



# Using Sentech STC-M Cameras with AutoVISION and VISIONSCAPE®

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## Supplemental User Guide

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## Purpose of This Document

The purpose of this document is to provide instructions on how to get Omron Sentech STC-M GigE and USB 3.0 cameras to function with OCR AutoVISION and Visionscape FrontRunner software.

## Introduction to AutoVISION/Visionscape PC-Based Vision

Omron OCR AutoVISION/Visionscape software, which is typically used to program OCR Smart Cameras, can also be used with industrial GigE and USB 3.0 cameras to create and deploy extremely fast and powerful pc based machine vision solutions.

In the case of Smart Cameras, image acquisition, image processing and IO are all done on the camera. In the case of PC vision, GigE or USB 3.0 cameras are used as the image input devices, and the PC is used for image processing and IO.

The user has two choices of programming and deployment software:

- **AutoVISION**, the simplest UI, allows the user to create a single camera PC based vision system.
- **Visionscape FrontRunner**, the full machine vision professional software allows the user to connect up to eight cameras to the PC Based Vision system.

**Note:** It is important for deployment to treat the PC as the vision system, rather than as an IT controlled device. The PC should not be loaded down with firewall/ virus protection etc. that will impede its performance.

## PC-Based Vision System Licensing

AutoVISION/Visionscape PC Based systems require a runtime license to be able to program them and to run them. There is no development license required. The license is supplied in the form of a USB flash drive that plugs into the PC.

There are two types of license flash drives. One is for use with Omron cameras, and the second more expensive one is for use with non-Omron 3<sup>rd</sup> Party cameras.

The part numbers for the license flash drives are shown in the table below.

Part Number	Description – GigE Licenses
GMV-VGL0-1DD1	Visionscape GigE License with IntelliFind®, DIVs and 8 Omron Cameras, 32/64 bit
GMV-VGL8-1DD1	Visionscape GigE License with IntelliFind®, DIVs and 8 Third Party Cameras, 32/64 bit

- **GMV-VGL0-1DD1** - This license is specifically for Omron STC-M MBS or MCS GigE or USB 3.0 cameras, as well as legacy Microscan GigE cameras.
- **GMV-VGL8-1DD1** – This license is for specific sets of other vendor's (3<sup>rd</sup> Party) cameras. These include the Basler ACE series, and the Baumer VCXG series.

# GigE and USB 3.0 Camera Support

## General Industrial Camera Support

AutoVISION/Visionscape PC Based vision will support both Omron Sentech STC-M GigE cameras and Omron Sentech STC-M USB 3.0 cameras. The system can handle a mix of both types of cameras. Older Sentech cameras are not officially supported.

## Omron Sentech STC-M GigE Camera Support

The bulk of this manual will concentrate on how to ensure a fast reliable connection between the PC and GigE cameras. GigE cameras transmit image packets via UDP, so are susceptible to dropped packets. Strict attention must be paid to the choice of the PC as well as the NIC card. Strict attention must also be paid to setting up the NIC card and Visionscape to operate with the correct Packet Size, Inter Packet Delay, Receive Buffers, and Interrupt Moderation necessary to ensure no packet loss.

The following is the current list of supported Omron Sentech STC-M GigE cameras models. All cameras are C-Mount. All cameras are PoE (Power over Ethernet). GigE cameras support data transfer rates up to 125 MB/s. They support cable lengths of up to 100 meters.

Model No.	Monochrome/Color	Resolution	Frame Rate	Pixels (H x V)	Sensor Size	Cell Size (H x V, $\mu\text{m}$ )	Shutter Type
STC-MBS43POE	Monochrome	0.4M	282fps	728 x 544	1/2.9"	6.9 x 6.9	Global
STC-MCS43POE	Color						
STC-MBS163POE	Monochrome	1.6M	70.7fps	1456 x 1088	1/2.9"	3.45 x 3.45	Global
STC-MCS163POE	Color						
STC-MBS202POE	Monochrome	2M	54.6fps	1624 x 1240	1/1.7"	4.5 x 4.5	Global
STC-MCS202POE	Color						
STC-MBS312POE	Monochrome	3.2M	34.9fps	2048 x 1536	1/1.8"	3.45 x 3.45	Global
STC-MCS312POE	Color						
STC-MBS500POE	Monochrome	5 M	21.9fps	2448 x 2048	2/3"	3.45 x 3.45	Global
STC-MCS500POE	Color						
STC-MBS1242POE	Monochrome	12M	9.2fps	4000 x 3000	1/1.7"	1.85 x 1.85	Rolling
STC-MCS1242POE	Color						
STC-MBS2041POE	Monochrome	20M	5.5ps	5472 x 3648	1"	2.4 x 2.4	Rolling
STC-MBC2041POE	Color						

## Omron Sentech STC-M USB 3.0 Camera Support

This manual will also describe how to install and run USB 3.0 cameras. USB 3.0 cameras are generally plug and play and operate more seamlessly with PC Vision than GigE. The frame rates for USB 3.0 cameras are 3.5x faster than the comparable GigE camera. The PC overhead required for transferring images from USB 3.0 cameras is also much lower so can result in much faster and efficient systems.

The following is the current list of supported Omron Sentech STC-M USB 3.0 cameras models. All cameras are C-Mount. USB 3.0 cameras support data transfer rates up to 375 MB/s. They support cable lengths of up to 8 meters.

Model No.	Monochrome/ Color	Resolution	Frame Rate	Pixels (H x V)	Sensor Size	Cell Size (H x V, $\mu\text{m}$ )	Shutter Type
STC-MBS43U3V	Monochrome	0.4M	527.1fps	720 x 540	1/2.9"	6.9 x 6.9	Global
STC-MCS43U3V	Color						
STC-MBS163U3V	Monochrome	1.6M	238fps	1440 x 1080	1/2.9"	3.45 x 3.45	Global
STC-MCS163U3V	Color						
STC-MBS241U3V	Monochrome		163fps	1920 x 1200	1/1.2"	5.86 x 5.86	Global
STC-MCS241U3V	Color						
STC-MBS312U3V	Monochrome	3.2M	56fps	2048 x 1536	1/1.8"	3.45 x 3.45	Global
STC-MCS312U3V	Color						
STC-MBS322U3V	Monochrome		121fps	2048 x 1536	1/1.8"	3.45 x 3.45	Global
STC-MCS322U3V	Color						
STC-MBCM401U3V	Monochrome	4M	89fps	2048 x 2048	1"	5.5 x 5.5	Global
STC-MCCM401U3V	Color						
STC-MBS500U3V	Monochrome	5M	35.8fps	2448 x 2048	2/3"	3.45 x 3.45	Global
STC-MCS500U3V	Color						
STC-MBS510U3V	Monochrome		75.7fps	2448 x 2048	2/3"	3.45 x 3.45	Global
STC-MCS510U3V	Color						
STC-MBS881U3V	Monochrome	8.9M	32.5fps	4096 x 2160	1"	3.45 x 3.45	Global
STC-MCS881U3V	Color						
STC-MBS891U3V	Monochrome		41.9fps	4096 x 2160	1"	3.45 x 3.45	Global
STC-MCS891U3V	Color						
STC-MBS1242U3V	Monochrome	12M	31.2fps	4000 x 3000	1/1.7"	1.85 x 1.85	Rolling
STC-MCS1242U3V	Color						
STC-MBS122BU3V	Monochrome		23.5fps	4096 x 3000	1.1"	3.45 x 3.45	Global
STC-MCS122BU3V	Color						
STC-MBS123BU3V	Monochrome		30.5fps	4096 x 3000	1.1"	3.45 x 3.45	Global
STC-MCS123BU3V	Color						
STC-MBS2041U3V	Monochrome	20M	18.5fps	5472 x 3648	1"	2.4 x 2.4	Rolling
STC-MCS2041U3V	Color						

# Getting Started with GigE Cameras

## Choosing the Correct PC and NIC Card for GigE PC Vision

### PC Hardware and NIC Cards

GigE cameras require high quality PCs, NIC cards and CAT cables to operate at their full potential. It is recommended to choose from among the several Windows 10 Industrial PCs (IPCs) on the market that are specifically designed for GigE vision. IPCs typically offer 2, 4 or 8 dedicated GigE camera PoE ports. They are designed to assure fast, efficient transfer of camera image to PC memory with minimal processor support, and thus can be used with the fastest and highest resolution GigE cameras at max frame rates.

Commercial Laptops or Desktops on the other hand are **not** designed or recommended for high speed PC Vision. The user is likely to experience Image or Packet Drops when using a standard PC, and will be forced to slow down the camera data rates to compensate.

### NIC Cards

IPCs typically have a number of high speed built in PoE Ethernet ports designed for GigE Vision. When using a more traditional PC, it is necessary to choose a high quality, high speed PCIe-4 GigE Vision proven NIC Card, typically based on the Intel Chip set and Gigabit IEEE 802.3 at POE+.

The NIC card should allow for an individual port for each camera, and should allow setting of Jumbo Packets, Receive Buffers, and Interrupt Moderation. These settings are explained below.

Some of the industry standards for GigE Vision are the Intel Pro1000, the Intel I350-T4, or the Neousys PCIe-PoE354at PCIe POE NIC card.

## Setting Up NIC Adapters for GigE Vision

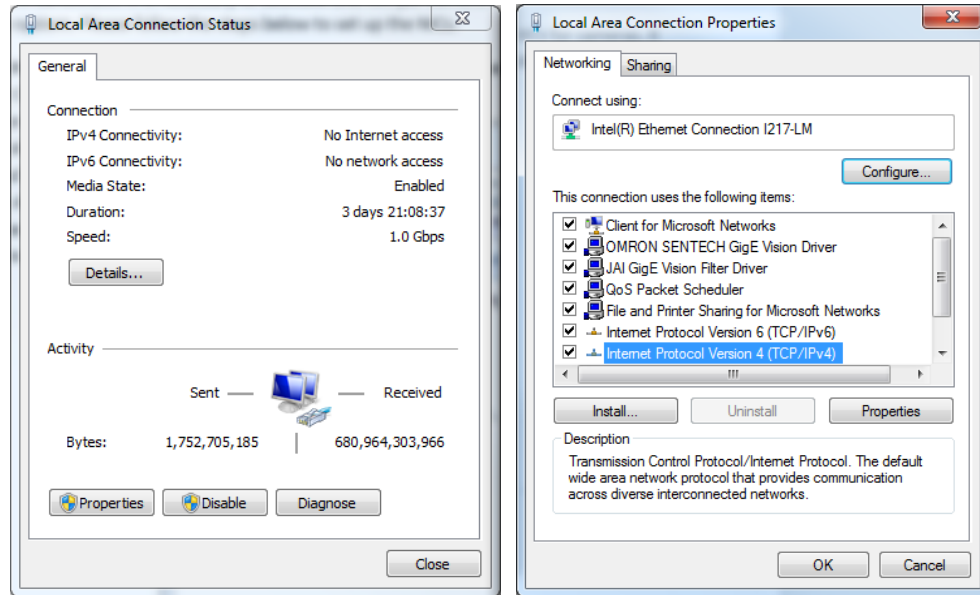
Multiple NIC settings must be set correctly to maximize system performance. These include using one NIC Port per camera, as well setting each NIC to use Jumbo Packets, Maximum Receive Buffers, and Interrupt Moderation. Each of these settings will be described below.

### 1) Setting Up NIC Card IP Address and Subnet per Camera

A single GigE Channel is capable of 125 MB/s. If multiple cameras are connected to this single port, they will all have to share this bandwidth. Therefore, it is necessary to dedicate one NIC per camera to get full performance from the system. Please follow the steps below to set up the NICs.

- a. Physically connect each camera to its own NIC port on the PC
- b. Open Control Panel
- c. Go to Network and Internet -> Network Connections
- d. Select Change Adapter Settings
- e. Click on each NIC in turn
- f. Click on Properties
- g. Double click on Internet Protocol Version 4
- h. Set each NIC to its own unique IP address and subnet. Refer to the example on the following page.

- i. When AutoVISION or Visionscape start up, the AVPBackplane will run and will automatically scan all NICs for GigE cameras. The AVPBackplane will then automatically set the IP and Subnet of each camera to match the NIC it is found on. The IP address for the camera will be the same as the NIC, except incremented by one.



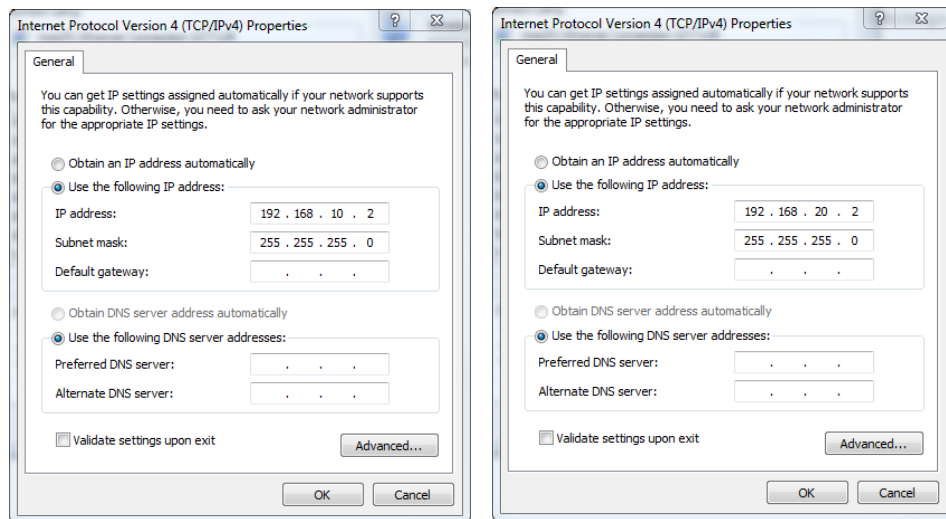
**Example: Setting NICs for Two-Camera System**

**Setup NIC 1 for Camera 1**

- a. Set NIC address to 192.168.10.2 (255.255.255.0).
- b. The camera will automatically be given the address 192.168.10.3 (255.255.255.0) when AutoVISION/Visionscape starts.

**Setup NIC 2 for Camera 2**

- a. Set NIC address to 192.168.20.2 (255.255.255.0).
- b. The camera will automatically be given the address 192.168.20.3 (255.255.255.0) when AutoVISION/Visionscape starts.

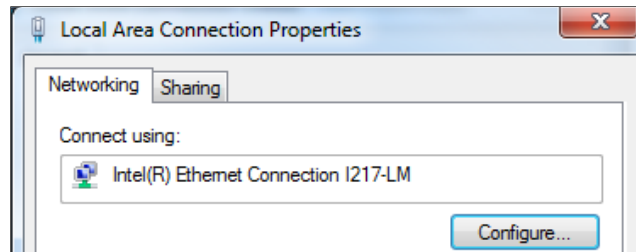


## 2) Setting Jumbo Packets (Jumbo Frames)

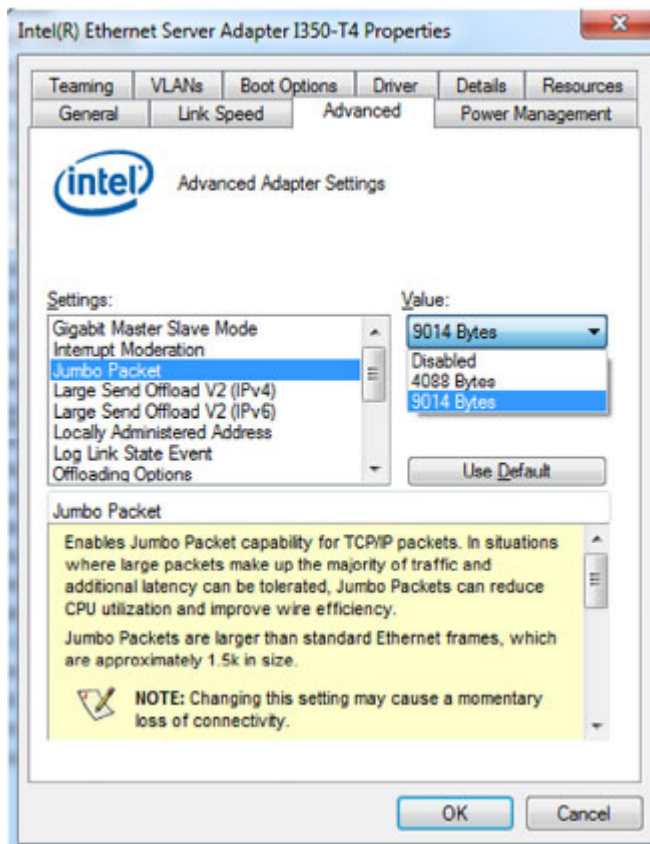
The GigE camera image is transferred to the PC in a series of UDP Packets. Each time the PC receives an Ethernet packet, a PC interrupt takes place. Each interrupt disturbs the image transfer flow and causes CPU loading and possible packet drops due to several OS internal switchover processes. The smaller the packet size, the more interrupts that will occur. The larger the packet size, the more efficient the image transfer will be.

For best performance, the NIC should be set up to use Jumbo Packets (sometimes called Jumbo Frames) which are 9014 bytes in size. This will increase the network performance, decrease the PC's CPU load, and minimize packet drops.

- a. Click on each NIC in turn.
- b. Click on Properties.
- c. Click on Configure button next to the network card description.



- d. Click on Advanced.
- e. Set Jumbo Packets to 9014 or maximum value.

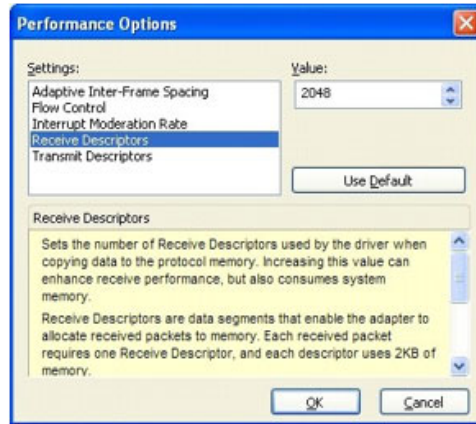


### 3) Setting Receive Buffers (Receive Descriptors)

The sets the number of buffers used by the Ethernet driver when copying data to the protocol memory. The NIC itself does not feature any buffer memory, but the received data packets need to be buffered in order to compensate CPU load changes caused by the operating system. Therefore, buffers are allocated in the PC's RAM.

In general, it is recommended to allocate as many receive buffers as possible to reduce the risk of packet resends.

- a. This value is often directly in the Advance Parameter list. Other times, this value is under Performance Options. Set this value to the maximum, typically 2048.

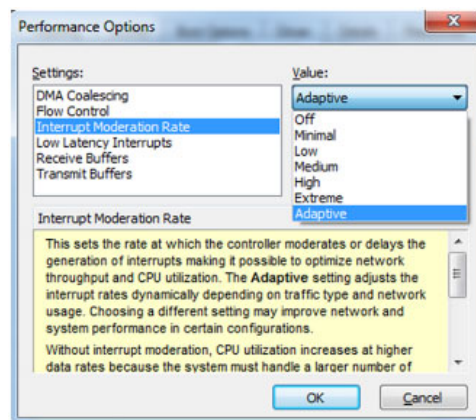


### 4) Setting Interrupt Moderation

When a packet arrives, the adapter generates an interrupt that allows the driver (CPU) to handle the packet. At greater link speeds, more interrupts are created and CPU usage increases which can result in poorer system performance. When you enable Interrupt Moderation, the interrupt rate is lower resulting in better CPU performance. However, this lower CPU usage can also result in dropped packets.

Interrupt Moderation is generally set to Adaptive by default to allow interrupt rates to be set dynamically depending on traffic type and network usage. If your system is experiencing dropped packets, this value should either be set to Minimal to allow the CPU to handle the packets, or to Extreme to minimize CPU usage. The user will have to experiment with this value because it is PC architecture dependent.

- a. This value is often directly in the Advance Parameter list. Other times, this value is under Performance Options. It is typically set to adaptive. You can leave it at adaptive, or set it to extreme, or minimal when tuning system performance.



## Setting Up Visionscape Registry for GigE Vision

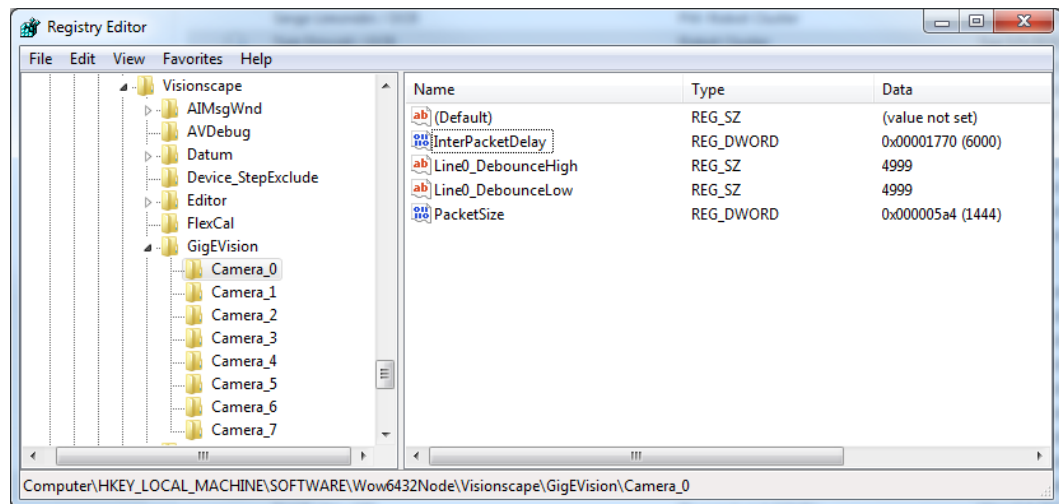
The section above described how to set up the NIC cards for each camera and to maximize NIC performance. The section below describes how to set up AutoVISION/Visionscape through the Registry to match the NIC settings and to maximize performance. Once done, AutoVISION/Visionscape will automatically program the cameras so they function correctly with these settings.

### 1) Setting Registry to Match NIC Card Setup

The NIC cards have been set with IP Address, Subnet Mask, Packet Size, Receive Buffers and Interrupt Moderation.

Next, each camera must be set to use the correct Packet size, Interpacket Delay, as well as Line Debounce Time for the Trigger Input. This is done through the Registry.

- a. Open the Registry by typing "regedit" in the start menu
- b. Navigate to the following registry key  
HKEY\_LOCAL\_MACHINE\SOFTWARE\Wow6432Node\Visionscape\GigEVision
- c. There are entries for each of the 8 cameras.



- d. **Packet Size** – By default, Packet Size is set to 1444 to account for NIC cards without Jumbo Packet setting capability. This value should be set to match the packet size setting in the NIC.

**If the NIC is set to Jumbo Frames (9014), it is recommended to set the Packet Size in the registry to a value between 8192 and 9014.**

**Note: If the registry setting is higher than the packet setting on the NIC card, the camera will not function.**

- e. **InterPacketDelay** – InterPacketDelay is the time delay inserted between sending each packet from the camera to the PC. This value is set in Ticks. Each Tick equals 0.001  $\mu$ s. A low value allows the camera to reach its maximum bandwidth. By default, InterPacketDelay is set to 6000 for the Sentech STC-M cameras.

There are instances however, when the PC cannot keep up with this bandwidth and packets are dropped. In this case increasing the InterPacketDelay can be used to throttle the data and allow the PC to keep up and not drop packets.

#### **One Camera per NIC**

Ideally, each camera will have its own NIC. In this case, on an IPC, this value can be set as low as 1000 for one camera per channel. On a laptop, this value may need to be set as high as 75,000 to allow the PC to keep up.

### **Multiple Cameras per NIC**

If you have multiple cameras going into one NIC, they will all need to share the NIC bandwidth. In this case, the Interpacket Delay must be set high enough so each camera has a chance to send its packets at the same time as the others. A jumbo packet takes 65  $\mu$ s to transfer. If you have two cameras, you will need to set Interpacket delay for each to 75,000 or more to insert this time. For four cameras, you will need to set this to 300,000 or higher. This must be tuned for your PC and NIC card.

- f. **LineDebounceHigh/Low** – This is not a communication setting. It is a setting AutoVISION/Visionscape uses to set the debounce time on the camera trigger input. This value is normally set to longer interval when the trigger has bounce or noise to prevent multiple triggers. The default debounce time is set to 100 (0.1 ms) The maximum settable debounce time for the Sentech STC-M cameras is 5000 (5 ms).

## **2) Using Camera-Based Settings Instead of Registry Settings**

Packet Size, Interpacket Delay and Line Debounce are all settings that can be set and stored on the camera into a USER SET as well. If the user wants the camera to use the values stored in the camera rather than from the registry, the registry values should be set to 0. Visionscape will not overwrite the values stored in the camera when the registry is set to 0.

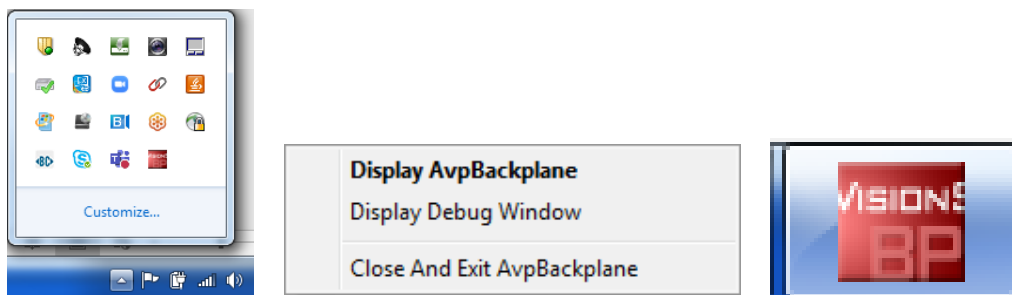
**Note: When reinstalling Visionscape, please go back to the registry to check that your desired settings have been maintained.**

## **Starting Up AutoVISION/Visionscape with GigE Cameras**

### **1) License Flash Drive and Camera Discovery**

When AutoVISION or Visionscape is started, the AVPBackplane (avpsvr.exe) is automatically launched. The AVP Backplane is responsible for discovering all the cameras and allocating them to the vision system.

This AVP Backplane is the Red Icon that can be seen in the system tray (see left hand image). Right clicking on the icon gives the menu shown in the center image. To view what the AVPBackplane is doing, click on “Display Debug Window”, and then click on the Visionscape Backplane icon in the task bar to open it.



The AVP BackPlane Output Window provides useful data explained below.

```

Visionscape Debug Window
2020:126:16:33:56 queryHASPDrvVer: HASP driver v7.60 installed
2020:126:16:33:59 querySWRights: Gige license rights detected, features: Visionscape Gige (x8): YES / DIVS: YES / IntelliFind: YES / Third Party Gige Cameras: 8 allowed
2020:126:16:34:04 CreateSystemsFromConfigFile: found 2 devices in dm.config file
2020:126:16:34:04 Creating Gige System 1: GigeVision1
2020:126:16:34:04 Channel 0 (Filter Driver): OMRON SENTECH STC-MBS202POE (1624x1240) Serial#="18LH511" MAC="D4-7C-44-30-10-89" IP="192.168.20.6" Connected
2020:126:16:34:04 Channel 1 (Filter Driver): OMRON SENTECH STC-MBS312POE (2048x1536) Serial#="18LH648" MAC="D4-7C-44-30-10-88" IP="192.168.20.4" Connected
2020:126:16:34:04 Channel 2 (Filter Driver): OMRON SENTECH STC-MCS2041POE (5472x3648) Serial#="20B8194" MAC="D4-7C-44-30-29-64" IP="192.168.20.5" Connected
2020:126:16:34:04 Creating SW System 1: SoftSys1
2020:126:16:34:08 Creating IO Server for System GigeVision1
2020:126:16:34:08 Creating IO Server for System SoftSys1
  
```

- License Key Detection** - When the AVP Backplane is launched, it first looks for the HASP Software License. This can be seen in top two rows. The critical information is that it has found the license and detected that Visionscape GigE (x8) is detected.
- GigE Vision System Creation** – The next step once it has found the GigE license is to create the GigE Vision System to contain all the discovered cameras. In this case, the system is called **GigE Vision1**.
- Adding Cameras to GigE System** – In the next step, all discovered cameras are added to the **GigE Vision1**. IP Addresses are automatically set into each camera based on the base NIC IP address. A system can have up to a total of 8 cameras, Cameras 1-8 (Channel 0-7).
- Warnings and Errors** – Any informational warnings will be printed into the Backplane Output window in Yellow. Any errors will be printed into the Backplane in Red.

## The GigE Vision1 System and the DM.Config File

The AVPBackplane detects all cameras on the GigE and USB ports, and then organizes them into a single “vision system”. The system appears in the programming UIs as “**GigE Vision1**”.

The `c:\omron\vscope\DM\DM.Config` file contains all the data for what cameras are connected, and for the order that they are connected in. This can be seen in the AVPBackplane Debug window.

```

CreateSystemsFromConfigFile: found 2 devices in dm.config file
Creating Gige System 1: GigeVision1
Channel 0 (Filter Driver): Microscan VISIONSCAPE CMG50 (2448x2050)
Channel 1 (Filter Driver): Baumer VCXG-13M (1280x1024) Serial#="700
Channel 2 (Filter Driver): OMRON SENTECH STC-MBS202POE (1624x400) S
Channel 3 (Filter Driver): OMRON SENTECH STC-MBS312POE (2048x1536)
  
```

If cameras are added to the system, they will be discovered and added to the DM.Config file the next time the AVPBackplane is started. See below.

```

CreateSystemsFromConfigFile: found 2 devices in dm.config file
Creating Gige System 1: GigeVision1
Channel 0 (Filter Driver): Microscan VISIONSCAPE CMG50 (2448x2050)
Channel 1 (Filter Driver): Baumer VCXG-13M (1280x1024) Serial#="700
Channel 2 (Filter Driver): OMRON SENTECH STC-MBS202POE (1624x400) S
Channel 3 (Filter Driver): OMRON SENTECH STC-MBS312POE (2048x1536)
Channel 4 (USB3 Vision): SENTECH STC-MBCM200U3V (2048x1088) Serial#
  
```

If cameras are disconnected from the system, they will continue to exist in the DM.Config file, and will be searched for when the AVPBackplane starts.

```

CreateSystemsFromConfigFile: found 2 devices in dm.config file
Creating Gige System 1: GigeVision1
Channel 0 (Filter Driver): Microscan VISIONSCAPE CMG50 (2448x2050)
Channel 1 (Filter Driver): Baumer VCXG-13M (1280x1024) Serial#="700
Channel 2 (Filter Driver): OMRON SENTECH STC-MBS202POE (1624x400) S
Channel 3 (Filter Driver): OMRON SENTECH STC-MBS312POE (2048x1536)
Channel 4 (USB3 Vision): SENTECH STC-MBCM200U3V (2048x1088) Serial#
  
```

For permanent removal, or when a different set of cameras is plugged into the system, it is recommended to delete the `c:\omron\vscope\DM\DM.Config` file, shut down the AVPBackplane, and then restart. The system will once again scan for all connected cameras and then create a new DM.Config file.

If you wish cameras to show up in the system in a particular order, plug them in one at a time, restarting the AVPBackplane in between.

Alternately, you can open the DM.Config file in an editor, and change the order there. Each camera has a unique identifier associated with it. Swap the rows in the device section to change the order. The following list corresponds to order shown below in the backplane.

```
<Devices>
  <Device name="GigEVision1" devClass="GigE">
    <Assignments>
      <Assignment type="ACQ" uid="c00c6f0c-5a6e-4e04-9f07-be46b3b7b5e1" />
      <Assignment type="ACQ" uid="f184ddbd-4319-411a-a8ad-8430d3dbfcff" />
      <Assignment type="ACQ" uid="d14c6b43-b2c4-4a34-975c-5e3958ef8748" />
      <Assignment type="ACQ" uid="405765fd-3ca7-4e2a-bbb0-e6529dab8018" />
    </Assignments>
  </Device>
```

```
CreateSystemsFromConfigFile: found 2 devices in dm.config file
Creating GigE System 1: GigEVision1
Channel 0 (Filter Driver): Microscan VISIONSCAPE CMG50 (2448x2050)
Channel 1 (Filter Driver): Baumer VCXG-13M (1280x1024) Serial#="700
Channel 2 (Filter Driver): OMRON SENTECH STC-MBS202POE (1624x400) S
Channel 3 (Filter Driver): OMRON SENTECH STC-MBS312POE (2048x1536)
```

Reversing the device order in the DM.Config results in the following when the AVPBackplane is restarted.

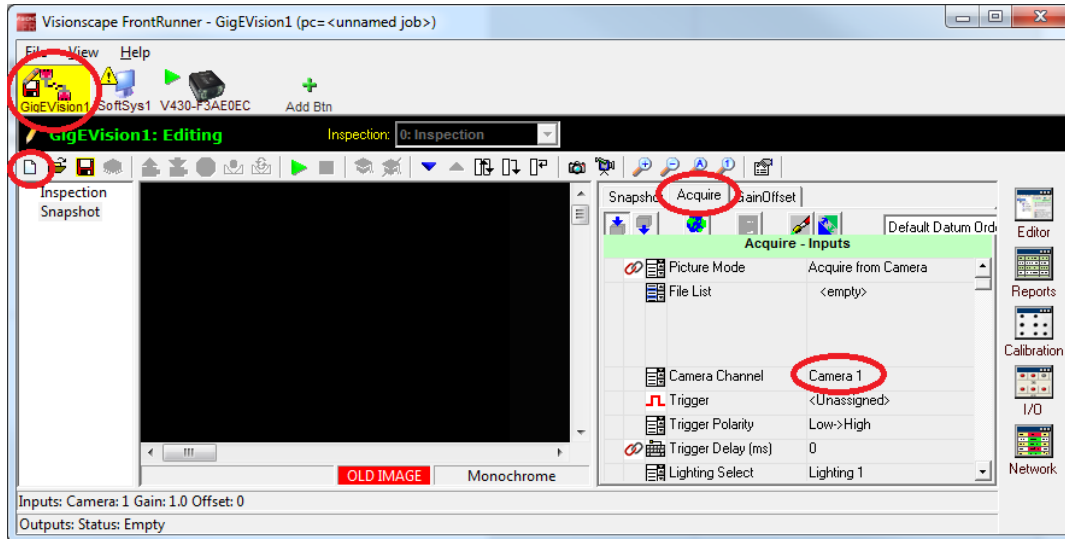
```
CreateSystemsFromConfigFile: found 2 devices in dm.config file
Creating GigE System 1: GigEVision1
Channel 0 (Filter Driver): OMRON SENTECH STC-MBS312POE (2048x1536)
Channel 1 (Filter Driver): OMRON SENTECH STC-MBS202POE (1624x400)
Channel 2 (Filter Driver): Baumer VCXG-13M (1280x1024) Serial#="70
Channel 3 (Filter Driver): Microscan VISIONSCAPE CMG50 (2448x2050)
```

# Programming and Running AutoVISION/Visionscape with GigE Cameras

## 1) FrontRunner Taking Control of the System

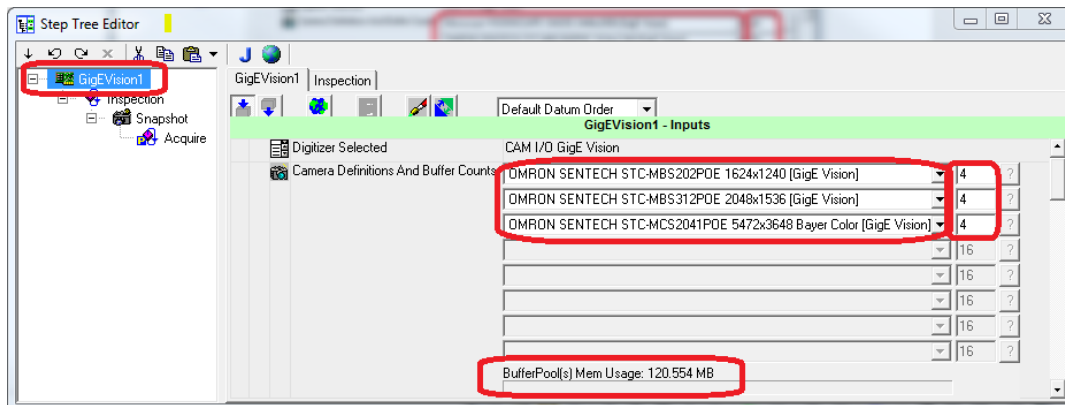
After Visionscape FrontRunner launches, the GigE vision system can be programmed by selecting the GigEVision1 icon, and then creating a new job. During the new job creation (or load job), Packet Size, InterPacket Delay, and Line Debounce times are written to the cameras.

The camera channel that takes the picture can be selected by clicking the Snapshot Step in the left-hand list and then selecting Acquire Tab on the right side. The cameras will go from 1 to 8.



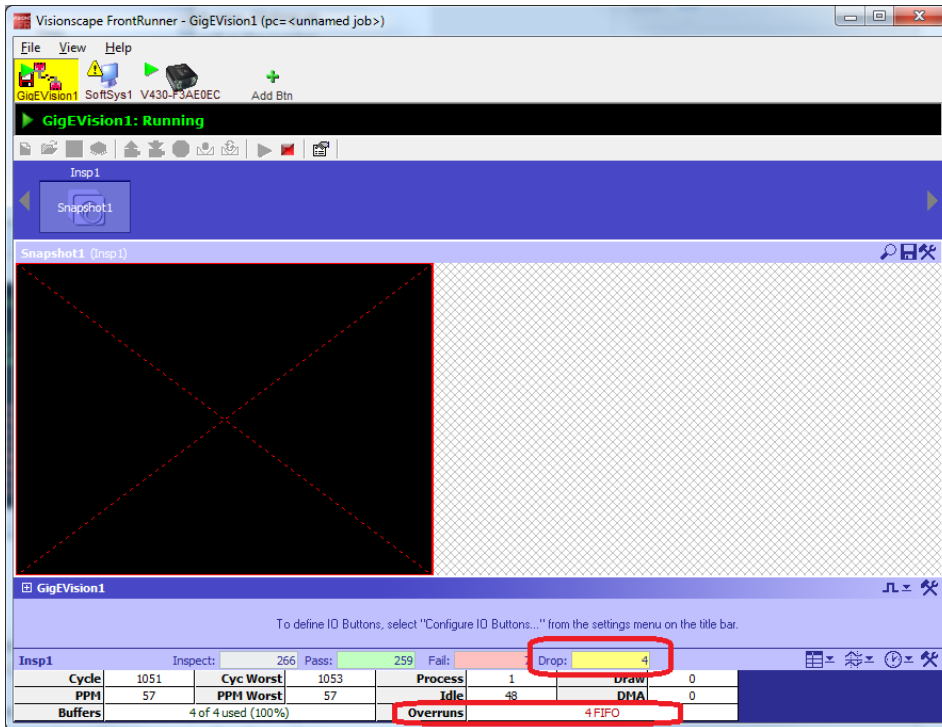
## 2) Viewing Job in the Job Editor

Selecting the Editor Button in the top right of the screen will show the job view. Clicking on the GigEVision1 vision system step will allow you to see the cameras as well as the number of buffers set for each. The default is 16. When using large cameras, it is advisable to reduce the number of buffers down to 4 to keep BufferPool memory usage under 200MB.



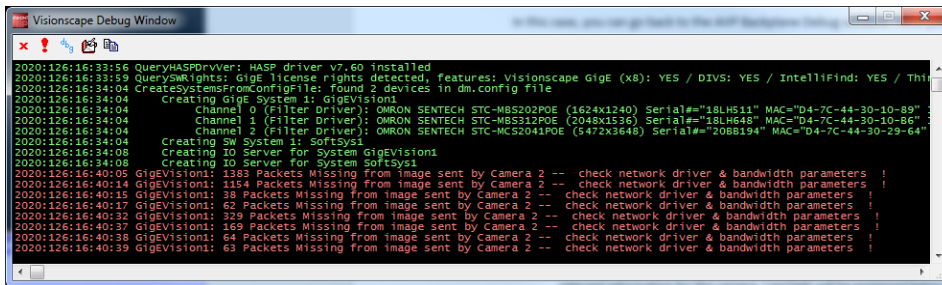
### 3) Running the Job

Once the job is programmed, it can be put into Run Mode. The Run Mode screen will display any GigE bandwidth issues. Typically, you will see FIFO errors, or the acquisition will stop.



### 4) Troubleshooting GigE Cameras

In this case, you can go back to the AVP Backplane Debug window. Here you will see what camera is having the issue, and what the issue is.

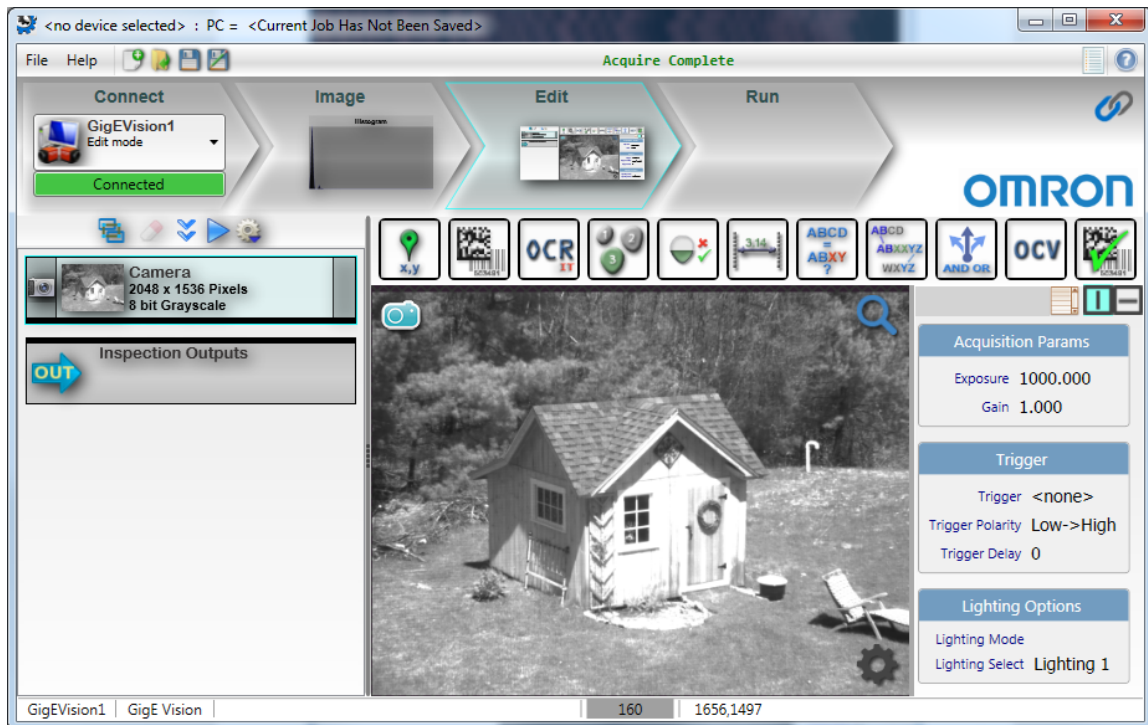


In this case, you can see that there are missing packets. At this point, you should take the following steps.

- Check NIC settings to make sure Jumbo Packets and Receive Buffers are set to max values. If not, shut down Visionscape, and close and exit the AVP Backplane by right clicking on it and selecting close.
- Check the Registry to see if Packet Size is set to Jumbo Packets (8192 or above). If not, set appropriately.
- If both of these are set correctly, increase the InterPacketDelay.
- Stop the Job, and then create a new Job to read in new values for Packet Size and Interpacket Delay. Repeat process until you can run reliably.

## 5) AutoVISION

AutoVISION can be used for a single camera. AutoVISION will always connect to channel 0 (camera 1). Trigger and Strobe can be set up from within the camera step.



## Getting Started with USB 3.0 Cameras

Setting up USB 3.0 cameras is much easier than GigE. Image transfer into PC memory via USB 3.0 is much faster and more efficient, requiring far less PC involvement. There will be no dropped frames issues when using USB 3.0.

USB 3.0 cameras require that the JAI Virtual IF driver be installed for each USB 3.0 camera has been plugged into the computer. The directions to do this are shown in the following section.

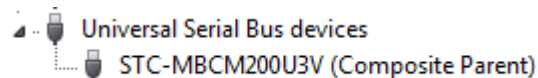
### Connecting USB 3.0 Cameras

- 1) Make sure the AVPBackplane is shut down
- 2) Connect all USB3 cameras to USB super speed ports on the computer. The ports are indicated with the following ICON on your PC.



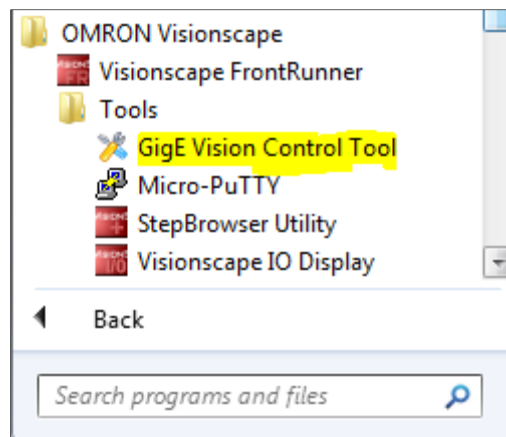
- 3) If the camera and driver have already been installed on the PC, you should hear the Windows sound when plugging the camera in.
- 4) You can check that the camera and driver have been installed successfully using the “Device Manager”

- a. Go to the USB Serial Bus Device section. Locate the camera. The cameras should appear with their full name. Example shown below.



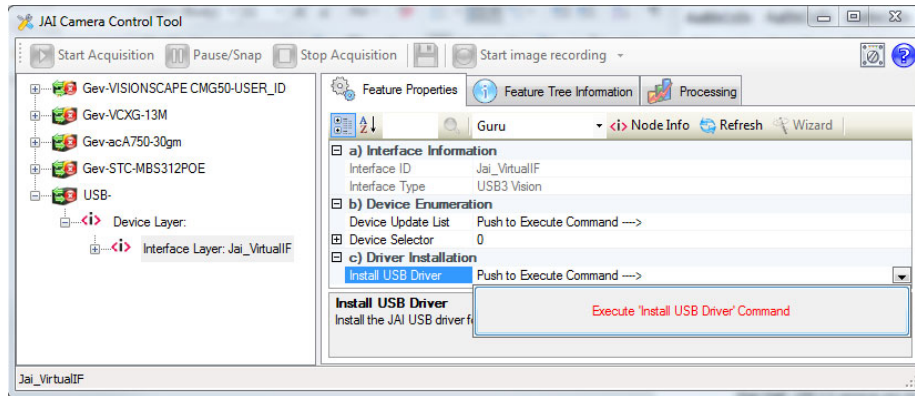
- b. Right click on the device. You should see “device is functioning properly.”

- 5) If this is the first time an individual camera is connected to the PC, you will need to explicitly load the USB3 driver for it. **This step must be performed for each camera that is connected to PC.**
  - a. To do so, please go to the start menu and run the “GigE Vision Control Tool” utility.

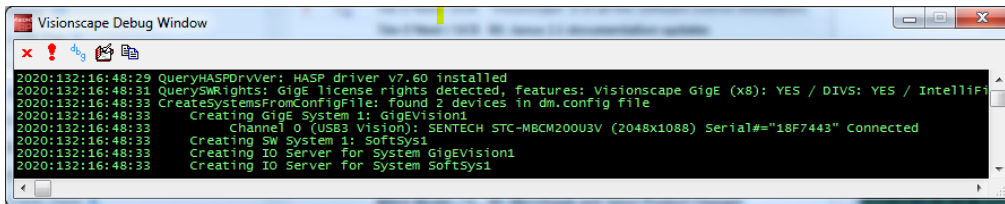


- b. The GigE Vision Control Tool will discover all cameras connected to the PC, both GigE and USB, and display them in the list on the left hand side of the UI.
- c. For each USB camera, expand the + signs under the USB camera entry until you get to the Interface Layer
- d. Click on the popup to the right under Driver Installation to Install the USB Driver.

- e. Click on the Execute button.



- f. A DOS shell will open and driver install will be initiated
  - g. Complete all prompts
  - h. Exit the GigE Camera Control Tool application when all cameras are complete.
- 6) Delete dm.config file from the c:\omron\vscope\DM or c:\microscan\vscope\DM folder.
  - 7) Start AutoVISION or Visionscape FrontRunner
  - 8) Open the AVP Backplane debug window. You should see the cameras. In this case with only one camera connected, it is channel 0 (camera 1).



- 9) The dm.config file will show the camera as GigE with INT=JAI Virtual Driver and non-zero width, height and serial number.

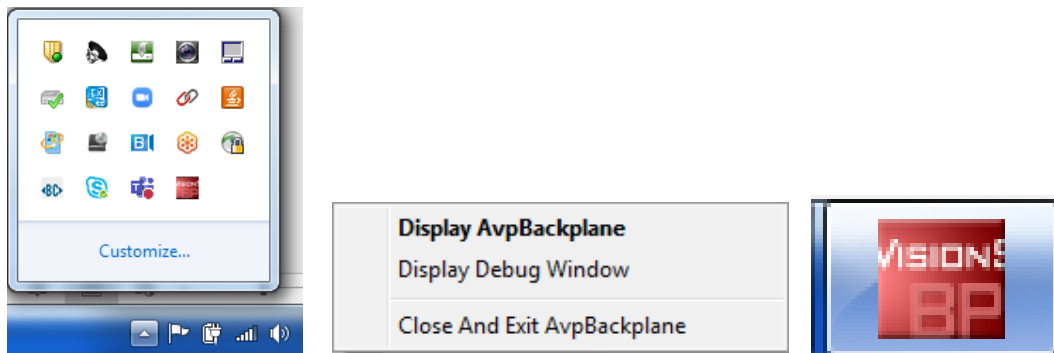
```
<Resource uid="bff1252e-4b31-4a31-ae28-0ef5678d34c6" type="GigE_Camera" SerialNumber="18F7443">
  <gige>
    <CameraID>TL=&gt;JaiUSB3vTL , INT=&gt;Jai_VirtualIF , DEV=&gt;142118607443_SENTECH_STCMBCM200U3V</CameraID>
    <IPAddress />
    <MACAddress />
    <SerialNumber>18F7443</SerialNumber>
    <VendorName>SENTECH</VendorName>
    <ResolutionX>2048</ResolutionX>
    <ResolutionY>1088</ResolutionY>
    <ModelName>STC-MBCM200U3V</ModelName>
    <PixelFormat>0</PixelFormat>
    <bIsColorCamera>>false</bIsColorCamera>
  </gige>
</Resource>
```

## Starting Up AutoVISION/Visionscape with USB 3.0 Cameras

### 1) License Flash Drive and Camera Discovery

When AutoVISION or Visionscape FrontRunner is started, the AVPBackplane (avpsvr.exe) is automatically launched. The AVPBackplane is responsible for discovering all the cameras (both GigE and USB 3.0) and allocating them to the vision system.

This AVP Backplane singleton is the Red Icon that can be seen in the system tray. Right clicking on the icon gives the following menu. To view what the backplane is doing, click on “Display Debug Window”, and then click on the Visionscape Backplane in the task bar to open it.



### AVP BackPlane Output Window:

```
Visionscape Debug Window
2020:132:13:17:05 QueryHASPDriver: HASP driver v7.60 installed
2020:132:13:17:07 QueryAPIRights: GIGe license rights detected; features: Visionscape Gige (x8): YES / DIVS: YES / IntelliFind: YES / Third Party Gige Cameras: 8 allowed
2020:132:13:17:13 CreateSystemsFromConfigFile: found 2 devices in dm.config file
2020:132:13:17:13 Creating Gige System 1: GigeVision1
2020:132:13:17:13 Channel 0 (Filter Driver): Microscan VISIONSCAPE CMG50 (2448x2050) Serial#="0026843909" MAC="00-06-BE-00-0A-7C" IP="192.168.20.6" Connected
2020:132:13:17:13 Channel 1 (Filter Driver): Baumer VCKG-13M (1280x1024) Serial#="70000179472" MAC="00-06-BE-01-7D-20" IP="192.168.20.5" Connected
2020:132:13:17:13 Channel 2 (Filter Driver): BASLER acA79-30um (120x75) Serial#="21397543" MAC="00-10-53-15-F3-27" IP="192.168.20.3" Connected
2020:132:13:17:13 Channel 3 (Filter Driver): OMRON SENTECH STC-MBS312POE (2048x1536) Serial#="18LH648" MAC="D4-7C-44-30-10-B6" IP="192.168.20.4" Connected
2020:132:13:17:13 Channel 4 (USB3 Vision): SENTECH STC-MBCN200U3V (2048x1088) Serial#="18F7443" Connected
2020:132:13:17:13 Creating SW System 1: SoftSys1
2020:132:13:17:14 Creating IO Server for System GigeVision1
2020:132:13:17:18 Creating IO Server for System SoftSys1
```

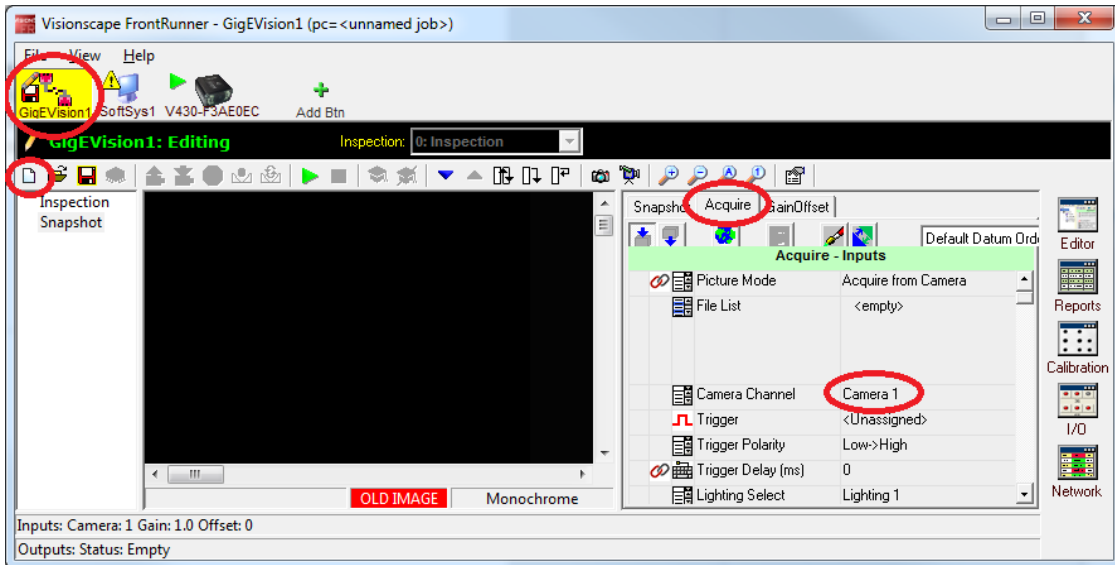
- e. **License Key Detection** - When the AVP Backplane is launched, it first looks for the HASP Software License. This can be seen in top two rows. The critical information is that it has found the license and detected that Visionscape GigE (x8) is detected.
- f. **GigE Vision System Creation** – The next step once it has found the GigE license is to create the GigE Vision System to contain all the discovered cameras. In this case, the system is called **GigEVision1**.
- g. **Adding Cameras to GigE System** – In the next step, all discovered cameras are added to the **GigEVision1** system. A single system can have up to a total of 8 cameras, Cameras 1-8 (Channel 0-7). Cameras can be a mix of USB 3.0 and GigE.
- h. **Warnings and Errors** – Any informational warnings will be printed into the Backplane Output window in Yellow. Any errors will be printed into the Backplane in Red.

## Programming and Running AutoVISION/Visionscape with USB 3.0 Cameras

### 1) Front Runner Taking Control of the System

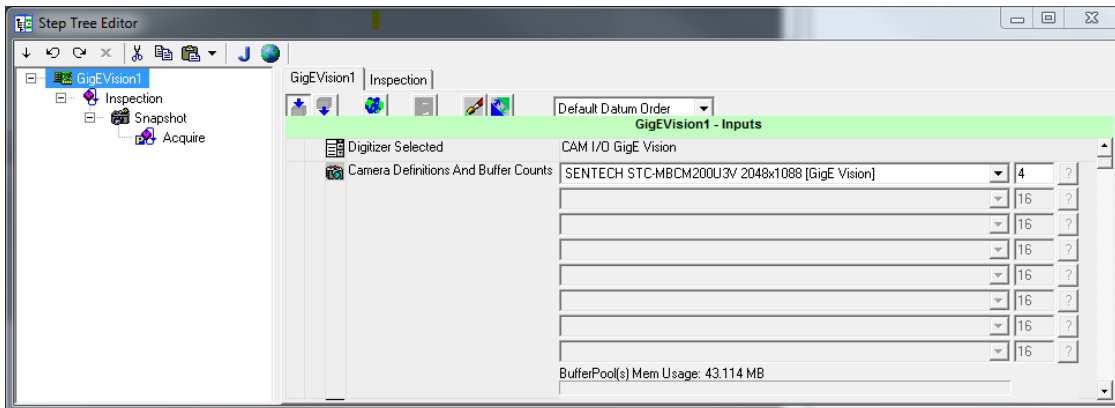
After Visionscape FrontRunner launches, the GigE vision system can be programmed by selecting the GigEvision1 icon, and then creating a new job.

The camera channel taking the picture can be selected by clicking on the Snapshot step on the left and then selecting the Acquire Tab on the right side. The cameras will go from 1 to 8.



### 2) Viewing Job in the Job Editor

Selecting the Editor Button in the top right of the screen will show the job view. Clicking on the GigEvision1 vision system step will allow you to see the cameras as well as the number of buffers set for each. The default is 16. When using multiple large cameras, it is advisable to set these down to 4 to keep BufferPool memory usage under 200MB.



### 3) Running the Job

Once the job is programmed, you can start Run Mode. The Run Mode screen will display any GigE bandwidth issues. Typically, you will see FIFO errors, or the acquisition will stop.

The screenshot shows the Visionscape FrontRunner software interface. The title bar reads "Visionscape FrontRunner - GigEVision1 (pc= <unnamed job>)". The menu bar includes "File", "View", and "Help". Below the menu bar is a toolbar with icons for "GigEVision1", "SoftSys1", "V430-F3AE0EC", and "Add Btn". A status bar indicates "GigEVision1: Running".

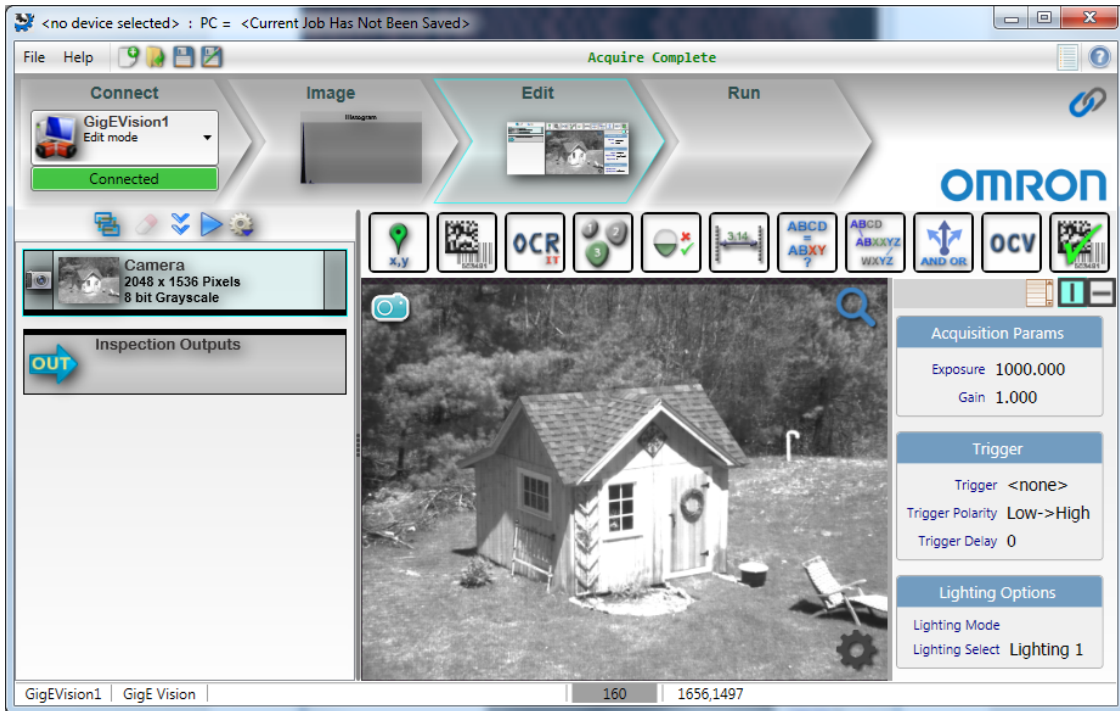
The main display area shows a live video feed from a camera, labeled "Snapshot1 (Insp1)". The video shows a small, white, gabled house in a field with trees in the background. The camera view is framed by a blue border.

Below the video feed is a status bar for "GigEVision1" with a message: "To define IO Buttons, select 'Configure IO Buttons...' from the settings menu on the title bar." Below this is a data table for "Insp1" showing inspection statistics.

Insp1		Inspect:	4021	Pass:	4021	Fail:	0
Cycle	17	Cyc Worst	60	Process	0	Draw	0
PPM	3529	PPM Worst	1000	Idle	14	DMA	0
Buffers	2 of 4 used (50%)		Overruns	None			

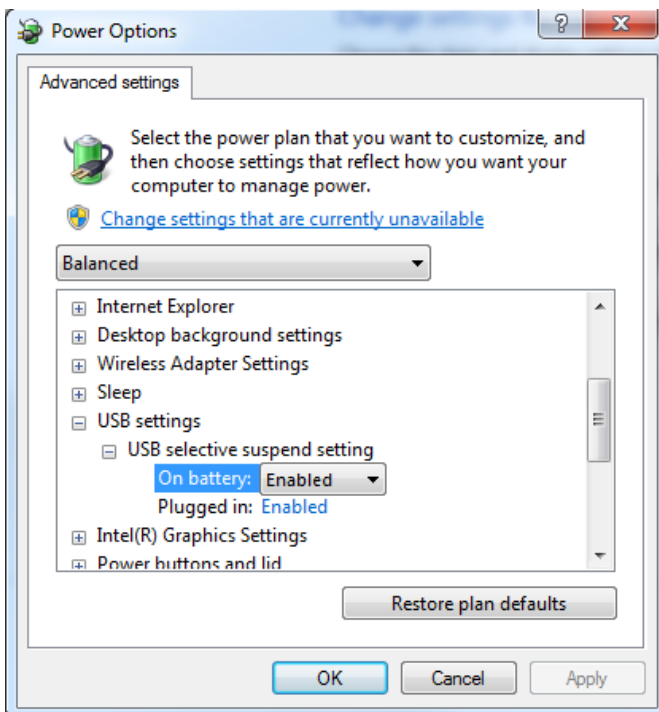
#### 4) AutoVISION

AutoVISION can be used for a single camera. AutoVISION will always connect to channel 0 (camera 1). Trigger and Strobe can be set up from within the camera step.



#### 5) Troubleshooting USB 3.0 Cameras

If USB 3.0 cameras lose connection, it may be necessary to adjust computer settings to make sure that USB ports are not set to low power modes or turned off altogether. Go to Power Options on our PC, and select Advanced Settings. Set USB so that it never turns off.



# Sentech GigE and USB 3.0 IO and Power Connections

AutoVISION/Visionscape supports both **Trigger Input** and **Strobe Output** for the Sentech STC-M cameras.

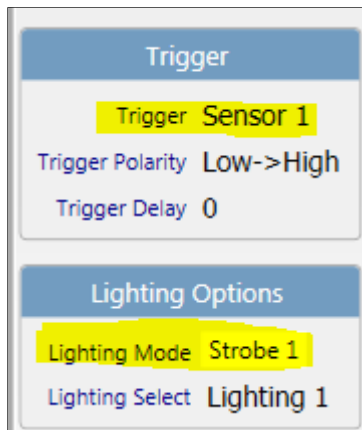
- Line0 is used for the Trigger Input
- Line1 is used for the Strobe Output
- Both Trigger and Strobe Share IO Common

**Important: Please refer to the Sentech STC-M GigE and Sentech STC-M USB 3.0 camera manuals for the exact camera pinouts and for proper wiring instructions. GigE and USB 3.0 cameras are wired differently. Also, the STC-M[ JS-231POE GigE camera does not follow the same wiring as the rest of the GigE cameras.**

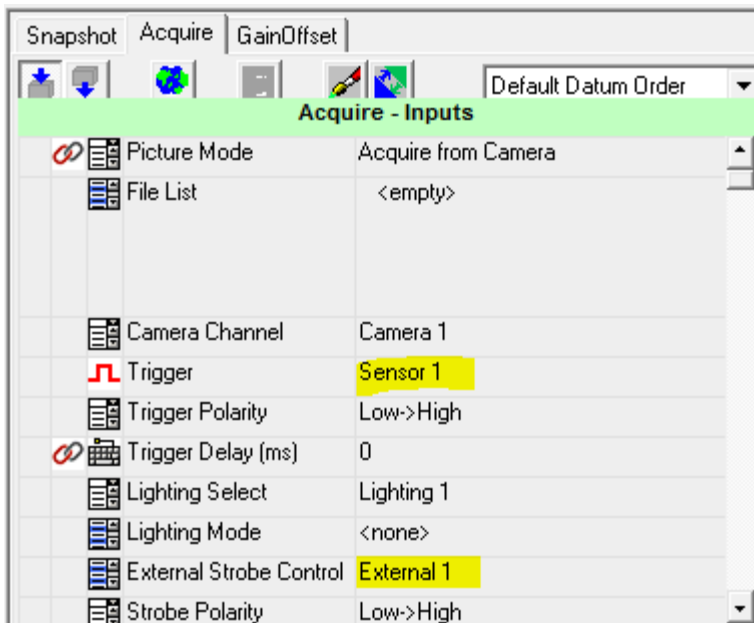
## Software Settings for Trigger and External Strobe Output

Both AutoVISION and Visionscape FrontRunner allow the user to set up trigger input and strobe output. For AutoVISION, the Trigger should be set to **Sensor 1**. The Lighting Mode should be set to **Strobe 1**. For FrontRunner, the Trigger should be set to **Sensor 1**. The External Strobe Control should be set to **External 1**.

### AutoVISION

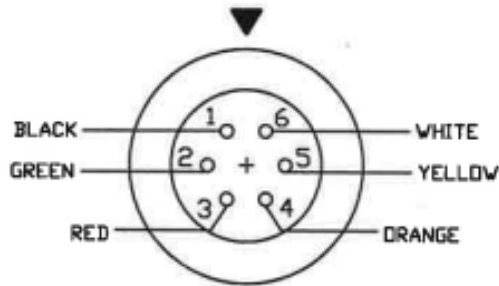


### FrontRunner



## Power and IO Cable

The HRS6-AV-6-2M can be used as the standard Power and IO Cable. The pinout and wire colors for this cable are shown below.



## GigE Camera Pinouts IO Table

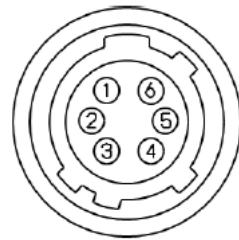
The pin assignments for the GigE cameras are shown in the table below.

- Line0 – Opto Isolated Trigger Input. Pin2
- Line1 – Opto Isolated Strobe Output. Pin4
- Common – Opto Isolated Common used for Trigger and Strobe. Pin 5
- Power IN/GND – Pin 1 and Pin 6

**Note:** Power can also be supplied though PoE Ethernet cable.

### Pin Assignment

Pin No.	Signal Name	IN / OUT	Voltage
1	POWER IN	IN	+10.8 to +26.4 Vdc
2	Opto-isolated in (Line0)	IN	Low: Smaller than +1.0 V High: +3.0 to +26.4 V * Potential difference between TRG_in and Opt. Isolated Common
3	Open Collector GPIO (Line2)	IN / OUT	+3.0 to +26.4 V / Open Collector
4	Opto-isolated out (Line1)	OUT	Open Collector
5	Opto-isolated Common	IN	
6	GND	IN	0 V



## USB 3.0 Camera Pinouts and IO Table

The pin assignments for the USB 3.0 cameras are shown in the table below.

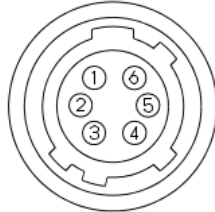
- Line0 – Opto Isolated Trigger Input. Pin4
- Line1 – Opto Isolated Strobe Output. Pin3
- Common – Opto Isolated Common used for Trigger and Strobe. Pin 1.

**Caution: Power to camera is supplied through USB 3.0 cable. The IO Cable does not support power to the camera. Using same wiring as GigE versions can cause damage to the camera.**

## USB 3.0 Standard Camera IO Table

### Pin Assignment

Pin No.	Signal Name	IN/OUT
1	GPIO_GND	-
2	GPIO2	IN/OUT
3	GPIO1	IN/OUT
4	GPIO0	IN/OUT
5	CAM_RESET	IN
6	N.C.	-

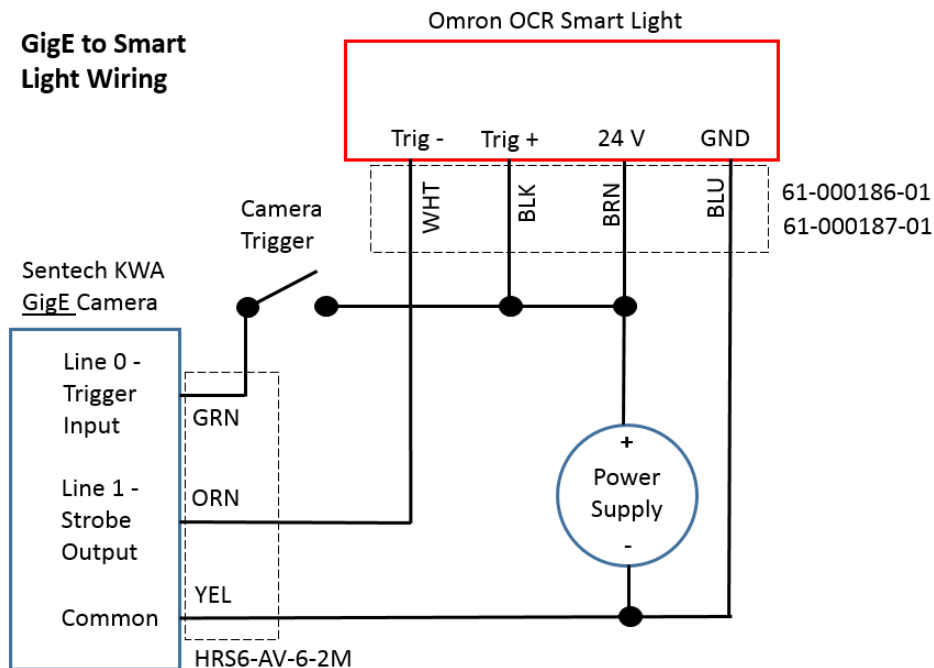


\* Possible Maximum Rated Voltage is +24 V on CAM\_RESET, GPIO0, GPIO1 and GPIO2.

\* Please set "OPEN" electrically on N.C. (Pin 6).

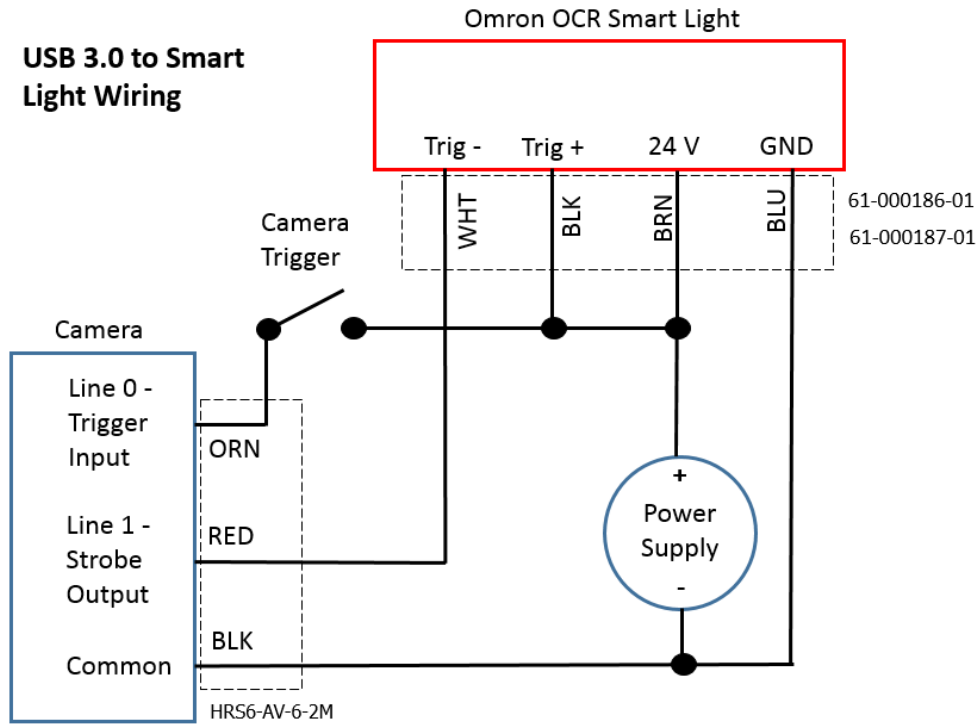
## Using Omron Sentech STC-M Cameras with OCR Smart Lights – Strobing

### GigE to Smart Light Wiring



# Using Omron Sentech STC-M Cameras with OCR Smart Lights – Strobing (Cont.)

## USB 3.0 to Smart Light Wiring

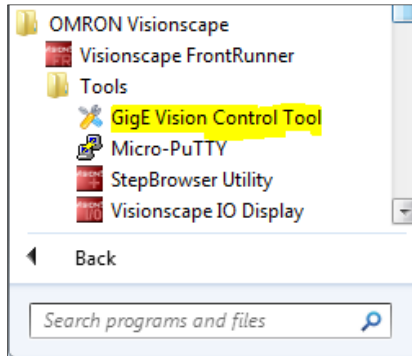


# Troubleshooting with the GigE Camera Control Tool

The GigE Camera Control Tool acts as a handy device for diagnosing issues with camera discovery, packet loss, and for setting custom parameters into the camera. The control tool uses the same driver as AutoVISION/Visionscape so acts as a sanity check.

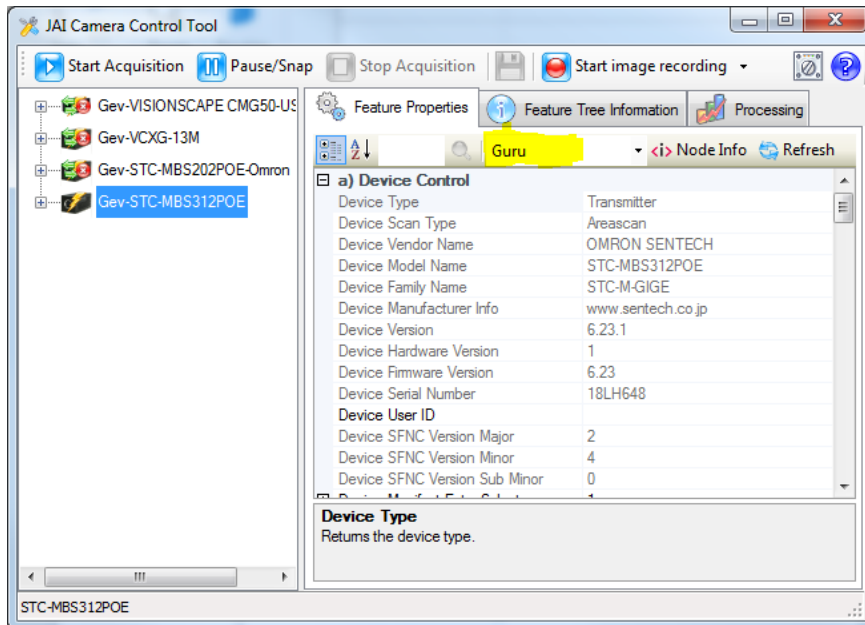
## Running the Control Tool

Close any AutoVISION or Visionscape jobs before running the GigE Vision Control Tool. This will release the cameras so that the Control Tool can take control of the cameras. The tool is started as shown below.



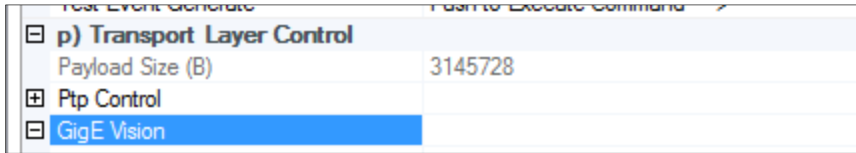
## Camera Discovery and Taking Control

When the tool starts up, it scans all the networks and USB hubs for cameras. It then lists the discovered camera in the left hand panel. Seeing if the cameras are discovered is the first level of troubleshooting. Change user from Beginner to Guru. Click on any camera to take control and see its settings.

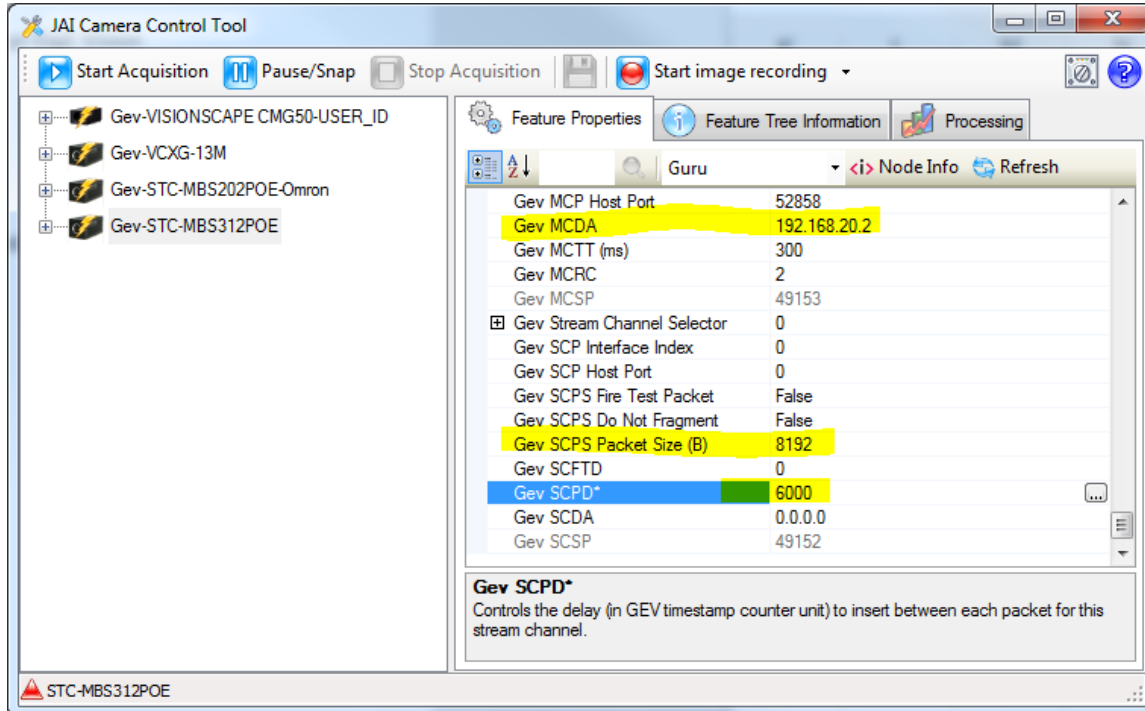


## Parameter Checking

One key feature allows you to see if the camera parameters are set up correctly. For example, scroll down the list on the right to the transport layer and open up GigE Vision.



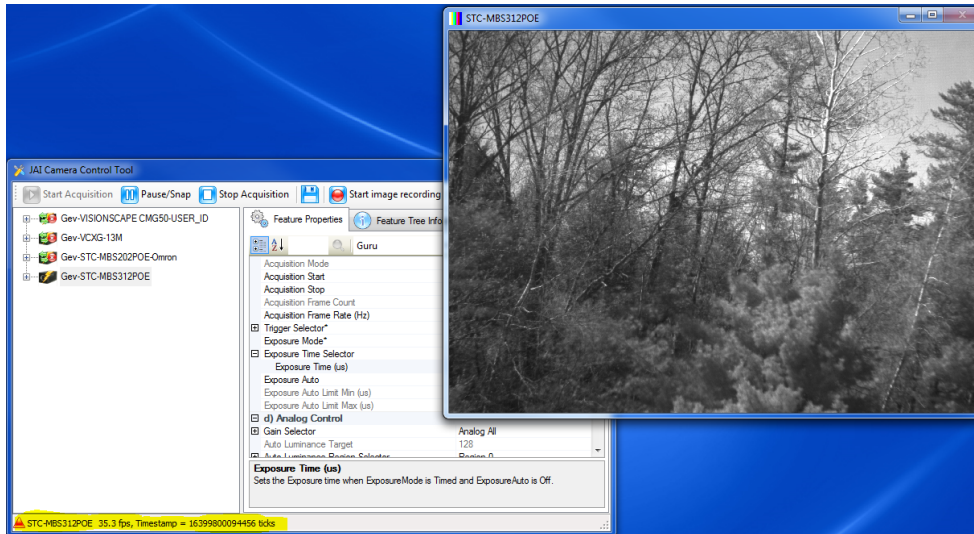
Scroll again to the bottom of that and you can see that the IP Address is set, and that Packet Size (SCPS), and InterPacketDelay (SCPD) have been set according to the registry.



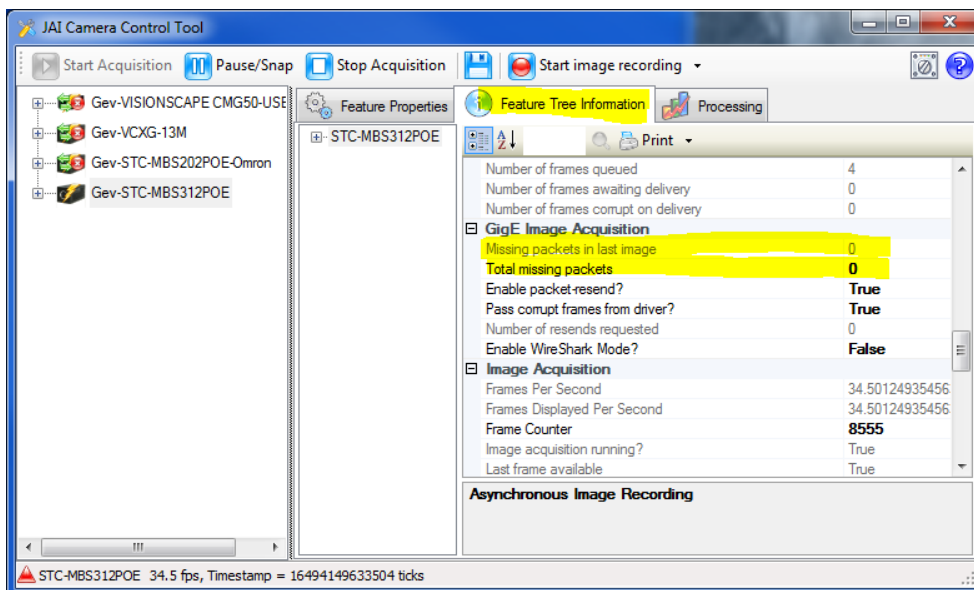
## Image Acquisition Checking

The major debug feature is to be able to see if the control tool can take pictures. Once it can, then it is assured that AutoVISION/Visionscape can. To take a picture, click on the “Start Acquisition” button on the menu bar. A window will open up to show the image. Image time stats will show up in the bottom bar.

Observe the image. Any ripping in the image is an indication of dropped packets and that packet parameters may have to be adjusted. If the Jumbo Packet setting is correct, then increase to the Interpacket delay. Do this iteratively until the image is solid.



Another way to observe this is to go to the Feature Tree Tab. Scroll down to see the GigE Image Acquisition section. This will show you if packets are being dropped as it is taking pictures. Again, adjust the packet parameters on the camera to keep this from happening.



You may also experiment with lowering Interpacket Delay. 6000 is a high default. On a good PC and NIC, this can be lowered to reach the fastest camera rates. The Missing Packet indicator, along with the FPS reading at the bottom of the screen are the guides for this operation. Once you are done tuning these values, they should be copied to the registry so they get set explicitly by Visionscape when new jobs are created.

## Preventing Computer Sleep

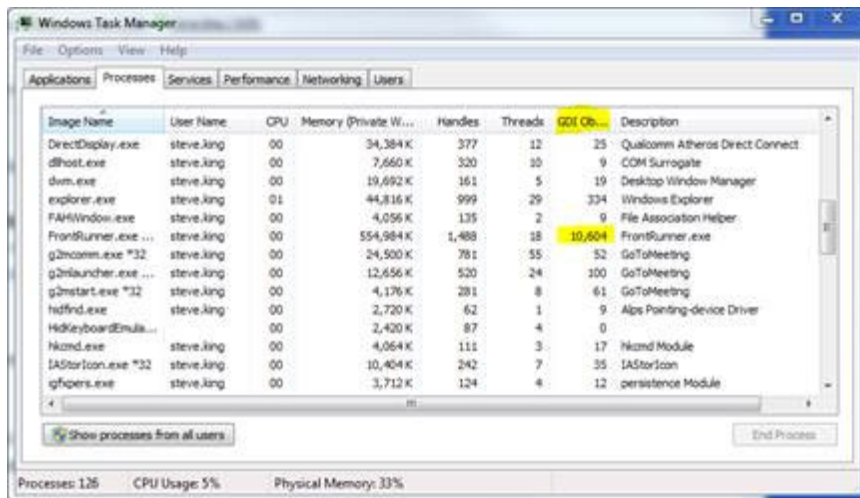
As noted at the beginning of this document, the PC should be regarded as a Vision System, not an IT controlled device. As such, it is recommended that the user edits the power options settings in the control panel to prevent the PC from going to sleep or locking the screen which can interrupt vision system processing during runtime.

## Making .NET Visionscape Programs Large Address-Aware

Many of the GigE cameras have large sensors which will require large amounts of memory for the image buffer pool. It is recommended that when deploying custom .NET applications, that they be made "large address aware." When a 32-bit application is large address aware, it can access up to 4 GB rather than be limited to 2G. Instructions for setting your application to large address aware either explicitly, or when compiling can be found on the web.

## Allocating Additional Windows Resources for Complex Visionscape Jobs

Very large or complex Visionscape jobs can cause Windows to run out of resources such as GDI object and handles. Windows defaults to allow 10,000 of each of these objects. This number can be increased in the registry to prevent any runtime issues. Evidence of this issue can be seen by using the Task Manager when running a job, and viewing the GDI object count. If it approaches 10000, then the following steps should be taken.



If this occurs, you may go into the registry and change the following two values:

HKEY\_LOCAL\_MACHINE\SOFTWARE\Microsoft\Windows  
NT\CurrentVersion\Windows\USERProcessHandleQuota

and

HKEY\_LOCAL\_MACHINE\SOFTWARE\Microsoft\Windows  
NT\CurrentVersion\Windows\GDIPProcessHandleQuota.

- **USERProcessHandleQuota** should be raised from 10,000 decimal to 18,000 decimal.
- **GDIPProcessHandleQuota** should be raised from 10,000 to at least 20,000 decimal.

Each can be set as high as 60,000 if required.

**Restart the computer for these settings to take effect.**

## Using Contec IO Boards

AutoVISION and Visionscape both support the use of Contec IO boards for expanding digital IO for GigE systems. The most recent Contec IO board driver for Window 7 and Windows 10 is installed automatically with Visionscape and is ready for use with select Contec IO boards.

Contec supplies both USB and PCI IO cards with varying numbers of inputs and outputs. All PCIe boards require a PCIe x1 slot. The following are a listed of suggested Contec IO boards.

USB 8 input/8 output board  
DIO-0808LY-USB

PCIe 16 input /16 output boards  
PCIe Sinking (Contec DIO-1616L-PE)  
PCIe Sourcing (Contec GDIO-1616RL-PE)

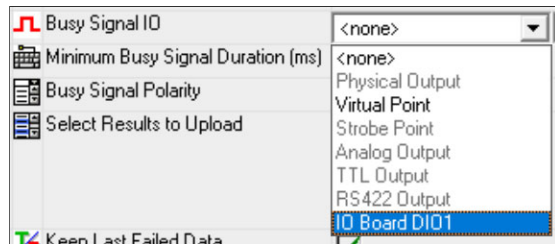
PCIe 32 input/32 output boards  
PCIe Sinking (Contec DIO-3232L-PE)  
PCIe Sourcing (Contec DIO-3232RL-PE)

### Accessing IO

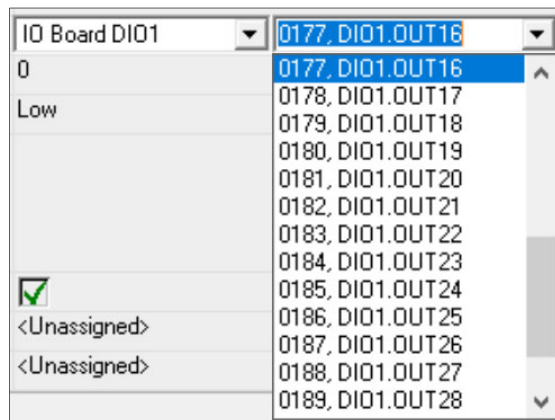
Contec DIO is serviced through Virtual IO. The virtual IO mapping for the boards is shown below.

- Contec 8 USB – Inputs VIO 161 to 168, Outputs VIO 169- 176
- Contec 16 – Inputs VIO 161 to 176, Outputs VIO 177- 192
- Contec 32x32 – Inputs VIO 161 to 192, Outputs VIO 193 - 224

In Visionscape, inputs and outputs can be selected using the standard dropdowns and picking the IO Board DIO1 selection.



Individual IO points can be selected from the list. The example below is for a 16 input, 16 output board. The first 16 (0-15) are inputs. The second set of 16 (16-31) are outputs. You can see the corresponding virtual IO next to the selection.



AutoVISION provides similar interfaces for inputs and outputs. AutoVISION will recognize the board type and enumerate all the IO that are available. The screen shot below shows the outputs that are available using the 16 input, 16 output board.

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