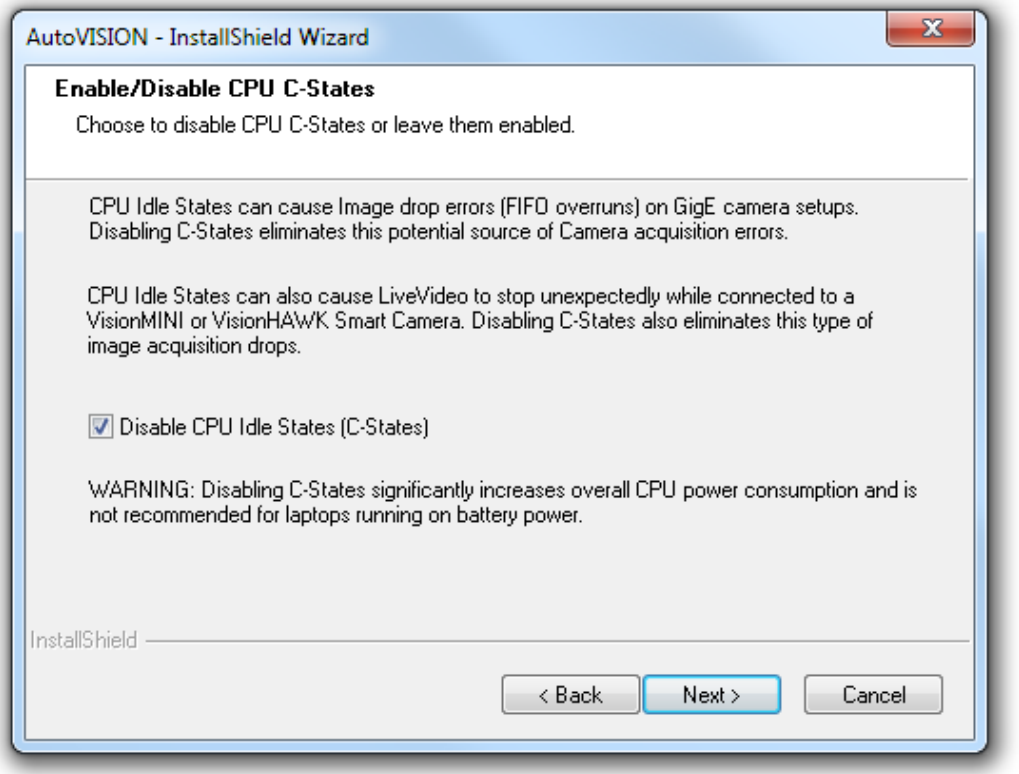
Note that jobs that are configured to run on stored images, saved, and then opened on a camera, will have their snapshot setting changed to **Acquire**.

Additional Notes

CPU Idle States (C-States)

During AutoVISION installation, you will see the dialog shown below. The dialog allows you to disable CPU idle states, also called C-states. The purpose of disabling C-states is to avoid image drop errors in applications using GigE Cameras with Visionscape, which is installed with AutoVISION.

Important: Disabling C-states helps you avoid image drop errors, but it also causes the CPU to run at full speed at all times, significantly increasing power consumption.



2 Connect

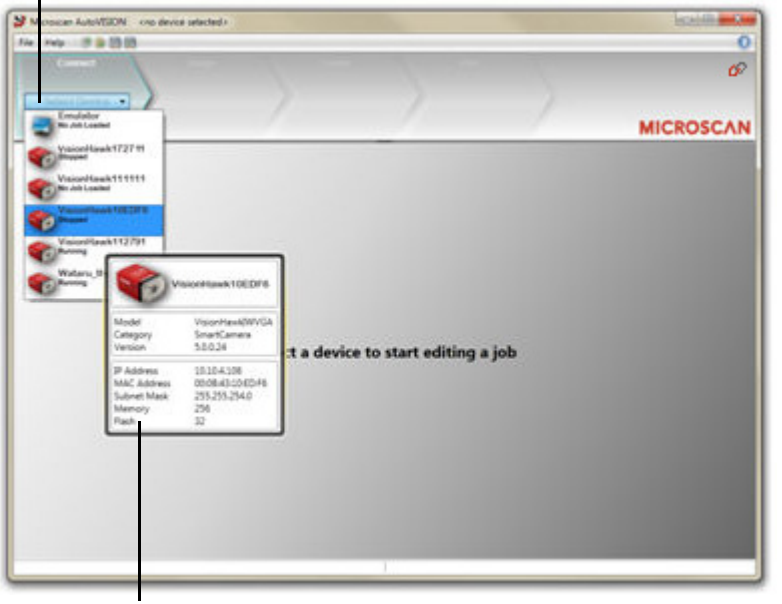
Contents

This section describes how to launch **AutoVISION**, select a device, and connect.

Launch the AutoVISION User Interface

Double-click the AutoVISION icon on your desktop or go to the Windows Start Menu and navigate to **All Programs > Microscan AutoVISION > AutoVISION**.

The Connect menu provides a list of available devices.



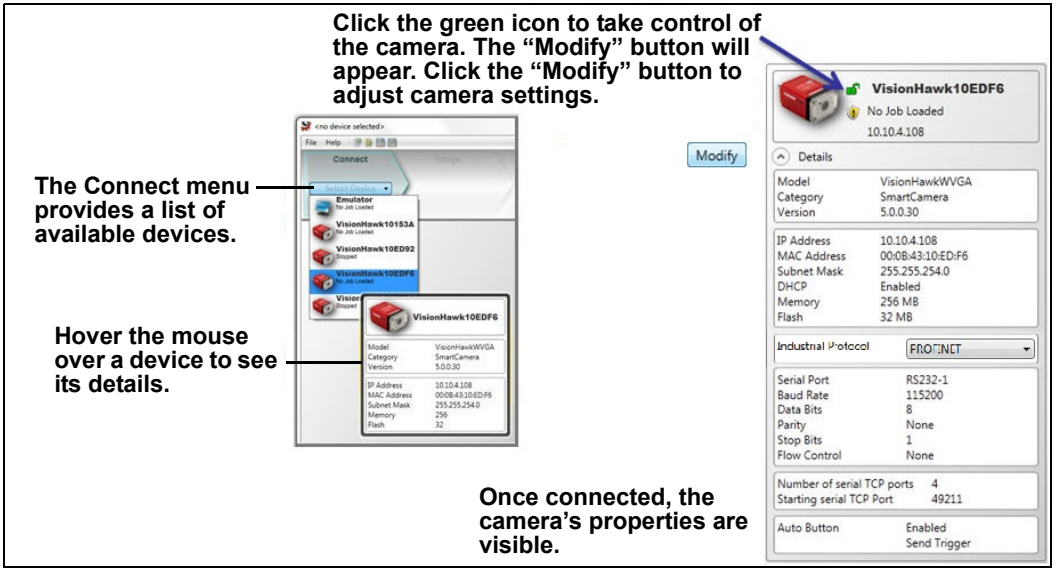
Hover the mouse over a device to see its details.

Select Device

AutoVISION's **Connect** view allows you to select your device and configure its settings, and to create a new job.

Cameras: Vision HAWK, Vision HAWK C-Mount, Vision MINI, or Vision MINI Xi.

Emulator: The software Emulator allows you to work from saved images without hardware.



Modifying Device Settings

When you click the **Modify** button, device settings under **Details** can be changed.

Note: If DHCP is disabled at startup and you click DHCP Enable, the IP Address and Subnet Mask fields are read-only and show the camera's current static IP Address and Subnet. If DHCP is enabled at startup, the IP Address and Subnet Mask assigned by DHCP are shown.

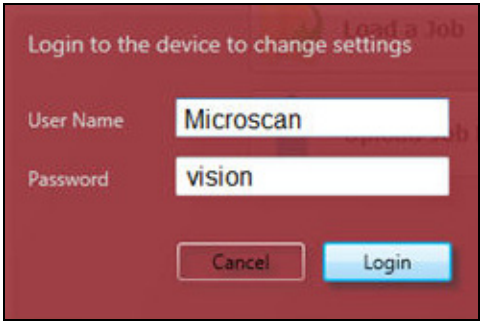
Important: The Vision HAWK's default IP address is **192.168.0.10**.

You can also create or change a username and password for your camera to protect device settings.

Create or change a username and password by right-clicking on the image of the camera and then clicking **Change User ID and Password**.

Then enter your new username of choice and password of choice and click the **Change** button:

Subsequent attempts to change device settings will require that the current username and password be entered:



Important: AutoVISION is not able to edit jobs that have been manipulated in FrontRunner. Switching jobs between AutoVISION and FrontRunner is not recommended.

Once a device is selected, you can **Create a New Job**, **Load a Job** from a saved **.avp** file on your PC, or **Upload Current Job from Device** (your camera).

Job Changeover

Multiple jobs can be loaded to the Vision HAWK, Vision MINI, or Vision MINI Xi. You can switch between the jobs without having to download each time. A number of features allow you to manipulate the jobs and retrieve information about the loaded jobs.

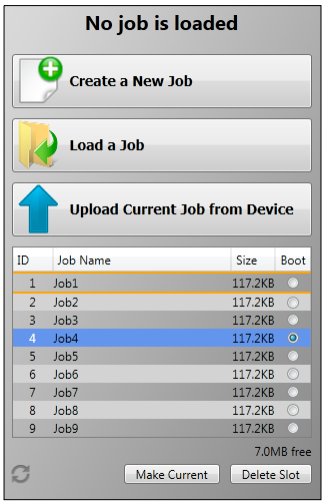
Job Slot – Each job is stored in a corresponding "slot" in the camera's memory, identified by a consecutive list of integers.

Boot Job – This is the job that loads when the camera is powered on.

Current Job – This is the job that is currently loaded in the camera's memory. AutoVISION allows the user to select a job in the job slots and make it the current job.

You can manipulate Job Changeover functionality in AutoVISION's **Connect** view, with the pop-up menu that appears when you click the flash memory icon on the file menu toolbar, and with the pop-up menu in the **Run** view.

When you select a camera that supports Job Changeover, the jobs are shown under the **Upload Current Job from Device** button in the device view.



Note: Job sizes are not shown until you log in to the camera.

From this view you can see the following information about the job:

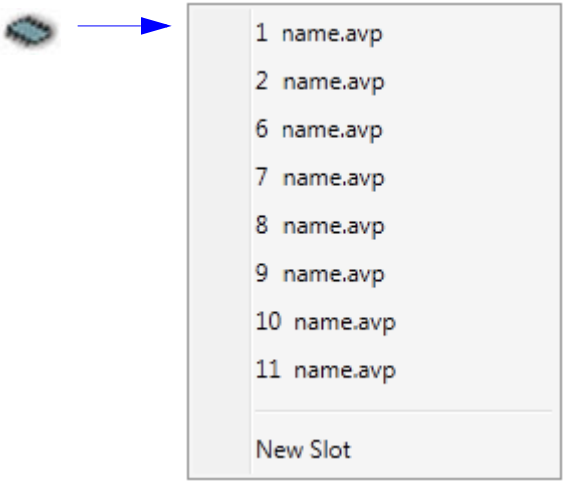
- Slot **ID**
- **Job Name** (.avp name)
- **Size** of the job
- Memory available on the camera
- Which job is the **Boot Job**
- Which job is the **Current Job** (highlighted in orange)

Size represents the amount of memory that would be saved if the job were deleted from the camera. The jobs share support files, so when there are two jobs using the same support files the second one deleted will make more memory available.

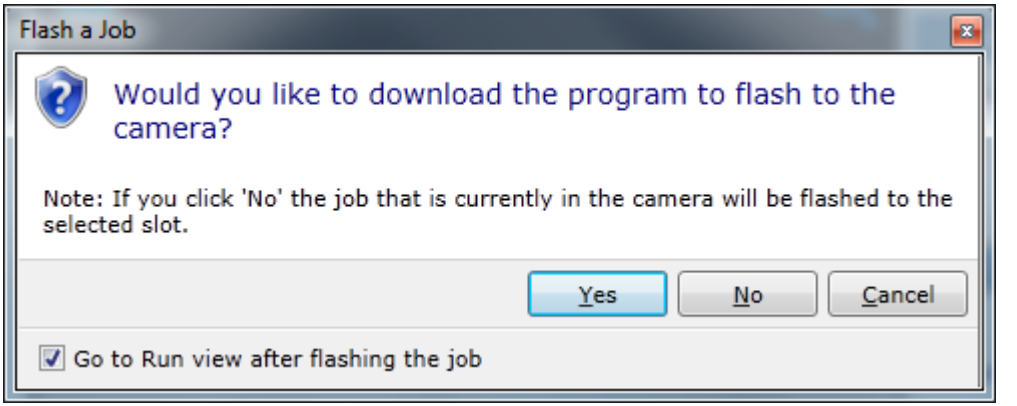
You can make a job the current job by selecting it and clicking the **Make Current** button.

You can also delete jobs from the camera by selecting a job and clicking the **Delete Slot** button. AutoVISION will warn you if you try to delete the current job, and will automatically reassign the new first job in the list to current.

The pop-up menu that appears when you click the flash memory icon allows you to see all jobs currently on the camera. You can then flash the job that is in the camera's memory or loaded on the computer by selecting a job to overwrite or by selecting **New Slot**.



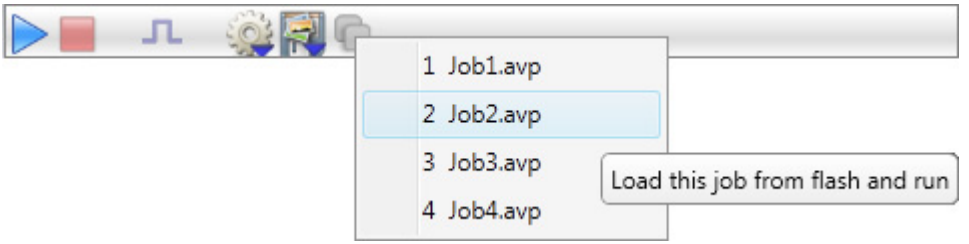
When you select a slot (or New Slot) you will see a dialog asking if you want to download the current job. This allows you either to flash the job in AutoVISION or the job on the camera. If you select New Slot, AutoVISION will search for an open slot or the next corresponding job slot and insert the job in that slot. After the job is flashed it will start running and AutoVISION will switch to the Run view if you have checked “Go to Run view after flashing the job”.



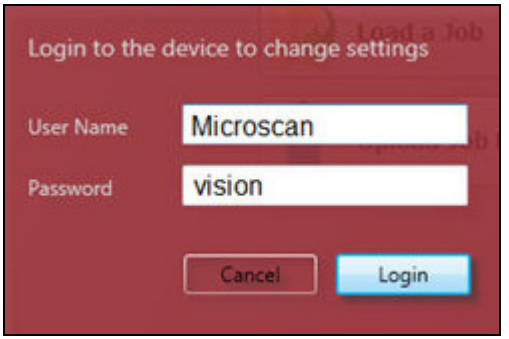
Job Switching

Important: AutoVISION is not able to edit jobs that have been manipulated in FrontRunner. Switching jobs between AutoVISION and FrontRunner is not recommended.

You can switch between jobs in AutoVISION's **Connect** or **Run** views. Click the job switch icon in the Run view to use the dropdown menu shown below.



If a username and password have been defined for the camera, the **Login** dialog will appear.



3 Image

Contents

This section describes **AutoVISION**'s **Image** area, how to use the image control tools, and how to **Auto Calibrate** on an acquired image.

Image Overview

The **Image** view allows you to calibrate your camera's focus and lighting settings automatically via the **Auto Calibration** button, or to adjust them manually via the **Exposure**, **Gain**, **Focus**, and **Lighting Mode** parameters. Calibration settings are saved to the camera, as are Exposure, Gain, and Focus settings that are adjusted manually.

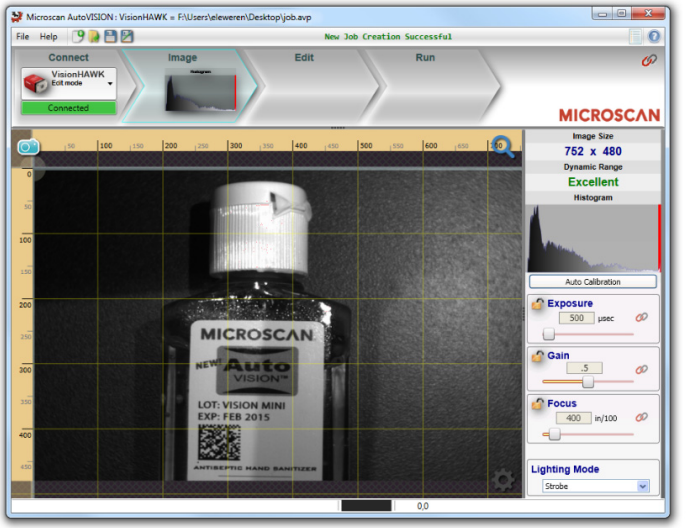
Note: The Vision HAWK C-Mount supports Exposure and Gain Calibration, but not Focus Calibration.

The upper-right corner of the view provides feedback on the current image, including its width and height, the quality of its **Dynamic Range** (**Excellent**, **Good**, **Fair**, **Poor**), and a histogram of the image to help you visualize the Dynamic Range. The colors blue and pink in the image are used to show undersaturated (**blue**) and oversaturated (**pink**) pixels.

The **photometry** values (**Exposure**, **Gain**, and **Focus**) shown to the right of the image area are determined either by the AutoVISION job or by photometry values stored on the camera. There are multiple ways these values can be set: manually with the sliders, Auto Calibration in AutoVISION, Auto Calibration with the **AutoVISION button** on the camera, and **Microscan Link**.

When you perform an Auto Calibration, the photometry values can be "locked down" so they are not changed by the calibration process. When a photometry value is "locked" during calibration, the value already stored in the AutoVISION job (not on the camera) is used.

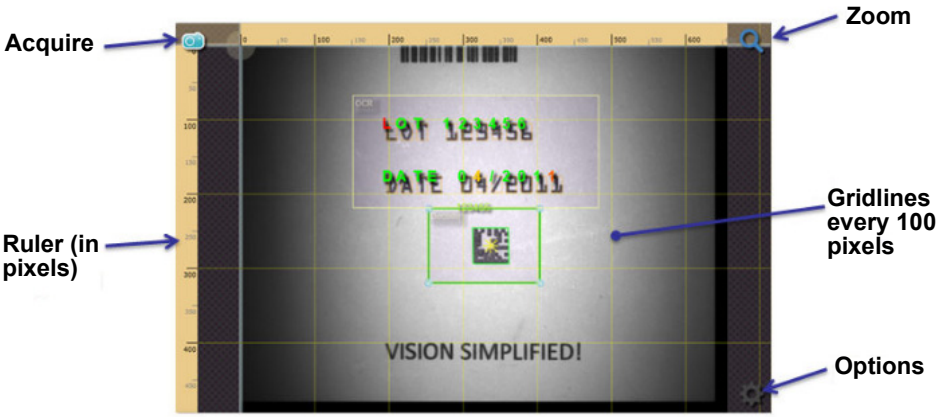
Note: Photometry values must be locked if you intend to tie them to AutoVISION/Visionscape global data service (GDS) tags using Microscan Link. Locking the values allows any new values that appear in the job to be used. If photometry values are unlocked, the values stored on the camera will be used, but they cannot be changed using Microscan Link.



Note: Auto Calibration, **Exposure**, **Gain**, **Focus**, and **Lighting Mode** do not function when the Emulator is being used instead of a camera.

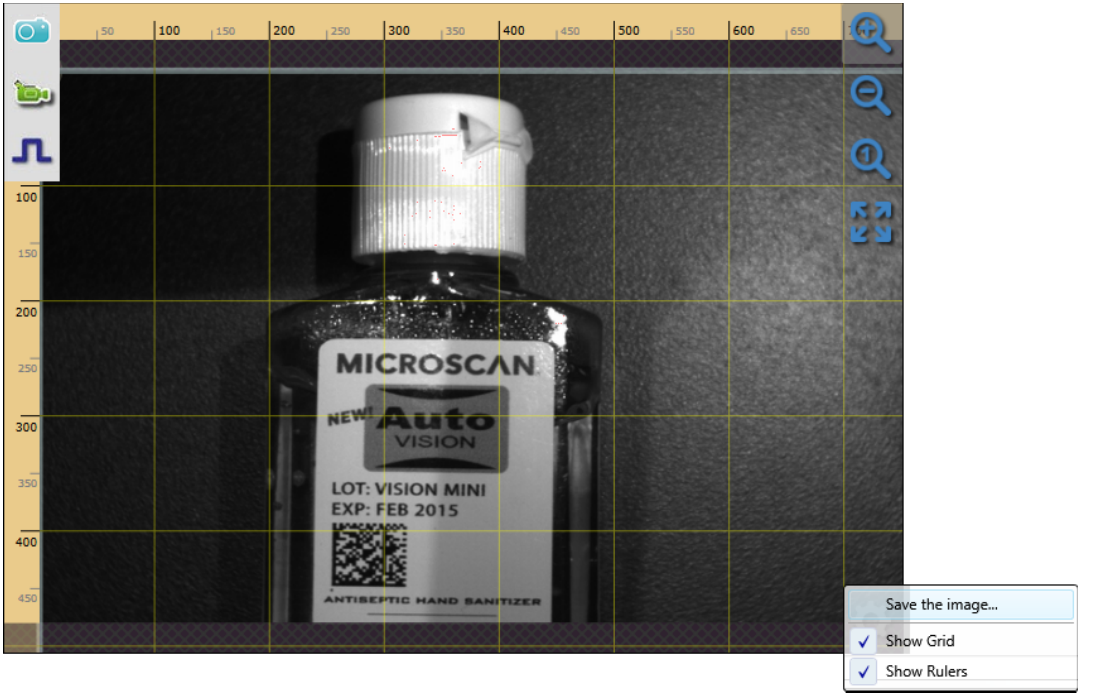
Image Area

The **Image Area** displays the current image and features various tools for controlling the image.



Hint: Right-click in the image area and move the mouse to drag the image to the desired position. Use the mouse wheel to zoom the image in or out.

Image Control Tools



Acquire

Acquire Single Image: Takes a single picture.

Acquire Live Images: Live video used for camera and part adjustment.

Enable or Disable Trigger for Image Acquisition: When checked, and your camera has a trigger assigned, Acquire, Live Video and Tryouts will all wait for a trigger before acquiring an image.

Zoom

Zoom In: Makes the image appear larger.

Zoom Out: Makes the image appear smaller.

Actual Size: Shows the image at actual size in pixels.

Fit to Screen: Fits the image to the boundaries of the image area.

Options

Save the Image...: Saves the captured image on the PC.
Show Grid: Places grid lines on the image for reference and measurement in pixels.
Show Rulers: Places rulers (in pixels) above and to the left of the image area.

Auto Calibration

AutoVISION performs **Acquisition Calibration**, which configures the camera sensor's **Focus** setting via an auto-focus step, and configures the **Exposure** and **Gain** settings via an auto-photometry step. The calibration process ensures that the camera captures and sends optimal images to the software for analysis.

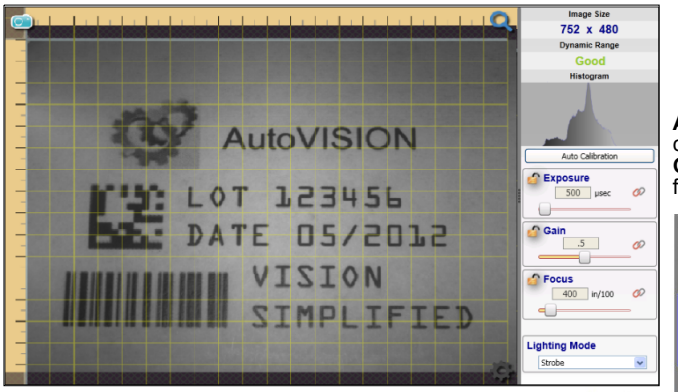
Click the **Auto Calibration** button in AutoVISION's **Image** view to perform a quick calibration on the image.

Another way to initiate Auto Calibration is by pressing the AutoVISION button on the Vision HAWK, Vision MINI, or Vision MINI Xi.

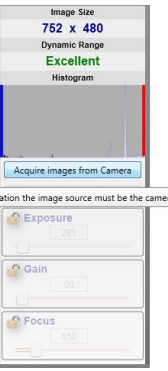
To perform **Auto Calibration** in AutoVISION's Image view, click the Auto Calibrate button to the right of the main image area. AutoVISION performs a quick calibration on the image in the field of view and provides output on **Image Size** and **Dynamic Range**, and also shows a **Histogram** for the captured image.

You can also adjust **Exposure**, **Gain**, and **Focus** individually, and set the **Lighting Mode**, as discussed in **Image Overview**.

Important: The Vision HAWK C-Mount supports Exposure and Gain calibration, but not Focus calibration. **Auto Calibration** does not adjust Focus in the Vision HAWK C-Mount, and the Focus setting is hidden when the Vision HAWK C-Mount is connected.



Auto Calibration configures the camera's **Focus**, **Exposure**, and **Gain** settings and shows a histogram for the captured image.

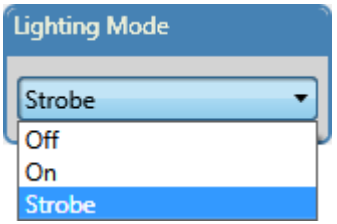


The image control settings are only available when a camera is connected and the image source is the camera.

Important: The image source must be the camera for these controls to be enabled. If you see the **Acquire Images from Camera** button instead of the **Auto Calibration** button, click it to make the camera the image source and capture an image. The **Auto Calibration** button and other controls will then be enabled.

Lighting Mode

There are three lighting modes for the Vision HAWK, Vision MINI, and Vision MINI Xi: **Off**, **On**, and **Strobe**.



Note: The Vision HAWK C-Mount does not have internal lighting, but does support external light control via **Output 3**.

When Lighting is set to **Off**, external lighting is disabled, and internal lighting (standard Vision HAWK, Vision MINI, and Vision MINI Xi) is turned off. This is the default state for the Vision HAWK C-Mount.

When Lighting is set to **On**, external lighting is enabled (Output 3 of the Vision HAWK C-Mount is placed in a de-energized or open state) and internal lighting (standard Vision HAWK, Vision MINI, and Vision MINI Xi) is enabled.

When Lighting is set to **Strobe**, Output 3 on the Vision HAWK C-Mount is enabled to control an external light. The normal state for Output 3 in this configuration is in an energized or closed state. At the start of an image acquisition the output is de-energized or placed in an open state. At the end of the camera's exposure period, the output is set back to a closed state.

Strobe is the default state for the standard Vision HAWK, Vision MINI, and Vision MINI Xi.

Strobe operation allows you to connect the appropriate NERLITE external lighting product for your application and to control that light in sync with image acquisition. The light can be switched on fast enough that it is at full brightness before the exposure begins.

4 Edit

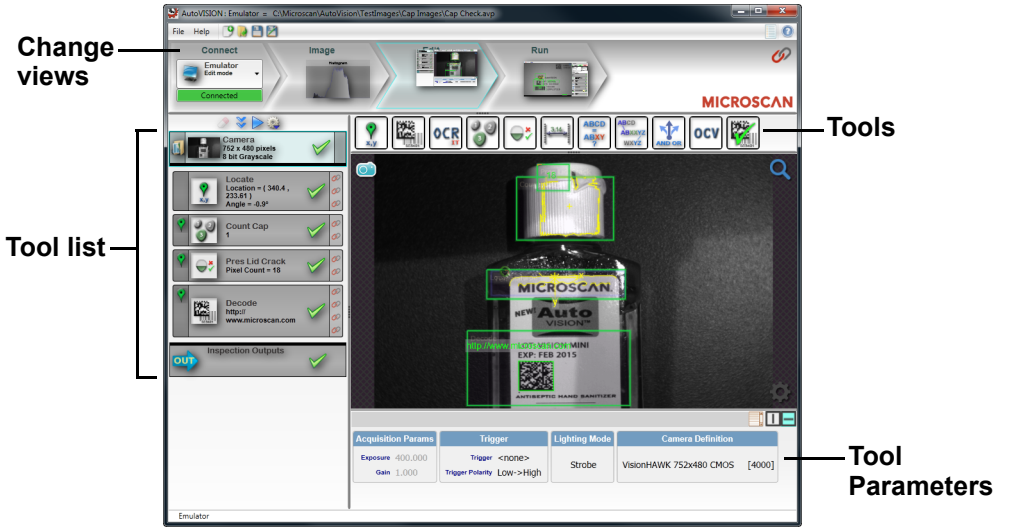
Contents

This section describes **AutoVISION**'s **Edit** interface, and explains how to use **AutoVISION Tools**.

Edit Overview

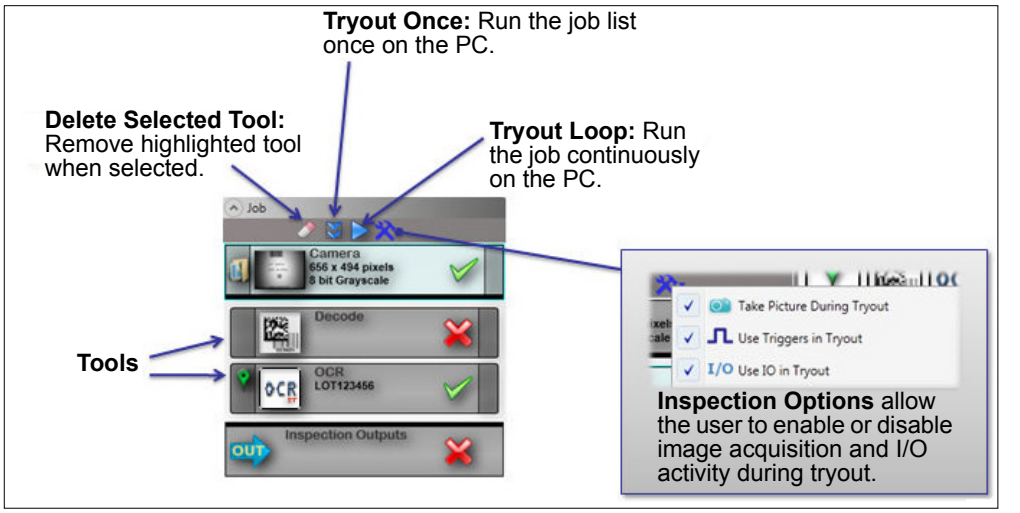
The **Edit** view allows you to edit and try out a job.

Hint: Right-click in the image area and move the mouse to drag the image to the desired position. Use the mouse wheel to zoom the image in or out.



Job List

The **Job List** displays all tools and represents the order of execution of tool functions. It also displays tool status and data.



Tools shown in the job list provide information about the current job.

Note: The **Camera** and **Inspection Outputs** tools are fixed and cannot be moved from their locations via drag-and-drop.

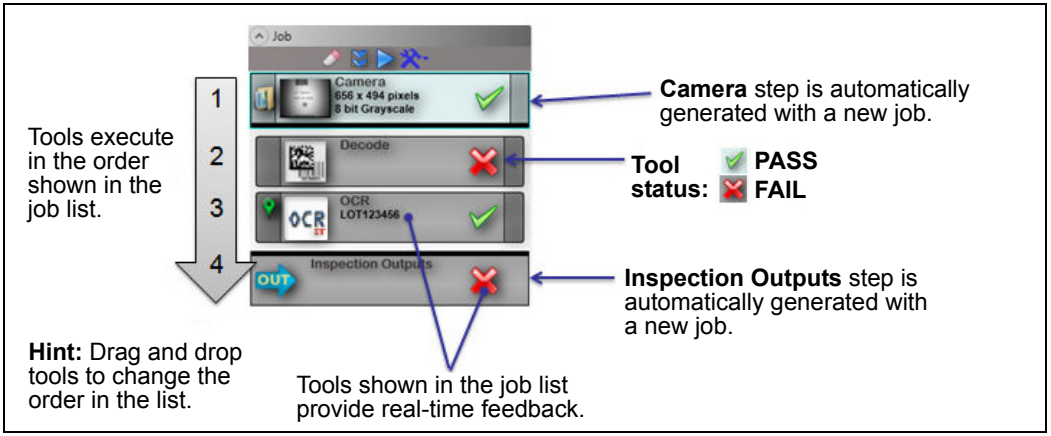
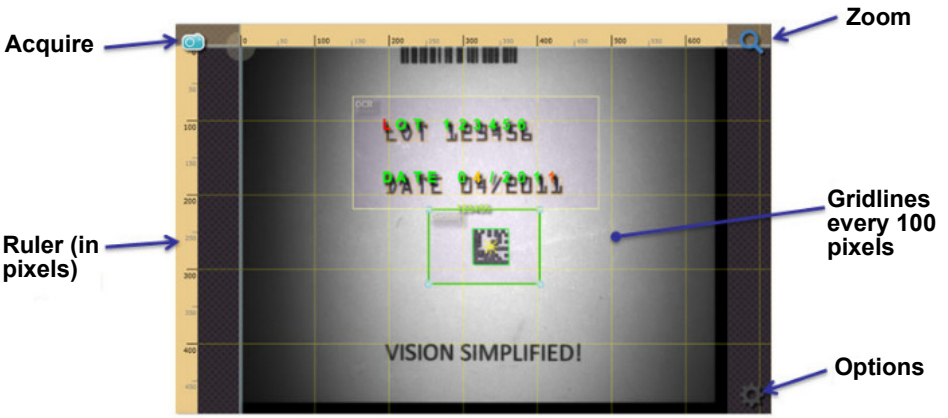


Image Area

The **Image Area** displays the current image, tool data, and controls for image adjustment.



Hint: Right-click in the image area and move the mouse to drag the image to the desired position. Use the mouse wheel to zoom the image in or out.

Image Control Tools

Acquire

Acquire Single Image: Takes a single picture.

Acquire Live Images: Live video used for camera and part adjustment.

Enable or Disable Trigger for Image Acquisition: When checked, and your camera has a trigger assigned, Acquire, Live Video and Tryouts will all wait for a trigger before acquiring an image.

Zoom

Zoom In: Makes the image appear larger.

Zoom Out: Makes the image appear smaller.

Actual Size: Shows the image at actual size in pixels.

Fit to Screen: Fits the image to the boundaries of the image area.

Options

Save the Image...: Saves the captured image on the PC.
Show Grid: Places grid lines on the image for reference and measurement in pixels.
Show Rulers: Places rulers (in pixels) above and to the left of the image area.

Tools Overview

The tool icons are located above the main view area.

The following sections describe how to add and configure tools.

Adding Tools

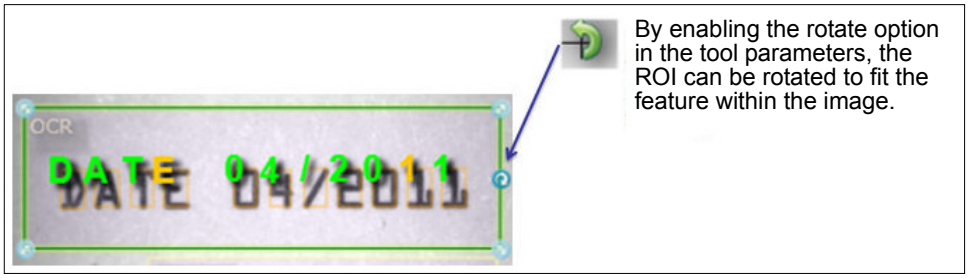
The tool icons are located above the image area.

There are two ways to add a tool to a captured image:

1. Click on the tool icon.
2. Click and drag a tool icon into the image area, then adjust the region of interest (ROI) by grabbing one of the ROI's four anchor points and sizing the ROI as needed.

Region of Interest (ROI)

- All AutoVISION tools have an ROI except **Match Strings**, **String Format**, and **Logic**.
- A tool executes its function within its own ROI.
- Larger ROIs require more processing time.
- ROIs of different tools can overlap and still function correctly.
- Some ROIs can rotate.



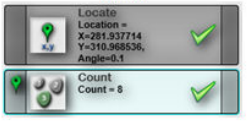
Dynamic Locate

The **Locate Tool** and **Decode Tool** can be used to locate other tools dynamically, because they report coordinates within the image.

Dynamic location: Tools move as features move

Using Dynamic Locate in the Locate Tool

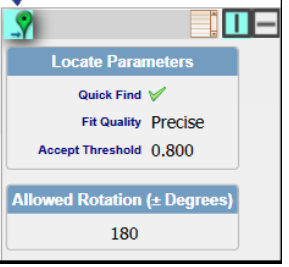
Once a tool has been set as a location source, other tools can move with it.



ON: Move this tool based on the coordinates reported by the **Locate Tool**.

OFF: Do not move this tool based on the coordinates reported by the **Locate Tool**.

Use the **Locate Tool** as a location source for other tools.



Using Dynamic Locate in the Decode Tool

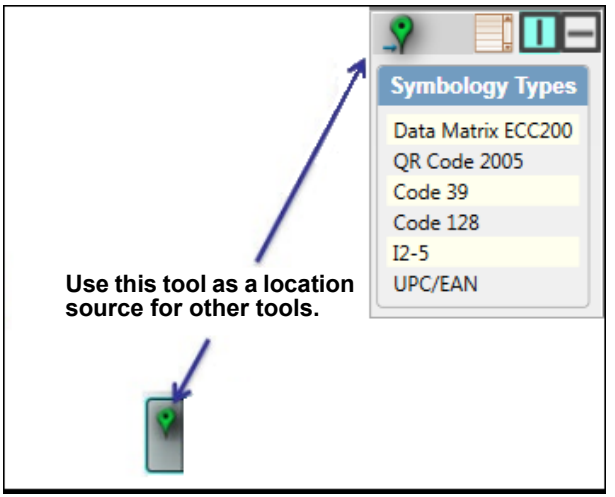


Image Pre-Processing

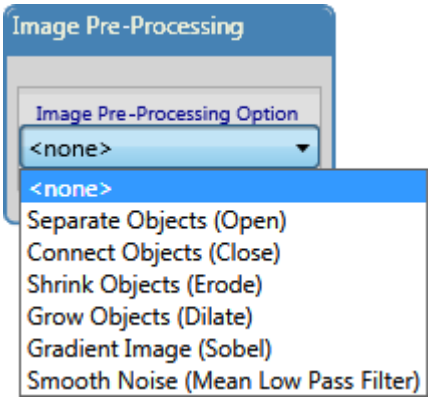
Image Pre-Processing is enabled by default.

AutoVISION's Image Pre-Processing algorithms are available for the following tools:

- **OCR Tool**
- **Count Tool (Blob Count)**
- **Measure Tool**

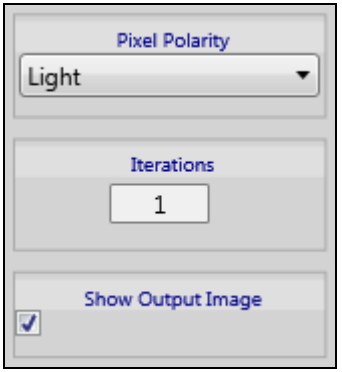
Image Pre-Processing makes it easier for the software to recognize and read characters in an image, detect features in an image, and measure width, height, and angle within an image. The Pre-Processing routine runs before the tool runs.

The Image Pre-Processing editor shown here is visible in the OCR Tool, Count Tool (Blob Count), and Measure Tool's parameters areas.



Separate Objects (Open)

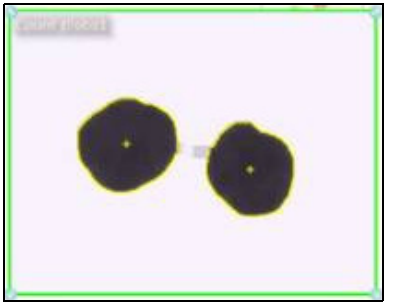
Separate Objects (Open) uses morphological pre-processing to perform an **open** operation. This operation is useful when you want to separate objects from each other, such as multiple connected OCR characters that are connected and are misidentified as a single character. Once this option is selected, the editor is updated to provide parameters specific to the open operation.



Pixel Polarity selects the color of the objects you want to separate.
Iterations sets the number of times the operation is repeated on the image. The effect of the operation is increased as this value is increased. This parameter is defaulted to **1**, but you will typically need to increase the number of iterations to achieve the desired effect.
Show Output Image is enabled by default. The pre-processed image will be shown within the ROI of your tool so you can see the effect of your chosen operation. You can use this option to hide the pre-processed image.

Separate Objects (Open) Example:

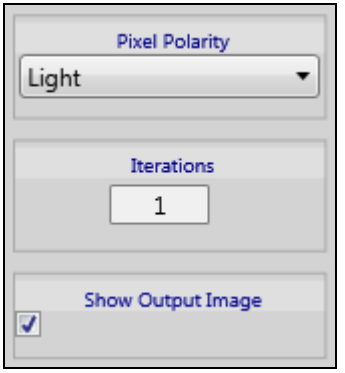
Count Tool, no image pre-processing, counting one blob.



Count Tool with Separate Objects (Open) enabled, Dark Pixels, 6 Iterations, counting two blobs.

Connect Objects (Close)

Connect Objects (Close) uses morphological pre-processing to perform a **close** operation. This operation is useful when you want to connect objects to each other, such as multiple dot-matrix-printed OCR characters whose dots are too far apart, making it difficult to segment the characters. Once this option is selected, the editor is updated to provide parameters specific to the close operation.

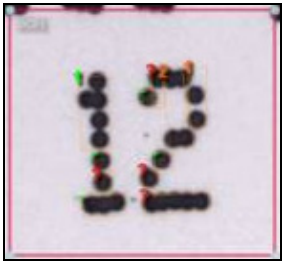


Pixel Polarity selects the color of the objects you want to separate.

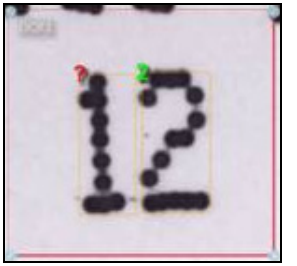
Iterations sets the number of times the operation is repeated on the image. The effect of the operation is increased as this value is increased. This parameter is defaulted to **1**, but you will typically need to increase the number of iterations to achieve the desired effect.

Show Output Image is enabled by default. The pre-processed image will be shown within the ROI of your tool so you can see the effect of your chosen operation. You can use this option to hide the pre-processed image.

Connect Objects (Close) Example:



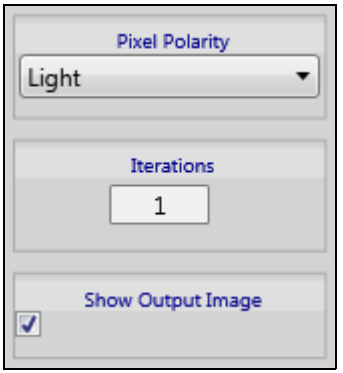
OCR Tool, dot matrix print, no image pre-processing, characters not well-segmented.



OCR with Connect Objects (Close) enabled, Dark Pixels, 1 Iteration.

Shrink Objects (Erode)

Shrink Objects (Erode) uses morphological pre-processing to perform an **erode** operation. This decreases the size of objects. This operation is similar to Separate Objects in that it is typically used to separate objects that are touching. The difference is that the Separate Objects operation performs an erosion followed by a dilation, so that objects are separated but then returned to their original size. The Shrink Objects option only erodes objects. The editor options for this operation are the same as for Separate Objects.

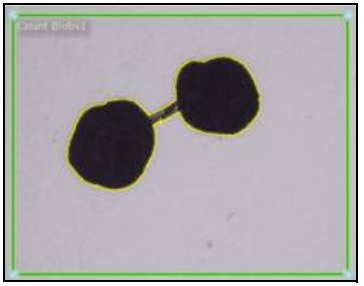


Pixel Polarity selects the color of the objects you want to separate.

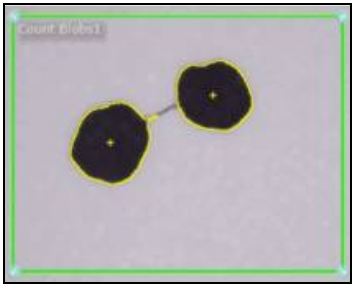
Iterations sets the number of times the operation is repeated on the image. The effect of the operation is increased as this value is increased. This parameter is defaulted to **1**, but you will typically need to increase the number of iterations to achieve the desired effect.

Show Output Image is enabled by default. The pre-processed image will be shown within the ROI of your tool so you can see the effect of your chosen operation. You can use this option to hide the pre-processed image.

Shrink Objects (Erode) Example:



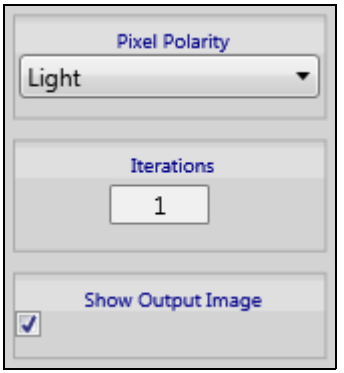
Count Tool, no image pre-processing, two blobs connected and counted as one.



Count Tool with Shrink Objects (Erode) enabled, Dark Pixels, 5 Iterations, counting two blobs.

Grow Objects (Dilate)

Grow Objects (Dilate) uses morphological pre-processing to perform a **dilate** operation. This increases the size of objects. This operation is similar to Connect Objects option in that it is typically used to connect objects. The difference is that the Connect Objects operation performs a dilation followed by an erosion, so that objects are connected but then returned to their original size. The Grow Objects option only dilates objects. The editor options for this operation are the same as for Connect Objects.



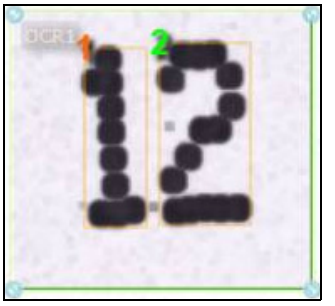
Pixel Polarity selects the color of the objects you want to separate.

Iterations sets the number of times the operation is repeated on the image. The effect of the operation is increased as this value is increased. This parameter is defaulted to **1**, but you will typically need to increase the number of iterations to achieve the desired effect.

Show Output Image is enabled by default. The pre-processed image will be shown within the ROI of your tool so you can see the effect of your chosen operation. You can use this option to hide the pre-processed image.

Grow Objects (Dilate) Example:

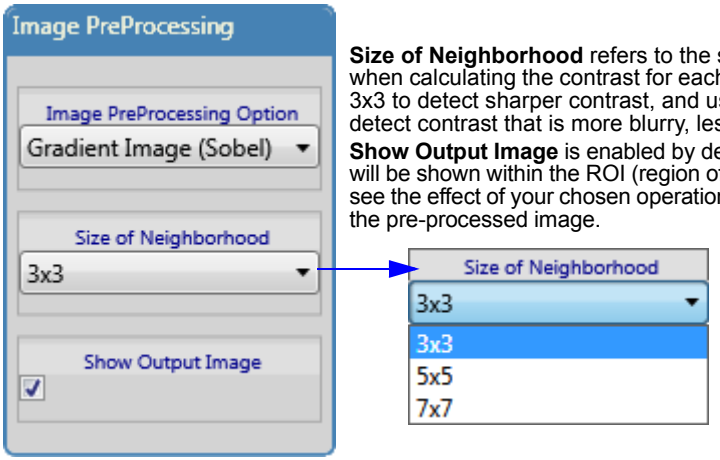
OCR Tool, dot matrix print, no image pre-processing, characters not well-segmented.



OCR with Grow Objects (Dilate) enabled, Dark Pixels, 1 Iteration.

Gradient Image (Sobel)

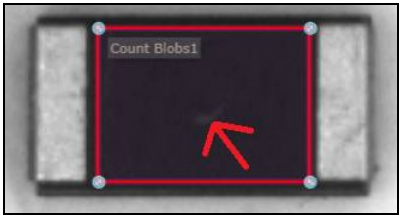
Gradient Image (Sobel) performs a Sobel operation on the image, which highlights areas where there is contrast. The resulting image is dark where there is no contrast and light where there is contrast. This option is often used when trying to detect features in an area where illumination is uneven or inconsistent. Use this option with the Count Tool for applications in which trying to set a grayscale threshold is nearly impossible, and in which you need to detect objects based on their degree of contrast with the background.



Size of Neighborhood refers to the size of the kernel that is used when calculating the contrast for each pixel within the image. Choose 3x3 to detect sharper contrast, and use 5x5 and 7x7 when trying to detect contrast that is more blurry, less sharp.

Show Output Image is enabled by default. The pre-processed image will be shown within the ROI (region of interest) of your tool so you can see the effect of your chosen operation. You can use this option to hide the pre-processed image.

Gradient Image (Sobel) Example:

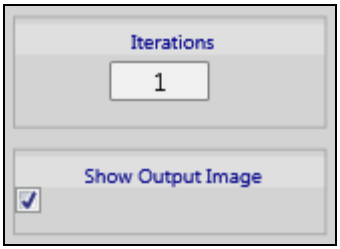


Count Tool (Blob Count) struggling to detect a subtle scratch on part.

Count Tool (Blob Count) with Gradient Image (Sobel) enabled, Light Pixels.

Smooth Noise (Mean Low Pass Filter)

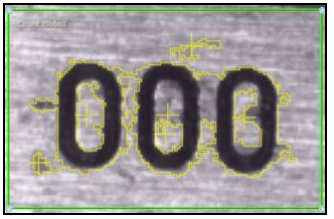
This option smoothes out background “noise” by softening image contrast via a weighted neighborhood average operation. It is typically used on specular, metallic backgrounds.



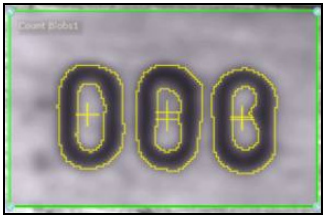
Iterations sets the number of times the operation is repeated on the image. The effect of the operation is increased as this value is increased. This parameter is defaulted to **1**, but you will typically need to increase the number of iterations to achieve the desired effect.

Show Output Image is enabled by default. The pre-processed image will be shown within the ROI of your tool so you can see the effect of your chosen operation. You can use this option to hide the pre-processed image.

Smooth Noise (Mean Low Pass Filter) Example:



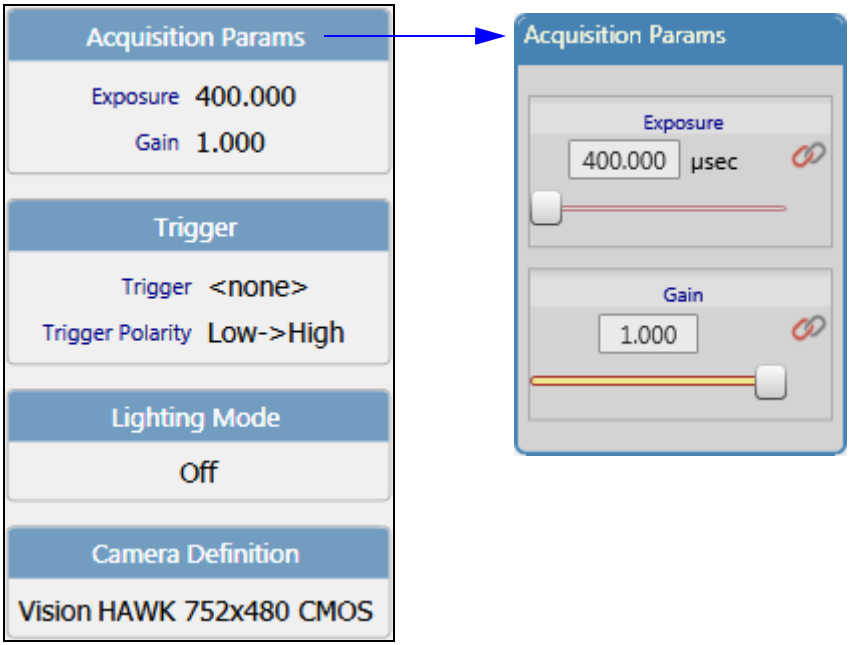
Count Tool (Blob Count) struggling to count features on a metallic surface.



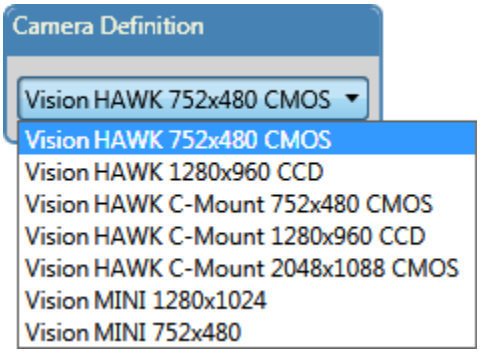
Count Tool (Blob Count) with Smooth Noise (Mean Low Pass Filter) enabled, 10 Iterations.

Camera

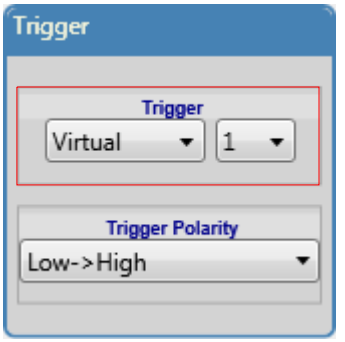
Camera parameters can be used to set up image acquisition.



- When connected to a smart camera, adjust camera-specific acquisition parameters such as **Exposure**, **Gain**, **Focus**, **Trigger**, and **Lighting Mode**.
- When using the Emulator, select your image file location on the PC, and use the **Camera Definition** menu to select which smart camera and resolution to emulate.



Trigger



- Use the **Trigger** dropdown menu to adjust trigger input settings.

  None: Continuous operation; no trigger defined.

  Digital: Select from available digital inputs on the camera.

  Virtual: Select virtual triggers 1 through 10.

  Sensor: The sensor input of the camera will trigger.

  Serial Trigger: A programmable serial command can be sent over a programmable port. The text field to the right of the Trigger dropdown menu accepts the following special non-printable characters:

  \a bell

  \b backspace

  \f form feed

  \n new line

  \r carriage return

  \t horizontal tab

  \v vertical tab

  \' single quote

  \x022 double quote (**"**)

  \? question mark

  \ooo three digit octal notation ASCII value, i.e. **\145** = **'e'**

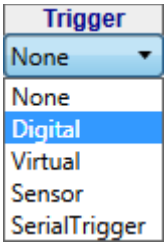
  \x0hh hexadecimal notation ASCII value, i.e. **\0x04C** = **'L'**

Force Trigger

When a trigger is selected and **Wait for Triggers During Acquire and Tryout** is selected, the **Force Trigger** button will appear above the Navigator Bar. This allows you to trigger the camera to acquire images and advance the Tryout Loop.

Important: Triggering from AutoVISION is intended for testing only and results in significant processing time variation. Use the actual trigger source for actual timing values.

Trigger Dropdown Menu

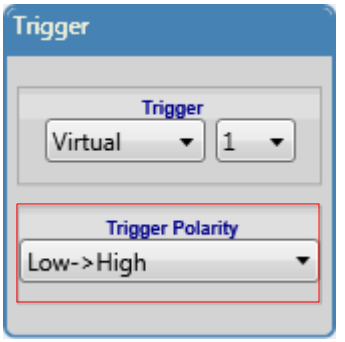


Wait for Triggers During Acquire and Tryout

Force Trigger Button

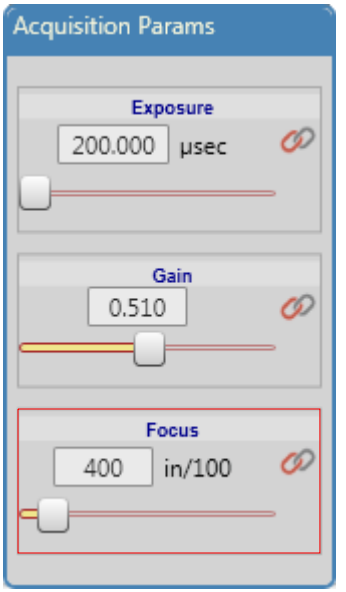
Trigger Polarity

Trigger Polarity allows you to set whether the trigger is **Low > High** or **High > Low**.



Focus

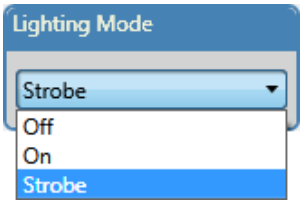
The **Focus** control slider allows you to set the focus of the Vision HAWK, Vision MINI, or Vision MINI Xi's built-in lens system.



The Vision HAWK C-Mount product does not support this focus control, because the lens is focused manually and there is no built-in lens system to adjust. The Focus control slider is hidden when a Vision HAWK C-Mount is connected.

Lighting

There are three lighting modes for the Vision HAWK, Vision MINI, and Vision MINI Xi: **Off**, **On**, and **Strobe**.



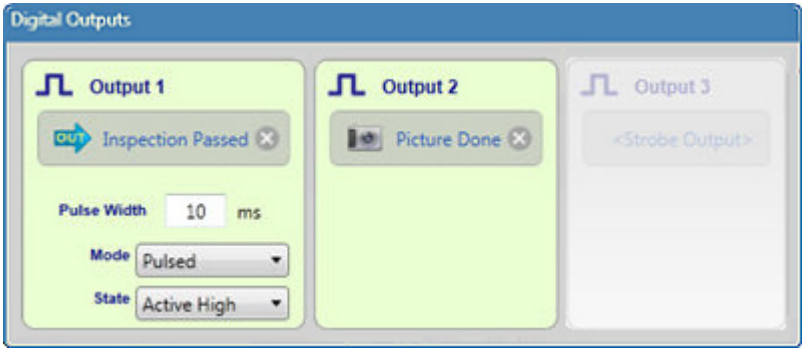
Note: The Vision HAWK C-Mount does not have internal lighting, but does support external light control via **Output 3**.

When Lighting is set to **Off**, external lighting is disabled, and internal lighting (standard Vision HAWK, Vision MINI, and Vision MINI Xi) is turned off. This is the default state for the Vision HAWK C-Mount.

When Lighting is set to **On**, external lighting is enabled (Output 3 of the Vision HAWK C-Mount is placed in a de-energized or open state) and internal lighting (standard Vision HAWK, Vision MINI, and Vision MINI Xi) is enabled.

When Lighting is set to **Strobe**, Output 3 on the Vision HAWK C-Mount is enabled to control an external light. The normal state for Output 3 in this configuration is in an energized or closed state. At the start of an image acquisition the output is de-energized or placed in an open state. At the end of the camera's exposure period, the output is set back to a closed state.

If the Vision HAWK C-Mount contains a job in which the camera's Lighting parameter is set to **Strobe**, Output 3 becomes fixed as an external strobe signal. This means that Output 3 can no longer be used as a general purpose output, and will therefore be disabled. Output 3 in the **Digital Outputs** editor will not be available, as shown in the example below. Note that the connection area of Output 3 says "Strobe Output" to provide feedback as to why Output 3 is disabled.

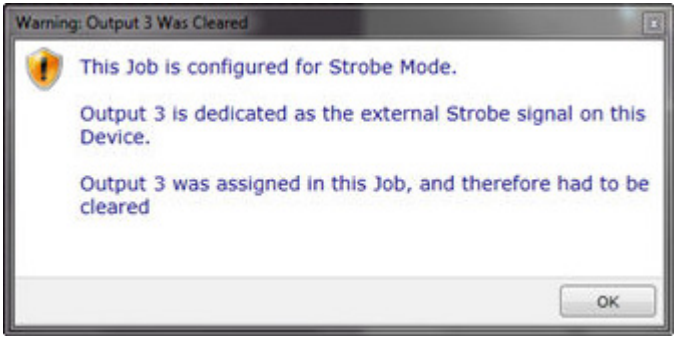


Strobe is the default state for the standard Vision HAWK, Vision MINI, and Vision MINI Xi.

Strobe operation also allows you to connect the appropriate NERLITE external lighting product for your application and to control that light in sync with image acquisition. The light can be switched on fast enough that it is at full brightness before the exposure begins.

Notes on Vision HAWK C-Mount Output 3

- If Output 3 is already connected and the Lighting parameter is changed to Strobe, Output 3 will be disconnected and then disabled.
- If a job is created on a standard Vision HAWK in which Output 3 is assigned and the Lighting parameter is set to Strobe, and then that job is loaded onto a Vision HAWK C-Mount, a warning will appear stating that Output 3 must be disconnected:



Camera Output

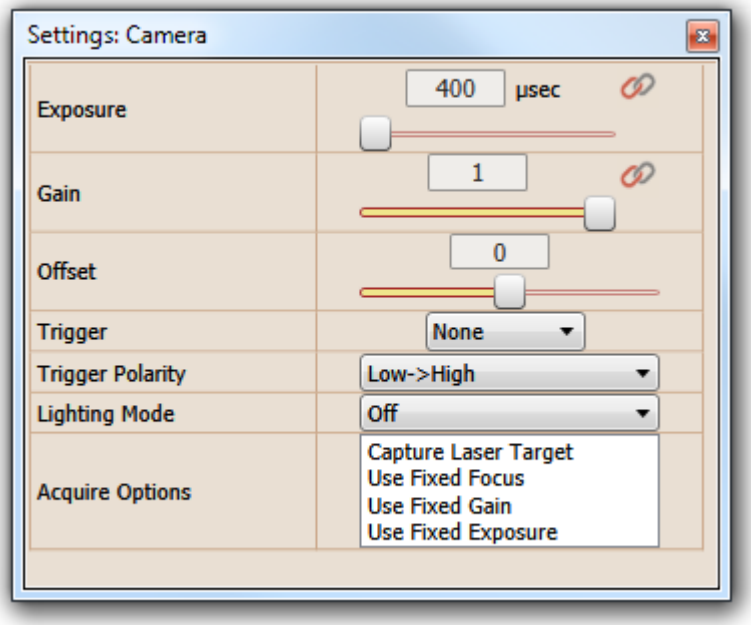
The following parameter output can be linked using **Microscan Link**:

- **Status: Pass/Fail** (Compatible with the **bool** data type)

Camera Advanced Parameters

Click the Advanced Parameters icon at the upper right of the Edit view to access **Camera Advanced Parameters**.

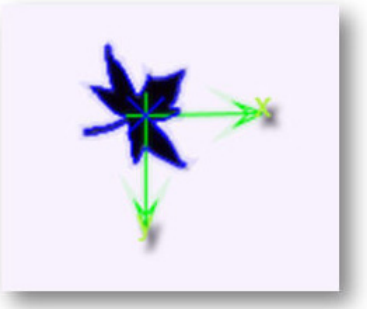
- **Exposure:** Allows you to set the integration time for the camera's image sensor pixels.
- **Gain:** Allows you to set the signal strength applied to pixel grayscale values prior to output.
- **Offset:** Allows you to set the level of digital offset to apply to the output signal to adjust the dark level. This provides a means for adjusting the dark level if clipping of the dark signal is occurring (dark value below 0) to provide more contrast.
- **Trigger:** Selects the type of I/O.
- **Trigger Polarity:** Defines whether trigger polarity is Low-to-High or High-to-Low.
- **Lighting Mode:** Selects how the camera's built-in lighting is configured.
- **Acquire Options:** Allows you to enable a capture target or to use fixed photometry values.



Locate Tool

The **Locate Tool** dynamically locates a learned pattern within a captured image. This tool:

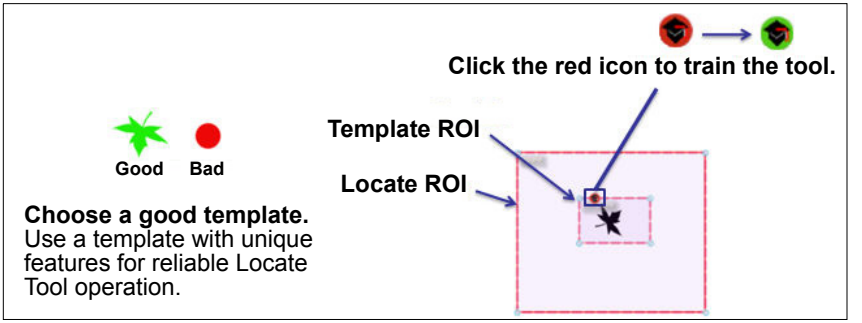
- Learns a pattern based on edges.
- Reports X, Y, and rotation coordinates of the edge pattern.
- Reports feature coordinates to locate other tools.
- Has a **template ROI (region of interest)** and a **locate ROI**.
- Can also be used for presence/absence inspection.



The **Locate Tool** locates features based on edges.

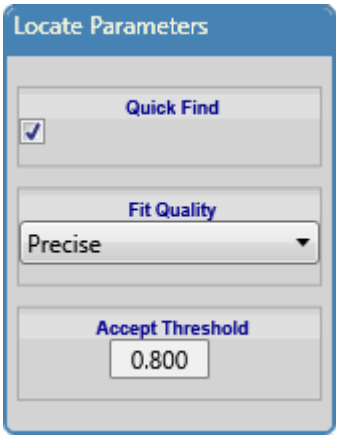
Setting Up the Locate Tool

- Add the **locate Tool** to the image area.
- Adjust the **template ROI** around the feature that you want the tool to learn.
- Adjust the **locate ROI** to cover the area within which you expect your feature to move from image to image. For best results, make this ROI as large as possible.
- Train the tool to recognize the pattern by clicking the **Train** icon.

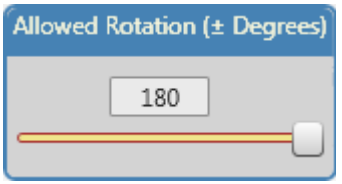


Locate Tool Parameters

- **Quick Find:** Uses a rough location. Faster but less accurate.
- **Fit Quality:** Defines how closely the identified feature must match the template (**Relaxed**, **Normal**, **Precise**).
- **Accept Threshold:** A ratio that determines how well the located feature must match the trained feature. (**0.1 – 1**, where **1** = perfect match.)



- **Allowed Rotation:** Sets a limit on how much the object can rotate and still be recognized.



Hint: The **Locate Tool** is configured to handle 360 degrees of rotation by default. However, reducing the **Allowed Rotation (± Degrees)** will speed up the tool's performance considerably.

Locate Tool Outputs

The following parameter outputs can be linked using **Microscan Link**:

- **Status: Pass/Fail** (Compatible with the **bool** data type)
- **Location: X, Y, Angle** (Compatible with the **double** data type)
- **Fit Quality** (Compatible with the **double** data type)

Locate Tool Advanced Parameters

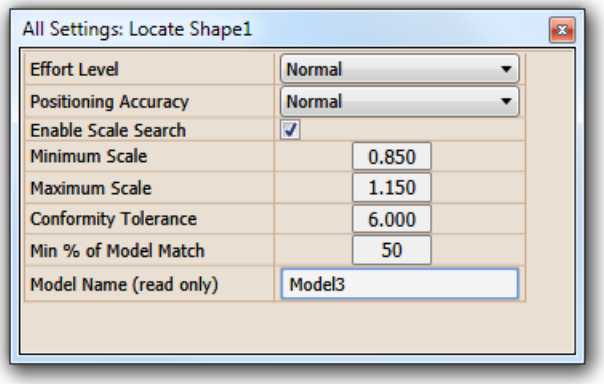
Click the **Advanced Parameters** icon at the upper right of the **Edit** view to access **Locate Tool Advanced Parameters**.

- **Effort Level:** Determines how hard the tool should work to locate the feature. Increasing the effort level slows down the inspection.
- **Positioning Accuracy:** Determines the precision with which the location of the feature is reported.

  Enable Scale Search: When enabled, features can still be located if they change in size from image to image.

  Note: Setting the Allowed Rotation of the Locate Tool to any value between 0-5° enables **Scale Search**. Setting Allowed Rotation to any value between 6-180° disables **Scale Search**.
- **Minimum Scale:** Sets the minimum scale change that is allowed between the located feature and the trained feature. For example, 2 signifies that half the trained size is acceptable.
- **Maximum Scale:** Sets the maximum scale change that is allowed between the located feature and the trained feature. For example, 0.5 signifies that half the trained size is acceptable.
- **Conformity Tolerance:** Determines how tolerant of distortion the tool is. Increase this value to allow more distorted features to be located.

  Important: Before the Locate Tool is trained on a feature, the Conformity Tolerance for **Relaxed Fit Quality** is **14.000**, **Normal** is **10.000**, and **Precise** is **6.000**. After the tool is trained, **Relaxed Fit Quality** is **10.000**, **Normal** is **6.000**, and **Precise** is **2.000**.
- **Min % of Model Match:** Sets the minimum percentage of the trained model that must match a feature for that feature to be located.
- **Model Name (Read Only):** The name that is assigned to the contour file for the tool. The contour file is saved in **\Microscan\Vscape\Jobs\Contours**.



Decode Tool

The **Decode Tool** uses Microscan's aggressive X-Mode algorithms to decode 1D and 2D symbols. Up to 100 symbols can be decoded in a single region of interest. The Decode Tool also features a **Match String** function that allows you to specify the string that must be matched for the Decode Tool to pass.

The Decode Tool supports the following:

All standard barcodes

GS1 DataBar

PDF417

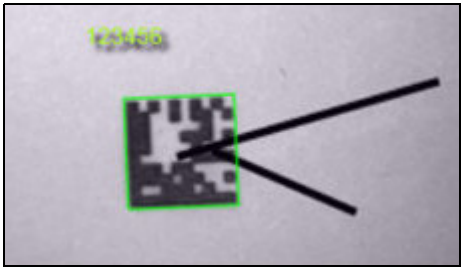
Data Matrix, Aztec, QR

DotCode

DPM decoding

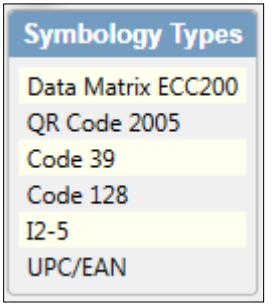
Omnidirectional decoding

The Decode Tool can also read damaged or obstructed symbols as in the example below.



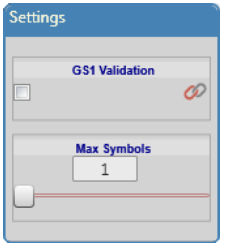
Decode Tool Parameters

- Adjust ROI (region of interest) to at least 2 times the symbol size.
- Leave at least 2x the symbol's element size between the ROI and the symbol.
- Disable unused symbologies to reduce decode times.



Note: DotCode cannot be decoded at the same time as other symbologies. If your application requires the decoding of DotCode symbols, enable DotCode only.

- Set the maximum number of symbols as needed.



- Enter the Match String value if required.

Decode Tool Match String

Match String allows you to specify the string that must be matched for the Decode Tool to pass.

The Match String function for the Decode Tool allows you to enter a '**?**' character as a wildcard character.

Non-Printable Characters

When a decoded symbol contains non-printable characters, the Match String can accept hexadecimal escape codes. These are of the form **\xFF**, where **FF** represents two hexadecimal digits. The "**x**" and the hex digits are not case sensitive.

To be processed, the escape sequence must be fully formed; otherwise it is treated as if it were not an escape sequence.

For example, to match **ABCD<cr>EFG**, where **<cr>** is a carriage return (**hex 0D**), set Match String to:

ABCD\x0DEFG

Using a serial command, this would be:

SET matchstring1 ABCD\x0DEFG

GS1 Validation

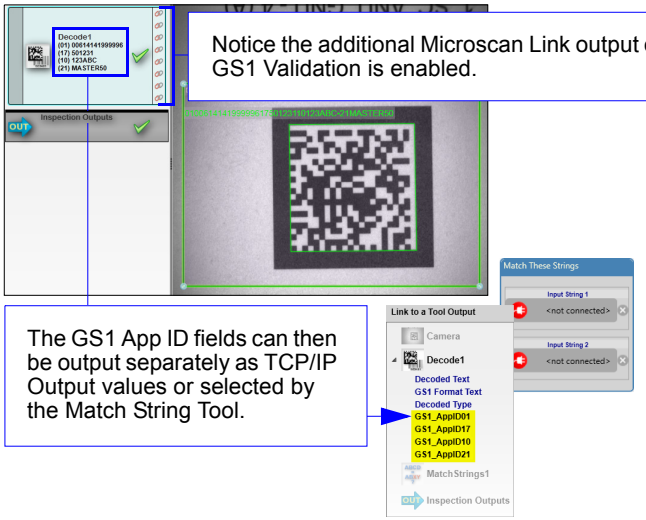
GS1 Validation allows you to output separate GS1 application identifiers such as GTIN, batch or lot number, expiration date, and serial number. GS1 Validation also checks the syntax of the symbol for conformance to the GS1 standard.

Microscan is a GS1 Solution Partner with a Certified GS1 Bar Code Professional on staff. This allows us to provide you with the background knowledge necessary to implement GS1 Standards successfully in your application.

Visit **www.gs1us.org** for more information about why to use a GS1 Solution Partner.

To enable GS1 Validation, click the GS1 Validation box in the Decode Tool Settings editor.

The example below shows the Decode Tool's output broken into individual GS1 App IDs.



App IDs

App ID output parameters are added to the Decode Tool when a GS1 symbol is decoded, and they are not automatically removed when subsequent GS1 symbols are decoded. Additional App IDs from subsequent decoded GS1 symbols are appended to the original App ID output parameters to preserve any Microscan Link connections that may have been made to those parameters.

Disabling GS1 Validation clears App ID output parameters. This is useful for clearing App IDs in applications requiring that a large number of different GS1 symbols be decoded.

Decode Tool Outputs

The following parameter outputs can be linked using **Microscan Link**.

Important: This tool shows additional linkable outputs in the **Data Navigator Tools View** that are not shown in the main user interface. Check the Data Navigator to ensure that you are aware of all possible linkable outputs for all AutoVISION tools.

- **Status: Pass/Fail** (Compatible with the **bool** data type)
- **Decoded Text** (Compatible with the **string** data type)
- **GS1 Format Text** (Compatible with the **string** data type)
- **Symbology Type** (Compatible with the **string** data type)
- **Center Point Location** (Compatible with the **double** data type)

Decode Tool Advanced Parameters

Click the **Advanced Parameters** icon at the upper right of the **Edit** view to access **Decode Tool Advanced Parameters**.

- **Symbology Types:** Allows you to determine which symbologies are enabled (blue) or disabled (white).
- **Match String Enable:** Enables or disables Decode Tool results for Match String output.
- **Match String:** Allows you to specify the string that must be matched for the Decode Tool to pass.
- **Wildcard Character:** Enables or disables a wildcard character in Decode Tool output.
- **Max Symbols:** Determines the maximum number of symbols to decode in a single Decode Tool ROI (region of interest).
- **Separator:** Allows you to define the character that will separate concatenated symbol output strings.
- **GS1 Validation:** Allows you to extract, validate, and output separate symbol data fields.
- **Code 128 Symbol Length:** Allows you to set the Code 128 Symbol Length.
- **Timeout (ms):** Determines the maximum amount of time (1 ms to 10,000 ms) the Decode Tool will spend processing an image.
- **Linear Security Level:** Sets Linear Security Level to Aggressive, Normal, or Secure, which determines the number of scan lines required for a good read (Normal requires more scan lines than Aggressive, and Secure requires more scan lines than Normal).
- **PDF417 Fixed Symbol Length Status:** When enabled, outputs status of Fixed Symbol Length along with symbol data.
- **PDF417 Symbol Length:** Allows you to set the PDF417 Symbol Length.
- **PDF417 Codeword Collection:** Collects PDF417 codewords from multiple images and assembles them throughout the read cycle until the read cycle ends or the symbol is fully decoded. Note that when this feature is enabled, only one PDF symbol per read cycle should be present in the field of view.
- **MicroPDF417 Fixed Symbol Length Status:** When enabled, outputs the status of Fixed Symbol Length along with symbol data.
- **MicroPDF417 Symbol Length:** Allows you to set the MicroPDF417 Symbol Length.
- **Code 128 Fixed Symbol Length Status:** When enabled, outputs status of Fixed Symbol Length along with symbol data.
- **Code 128 EAN Status:** When enabled, outputs EAN Status along with symbol data.
- **Code 128 Output Format:** Allows you to set Code 128 Output Format to Standard or Application.
- **Code 128 Application Record Separator Status:** When enabled, outputs the status of the Application Record Separator along with symbol data.
- **Code 128 Application Record Separator Character:** Allows you to set the separator character for Application Records.

- **Code 128 Application Record Brackets Status:** When enabled, outputs Application Record Brackets status along with symbol data.
- **Code 128 Application Record Padding Status:** When enabled, outputs Application Record Padding status along with symbol data.
- **Code 93 Fixed Symbol Length Status:** When enabled, outputs the status of Fixed Symbol Length along with symbol data.
- **Code 93 Symbol Length:** Allows you to set the Code 93 Symbol Length.
- **Code 39 Check Character Status:** When enabled, outputs the status of the Check Character along with symbol data.
- **Code 39 Check Character Output Status:** When enabled, outputs the status of Check Character Output along with symbol data.
- **Code 39 Large Intercharacter Gap Status:** When enabled, outputs the status of Large Intercharacter Gap along with symbol data.
- **Code 39 Fixed Symbol Length Status:** When enabled, outputs the status of Fixed Symbol Length along with symbol data.
- **Code 39 Symbol Length:** Allows you to set the Code 39 Symbol Length.
- **Code 39 Full ASCII Set Status:** When enabled, outputs the status of Full ASCII Set along with symbol data.
- **Interleaved 2 of 5 Check Character Status:** When enabled, outputs the status of the Check Character along with symbol data.
- **Interleaved 2 of 5 Check Character Output Status:** When enabled, outputs the status of Check Character Output along with symbol data.
- **Interleaved 2 of 5 Symbol Length 1:** Allows you to set Symbol Length 1 for Interleaved 2 of 5.
- **Interleaved 2 of 5 Symbol Length 2:** Allows you to set Symbol Length 2 for Interleaved 2 of 5.
- **Interleaved 2 of 5 Guard Bar Status:** When enabled, outputs the status of Guard Bar along with symbol data.
- **Interleaved 2 of 5 Range Mode Status:** When enabled, outputs the status of Range Mode along with symbol data.
- **UPC/EAN Status:** When enabled, outputs UPC/EAN status along with symbol data.
- **UPC/EAN Supplementals Status:** When enabled or required, outputs the status of UPC/EAN Supplementals along with symbol data.
- **UPC/EAN Separator Status:** When enabled, outputs the status of the UPC/EAN Separator along with symbol data.
- **UPC/EAN Separator Character:** Allows you to set the separator character for UPC/EAN output.
- **UPC/EAN Supplementals Type:** Allows you to set the UPC Supplementals Type (Both, 2 Digits, or 5 Digits).
- **UPC/EAN UPC-E as UPC-A Status:** When enabled, outputs the status of UPC-E outputs as UPC-A.
- **Codabar Start and Stop Match Status:** When enabled, the camera will not decode Codabar symbols unless the start and stop characters are the same.

- **Codabar Start and Stop Output Status:** When enabled, the start and stop characters will be present in the data output of the decoded symbol. Note that because the start and stop characters are included as part of the data, the characters must be included as part of the length in a fixed length mode of operation.
- **Codabar Large Intercharacter Gap Status:** When enabled, outputs the status of Large Intercharacter Gap along with symbol data.
- **Codabar Fixed Symbol Length Status:** When enabled, outputs the status of Fixed Symbol Length along with symbol data.
- **Codabar Symbol Length:** Allows you to set the Codabar Symbol Length.
- **Codabar Check Character Type:** Allows you to select the type of check character.
- **Codabar Check Character Output Status:** When enabled, outputs the status of Check Character Output along with symbol data.
- **BC412 Check Character Output Status:** When enabled, outputs the status of Check Character Output along with symbol data.
- **BC412 Fixed Symbol Length Status:** When enabled, outputs the status of Fixed Symbol Length along with symbol data.
- **BC412 Symbol Length:** Allows you to set the BC412 Symbol Length.
- **DataBar Expanded Fixed Symbol Length Status:** When enabled, outputs the status of Fixed Symbol Length along with symbol data.
- **DataBar Expanded Symbol Length:** Allows you to set the DataBar Expanded Symbol Length.
- **Composite Separator Status:** When enabled, outputs the status of the Composite Separator along with symbol data.
- **Composite Separator Character:** Allows you to set the separator character for Composite output.
- **Pharmacode Fixed Symbol Length Status:** When enabled, outputs the status of Fixed Symbol Length along with symbol data.
- **Pharmacode Symbol Length:** Allows you to set the Pharmacode Symbol Length.
- **Pharmacode Minimum Bars:** Sets the minimum number of bars that a Pharmacode symbol must have to be considered valid.
- **Pharmacode Bar Width:** If set to Mixed, the camera will autodiscriminate between narrow and wide bars. If set to All Narrow, all bars will be considered as narrow bars. If set to All Wide, all bars will be considered as wide bars. If set to Fixed Threshold, the fixed threshold value will be used to determine whether bars are all narrow or all wide. This setting is ignored if the camera is unable to tell the difference between narrow and wide bars.
- **Pharmacode Direction:** Sets the direction in which bars are prioritized. For example, left bars are considered more significant than right bars for horizontal symbols, and top bars are considered more significant than bottom bars for vertical symbols.
- **Pharmacode Fixed Threshold Value:** Defines the minimum difference in pixels that will distinguish a narrow bar from a wide bar.
- **Pharmacode Background Color:** Defines the background (black or white) on which a Pharmacode symbol is printed or marked.

- **DotCode Rotation:** Defines the amount of rotation allowed for DotCode symbols (No Rotation, Low Rotation, Omni).

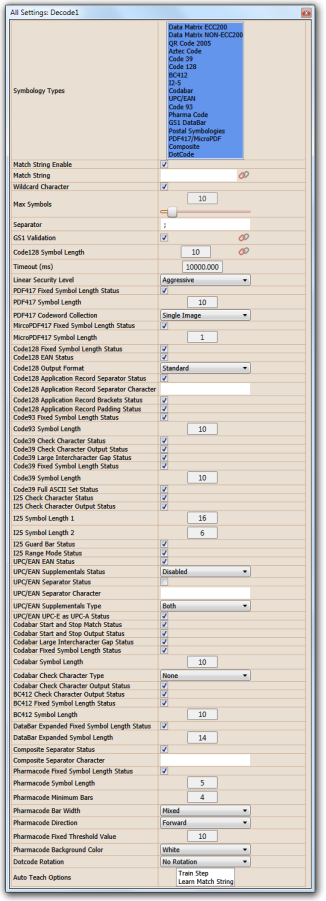
  Important: DotCode cannot be decoded at the same time as other symbologies. If your application requires the decoding of DotCode symbols, enable DotCode only.

- **Auto Teach Options:** When **Train Step** is selected and the **New Master pin** is toggled, the software will learn the data that has just been decoded. It will also learn the symbol's background color, element size, symbology, and various other characteristics. This allows the software to process future instances of the same symbol more quickly.

  When **Learn Match String** is selected and the New Master pin is toggled, the software will set the data that has just been decoded as the Match String.

  The **AutoVISION button** on the camera can also be used to set **Auto Teach** input. Hold the AutoVISION button down until you see three LED flashes, releasing the button after the third flash. Match String will be set to the symbol that is decoded in the next read cycle.

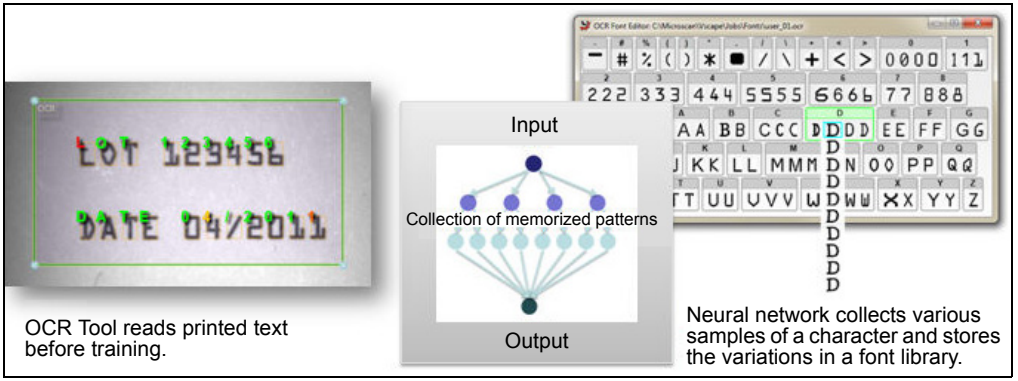
  De-select all **Auto Teach Options** in AutoVISION if you want nothing to occur when the New Master pin is toggled.



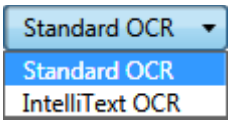
OCR Tool

The **OCR Tool** reads printed text and translates it to ASCII text. This tool:

- Reads multiple lines of text in a single ROI (region of interest).
- Features pre-loaded OCR fonts that are designed to be read without the need for training.
- Features user-trained fonts for more robust character recognition.
- Uses a multi-neural network model to allow greater character variation.
- Features **Image Pre-Processing**, which makes it easier for the tool to recognize and read characters in an image.



The OCR Tool has a **Standard OCR** capability and an **IntelliText OCR** capability. Select Standard OCR or IntelliText OCR from the dropdown menu above the tool parameters.



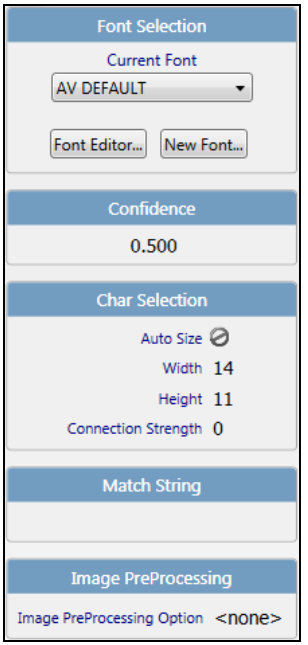
Standard OCR is sufficient for most applications, and offers font selection and editing, the ability to create new fonts, user-definable text reading confidence, auto-sizing or character selection based on width, height, and connection strength, and match string functionality.

IntelliText OCR offers most features of the standard algorithm plus the ability to set character polarity, use regular expression syntax in Match String, and perform image binarization. Use IntelliText OCR for symbols that are badly printed or marked. The IntelliText OCR algorithm is optimized for identification of characters that are tilted, out of scale, badly segmented, or otherwise difficult to read with the standard algorithm.

Important: When switching between Standard OCR and IntelliText OCR, the links between tool outputs and GDS tags are lost. This is because the underlying components that make up the OCR Tool are completely removed and then recreated whenever you change the tool's capability.

OCR Tool Parameters

Standard OCR Parameters

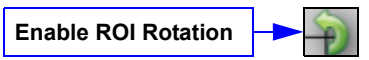


- **Font Selection:** Allows you to select the font to use, to create a new font, or to edit the current font library. New fonts are created from existing font libraries.
- **Confidence:** Allows you to specify the minimum level of character identification confidence required before a character will be read and output.
- **Character Selection:** Allows you to specify the **width** and **height** of a character (in pixels) or use **Auto Size**. Disable Auto Size for more reliable reading.

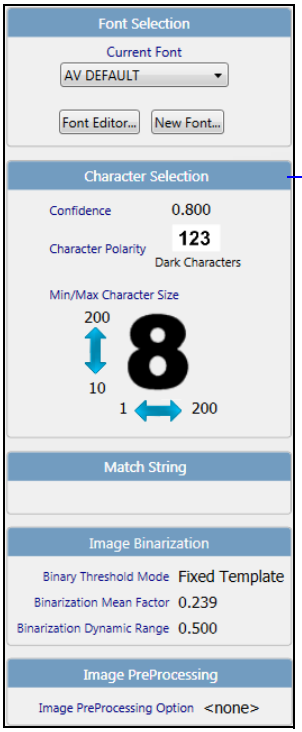
  Connection Strength helps correct for characters that are either touching or are formed by individual dots such as those produced by a dot peen stylus or inkjet printing.

  This parameter ranges from **-3** (AutoVISION will search for characters that are underprinted or not touching) to **3** (AutoVISION will search for characters that are overprinted or touching).

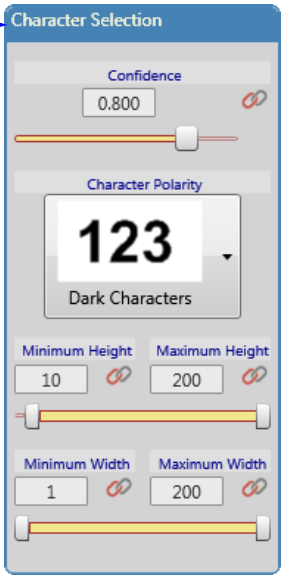
  When set to **0**, AutoVISION does not perform any pre-processing (multiple passes of an "erode" function for **-3**, **-2**, and **-1** or multiple passes of a "dilate" function for **1**, **2**, and **3**), so processing time will be decreased.
- **Match String:** Allows you to specify the string that must be matched for the OCR Tool to pass.
- **Image Pre-Processing:** Makes it easier for the tool to recognize and read characters in an image.
- **Enable ROI (Region of Interest) Rotation:** The OCR Tool can be enabled for ROI rotation by clicking the rotation icon at the upper left of the parameters view.



IntelliText OCR Parameters



Click the **Character Selection** area to open the Character Selection editor, where you can set read confidence, character polarity, and min./max. character height and width.

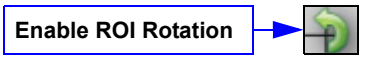


- **Font Selection:** Allows you to select the font to use, to create a new font, or to edit the current font library. New fonts are created from existing font libraries.
- **Character Selection:** Allows you to specify character requirements in multiple ways – **Confidence**, **Character Polarity**, **Min./Max. Height**, and **Min./Max. Width**.

  Confidence: Allows you to specify the minimum level of character identification confidence required before a character will be read and output.

  Character Polarity: Allows you so specify **Dark Characters** – black characters on a white background – and **Light Characters** – white characters on a black background.

  Min./Max. Character Size: Allows you to configure minimum and maximum **character width** and the minimum and maximum **character height** limits.
- **Match String:** Allows you to specify the string that must be matched for the OCR Tool to pass.
- **Image Binarization:** Converts grayscale images to black and white (binary) to optimize the readability of poorly segmented characters.
- **Image Pre-Processing:** Makes it easier for the tool to recognize and read characters in an image.
- **Enable ROI (Region of Interest) Rotation:** The OCR Tool can be enabled for ROI rotation by clicking the rotation icon at the upper left of the parameters view.

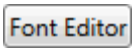


Font Editor

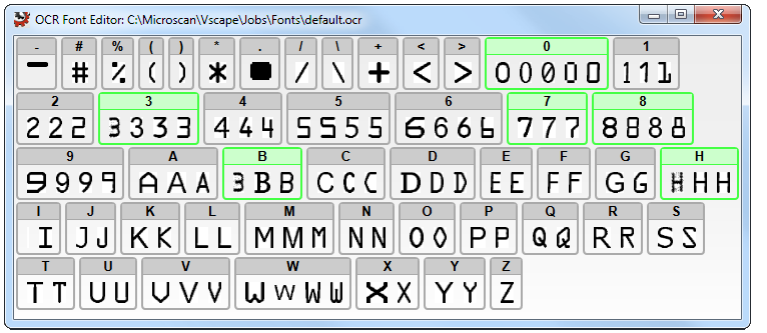
The **Font Editor** allows you to:

- View a character set
- Remove trained samples
- View default sample set characters
- View user-defined characters

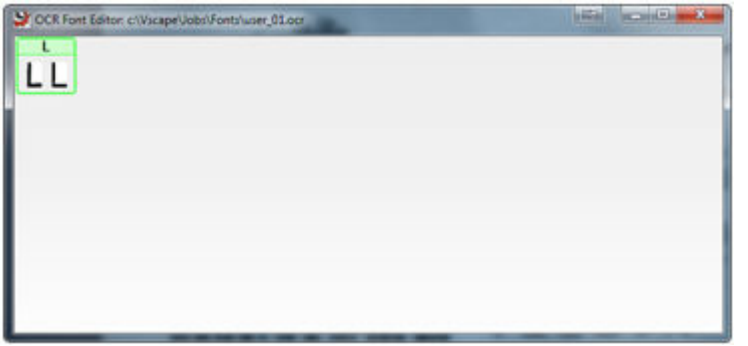
Click the **Font Editor** button in the OCR tool parameters to bring up the Font Editor.



Default characters are highlighted in gray, and user-trained characters are highlighted in green.



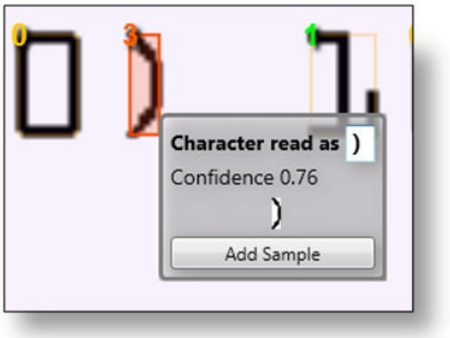
When **Use Default Font** is unchecked in OCR Advanced Parameters, the Font Editor shows only user-trained characters.



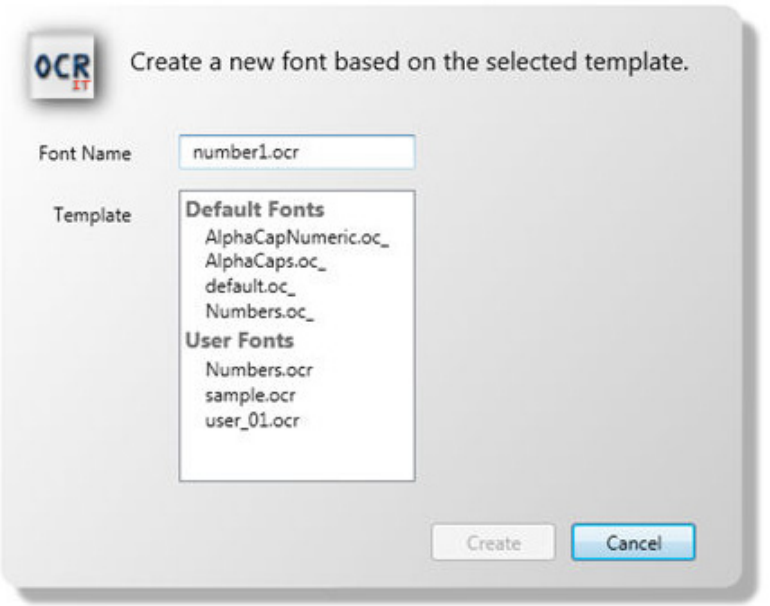
Adding a New Font

When adding a new font to AutoVISION's font library, it is only necessary to include the characters that will be used. The new characters will be added to a new font based on an existing font.

For example, if you want to add parentheses to a number library so that parentheses will be identified correctly, right-click on the character that you want to add to the library, enter it in the **Character read as** text field, and then click the **Add Sample** button.



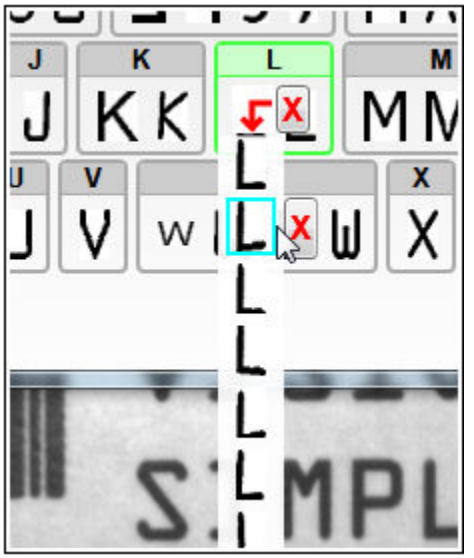
New ("user") fonts are based on existing ("default") fonts. Fonts can be named by clicking the **New Font** button and then entering the new font name in the **Font Name** text field.



Removing Multiple Character Samples Simultaneously for User-Trained Characters

When you train a new OCR character, multiple samples are added to the font library. If you add a new character accidentally, you can remove all user-trained samples for that character simultaneously.

Hovering over the first character position in a font entry shows the popup list of trained symbols. A red **X** button will appear at the top of the column of symbols. Pressing this button will remove all the user-trained data from the selected character.



Non-Printable Characters

When an OCR string contains non-printable characters, the Match String can accept hexadecimal escape codes. These are of the form **\xFF**, where **FF** represents two hexadecimal digits. The "**x**" and the hex digits are not case sensitive.

To be processed, the escape sequence must be fully formed; otherwise it is treated as if it were not an escape sequence.

For example, to match **ABCD<cr>EFG**, where **<cr>** is a carriage return (**hex 0D**), set Match String to:

ABCD\x0DEFG

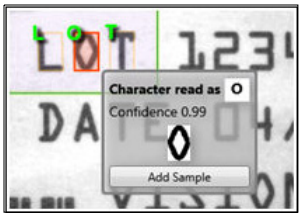
Using a serial command, this would be:

SET matchstring1 ABCD\x0DEFG

OCR Confidence

- The decoded ASCII text is placed over the printed text in the image.
- The color of the ASCII text character represents the confidence level with which it was recognized.
  - **Green: ~80 – 100%**
  - **Orange: ~60 – 79%**
  - **Red: < 60%**
- Click on any character to:
  - View confidence level
  - Add a sample to the character library
  - View a reference image

When a character is first added to the library, the original image is modified and variations of the character are also added. When samples for a given character already exist, samples up to a maximum of 10 are added. A replacement method is used to maintain the best statistical variety of samples for training.



OCR Tool Match String

OCR Tool Match String allows you to specify the string that must be matched for the OCR Tool to pass. OCR Match String allows you to enter a '**?**' character as a wildcard character.

With **IntelliText OCR**, you can also create a variable match string using **regular expressions**.

When **String Matching Method** is set to **Basic**, basic string matching will be performed on the result string.

When it is set to **Regular Expression (TRE)**, the result string will be tested against the user-defined regular expression in the match string field.

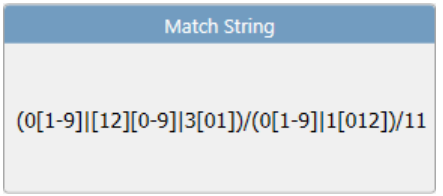
Regular expression syntax can be found here:
http://laurikari.net/tre/documentation/regex-syntax/.

Regular Expression Examples

Example expiration date string matching **"EXP (JUN|FEB) [0-9]{2} [0-9]{4}"**:

"EXP JUN 12 1998" - **match**
"EXP JUN 30 1999" - **match**
"EXP FEB 12 1998" - **match**
"EXP JVN 12 1998" - **fail**
"EXP JUN 12 98" - **fail**
"EXP JUN 12 199B" - **fail**
"LXP JUN 12 1998" - **fail**

Example date string matching **"(0[1-9]|[12][0-9]|3[01])/(0[1-9]|1[012])/11"**:



(0[1-9]|[12][0-9]|3[01]) matches **01** to **31** only.
Read as:
0 followed by **1** through **9** (**01**-**09**) *OR*
1 or **2** followed by **0** through **9** (**10**-**29**) *OR*
3 followed by **0** or **1** (**30**-**31**)

Example result

Image Binarization

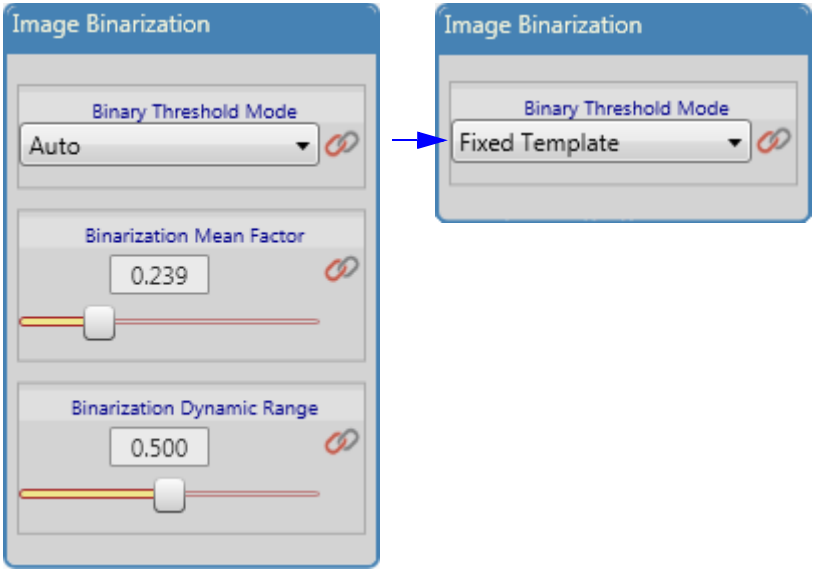
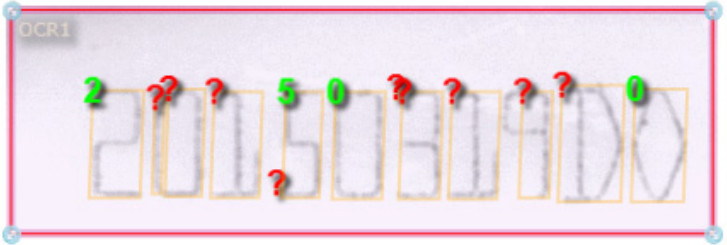


Image binarization, available in IntelliText OCR only, converts grayscale images to black and white (binary) to optimize the readability of poorly segmented characters.

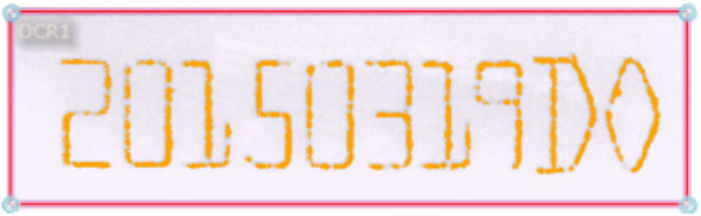
The **Auto** setting is satisfactory for most applications.

Fixed Template allows nuanced control of binarization parameters.

In the example below, multiple characters are not detected due to segmentation problems when Image Binarization is set to **Auto**. When Image Binarization is set to **Fixed Template**, the cause of the segmentation problem is revealed to be poor binarization in the original grayscale image.

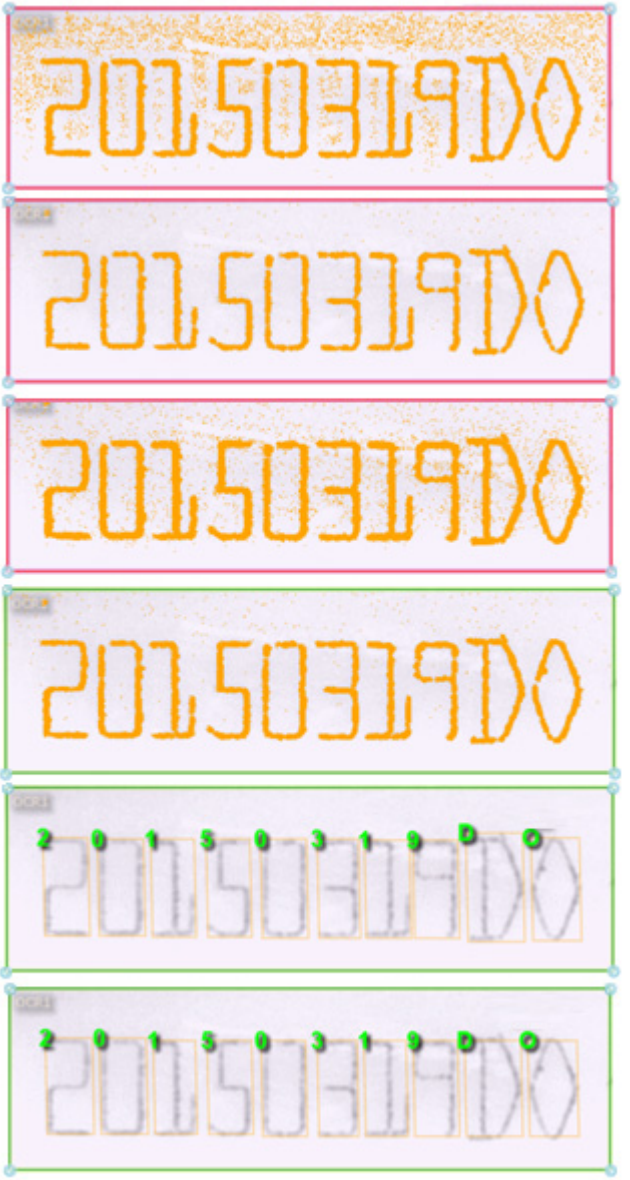


Original Grayscale Image



Binarized Image

IntelliText OCR Image Binarization – Example 1



Binarization Mean Factor: Lower from **0.5** until image noise begins to appear.

Binarization Mean Factor: Increase slightly until most of the noise disappears.

Binarization Dynamic Range: Lower from **0.5** to increase the thickness of the characters until image noise begins to appear.

Binarization Dynamic Range: Increase slightly until most of the noise disappears.

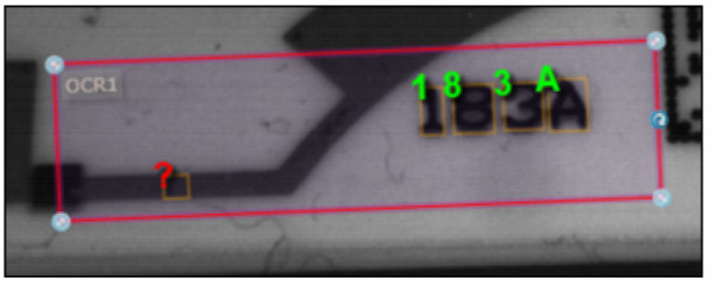
Resize the ROI: This switches the view back to the grayscale image to show corrected segmentation.

Character Size: Adjust width, height, and scale to improve segmentation further.

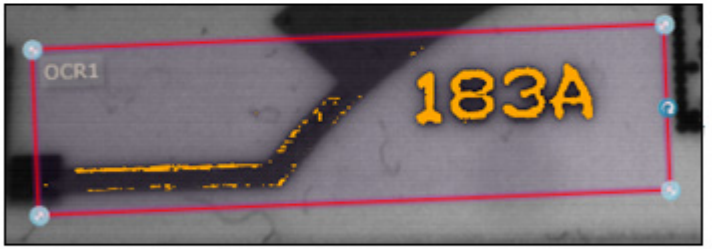
IntelliText OCR Image Binarization – Example 2

Segmentation Issue:
A and **F** tied together.

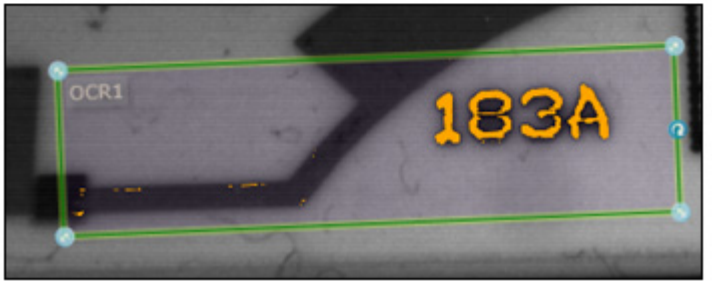
Character Size:
Use **Width** and **Height** for more consistent spacing.



Binarization Example:
Artifact causes an extra character to be detected.



Binarization:
Shows the source of the problem.



Binarization Dynamic:
Adjust fixed values to eliminate image noise.

Scaling Factor

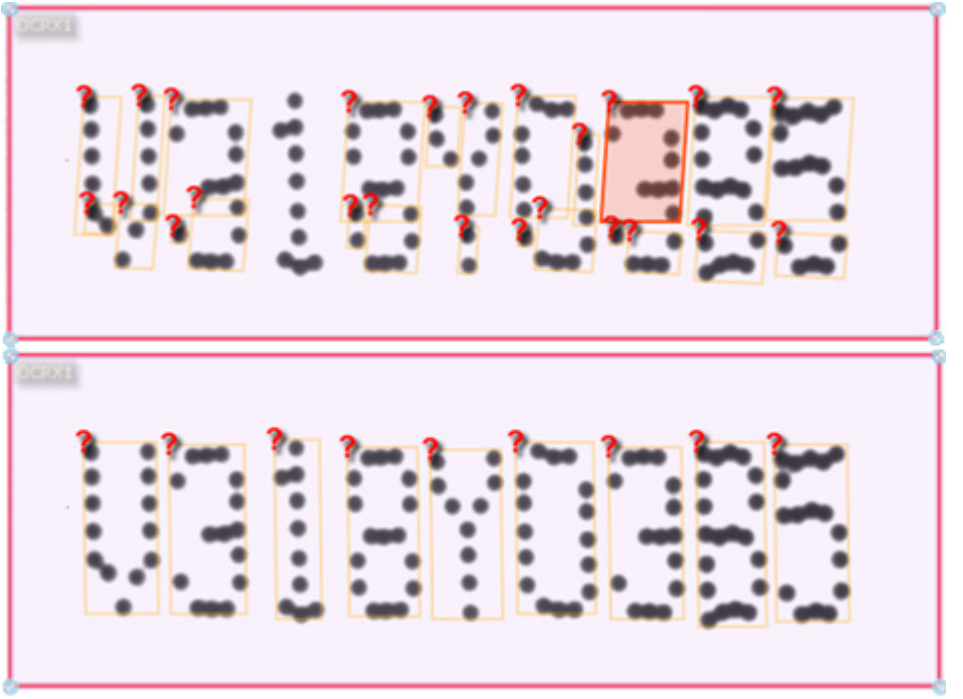
The **Scaling Factor** parameter allows you to increase or decrease the number of pixels for IntelliText OCR to process in a given OCR character. This parameter is used to change the sampling interval of the ROI (region of interest).

IntelliText OCR is optimized for detecting characters in the range of **25-50 pixels in height**. Optimal character width is **30 pixels**. If your application requires the reading of text at high resolution, particularly high resolution dot print, this parameter can improve character detection by reducing character scale.

Because reducing the sampling introduces some loss of information, you may need to configure the optical setup accordingly. Scaling provides some speed enhancements when using larger ROIs and relatively low character counts.

Scaling Factor Decrease – Example 1

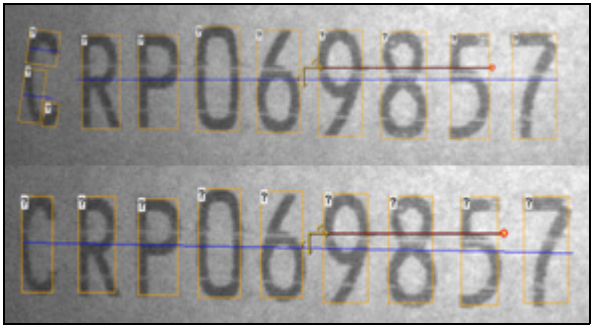
The large dot mark in this example has excellent contrast and does not require optimization using binarization, but it does have segmentation problems. This particular mark is **130 pixels high**, which causes the text segmentation not to identify entire characters properly. By reducing the scaling to **0.5**, the character height is reduced to **65 pixels** and proper segmentation becomes possible. Note, however, that a symbol such as this should be captured at a lower resolution for optimal performance.



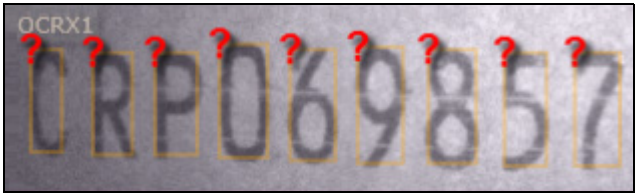
Scaling Factor Decrease – Example 2

The following large mark shows image noise and a wide dynamic change across the ROI. The automatic binarization selection works well, but the low signal-to-noise ratio on the left side of the mark causes the **C** to fail. This could be optimized by fixing the binarization.

As this mark is approximately **80 pixels high**, it is rather large for optimum text segmentation. Because the mark is so large, the algorithm has detected segments from the **C** on different lines of characters.

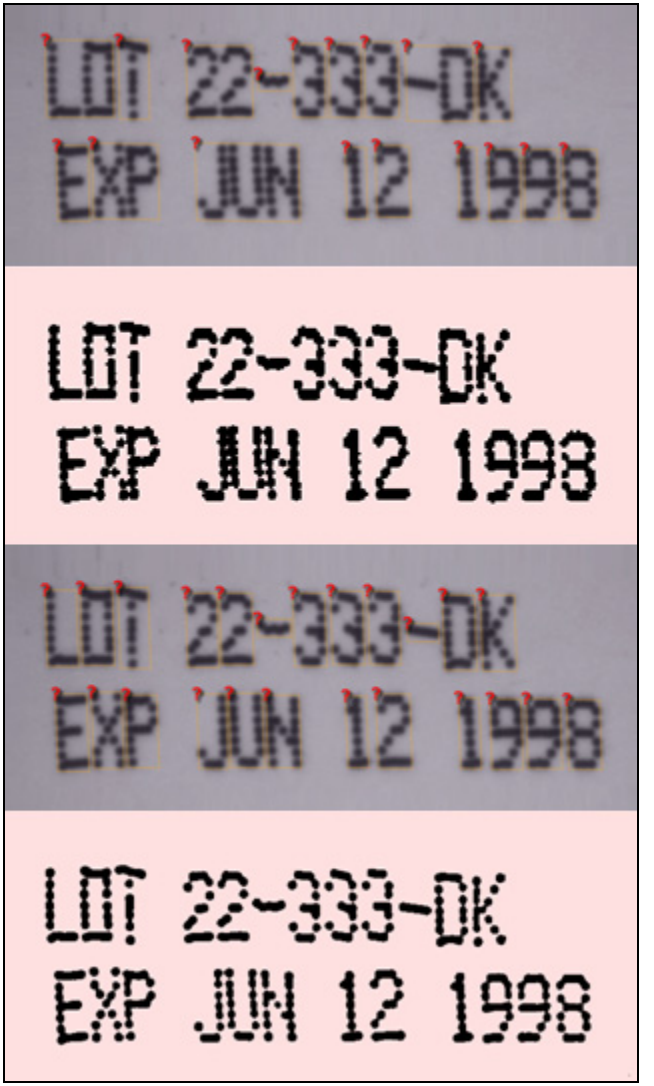


The segmentation problem is resolved by modifying scaling. This low-contrast mark may experience some instability from image to image with binarization set to **Auto**, and would likely benefit from a **Fixed Template** setting.



Scaling Factor Increase Example

In the following example, the dot mark has close characters and partially touching characters. The mark is at reasonable resolution but the close characters are creating segmentation problems. Character thresholds can be modified to separate them, but this can be challenging, particularly in the **JUN** segment. Setting the scaling to **2.0** and over-exposing the image creates a good separation that binarizes well and subsequently segments properly and consistently.



OCR Tool Outputs

The following parameter outputs can be linked using **Microscan Link**.

Important: This tool shows additional linkable outputs in the **Data Navigator Tools View** that are not shown in the main user interface. Check the Data Navigator to ensure that you are aware of all possible linkable outputs for all AutoVISION tools.

- **Status: Pass/Fail** (Compatible with the **bool** data type)
- **Character String** (Compatible with the **string** data type)
- **Number of Characters Found** (Compatible with the **sint32** data type)
- **Match Status** (Compatible with the **bool** data type)
- **Minimum Character Confidence** (Compatible with the **double** data type)
- **Maximum Character Confidence** (Compatible with the **double** data type)
- **Mean Character Confidence** (Compatible with the **double** data type)

OCR Tool Advanced Parameters

Click the **Advanced Parameters** icon at the upper right of the **Edit** view to access **OCR Tool Advanced Parameters**.

Standard OCR

- **Use Default Font:** Intended for when no user-trained character is found.
- **Font:** Selects the font that the OCR Tool will use to identify characters.
- **Confidence:** Specifies the minimum level of confidence required before a character will be read.
- **Auto Size:** Automatically determines the size of OCR output text.
- **Connection Strength:** Determines the required connection strength for text to be read.
- **Unknown Character:** Allows you to specify the character that will be output if a detected character is not recognized.
- **Multiline Separator:** Allows you to determine the character that will be used as a separator for multi-line OCR output.
- **Match String Enable:** Enables or disables Match String functionality for the OCR Tool.
- **Match String:** Allows you to specify the string that must be matched for the OCR Tool to pass.
- **Min Character Area (Pixels):** Allows you to determine the minimum size in pixels of the area in which a given character is located.
- **Use Wildcard ? in Match String:** Sets the wildcard character to **'?'** for Match String.
- **Auto Teach Options:** When **Learn Match String** is selected and the **New Master pin** is toggled, the software will set the OCR string that has just been decoded as the Match String.

  The **AutoVISION button** on the camera can also be used to set **Auto Teach** input. Hold the AutoVISION button down until you see three LED flashes, releasing the button after the third flash. Match String will be set to the OCR string that is decoded in the next read cycle.

  Note: De-select **Auto Teach Options** if you want nothing to occur when the New Master pin is toggled.

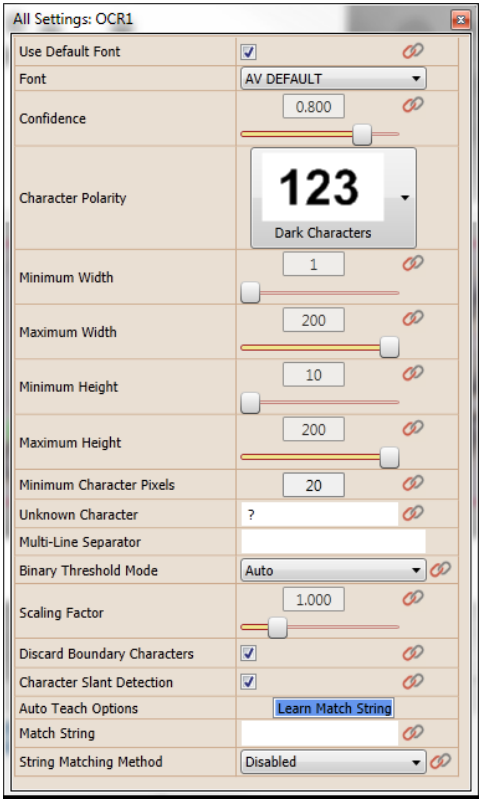
IntelliText OCR

- **Use Default Font:** Intended for when no user-trained character is found.
- **Font:** Selects the font that the OCR Tool will use to identify characters.
- **Confidence:** Specifies the minimum level of confidence required before a character will be read.
- **Character Polarity:** Dark Characters = black characters on a white background. Light Characters = white characters on a black background.
- **Minimum Width:** Minimum width of detected characters.
- **Maximum Width:** Maximum width of detected characters.
- **Minimum Height:** Minimum height of detected characters.
- **Maximum Height:** Maximum height of detected characters.
- **Minimum Character Pixels:** Defines the minimum number of foreground pixels required to form a valid character. Characters with a foreground pixel count lower than this value will be filtered from the segmented characters as a final step before characters are processed for identification.

- **Unknown Character:** Allows you to specify the character that will be output if a detected character is not recognized.
- **Multi-Line Separator:** Allows you to determine the character that will be used as a separator for multi-line OCR output.
- **Binary Threshold Mode:** Change between fixed template and automatic binary thresholding.
- **Scaling Factor:** The factor by which characters are scaled up or down.
- **Discard Boundary Characters:** Eliminates any binary objects that are touching the boundary ROI (region of interest).
- **Character Slant Detection:** Detects and processes characters that are slanted in relation to the text string angle.
- **Auto Teach Options:** When **Learn Match String** is selected and the **New Master pin** is toggled, the software will set the OCR string that has just been decoded as the Match String.

  The **AutoVISION button** on the camera can also be used to set **Auto Teach** input. Hold the AutoVISION button down until you see three LED flashes, releasing the button after the third flash. Match String will be set to the OCR string that is decoded in the next read cycle.

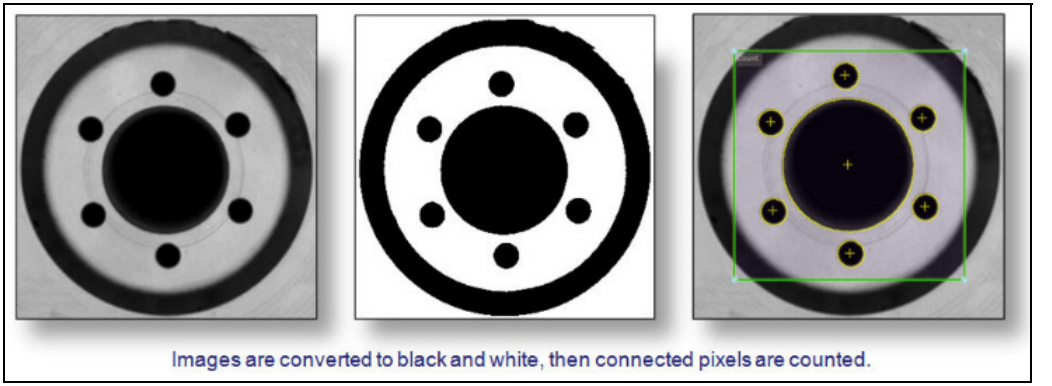
  Note: De-select **Auto Teach Options** if you want nothing to occur when the New Master pin is toggled.
- **String Matching Method:** Method of string matching to apply to the Output String during tool execution.



Count Tool

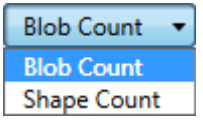
The **Count Tool** allows you to count the number of objects found within the region of interest. This tool counts areas of connected light or dark pixels. The Count Tool is ideal for:

- Verifying the correct number of parts in a tray.
- Verifying the correct number of holes in a part.
- Detecting and reporting the number of objects in the image.



Images are converted to black and white, then connected pixels are counted.

The Count Tool has a **Blob Count** capability and a **Shape Count** capability. Select Blob Count or Shape Count from the dropdown menu above the tool parameters.



The Count Tool's Blob Count capability features **Image Pre-Processing**, which makes it easier for the tool to detect features in an image.

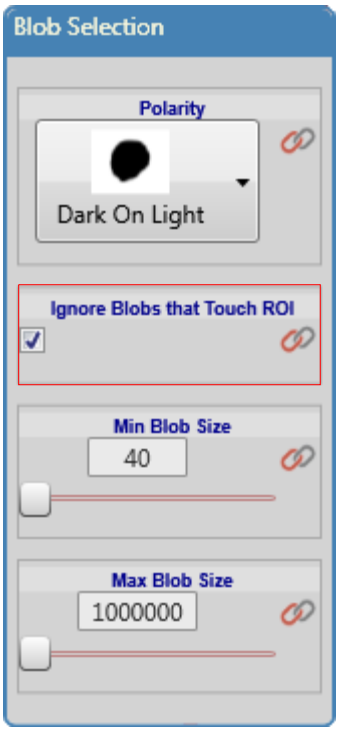
Important: When switching between **Blob Count** and **Shape Count**, the links between tool outputs and GDS tags are lost. This is because the underlying components that make up the Count Tool are completely removed and then recreated whenever you change the tool's capability.

Count Tool Parameters

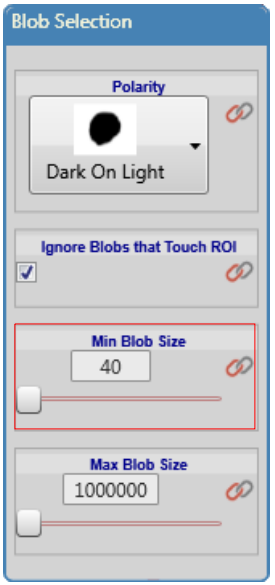
Blob Count

- **Polarity:** Determines whether to count objects that are either lighter or darker than the background.

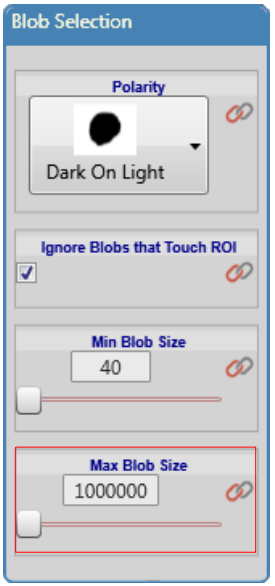
- **Ignore Blobs that Touch the ROI:** When enabled, blobs that touch the edge of the ROI (region of interest) will not be detected.



- **Min Blob Size:** Objects smaller than the defined size (in pixels) will be ignored.

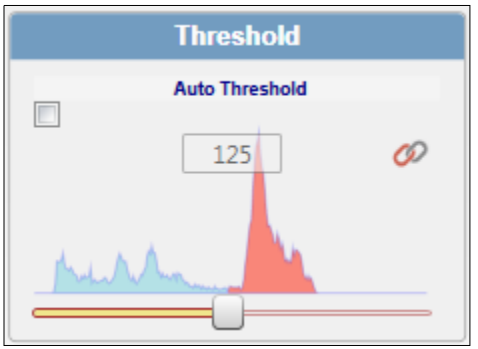


- **Max Blob Size:** Objects larger than the defined size (in pixels) will be ignored.

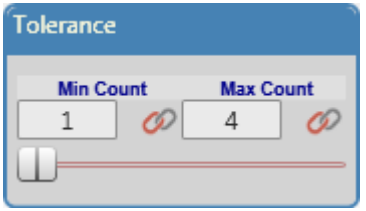


- **Threshold:** The Count Tool's Blob Count capability displays a histogram of the gray values witin its region of interest. This provides a visual aide when setting the tool's threshold value. The histogram shows where the majority of the dark pixels (to the left) and the light pixels (to the right) are on the gray scale. You can use the slider to adjust the threshold to a point between the two peaks. The portion of the histogram that is above the threshold is displayed in red; the portion that is below the threshold is displayed in blue.

  Selecting **Auto Threshold** will instruct the software to compute the threshold automatically.



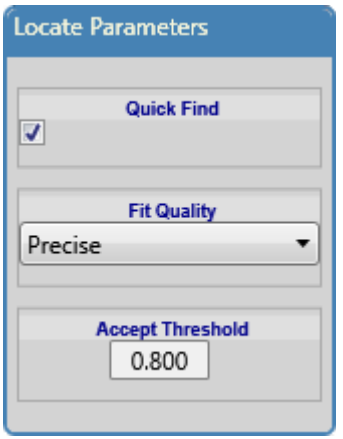
- **Tolerance:** Sets the tolerance on the minimum and maximum number of pixels allowable for the inspection to pass.



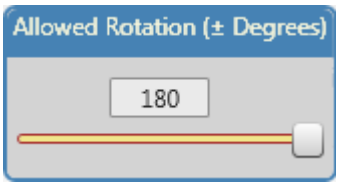
- **Enable ROI (Region of Interest) Rotation:** The Count Tool's Blob Count capability can be enabled for ROI rotation by clicking the rotation icon at the upper left of the parameters view.

Shape Count

- **Quick Find:** Uses a rough location. Faster but less accurate.
- **Fit Quality:** Defines how closely the identified feature must match the template (**Relaxed**, **Normal**, **Precise**).
- **Accept Threshold:** A ratio that determines how well the located feature must match the trained feature. (**0.1 – 1**, where **1** = perfect match.)

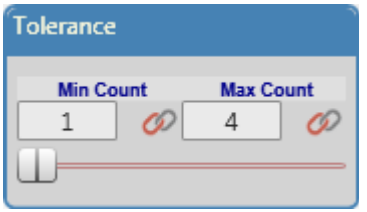


- **Allowed Rotation:** Sets a limit on how much the object can rotate and still be recognized.



Hint: The Count Tool is configured to handle 360 degrees of rotation by default. However, reducing the Allowed Rotation (± Degrees) will speed up the tool's performance considerably.

- **Tolerance:** Sets the tolerance on the minimum and maximum number of pixels allowable for the inspection to pass.



Count Tool Outputs

The following parameter outputs can be linked using **Microscan Link**:

- **Status: Pass/Fail** (Compatible with the **bool** data type)
- **Number of Parts** (Compatible with the **sint32** data type)
- **Location: X, Y, Angle (Shape Count Only)** (Compatible with the **double** data type)
- **Fit Quality (Shape Count Only)** (Compatible with the **double** data type)

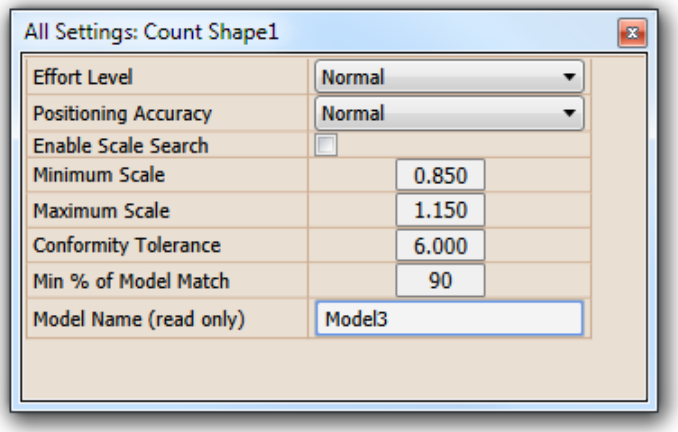
Count Tool Shape Count Advanced Parameters

Click the **Advanced Parameters** icon at the upper right of the **Edit** view to access **Count Tool Shape Count Advanced Parameters**.

- **Effort Level:** Determines how hard the tool should work to locate the feature. Increasing the effort level slows down the inspection.
- **Positioning Accuracy:** Determines the precision with which the location of the feature is reported.
- **Enable Scale Search:** When enabled, features can still be located if they change in size from image to image.

  Note: Setting the Allowed Rotation of the Count Tool (Shape Count) to any value between **0-5°** enables **Scale Search**. Setting Allowed Rotation to any value between **6-180°** disables Scale Search.
- **Minimum Scale:** Sets the minimum scale change that is allowed between the located feature and the trained feature. For example, 2 signifies that half the trained size is acceptable.
- **Maximum Scale:**Sets the maximum scale change that is allowed between the located feature and the trained feature. For example, 0.5 signifies that half the trained size is acceptable.
- **Conformity Tolerance:** Determines how tolerant of distortion the tool is. Increase this value to allow more distorted features to be located.

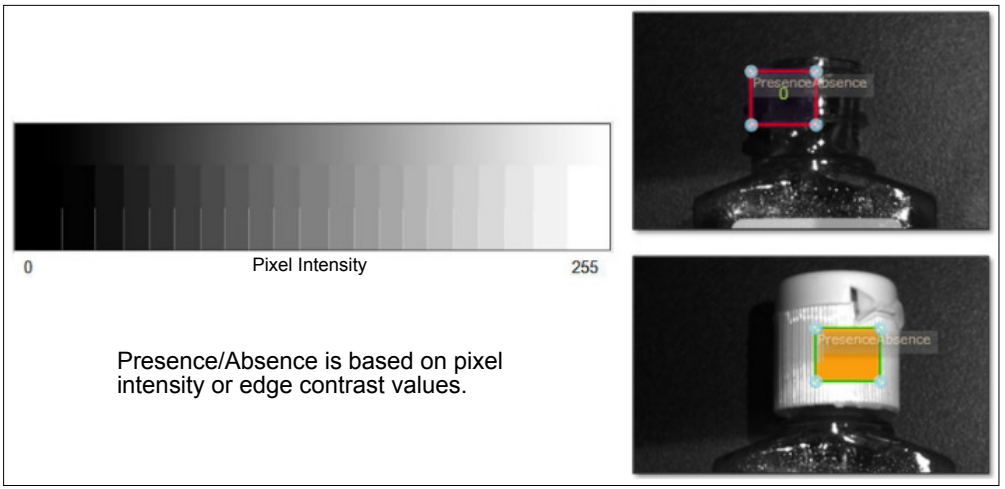
  Important: Before Shape Count is trained on a feature, the Conformity Tolerance for **Relaxed Fit Quality** is **14.000**, **Normal** is **10,000**, and **Precise** is **6.000**. After the tool is trained, **Relaxed Fit Quality** is **10.000**, **Normal** is **6.000**, and **Precise** is **2.000**.
- **Min % of Model Match:** Sets the minimum percentage of the trained model that must match a feature for that feature to be located and counted.
- **Model Name (Read Only):** The name that is assigned to the contour file for the tool. The contour file is saved in **\Microscan\Vscape\Jobs\Contours**.



Presence/Absence Tool

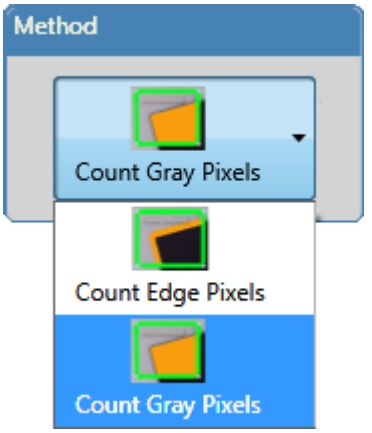
The **Presence/Absence Tool** detects the presence of a feature based on pixel intensity or contrast. This tool:

- Counts the number of pixels within a range of intensity from **0** to **255**.
- Counts the number of pixels where there is contrast in the image (pixels that lie along the edge of a feature, for example).



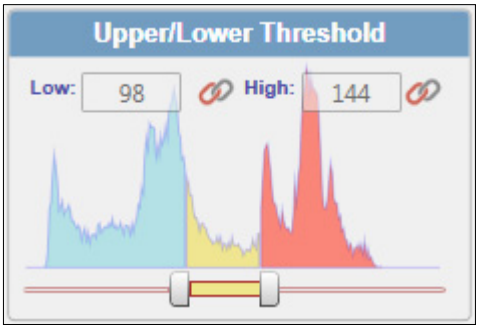
Presence/Absence Tool Parameters

- **Function:** Counts gray pixels within the range defined by the threshold; counts edge pixels that cross over the gradient threshold value.
- **Method:** Counts pixels between a range of gray values *or* counts pixels along an edge transition. **Count Edge Pixels** counts pixels along the edges of objects. **Count Gray Pixels** counts pixels that fall within the specified range of gray values.

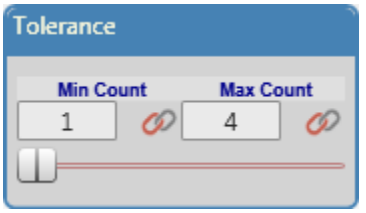


- **Threshold:** Sets the pixel value(s) to be located (**0** = black, **255** = white). This changes based on whether **Count Gray Pixels** or **Count Edge Pixels** is selected in the **Function** menu. Count Gray Pixels allows you to set both a **Low Threshold** and **High Threshold** within which to count. Count Edge Pixels allows you to determine the point at which a feature's edges are recognized as edges.

  The Presence/Absence Tool's Count Gray Pixels capability displays a histogram of the gray values within its region of interest. This provides a visual aide when setting the tool's low and high threshold values. The dual slider allows you to adjust both the upper and lower thresholds. The portion of the histogram that is within the threshold range is displayed in yellow; the portion that is below the low threshold is displayed in blue; the portion that is above the high threshold is displayed in red.



- **Tolerance:** Sets the tolerance on the minimum and maximum number of pixels allowable for the inspection to pass.



- **Enable ROI (Region of Interest) Rotation**

Presence/Absence Tool Outputs

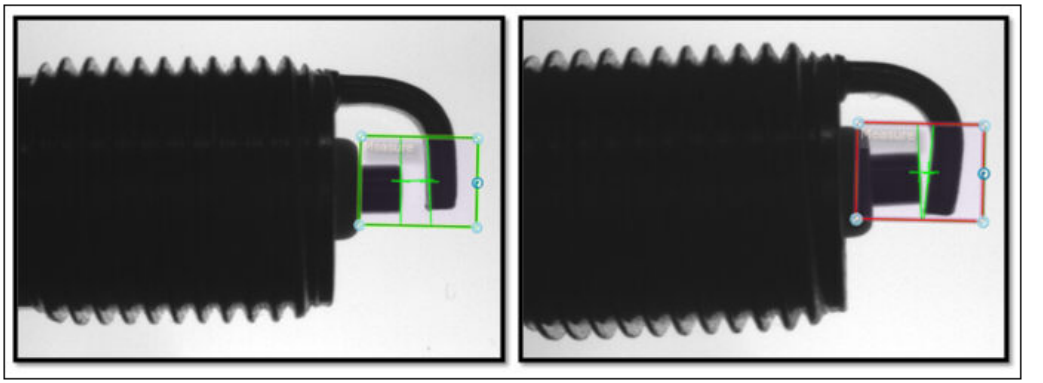
The following parameter outputs can be linked using **Microscan Link**:

- **Status: Pass/Fail** (Compatible with the **bool** data type)
- **Pixel Count** (Compatible with the **sint32** data type)

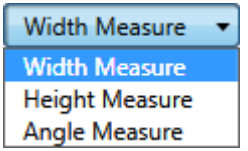
Measure Tool

The **Measure Tool** allows you to perform width or height measurements between two edges. This tool:

- Finds two edges, then measures the distance between them.
- Looks for dark objects on a light background or light objects on a dark background.
- Outputs measurements in pixels.
- Rejects measurements outside the user-defined tolerances.
- Features **Image Pre-Processing**, which makes it easier for the tool to measure width, height, and angle within an image.



The Measure Tool has a **Width Measure**, **Height Measure**, and **Angle Measure** capability. Select the desired capability from the dropdown menu above the tool parameters.



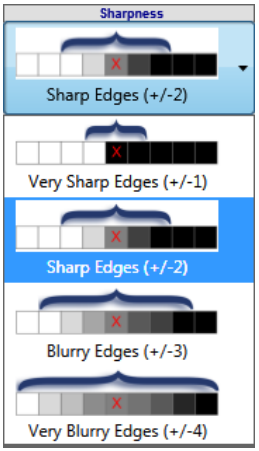
Important: When switching between Width Measure, Height Measure, and Angle Measure, the links between tool outputs and GDS tags are lost. This is because the underlying components that make up the Measure Tool are completely removed and then recreated whenever you change the tool's capability.

Measure Tool Parameters

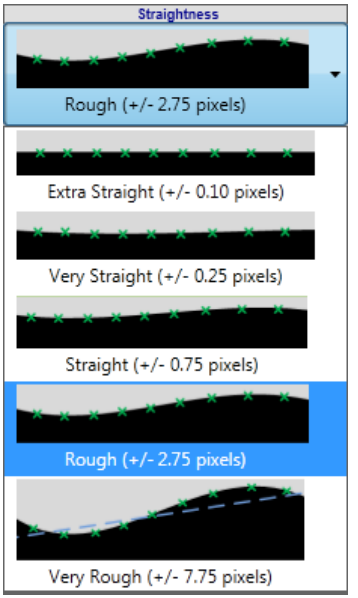
Width Measure

- **Function:** Width measurement
- **Edge Selection – Polarity:** Determines whether to measure a dark or light object with respect to the background. **Light to Dark Edges** searches for edges that transition from a light background to a dark object. **Dark to Light Edges** searches for edges that transition from a dark background to a light object. **Any Edge** searches for edges of any polarity.

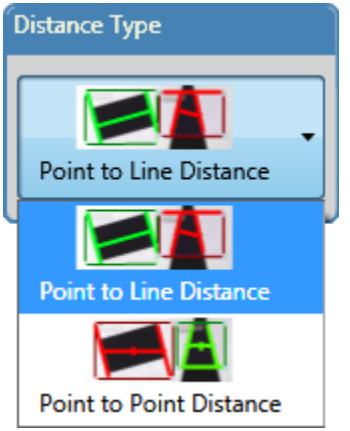
- **Edge Selection – Sharpness:** Determines the sharpness of the edge. **Very Sharp Edges (+/-1)** calculates gradients by looking 1 pixel before and 1 pixel after the analysis pixel. **Sharp Edges (+/-2)** calculates gradients by looking 2 pixels before and 2 pixels after the analysis pixel. **Blurry Edges (+/-3)** calculates gradients by looking 3 pixels before and 3 pixels after the analysis pixel. **Very Blurry Edges (+/-4)** calculates gradients by looking 4 pixels before and 4 pixels after the analysis pixel.



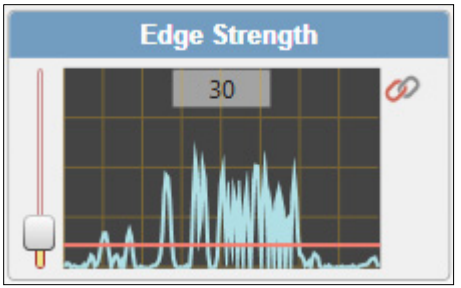
- **Edge Selection – Straightness:** Determines the straightness of the edge.



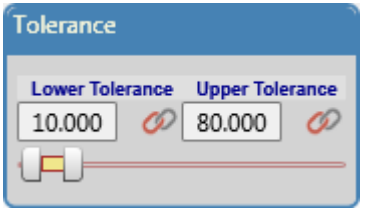
- **Distance Type:** Determines how the distance between two edges of the object should be calculated. **Point to Line Distance** measures the perpendicular distance from the first edge's center point to the second edge's best fit line. Choose Point to Line Distance when measuring between parallel lines. **Point to Point Distance** measures the distance from the center points of two edges. Choose Point to Point Distance when measuring between non-parallel lines, or when you want the rotation of the lines to be ignored.



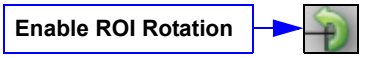
- **Edge Strength:** The Measure Tool provides a gradient plot to assist with the setting of the edge threshold. The plot shows you how strong the transitions from dark to light or light to dark (gradients) are within the tool's region of interest. The plot is calculated down the center of the ROI, left-to-right when measuring width, top-to-bottom when measuring height, and at the user-defined angle when measuring angle. A red horizontal line shows where the current threshold is set. Use the slider to adjust the threshold to an optimum value.



- **Tolerance:** Lower and upper tolerance in pixels.



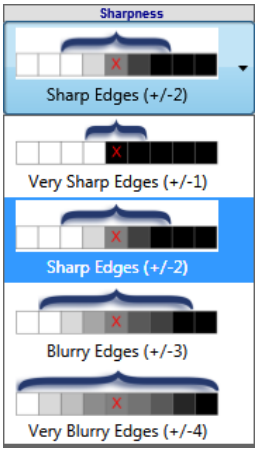
- **Enable ROI (Region of Interest) Rotation:** The Measure Tool's Width Measure capability can be enabled for ROI rotation by clicking the rotation icon at the upper left of the parameters view.



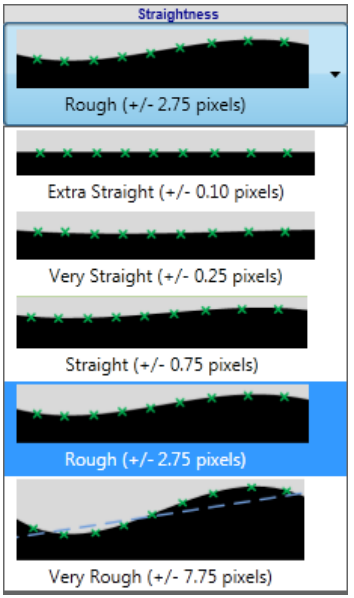
Height Measure

- **Function:** Height measurement
- **Edge Selection – Polarity:** Determines whether to measure a dark or light object with respect to the background. **Light to Dark Edges** searches for edges that transition from a light background to a dark object. **Dark to Light Edges** searches for edges that transition from a dark background to a light object. **Any Edge** searches for edges of any polarity.

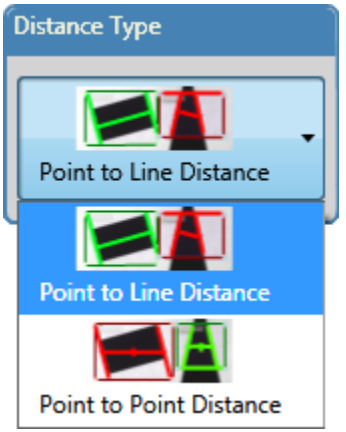
- **Edge Selection – Sharpness:** Determines the sharpness of the edge. **Very Sharp Edges (+/-1)** calculates gradients by looking 1 pixel before and 1 pixel after the analysis pixel. **Sharp Edges (+/-2)** calculates gradients by looking 2 pixels before and 2 pixels after the analysis pixel. **Blurry Edges (+/-3)** calculates gradients by looking 3 pixels before and 3 pixels after the analysis pixel. **Very Blurry Edges (+/-4)** calculates gradients by looking 4 pixels before and 4 pixels after the analysis pixel.



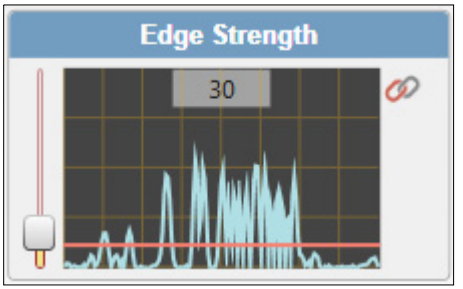
- **Edge Selection – Straightness:** Determines the straightness of the edge.



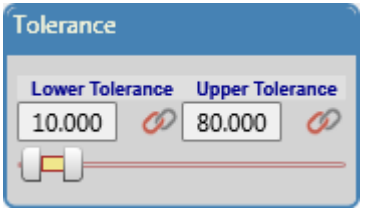
- **Distance Type:** Determines how the distance between two edges of the object should be calculated. **Point to Line Distance** measures the perpendicular distance from the first edge's center point to the second edge's best fit line. Choose Point to Line Distance when measuring between parallel lines. **Point to Point Distance** measures the distance from the center points of two edges. Choose Point to Point Distance when measuring between non-parallel lines, or when you want the rotation of the lines to be ignored.



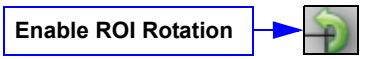
- **Edge Strength:** The Measure Tool provides a gradient plot to assist with the setting of the edge threshold. The plot shows you how strong the transitions from dark to light or light to dark (gradients) are within the tool's region of interest. The plot is calculated down the center of the ROI, left-to-right when measuring width, top-to-bottom when measuring height, and at the user-defined angle when measuring angle. A red horizontal line shows where the current threshold is set. Use the slider to adjust the threshold to an optimum value.



- **Tolerance:** Lower and upper tolerance in pixels.

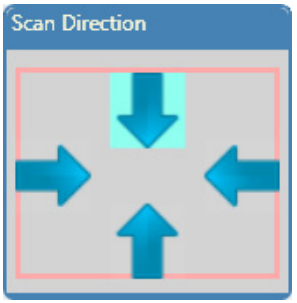


- **Enable ROI (Region of Interest) Rotation:** The Measure Tool's Height Measure capability can be enabled for ROI rotation by clicking the rotation icon at the upper left of the parameters view.



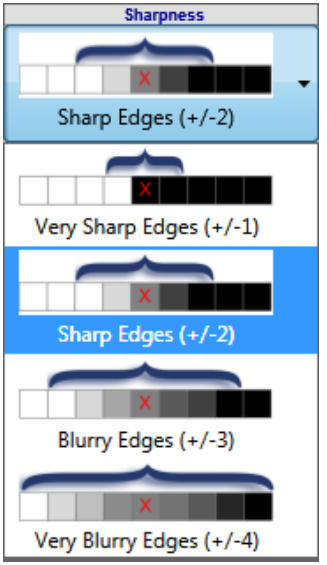
Angle Measure

- **Function:** Angle measurement
- **Scan Direction:** Determines whether the tool will scan for an edge from top to bottom, left to right, right to left, or bottom to top.

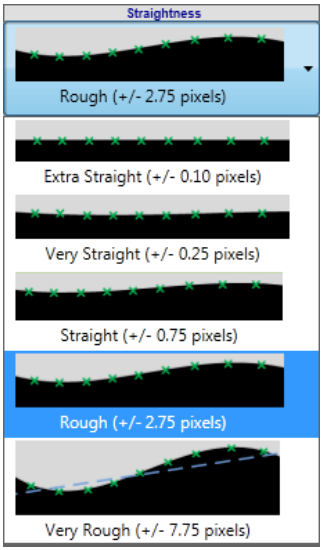


- **Edge Selection – Polarity:** Determines whether to measure a dark or light object with respect to the background. **Light to Dark Edges** searches for edges that transition from a light background to a dark object. **Dark to Light Edges** searches for edges that transition from a dark background to a light object. **Any Edge** searches for edges of any polarity.

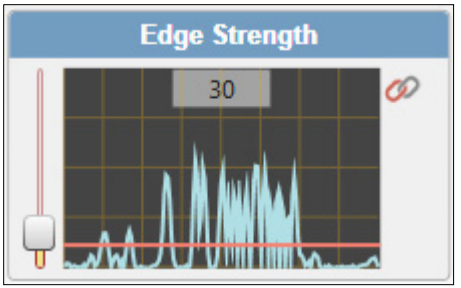
- **Edge Selection – Sharpness:** Determines the sharpness of the edge. **Very Sharp Edges (+/-1)** calculates gradients by looking 1 pixel before and 1 pixel after the analysis pixel. **Sharp Edges (+/-2)** calculates gradients by looking 2 pixels before and 2 pixels after the analysis pixel. **Blurry Edges (+/-3)** calculates gradients by looking 3 pixels before and 3 pixels after the analysis pixel. **Very Blurry Edges (+/-4)** calculates gradients by looking 4 pixels before and 4 pixels after the analysis pixel.



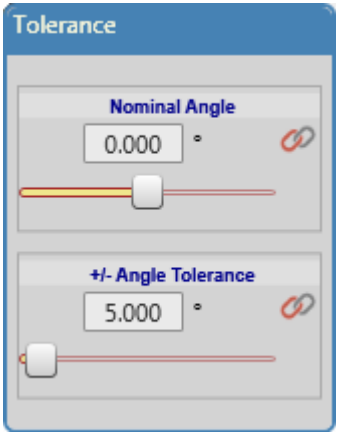
- **Edge Selection – Straightness:** Determines the straightness of the edge.



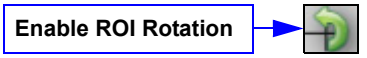
- **Edge Strength:** The Measure Tool provides a gradient plot to assist with the setting of the edge threshold. The plot shows you how strong the transitions from dark to light or light to dark (gradients) are within the tool's region of interest. The plot is calculated down the center of the ROI, left-to-right when measuring width, top-to-bottom when measuring height, and at the user-defined angle when measuring angle. A red horizontal line shows where the current threshold is set. Use the slider to adjust the threshold to an optimum value.



- **Tolerance:** Expected angle measurement and the range the angle can vary from the nominal angle, in degrees.



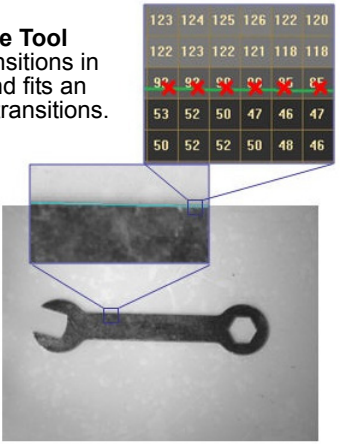
- **Enable ROI (Region of Interest) Rotation:** The Measure Tool's Angle Measure capability can be enabled for ROI rotation by clicking the rotation icon at the upper left of the parameters view.



Identifying an Edge

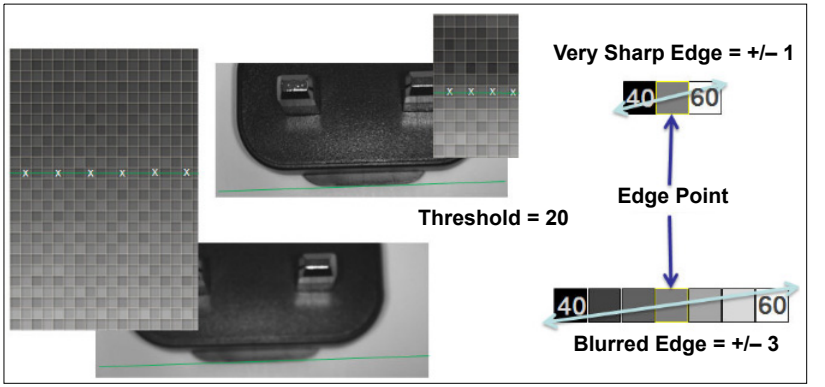
- Transitions between dark and light pixels are located.
- Several edge points are created from those transitions.
- The best possible line is then fit to the edge points.

The **Measure Tool** looks for transitions in grayscale and fits an edge to the transitions.



Locating Transitions between Light and Dark

- Edge points are found based on gradient changes over a number of pixels.
- Threshold = Transition of gradient values
- Sharpness = Number of pixels allowed for gradient change

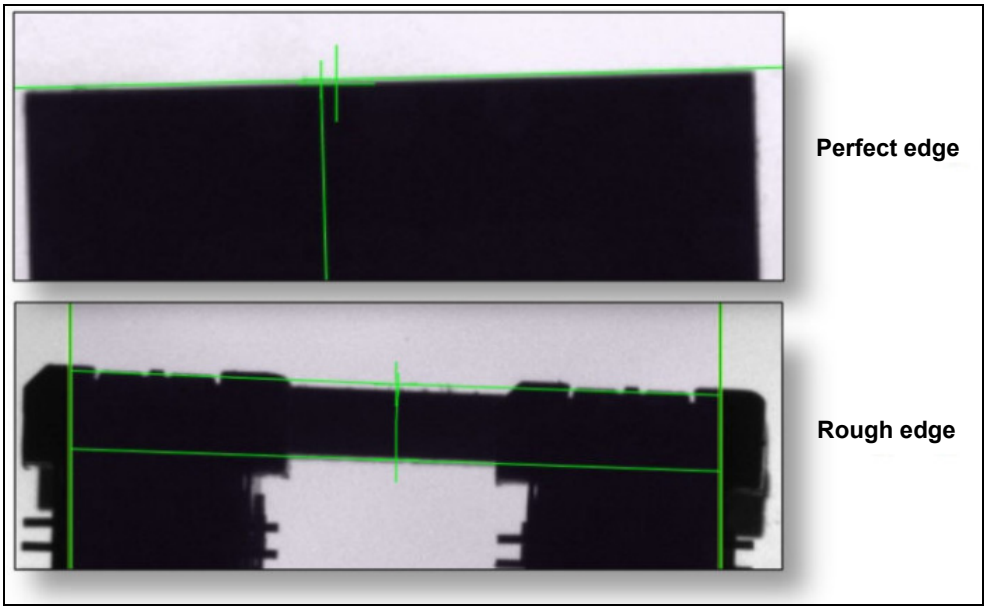


Fitting an Edge Line to Edge Points

- Edge straightness determines how to fit the line.

  Perfect Edge = Accurate edge line placement; stray edge points are ignored.

  Rough Edge = Edge line placement uses an average of all edge points including stray edges. This is useful when no clearly-defined line is available.



Measure Tool Outputs

The following parameter outputs can be linked using **Microscan Link**.

Important: This tool shows additional linkable outputs in the **Data Navigator Tools View** that are not shown in the main user interface. Check the Data Navigator to ensure that you are aware of all possible linkable outputs for all AutoVISION tools.

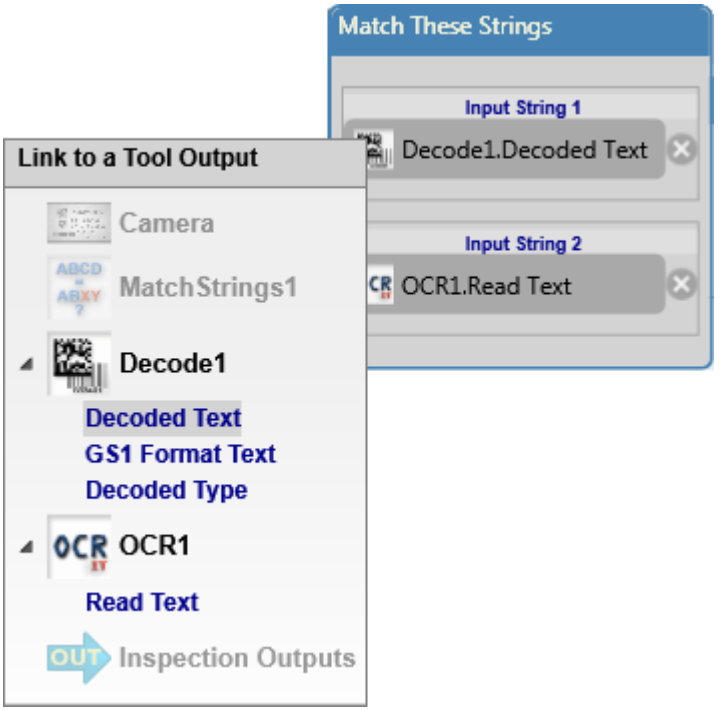
- **Status: Pass/Fail** (Compatible with the **bool** data type)
- **Measurement (Width Measure and Height Measure only)** (Compatible with the **double** data type)
- **Edge Point 1** (Compatible with the **double** data type)
- **Edge Point 2 (Width Measure and Height Measure only)** (Compatible with the **double** data type)
- **Edge Line 1** (Compatible with the **double** data type)
- **Edge Line 2 (Width Measure and Height Measure only)** (Compatible with the **double** data type)
- **Edge Angle (Angle Measure only)** (Compatible with the **double** data type)

Match Strings Tool

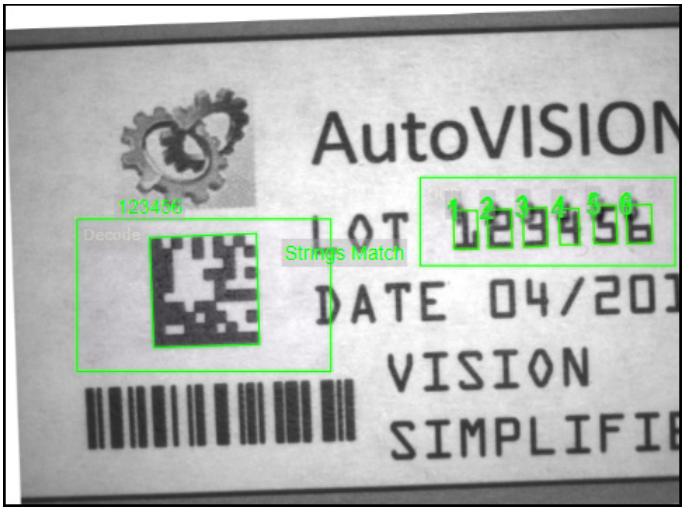
The **Match Strings Tool** allows you to specify the string that must be matched for the tool to pass.

The Match Strings Tool:

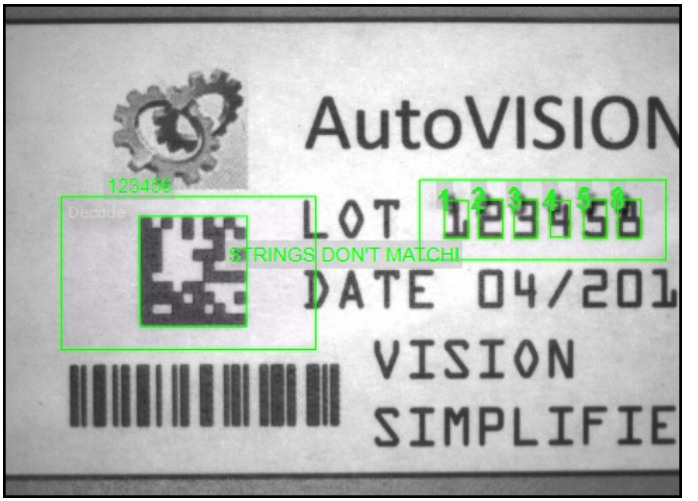
- Uses the outputs from the **Decode Tool**, **OCR Tool**, **String Format Tool**, and **Verification Tool**.
  Note: These other tools must execute before **Match Strings** in the job list.
- Compares the two strings.
- Reports whether the tool passes (i.e. the two strings are the same) and when the tool fails (i.e. when the two strings are different).



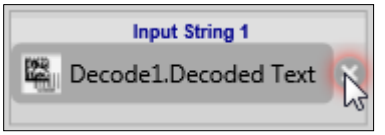
When the two strings match, the message "Strings Match" is shown in the main view area.



When the two strings don't match, the message "STRINGS DON'T MATCH!" is shown in the main view area.



Hint: To reset the **Input String 1** or **Input String 2** values to **Not Connected**, click the **X** to the right of the value you want to disconnect.



Match Strings Tool Output

The following parameter output can be linked using **Microscan Link**:

- **Status: Pass/Fail** (Compatible with the **bool** data type)
- **Output String** (Compatible with the **string** data type)

String Format Tool

This tool allows you to format a string to be output. You can select up to two input strings and format based on the following rules:

- Extracted characters are specified by []. [1-4] extract characters 1 through 4. [12] Extracts character 12. [] = Entire string.
- Special characters are specified by '\'. **\t** (horizontal tab), **\r** (carriage return), and **\n** (new line) are supported.
- Any other characters are inserted into the final string.

Examples:

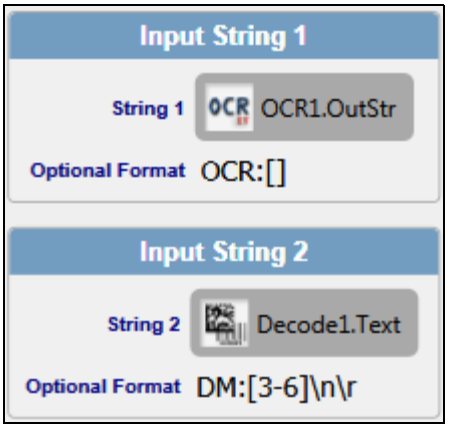
- String = 123
  Format = Start[]end
  Output = Start123end
- String = ABCDEFG
  Format = [2-4][7]
  Output = BCDG
- String = ABCDEFG
  Format = *[2-4]**[7]?
  Output = *BCD**G?

Note: The String Format Tool only accepts the three special characters mentioned above.

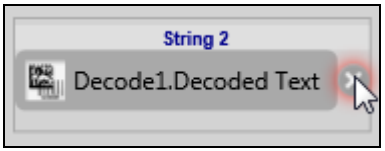
The String Format Tool can:

- Extract a substring from the input string(s) from the **Decode Tool**, **OCR Tool**, or **Verification Tool**.
- Format characters to be appended or inserted into the input string;
- Append the second input string to the first input string (if two strings are specified).

Hint: Reformat the data as required, then use **Match Strings**.



Hint: To reset the **Input String 1** or **Input String 2** values to **Not Connected**, right-click the Input String value you want to reset and click **Disconnect**.



Non-Printable Characters

The String Format Tool accepts the following special characters, which can be used to configure the output string:

\a bell
\b backspace
\f form feed
\n new line
\r carriage return
\t horizontal tab
\v vertical tab
\' single quote
\x022 double quote (**"**)
\? question mark
\ooo three digit octal notation ASCII value, i.e. **\145** = **'e'**
\x0hh hexadecimal notation ASCII value, i.e. **\0x04C** = **'L'**

Note: To escape the '\' character, use the hexadecimal or octal versions **\x5c** or **\134**.

String Format Tool Outputs

The following parameter outputs can be linked using **Microscan Link**.

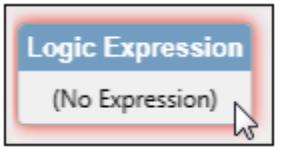
- **Status: Pass/Fail** (Compatible with the **bool** data type)
- **Output String** (Compatible with the **string** data type)
- **String 1 Formatted** (Compatible with the **string** data type)
- **String 2 Formatted** (Compatible with the **string** data type)

Logic Tool

The **Logic Tool** allows you to build simple logic expressions in AutoVISION. These expressions make it possible to combine the results of multiple Tools and tie those results to outputs.

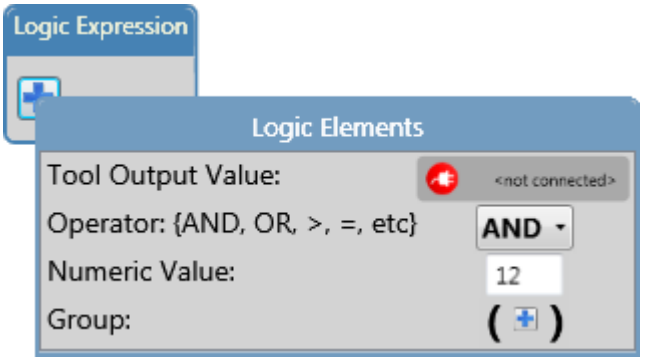
Logic Tool Parameters

Click the **Logic Expression** field to start building a logic expression.



Click the **+** to show the **Logic Element Types** menu.

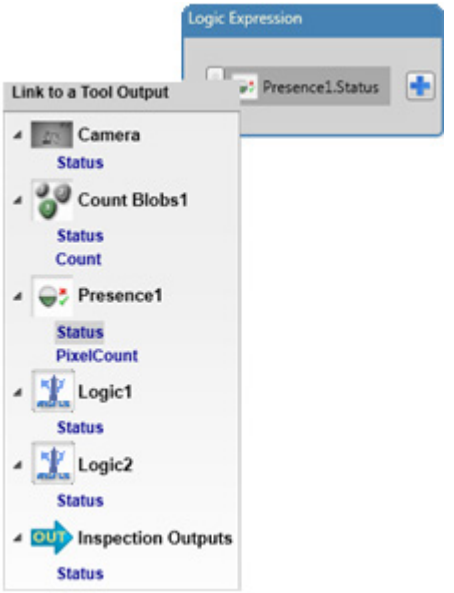
The Logic Element Types menu shows a list of logic elements that can be added to the expression: **Value**, **Operator**, **Numeric Value**, and **Group**.



When you select a logic element, that element appear in the **Logic Expression** popup. You can now add further elements to build the logic expression.

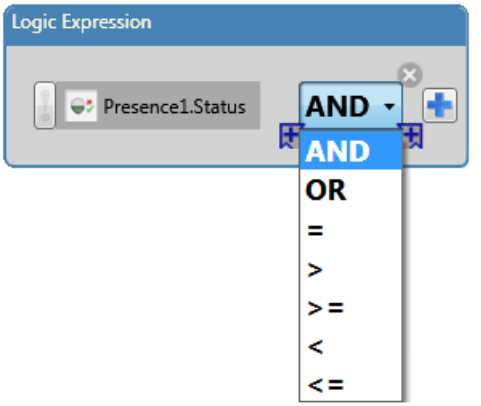
Value

In the example below, **Value** has been selected from the Logic Element Types menu, and the Status (pass/fail) of the Presence/Absence Tool from the vision job has been added to the logic expression.



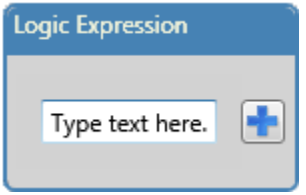
Operator

Click the **+** button again to add another element to the logic expression. In the example below, **Operator** has been selected from the Logic Element Types menu. The operators **AND**, **OR**, **=**, **>**, **> =**, **<**, and **< =** can be added to the logic expression using the Operator dropdown menu.



Numeric Value

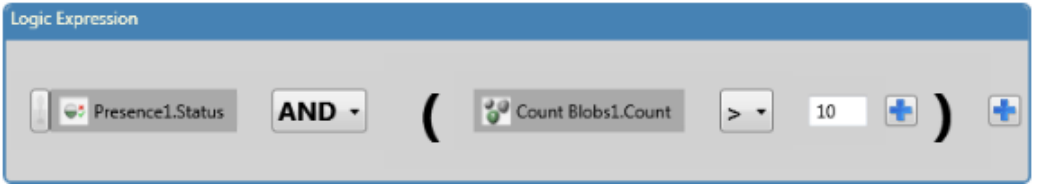
Select **Numeric Value** from the Logic Element Types menu to add text to the logic expression:



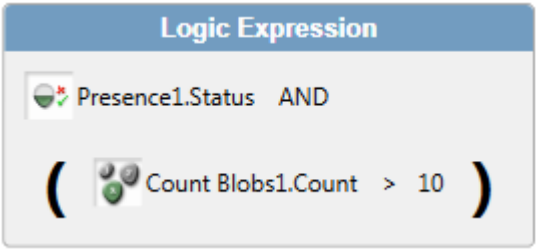
Group

Parentheses can be added to the expression by selecting **Group** from the Logic Element Types menu. The Group element type has two **+** buttons for inserting elements inside and after the parentheses.

The example below shows an expression that has been built using the following sequence of Logic Element Types: **Value** (Presence/Absence Tool, Status output); **Operator**; **Group**; **Value** (Count Tool, Count output); **Operator**; and **Text**.

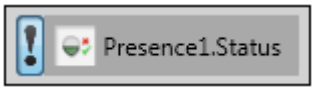


When the Logic Tool Editor is closed, the parameter panel for the Logic Tool shows the completed logic expression:



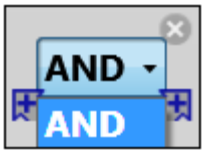
NOT Button

The **NOT** button (**!**) appears to the left of any Tool Status Value that is added to the logic expression. When selected, it inverts the Status of the Tool Value. In the example below, the expression is TRUE if the Presence/Absence Tool fails.



Option Buttons

When you hover the mouse over any element in the logic expression, three option buttons appear at the corners of the element:



= Remove this element from the expression.

= Insert a new element BEFORE this one.

= Insert a new element AFTER this one.

Logic Tool Output

The following parameter output can be linked using **Microscan Link**:

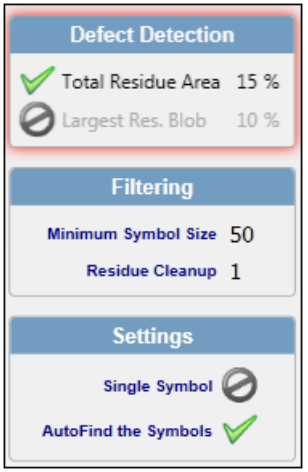
- **Status: Pass/Fail** (Compatible with the **bool** data type)

OCV Tool

The **OCV Tool** verifies the quality of characters (also referred to as symbols) being inspected by comparing them to a standard font and detecting defects.

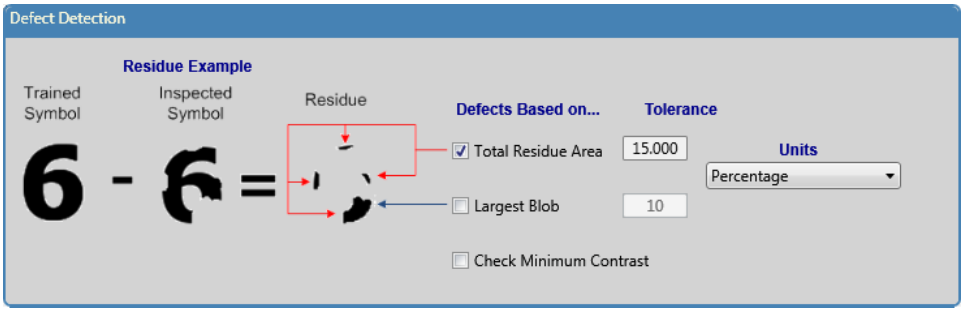
OCV Tool Parameters

OCV Tool parameters include controls for **Defect Detection**, **Filtering**, and **Settings**.



Defect Detection

Click the **Defect Detection** area of the OCV Tool parameters to display controls for **Tolerance** and **Units** (**Percentage** of total symbol size, or an absolute value in **Pixels**). You can also determine whether the tool bases defects on **Total Residue Area** or **Largest Blob**, or set it to **Check Minimum Contrast**, which rejects any symbol whose contrast falls below 50% of the trained symbol's contrast.

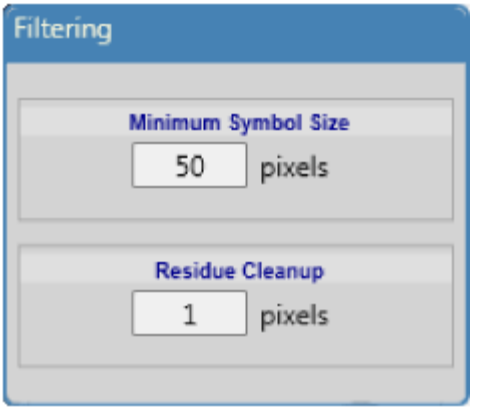


Filtering

Click the **Filtering** area of the OCV Tool parameters to display controls for **Minimum Symbol Size** and **Residue Cleanup**.

Minimum Symbol Size allows you to set the minimum number of pixels required for a blob to constitute a symbol.

Residue Cleanup allows you to set the number of pixels to remove around the perimeter of each blob of residue. Increase this value if the size of symbols varies by a large amount.



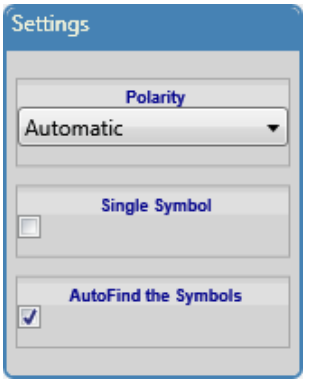
Settings

Click the Settings area of the OCV Tool parameters to display controls for **Polarity**, **Single Symbol**, and **AutoFind the Symbols**.

The OCV Tool can usually detect polarity on its own, but when it can't, set Polarity directly to **Light on Dark** or **Dark on Light**.

Enable **Single Symbol** if you want all features within the template ROI (region of interest) to be trained as one symbol.

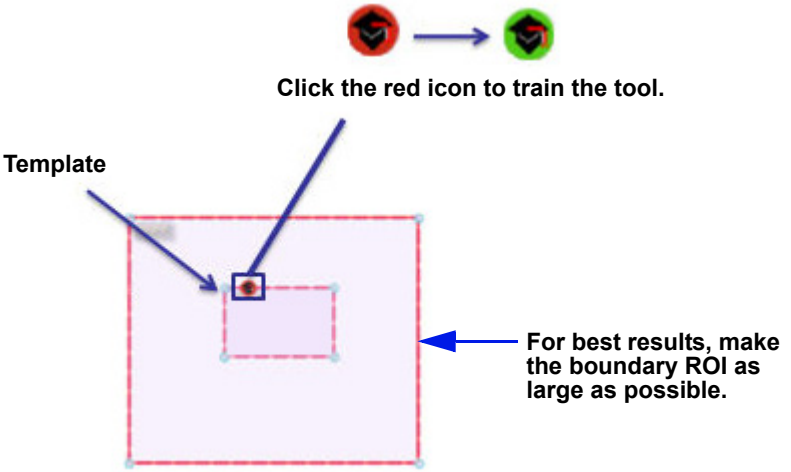
Enable **AutoFind the Symbols** to search automatically for trained symbols. Disable AutoFind to save processing time if you are already using a Locate Tool.



Training the OCV Tool

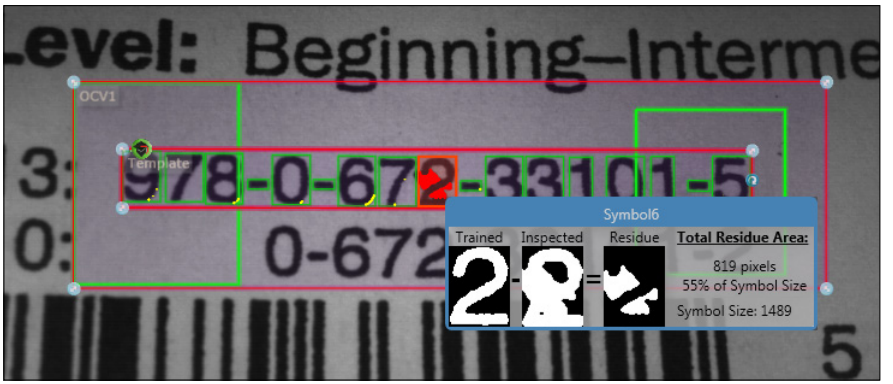
The OCV Tool is trained in the same way as the **Locate Tool**.

- Add the **OCV Tool** to the image area.
- Adjust the **template ROI (region of interest)** around the feature that you want the tool to learn.
- Adjust the **boundary ROI** to cover the area within which you expect your feature to move from image to image. For best results, make this ROI as large as possible.
- Train the tool to recognize the characters in the template ROI by clicking the **Train** icon.



You can then verify the quality of individual characters in the inspection area.

Hint: Click on individual letters to show their detailed results as in the example below, which shows an analysis of a symbol's size and total residue area.



Note: When using the OCV Tool, you may see two additional boxes within the boundary ROI and outside the template ROI, as in the example above. This is normal and does not affect OCV Tool performance.

OCV Tool Output

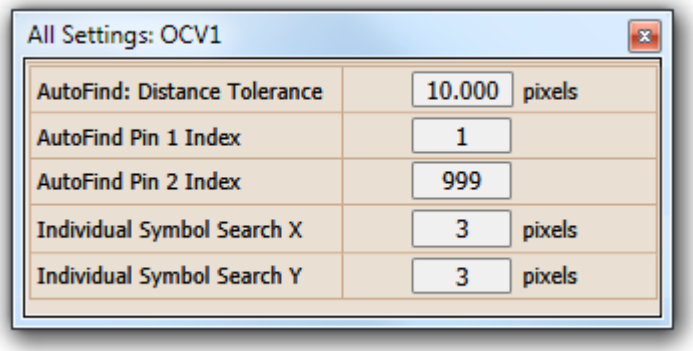
The following parameter output can be linked using **Microscan Link**:

- **Status: Pass/Fail** (Compatible with the **bool** data type)

OCV Tool Advanced Parameters

Click the Advanced Parameters icon at the upper right of the Edit view to access **OCV Tool Advanced Parameters**.

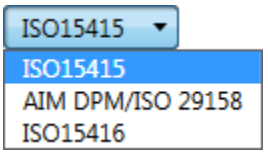
- **AutoFind: Distance Tolerance:** Sets the maximum allowed change in the trained distance between the two symbols used by AutoFind.
- **AutoFind Pin 1 Index:** Sets the index of the symbol to use as the first AutoFind feature.
- **AutoFind Pin 2 Index:** Sets the index of the symbol to use as the second AutoFind feature.
- **Individual Symbol Search X:** Sets a +/- search range on the X axis that is used to position the template for each symbol more accurately. Increase this value when symbol position varies significantly within the string. Note however that the tool runs more slowly as you increase this value.
- **Individual Symbol Search Y:** Sets a +/- search range on the Y axis that is used to position the template for each symbol more accurately. Increase this value when symbol position varies significantly within the string. Note however that the tool runs more slowly as you increase this value.



Symbol Quality Verification Tool

The **Symbol Quality Verification Tool** evaluates 1D or 2D symbols against the **ISO 15415**, **AIM DPM/ISO 29158**, and **ISO 15416** standards, depending on which verification capability you select.

Symbol Quality Verification Tool Parameters

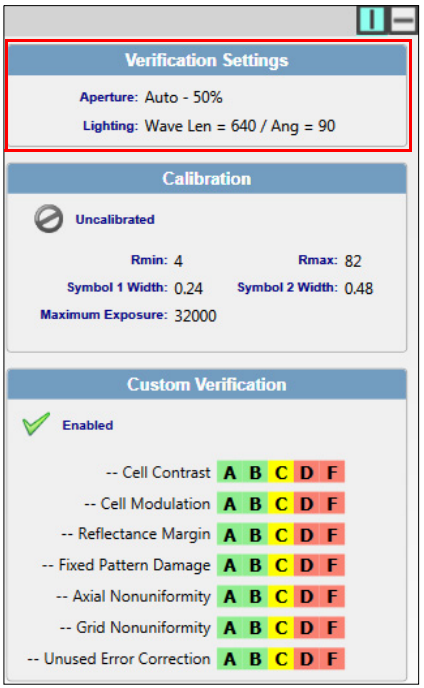


Important: When switching between ISO 15415, AIM DPM/ISO 29158, and ISO 15416, the links between tool outputs and GDS tags are lost. This is because the underlying components that make up the Symbol Quality Verification Tool are completely removed and then recreated whenever you change the tool's capability.

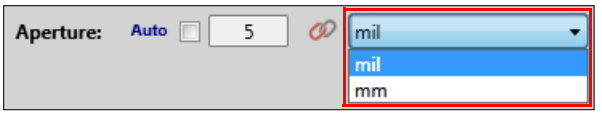
ISO 15415 Verification

Verification Settings

Click the **Verification Settings** area of the parameters to bring up the controls for **Aperture**, **Lighting**, and **Setup Notes**.



Aperture automatically sets the aperture size to the user-defined percentage of the decoded cell size. Choose **Auto** if you want the aperture size to be set automatically based on the symbol's cell size. The aperture is set to 50% of the cell size by default. Turn Auto off if you want to enter the Aperture value manually. When Auto is de-selected, a dropdown menu appears allowing you to enter units in **mil** or **mm**.



Lighting Wave Length specifies the wavelength of the lighting being used. This value is for reporting only and does not affect verification results.

Lighting Angle specifies the angle of the lighting being used. Note that this value is for reporting only and does not affect verification results.

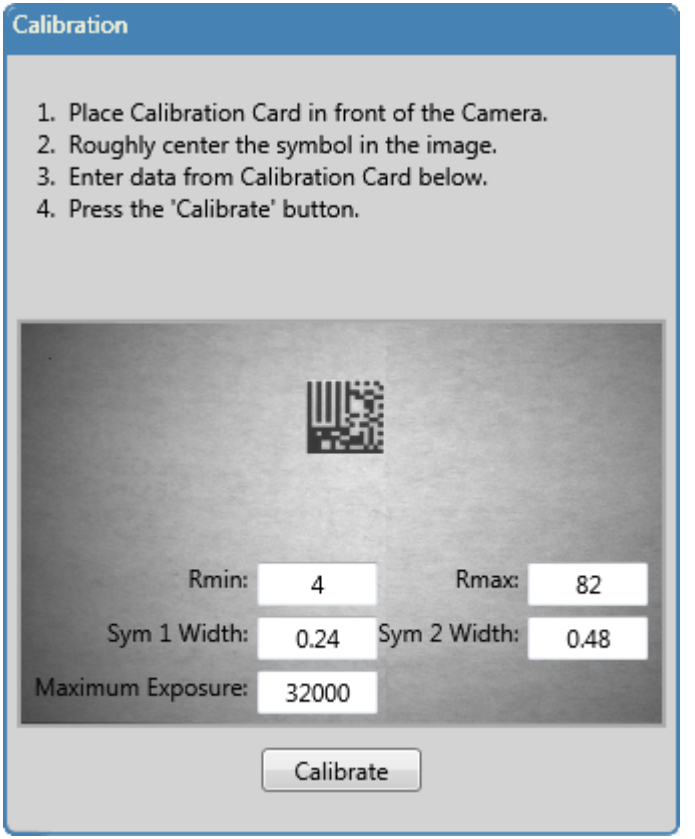
Setup Notes allows you to record any additional information that needs to be considered about your camera or lighting configuration.

Calibration

Click the **Calibration** section of the parameters to bring up the dialog shown below. The Calibration dialog features simple instructions about how to calibrate your camera and the Verification Tool in order to be compliant with your chosen verification specification. You must have a Calibration card in order to calibrate your system.

Use this dialog to enter the data from your Calibration card, and then click the **Calibrate** button to start the process.

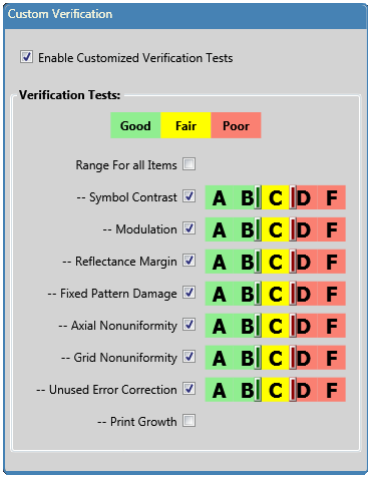
As part of the calibration process, the **Exposure Time** setting of your camera will be adjusted. Use the **Maximum Exposure** value in the Calibration dialog to set the maximum Exposure Time that can be set.



Custom Verification

When you click the box next to **Enable Customized Verification Tests**, you will see the dialog shown below. This dialog allows you to select the individual attributes on which the verification will be based, and to define **Good/Fair/Poor** ranges for each attribute.

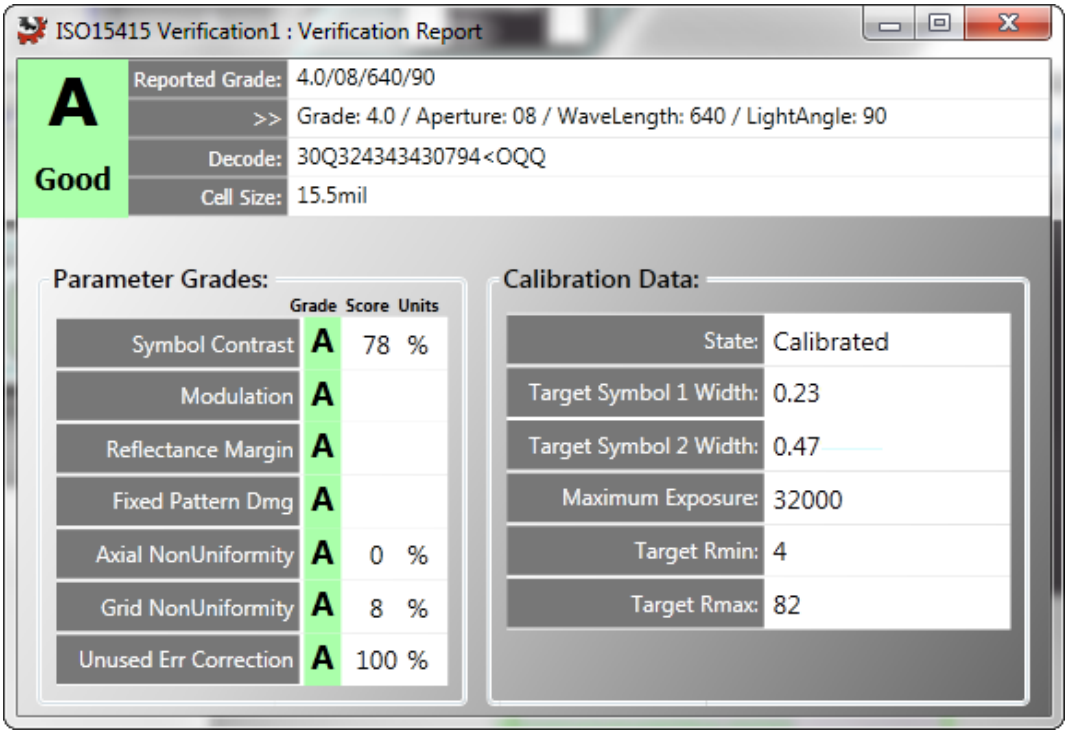
Important: Disabling parameters using the **Custom Verification** dialog results in a verification process that no longer strictly conforms to the ISO 15415 standard.



ISO 15415 Verification Parameters

- **Symbol Contrast —** The difference in the population of dark pixels to the population of light pixels; compares to AIM DPM/ISO 29158 “Cell Contrast”.
- **Modulation —** In ISO/IEC 15415, a measurement of the uniformity of the color of the dark areas and the light areas of the Data Matrix similar to “Cell Modulation”, but differs in the implementation details.
- **Reflectance Margin —** A measurement of how well each module is correctly distinguishable as light or dark in comparison to the global threshold.
- **Fixed Pattern Damage —** A measurement of the errors in the borders of the Data Matrix as well as any errors in the quiet zone around the symbol necessary for the decoding process.
- **Axial Nonuniformity —** The difference between the height and the width with respect to the rows and columns.
- **Grid Nonuniformity —** This measurement is a delta of the difference of the measured grid in relation to the ideal grid formed from the four corners of the Data Matrix.
- **Unused Error Correction —** The amount of error correction that could be read incorrectly when the symbol is still readable that is currently being read correctly, expressed as a percentage.
- **Print Growth —** The positive or negative size relation of the cells as printed with respect to the ideal grid.
- **Reference Decode —** A pass/fail measurement of the Data Matrix based upon a binary image of the symbol as specified in ISO/IEC 16022.

ISO 15415 Verification Report



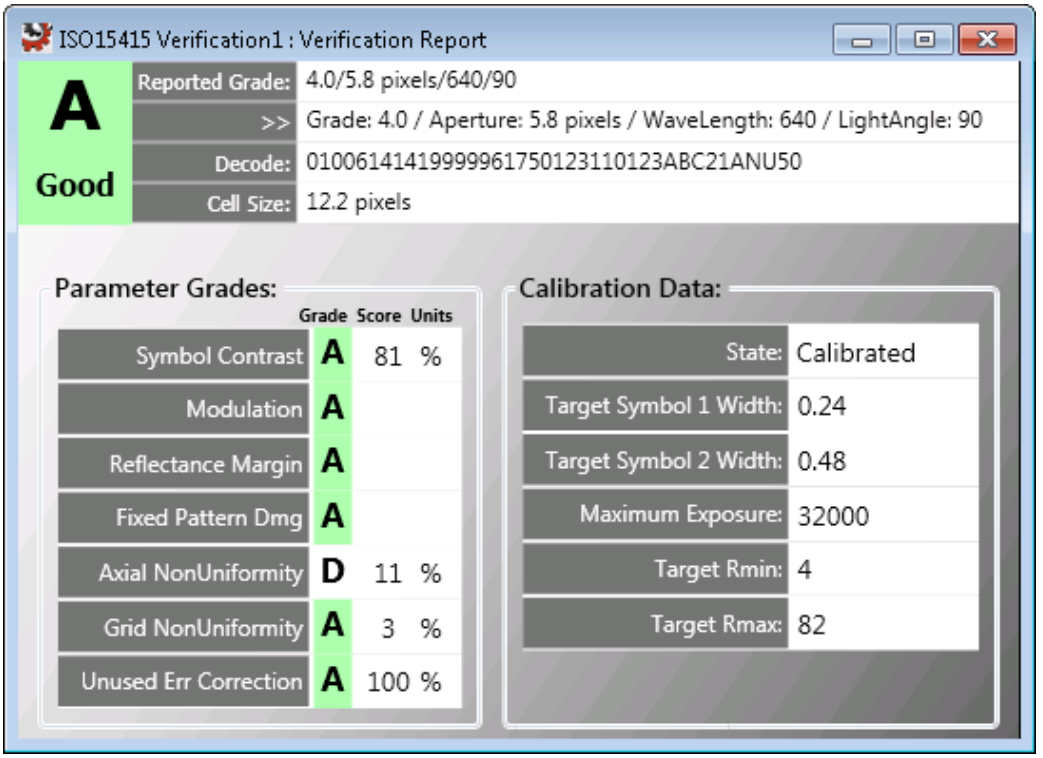
ISO 15415 Numeric Score and Grade Level Comparison

Grade	A 4	B 3	C 2	D 1	F 0	Comments
Axial Nonuniformity	<=0.06	<=0.08	<=0.10	<=0.12	>0.12	X and Y
Contrast	>=0.70	>=0.55	>=0.40	>=0.20	<0.20	
Fixed Pattern Damage	This measurement is developed through a three stage process. There is no grade correlation between raw score and the final score. The initial raw value is used with an overlay technique to achieve the final result.					
Grid Nonuniformity	<=0.38	<=0.50	<=0.63	<=0.75	>0.75	
Modulation	This measurement is developed through a three stage process. There is no grade correlation between raw score and the final score. The initial raw value is used with an overlay technique to achieve the final result.					
Reference Decode	Pass				Fail	
Unused Error Correction	>=0.62	>=0.50	>=0.37	>=0.25	<0.25	
Reflectance Margin	A measurement of how well each module is correctly distinguishable as light or dark in comparison to the global threshold.					

ISO 15415 Verification Final Grade

The ISO 15415 final grade is shown in the upper left corner of the verification report and the numeric value is reported as the first field in the reported grade string. The final grade is defined by the lowest grade achieved by any individual grade parameter.

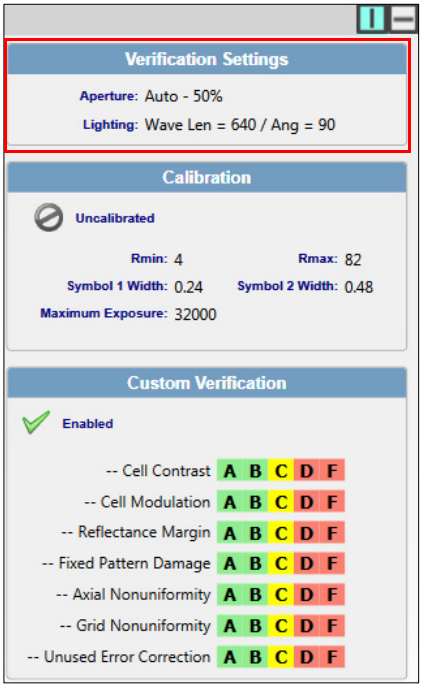
When custom verification is enabled, in addition to setting threshold for Good/Fair/Poor, you have the option to select which parameters are to be included in the final grade calculation. In the below example you can see the impact of removing Axial Non-Uniformity from the grade calculation.



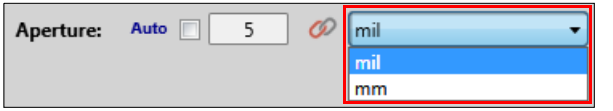
AIM DPM/ISO 29158 Verification

Verification Settings

Click the **Verification Settings** area of the parameters to bring up the controls for **Aperture**, **Lighting**, and **Setup Notes**.



Aperture automatically sets the aperture size to the user-defined percentage of the decoded cell size. Choose **Auto** if you want the aperture size to be set automatically based on the symbol's cell size. The aperture is set to 50% of the cell size by default. Turn Auto off if you want to enter the Aperture value manually. When Auto is de-selected, a dropdown menu appears allowing you to enter units in **mil** or **mm**.



Lighting Wave Length specifies the wavelength of the lighting being used. This value is for reporting only and does not affect verification results.

Lighting Angle specifies the angle of the lighting being used. Note that this value is for reporting only and does not affect verification results.

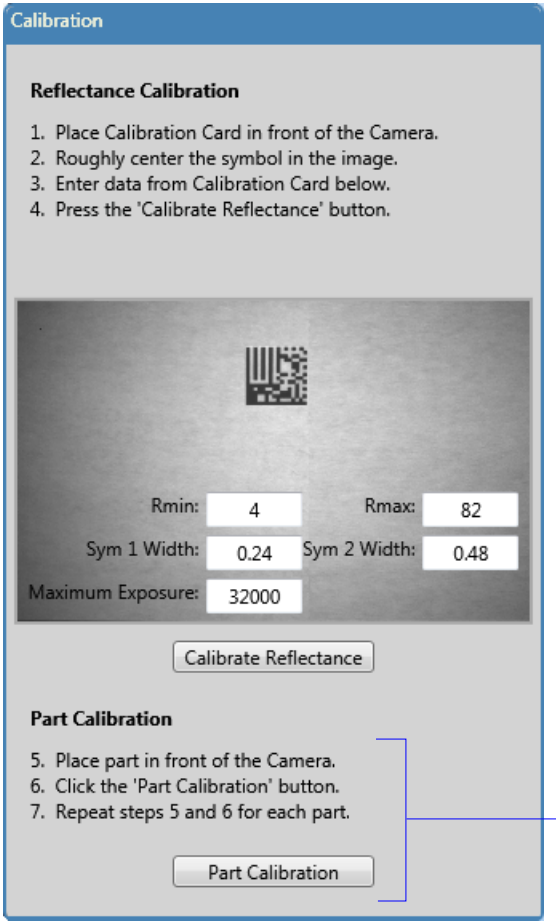
Setup Notes allows you to record any additional information that needs to be considered about your camera or lighting configuration.

Calibration

Click the **Calibration** section of the parameters to bring up the dialog shown below. The Calibration dialog features simple instructions about how to calibrate your camera and the Verification Tool in order to be compliant with your chosen verification specification. You must have a Calibration card in order to calibrate your system.

Use this dialog to enter the data from your Calibration card, and then click the **Calibrate Reflectance** button to start the process.

As part of the calibration process, the **Exposure Time** setting of your camera will be adjusted. Use the **Maximum Exposure** value in the Calibration dialog to set the maximum Exposure Time that can be set.



Important: Part calibration must be performed per the AIM DPM standard to obtain proper results.

Custom Verification

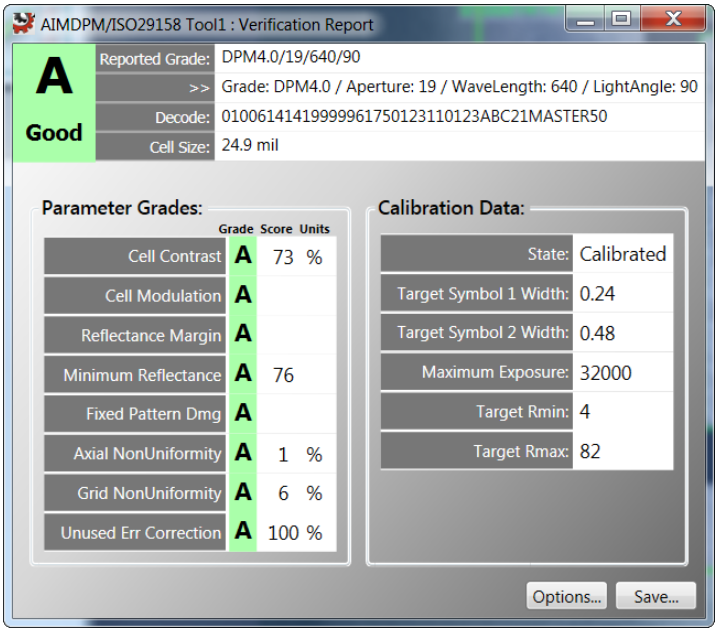
When you click the box next to **Enable Customized Verification Tests**, you will see the dialog shown below. This dialog allows you to select the individual attributes on which the verification will be based, and to define **Good/Fair/Poor** ranges for each attribute.

Important: Disabling parameters using the **Custom Verification** dialog results in a verification process that no longer strictly conforms to the AIM DPM/ISO 29158 standard.

AIM DPM/ISO 29158 Verification Parameters

- **Cell Contrast —** In AIM DPM/ISO 29158, the difference in the population of dark pixels to the population of light pixels, using the sample principle as “Symbol Contrast” with modified definition.
- **Cell Modulation —** In AIM DPM/ISO 29158, a measurement of the uniformity of the color of the dark areas and the light areas of the Data Matrix similar to “Modulation”, but differing in the implementation details.
- **Reflectance Margin —** A measurement of how well each module is correctly distinguishable as light or dark in comparison to the global threshold.
- **Fixed Pattern Damage —** A measurement of the errors in the borders of the Data Matrix as well as any errors in the quiet zone around the symbol necessary for the decoding process.
- **Axial Nonuniformity —** The difference between the height and the width with respect to the rows and columns.
- **Grid Nonuniformity —** A delta of the difference of the measured grid in relation to the ideal grid formed from the four corners of the Data Matrix.
- **Unused Error Correction —** The amount of error correction that could be read incorrectly when the symbol is still readable that is currently being read correctly, expressed as a percentage.
- **Print Growth —** The positive or negative size relation of the cells as printed with respect to the ideal grid.
- **Minimum Reflectance —** During “Card Calibration”, the NIST-traceable card is used to calibrate the system and to calculate a “calibrated system reflectance value”. During “Part Calibration”, a good example of the actual part is used to calculate an exposure time that optimizes the brightness and contrast of that symbol. During the Verification cycle, the calibrated system reflectance value is compared with the reflectance value of the part viewed with this adjusted exposure time. Parts whose bright symbol elements are less reflective than the calibration standard card will need more light energy for the camera to achieve the appropriate image brightness. Minimum Reflectance is the ratio of the part’s reflectance to the calibrated system reflectance. Every part must provide at least a minimum level of reflectance.
- **Reference Decode —** A pass/fail measurement of the Data Matrix based upon a binary image of the symbol as specified in ISO/IEC 16022.

AIM DPM/ISO 29158 Verification Report



AIM DPM/ISO 29158 Numeric Score and Grade Level Comparison

Grade	A 4	B 3	C 2	D 1	F 0	Comments
Cell Contrast	>=30%	>=25%	>=20%	>=15%	<15%	
Axial Nonuniformity	<=6%	<=8%	<=10%	<=12%	>12%	Calculation differs slightly from ISO 15415
Grid Nonuniformity	<=0.38	<=0.50	<=0.63	<=0.75	>0.75	Calculation differs slightly from ISO 15415
Unused Error Correction	>=62%	>=50%	>=37%	>=25%	<25%	
Fixed Pattern Damage	This measurement is developed through a three stage process. There is no grade correlation between raw score and the final score. The initial raw value is used with an overlay technique to achieve the final result.					
Cell Modulation	This measurement is developed through a three stage process. There is no grade correlation between raw score and the final score. The initial raw value is used with an overlay technique to achieve the final result.					
Reference Decode	Pass				Fail	
Minimum Reflectance	>=5%				<5%	
Reflectance Margin	A measurement of how well each module is correctly distinguishable as light or dark in comparison to the global threshold.					

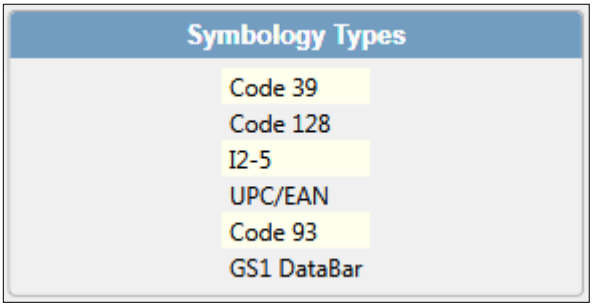
AIM DPM/ISO 29158 Verification Final Grade

The AIM DPM/ISO 29158 final grade is determined in the same way as the ISO 15415 final grade.

ISO 15416 Verification

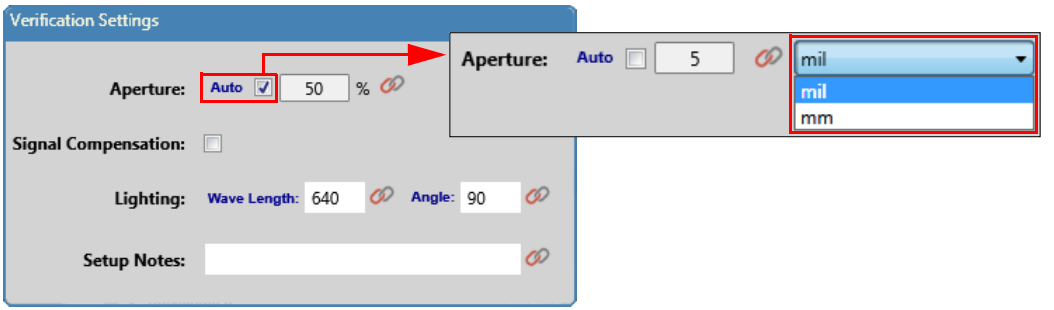
Symbology Types

Click the **Symbology Types** you want to verify to the ISO 15416 standard.



Verification Settings

Click the **Verification Settings** area of the parameters to bring up the controls for **Aperture**, **Signal Compensation**, **Lighting**, and **Setup Notes**.



Aperture automatically sets the aperture size to the user-defined percentage of the decoded cell size. Choose **Auto** if you want the aperture size to be set automatically based on the symbol's cell size. The aperture is set to 50% of the cell size by default. Turn Auto off if you want to enter the Aperture value manually. When Auto is de-selected, a dropdown menu appears allowing you to enter units in **mil** or **mm**.

Signal Compensation compensates for uneven lighting. This parameter improves grading performance, but note that it is not a part of the ISO 15416 standard, and therefore not technically compliant.

Lighting Wave Length specifies the wavelength of the lighting being used. Note that this value is for reporting only and does not affect verification results.

Lighting Angle specifies the angle of the lighting being used. Note that this value is for reporting only and does not affect verification results.

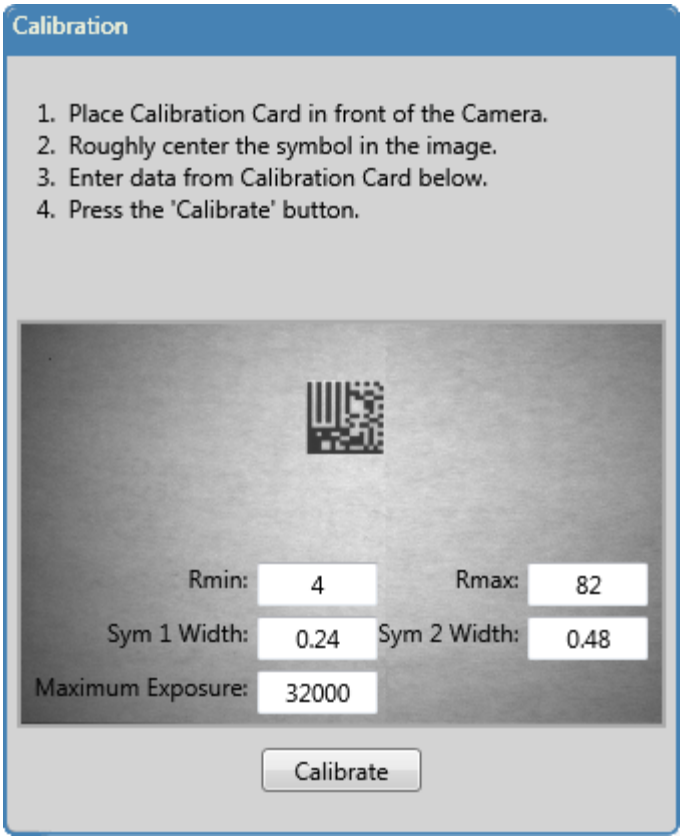
Setup Notes allows you to add any other information about your camera or lighting configuration that needs to be considered.

Calibration

Click the **Calibration** section of the parameters to bring up the dialog shown below. The Calibration dialog features simple instructions about how to calibrate your camera and the Verification Tool in order to be compliant with your chosen verification specification. You must have a Calibration card in order to calibrate your system.

Use this dialog to enter the data from your Calibration card, and then click the **Calibrate** button to start the process.

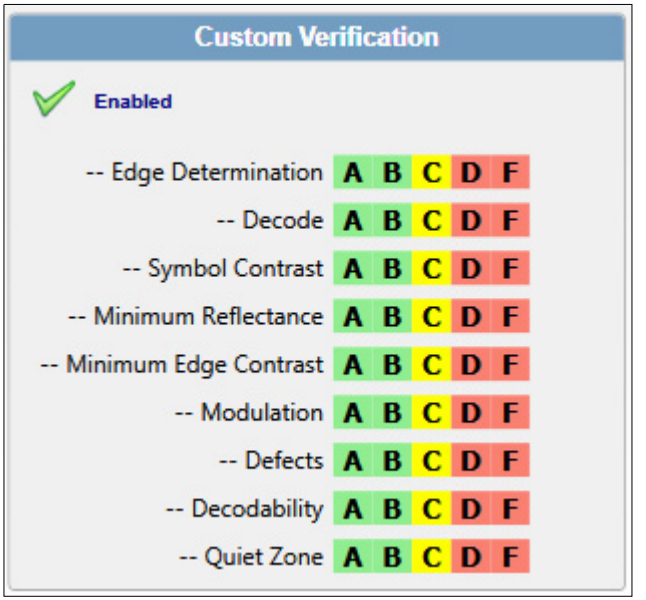
As part of the calibration process, the **Exposure Time** setting of your camera will be adjusted. Use the **Maximum Exposure** value in the Calibration dialog to set the maximum Exposure Time that can be set.



Custom Verification

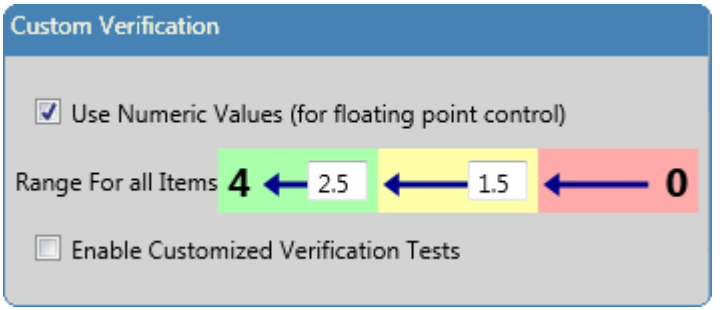
When you click the box next to **Enable Customized Verification Tests**, you will see the dialog shown below. This dialog allows you to select the individual attributes on which the verification will be based, and to define **Good/Fair/Poor** ranges for each attribute.

Important: Disabling parameters using the **Custom Verification** dialog results in a verification process that no longer strictly conforms to the ISO 15416 standard.



Custom Verification Editor

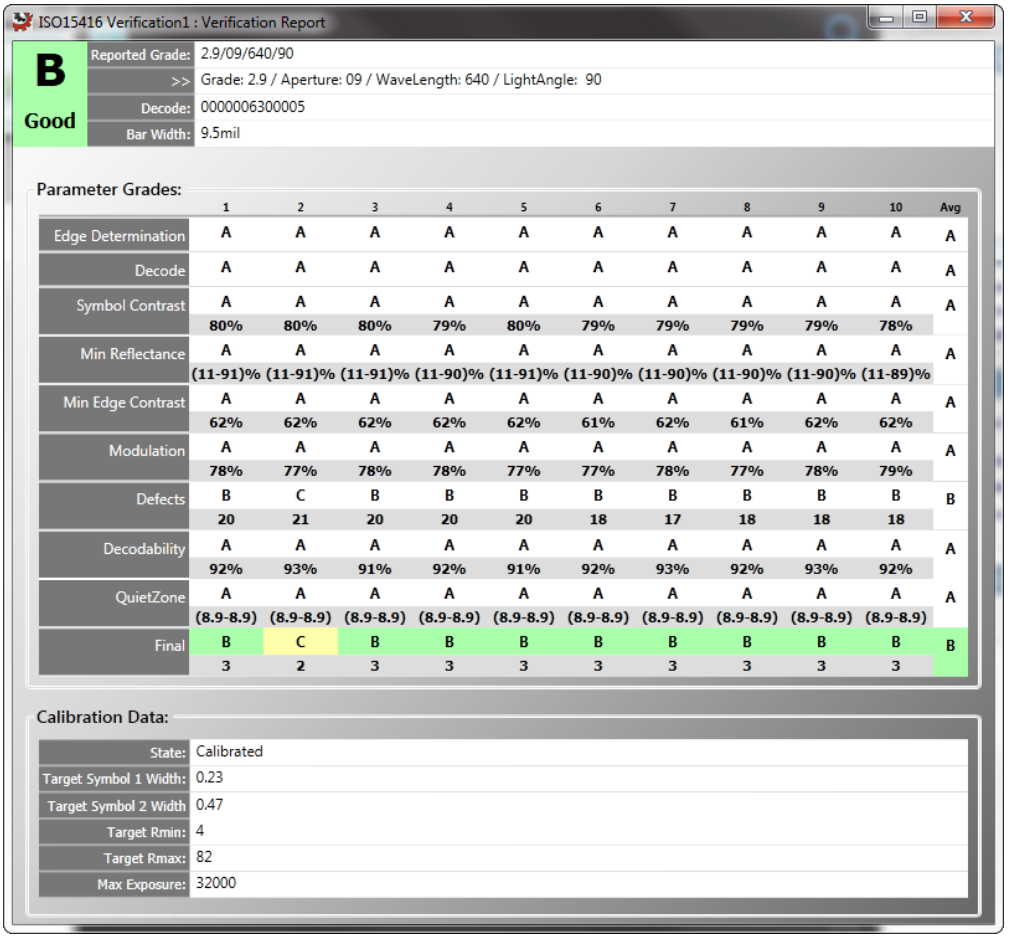
The **Custom Verification Editor** is used to define when grades are considered **Good** or **Fair**. ISO 15416 reports a floating point grade value and allows you to define limits for Good or Fair based on letter grades. If you want to specify numeric values for Good and Fair limits, check the **Use Numeric Values (for floating point control)** option. The standard **ABCDF** control is replaced with a different control that allows you to enter any numeric value for Good and Fair limits. The example below shows the default numerical Good and Fair values of **2.5** and **1.5** respectively.



ISO 15416 Verification Parameters

- **Edge Determination —** Bar and space edge transitions are defined by where they cross the global threshold of the symbol. The global threshold is the midpoint of the maximum reflectance (brightest) and the minimum reflectance (darkest) sample in the scan line. If the global threshold is crossed more than once per bar space transition or does not cross between one of these bar space pairs the symbol will not be able to decode and will receive an **F** grade for Edge Determination. If the proper number of element transitions occurs the symbol will receive an **A** grade for Edge Determination.
- **Decode —** The decoding of the symbol using the symbology reference decode algorithm using the element edges found in Edge Determination.
- **Symbol Contrast —** The difference between the highest and the lowest reflectance values in a scan reflectance profile.
- **Minimum Reflectance —** Percentage value of reflectance of darkest bar.
- **Minimum Edge Contrast —** Percentage value of minimum edge contrast. Edge Contrast is the difference between the bar reflectance and space reflectance of two adjacent elements.
- **Modulation —** The ratio of minimum edge contrast to symbol contrast.
- **Defects —** Irregularities found within elements and quiet zones, measured in terms of element reflectance non-uniformity.
- **Decodability —** Decodability can be defined as the amount of margin remaining to properly read the characters in the symbol. Each symbology specification graded under ISO 15416 has published dimensions and margins of tolerance for the decoding of characters. Printing and imaging accuracy will impact these dimensions and the ability to decode the symbol. Decodability quantifies this margin for each symbol.
- **Quiet Zone —** The regions before the start and stop characters. Each symbology specification graded under ISO 15416 has published the required amount of Quiet Zone for both the region before the start and after the stop character. The Quiet Zone is measured as an integer factor of the nominal bar width. For example, 10x would be a quiet zone 10 times larger than the nominal bar width. If either the start or stop Quiet Zone is violated, the scan line will receive an **F** grade for the Quiet Zone for that scan line.

ISO 15416 Verification Report



ISO15416 Verification1 : Verification Report

B Good	
Reported Grade:	2.9/09/640/90
>>	Grade: 2.9 / Aperture: 09 / WaveLength: 640 / LightAngle: 90
Decode:	0000006300005
Bar Width:	9.5mil

Parameter Grades:

	1	2	3	4	5	6	7	8	9	10	Avg
Edge Determination	A	A	A	A	A	A	A	A	A	A	A
Decode	A	A	A	A	A	A	A	A	A	A	A
Symbol Contrast	A	A	A	A	A	A	A	A	A	A	A
	80%	80%	80%	79%	80%	79%	79%	79%	79%	78%	
Min Reflectance	A	A	A	A	A	A	A	A	A	A	A
	(11-91)%	(11-91)%	(11-91)%	(11-90)%	(11-91)%	(11-90)%	(11-90)%	(11-90)%	(11-90)%	(11-89)%	
Min Edge Contrast	A	A	A	A	A	A	A	A	A	A	A
	62%	62%	62%	62%	62%	61%	62%	61%	62%	62%	
Modulation	A	A	A	A	A	A	A	A	A	A	A
	78%	77%	78%	78%	77%	77%	78%	77%	78%	79%	
Defects	B	C	B	B	B	B	B	B	B	B	B
	20	21	20	20	20	18	17	18	18	18	
Decodability	A	A	A	A	A	A	A	A	A	A	A
	92%	93%	91%	92%	91%	92%	93%	92%	93%	92%	
QuietZone	A	A	A	A	A	A	A	A	A	A	A
	(8.9-8.9)	(8.9-8.9)	(8.9-8.9)	(8.9-8.9)	(8.9-8.9)	(8.9-8.9)	(8.9-8.9)	(8.9-8.9)	(8.9-8.9)	(8.9-8.9)	
Final	B	C	B	B	B	B	B	B	B	B	B
	3	2	3	3	3	3	3	3	3	3	

Calibration Data:

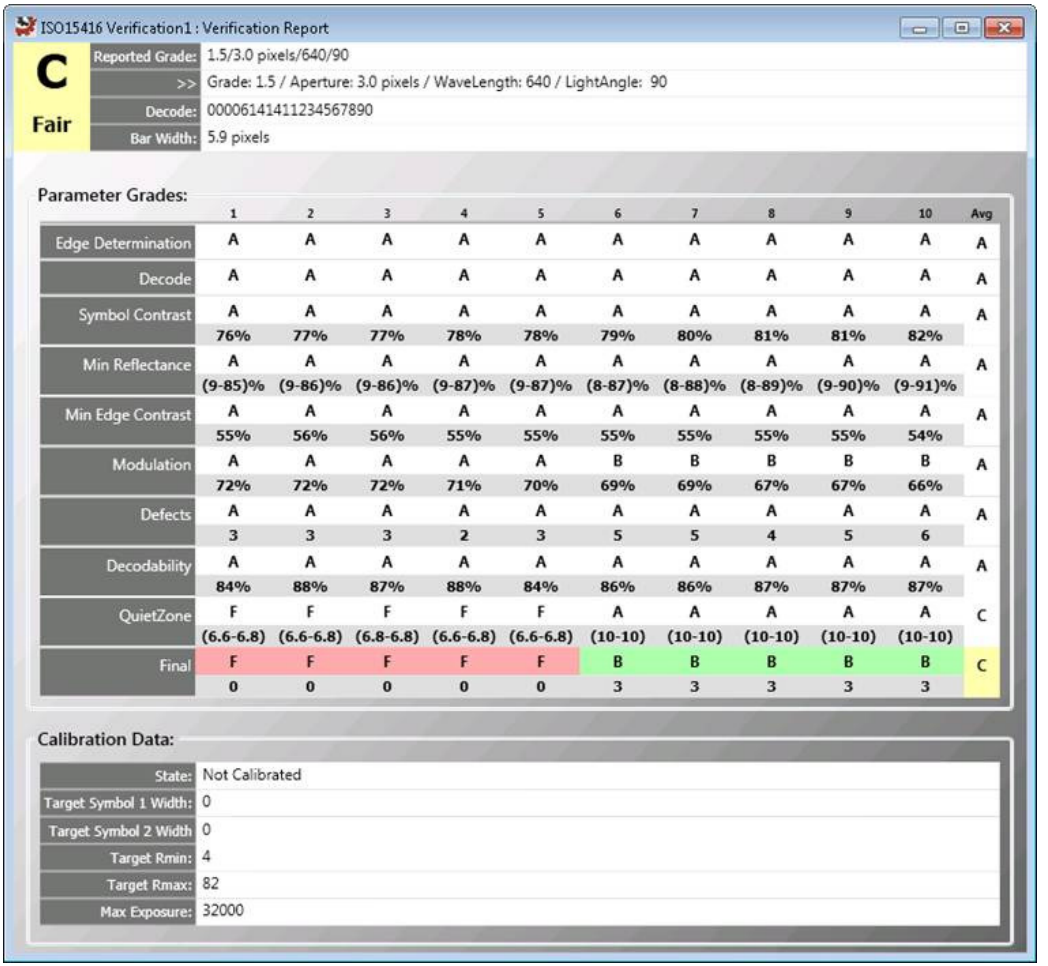
State:	Calibrated
Target Symbol 1 Width:	0.23
Target Symbol 2 Width	0.47
Target Rmin:	4
Target Rmax:	82
Max Exposure:	32000

ISO 15416 Numeric Score and Grade Level Comparison

Grade	A 4	B 3	C 2	D 1	F 0	Comments
Min Reflectance	<=0.5Rmax				>0.5Rmax	Rmax is Max Reflectance
Symbol Contrast	>=0.70	>=0.55	>=0.40	>=0.20	<0.20	
Min Edge Contrast	>=0.15				<0.15	
Modulation	>=0.70	>=0.60	>=0.50	>=0.40	<0.40	
Defects	<=0.15	<=0.20	<=0.25	<=0.30	>0.30	
Decodability	>=0.62	>=0.50	>=0.37	>=0.25	<0.25	
Quiet Zone	>= spec				<spec	

ISO 15416 Verification Final Grade

The ISO 15416 final symbol grade is shown in the upper left corner and lower right corner of the verification report and the numeric grade is reported as the first field in the reported grade string. The ISO 15416 final symbol grade is a compilation of the 10 individual scan line final grades applied over the region of the symbol. Each individual scan grade from the 10 scans applied can be found at the bottom of each scan column. This scan grade is the lowest grade from that individual scan. The final symbol grade is the average result of the 10 individual scans. In the follow example you see scans 1-5 have quiet zone violations and receive a grade of F or grade value 0. The scans 6-10 receive a B grade based on the minimum grade of modulation. The final symbol grade is the average of the final scans (0 + 0 + 0 + 0 + 0 + 3 + 3 + 3 + 3 + 3) / 10 = 1.5 or grade C. Note that if custom verification is enabled individual parameters can be removed from the scan grade and final grade calculation.



ISO15416 Verification1 : Verification Report

C Fair		
	Reported Grade:	1.5/3.0 pixels/640/90
	>>	Grade: 1.5 / Aperture: 3.0 pixels / WaveLength: 640 / LightAngle: 90
	Decode:	00006141411234567890
	Bar Width:	5.9 pixels

Parameter Grades:

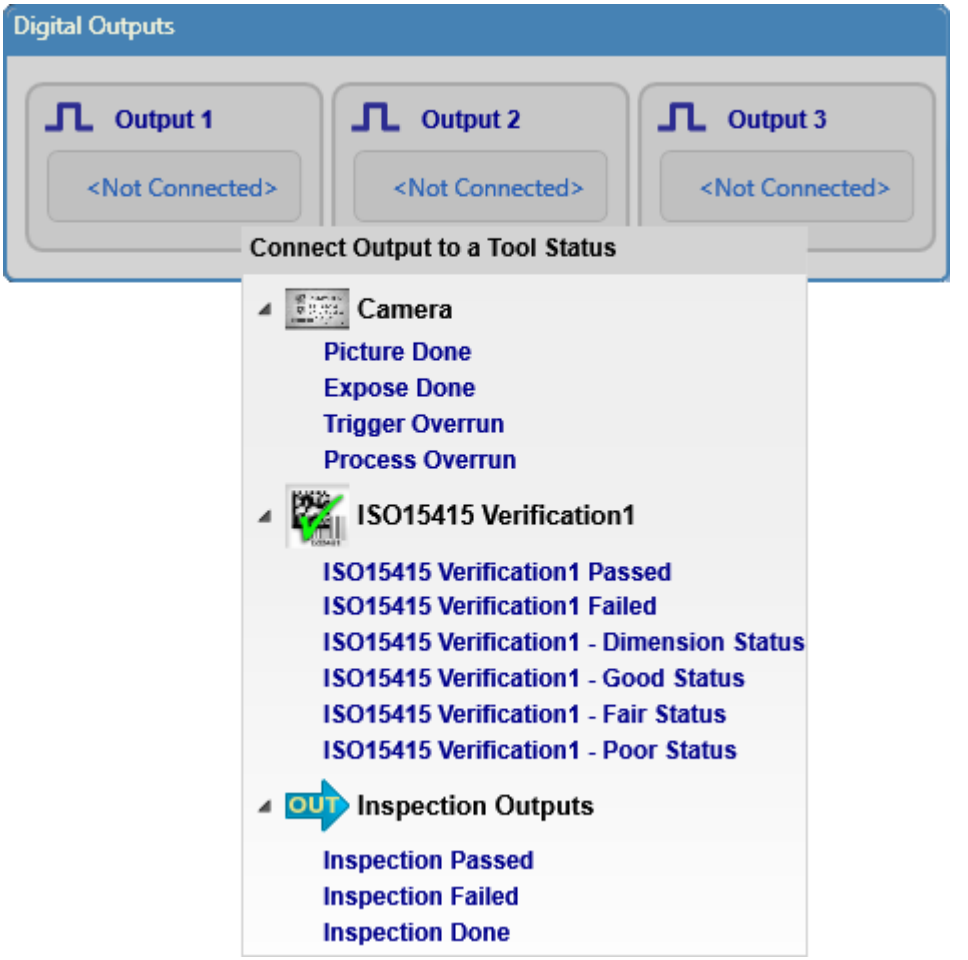
	1	2	3	4	5	6	7	8	9	10	Avg
Edge Determination	A	A	A	A	A	A	A	A	A	A	A
Decode	A	A	A	A	A	A	A	A	A	A	A
Symbol Contrast	A	A	A	A	A	A	A	A	A	A	A
	76%	77%	77%	78%	78%	79%	80%	81%	81%	82%	
Min Reflectance	A	A	A	A	A	A	A	A	A	A	A
	(9-85)%	(9-86)%	(9-86)%	(9-87)%	(9-87)%	(8-87)%	(8-88)%	(8-89)%	(9-90)%	(9-91)%	
Min Edge Contrast	A	A	A	A	A	A	A	A	A	A	A
	55%	56%	56%	55%	55%	55%	55%	55%	55%	54%	
Modulation	A	A	A	A	A	B	B	B	B	B	A
	72%	72%	72%	71%	70%	69%	69%	67%	67%	66%	
Defects	A	A	A	A	A	A	A	A	A	A	A
	3	3	3	2	3	5	5	4	5	6	
Decodability	A	A	A	A	A	A	A	A	A	A	A
	84%	88%	87%	88%	84%	86%	86%	87%	87%	87%	
QuietZone	F	F	F	F	F	A	A	A	A	A	C
	(6.6-6.8)	(6.6-6.8)	(6.8-6.8)	(6.6-6.8)	(6.6-6.8)	(10-10)	(10-10)	(10-10)	(10-10)	(10-10)	
Final	F	F	F	F	F	B	B	B	B	B	C
	0	0	0	0	0	3	3	3	3	3	

Calibration Data:

State:	Not Calibrated
Target Symbol 1 Width:	0
Target Symbol 2 Width	0
Target Rmin:	4
Target Rmax:	82
Max Exposure:	32000

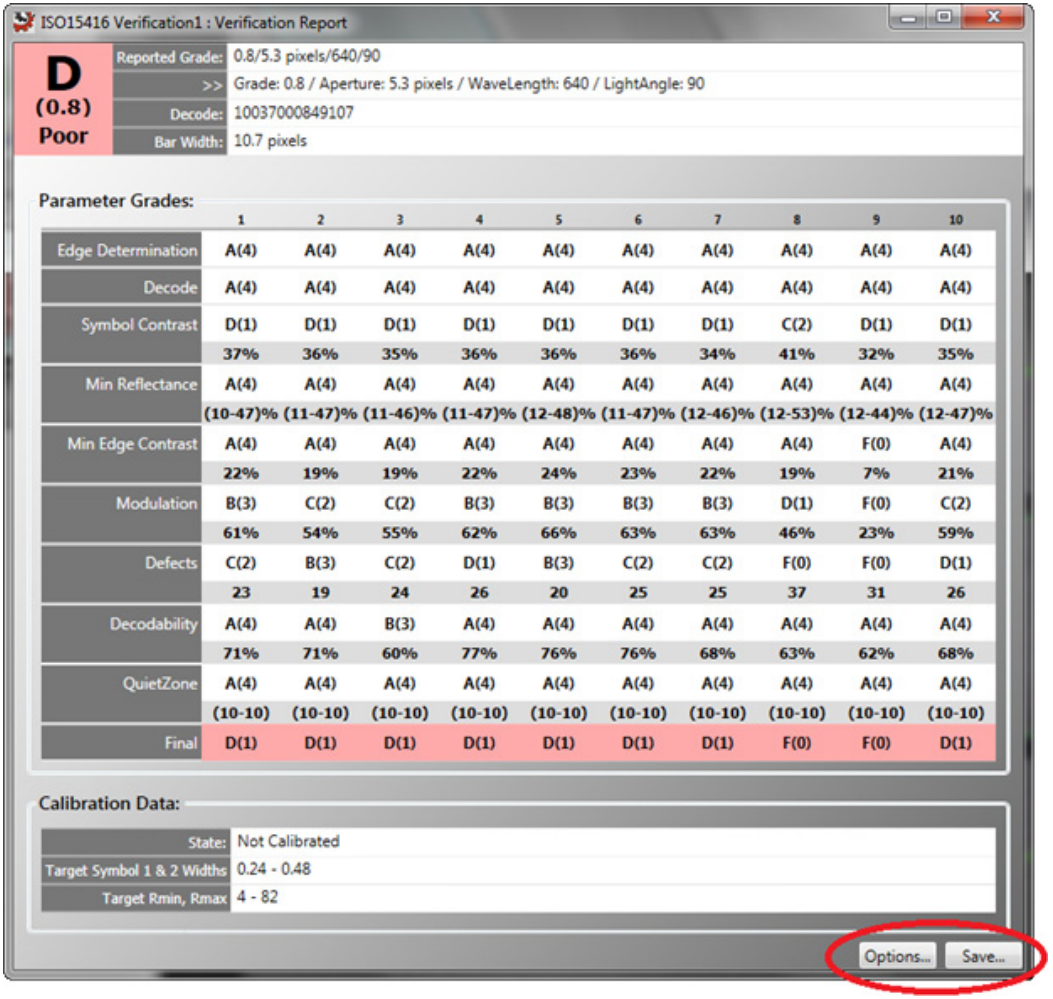
Verification Results

All verification output values can be output through **Inspection Outputs**. All verification status outputs can be tied to the camera's **Digital Outputs**.



Symbol Quality Verification Reports

The report that is produced by AIM DPM/ISO 29158, ISO 15415, and ISO 15416 Symbol Quality Verification can be saved in either PDF or plain text format.



ISO15416 Verification1 : Verification Report

D (0.8) Poor

Reported Grade:	0.8/5.3 pixels/640/90
>>	Grade: 0.8 / Aperture: 5.3 pixels / WaveLength: 640 / LightAngle: 90
Decode:	10037000849107
Bar Width:	10.7 pixels

Parameter Grades:

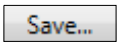
	1	2	3	4	5	6	7	8	9	10
Edge Determination	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)
Decode	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)
Symbol Contrast	D(1)	D(1)	D(1)	D(1)	D(1)	D(1)	D(1)	C(2)	D(1)	D(1)
	37%	36%	35%	36%	36%	36%	34%	41%	32%	35%
Min Reflectance	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)
	(10-47)%	(11-47)%	(11-46)%	(11-47)%	(12-48)%	(11-47)%	(12-46)%	(12-53)%	(12-44)%	(12-47)%
Min Edge Contrast	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	F(0)	A(4)
	22%	19%	19%	22%	24%	23%	22%	19%	7%	21%
Modulation	B(3)	C(2)	C(2)	B(3)	B(3)	B(3)	B(3)	D(1)	F(0)	C(2)
	61%	54%	55%	62%	66%	63%	63%	46%	23%	59%
Defects	C(2)	B(3)	C(2)	D(1)	B(3)	C(2)	C(2)	F(0)	F(0)	D(1)
	23	19	24	26	20	25	25	37	31	26
Decodability	A(4)	A(4)	B(3)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)
	71%	71%	60%	77%	76%	76%	68%	63%	62%	68%
QuietZone	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)
	(10-10)	(10-10)	(10-10)	(10-10)	(10-10)	(10-10)	(10-10)	(10-10)	(10-10)	(10-10)
Final	D(1)	D(1)	D(1)	D(1)	D(1)	D(1)	D(1)	F(0)	F(0)	D(1)

Calibration Data:

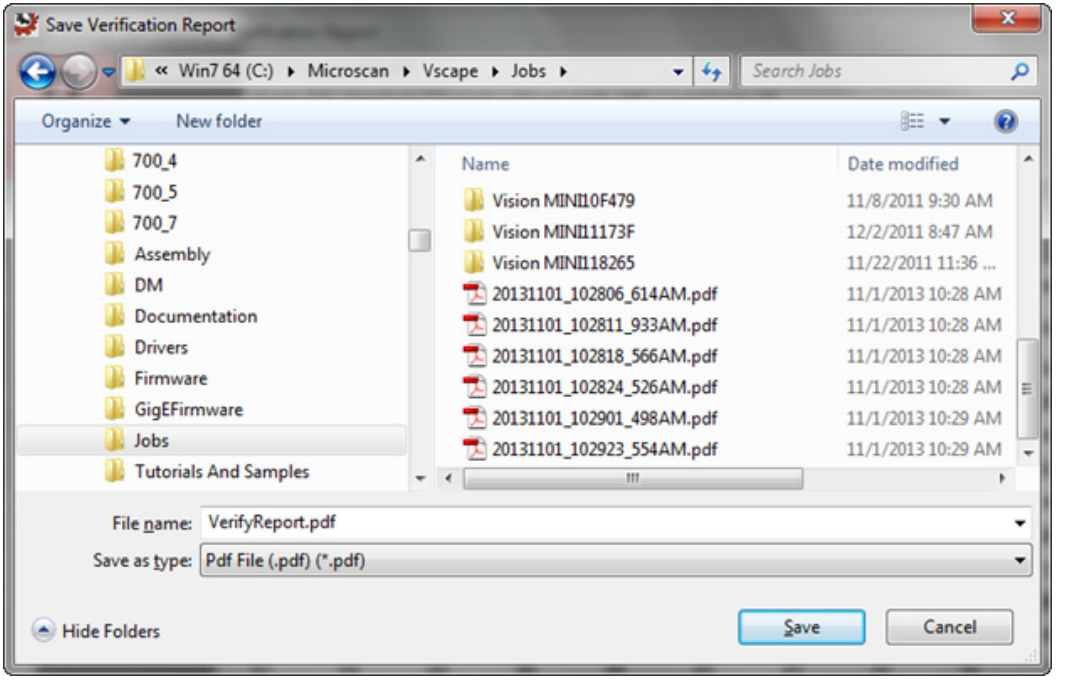
State:	Not Calibrated
Target Symbol 1 & 2 Widths	0.24 - 0.48
Target Rmin, Rmax	4 - 82

Options... Save...

Click the **Save** button to save a report manually for the current symbol.

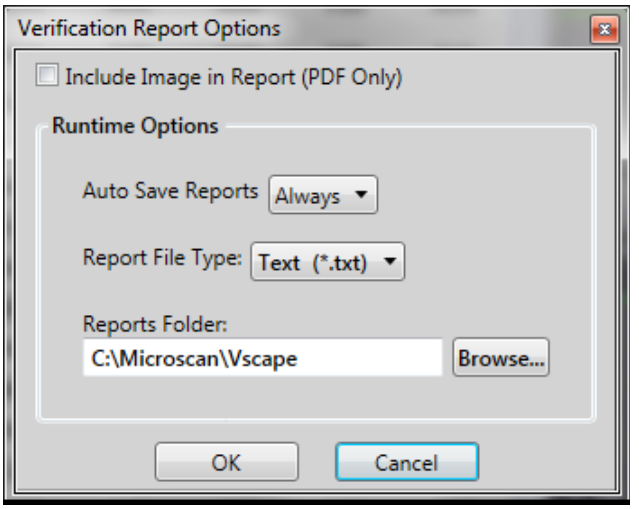


Choose your folder and file name, and whether to save the report as a PDF (default) or as plain text.



Click the **Options** button to configure various options that govern the saving of Verification reports.

The following dialog is displayed when the **Options** button is clicked:



Include Image in Report (PDF Only) includes a bitmap of the image that was inspected. This affects both manual and auto-saved reports.

Auto Save Reports enables or disables auto-saving of reports when AutoVISION is in Run mode. Auto-save options are as follows:

- **Never:** Never save reports, this turns the auto-save feature off.
- **Always:** Save a report for every part that is inspected.
- **For Poor Grades Only:** A report will only be saved for symbols that receive a grade that is rated as Poor.
- **For Fair and Poor Grades Only:** A report will only be saved for symbols that receive a grade that has been rated as either Fair or Poor.

Report File Type selects the file type that will be used when auto-saving reports.

Reports Folder: Enter the path to the folder where reports will be automatically saved.

Files are auto-saved with a file name in this format:

YYYYMMDD_HHmmss_fff.ext

YYYY = Year

MM = Month

DD = Day

HH = Hour (military time)

mm = Minutes

ss = Seconds

fff = Milliseconds

.ext = File extension, either **.pdf** or **.txt**, depending on the selected report format.

Example file name: **20141227_114803_080.pdf**

Example Symbol Quality Verification Reports

ISO 15416 Report, PDF Format

MICROSCAN. **ISO 15416 Verification Report**

Final Grade: A 4.0/2.6 pixels/640/90

Parameters:

	1	2	3	4	5	6	7	8	9	10
Edge Determination	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)
Decode	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)
Symbol Contrast	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Min Reflectance	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)
	(0-100)%	(0-100)%	(0-100)%	(0-100)%	(0-100)%	(0-100)%	(0-100)%	(0-100)%	(0-100)%	(0-100)%
Min Edge Contrast	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Modulation	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Defects	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)
	0	0	0	0	0	0	0	0	0	0
Decodability	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)
	71%	71%	71%	71%	71%	71%	71%	71%	71%	71%
QuietZone	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)
	(10-10)	(10-10)	(10-10)	(10-10)	(10-10)	(10-10)	(10-10)	(10-10)	(10-10)	(10-10)
Final	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)	A(4)

Reference Decode: 12345678

Non-Graded Parameters:

Symbol Type	Code 128	**State:**	Not Calibrated
Symbol Size	50	**Target Symbol 1 & 2 Widths**	0.24 - 0.48
Aperture	26	**Target Rmin, Rmax**	4 - 82
Bar Width	5		

Symbol Image:

Aperture: 2.6 pixels **Wavelength:** 640 **Angle:** 90

Date:	12/05/2013 11:08:56
Setup Notes:	
Software Version:	Emulator
Device Name:	SoftSys1

This Report Created using Microscan AutoVISION Software

www.microscan.com

ISO 15415 Report, PDF Format

MICROSCAN. ISO 15415 Verification Report

Final Grade: A 4.0/5.8 pixels/640/90

Parameters:

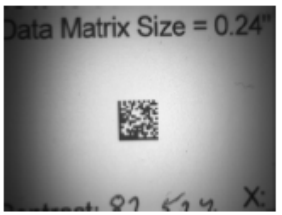
	Grade	Score
Symbol Contrast	A	70
Modulation	A	
Reflectance Margin	A	
Fixed Pattern Dmg	A	
Axial NonUniformity	A	1
Grid NonUniformity	A	7
Unused Err Correction	A	100

Reference Decode: DMx Size 240

Non-Graded Parameters:

Symbol Type	Data Matrix ECC 200	State:	Not Calibrated
Symbol Size	16x16	Target Symbol 1 Width:	0.24
Cell Size	11.6 pix	Target Symbol 2 Width:	0.48
Aperture	58	Target Rmin:	4
Print Growth	x=2, y=2	Target Rmax:	82

Symbol Image:



Aperture: 5.8 pixels **Wavelength:** 640 **Angle:** 90

Date:	10/29/2013 2:36:05 PM
Setup Info:	
Software Version:	
Device Name:	SoftSys1

This Report Created using Microscan AutoVISION Software

www.microscan.com

Symbol Quality Verification Tool Outputs

ISO 15415

The following parameter outputs can be linked using **Microscan Link**.

Important: This tool shows additional linkable outputs in the **Data Navigator Tools View** that are not shown in the main user interface. Check the Data Navigator to ensure that you are aware of all possible linkable outputs for all AutoVISION tools.

- **Status: Pass/Fail** (Compatible with the **bool** data type)
- **Final Grade** (Compatible with the **sint32** data type)
- **Report Grade** (Compatible with the **string** data type)
- **Good Status** (Compatible with the **bool** data type)
- **Fair Status** (Compatible with the **bool** data type)
- **Poor Status** (Compatible with the **bool** data type)
- **Verification Standard** (Compatible with **string** the data type)
- **Symbology Type** (Compatible with the **string** data type)
- **Decoded Text** (Compatible with the **string** data type)
- **Calibration Status** (Compatible with the **string** data type)
- **Decode Grade** (Compatible with the **sint32** data type)
- **Contrast Grade** (Compatible with the **sint32** data type)
- **Modulation Grade** (Compatible with the **sint32** data type)
- **Reflectance Margin Grade** (Compatible with the **sint32** data type)
- **Fixed Pattern Damage Grade** (Compatible with the **sint32** data type)
- **Axial Nonuniformity Grade** (Compatible with the **sint32** data type)
- **Grid Nonuniformity Grade** (Compatible with the **sint32** data type)
- **Unused Error Correction Grade** (Compatible with the **sint32** data type)
- **Symbol Contrast Value (%)** (Compatible with the **sint32** data type)
- **Axial Nonuniformity Value (x100)** (Compatible with the **sint32** data type)
- **Grid Nonuniformity Value (x100)** (Compatible with the **sint32** data type)
- **Unused Error Correction Value (x100)** (Compatible with the **sint32** data type)
- **Contrast Uniformity (x100)** (Compatible with the **double** data type)
- **Rmin (%)** (Compatible with the **double** data type)
- **Rmax (%)** (Compatible with the **double** data type)
- **Symbol Size** (Compatible with the **string** data type)
- **Cell Size (mil)** (Compatible with the **sint32** data type)
- **Cell Size (mm)** (Compatible with the **double** data type)
- **Cell Size (pixels)** (Compatible with the **double** data type)
- **Print Growth X (%)** (Compatible with the **sint32** data type)
- **Print Growth Y (%)** (Compatible with the **sint32** data type)

AIM DPM/ISO 29158

The following parameter outputs can be linked using **Microscan Link**.

Important: This tool shows additional linkable outputs in the **Data Navigator Tools View** that are not shown in the main user interface. Check the Data Navigator to ensure that you are aware of all possible linkable outputs for all AutoVISION tools.

- **Status: Pass/Fail** (Compatible with the **bool** data type)
- **Final Grade** (Compatible with the **sint32** data type)
- **Report Grade** (Compatible with the **string** data type)
- **Good Status** (Compatible with the **bool** data type)
- **Fair Status** (Compatible with the **bool** data type)
- **Poor Status** (Compatible with the **bool** data type)
- **Verification Standard** (Compatible with **string** the data type)
- **Symbology Type** (Compatible with the **string** data type)
- **Decoded Text** (Compatible with the **string** data type)
- **Calibration Status** (Compatible with the **string** data type)
- **Decode Grade** (Compatible with the **sint32** data type)
- **Cell Contrast Grade** (Compatible with the **sint32** data type)
- **Cell Modulation Grade** (Compatible with the **sint32** data type)
- **Reflectance Margin Grade** (Compatible with the **sint32** data type)
- **Fixed Pattern Damage Grade** (Compatible with the **sint32** data type)
- **Axial Nonuniformity Grade** (Compatible with the **sint32** data type)
- **Grid Nonuniformity Grade** (Compatible with the **sint32** data type)
- **Unused Error Correction Grade** (Compatible with the **sint32** data type)
- **Minimum Reflectance Grade** (Compatible with the **sint32** data type)
- **Cell Contrast Value (x100)** (Compatible with the **sint32** data type)
- **Axial Nonuniformity Value (x100)** (Compatible with the **sint32** data type)
- **Grid Nonuniformity Value (x100)** (Compatible with the **sint32** data type)
- **Unused Error Correction Value (x100)** (Compatible with the **sint32** data type)
- **Minimum Reflectance Value** (Compatible with the **sint32** data type)
- **Contrast Uniformity (x100)** (Compatible with the **double** data type)
- **Symbol Size** (Compatible with the **string** data type)
- **Mean Light** (Compatible with the **sint32** data type)
- **Cell Size (mil)** (Compatible with the **sint32** data type)
- **Cell Size (mm)** (Compatible with the **double** data type)
- **Cell Size (pixels)** (Compatible with the **double** data type)
- **Print Growth X (%)** (Compatible with the **sint32** data type)
- **Print Growth Y (%)** (Compatible with the **sint32** data type)

ISO 15416

The following parameter outputs can be linked using **Microscan Link**.

Important: This tool shows additional linkable outputs in the **Data Navigator Tools View** that are not shown in the main user interface. Check the Data Navigator to ensure that you are aware of all possible linkable outputs for all AutoVISION tools.

- **Status: Pass/Fail** (Compatible with the **bool** data type)
- **Report Grade** (Compatible with the **string** data type)
- **Overall Grade (Average Final Grade)** (Compatible with the **double** data type)
- **-- Overall Grade** (Compatible with the **double** data type)
- **Good Status** (Compatible with the **bool** data type)
- **Fair Status** (Compatible with the **bool** data type)
- **Poor Status** (Compatible with the **bool** data type)
- **Verification Standard** (Compatible with **string** the data type)
- **Symbology Type** (Compatible with the **string** data type)
- **Decoded Text** (Compatible with the **string** data type)
- **Calibration Status** (Compatible with the **string** data type)
- **Average Edge Determination Grade** (Compatible with the **double** data type)
- **Average Decode Grade** (Compatible with the **double** data type)
- **Average Contrast Grade** (Compatible with the **double** data type)
- **Average Minimum Reflectance Grade** (Compatible with the **double** data type)
- **Average Minimum Edge Contrast Grade** (Compatible with the **double** data type)
- **Average Modulation Grade** (Compatible with the **double** data type)
- **Average Defects Grade** (Compatible with the **double** data type)
- **Average Decodability Grade** (Compatible with the **double** data type)
- **Average Quiet Zone Grade** (Compatible with the **double** data type)
- **Final Grade – Scan Lines 1 – 10** (Compatible with the **sint32** data type)
- **(Scan Lines 1 – 10) Edge Determination Grade** (Compatible with the **sint32** data type)
- **(Scan Lines 1 – 10) Decode Grade** (Compatible with the **sint32** data type)
- **(Scan Lines 1 – 10) Contrast Grade** (Compatible with the **sint32** data type)
- **(Scan Lines 1 – 10) Minimum Reflectance Grade** (Compatible with the **sint32** data type)
- **(Scan Lines 1 – 10) Minimum Edge Contrast Grade** (Compatible with the **sint32** data type)
- **(Scan Lines 1 – 10) Modulation Grade** (Compatible with the **sint32** data type)
- **(Scan Lines 1 – 10) Defects Grade** (Compatible with the **sint32** data type)
- **(Scan Lines 1 – 10) Decodability Grade** (Compatible with the **sint32** data type)
- **(Scan Lines 1 – 10) Quiet Zone Grade** (Compatible with the **sint32** data type)
- **(Scan Lines 1 – 10) Symbol Contrast Value (%)** (Compatible with the **sint32** data type)
- **(Scan Lines 1 – 10) Rmin (%)** (Compatible with the **sint32** data type)
- **(Scan Lines 1 – 10) Rmax (%)** (Compatible with the **sint32** data type)

- **(Scan Lines 1 – 10) Minimum Edge Contrast Value (%)** (Compatible with the **sint32** data type)
- **(Scan Lines 1 – 10) Modulation Value (x100)** (Compatible with the **sint32** data type)
- **(Scan Lines 1 – 10) Defects Value (x100)** (Compatible with the **sint32** data type)
- **(Scan Lines 1 – 10) Decodability Value (x100)** (Compatible with the **sint32** data type)
- **(Scan Lines 1 – 10) Quiet Zone Start Value (X-dim)** (Compatible with the **double** data type)
- **(Scan Lines 1 – 10) Quiet Zone Stop Value (X-dim)** (Compatible with the **double** data type)
- **Rmin (%)** (Compatible with the **double** data type)
- **Rmax (%)** (Compatible with the **double** data type)
- **X Dimension (mil)** (Compatible with the **sint32** data type)
- **X Dimension (mm)** (Compatible with the **double** data type)
- **X Dimension (pixels)** (Compatible with the **double** data type)

Process Control and Verification for 1D Symbologies

This section describes the differences between process control and true verification of 1D symbols, as well as detailed verification requirements, hardware configuration, and lighting suggestions.

Process Control

Simple process control requires you to decide what is necessary for your application so you can produce marks that can be read reliably. The Vision MINI, Vision MINI Xi, and Vision HAWK with built-in lens and lighting can be used for process control.

To use the Vision MINI, Vision MINI Xi, or Vision HAWK for process control:

- You may need to set up the camera at an angle to the part to avoid specular reflection from the built-in light.
- You may or may not need to calibrate the camera.
- You may need to turn off certain parameters in AutoVISION's **Custom Verification** editor for marks to pass.
- You may need to change exposure time and gain to create good contrast. An example is black print on dark cardboard.
- You may need to turn on **Signal Compensation**.

Process control can help ensure that you create reliable marks. They do not, however, ensure that the mark is certified against a standard.

Process control is best used to produce a grade of "Good", "Fair", or "Poor" to indicate when the marking process is out of spec for your application.

Verification

Verification ensures that a mark is certified against a specific standard. The camera must be calibrated and must have correct optics and lighting. The algorithm fully conforms to the ISO standards. All verification parameters must be enabled. Marks that are verified with a fully conforming system can be sent out with a report certifying them.

To achieve true verification, the following must be observed:

- The camera must be positioned perpendicular to the surface on which the symbol is marked. See **Proper Camera and Light Configuration**.
- For linear symbols, a diffuse floodlight must be mounted at a 45º angle from the perpendicular. If anything other than 45º is used, it must be stated in the **Verification Settings**.
- The standard requires measurements to be made using the wavelength of light which the intended scanning environment will use. The wavelength must also be stated in the Verification Settings.
- The setup must be shielded from ambient light.
- The unit must be calibrated since Reflectance measurements must be expressed in percentage terms that are calibrated to a recognized international standard (i.e. a calibrated conformance test card.)

Additional suggestions to ensure true verification:

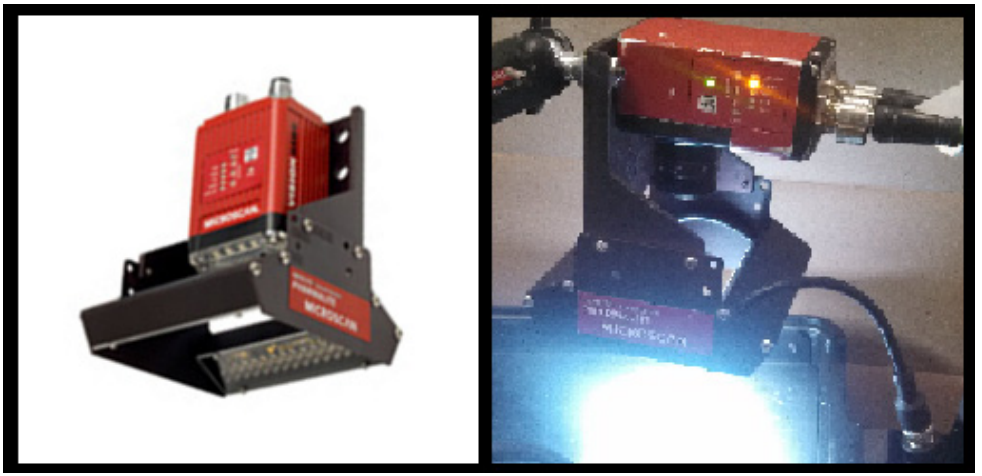
- True verification requires an undistorted image, so a good lens must be used. Typically this is a C-Mount lens with a high **Resolution Requirements**.
- There should be enough pixel resolution per narrow bar that the blackest value of the narrow bar is roughly equal to the blackest value of the thickest bar. The same goes for the spaces. This requires at least 5 pixels per element, preferably 8. Failure to do this will result in errors including Modulation errors. See **Resolution Requirements**.
- The floodlight must be large enough that the background and foreground gray values are perfectly even across the symbol. Failure to do this will cause problems with Modulation, but may also cause problems with Contrast and Reflectance.

Lighting

Optics and lighting are the key to successful 1D verification. Microscan offers a number of light setups that can be used for 1D verification. The choice of the light depends on the size of the mark.

Pharmalite Option

For symbols up to 50 mm long, Microscan offers the Pharmalite. It consists of two 100 mm long rows of white LEDs and a bracket that can be mated to any Microscan camera. The first image shows it with an integrated Vision HAWK. The second shows it with a C-Mount lens.



Pharmalite kit and cable required to power the Pharmalite using a QX-1:

98-000228-01 KIT, SMART SERIES PHARMA, WHITE, DARK FIELD
61-000204-01 CABLE, POWER, SMART SERIES-TO-QX-1, CONTINUOUS

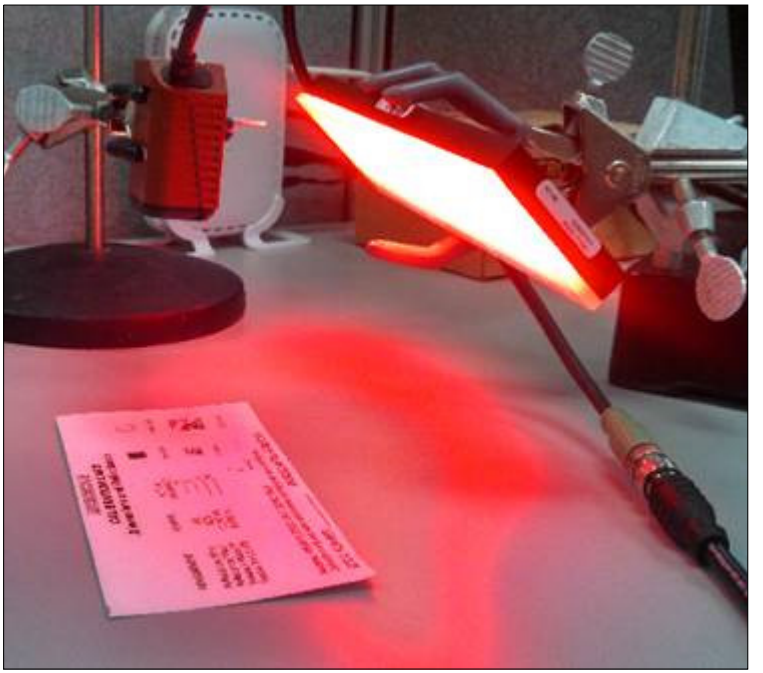
You can also use the following cable with GigE or Vision MINI cameras and power it with your own 24V source:

61-000186-01 CABLE, 5 PIN M12 CONNECTOR, FEMALE-TO-FLYING LEADS, 3M

Note: When sourcing a C-Mount lens, you will likely need a 2 mm spacer so that you can focus the lens up close.

Edge-to-Edge Backlight Option

Intended for symbols up to 100-125 mm long. The 50 x 200 mm Edge-to-Edge diffuse backlight kit consists of a light, extension cable, and power supply. Red, white, blue and infrared options are available.



Red LED option:

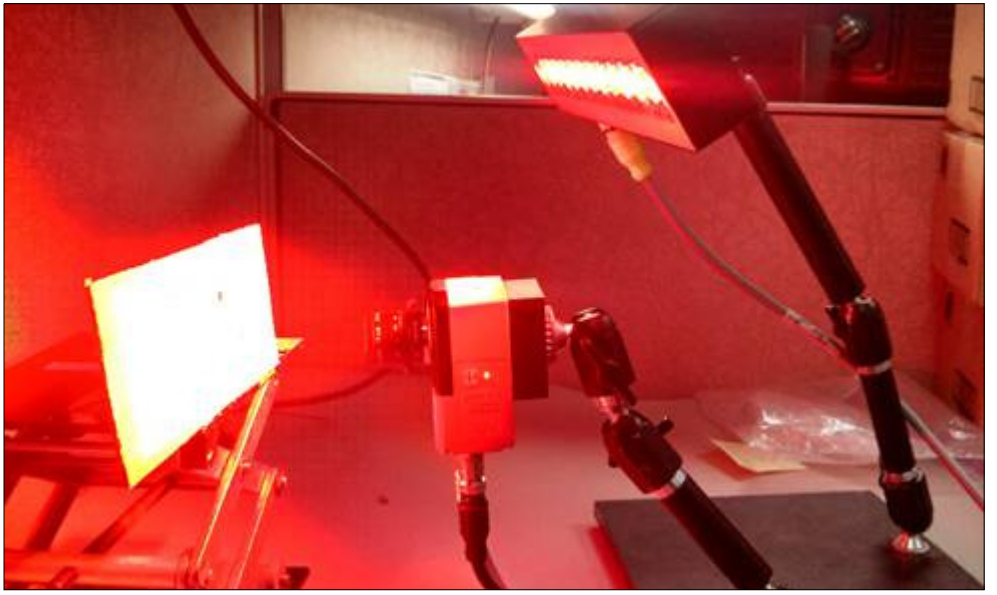
NER-011659600G NERLITE, 50 x 200 MM, RED, BACKLIGHT, 24V CONTINUOUS, 150 MM, M12

Extension cable and power supply:

NER-011504100 DSP60, 24VDC, 2.5A, DIN MOUNT, POWER SUPPLY
NER-030029100 CABLE, NERLITE, M12 CONNECTOR, 5 PIN-TO-FLYING LEADS

MAX 300 Option

For even larger symbols up to 200 mm long, Microscan offers the MAX 300. This is a 300 mm large area array light. Its kit consists of a light, extension cable, and power supply. Red, white, and blue options are available.



Red LED option with cable required to power the light using a QX-1:

NER-011660300G NERLITE, MAX 300, RED, NARROW, M12 CONNECTOR
61-000204-01 CABLE, POWER, SMART SERIES-TO-QX-1

You can also use the following cable with GigE or Vision MINI cameras and power it with your own 24V source:

61-000186-01 CABLE, 5 PIN M12 FEMALE TO FLYING LEADS, 3M

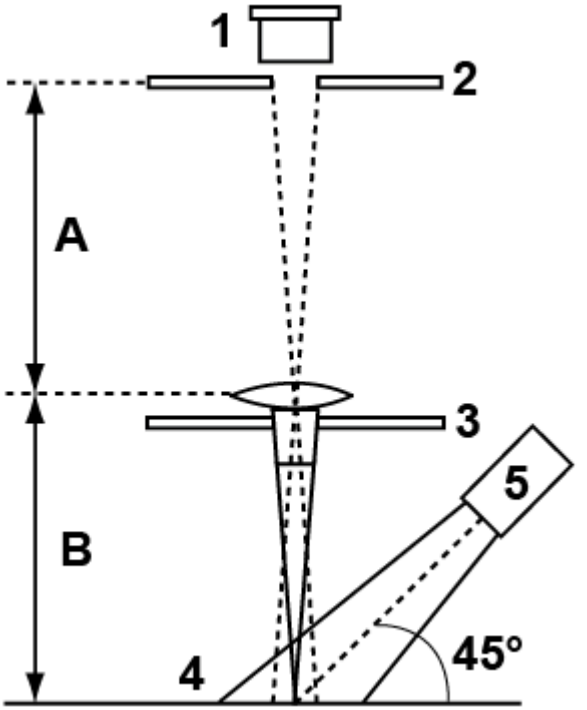
Proper Camera and Light Configuration

Below is the required setup for 1D verification as detailed in the ISO 15416 specification.

The correct ISO 15416 symbol verification setup includes an illumination source that is uniform across the symbol area at a 45 degree angle to the surface, and in a plane containing the illumination source that is perpendicular to the surface and parallel to the bars of the 1D symbol. The configuration also includes a camera whose axis is perpendicular to the symbol surface.

The light reflected from a circular sample area of the symbol surface is collected in a cone formation with a vertex angle of 15 degrees, centered on the perpendicular to the surface, through a circular measuring aperture with a diameter of 1:1 magnification which is equivalent to that of the sample area (the area containing the 1D symbol).

The angles of the configuration described above minimize specular reflection and maximize diffuse reflection from the symbol. This configuration is intended to provide a reference for measurement consistency.



1 = Image Sensor

2 = Aperture at 1:1 Magnification (such that measurement A is equal to measurement B)

3 = Light Baffle

4 = Symbol Surface

5 = Illumination Source

Resolution Requirements

Of all verification parameters, the most difficult test to pass using machine vision is Modulation. This is because the scan brightness profile typically shows narrow spaces as being less bright than wide spaces, and narrow bars as being less dark than wide bars. The reasons for this have to do with resolution, optics, focus, and lighting used for verification.

The first figure below demonstrates this problem. Gray values for wide white bars are 210-230 where they are only 150 for narrow white bars. Gray values for wide black bars are 20, while they are 60-70 for narrow black bars.

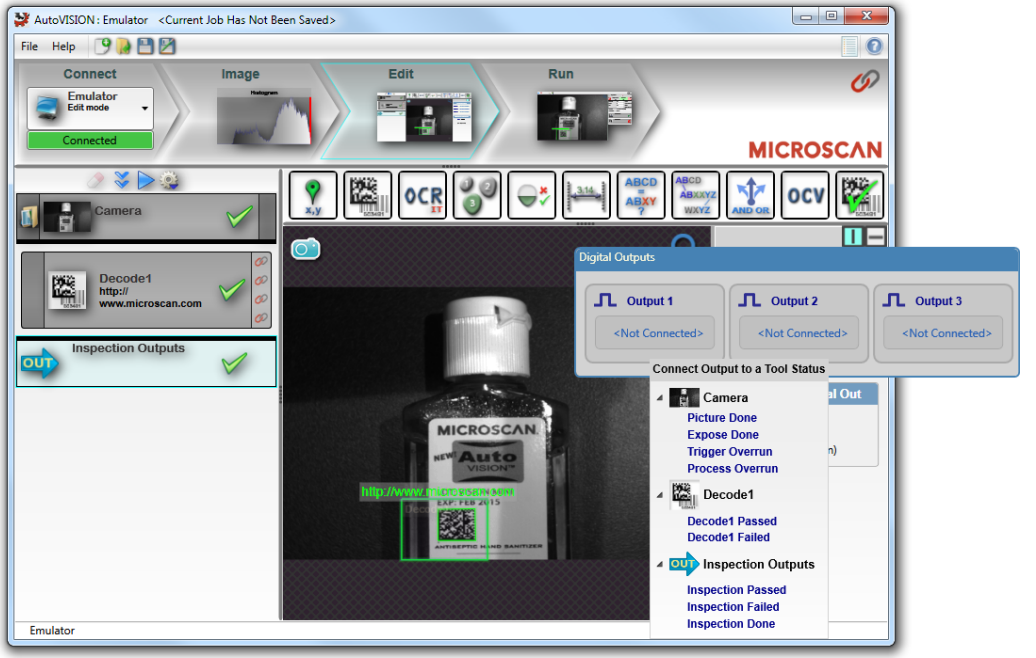
The second figure below shows how adequate resolution resolves this. Gray values for both wide and narrow white bars are 210-230. Gray values for wide and narrow black bars are 20-30.

Inspection Outputs

The **Inspection Outputs Tool** is used to communicate the results of your inspection to the outside world. You can output results via Digital I/O, or as string data sent via the Serial port or the Ethernet port (via TCP/IP).

Inspection Outputs allow you to:

- Connect the Digital I/O of the camera to the results of your job;
- Produce a formatted string from the inspection data and send it out the Serial or Ethernet port.

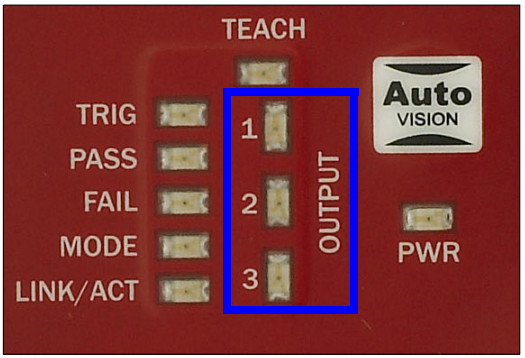


Digital Outputs

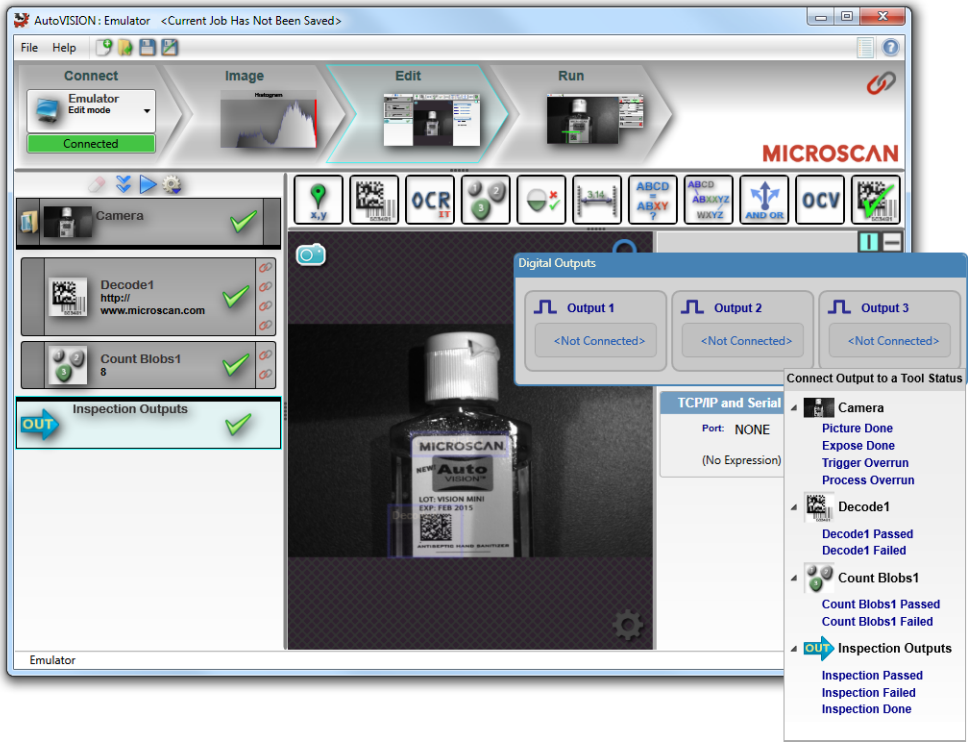
There are three outputs (**Output 1**, **Output 2**, **Output 3**) that can be assigned to report inspection status.

Note: Outputs only function when a camera is connected.

Outputs **1**, **2**, and **3** are shown on the top of the Vision HAWK, where LEDs indicate output status:



Digital Outputs can be configured for all three outputs on the **Digital Outputs** tab of the **Inspection Outputs** tool.

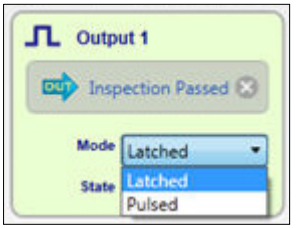


Inspection

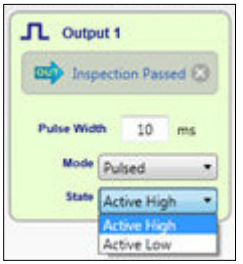
- **Inspection Passed:** Activates the output if the inspection passes. The pass state can be connected to any tool in the job for output.
- **Inspection Failed:** Activates the output if the inspection fails. The fail state can be connected to any tool in the job for output.
- **Inspection Done:** Pulses the I/O point at the end of each inspection cycle. The length of the pulse is user-configurable. The default pulse length is 10ms.

Pulse Mode

When an output is connected to the state of a tool or to the overall inspection, you have the option of changing the behavior of the output via **Pulse Mode**. Output 1 is connected to the "Inspection Passed" state in the example below. This brings up the **Mode** dropdown menu.



- **Latched:** This is the default. The output state is set at the end of the inspection cycle, and that state will remain latched until the end of the next inspection cycle when this output is updated again.
- **Pulsed:** The output state is set at the end of the inspection cycle and a timer is started. When the timer expires, the output is reset to its default state (**Off** if “Active High” is selected in the **State** dropdown menu, **On** if “Active Low” is selected). When **Pulsed** is selected in the **Mode** dropdown menu, a new “Pulse Width” parameter becomes visible as shown in the example below. This parameter allows you to set the width of the pulse in milliseconds.



Active State

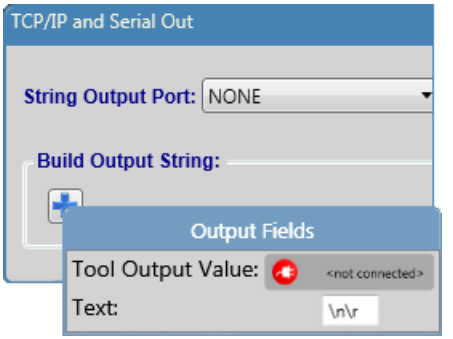
When an output is connected to the state of a tool or to the overall inspection, you have the option of changing the active state of the output via the **State** setting.

- **Active High:** The normal state of the output is open (low), and it transitions to a closed (high) state whenever it is activated.
- **Active Low:** The normal state of the output is closed (high), and it transitions to an open (low) state whenever it is activated.

Camera

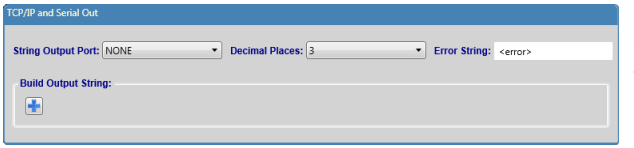
- **Picture Done:** The I/O point is off while the image is being acquired, on when the acquisition is complete.
- **Expose Done:** Turns the I/O point off while the image sensor is being exposed, and on when the exposure is complete. On an indexing machine, it is safe to move your part when the exposure is complete. Note that acquisition is not complete at this point.
- **Trigger Overrun:** Turns on to indicate an error condition in which the camera has been triggered while already in the process of acquiring an image.
- **Process Overrun:** Turns on to indicate the error condition in which the camera is being triggered at a rate that is faster than the speed of the inspection. If the camera is triggered and the previous inspection cycle has not completed, a new image will be acquired and that image buffer will be put into a queue until the camera is ready to process it. If the trigger rate is too high, the number of buffers in this queue may steadily increase until the camera eventually runs out of buffers, and this is when a Process Overrun occurs.

TCP / Serial Output



TCP/Serial Output options allow you to:

- Select Serial or TCP ports for output
- Specify the decimal places for measurement tool output
- Output up to four different tool report fields and five text fields.
- Use special non-printable characters to format TCP/Serial Output.



Hint: To reset any output string value to **Not Connected**, click the **X** to the right of the value you want to disconnect.

Note: When using AutoVISION's Emulator, you can use your TCP connection to view data output.

Special Non-Printable Characters in TCP/Serial Output

TCP/Serial Output accepts the following special characters, which can be used to configure the output string:

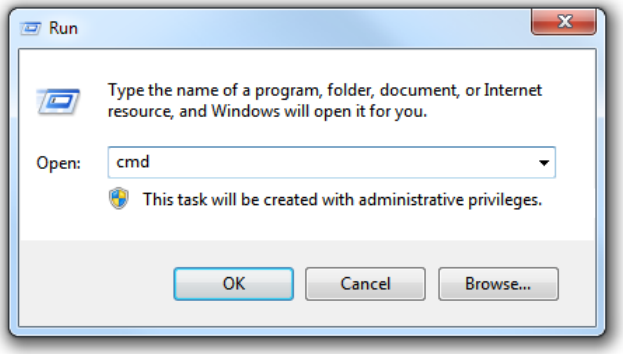
\a bell
\b backspace
\f form feed
\n new line
\r carriage return
\t horizontal tab
\v vertical tab
\' single quote
\x022 double quote (**"**)
\? question mark
\ooo three digit octal notation ASCII value, i.e. **\145 = 'e'**
\x0hh hexadecimal notation ASCII value, i.e. **\0x04C = 'L'**

Viewing TCP Output

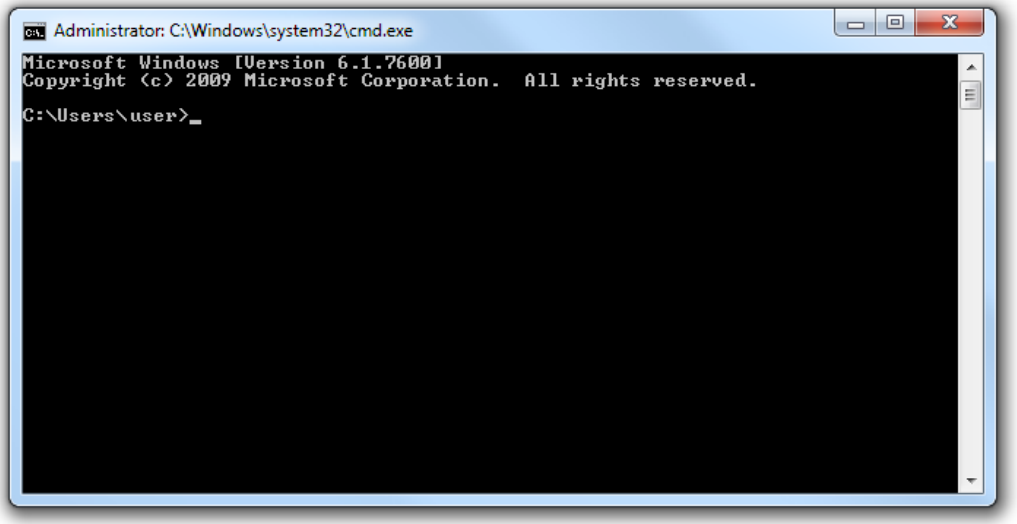
When you have configured how you want data to be output over TCP, run the job in a tryout loop or click the **Run** view to begin data output.

Here is how to view output using the TCP connection and AutoVISION's Emulator:

- While the tryout loop or the job is running, open **Run** from the Start Menu in Windows.



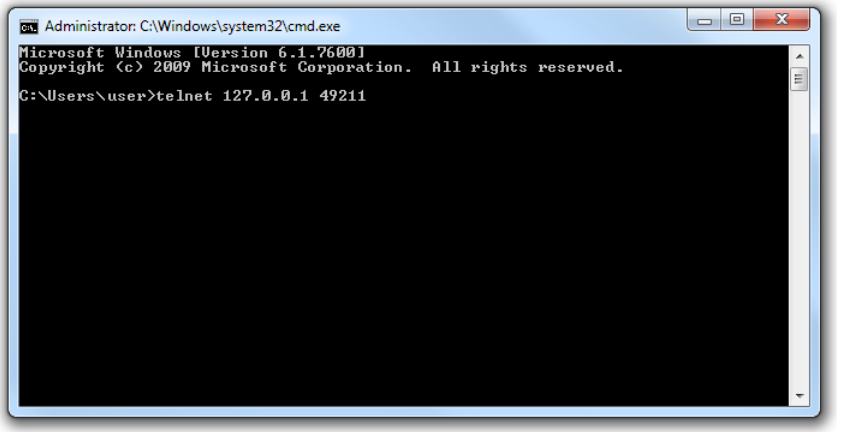
- Type **cmd** in the text field. This will bring up the Windows command line interface.



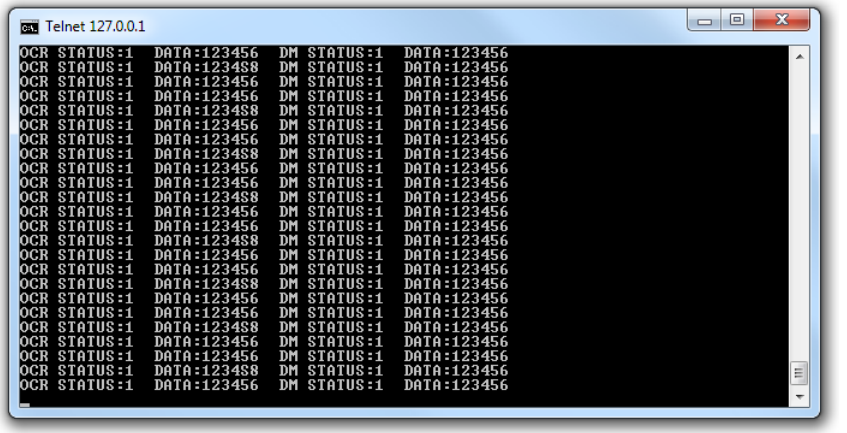
- At the prompt, type **telnet 127.0.0.1 4921x** (where '**x**' = the TCP port number - for example, 4921**1**, 4921**2**, 4921**3**, etc.) and **Enter**.

  Note: 127.0.0.1 means "this computer".

  Important: If you are connected to a camera, type **telnet [camera's IP address] 4921x** (where '**x**' = the TCP port number – 4921**1** to 4921**5**) and **Enter**.



- After you type **Enter** you will be connected to a Telnet session that shows data output as it was formatted on AutoVISION's **TCP/Serial Output** tab.



Inspection Output

The following parameter output can be linked using **Microscan Link**:

- **Status: Pass/Fail** (Compatible with the **bool** data type)

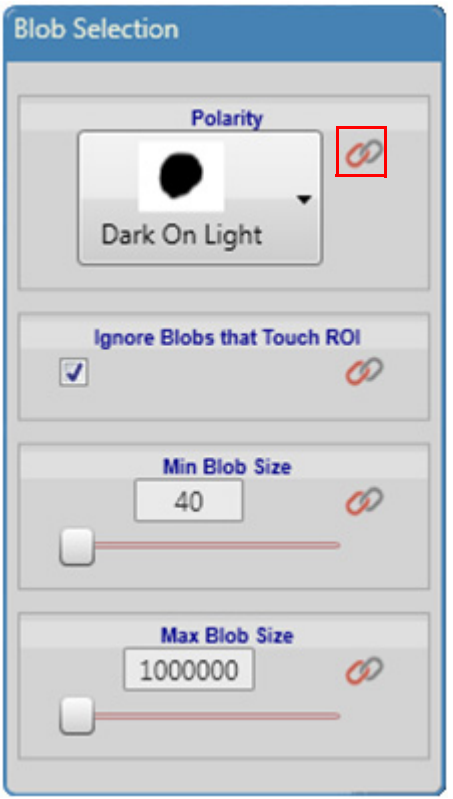
Microscan Link

AutoVISION allows you to link tool parameters to tags within the Global Data Service (GDS). This makes it possible to "set and get" the parameter values via any GDS-supported protocol, including serial, **TCP/IP**, **EtherNet/IP**, and **PROFINET I/O**.

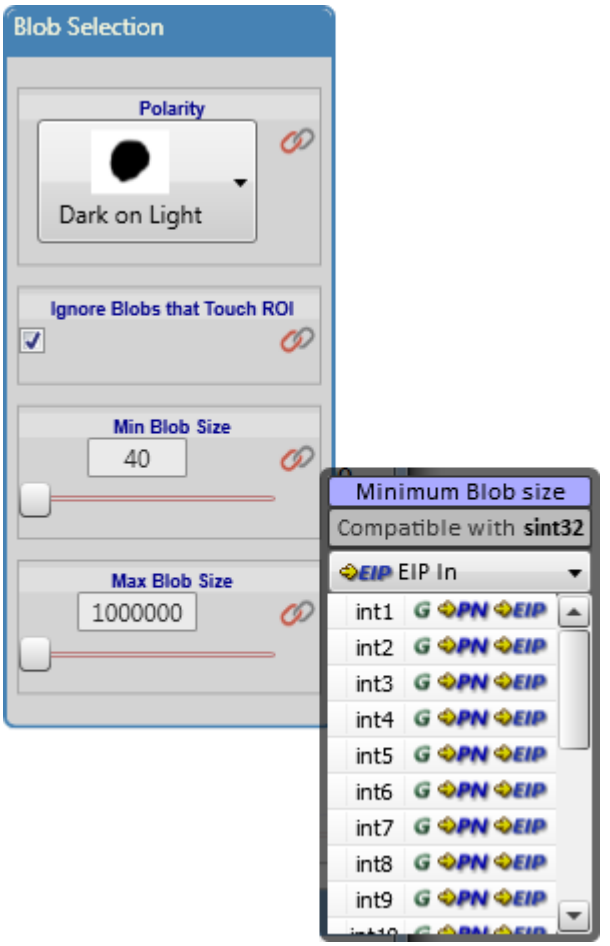
Link Buttons

Link buttons appear throughout the editing views of AutoVISION. Linkable output parameters all have a Microscan Link icon displayed next to them.

Example:

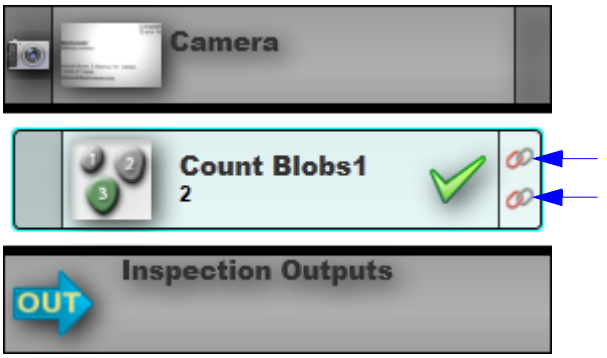


Clicking a link icon displays the **Link Menu** for that parameter:

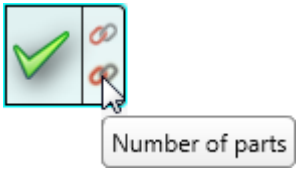


The Link Menu shows the names of compatible GDS tags. For example, the Min Blob Size parameter is an integer, so it can be linked to integers and longs.

The Link buttons for tool outputs appear in the right column of a tool within the tool list:



Hovering the mouse over any link button identifies its associated parameter as shown below:

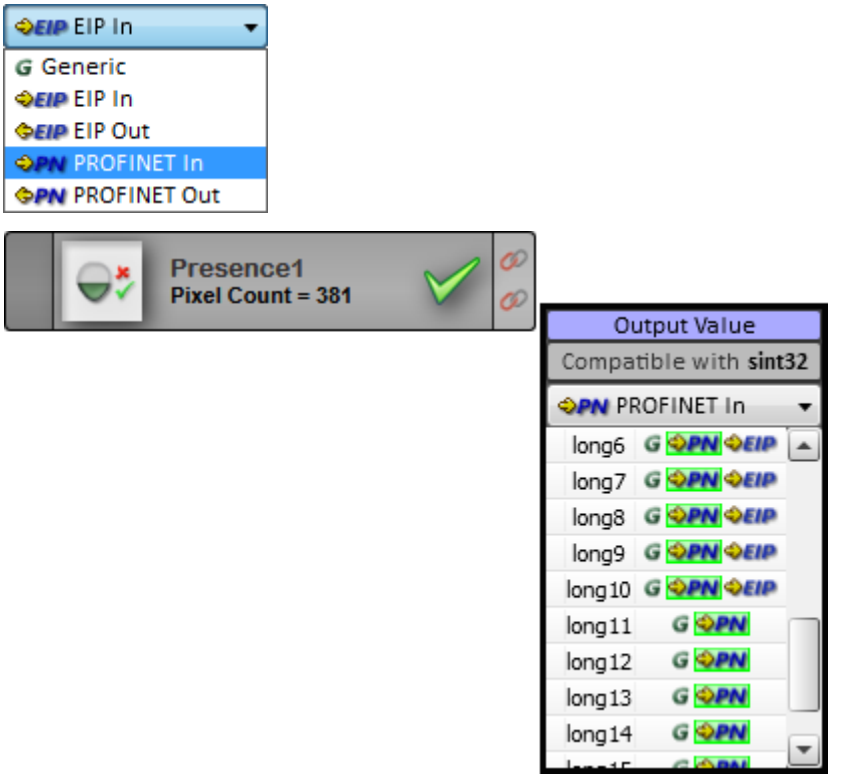


Clicking the link button displays the link menu populated with GDS tags of a compatible type. Once a parameter is linked, the background of the link button turns green:

Link Menus

The **Link Menu** displays the compatible GDS tags to which the parameter can be linked. At the top of the menu is a dropdown that acts as a filter limiting the choices available.

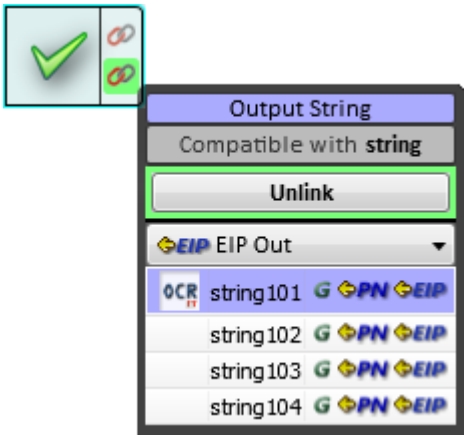
- The first option, **Generic**, filters the list to include all 200 Generic tags.
- The second option, **EIP In**, filters the list to include only items that can be accessed via the EIP input assembly.
- The third option, **EIP Out**, filters the list to include only items that can be accessed via the EIP output assembly.
- The fourth option, **PROFINET In**, filters the list to include only items that can be accessed via a PROFINET I/O input slot.
- The fifth and final option, **PROFINET Out**, filters the list to include only items that can be accessed via a PROFINET I/O output slot.



The list displays icons representing which protocols can access the particular item.

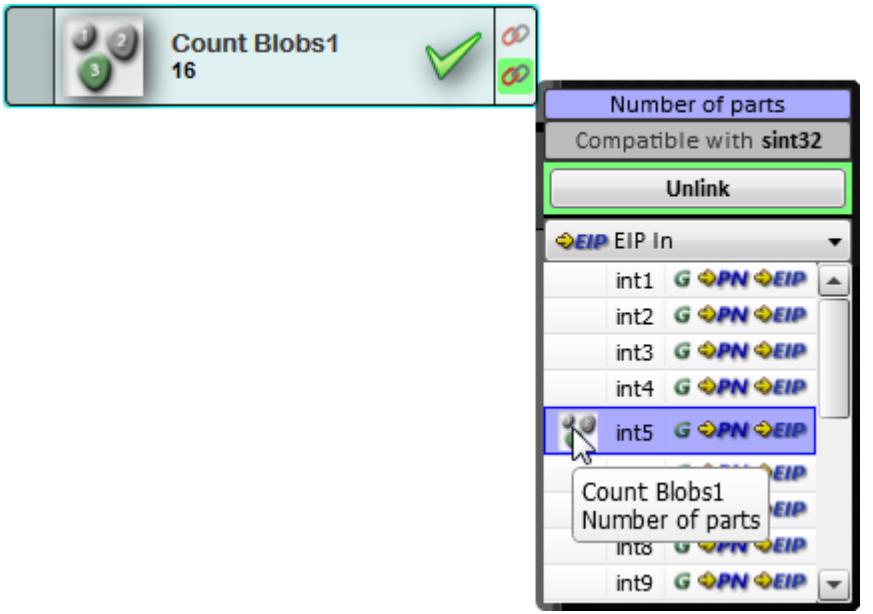
The currently active protocol – the protocol that has been enabled on the selected device – is highlighted with a green rectangle as shown above.

If the parameter has already been linked at the time the Link Menu is shown, an additional **Unlink** button appears at the top:



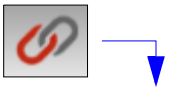
Clicking the **Unlink** button will remove the existing link.

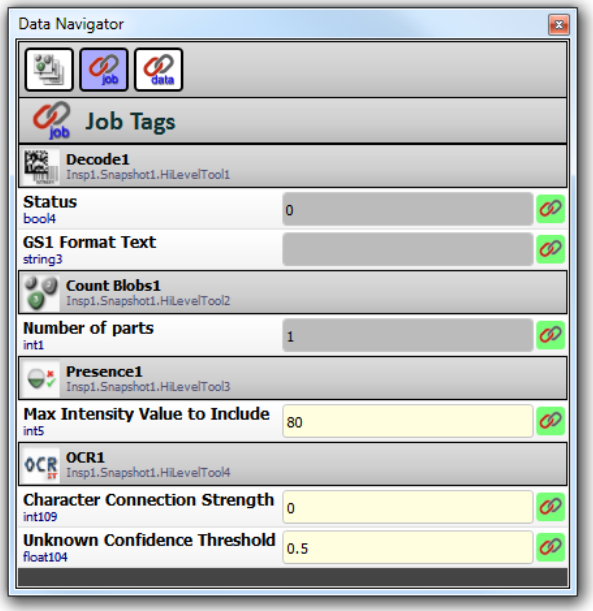
An icon representing the corresponding tool appears next to any GDS tags that have already been linked. Hovering the mouse over the icon shows information about the tool it represents.



Data Navigator

The **Data Navigator** is a utility window that can be shown by clicking the link icon shown below or by typing the keyboard combination **Ctrl + D**. It allows you to browse the information stored in AutoVISION's Global Data Service (GDS).





At the top of the Data Navigator are buttons that show different views.

The **Tools** button shows the GDS information for each tool in the job.

The **Job Tags** button shows a summary of the GDS links in the current job.

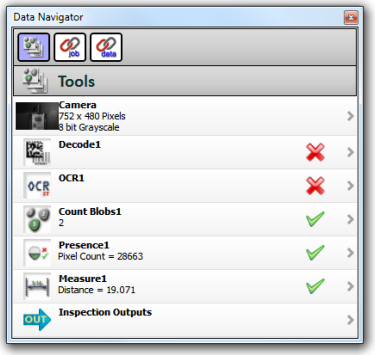
The **Data Tags** button shows GDS information about the various EIP services.

The Data Navigator can be shown while editing and also running a job. When displayed during Run mode, only the **Data Tags** button is visible.

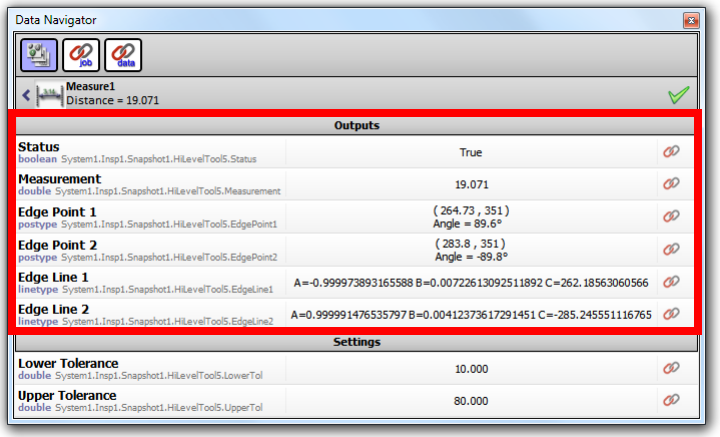
Tools View

The **Tools View** is shown when you click the **Tools** button:

This view shows a summary of all of the linkable parameters for all the tools in the job. A typical tools view is shown here:



Each tool within the job is shown much as it would be shown in the tool list. For each tool, the icon, tool name, current output, status are shown. There is a right arrow button to the right of the tool status icon that allows you to "drill down" to further information about the tool. For example, drilling down on Measure1 shows the following:



Important: For the Decode, OCR, Measure, and Symbol Quality Verification Tools, the Data Navigator Outputs list shows additional linkable outputs that are not shown in the main user interface. Check the Data Navigator to ensure that you are aware of all possible linkable outputs for these tools.

The header of this view shows the current tool and also a button to "drill up" or return to the previous view.

The parameters are displayed in a categorized list, along with GDS type and path information. The current value is also shown, but cannot be altered from this view. A link button is shown for any linkable parameters.

Data Tags View

The **Data Tags View** is shown when you click the **Data Tags** button:

This view shows information from the point-of-view of the industrial protocol services. These include viewing the EIP explicit input and output assemblies, items accessible via explicit EIP messages, and items accessible via PROFINET I/O input and output slots.

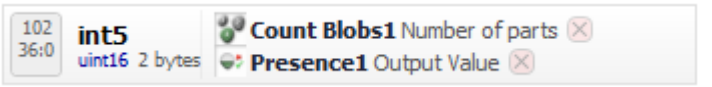
A typical example is shown here:

In the above example, the display is filtered to show only integers which are part of the EIP input assembly.

Each assembly item is shown along with its offset within the assembly, its size, and its links.

Each of the links is shown, along with an **Unlink** button:

If more than one parameter is linked to the same location, a list of those parameters is shown:



Job Tags View

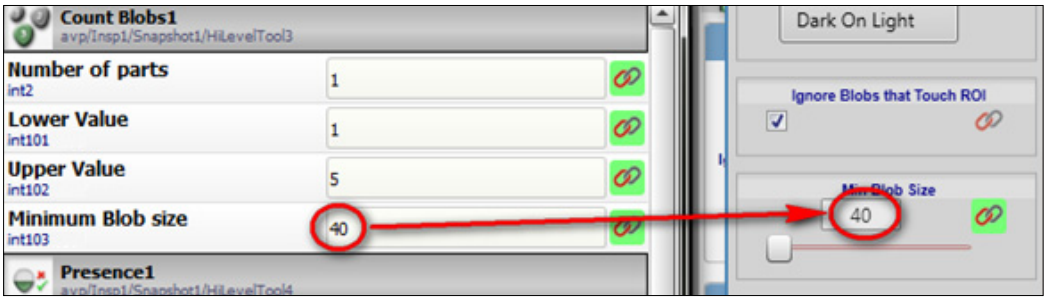
The **Job Tags View** is shown when you click the **Job Tags** button:

Each of the parameters that have been linked in the job are shown here, categorized by the tool to which they belong.

The items are displayed as follows:

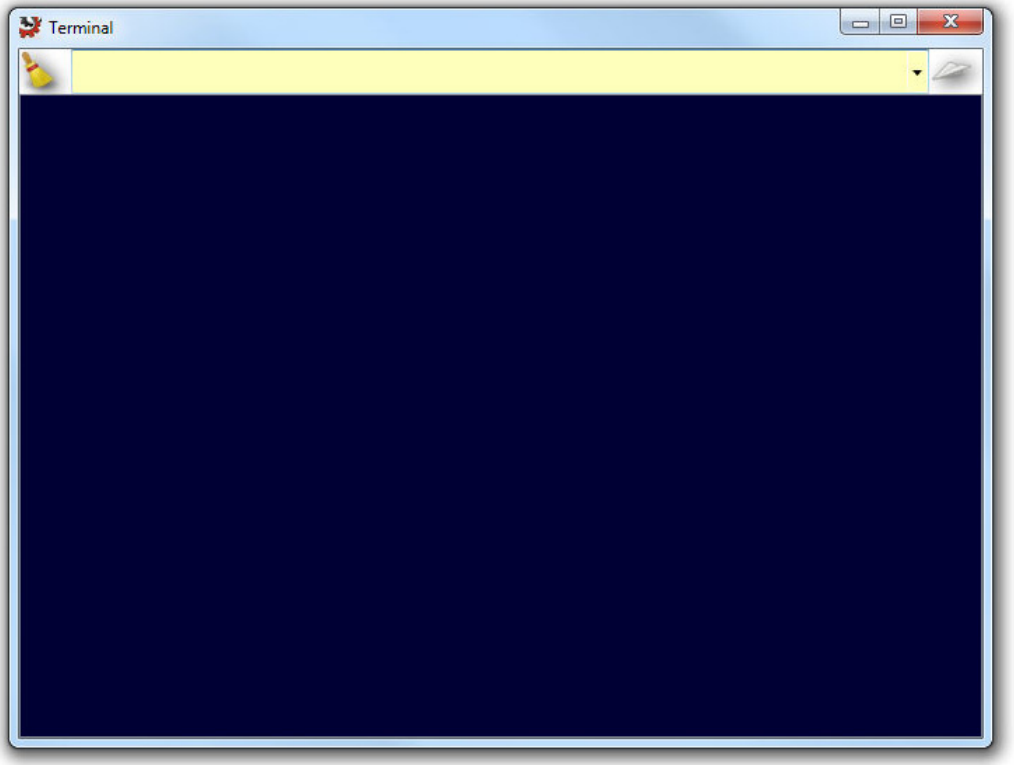
Each tool that contains links is shown as a section header, along with its icon and GDS path. Within each tool section, each of the linked parameters is shown, along with its GDS path, current value, and a link button. The link button can be used as always – i.e., it displays a Link Menu with which one can change the link assignment or unlink the parameter. The value display within each item permits text entry, so a new value can be assigned to the linked parameter.

The following example shows how changing the Minimum Blob Size to **40** within the Data Navigator window writes the data to the linked parameter within the job, which then appears as the value in the parameter panel.



Terminal

To access the Terminal, type **Ctrl + T** on the keyboard. The following view will appear:



The Terminal can be used to send serial commands.

At the top of the Terminal is a field where commands can be typed. There are also two buttons:

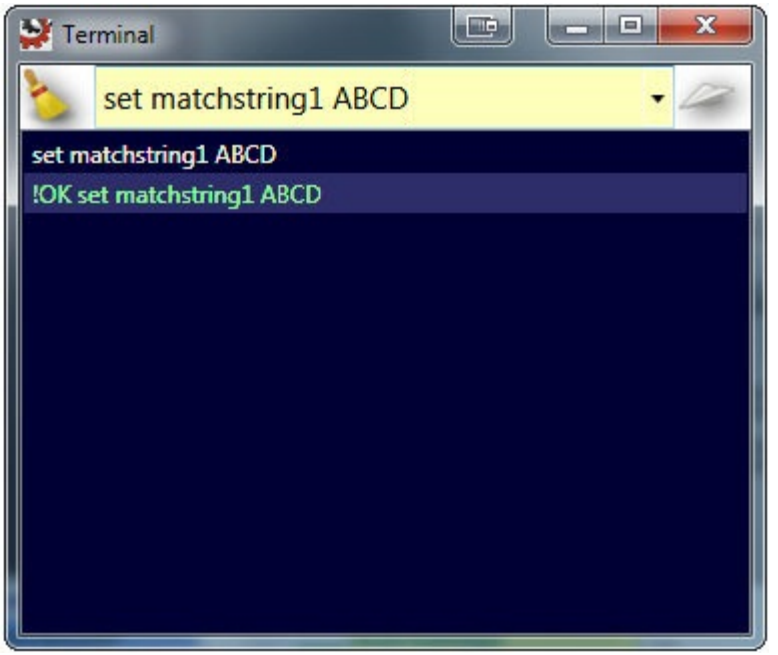
Clear Display

Send Entered Command to Currently Selected Device

Typing the **Enter** key on the keyboard will also send the command.

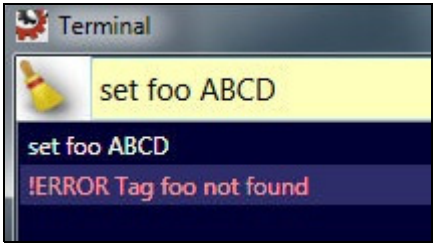
Setting a Match String with Terminal

Type a **SET** command followed by the string shown below:

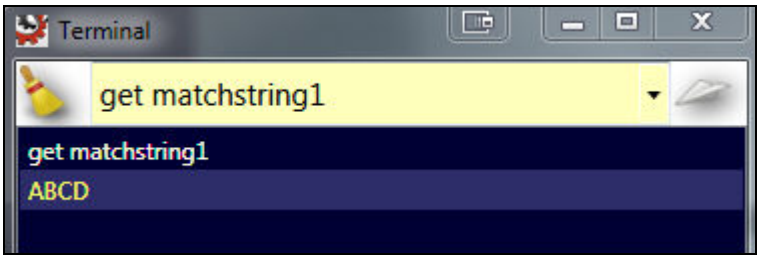


If the SET command is successful, the response will be **!OK** followed by an echo of the command.

If the command is not successful, the response will be **!ERROR** followed by text describing the error.

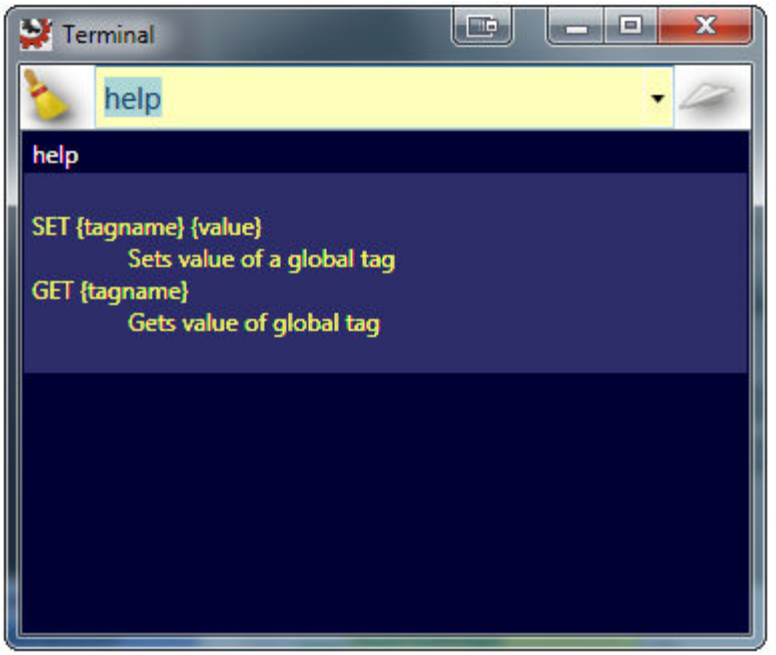


The following illustrates how to **GET** the value of “matchstring1”:



The response for a GET command returns just the value if the command succeeds. There is no beginning **!OK**, as in the SET command. However, an error condition will always begin with **!ERROR**.

The **HELP** command shows a list of the supported serial commands and their syntax:



Serial Commands

Serial commands can be sent via **TCP (Telnet) port**, **AutoVISION Terminal**, or **HyperTerminal**.

Serial Command Syntax

< > = Required argument. Replace appropriately.

For example:

-u <DB_User_name> becomes **-u av** where **av** replaces **DB_User_name**.

| = Mutually exclusive arguments. Choose one from the list.

{ } = Used with **|** to specify a list of choices for an argument.

[ ] = Optional parameter.

Important: Unless otherwise stated, commands will respond with **!OK** on success and **!ERROR** on failure.

GETIMAGE <-transfer=ymodem> [-format={jpg|png}] [-quality={0-100}] [-woi=left,top,right,bottom] [-inspection=n]

Initiates serial transfer of inspection image (RS-232 only).

Note: This command always returns the last (most recent) image.

-transfer=ymodem is currentlynot optional - only Ymodem protocol is supported.

-format={jpg|png} specifies the format of the image. If omitted, the image format is JPG.

-quality=*n* specifies a JPG compression quality of ***n*** less than or equal to 100. The default quality is **80** if not specified.

Note: The PNG format provides lossless image compression. If **format** is set to **PNG**, the **quality** setting does not apply.

woi=left,top,right,bottom specifies a rectangular area of the image to be included in the output image. If omitted, the full image buffer is returned.

-inspection=*n* specifies the inspection from which to retrieve an image. The image will be from the first snapshot within that inspection. If not specified, the image will be from the first inspection that does contain a snapshot.

The following example will retrieve an image from the camera with these settings: **Protocol:** ymodem; **Format:** png; **Quality:** N/A; **Inspection:** second inspection.

GETIMAGE –transfer=ymodem –format=png –inspection=2

The following example will retrieve an image from the camera with these settings: **Protocol:** ymodem; **Format:** jpg (default); **Quality:** 50; **Inspection:** first inspection (default).

GETIMAGE –transfer=ymodem –quality=50

ONLINE

Starts all inspections.

OFFLINE

Stops all inspections.

TRIGGER

Triggers an inspection.

vt [n]

Triggers an inspection by pulsing a Virtual I/O point.

For example:

vt 1

will return pulse **VIO1**. The inspection will run if it is configured to use **VIO 1** as a trigger.

If specified, the VIO index must be in the allowed range for Virtual I/O points within Visionscape. The virtual I/O line will be set high then low.

If VIO Index is not specified, VIO1 is assumed.

Fail Return: Return **!ERROR** followed by the reason for the failure.

For example:

!ERROR No such trigger

when the index specified '**n**' is out of range of virtual triggers.

REBOOT [-noload]

Reboots the device.

-noload = do not load BOOT job.

MEMAVAIL [-cp]

Returns available memory for device or coprocessor.

MEMCONTIG [-cp]

Returns maximum memory block for device or coprocessor.

MEMFRAGS [-cp]

Returns memory fragments for device or coprocessor.

MEMINFO [-cp] [-v]

Returns memory summary "avail/contig/frags" for device or coprocessor. Verbose.

VERSION

Returns Visionscape software version.

JOBSAVE [-slot=]<n>

Saves current job to slot ***n***.

JOBLOAD [-slot=]<n> [-r]

Loads job from slot ***n***.

-r = Start inspections.

JOBDELETE {[-slot=]n|-all}

Deletes job in slot ***n***, or all jobs if **-all**.

Important: Does not delete the current job loaded in camera memory.

JOBINFO [[-slot=]n] [-v]

Gets job summary or info about slot ***n***.

JOBINFO with no arguments returns a list of all jobs on the device.

-v = Verbose ***n***. This option shows the amount of space that would be freed if the job were deleted. It also lists the total disk space and free disk space.

JOBBOOT [-slot=]<n>

Sets bootup job slot ***n*** (RS-232 only).

JOBDOWNLOAD <-transfer=ymodem>

Downloads .avz job packaged via transfer method (RS-232 only).

SET <tagname> <value>

Sets value of a global tag.

The tagname must correspond to one of the supported tags within the device.

The value can contain spaces.

The command is terminated by a carriage return and/or line feed character.

The value can be a list of comma-separated items to set a sequence of tags:

Send **SET int1 1, 2, 3** to set int1 = 1, int2 = 2, int3 = 3.

The AVP service allows setting of step and datum information from the job tree using forward slash '/' in the symbolic name path. **SET avp/insp1/snapshot1/acq1/gain 2.0** paths are not case-sensitive and do not need to be fully qualified if unique.

SET avp/acq1/gain 2.0 will set the same gain value if there is only one acquire.

Control tags in the AVP service such as **START**, **STOP**, and **TRIGGER** act as momentary switches. **SET avp.start 1** is equivalent to the **ONLINE** command. **avp.start** will reset immediately and always read as **0**.

Success Return: On success will return **!OK** followed by an echo of the command.

For example:

!OK SET matchstring1

Fail Return: On failure will return **!ERROR** followed by the reason for the failure.

For example:

!ERROR Tag matchstring66 not found

GET {tagname|service|service.tagname}

Gets value of a global tag.

The tagname must correspond to one of the supported tags within the device.

The command is terminated by a carriage return and/or line feed character.

Include an index to get a single value from an array such as **GET int1**. If the index is omitted, the full array of values will be returned in a comma-separated list of values.

Send **Get {tagname|service.tagname|service}** to get the value of a tag within the global data service. To get the value of a tag within another service, prefix the tagname with the service name. For example, a **GET <service.tagname>** command such as **GET eip.input** for the EIP input assembly.

The AVP service allows retrieval of step and datum information from the job tree using forward slash '/' in the symbolic name path. **GET avp/insp1/snapshot1/status** paths are not case-sensitive and do not need to be fully qualified if unique.

GET avp/snapshot1/status will return the same result if there is only one inspection.

When issued against a step, **GET avp/snapshot1** will return the values for all datums.

Success Return: On success will return the value stored in the tag.

For example:

ABCD

Fail Return: On failure will return !ERROR followed by the reason for the failure.

For example:

!ERROR Tag matchstring66 not found

INFO [tagname|service]

Gets information about a tag or service.

INFO with no arguments gets a list of services.

INFO <service> gets a list of tags in that service.

INFO <service.tagname> gets attributes of the tag as well as a list of subtags.

The AVP service allows retrieval of step and datum information from the job tree using forward slash '/' in the symbolic name path. **INFO avp/insp1/snapshot1/status** paths are not case-sensitive and do not need to be fully qualified if unique.

INFO avp/snapshot1/status will return the same result if there is only one inspection.

When issued against a step, **INFO avp/snapshot1** returns properties of the step, a list of child datums, and a list of child steps. Child steps are indicated by a trailing forward slash.

QUERYAUTOCAL

Returns photometry settings: Gain, Exposure, and Focus.

AUTOCAL

Performs automatic calibration of photometry settings: Gain, Exposure, and Focus.

TARGET {0|1|off|on}

Turns targeting LEDs On or Off.
target 1 = Turn Target On
target 0 = Turn Target Off

CHECKSUM {BOOT | KERNEL | BOOTPARAM}

Gets a checksum on an individual part of the system.

HELP

Returns a list of all serial commands showing correct syntax and functionality descriptions.

5 Run

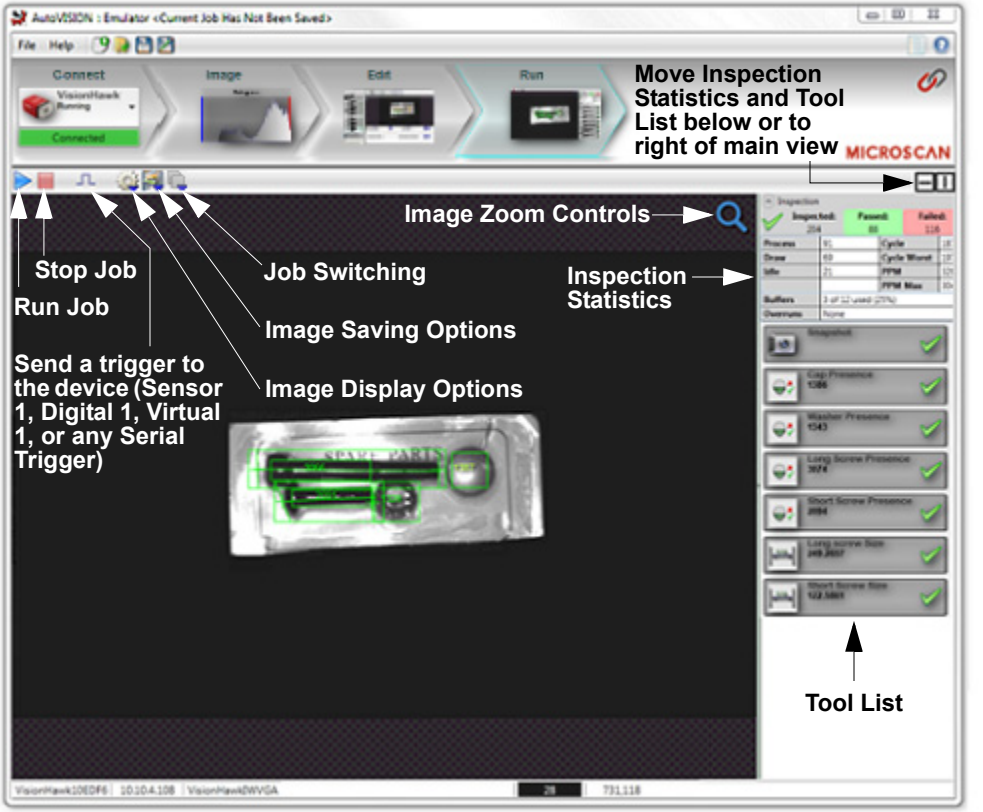
Contents

This section describes the various elements of **AutoVISION**'s **Run** view.

Run Overview

The **Run** view is a monitoring interface with real-time information, the ability to save images, and the ability to configure how images are displayed.

This view allows you to monitor current inspection status, and features image saving options (**Save No Images**, **Save All Images**, **Save Failed Images**, or **Save Passed Images**) as well as image display options.



The following sections describe **Image Display Options** and **Image Saving Options** in greater detail.

Important: Triggering from AutoVISION is intended for testing only and results in significant processing time variation. Use the actual trigger source for actual timing values.

Image Display Options

Image Display Options allow you to choose which images to display and how to display them. You can also determine how many images to display per second, or choose to show tool graphics (boundary ROIs or OCR characters, for example).

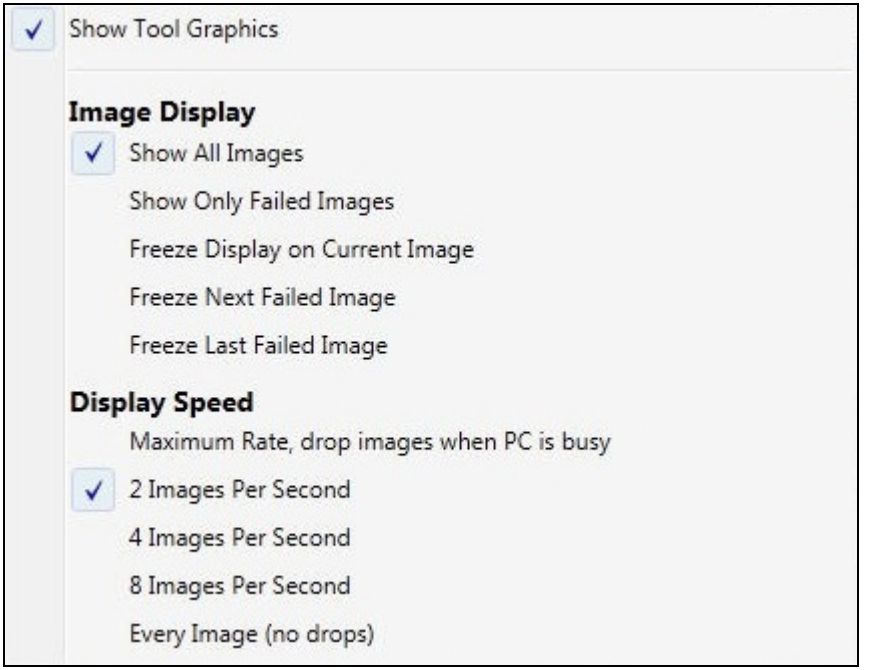
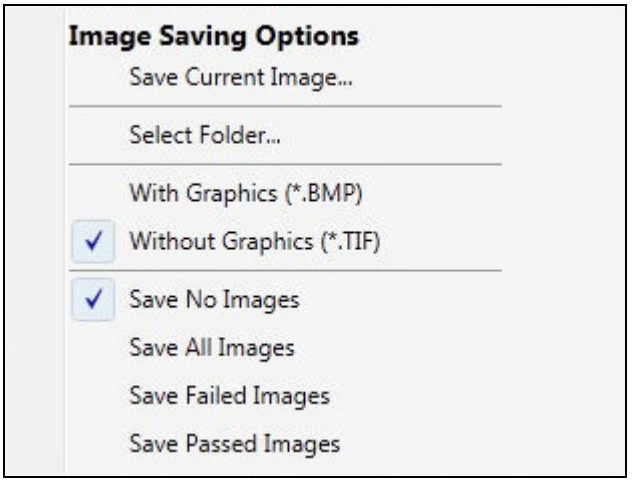


Image Saving Options

Image Saving Options allow you to determine which kinds of images to save and where to save them. Select the folder where you want to save the images on your PC, and choose whether you want AutoVISION to save no images, all images, only failed images, or only passed images. You can also choose whether to display the images with graphics that show results of tool processes (boundary ROIs or OCR characters, for example) or to save the images without those graphics.

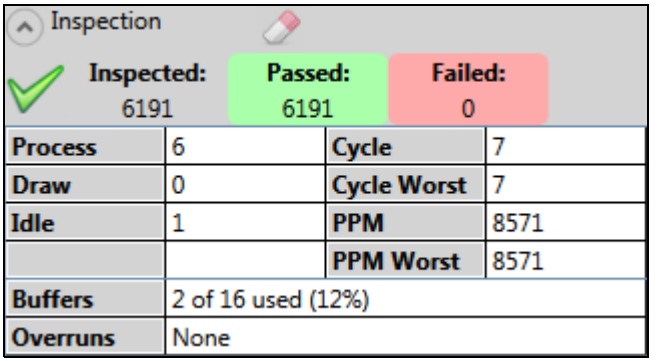
Note: Save No Images is selected by default at startup.



Inspection Statistics

The **Run** view provides the following statistics:

- **Inspection Counts:** Displays the number of parts inspected, passed and rejected;
- **Inspection Timing Statistics:** Displays statistics on the speed of your inspection;
- **Tool Results:** Shows the Pass/Fail status and inspection data from each of your tools.



6 Firmware and License Upgrades

Contents

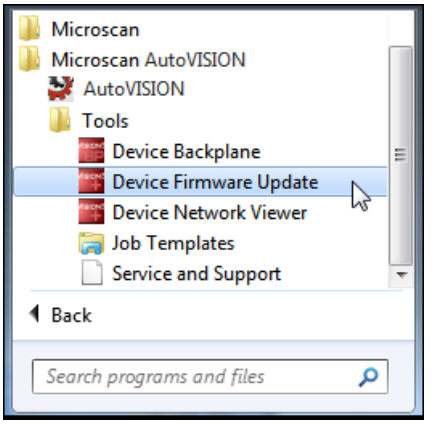
This section describes how to upgrade your camera's firmware using **AutoVISION**'s **Device Firmware Update** feature, and how to upgrade your camera for use with Microscan's **Visionscape** software.

Updating Firmware

AutoVISION's simple **Device Firmware Update** feature makes it easy to download and install firmware on your camera.

To download and install firmware:

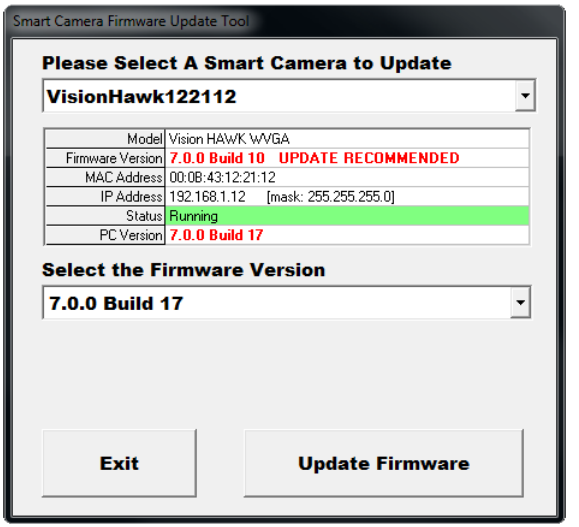
- Navigate to **Windows Start Menu > Programs > Microscan AutoVISION > Device Firmware Update**.



- After you click Device Firmware Update, the **Smart Camera Firmware Update Tool** will appear. Select your camera from the **Please Select a Smart Camera to Update** dropdown menu.

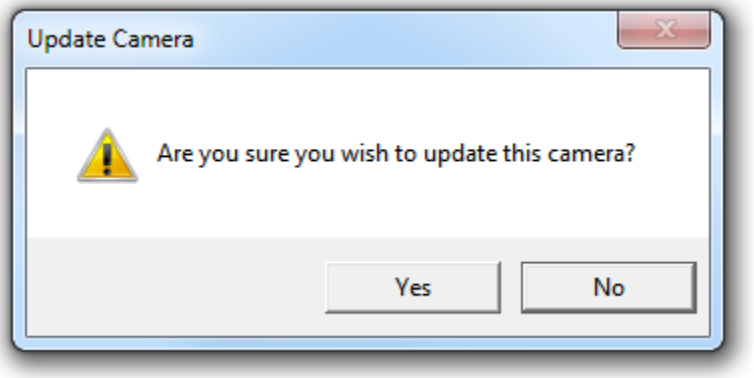
  Note: Only cameras on the same network as your PC will be visible in this menu.

- Once you have selected your camera, its identifying details, such as **Model**, **Firmware Version**, **MAC Address**, **IP Address**, **Status**, and **PC Version** will be displayed.



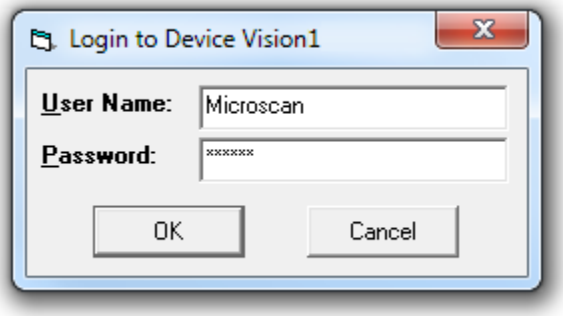
- Select the desired version of firmware from the **Select the Firmware Version** dropdown menu. This menu will list all the firmware versions on your PC.

  Note: The firmware versions shown below are representative examples and may not necessarily reflect what you see on the dropdown menu.
- Click the **Update Firmware** button.
- A dialog will appear asking **Are you sure you wish to update this camera?** Click **Yes**.

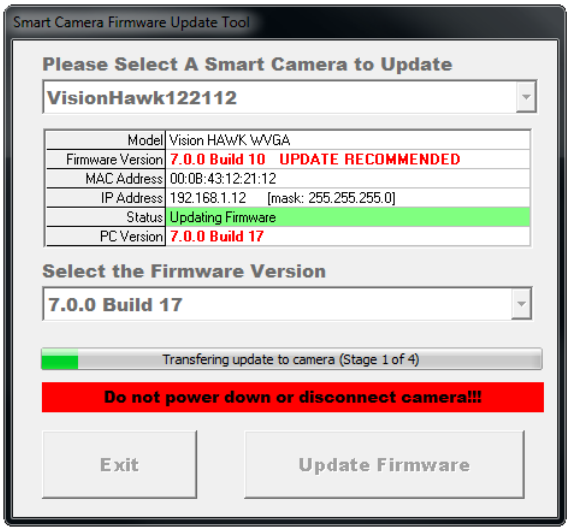


- If a username and password have been defined for the camera, a second dialog will then appear prompting you for your username and password.

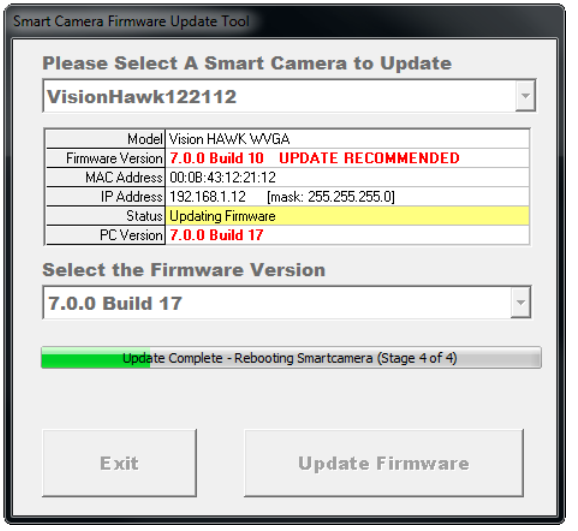
  Important: The username and password are both case-sensitive. Click **OK** after you have entered your username and password to begin the download and install process.



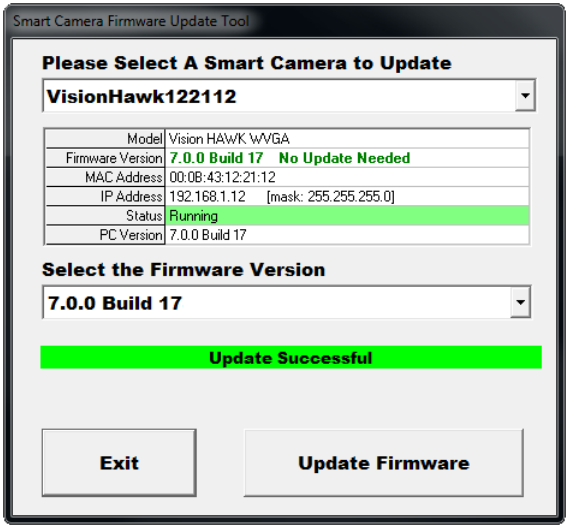
The firmware update process may take more than a minute for the Vision MINI or Vision MINI Xi and several minutes for the Vision HAWK.



Once the firmware is downloaded and installed, the camera will reboot.

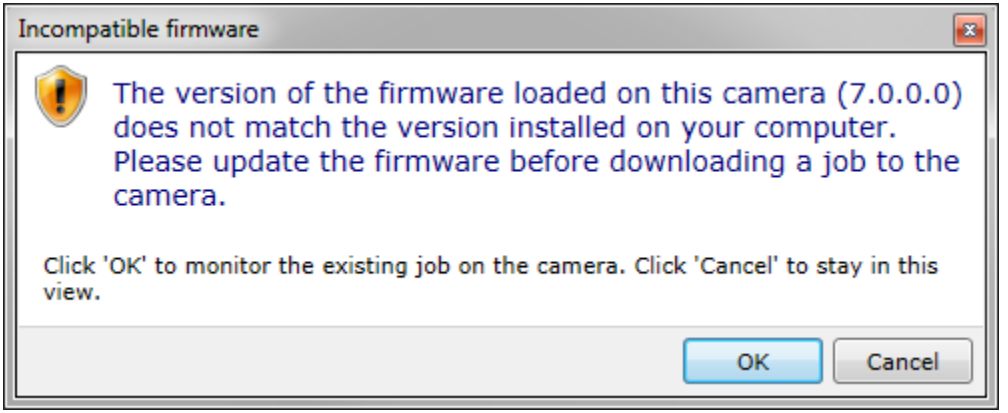


- When the entire firmware update process is complete, click the **Exit** button to close the utility.



Firmware Compatibility

Note that the camera's firmware version must match the version of Visionscape being used to manipulate a job on the PC. The following dialog will appear if the firmware and software versions do not match.

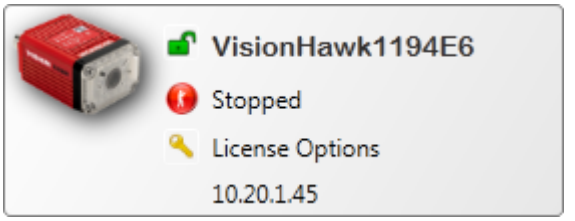


Camera License Upgrade

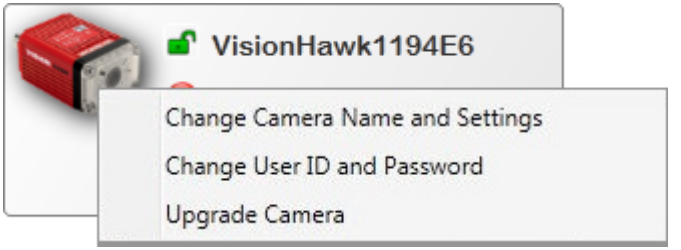
Some advanced AutoVISION features can only be accessed if your camera has the correct license. The following features require a license:

- **Visionscape access** – allows your camera to be accessed from Visionscape FrontRunner or from a custom user interface;
- The **OCV Tool** and **Symbol Quality Verification Tool**.

If you require one of these licenses, you can automatically generate a request by clicking the **License Options** button.

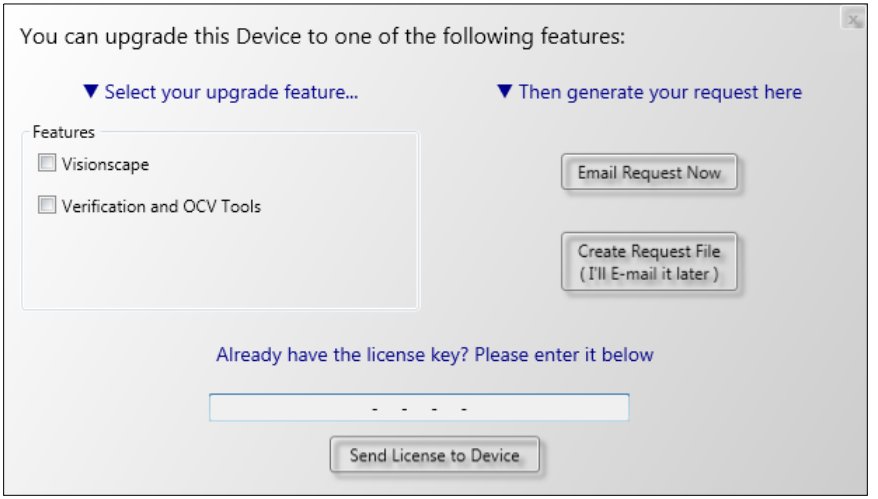


Or right-click on the camera image and select **Upgrade Camera**:

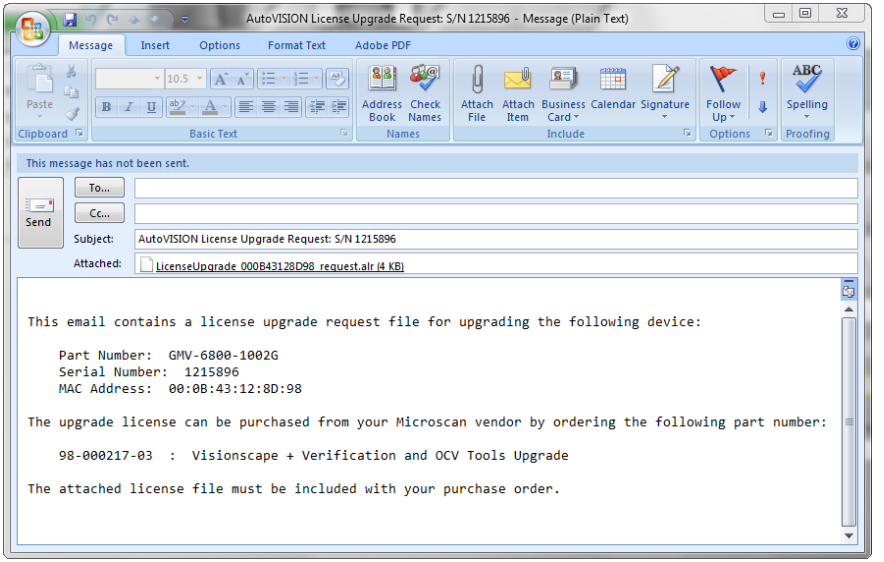


(continued next page)

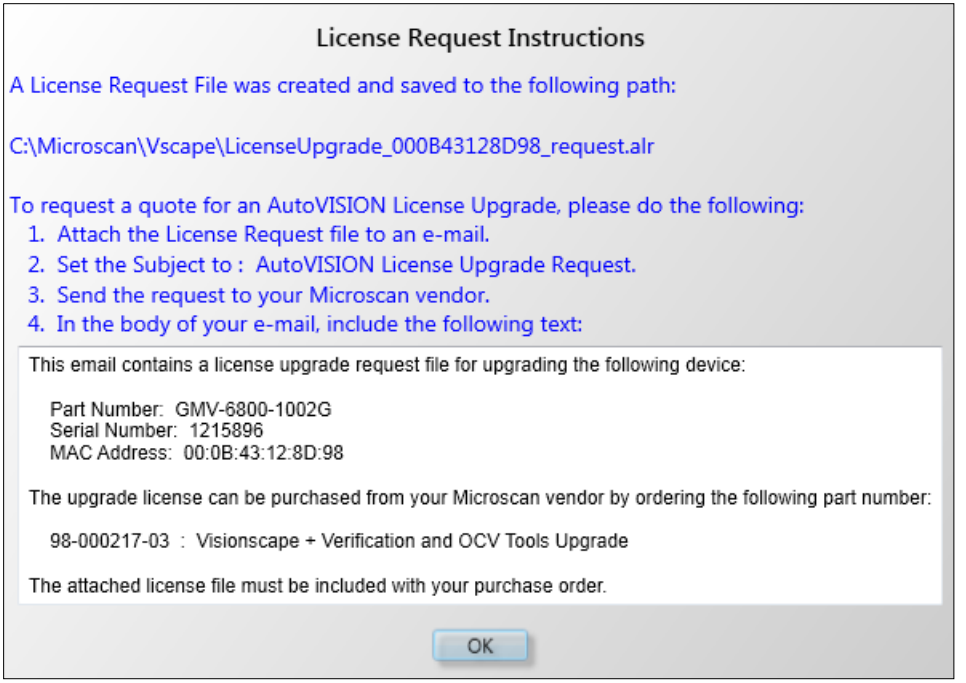
The following dialog will then appear, allowing you to choose an upgrade to **Visionscape** or an upgrade to a **Verification and OCV Tools** license, or allowing you to enter the license key if you already have it. If you select Visionscape or Verification and OCV Tools an ALR file (AutoVISION License Request) is generated. That file must be attached to an e-mail that you can then send to your Microscan Partner. You can also save the ALR file to your PC and then e-mail it to your Partner from a different PC.



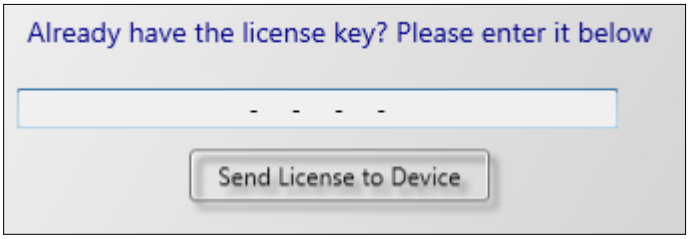
If you click **E-mail Request Now**, a message similar to the one below will be generated. Send the message to your Microscan Partner to purchase the upgrade.



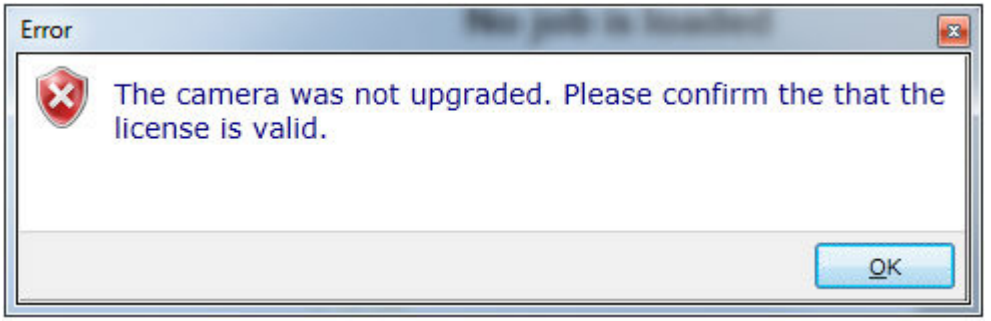
If you click **Create Request File (I'll E-mail It Later)**, the following dialog will appear, providing instructions for how to request the upgrade from your Microscan Partner.



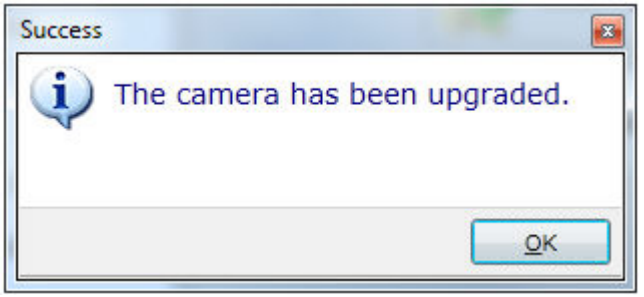
Once you receive the key from your Microscan Partner, you can enter it in text field shown below to upgrade the camera.



You will receive this error message if the license key is not valid:



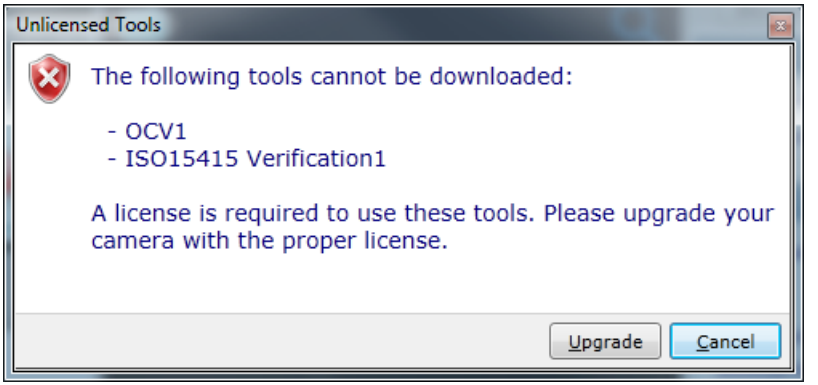
You will receive this message if the license key is valid and the camera is successfully upgraded.



Licensing the OCV and Symbol Quality Verification Tools

The **OCV** Tool and **Symbol Quality Verification Tool** can be used in the Emulator, but for use with a camera, both tools require a license. The license can be purchased using the **Upgrade License** feature.

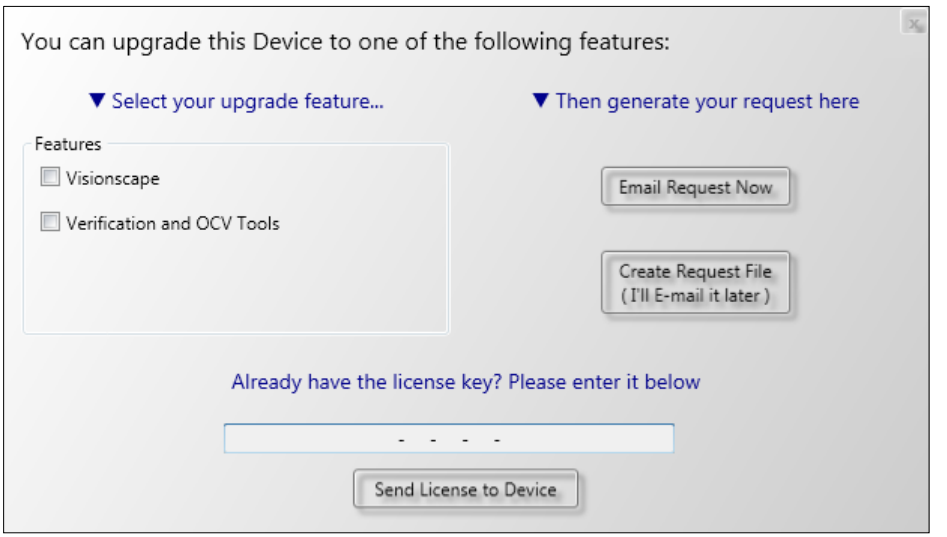
When you try to download a job with unlicensed tools to the camera, the **Unlicensed Tools** dialog will appear:



If you click **Cancel**, the job will still be editable and can be saved to your PC, but not downloaded to the camera.

If you click **Upgrade**, the following upgrade dialog will appear. This dialog allows you to select which upgrades to purchase, to create and e-mail an upgrade request to your Microscan Partner, and to enter the license key if you already have it.

Note: The **Verification and OCV Tools** license must be purchased in order to download those tools.



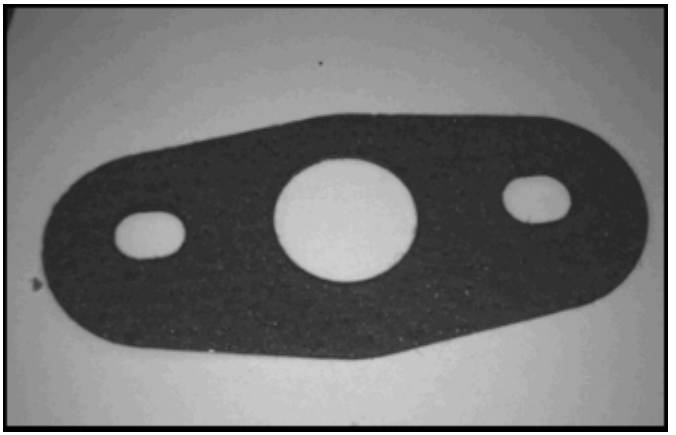
7 Example Job: Gasket Inspection

Contents

This section demonstrates some of **AutoVISION**'s tools and output capabilities in action. The purpose of the vision job in this example is to verify the following elements of an automotive gasket:

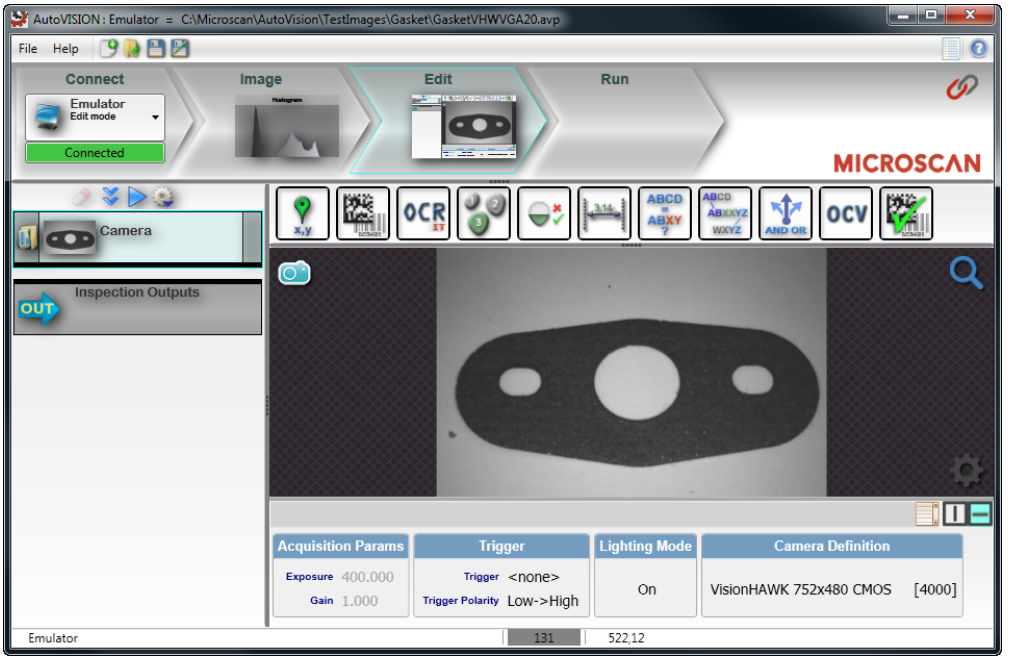
- **Cut size**
- **Presence of bolt holes**
- **Correct size of center hole**

and then to report the inspection status and gasket height.

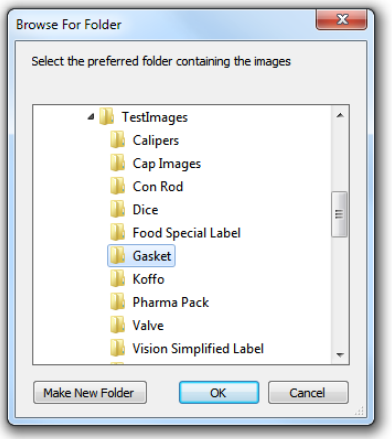


Start Gasket Job

- Select the **Emulator** from the **Select Device** menu in the **Connect** view.
- Create a new job and proceed to the **Edit** view.



- Select the directory in which the image you want to inspect is stored (in this example, an image of an automotive gasket). Click the folder icon to the left of the **Camera** tool. This will bring up the **Browse For Folder** dialog. Click on the folder containing the images you want to inspect, and then click **OK**.

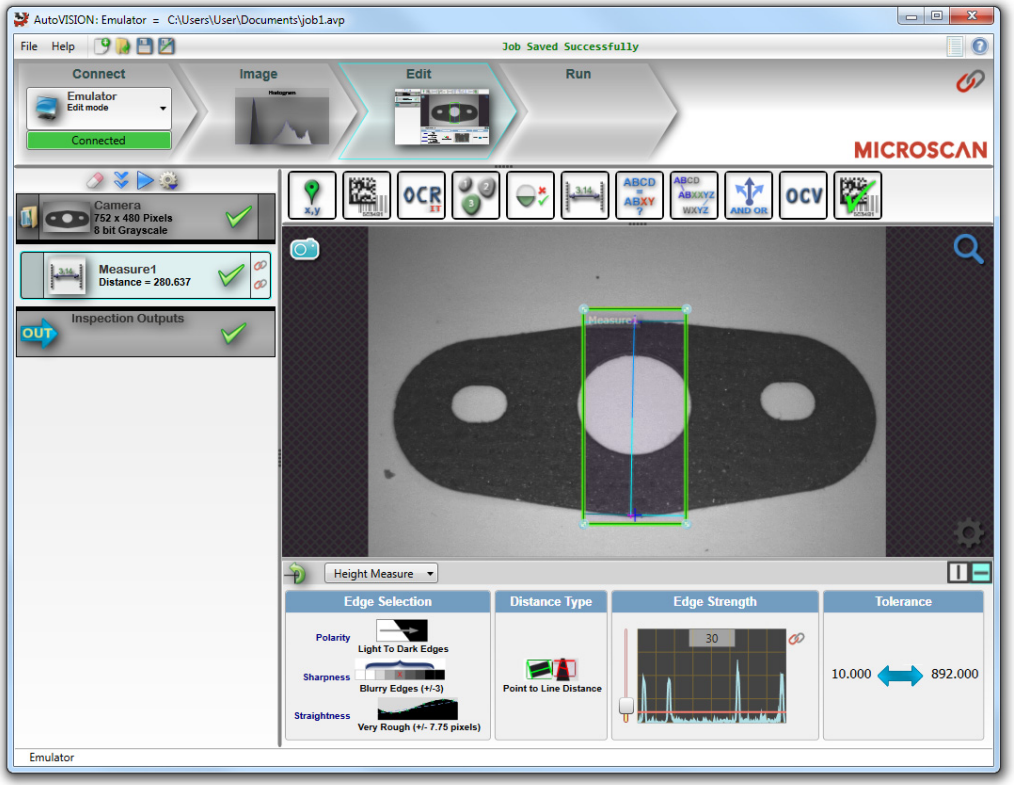


Add Measure Tool

Add a **Measure Tool** to check the height of the gasket.

Set the following Measure Tool parameters:

- **Function:** Height Measurement, Light Background to Dark Object
- **Edge Quality:** A Little Rough, Not Always Straight
- Set tolerances to accept good cuts but reject bad cuts



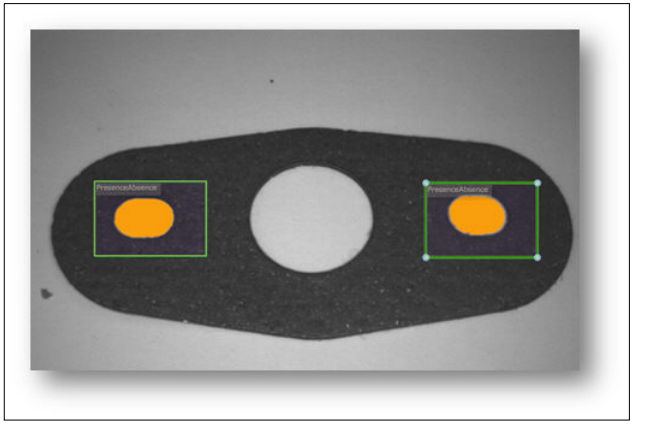
Hint: Double-click on the name of the tool (**Measure1**) in the tool list on the left side of the interface to re-name the tool.

Add Three Presence/Absence Tools

Add two **Presence/Absence Tools**: one for each of the gasket's two smaller holes.

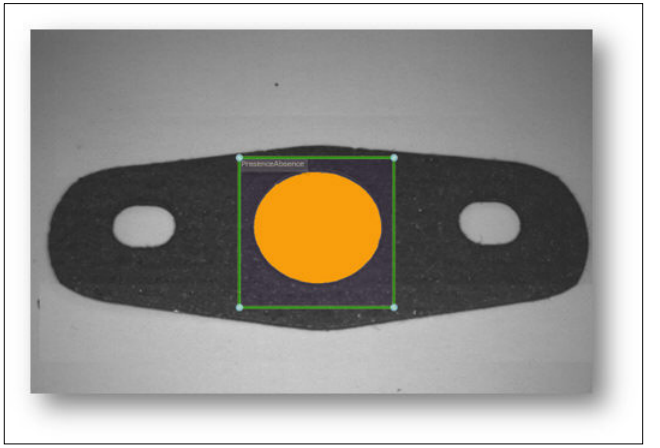
Set the following Presence/Absence Tool parameters:

- Adjust Threshold to look for light pixels.
- Adjust Limits so the tool fails when no hole is present.



Add a third Presence/Absence Tool to measure the size of the gasket's center hole.

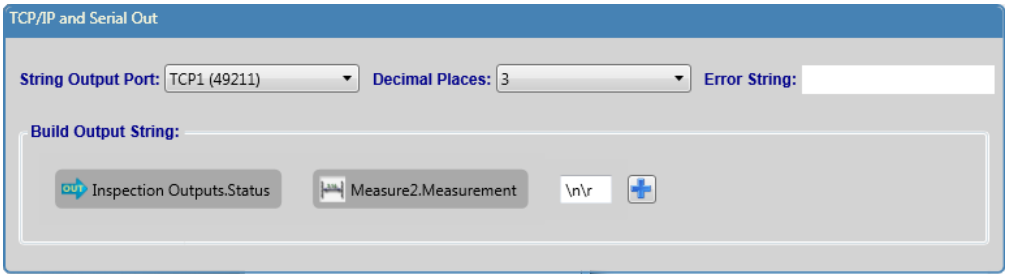
- Adjust Threshold to look for light pixels.
- Adjust Limits so the tool fails when the hole is too small.



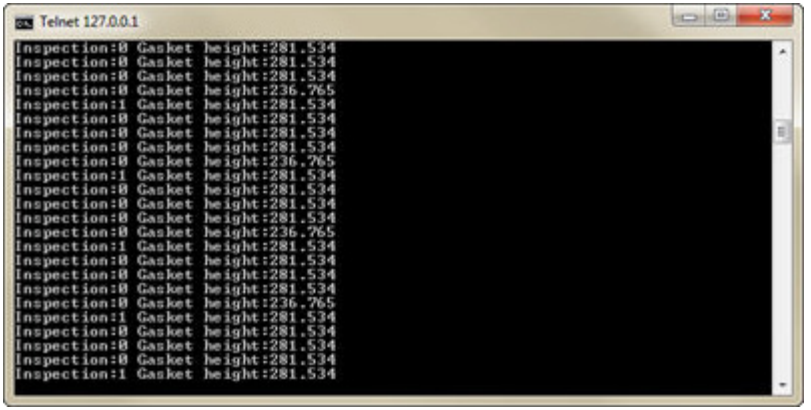
Report Gasket Inspection Status and Gasket Height

Click on **Inspection Outputs** in the job list to report inspection status and gasket height. Set the following output parameters:

- Use **TCP/Serial Output** for Emulator testing.
- Add formatting around inspection status and measurement value.



- Telnet to 127.0.0.1 to check the data format.



Note: See **TCP/Serial Output** for a description of how to use Telnet to view TCP output.

Run the Gasket Job

Click on the **Run** section of the Navigator Bar to begin the job. The Run view allows you to watch the total number of inspections that pass and fail, as well as other data such as **Cycles**, **PPM** (Parts Per Minute), **Buffers** used, and **Overruns**.