



Settings Reference Guide

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- The model and serial number of the device, located on the bottom of the unit. The version number of the Impact software you are running, found in the title bar of the software.
- The type and version number of the operating system software you are running on the client computer.

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Settings

Introduction

The Settings module is used to configure the Datalogic camera, including the camera's Internet Protocol (IP) Address, inputs, and outputs. This chapter explains the Settings module and reviews the cameras you can use with Impact Software, including details of proper setup and calibration on the client computer, and lighting adjustments.

Help



To access online Help, press the F1 key, or click the Help icon in the tool bar. Click the desired topic in the Table of Contents in the left pane of the Help window or type a topic in the search field.

Starting Settings

NOTE: Access to some Settings functions is limited based on the security access level.

To start Settings:

1. Double-click the Settings shortcut on the desktop.
2. When Settings starts, it automatically scans for Datalogic cameras on the client's network and displays the Device Selection list. If the desired camera doesn't appear in the list, click Refresh. If it still doesn't appear, check the camera's power and Ethernet connections.

Main Tool bar

The Settings tool bar is a row of buttons at the top of the Settings window. Some buttons are disabled depending on the current function selected.



Select Camera

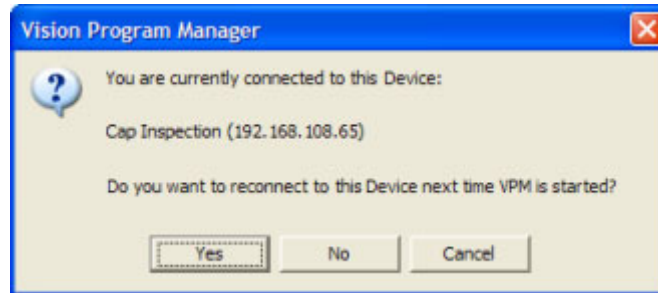
You can connect to multiple Vision Devices or Emulators with Settings. This row of tabs shows those that are connected. Click one of the tabs to select the desired Vision Device or Emulator. Multiple users can connect to one Vision Device or Emulator.



Connect to Vision Device

NOTE: Settings will not connect to a P-Series camera that is licensed for VPM Lite.

Click the Connect button to connect Settings to a Vision Device or Emulator. (See “Choose a Vision Device or Emulator” on page 4 and “How Impact Software Connecting Works” on page 7 for more details.) When you are connected to a Vision Device or Emulator, the button changes to the Disconnect button. If you close Settings while you are connected to a Vision Device or Emulator, you see the following prompt. If you click Yes, Settings automatically reconnects to that Vision Device or Emulator the next time Settings starts. If you click No, the Device Connect dialog is displayed the next time Settings starts.



Online/Offline

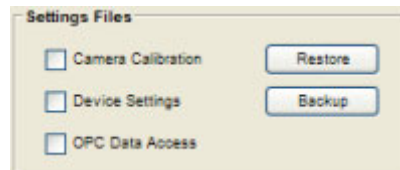
This button indicates whether the Vision Device or Emulator is online or offline. When it is online (the switch is labeled “1”), the Vision Device or Emulator accepts hardware or software triggers. Any tasks that are loaded are executed when they are triggered by their selected trigger events.

When the Vision Device or Emulator is offline (the switch is labeled “0”), tasks that are loaded remain loaded, but the camera does not accept hardware or software triggers.



Print Options

- **Print**
This prints a formatted, expanded list of all properties and values in the currently selected system object. This button is disabled if the file is password protected.
- **Print preview**
This prints a preview of a formatted, expanded list of all properties and values in the currently selected system object. This button is disabled if the file is password protected.
- **Print to text file**
This prints an expanded list of all properties and values in the currently selected system object to a text file. This button is disabled if the file is password protected.



- **Print Settings Files**
(displayed only when Settings-General-General Panel is selected) This prints the values in the Settings Files currently selected in the Settings Files dialog (Camera Calibration, Device Settings, and/or OPC Data Access). This button is disabled if the file is password protected.
- **Print Settings Files Preview**
(displayed only when Settings-General-General Panel is selected) This displays a preview of the values in the Settings Files currently selected in the Settings Files dialog (Camera Calibration, Device Settings, and/or OPC Data Access). This button is disabled if the file is password protected.



Program Preferences

- **Use small icons:** Small system object icons and toolbar buttons are displayed.
- **Hide Camera Tabs -** The Select Camera and Add Device tabs are hidden. You can choose this option to save screen space if you are only working with one camera.
- **Text Size:**
Default: Settings uses Window's default font size for all displayed text.
Custom: You can enter the font size you want Settings to use. If you are using Settings with a non-English translation file, we recommend that you use the default size (11).



Camera Preferences

- **Display Refresh Rate:** The rate at which the Summary Table and Display tab values are refreshed while the camera is in Trigger Continuously mode or online. If the system is online, this setting affects only the refresh rate, not the trigger rate.
- **Display Refresh Timeout:** Occasionally communication timeouts can cause Settings to stop refreshing the Summary Table and Display tab values. The timeout value can be too short for the amount of information being gathered for display and/or the Datalogic camera is being triggered at a rate that does not allow it to return information to Settings. If a timeout occurs after three consecutive attempts, a warning is displayed indicating that you should increase this setting.
The timeout can be adjusted from one to thirty seconds; each mark on the scale represents approximately three seconds. You should adjust this timeout value only when necessary.



Help

Click Help to display the Impact Reference Guide, then click the desired topic in the Table of Contents in the left pane of the Help window.



About Settings

This displays version and build information about Settings.

Add Vision Device tab



Add Vision Device tab

You can connect to multiple cameras with Settings. If you are already connected to one or more, click the Add Camera tab to add another connection. When you click the tab, a dialog is displayed where you can select the desired camera. See "Choose a vision device or Emulator" on page 4.

If the Add Vision Device tab is not visible, click the Program Preferences button and clear the "Hide Camera Tabs" check box.

Design Mode



File Camera or Camera

Click this button to switch between File Camera and Camera mode. See "File Camera" on page 42 for details about the File Camera. See "Camera" on page 20 for details about Camera setup.



Live Images

When this button is clicked, images are displayed as rapidly as possible. If a camera is connected to the Vision Device, images are acquired and displayed. If an Emulator is connected, or File Camera is selected, all the images in the file camera are displayed, one at a time. No tasks or tools are run in this mode.

Choose a vision device or Emulator

Connecting to and choosing a vision device or Emulator works differently on A30, P-Series, T4x-Series, M-Series, MX-E Series, and MX-U Series systems. For more details about how each system works, see “How Impact Software Connecting Works” on page 50.

CAUTION: Any program on a camera that controls outputs that are connected to and control external mechanical equipment can cause that equipment to operate when the program runs.

When Settings first starts

When Settings first starts, a dialog is displayed so you can choose a vision device or Emulator.

No vision device is currently connected

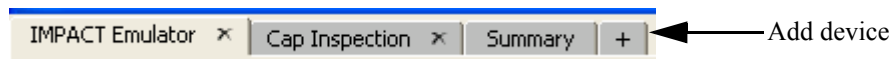


If Settings is not currently connected to a vision device, click the Connect button in the tool bar. A dialog is displayed so you can choose what connection you want to make. The first time you physically connect a camera to the MX-U Series processor, you must assign that camera to a vision device. See “Assign Tab (USB Cameras Only)” on page 29.

One or more vision devices are connected



To maintain current connections and connect to an additional vision device or Emulator, click the Add device tab to the right of the Summary tab. Another tab will be added to the row. Select the desired vision device or Emulator from the dialog.

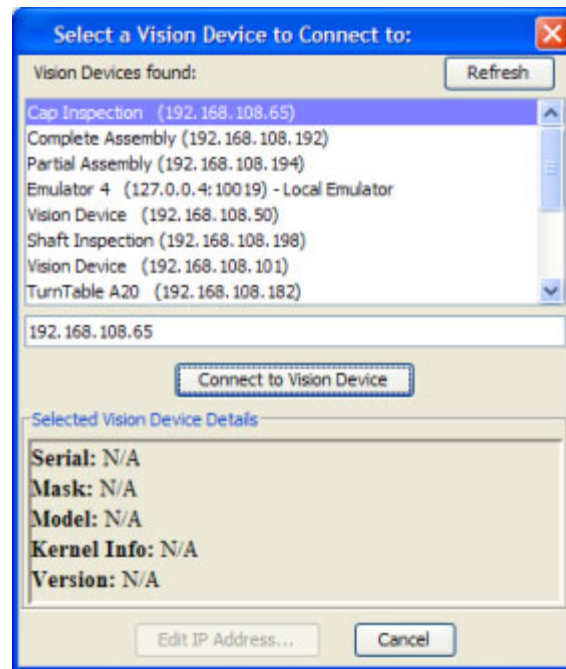


To choose a vision device or Emulator:

1. When the vision device select dialog is displayed, select one or more items from the list (press the Control key while you click to select multiple items). An Emulator appears in the list with Local Emulator

as part of its name.

TIP: Details about a device selected in the list are displayed at the bottom of the dialog.



- Click Connect to Vision Device.
If security is enabled on the camera, the User Logon dialog is displayed. When a valid User ID and password have been entered, Settings connects with the vision device or Emulator.
- When the connection has been made, you may see a message that Settings is reading from the newly connected vision device.

- **Vision Devices found**

This list displays the names and IP addresses of the vision devices and Emulators visible on the network.

- **Connect to Vision Device**

Click this to connect to the vision devices selected in the list.

NOTE: If another user is already connected to the vision device, a dialog will be displayed indicating that the vision device is in use.

- **Edit IP Address...**

To change the IP address of the selected camera, click this button. See “Camera” on page 20 for more details.

To disconnect from a vision device or Emulator:

- Select the tab for the vision device you want to disconnect.
- Click the Disconnect button in the tool bar.

Settings Tab



Settings must be connected to a camera, Vision Device, or Emulator to access the Settings tab.

You can access camera or Emulator properties through the system objects on the Settings Tab shown in the Design view. Every object has the general properties of Name, Description, and Type. Some system objects have inputs and outputs. Most system objects have both a Setup and a Properties tab.

NOTE: Some tabs, panels, and fields may be disabled when the camera or Emulator is online. Access to some Settings functions is limited based on the security access level. See “Impact Vision Device and Camera Security” on page 17 for details.

General



The General system object allows access to system parameters on the camera. The General system object's Properties tab shows some of the parameters. The Setup tab lets you set additional system parameters.

General Properties Tab

Input Name	What it is
Device Name	The camera name. For example, Bearing Diameter Inspection. This name appears in the Device Connection dialog.
Device Comment	A comment about the camera. For example, Inspects Bearing Diameter. This comment appears in the Device Connection dialog.
Task Timeout	See “Enable Timeout” on page 11.
TCP/IP Port	See “TCP/IP” on page 14.
Serial Port Baud Rate	“TCP/IP” on page 14.
Serial Port Parity	“Serial Port” on page 14.
Serial Port Data Bits	“Serial Port” on page 14.
Serial Port Stop Bits	“Serial Port” on page 14.

Output Name	What it is
System Time	The current time (the number of seconds elapsed since January 1, 1970).
CPU Temperature	The temperature on the processor board (in degrees Celsius)
Sensor Board Temperature	(A30, P-Series, and T4x-Series only) The temperature on the sensor board (in degrees C)
Available RAM	The amount of RAM (in bytes). This number remains static while the system is online.
Model	The model number
Serial Number	The serial number. M-Series cameras include the camera number.
Software Version	The Impact software version (Major version.minor version.sub-minor version Build number)

Output Name	What it is
Kernel Version	The operating system software version (Major version.minor version.sub-minor version Build number)
Firmware Version	The firmware version
Board ID	The identification number
HTTP Port	The system port the camera is using for HTTP commands
WatchDog Enabled (P-Series Only)	If True, the WatchDog is enabled. The WatchDog function checks at specific intervals (WatchDog Timeout) that the camera is running normally. If the check reveals a problem, the camera is restarted.
WatchDog timeout (ms) (P-Series Only)	If WatchDog Enabled is True, this is the amount of time delay (in milliseconds) between WatchDog function checks.

General Setup Tab

NOTE: Access to functions on this tab may be limited based on a user's access level and while the camera is online.

General Panel

Name

The camera name can contain any combination of letters or numbers up to 25 characters in length. You may use the same name for multiple Datalogic cameras on the network, although this may cause confusion.

IP Address, IP Gateway, and IP Mask

Note: Usually you will not need to use the IP Gateway address. Do not change it.

IMPORTANT: Do NOT include a leading zero in an IP Address group (for example 192.168.108.**065**)

The IP Mask and Address on the client, M-Series, MX-E Series, and MX-U Series processor and the Vision Device work together so data can be exchanged. The IP Mask is network dependent, but it is the same for each Vision Device on a particular network. The IP Address must be unique to each Vision Device if there is more than one on a network.

You may need to change the client computer's mask and address to match the desired camera's IP Address. See the following sections for details.

Note: Do not attempt to change the IP Address or Mask without the authorization of your network administrator; doing so could disrupt your network connection.

A30, P-Series, and T4x-Series

To be able to communicate with the camera, a client computer's IP Mask and Address must be configured correctly. During address configuration, we recommend that the client computer and the camera be connected directly to each other and not through a network server.

Changing the client computer's addresses: Windows 7

1. In the Start Menu, select Computer, Network, then click Network and Sharing Center.
2. Under "View Your Active Networks," click Local Area Connection.
3. Click Internet Protocol Version 4 in the list, then click Properties.
4. On the Alternate Configuration tab, select User Configured.
5. Enter the desired IP address and Subnet Mask. Remember, to be able to communicate with the camera, a client computer's Subnet mask must correspond correctly to the camera's IP mask, and the address must match the camera's address in the first three sets of numbers.
6. Click OK, then close all the open dialog windows.

Changing the client's mask and address: Windows XP

1. In the Start menu, right click on My Network Places and select Properties.
2. Right click on Local Area Connections and select Properties.
3. On the General tab, select Internet Protocol (TCP/IP) and click Properties.
4. On the Alternate Configuration tab, select User Configured.
5. Enter the IP Address 192.168.0.1 and the Subnet Mask 255.255.255.0, then click OK to close all the dialog windows.

M-Series, MX-E Series, and MX-U Series Processor

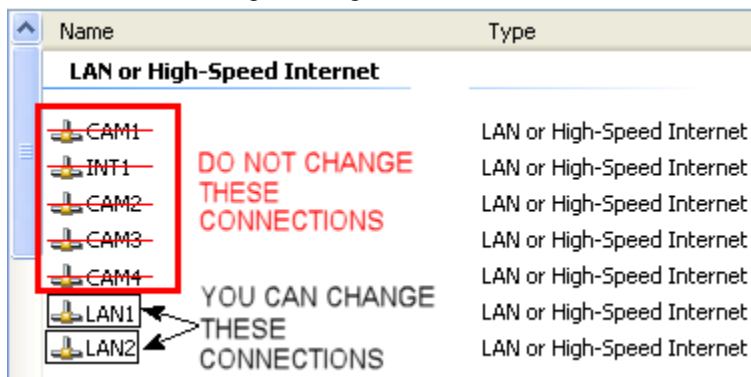
Changing the Processor's IP Address (Windows XP)

IMPORTANT NOTE: Change only the Local Area Connection named LAN1 or LAN2. These correspond to Ethernet Ports 1 and 2 on the front of the processor.

DO NOT change any of the other Local Area Connections. Changing any other connection can cause M-Series, MX-E Series, and MX-U Series cameras to stop functioning.

1. In the Start menu, right click on My Network Places and select Properties.
2. Right click Local Area Connection LAN1 or LAN2 and select Properties.
3. On the General tab, select Internet Protocol (TCP/IP) and click Properties.
4. On the General tab, select Use the following IP address.
5. Enter the desired IP address.

- Click OK to close all the open dialog windows.

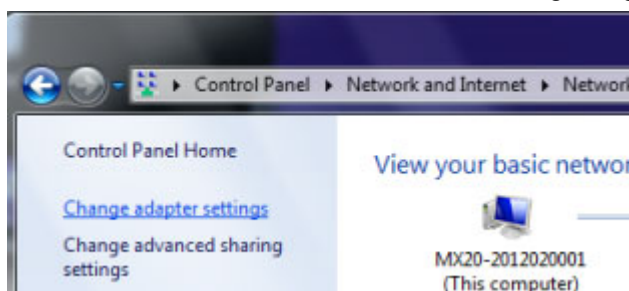


Changing the Processor's IP Address (Windows 7)

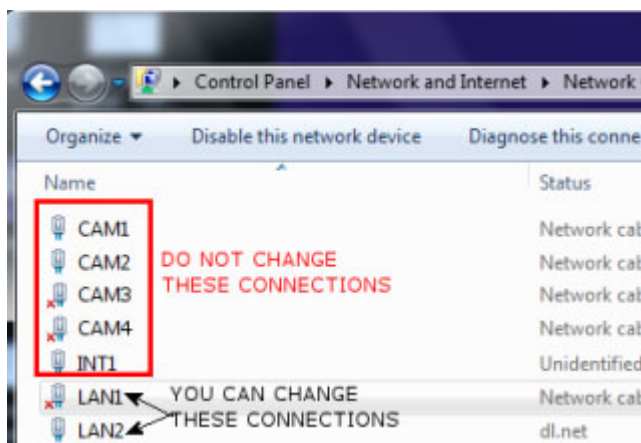
IMPORTANT NOTE: Change only the Local Area Connection named LAN1 or LAN2. These correspond to Ethernet Ports 1 and 2 on the front of the processor.

DO NOT change any of the other connections. Changing any other connection can cause the M-Series, MX-E Series, and MX-U Series cameras to stop functioning.

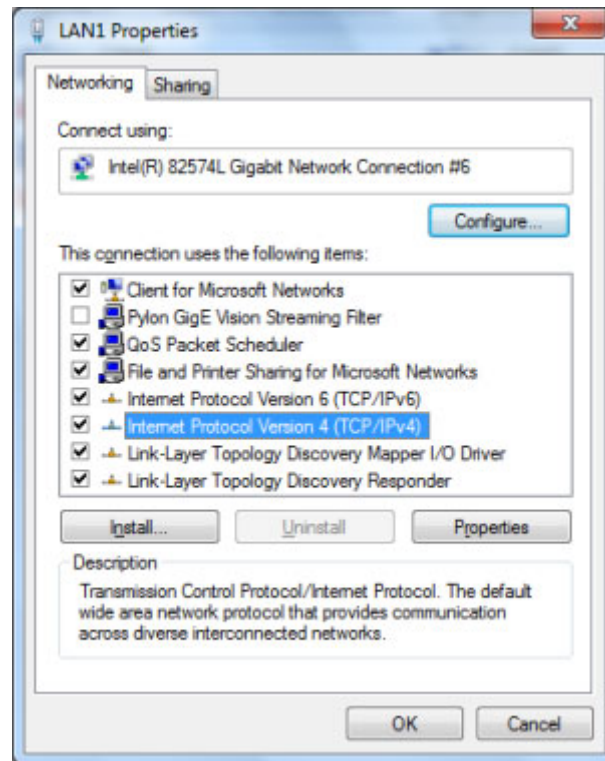
- In the Start menu, click on Control Panel.
- Under Network and Internet, click on View Network Status and Tasks.
- On the left side of the screen, click Change Adapter Settings.



- Right click LAN1 or LAN 2 and select Properties.



5. In the list of items, select Internet Protocol Version 4 (TCP/IPv4), then click Properties.



6. Select Use the following IP address.
7. Enter the desired IP address.
8. Click OK to close all the open dialog windows.

Changing the camera or Vision Device Mask and Address

To change the IP Mask and Address, you must know the current IP Address and Mask so you can configure the client correctly. The Impact A30, P-Series, and T4x-Series cameras are shipped with a default IP Address of 192.168.0.128 and a default Mask of 255.255.255.0. The M-Series, MX-E Series, and MX-U Series Vision Devices have a default IP Address range from 192.168.0.129 to 192.168.0.132 (The number of Vision Devices is determined by the processor type and number of camera licenses.)

IMPORTANT: If you change a camera or Vision Device's Mask or Address, be sure to record the change.
IMPORTANT: Do NOT include a leading zero in an IP Address group (for example 192.168.108.**065**)

1. A30, P-Series, and T4x-Series: Be sure that the client computer's IP Address and Mask are set correctly. Connect the client computer and camera's Ethernet ports directly using an Ethernet cable and turn on power to the camera.
 M-Series, MX-E Series, and MX-U Series: It is not necessary to connect a camera during this process.
2. Connect to the desired Vision Device or camera. See "Choose a Vision Device or Emulator" on page 4.
IMPORTANT NOTE: If you intend to change **both** the IP Address and the IP Mask, do not Reboot until you have changed them both. After you change the IP Address, you will see a message that states you must reboot for the changes to take effect. Do not reboot until after you have changed both the Mask and the Address. On A30, P-Series, and T4x-Series cameras, you need to cycle power for the changes to take effect.

- When the connection has been made, click the General System Object, click the Setup tab, then click the General radio button. Enter the new IP Mask and/or IP Address in the appropriate field(s). Record the new value (along with the serial number) and store it where you can find it again.

A screenshot of a web interface showing two input fields. The top field is labeled 'IP Address:' and the bottom field is labeled 'IP Mask:'. Both fields are empty and have a light gray border.

- Click the Diagnostics radio button, then click the Reboot Device button. You must reboot to make the changes take effect in the camera or Vision Device.

IP Gateway

The IP Gateway address is used when you want to access an IP Address through a router. You will ordinarily leave this field blank.

Comment

The comment can contain notes about the camera or Emulator, such as its function, the physical location, what it is inspecting, or when it was put into service. This comment is displayed on the Device Information panel.

Go Online At Startup

Check this box if you want the camera or Emulator to go Online when it starts. Any tasks that are loaded are executed, based on their trigger parameters. To mark which tasks get loaded when the camera or Emulator starts, see “File Manager Setup Tab” on page 45.

Connections

Maximum

The maximum number of users at each level (1 to 100) that can be connected to this camera or Emulator at one time. Multiple users can connect to one camera or Emulator, but only one user at a time can edit programs or change data on the camera or Emulator.

- **Current**

The number of users at each level currently connected to the camera.

Vision Device Date/Time

(A30, P-Series, and T4x-Series only) This displays the current date and time stored on the camera. To set the camera date and time to match the client computer’s date and time, click Synchronize to PC. The time is also automatically synchronized when a connection is made.

NOTE: The camera does not automatically adjust for daylight savings time changes. You will need to manually synchronize it.

Enable Timeout

Here you can define the maximum length of time a task may take to execute, and the maximum length of time the Data Transfer tool will wait for a response from a control panel.

NOTE: Task Timeout applies only to tasks with the Trigger Event set to Image In Event and is effective only while the camera is online and triggering.

- **Task** - When this property is enabled, the Task Timeout value determines how much time the task has to complete execution before it aborts.

If the task's Trigger Event type is set to "Image In Event," the time starts when the camera trigger is complete, not at the beginning of task execution. For all other Trigger Event settings, the time starts when task execution begins. The timing accuracy depends on the tools in the task, but it is generally accurate to within a few milliseconds.

For example, if Task Timeout is enabled, and the Timeout value is set for 10,000 milliseconds, a task will run until it completes or 10,000 milliseconds has elapsed, whichever comes first. If the Task Timeout occurs first, and Abort On Error is True, the Abort Task runs, if one is defined. If Abort On Error is False, then the task keeps running and any remaining tools abort and fail.

- **Data Transfer Tool** - When if this property is enabled, the Timeout value indicates the maximum length of time a Data Transfer tool will wait for a control panel response before it stops trying to send data to it. For example, if the timeout is enabled, and the Timeout value is set for 10,000 milliseconds, if the control panel does not respond to the Data Transfer tool's command within 10,000 milliseconds, the data transfer is terminated.

Settings Files

This section lets you select what camera settings are saved and printed. Both is selected by default. To copy settings files from one camera to another, see "To copy files..." on page 13.

IMPORTANT NOTE: Settings files contain information about which vision programs should be loaded when the camera starts. Since vision program files *are not copied* to the Datalogic camera when you backup and restore the settings file, some vision programs may not get loaded when the camera starts. It is the system programmers responsibility to insure that the proper vision program files are copied to the camera.

- **Camera Calibration**
When you click Backup, the settings displayed on the Camera System Object - Setup Tab - Calibration panel are saved to the client. Restore sends the calibrations from the client's file to the camera or Emulator. Calibration settings are also saved whenever the calibration is changed.
- **Vision Device Settings**
When you click Backup, the settings displayed on the General System Object are saved to the client. Restore sends the camera or Emulator settings from the client's file to the camera or Emulator.
- **OPC Data Access**
When you click Backup, the OPC data settings displayed on the OPC Data Access System Object are saved to the client. Restore sends the camera or Emulator settings from the client's file to the camera or Emulator.

IMPORTANT NOTE: Restore will overwrite any existing settings on the camera with those currently on the client computer. If more than one client computer is connected to the camera, the most recently restored settings are kept on the camera.

- **Restore:** The Restore button sends camera settings currently saved on the client computer to the camera. Vision program files are *not* copied to the camera. See "Folder List" on page 45 for image file copying details.

IMPORTANT NOTE: The client computer will backup the settings for only one Datalogic camera at a time. Only the currently connected camera's settings are backed up. Any previously saved settings are overwritten.

- **Backup:** The Backup button saves the selected settings from the camera to the client computer. Vision program files are *not* copied from the camera. See “File List” on page 46 for image and vision program file copying details.

To copy settings files from one Vision Device, camera, or Emulator to another (A30, P-Series, and T4x-Series)

1. Connect to the source (where you are copying from).
2. Click the Settings Tab - General - Setup - General panel
3. In the Settings Files group, select the Vision Device Settings check box.
4. Click Backup.
5. Disconnect from the source.
6. Connect to the destination (where you are copying to).
7. Click the Settings Tab - General - Setup - General panel
8. In the Settings Files group, select the Vision Device Settings check box.
9. Click Restore.
10. Disconnect from the destination.
11. Repeat steps 6 through 9 to copy the files to other destination.

To copy settings files from one M-Series, MX-E Series, or MX-U Series to another

1. On the M-Series, MX-E Series, or MX-U Series processor storage device, find the directories C:\installdirectory\IMPACT\Applications\Device\VisionDevice# (where “installdirectory” is the default install location and “VisionDevice#” is the number of the camera you want to back up)
2. Copy each of the desired directories to the back up device. Each directory contains the information for a specific camera.
3. If you want to duplicate the settings to a different M-Series, MX-E Series, or MX-U Series processor, copy each of the directories from the back up to the appropriate location (in step 1) on the new processor.

Communication Panel

Shift Source

This setting is not used on the A30, P-Series, T4x-Series, M-Series, MX-E Series, and MX-U Series cameras.

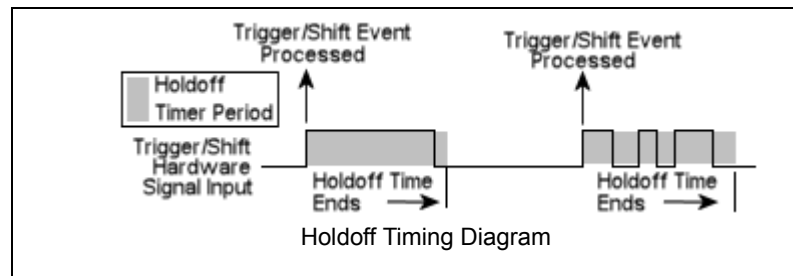
Input Debounce

Here you define the debounce time for event trigger signals. Debounce determines the maximum trigger rate the system will allow (basically like a governor on an engine) to help prevent negative effects from noise and high frequency bursts. The debounce setting must be able to filter out noise while not introducing any unnecessary delays.

NOTE: Third-party cameras have varying Delay and Holdoff Input Debounce settings. Refer to the M-Series Camera and Processor Guide (843-0138) for details.

- **Delay**
This setting is not supported in the M-Series, MX-E Series, and MX-U Series processor.
- **Holdoff**

The event is triggered when the signal's active edge is detected, but another active edge will not trigger the input until the Holdoff time has elapsed. Holdoff is good for noise on the signal's leading edge and it is not speed-dependent, but it is susceptible to random noise on the input signal. Use a Holdoff time long enough to reject leading edge noise, but not so long that the inspection rate is limited.



Enable OPC/ActiveX Server

If this check box is checked, the OPC/ActiveX Server on the camera will be started each time the camera starts. This server must be running if you are using OPC Data Access (refer to the OPC Server Reference Guide 843-0136) or the Impact ActiveX Interface (refer to the Impact ActiveX Reference Guide 843-0119).

TCP/IP

This is the camera or Emulator's Ethernet input port number where the camera or Emulator "listens" for a TCP/IP message or command. When a message is received on this port, the camera or Emulator triggers the TCP/IP event and tasks that have the Task Trigger event set to TCP/IP are queued to run.

When a Telnet command is received on this port, the command processor evaluates and executes it. You can use Telnet and other network devices to send commands to this port. The port number used should be the same as this port number. See "Telnet Commands" on page 5 for more details.

You can use the TCP/IP Out tool in a task in another camera or Emulator to send messages to this port. The port number used in that TCP/IP Out tool should be the same as this port number. However, as the communication is one-way, the input port number cannot be the same on both cameras or Emulators.

A delimiter must be defined. Click the Edit button to change the hex-value delimiter characters that indicate the end of a data string. In the Create Delimiter Sequence dialog, select a character from the list, then click Append, or click Clear to delete the delimiter. Click OK when the sequence is defined.

Serial Port

This section defines the parameters for the camera's serial port that will be used by Vision Program Manager's Serial Port Out and Serial Port In tools. Consult the documentation for the requirements of the camera you are connecting to the Datalogic camera's serial port, then set these values accordingly. The serial port does not support hardware (CTS/RTS) or software (Xon/Xoff) data flow control. Datalogic cameras support only RS-232 communication protocol. RS-485 is not supported. The Emulator has no serial port.

- **Speed:** The camera's data transmission rate. Speeds supported: 300; 2,400; 9,600; 19,200; 38,400; and 115,200. Settings defaults to 115,200 when it is installed.
- **Parity:** The number of parity bits used.
- **Data Bits:** The number of data bits used.
- **Stop Bits:** The number of stop bits used.
- **Delimiter:** (This Delimiter character is used only by the Serial Port In tool.) The delimiter is placed at the end of the input string when it is transmitted. The receiving camera's Serial Port Delimiter must match this setting.

When the camera detects a delimiter in the data string, it creates a Serial Input task trigger event. If no delimiter is defined, an event is created after every character in the data. To create the Delimiter, in the Create Delimiter Sequence dialog, select a character from the list, then click Append. Click OK when the sequence is defined. You can only use one delimiter character in the data string.

To create the Delimiter

1. Click the Edit button next to the Delimiter field.
2. In the Create Delimiter Sequence dialog, select a character from the list.
3. Click Append.
4. Repeat steps 2 and 3 until the delimiter is defined.
5. Click OK.

NOTES for M-Series processors:

The M-Series processor will only accept one delimiter character in the data string.

The MX20 and MX40 processors have two serial ports. Serial port 1 is controlled by Camera 1 (CAM1) and Serial port 2 is controlled by Camera 2 (CAM2).

The Serial Port 1 connector is on the front of the processor box, left of the VGA connector.

The MX80 processor has four serial ports. Each Serial Port is controlled by its respective Camera (e.g port 1 is controlled by Camera 1 (CAM1) and so on).

NOTES for MX-U Series processors:

The MX-U Series processor will only accept one delimiter character in the data string.

All MX-U Series processors have one serial port. Serial port 1 is controlled by the camera assigned to Vision Device 1. The Serial Port 1 connector is on the top of the processor box, next to the Ethernet connectors.

Diagnostics Panel

NOTE: Access to functions on this tab may be limited based on a user's access level and while the camera is online.

The Diagnostics tab lets you run diagnostic tests on various functions of the Datalogic camera.

Outputs

Click a button to turn individual outputs on and off. The indicator is green when the output is on. If you connect a "loopback" connection between an output and an input, you should see the state change in the Inputs section of this tab.

Strobes

Use this function to test your strobe outputs. When you click a strobe button, the corresponding output will pulse for 30 microseconds.

Options

I/O Polling Rate

Enter a number from 50 to 10,000 milliseconds. Settings polls the Impact camera at this rate and updates all the indicators on the Diagnostics tab.

NOTE: Enable System Log Trace only when you need to trace all system events. For instance, if you are having trouble tracking down an intermittent problem with a vision program. The system log can quickly become filled with entries and system performance can be affected, depending on the program's complexity.

Enable System Log Trace

When this is checked, all system events that occur on the camera are entered in the system log. This includes events, task and tool run completion, and many other occurrences that would not ordinarily get logged.

Inputs

This section shows the current state of each of the camera, Emulator, or processor's inputs. (Settings polls the camera at the I/O Polling Rate shown.) The indicator is green when the input is On. If the input change rate is too fast, the indicator may not switch quickly enough to indicate the true current state.

To test a camera or processor input, connect a "loopback" between an output and the input. The input's state will change when the output changes.

Events

This section shows the hardware signal frequency on the camera's trigger, shift, or event inputs (in Hz). These values are inactive if the camera is not online and receiving hardware trigger signals. The appropriate Trigger Event property must also be set.

Trigger Rate: The signal on the Trigger Input. A task that has the Trigger Event property set to one of the types of Image Trigger Event must be loaded.

Shift Rate: The signal on the Shift Input. A task must be loaded that has the Trigger Event property set to one of the types of Shift Event must be loaded.

Event Rate: The signal on the Event Input. A task must be loaded that has the Trigger Event property set to one of the types of Input Event must be loaded.

Reboot Device

Click this button to restart the camera or Vision Device. All tasks stop executing and all vision programs are unloaded. (This has the same effect as pressing the Reset button on the A30, P-Series, or T4x-Series camera.)

When the Vision Device restart has completed, any vision programs set to load on startup are loaded and tasks in those vision programs are queued to execute when they are triggered. See "File Manager Setup Tab" on page 45 for setting vision programs to load on startup.

IMPORTANT NOTE: The camera or Vision Device must completely reboot (the Stat indicator light is off) before you can connect to it.

Advanced

This button presents a menu of advanced functions.

- **Calibration Editor** - When you save images in Settings, the lens calibration information is stored with them. You can edit the calibration values, or copy that information to other image files.
- **Memory Meter** - This utility displays the current memory usage for a camera. The amount of available memory shown is not updated while the camera is online.
- **TCP Tester** - This utility emulates a camera to test Ethernet data transfer between the client and Datalogic cameras.
- **Modbus TCP/IP Client** - Send commands to and read information directly from the camera Modbus TCP/IP Server using Modbus TCP/IP protocol. (Datalogic does not support serial Modbus protocol.)

Administration Panel

NOTE: Access to this tab is limited to users with an Administrator access level. Some options are unavailable while the camera is online.

Impact Vision Device and Camera Security

Impact security resides in each camera and Vision Device. (Control panel applications and vision programs can be password protected separately. You must connect and log on to a camera to modify security for that camera. When you attempt to connect to a camera or Vision Device that has security enabled, you will have to enter a valid User ID and password. The User ID will determine your security level. Some functions are limited based on the user's security level. Control Panel designers can check for the user's security level and allow access to specific functions based on that level.

Enable Security

Security for each camera or Vision Device resides in the camera. If the Enable Security check box is checked security is enabled, and whenever the camera starts, the logon screen is displayed. The user cannot gain access to the camera until a valid User ID and password have been entered. For more details, see "Impact Vision Device and Camera Security" on page 17. There must be at least one Administration level user defined to enable security.

Users

- **User ID and Level:** All currently defined users and their access levels are displayed in this list. Access to a camera is determined by the access level assigned to each User ID. Access to functions on Control Panels is assigned by the Control Panel creator. The following access levels can be assigned, with Administrator level having full access to all functions.
- **Administrator:** modify images, adjust inspection settings, put the camera online and offline, modify vision program parameters, create and edit vision programs, make camera settings, and modify system security.
Note: Before you can enable security on the camera, there must be at least one Administration level user defined. (See "Enable Security" on page 17.)
- **Programmer:** modify images, adjust inspection settings, put the camera online and offline, modify vision program parameters, create and edit vision programs, and change camera settings. Programmer level cannot change security settings or passwords.
- **Controller:** view images; adjust some inspection settings, and put the camera online and offline; and modify some vision program parameters. Controller level cannot change security settings or passwords.
- **Operator:** view images, adjust some inspection settings, and put the camera online and offline.
- **Monitor:** View inspection fields and values as allowed by Control Panel security; view vision program parameters, and control functions; modify values as allowed by Control Panel security; and view all fields on the Device Information tab. Monitor level cannot change passwords.

To add a User

1. Click the Add User button.
2. Enter a User ID. It may contain any letter or number. For example, this may be a name, a shift designation, or some other unique identifier. The User ID is case sensitive.
3. Select the access level from the drop-down list.
4. Enter a password in the Password field. See "Passwords" on page 18 for more about passwords. Asterisks are displayed for the password. The password is case sensitive.

5. Enter the same password again in the Confirm Password field. Asterisks are displayed for the password.
6. If you want the user's password to expire after a fixed time period, check the Number of days before password expires check box and enter the number of days. Administrator level passwords never expire.
7. If you want anyone (including Administrators) to be able to change this password, check the Can Change Password check box.
8. Click the OK button.

To modify a User

1. Select the User ID you want to modify.
2. Click the Modify User button.
3. Change the desired field. If you change the password, you will have to enter the new password again in the Confirm Password field.
4. Click the OK button.

To delete a User

1. Select the User ID you want to delete.
2. Click the Delete User button.
3. Click the Yes button to confirm the deletion.

Install Users on Multiple Cameras or Emulators

You can copy the User IDs and passwords from the connected camera or Emulator to another.

To install Users on multiple cameras

1. Click Install, then select the target cameras for the User IDs and passwords.
NOTE: Any existing User IDs and passwords on the selected cameras are overwritten.
2. Click OK.

Passwords

Passwords are case sensitive, can contain any ASCII character (except CR or LF), and must be at least as long as the Minimum Character Length defined in the Passwords group. They are displayed as asterisks in entry fields. The Minimum Character Length and Password Reuse values apply to all passwords.

- **Minimum Character Length:** Specifies the minimum number of characters all newly defined system passwords must contain. Existing passwords are not be affected.
- **Password Reuse**
 - Number of Passwords:** If Password Expires is enabled, this is the minimum number of new passwords that must be used before an old password can be used again. A zero indicates passwords can be reused immediately.
 - Minimum Days:** If Password Expires is enabled, this is the minimum number of days that must pass before a password that has already been used can be used again. A zero indicates passwords can be reused immediately.

You can also modify a password during logon.

To modify a password during logon

A user cannot change their password unless the "Can Change Password" check box is checked. (See "To add a User" on page 17.)

1. Click the Connect button, select a camera from the Device Selection list, then click OK.
2. When the User Logon dialog is displayed, click Change Password.
3. Enter the User ID and the Old Password for that User ID.
4. Enter the New Password and type the same password in the Confirm Password field.
5. Click Log On.

Client Directory

The Client directory contains all of the files used by the Impact software. It is stored in the default directory on the client computer during installation, but it may be stored in a folder of your choice.

To change the Client directory

1. Type in a directory path and name, or click Browse to locate the desired directory. If the directory is located on a network, be sure all clients have access to it.

Tool Activation

Some Vision Program Manager tools require a Software License Key to be activated before you can use them. The Tool Activation dialog displays the current status of activated tools, and lets you enter the Software License Key for new tools.

- **Software License Key:** Enter the number provided by Datalogic.
- **License States:** This area lists all the currently active tools and their license numbers.

About Panel

NOTE: All users have access to this tab regardless of their access level.

When you click the Connect button, Impact software automatically scans for Datalogic cameras on the network and displays their names, IP addresses, and other camera information in the camera selection list. When the client connects to the camera, it determines the camera's hardware configuration and current status and displays it on this panel. None of the information on this tab can be modified.

Storage

Storage is the camera memory used to store the camera's operating system software and firmware and user-defined vision programs.

Memory

Memory is the camera memory that stores dynamic vision program data. The amount of available memory shown is not updated while the camera is online.

Vision Device Information

This camera system information is for display only. Technical support personnel may ask you for this information if you call for assistance.

Camera Information

This camera information is for display only. Technical support personnel may ask you for this information if you call for assistance.

Camera



The Camera system object displays some of the camera's parameters.

Camera Properties Tab

Input Name	What it is
Digital Shift	Non-functional
Gain	Gain adjusts the actual signal intensity from the camera. NOTE: The gain setting for M-Series, MX-E Series, and MX-U Series cameras is the "raw" gain setting, not a percentage gain. The range of values will vary from camera to camera. In all cases the recommended value is the minimum gain, which corresponds to 0dB.
Red Gain	Adjusts the signal intensity of the camera's red pixels. (Color cameras only)
Blue Gain	Adjusts the signal intensity of the camera's blue pixels. (Color cameras only)
Offset	Offset adjusts the zero grey-level setting for the camera which causes the entire image to brighten or darken. Images become darker as the offset is increased.
Shutter Speed	Shutter Speed: the amount of time the shutter is open. The higher the number, the longer the shutter is open and the brighter the image.
Next Image Number	This number is appended to the image name which is displayed at the top of the image display window. The number is incremented by one for each subsequent image snapped.
Image Scan Left Edge	Sets the left edge where the camera's horizontal scan starts. The default value is determined by the camera type. (See *Note below this table)
Image Scan Right Edge	Sets the right edge where the camera's horizontal scan stops. The default value is determined by the camera type. (See *Note below this table)
Image Scan Top Edge	Sets the top edge where the camera's vertical scan starts. The default value is determined by the camera type. (See *Note below this table)
Image Scan Bottom Edge	Sets the bottom edge where the camera's vertical scan stops. The default value is determined by the camera type. (See *Note below this table)
Binning (M-Series, MX-E Series, and MX-U Series only)	The number of adjacent image pixels to combine to produce a brighter, but lower resolution, image. For example, a value of two combines two pixels in the x direction and two pixels in the y direction, resulting in a total of four sensor pixels for each image pixel. If this property value is changed, the camera must be calibrated again. If calibration is not used, then tool ROIs will need to be resized.

Input Name	What it is
Scan Lines to Overlap	The number of scan lines to copy from the bottom of the previous image and add to the top of the current image. As a result of the overlap, the resultant image is this number of lines taller than the Partial Scan setting used by the camera.
Line Trigger Pre-Divider	See “Frequency Converter” on page 30.
Line Trigger Multiplier	See “Frequency Converter” on page 30.
Line Trigger Divider	See “Frequency Converter” on page 30.
Units Per Pixel	Units per Pixel is the scale factor for converting measurements in the image to “real-world” units. See “Units per Pixel” on page 40 for details.
Camera Trigger Edge Type	This value sets the Camera Trigger type as follows: 0 = Rising Edge 1 = Falling Edge 2 = Both Edges (See “Frame Trigger Tab” on page 25) (Not available on M-Series, MX-E Series, and MX-U Series processors)
Strobe 1 Duration	Strobe 1 pulse length in microseconds
Internal Lighting Mode (P-Series only)	See “Illuminator Tab (P-Series Cameras Only)” on page 32
Enable Internal Lighting Chains (P-Series only)	See “Illuminator Tab (P-Series Cameras Only)” on page 32
Enable First LED Chain (P-Series only)	If True, the top/left LED chains are enabled.
Enable Second LED Chain (P-Series only)	If True, the bottom/right internal LED chain is enabled.
Enable Third LED Chain (P-Series only)	If True, the top/right internal LED chain is enabled.
Enable Fourth LED Chain (P-Series only)	If True, the bottom/left internal LED chain is enabled.

Input Name	What it is
Calibration Mode	This selection sets the type of calibration to use Circles Hexagon Target: Use a hexagonal target and enter the target pitch Circles Grid Target: Use a grid target and enter the target pitch Checkerboard Target: Use a checkerboard target and enter the target pitch Real World Coordinates: Use user-entered Image point and Real World point coordinates Manual: Use an entered value for Units per Pixel (see "Units per Pixel" on page 40) Two Points: Use a Target length and an ROI between two points, or two user-entered point coordinates
Calibration Image	The image used for the previous calibration
Target Pitch (Units)	This is the distance between dots or checkerboard squares on the calibration target. It is independent of the units (e.g. millimeters, inches, centimeters). Used with Circles Hexagon Target, Circles Grid Target, and Checkerboard Calibration Modes.
Image Points	The list of points generated when the Generate Points button is pressed. Used with Real World Coordinate Calibration Mode.
Real World Points	Enter X and Y point coordinates of "Real World" points that correspond to the Image Points. Used with Real World Coordinate Calibration Mode.
Datalogic TCP Image Input Mode	If True, the camera supports input from Datalogic AV6010 cameras.

Output Name	What it is
Acquisition Time	The amount of time taken to acquire the current image
Number of Buffered Images	The number of images currently in the camera's image buffers
Buffered Images Maximum	The number of buffers in use when a new image acquisition is started. For example, when the first image is acquired, the value is zero. If another image is acquired before the previous image is released, the value is incremented. This continues until the maximum number of image buffers available is reached. When this happens, it means that all the buffers are occupied at the beginning of an acquisition and a buffer overrun situation may exist. This value is reset to zero when the device is turned on. There are sixteen image buffers in the A30, T40, T47, and P-Series smart cameras. The T49 has eight image buffers. M-Series, MX-E Series, and MX-U Series processors have thirty-two image buffers.
Model	The camera's model
Illuminator Info (P-Series Only)	The model name of the illuminator attached to the camera

Output Name	What it is
Lens Distortion Calibration Enabled	If True, distortion calibration is enabled
Real World Origin	This is the X and Y coordinate location (in pixels), and the rotation angle (in degrees) of the image's upper left corner relative to the upper left corner of the image display.
Serial Number	Not Used in A30, P-Series, and T4x-Series; The camera's internal serial number in the M-Series, MX-E Series, and MX-U Series.
RMS Reprojection Error	Given an image point (in raw pixel space) and its corresponding real world location (in real world units), first the calibration is applied to the real world point to get its estimated position on the raw image plane. Then, the reprojection error is computed as the distance between such point and the corresponding image point. Summing all the squared value of such distances for every point match, then dividing by the number of matches and extracting the square root gives the Root Mean Square (RMS) of the Reprojection Error.
Max Reprojection Error	This is the maximum value of all the reprojection errors computed for every point match.
Calibration Error Code	Any error that occurred during the calibration. Any error that occurred during the calibration. See "Calibration Errors" on page 41.
Snapped Image	The most recent image snapped by the camera.
Snapped Color Image	The most recent color image snapped by the camera.

Camera Setup Tab

NOTE: Access to functions on this panel may be limited based on a user's access level and while the camera is online.

Datalogic's digital cameras contain no hardware switches so all operating parameters must be set from here. This section provides details about each of the Camera System Object Setup tab options. (Available options are dependent on camera type.)

Setup Panel

Snap

Click the Snap button to acquire and display an image in the image window. You can use this to see how camera settings affect the image, or to position objects within the camera's field of view. The acquired image is also displayed in the image display area of the Design and Display tabs.

Live

Click the Live button to continuously acquire images and display images in the image window until you click the Snap or Live buttons. You can use this to see how camera settings affect the image, or to position objects within the camera's field of view. The acquired image is also displayed in the image display area of the Design and Display tabs.

Image Source

The type of camera currently acquiring images.

Frames per Second

This field indicates the number of images the Datalogic camera can capture and process per second. It is calculated based on the current Shutter Open Time, Partial Scan line, and Half Resolution Mode settings.

(MX-U Series Only) The total processor-to-camera bandwidth is 600 Megapixels per second. Each connected camera shares this bandwidth. For example, if two cameras are connected, each camera can use up to a maximum of 300 Megapixels per second. For four cameras, each camera can use up to a maximum of 150 Megapixels per second. This means that both the camera resolution and the number of connected cameras can affect the fps value for each connected camera.

General Tab

Shutter

Shutter Open Time indicates the amount of time the shutter will be open. The longer the shutter is open (a higher number), the brighter the image. A shutter open time that is too low can cause the inspected image to be too dark. Higher shutter open times will decrease the number of frames per second acquired and may blur the image. You can enter the value in the field or use the slider. The range of acceptable values is determined by the camera type.

External Strobe - Pulse Length (microseconds)

The number of microseconds the strobe is on. The strobe pulse length must be coordinated with the shutter open time to provide optimum image capture and eliminate image blur. (The range of acceptable values is determined by the camera type. A zero value turns the strobe off.)

NOTE: Some third-party cameras do not have a Strobe Pulse Length setting. The strobe trigger pulse width coincides with the camera shutter speed open time setting so that it turns on when the exposure starts (shutter opens) and turns off when the exposure ends (shutter closes). Line scan cameras do not have a strobe output.

Advanced Button

Strobe Trigger

Select the type of trigger that the strobe you are using requires.

Rising - The output is normally off and a positive going signal is generated for the camera's strobe.

Falling - The output is normally on and a negative going signal is generated for the camera's strobe.

Gain

Gain adjusts the actual signal intensity from the camera. Doubling the gain value has the same effect as opening the camera lens aperture approximately one f-stop. The range of acceptable values is determined by the camera type.

NOTE: The gain setting for M-Series and MX-U Series cameras is the "raw" gain setting. The range of values will vary from camera to camera. In all cases the recommended value is the minimum gain, which corresponds to 0dB. For example, the minimum gain setting for the M200 camera is 320 which corresponds to a gain of 0 dB.

Offset

Offset adjusts the zero grey-level setting for the camera. Adjusting the offset causes the entire image to brighten or darken. Images become darker as the offset is increased.

Frame Trigger Tab

Trigger On

This setting determines how the camera responds to the hardware signal as an active input on the camera trigger input or how it is triggered automatically. Refer to the camera's hardware guide for appropriate trigger voltage levels. The camera must be Online to respond to a hardware trigger input signal or to automatic triggers.

NOTE: When it is triggered while in File Camera mode, the camera will always acquire the next File Camera image, not a live camera image.

- **Rising Edge** - An input signal is indicated by a trigger input voltage increase.
- **Falling Edge** - An input signal is indicated by a trigger input voltage decrease.
- **Both Edges** - An input signal is indicated by a trigger input voltage increase *and* decrease (two triggers per input cycle). (Not available on M-Series processors)

NOTE: While either Auto-trigger or Periodic Auto-trigger mode is active, the camera will ignore any hardware trigger signals. Select one of the above modes if you want to use hardware triggers.

NOTE: Auto-Trigger modes are disabled when VPM is connected to a line scan camera.

- **Periodic Auto-trigger**

This is a fixed-pace auto-trigger mode. The camera or Emulator is automatically triggered and ImageIn task execution begins after the image is acquired. After the Delay period expires, the camera or Emulator is triggered and the next image acquisition begins, even if the previous image's processing is incomplete. If the image acquire time plus the delay value is less than the ImageIn task execution time, triggering is too fast and the image buffers will be overrun. This is a software-generated trigger and does not require a hardware trigger connection.

Periodic Auto-Trigger mode is activated using the same methods as the Self-Paced Auto-Trigger mode.



Start/Stop
Auto-
Trigger

Delay (milliseconds)

(for Periodic Auto-trigger mode) This is the delay time between camera or Emulator triggers. This value should be larger than the longest ImageIn task execution time so there is time for all images to be processed.

- **Self-Paced Auto-trigger**

Self-paced means that the camera or Emulator is automatically triggered at the fastest rate possible without overrunning image buffers. The trigger interval is the sum of either the acquire time or the ImageIn task's execution time (whichever is greater), plus the Delay time. Each time the camera or Emulator starts processing an image, it triggers the next image, so that the acquisition and processing happen in parallel. This means that the acquire rate adapts to the processing rate so that the image buffers cannot be overrun.

How to activate Self-Paced Auto-Trigger mode

- Auto-trigger When Online check box is checked: automatic triggers will start when the camera or Emulator goes Online and stop when it goes Offline. The Start/Stop Auto-trigger button is disabled. No other Start/Stop control is available.

- b) Auto-trigger When Online check box is NOT checked: the camera or Emulator must be Online to enable the Start/Stop Auto-trigger button. Automatic triggers will start when the Start/Stop Auto-trigger button is clicked on and stop when it is clicked off.

How Self-Paced Auto-trigger mode works

After an image is acquired and the ImageIn task begins, the next image acquisition is started. When the task is complete, processing is delayed the number of milliseconds entered in the Delay field, then the task begins processing the next image and another image acquisition begins. This is a software-generated trigger and does not require a hardware trigger connection.

This mode is especially useful in applications that use a fast tool to sense part presence then branch to a full inspection when the part is present. The camera or Emulator triggers quickly when it is just running the fast tool. When the part is present, the camera or Emulator will not trigger again until the inspection task is done, so the inspection is self-pacing. Also, if the task execution time changes, the trigger rate does not need to be changed.

Delay (milliseconds)

(for Self-Paced Auto-trigger mode) This is the delay time between the end of processing one image in the ImageIn task and beginning to process the next image. The value can be between 1 and 100 milliseconds. Without the delay, the camera or Emulator may stay too busy to send data to VPM or CPM. If VPM or CPM is updating very slowly, especially with large images, it might help to increase this delay, although this will slow the trigger rate.

- **Auto-trigger When Online**

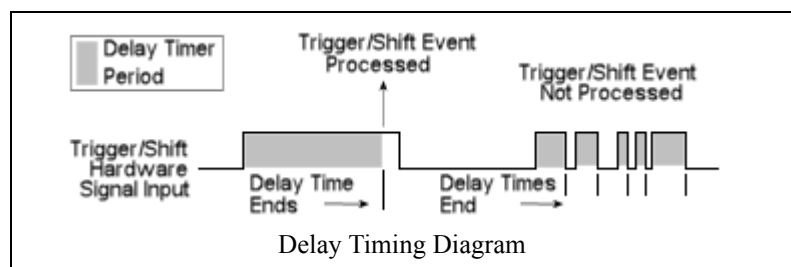
If this is checked, automatic triggers will start when the camera or Emulator goes Online and stop when it goes Offline. The Start/Stop Auto-trigger button is disabled. No other Start/Stop control is available.

Trigger Input Debounce

Here you can define the debounce time for the Datalogic camera trigger signal. Debounce determines the maximum trigger rate the system will allow (basically like a governor on an engine) to help prevent negative effects from noise and high frequency bursts. The debounce setting must be able to filter out noise while not introducing any unnecessary delays.

- **Delay**

The debounce timer starts when the signal's active edge is detected, and stops when the opposite edge is detected. The input must remain active for the delay amount of time for the event to be triggered. Delay is good for filtering random noise on the input, but delay makes the time between the input signal's edge and system triggering speed-dependent, especially on high-speed inspections. Use a Delay time that is long enough to filter out the worst expected noise, but short enough to accommodate your fastest inspection times.



- **Holdoff:** This setting is not supported in the M-Series, MX-E Series, and MX-U Series.

Partial Scan Tab

The values for the left, right, top, and bottom edges control the maximum vertical and horizontal line numbers scanned by the camera. Use this setting to decrease the image area scanned and increase the inspection speed. The range of acceptable values is determined by the camera type. For line scan cameras, the bottom edge value is also the height of the line scan image.

If you want to use partial scanning on an image, you should calibrate the entire image first and then set the partial scan parameters.

For partial scan images, the image coordinates of 0,0 correspond to the sensor pixel coordinates 0,0. This means that, when the image is partially scanned from the left or top, the upper left image pixel coordinate becomes the top left partial scan setting. The image above and to the left of the partial scan setting will not be displayed in the image window.

- **Scan Lines to Overlap:** This property indicates the number of scan lines to copy from the bottom of the previous image and add to the top of the current image. As a result of the overlap, the resultant image is this number of lines taller than the Partial Scan setting used by the camera.

For example, if a camera with 480 lines has an Overlap value of 100, the resultant image delivered to the vision program will be 580 lines, with the top 100 lines copied from the previous image and the remaining 480 lines from the camera sensor.

The feature is primarily intended for use with line scan cameras, however it works with any camera. It works best with line scan cameras because the bottom line of the previous image will be placed directly adjacent to the top line of the current image. One primary application is inspection of a moving part, such as a web, that requires multiple images. If an interesting object, such as a defect, falls in the area where one image ends and the next image begins, the object can not be fully seen in either image. By setting the overlap setting to the maximum height of the object of interest, the entire object at the top of the second image will be visible.

This is a property of the Camera Object, so it can be linked into your vision program and used when analyzing results. For example, smaller objects may get duplicated at the bottom of the previous image and the top of the current image, so you can recognize that the position of the object is in the overlap and avoid counting it twice.

The maximum value for this property is equal to the height of the camera image.

The overlap area is expressed in scan lines, not calibrated units.

The overlap feature only works for vertical overlap, not horizontal overlap.

The overlap feature is not currently compatible with lens distortion calibration. It is compatible with pixel size calibration.

Some third-party cameras do not allow partial scanning.

Color Tab

This tab is enabled only when a color camera is being used. Impact software uses a 3x3 bilinear interpolation to convert the incomplete color imager output to a usable color image.

White Balance

If you are using a color camera, you can apply automatic white balance correction which calculates the proper red and blue pixel gains needed to provide an accurate color image, or you can manually enter values for the red and blue pixel gains.

To automatically adjust the white balance:

1. Point the camera at a uniformly white or grey object or image. Be sure the image is well-lit and not too bright. Errors are returned if any of the color channels are saturated (the gain is greater than 100%).
2. Adjust the purple rectangular ROI so that it covers only a white or grey area of the image.

- Click “Auto.” The camera automatically calculates the proper red and blue gain values to bring all three colors into balance.

How White Balance Works

Datalogic’s color cameras have two stages of gain, the overall gain (set with the Gain slider on the General tab), and a gain for the red and blue pixels.

When you click the Auto button, the average value is calculated for the red, green, and blue pixels. The red gain is computed as the average green pixel value divided by the average red pixel value. The blue gain is computed as the average green pixel value divided by the average blue pixel value. Errors are returned if any of the color channels are saturated (the gain is greater than 100%) or if the computed red or blue gain is outside of the range supported by the camera.

After the red and blue gain values are calculated by clicking the Auto button, or entered manually, they are applied to the camera.

First, the overall gain is applied to all pixels, then the red gain is applied to the red pixels and, finally, the blue gain is applied to the blue pixels. This means that only the overall gain is applied to the green pixels. Red pixel gain is overall gain times the red gain and blue pixels gain is overall gain times the blue gain. In all cases 100% gain equals unity gain.

Line Scan Tab

This tab is enabled only when a line scan camera is being used. Refer to the M-Series Processor and Camera Guide for more details about connecting line scan cameras.

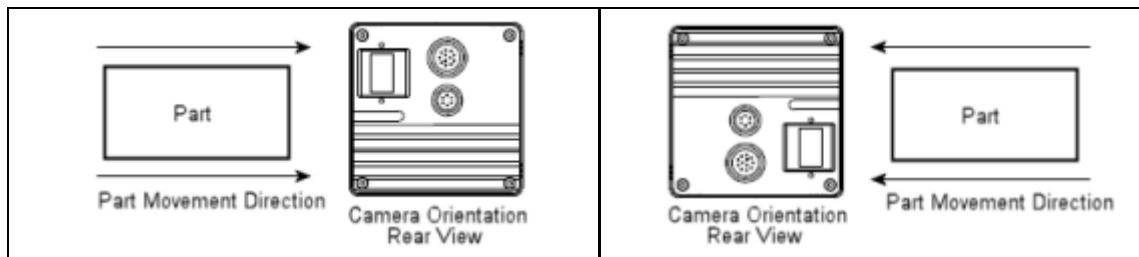
Datalogic M5xx cameras

Datalogic’s M5xx line scan cameras have a sensor with only one row of pixels and so they acquire one line at a time. The image is formed by moving the part in front of the camera, acquiring multiple lines and stacking them together to form the image. The Acquisition Mode determines when the camera needs to be triggered, e.g. for each line, for a frame, continuously, etc. Line triggers typically come from an encoder that ensures that the lines are evenly spaced.

Basler cameras

The sensor used in the Basler color line scan camera has three lines of pixels. The center-to-center distance between each line is 112µm. This spacing results in each line having a different field of view on any object that is passing the camera. When an acquisition is triggered, all three lines in the sensor are exposed simultaneously. This means that each line in the sensor acquires a different area on the object for a single acquisition. To ensure that there will be no color banding in the image, it is very important that:

- The line trigger rate, pre-divider, multiplier, and post-divider settings are set so the image is composed of square pixels (horizontal pixel size = vertical pixel size). See “Frequency Converter” on page 30.
- The camera is correctly oriented for the scan direction. The figure below shows the proper camera orientation relative to part movement direction.



Acquisition Mode

The line scan cameras can operate in several acquisition modes. The continuous modes allow the camera to acquire multiple images without requiring multiple frame triggers. This eliminates any concern about “missing lines” between images when long parts are scanned.

In all the acquisition modes, the number of scan lines needed to create an image is set in the bottom edge value of the Partial Scan tab (see “Partial Scan Tab” on page 26). Offline operation, using the Snap or Trigger Once buttons, does not require line triggers since the lines are self-triggered based on shutter time.

Single Frame, Edge Triggered

In this mode, the camera begins to capture a single image beginning with the edge of the frame trigger. To select the frame trigger edge type, see “Frame Trigger Tab” on page 25.

Continuous While Online

In this mode, the frame trigger signal is not used. Lines continue to be acquired as long as the camera is online. The signal to begin acquiring a line depends on the Line Trigger Type selected.

The camera will wait as long as necessary to get enough scan lines to fill each image. Since there is nothing to indicate the end of the scan, the last image can wait forever to fill. To flush a partial last image out of the camera and start a new one, the camera must be put Offline. If the camera is not put Offline, when a new image is started the first lines of the new image will contain the left over lines from the end of the previous image.

Continuous While Frame Trigger High

While the frame trigger is held high, the camera will accept line triggers and create images. When the current image is filled with scan lines, the camera sends it and the next image starts with the next line trigger. When the frame trigger goes low, image acquisition is complete and the camera will send the current image regardless of the number of lines acquired. The next image starts with the next line trigger after the frame trigger goes high.

Continuous While Frame Trigger Low

While the frame trigger is held low, the camera will accept line triggers and create images. When the current image is filled with scan lines, the camera sends it and the next image starts with the next line trigger. When the frame trigger goes high, image acquisition is complete and the camera will send the current image regardless of the number of lines acquired. The next image starts with the next line trigger after the frame trigger goes low.

IMPORTANT: The camera can malfunction if the frame trigger goes high or low immediately after the image height is reached and a full buffer has been sent, since this results in a partial image of zero lines. The malfunction may cause the camera to stop operating. If this happens, power the camera off, then on. To avoid this problem, set the image height to be greater than the maximum number of lines that could be acquired during any Frame Trigger time. The image height is set in the Partial Scan tab (see “Partial Scan Tab” on page 26.)

Line Trigger Type

The line trigger signals the camera to start acquiring a line. The acquisition time is determined by the Shutter Open time.

Single Phase

The trigger signal is connected to Input 2 and the line start is triggered on the rising edge of the signal only. There are no debounce settings for Input 2.

Quadrature Forward Only

Use this setting with a quadrature encoder. Phase A is connected to Input 2 and Phase B is connected to Input 3. The line start is triggered on the rising and falling edge of each input as long as Phase A leads Phase B (forward direction). There are no debounce settings for Input 2 and 3.

The camera does not start a line in the backward direction. It counts the trigger pulses until the encoder goes forward again, then it counts the forward pulses until all the backward pulses have been retraced, then it starts triggering. This setting allows the line start to ignore backward jitters.

Quadrature Forward and Back

Use this setting with a quadrature encoder. Phase A is connected to Input 2 and Phase B is connected to Input 3. Line starts are triggered on the rising and falling edge of each input in either direction.

Time-Based

When this setting is selected, an internal trigger signal is generated based on the Trigger Period (microseconds) value and an external trigger source is not required.

Note for Snap and Live Button: When you use the Snap or Live Button with a Line Scan Camera, set the Line Trigger Type to Time-Based and adjust the Trigger Period. Any other Line Trigger Type requires an external hardware line trigger. (See “Snap” on page 23.)

Trigger Period (microseconds)

This is the period between internally generated line trigger signals. This field is enabled only when Line Trigger Type is set to Time-Based. The Trigger Period must be greater than the Shutter Open Time.

Shutter Open Time (microseconds)

The Shutter Open Time must be less than the Trigger Period. See “Shutter” on page 24.

Line Trigger Input Termination

CAUTION: Maximum Input Voltage is +6 VDC when the termination resistor is in the circuit.

This setting only affects Inputs 2 and 3. Input 1 is not terminated. There are no debounce settings for Inputs 2 and 3. The ability to configure the termination resistor is necessary because Inputs 2 and 3 can accept TTL, RS-422, or RS-644 signal types. If this check box is checked, a termination resistor is present on camera Inputs 2 and 3.

The check box is cleared automatically when the Line Trigger type is set to Single Phase. It is checked automatically when the Line Trigger type is set to either of the Quadrature Line Trigger Types.

You should also check or clear the check box based on the following signal input configurations.

- **RS-422**
 - Camera is the end device on the bus: check box must be checked
 - Camera is not the end device on the bus: check box must be cleared
- **RS-644:** check box must be checked
- **TTL:** check box must be cleared

Frequency Converter

Because the maximum trigger input rate of the Line Scan camera is 20 MHz, which is faster than the camera's number of lines per second acquisition rate, an internal frequency converter can be configured that will scale the line trigger input rate up or down to create fractional scale factors. This way you can match the x

and y resolutions without modifying the encoder frequency. The Frequency Convertor setting can be used with any of the three Line Trigger types.

Refer to the M-Series Processor and Camera Guide (843-0138) for each Line Scan camera's maximum lines per second acquisition rate.

The **Line Trigger Multiplier** and **Line Trigger Dividers** are integer scale factors. They can be combined to create a fractional scale factor. For example, if the trigger input rate is 3000 and the desired lines per second is 2000, then the Multiplier value would be 2 and the Post-Divider would be 3.

$$3000 * (2/3) = 2000$$

Pre-Divider

This setting is used to scale the frequency down to less than 30 KHz, the maximum value for the Multiplier field. For example, if the trigger input rate is 30 KHz, the pre-divider value would be 10. Using the example above:

$$30000/10 * (2/3) = 2000$$

Here is an example using the M565 line scan camera to acquire an image of a cylindrical-shaped object. (For other line scan cameras, substitute the appropriate values.)

The M565 camera has a resolution of 2048 lines. The Field of View (FOV) is 41 mm and the object has a circumference of 73 mm. The encoder produces 2500 pulses per revolution.

The horizontal resolution is calculated by:

$$\text{FOV} / \text{camera resolution} = \text{horizontal resolution}$$

Example: $41 \text{ mm} / 2048 = 0.020 \text{ mm/pixel}$

The vertical resolution is

$$\text{circumference} / \text{encoder frequency} = \text{vertical resolution}$$

Example: $73 \text{ mm} / 2500 = 0.029 \text{ mm/pixel}$

Because the horizontal and vertical resolutions are different, the resultant image will appear stretched or compressed. To correct for this, set the Pre-Divider, Multiplier, and Divider to create a fractional scale factor. (First, multiply the horizontal and vertical resolutions by 1000 so the Multiplier and Post-Divider values are integers.)

Example:

Pre-Divider: 0

Multiplier: $0.029 * 1000 = 29$

Post-Divider: $0.020 * 1000 = 20$

You can now use these newly calculated values to adjust the number of lines to acquire (so that the horizontal and vertical resolutions are equal).

$$\text{Circumference (in pulses per revolution)} * \text{Multiplier} / \text{Post-Divider} = \text{Number of lines}$$

Example: $2500 * 29 / 20 = 3625$

(If this result is greater than 12,228, the resolution must be changed, since the camera's maximum number of lines is 12,228.)

Recalculating the vertical resolution using the new number of lines shows that the vertical and horizontal resolution are equal:

$$\text{circumference} / \text{encoder frequency (Example: } 73 / 3625 = 0.020 \text{ mm/pixel)}$$

Assign Tab (USB Cameras Only)

Select Camera

Be sure a USB 3.0 camera is plugged into any of the USB 3.0 ports labeled USB1 through USB4 on the MX-U Series processor. Do not connect a USB camera to the port labeled USB5 or any other USB 2.0 port.

If no camera is connected to, or assigned to, a Vision Device, the Vision Device acts as a Local Emulator. (See “MX-U Series” on page 52.)

To assign a USB camera to a Vision Device

1. Click the Connect button in the VPM tool bar.
2. Select one of the IMPACT Devices from the dialog that does not have a camera assigned to it, then click Connect to Vision Device.
3. Click the Settings tab.
4. Click the Camera icon.
5. On the Setup tab, click the Assign tab.
6. From the Select Camera drop down, select the camera you want to use. The list includes camera serial and model numbers.
7. The camera selection is disabled if a camera is already assigned or the camera is connected to a USB port that is operating in USB 2.0 mode.
To reset a camera that is in USB 2.0 mode, disconnect then reconnect the affected camera.
8. Click OK in the Camera Connected dialog.

To remove a USB camera assignment

1. Click the Connect button in the VPM tool bar.
2. Select one of the IMPACT Devices from the dialog that has a camera assigned to it, then click Connect to Vision Device.
3. Click the Settings tab.
4. Click the Camera icon.
5. On the Setup tab, click the Assign tab.
6. From the Select Camera drop down, select None.
7. Click OK in the Camera Disconnected dialog.

Illuminator Tab (P-Series Cameras Only)

Mode

The Mode sets the Internal Illuminator’s permitted Shutter Speed range.

Mode	Shutter Speed Range (microseconds)
Disabled	10, 1000000
Normal	100, 3300
Power	1, 500

Shutter

This is the amount of time the shutter is open. The higher the number, the longer the shutter is open and the brighter the image. The Mode type affects the Shutter range limits.

Model

This box contains the model name of the Internal Illuminator mounted on the camera, and the number of Lighting Chains that the Illuminator contains.

Lighting Chains

If the Illuminator contains multiple chains, this box configures the number of LEDs that will be enabled.

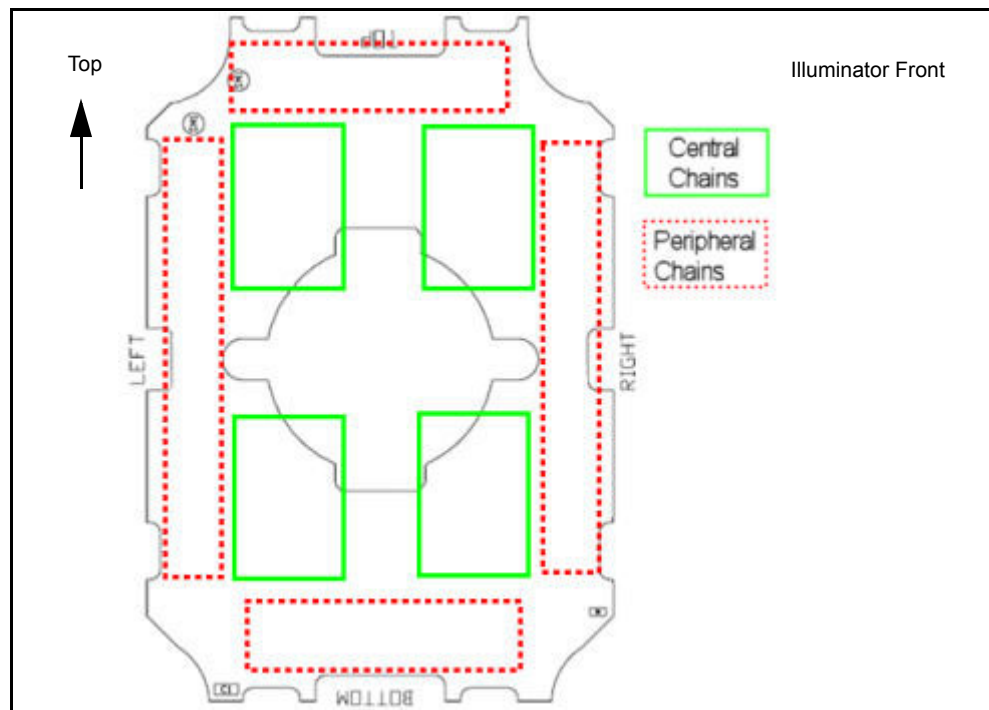
- **Chains Enabled**

Peripheral: The four LEDs around the edge of the Illuminator can be enabled (top, bottom, left, right).

Central: The four LEDs in the central part of the Illuminator can be enabled (top/left, top/right, bottom/left, bottom/right).

- **LEDs Enabled**

If a check box is checked, the LEDs in those areas of the illuminator will fire when the camera is triggered. The choices are based on the Chains Enabled setting.



Set to Defaults Button

Clicking this button restores all camera settings to their factory defaults. Default settings are determined by the camera type (and Illuminator type for the P-Series).

Save Image

Click this button to save the displayed image to a file. The image is saved in Portable Networks Graphics (PNG) format.

Calibration Panel

NOTE: Access to functions on this tab may be limited based on the user's access level and while the camera is online.

A camera will require calibration the very first time you use it, when the camera-to-subject distance is changed, when a new camera is connected, or if the lens is changed. Calibration insures that the measurements indicated in VPM tools accurately relate to the inspected object's measurements. You may calibrate a camera using a calibrated target or enter the camera's units-per-pixel factor manually.

If you want to use partial scanning on an image, you must calibrate the entire image first and then set the partial scan parameters.

NOTE: For details about how to set up calibration and how it works, see "How Calibration Works" on page 39.

Snap

Click the Snap button to acquire and display an image in the image window. You can use this to see how camera settings affect the image, or to position objects within the camera's field of view. The acquired image is also displayed in the image display area of the Design and Display tabs.

NOTE: Clicking the Trigger Once button in the Summary Table buttons toolbar will not acquire a new image for this image display.

Live

Click the Live button to continuously acquire images and display images in the image window until you click the Snap or Live buttons. You can use this to see how camera settings affect the image, or to position objects within the camera's field of view. The acquired image is also displayed in the image display area of the Design and Display tabs.

NOTE: Clicking the Trigger Continuously button in the Summary Table buttons toolbar will not acquire a new image for this image display.

Image Source

The type of camera currently acquiring images.

Frames per Second

This field indicates the number of images the camera can capture and process per second. It is calculated based on the current Shutter Open Time, Partial Scan line and Half Resolution Mode settings.

(MX-U Series Only) The total processor-to-camera bandwidth is 600 Megapixels per second. Each connected camera shares this bandwidth. For example, if two cameras are connected, each camera can use up to a maximum of 300 Megapixels per second. For four cameras, each camera can use up to a maximum of 150 Megapixels per second. This means that both the camera resolution and the number of connected cameras can affect the fps value for each connected camera.

Set To Defaults

Click this button to restore all camera settings to their factory defaults.

Calibrate

Click this button to calibrate the camera when the desired image is displayed in the image window and all calibration settings are complete. You can use the Snap button or Load Image button to acquire an image.

Load Image

Click this button to load a file image into the image display window. You can calibrate the camera using this image and the image is displayed in the task image window.

Pixel Size Only

Use the distance between two points on the image to calculate the image scale, or enter the scale value. This type of calibration does not correct lens or perspective distortion. (See “Units per Pixel” on page 40.)

Two Points

Calibration with two points provides an ROI you can position to indicate beginning and ending calibration points on the image, or you can manually enter the point coordinates.

Two Points Settings

- **Target Length (units):** The distance in real-world units between the points into the Target Length field (e.g. if the distance is 100 mm, enter 100 in the field).
- **Points Table:** This table contains the X and Y coordinates of the beginning and ending points of the line ROI drawn in the image.
- **Calibration Error:** See “Calibration Errors” on page 41.

To calibrate with Two Points using the ROI

1. Select the Pixel Size Only tab.
2. Select the Two Points radio button.
3. Snap the desired image so it appears in the image window. A line ROI is placed on the image. Move and size the line until it stretches between two points with a known distance between them.
4. Enter a value in the Target Length field.
5. Click the Calibrate button. The calibration results are displayed at the bottom of the Settings and the Current Calibration areas (see “Current Calibration” on page 40).

To calibrate with Two Points using entered coordinates

1. Select the Pixel Size Only tab.
2. Select the Two Points radio button.
3. Double-click on a field in the endpoint coordinates table and enter the X and Y endpoint coordinate for each of the two points.
4. Enter a value in the Target Length field.
5. Click the Calibrate button. The calibration results are displayed at the bottom of the Settings and the Current Calibration areas (see “Current Calibration” on page 40).

Manual

Use this option when you know the image scale.

Manual Points Settings

- **Units per Pixel:** See “Units per Pixel” on page 40.
- **Calibration Error:** See “Calibration Errors” on page 41.

To calibrate manually

1. Select the Pixel Size Only tab.
2. Select the Manual radio button.

3. Click in the Units per Pixel field and enter the value.
4. Click the Calibrate button. The calibration results are displayed at the bottom of the Settings and the Current Calibration areas (see “Current Calibration” on page 40).

Target

Use this option when you have a calibration target with a hexagonal, grid, or checkerboard pattern. Also see “Target Calibration” on page 40.

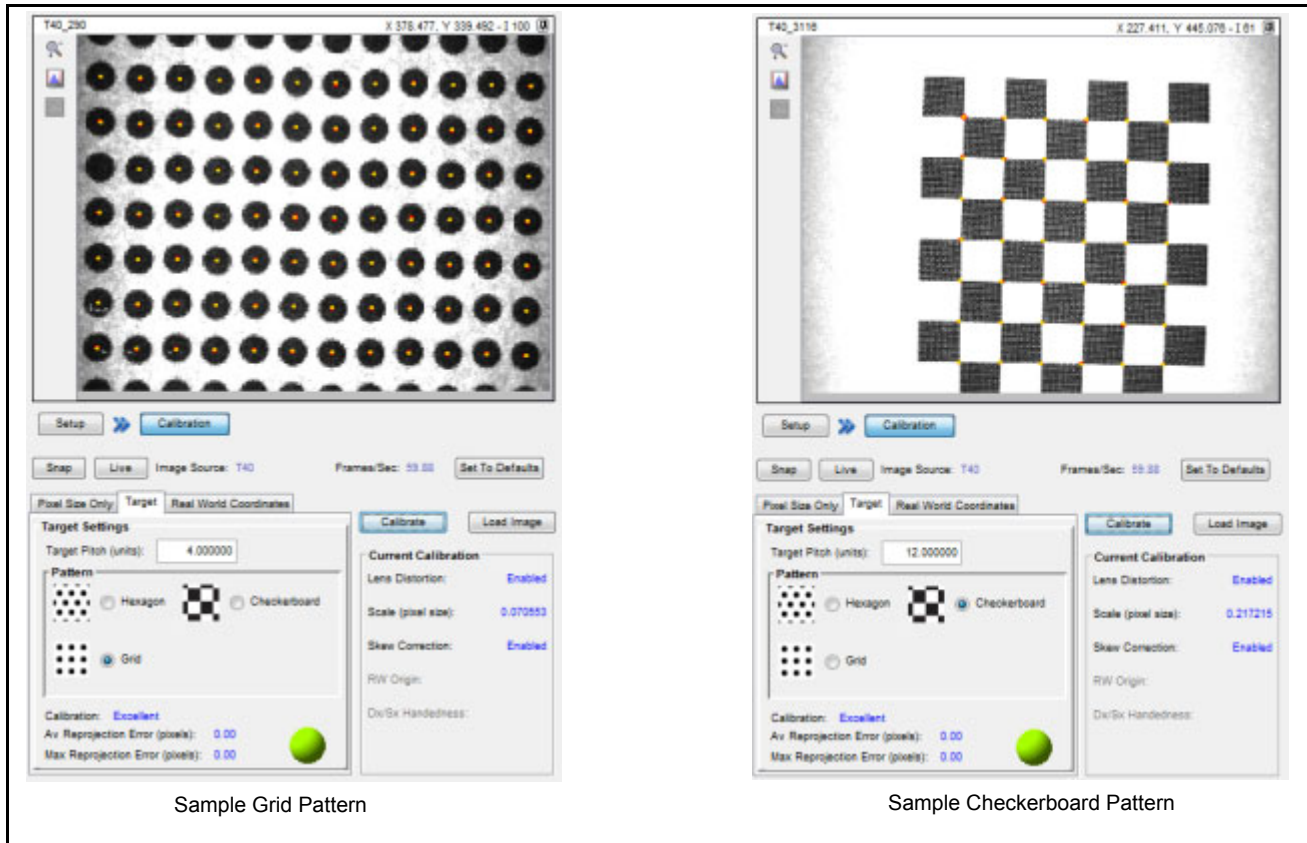
Target Settings

- **Target Pitch (units)**
This is the real-world distance between dots on the calibration target. It is independent of the units (e.g. millimeters, inches, centimeters).
- **Pattern**
You can use a target that is laid out in a hexagonal, grid, or checkerboard pattern. The small sample images show the different types. For Hexagon and Grid targets, the dots must be a minimum of twenty pixels in diameter spaced twenty pixels apart.
Checkerboard Pattern
The image should be high resolution with sharp edges, clear corners, and high contrast. Each square must be a minimum of ten pixels on each side. The squares must touch each other at one corner point, with no overlapping. The pattern must be at least four columns by four rows.
- **Calibration Error:** See “Calibration Errors” on page 41.

To Calibrate from a target

1. Select the Target tab.
2. Select the desired target radio button.
3. Place the calibration target in front of the camera.
4. Click the Live button. Move the target so that the center of the image corresponds to the center of the lens (optical axis) as much as possible.
5. **Hexagon or Grid Pattern**
Be sure that the target is well lit but not saturated. Place the target in the camera’s field of view (FOV). Focus the camera so that the target dots are clear and sharp.
Checkerboard Pattern
Be sure that the target is well lit. Place the target in the camera’s field of view (FOV). Focus the camera

so that the squares are clear and sharp with high contrast. Increase the exposure so that the white squares are saturated.



6. Click the Snap button.
7. Type the pitch measurement into the Target Pitch (units) field. The pitch is the distance between each calibration object. Calibration targets have a known pitch.
8. Click the Calibrate button. The calibration results are displayed at the bottom of the Target Settings area and in the Current Calibration area (see “Current Calibration” on page 40).

Real World Coordinates

Use this option when you have a calibration target with at least four points. You can generate points from the target, then enter corresponding real-world point coordinates to transform left-handed or right-handed coordinate systems.

Real World Point Management

- **Generate Points**
Click this button to generate point coordinates to fill the Image X and Image Y sections of the point table.
- **Point Table**
The Image X and Image Y coordinates are generated when the Generate Points button is clicked. The coordinates are derived from the centroid of blobs found on the image.
- **Append**
Click to append a pair of points to the point table.
- **Delete**

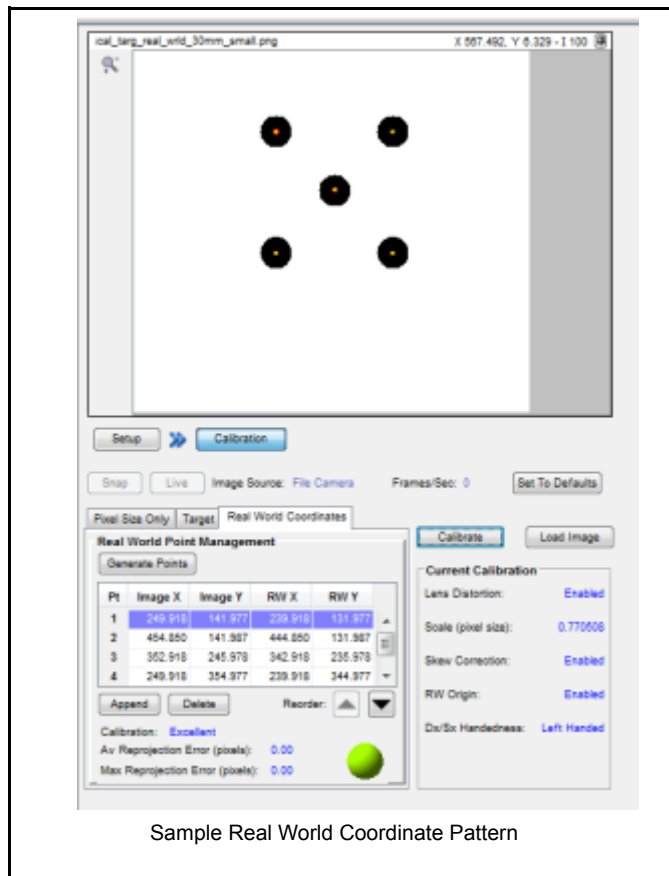
Click to delete a pair of points from the point table.

- **Reorder**

Select a row from the point table, then click the appropriate arrow to move the row up or down. This operation only reorders the Image X and Image Y coordinates.

To Calibrate using Real World Coordinates

1. Select the Real World Coordinates tab.
2. Place the calibration target in front of the camera. The target must contain at least four points.
3. Click the Live button. Move the target so that the center of the image corresponds to the center of the lens (optical axis) as much as possible.
4. Be sure that the target is well lit but not saturated. Place the target in the camera's field of view (FOV). Focus the camera so that the target dots are clear and sharp.



5. Click the Snap button.
6. Click the Generate Points button. The coordinates of centroid points of blobs found on the image are automatically entered in the Image X and Image Y columns of the table.
7. In the RW X and RW Y columns, enter the real-world coordinates of the corresponding Image X and Image Y coordinates.
8. Click the Calibrate button. The points indicated by the RW X and RW y coordinates are drawn on the image.
9. The calibration results are displayed at the bottom of the Real World Point Management area and in the Current Calibration area (see “Current Calibration” on page 40).

How Calibration Works

Color Cameras

A color camera has half the measurement accuracy (twice the error) of a greyscale camera with the same number of pixels. The resolution rules-of-thumb for greyscale and color cameras are as follows:

	Greyscale	Color
Smallest Detectable Defect	2x2 pixels	3x3 pixels
Gauging resolution	1/4 pixel	1/2 pixel

The Bayer filter mosaic halves the effective resolution of the color cameras because each pixel detects either red, green, or blue. The smallest detectable defect corresponds to the smallest size defect that always fills at least one pixel. This is a theoretical lower limit. In most applications the defect will need to be larger.

Note that some tools provide sub-pixel options, which can improve the resolution and measurement accuracy of the image.

Determining the calibration type

The type of calibration to use is determined by the camera and lens characteristics. The following table illustrates some characteristics that can be mitigated by calibrating.

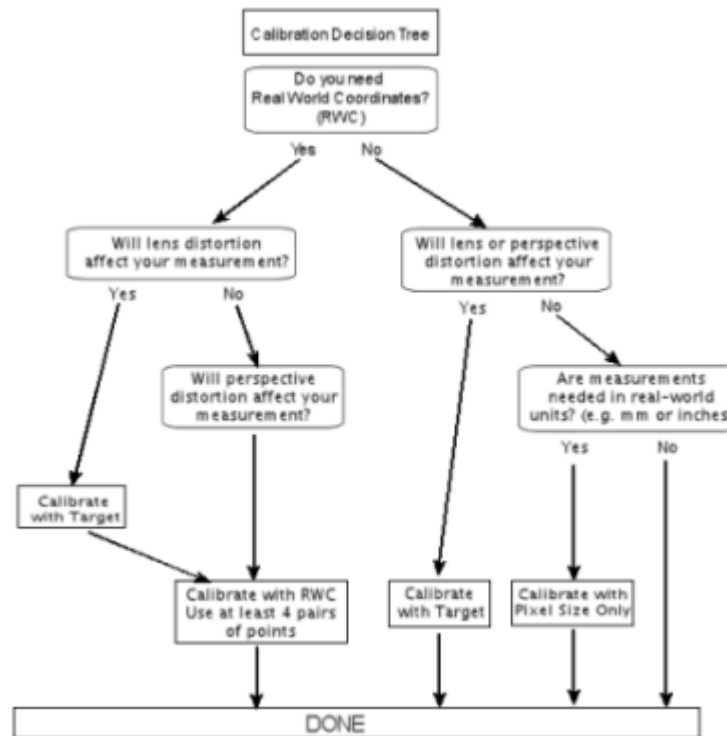
Calibration Type	Lens Distortion	Pixel Size	Perspective Distortion (Skew)	Left/Right Handedness	Real World Origin
Target	Yes	Yes	Yes	Default Value	Default Value
RWC* with 4 or more pairs of points	No (See Note 1)	Yes	Yes	Yes	Yes
Pixel Size Only	No (See Note 2)	Yes	No	No	No
Calibration Type	Lens Distortion	Pixel Size	Perspective Distortion (Skew)	Left/Right Handedness	Real World Origin

*RWC = Real World Coordinates

Note 1: Does not remove existing lens distortion correction

Note 2: Removes existing lens distortion correction

The following diagram can help you determine the optimal calibration steps.



Target Calibration

It is best practice to have the dot target cover all parts of the field of view (FOV) where any inspection measurements will be made. Larger dots provide a more accurate calibration because the dot centers can be more accurately located. The dots must be a minimum of twenty pixels in diameter spaced twenty pixels apart. The minimum blob size is nine pixels. The calibration algorithm works best when the target's dot pattern fills the camera's (FOV). Any areas outside of the dot target are extrapolated.

Lens distortion is a radial phenomenon (a function of the distance from the center of the lens), so the extrapolation will not be as accurate as the calibration.

It is not critical to center the calibration target in the FOV. It is important, however, that the center of the image you use corresponds to the center of the lens (optical axis). The calibration algorithm assumes that the center of the calibration image is the center of the lens. It accounts for partial scanning of the run-time image, and cropped and sampled images from the Image Sampling tool. It does not account for the case where the calibration image is offset from the optical axis due to partial scanning. If you want to use partial scanning on an image, you should calibrate the entire image first and then set the partial scan parameters.

Units per Pixel

Units per Pixel (also called Scale or pixel size) is the factor used to convert measurements in the image into "real-world" units. This calculates the Units per Pixel for an object that measures 100 millimeters, and is 640 pixels in the image:

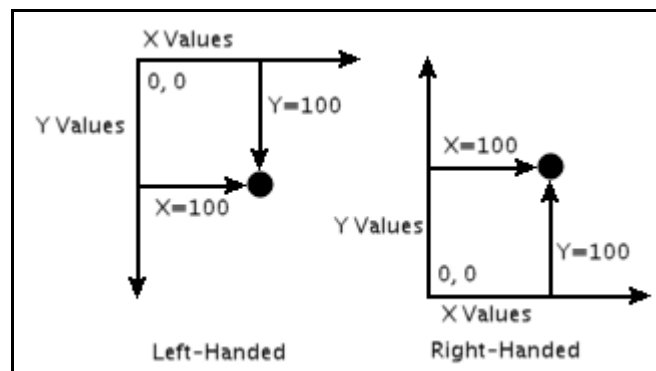
$$100 \text{ millimeters divided by } 640 \text{ pixels} = 0.15625 \text{ (or } 0.15625 \text{ mm per pixel)}.$$

This value is used to automatically calibrate measurements in VPM tools with the physical dimensions of the image.

Current Calibration

This section indicates the values after calibration is complete.

- **Lens Distortion:** When a camera is calibrated, the calibration process can account for the natural distortion present in the camera lens. When an image is saved, the distortion information can be stored with it.
- **Scale (pixel size):** This is the number of units represented by one pixel in the displayed image. When calculated by the calibration operation, this value can be reliably used only if there is very low lens distortion and low skew, otherwise it is only a reference.
- **Perspective Correction:** If enabled, correction for skew was applied to the calibration. Skew is perspective distortion due to an angle between the image plane and the working plane.
- **RW Origin:** If enabled, an origin in real world coordinates was calculated.
- **Dx/Sx Handedness:** Indicates whether the real world coordinates are left or right handed. "Left-Handed" means that the origin (0,0) is in the upper-left corner of the image so that the X coordinate value increases to the right and the Y coordinate value increases downward. "Right-Handed" means that the X coordinate value increases to the right and the Y coordinate value increases upward.



Calibration Errors

Calibration errors are displayed on their respective calibration tabs.

- For Target and RWC calibration methods: if there is no calibration error, the accuracy of the calibration is displayed, based on the Reprojection Error (Excellent, Good, Fair, Poor, Very Poor).
- Unexpected Error: An unknown error occurred.
- No image found: There was no image in the image window.
- Target Not Found: A valid target was not found in the image. Try increasing the image contrast. If you are using a checkerboard target, verify the number of rows and columns or adjust the gain or exposure. Also, make sure that the corners of the black squares touch each other and don't overlap.
- Too few points were entered or found: There were too few points in a target. Dot targets require at least seven points, checkerboard targets must have at least four rows and columns, and real-world targets need four points minimum.
- The Image Point List and Real-World Point List are different lengths.
- Intrinsic Estimation Failed: The basic input value checks have passed but the calibration routine from target has failed. This could be related to poor localization of the image points or numerical issues.
- The pitch or units per pixel are not greater than zero.
- Estimation of pixel pitch, image center, and distortion parameters failed.
- Real World Estimation Failed: This may happen when correcting for the skew of the working plane (in Calibrate From Target) or when computing the real-world units. This error is also shown when you enter three collinear point pairs.

Reprojection Errors

RMS or Av Reprojection Error

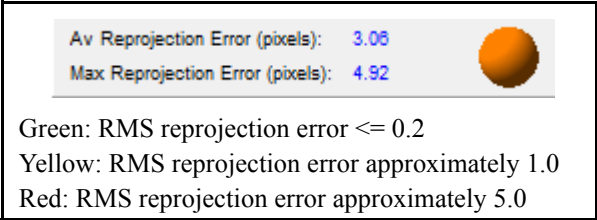
The reprojection error is the distance, in pixels, between an image point extracted from the image (drawn in red on the image), and the corresponding real world point projected onto the image plane (drawn in orange) according to the estimated calibration.

To calculate the Average Reprojection Error, square each reprojection error distance and find the sum of all these results, then divide this sum by the number of point pairs. Find the square root of this result. If a calibration has not been performed, the value is -1.

Max Reprojection Error

This is the maximum value of all the reprojection errors computed for every point match. If a calibration has not been performed, the value is -1.

Each calibration panel contains a visual display of the relative reprojection error.



File Camera



The File Camera system object accesses the camera’s system memory where file images are stored.

File Camera Properties Tab

Output Name	What it is
Number of Active Images	The number of images currently in the camera’s RAM

File Camera Setup Tab

NOTE: Access to functions on this tab may be limited based on a user’s access level and while the camera is online.

This tab lets you configure a camera to work with saved images. Previously captured images in PNG format can be selected in the File Camera tab, then the Active selected images are displayed in the image window when the camera is triggered. The following section describes each of the tab parameters in detail.

File Camera mode and the Emulator function the same, except that images are stored on the client PC when you use the Emulator. In File Camera mode, images are stored in the camera’s compact flash memory.

When File Camera mode is enabled, the camera will not acquire live images, but it will use the images in the RAM Images Active list as though they were acquired live. To enable File Camera mode, click the File Camera/Camera button. See “File Camera or Camera” on page 3.

Available File Images

The images listed in the Available list are stored in the Datalogic camera's compact flash and are available to be copied to the Active Images list. When you select an image in the list, it is displayed in the Image Window.

To add an image to the Available list:

1. Click Add.
2. In the Locate Image dialog, navigate to the directory that contains the image you want to use and select it. Images with a name greater than 44 characters cannot be added to the list.

Tip: If you select an image format other than .png, it is automatically converted to png format when it is added to the list.

3. Click Add. (Images are saved, by default, in the Root/Images folder in the default installation location.) The image is also automatically added to the Active list in RAM Images.

To remove an image from the Available list:

1. Select the desired image.
2. Click Remove.

Tip: To save images from the camera to the client, click the File Manager system object, open the Impact Root folder, open the Images folder, then copy the desired images to a client folder. To save a displayed image, click the Save Image button in the image display area in Settings-Camera.

Active Images

Images listed in the Active list are in the Datalogic camera's RAM and available for processing. These images are displayed in a repeating list in order from top to bottom when the camera is triggered or when the Snap or Live button is pressed anywhere in Settings-Camera system object. When you select an image in the list, it is displayed in the Image Window.

To add an image to the Active list

1. Select the desired image in the Compact Flash Images Available list.
2. Click the Activate arrow in the space between the lists.
3. To change the order of the image in the list, if necessary, click the Reorder arrows below the list.

To remove an image from the list

1. Select the desired image in the list.
2. Click the Deactivate arrow in the space between the lists.

System Log



The System Log system object is used to view and save the System Log. Events in the System log are time and date stamped and stored on the camera. If the camera loses power for an extended period of time, system log events are lost. This object has an additional General property named Log Entries that is a String List containing all the system log events.

System Log Properties Tab

Input Name	What it is
Log Entry	The most recent log event

System Log Setup Tab

NOTE: Access to functions on this tab may be limited based on a user's access level and while the camera is online.

Archive Log

On A30, P-Series, and T4x-Series cameras, the System Log is stored on the camera. If the camera loses power for an extended period of time, existing system log events are lost unless you archive them first. On M-Series, MX-E Series, and MX-U Series Processors, the system log is written to a disk file when the system is closed by using Windows shutdown or when the Vision Device exits. When the system is restarted, the system log is initialized from the saved file.

To Archive System Log Events:

Overwrite an Existing File

1. Click Archive Log to archive System Log Events to the default file displayed in the File field. An existing file with the same name can be overwritten.

Archive to a new file

1. Click Browse.
2. Navigate to the desired folder.
3. Enter a new file name. IMPORTANT: File names are case sensitive.
4. Click Open.
5. Click Archive Log.

Event

The events are sorted in ascending time order and contain information about the camera and tasks such as online and offline events, system restarts, camera and image acquisition errors, trigger overruns, tool failures, and other types of system events and failures.

Clear

Click Clear to clear all the events in the system log.

Refresh

Click Refresh to update the list of events.

File Manager



The File Manager tab lists and manipulates files that are in the Datalogic camera's flash memory. You can use this tab to copy files between the camera and other network devices, including client computers.

File Manager Properties Tab

Input Name	What it is
Display Tab Program Filter	Programs that contain this name appear on the Display tab's File Load dropdown list.
Output Name	What it is
Available Flash	The amount of flash memory on the camera (in bytes)

File Manager Setup Tab

NOTE: Access to functions on this tab may be limited based on a user's access level and while the camera is online.

Display Tab Program Filter

Programs that contain this name appear on the Display tab's File Load dropdown list.

Refresh

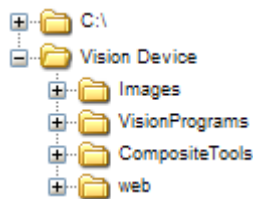
Click to refresh the list of files.

Select All

Click to select all the files listed.

Folder List

The left pane of the tab shows the folders on the client computer and the camera.



WARNING: The files in the camera or Emulator's Root folder are important system files. The camera or Emulator may fail to operate correctly if these files are modified or deleted.

- **Vision Device:** The camera or Emulator's operating system and firmware files. Do not put more than thirty two files in the root directory or the install may fail.
- **Images:** contains images stored on the camera or on the Emulator PC. To backup images, copy them from this folder to a folder on the client PC. To add images, copy them into this folder using the File Manager. Images with a name greater than 44 characters cannot be used by the file camera.
- **Composite Tools:** Composite Tools are created by combining existing tools into new configurations.
- **VisionPrograms:** Datalogic and user-created vision programs
- **Web folder:** User-defined files that can be accessed with a web browser.

To access the files in the Web folder with a browser

1. Open a web browser.
2. In the Address field, type `http://123.123.123.123/file/` where 123.123.123.123 is the IP address of the camera.
3. Press Enter. If there is a file in the folder named `index.htm` or `default.htm`, the browser will automatically display it. If not, the directory is displayed. To display a different file, enter the file name after the directory name.
For example: `http://123.123.123.123/file/index_help.htm`
IMPORTANT: File names are case sensitive.

File List

To select a file from the list, click on the file name in the list. To select multiple files, hold down the Ctrl key and click each file. If a file that is pasted into the Vision Programs folder is already loaded on the camera or Emulator, the new file is automatically loaded in place of it.

Cut or Delete a File

1. Select the desired file(s)
2. Use the Cut or Delete button on the main tool bar.

To Copy and Paste a File

1. Select the desired file(s)
2. Use the Copy and Paste buttons on the main tool bar or click the file and drag it to the desired folder.

The right pane of the tab shows the files in the folder that is selected in the left pane. Click on the respective header to sort the files by name, size, or date modified. The small arrow on the header indicates the sort order. Not all headers are displayed for all folders.

- **File Name:** Vision program files have a .vp extension. Each vision program file must have a unique name.
- **Vision Program Name:** This column is displayed only when the Vision Programs folder is selected. It shows the name of the vision program within the vision program file. Vision Programs are created with Vision Program Manager. Multiple vision programs can have the same name. Links are made from control panels to a vision program. IMPORTANT: Program names are case sensitive.
- **Size, Modified:** Shows the size in kilobytes and the date the file was modified.
- **Load/Unload:** This column is displayed only when the Vision Programs folder is selected. When this box is checked, the indicated vision program is immediately loaded in the Datalogic camera. When the box is unchecked, the file is unloaded. Loaded programs can be edited in Vision Program Manager and are queued to run if a trigger is received when the camera is online.
- **Load On Startup:** This column is displayed only when the Vision Programs folder is selected. When this box is checked, the indicated vision program is loaded into the camera when it restarts. Loaded programs can be edited in Vision Program Manager and are queued to run if a trigger is received when the camera is online.

File Name ▲	Vision Program Name	Size	Modified	Load/Unload	Load On Startup
Blobs.vp	Blobs	337 KB	02/20/2003 02:21 PM	☐	☐
Measurements.vp	Measurements	373 KB	02/20/2003 02:21 PM	☒	☒
Locates.vp	Locates	815 KB	02/20/2003 02:21 PM	☐	☐
Helper_Tools.vp	Helper_Tools	317 KB	02/20/2003 02:21 PM	☐	☐

Restoring vision program files

To restore vision program files from the client to the camera or Emulator:

1. Connect to the desired camera or Emulator.
2. Click Settings Tab - File Manager - Setup.
3. Open the folder on the client drive that contains the file to be restored.
4. Click the file to be restored to select it.
5. Click the Copy button.
6. Click the plus sign to the left of the Vision Device folder to open it.
7. Click the VisionPrograms folder.
8. Click the Paste button.
9. The file is pasted into the VisionPrograms folder.
10. If you want the file to be loaded on the camera or Emulator, check the Load/Unload check box.

Modbus Server



The Modbus Server interfaces with other Datalogic cameras that use Modbus TCP/IP protocol. There are brief details of the server's operation after the following table. (Datalogic does not support serial Modbus protocol.)

All Modbus registers are 16 bit integers. The Settings Modbus server registers (the number in brackets) are used as described here.

NOTE: This System Object is not available while the camera is online. Settings cannot edit the property values.

Modbus Server Properties Tab

Input Name	What it is
Online [0]	If this value is set to one, the camera goes online. If it is set to zero, the camera goes offline.
Trigger [1]	If this value is set to non-zero, the camera is triggered if it is Online. This value is also written to the Trigger Ack register as a trigger acknowledgment.
Gain [2]	The camera's current gain setting
Shutter Speed (x 10us) [3]	The camera's current shutter speed setting in microseconds (divided by ten)
Strobe 1 Duration (ms) [4]	Strobe 1 current duration setting in milliseconds
Strobe 2 Duration (ms) [5]	Strobe 2 current duration setting in milliseconds
Strobe 3 Duration (ms) [6]	Strobe 3 current duration setting in milliseconds
Reserved [7] - [32]	These registers are reserved for future use

Input Name	What it is
Trigger Ack [33]	If the Trigger register value is set to non-zero, the camera is triggered and that value is also written to this register as a trigger acknowledgment.
Reserved [34] - [63]	These registers are reserved for future use
Register [64] - [127]	The Modbus client can write to these registers.

How Modbus TCP/IP Works

The Modbus server runs continuously on the camera or Emulator, listening on the standard Modbus port 502. It does not initiate any communications, but waits for other Modbus devices on the network.

The server supports only Conformance Class 0 functions — Read Multiple Registers (Function Code - 3 (0x03)) and Write Multiple Registers (Function Code - 16 (0x10)). There is one register address space starting at address 0. All Modbus registers are 16 bit integers and the most-significant bit (at the lowest address) is sent first (known as Big Endian).

AB PCCC Server



The AB PCCC Server allows Allen-Bradley®, Rockwell Automation®, and compatible PLC devices to exchange data with Datalogic cameras using the Programmable Controller Communication Commands (PCCC) protocol encapsulated inside EtherNet/IP commands. The PCCC format is compatible with the Allen-Bradley standard PLC-5 which is supported by a wide variety of their PLCs including the SLC™-5, PLC-5®, and later products. There are brief details of the server's operation after the following table.

No values for the PCCC Server properties are saved in the Vision Program (*.vp) files. If you require initial values, they must be set using explicit Data Set operations in the program when it loads. The PCCC server properties (the number in brackets) are described here.

NOTE: This System Object is not available while the camera is online. Settings cannot edit the property values.

AB PCCC Server Properties Tab

Input Name	What it is
N7-Integer [0] through N7-Integer [63]	64 indexed integer values
F8-Float [0] through F8-Float [63]	64 indexed float values
A9-ASCII [0] through A9-ASCII [63]	64 indexed 1-byte characters
ST10-String [0] through ST10-String [31]	32 indexed string values

How the AB PCCC Server Works

The AB PCCC server runs continuously on the camera or Emulator. It does not initiate any communications, but waits for other PCCC devices on the network.

The server supports Typed Read and Typed Write commands. These are standard PCCC commands using command code 15 (0x0F) and functions 104 (0x68) and 103 (0x67) respectively. The PCCC command is placed inside an EtherNet/IP command that targets the EiP object 103 (0x67) and service 75 (0x4B) on the camera or Emulator.

There are four files of data that can be read or written. These are statically-allocated arrays of data analogous to Modbus registers.

File Type	File Name	PCCC Data Type	Depth	Port Names
Integer 16-bit	N7	INT	64	INT [*]
Float 4-byte	F8	REAL	64	REAL [*]
Character 1-byte	A9	SINT	64	SINT [*]
String n-chars	ST10	SINT	32	String SINT [*]

The Integer file is limited to sixteen bits which is the standard for PLC-5 devices and the protocol.

Reals conform to the IEEE 754 standard for representing a real number in four bytes.

The Character file has signed characters. These may be used for characters of other signed one-byte data as well as Boolean values.

The String file entries each contain a variable-length string. The data is passed as the SINT format. Only one string at a time may be read or written as it is already passing an array of data. The other three data types may pass one to n data elements at a time.

To access Impact data from a PLC, use Read/Write Message commands with PLC5 as the target device. There are variations in PCCC command implementations across PLC5 product generations. The files must be accessed using the right combination of File Type, File Name, and File Name index as shown in the two tables above. Refer to your PLC documentation for command details.

OPC Data Access



The OPC Data Access system object interfaces with the Datalogic OPC Server. The Server provides OPC capable clients on the network with access to the camera through the OPC Data Access system object. The Server can read and write data to the OPC Data Access properties which are described here.

For more details about the OPC Server, refer to the OPC Server Reference (Publication 843-0136.)

NOTE: OPC Server and OPC Data Access cannot be used on the Datalogic model A30, T4x-Series, or P-Series Smart Cameras. This System Object is not available while the camera is online. Settings cannot edit the property values.

OPC Data Access Properties Tab

Input Name	What it is
Online	When true, places the camera online.
Trigger	When true, a camera trigger event is created in the camera

Input Name	What it is
Gain	The camera gain value
Shutter Speed (x 10 microseconds)	The camera shutter speed
Strobe 1 Duration (ms)	The duration for strobe 1
Strobe 2 Duration (ms)	The duration for strobe 2
Strobe 3 Duration (ms)	The duration for strobe 3

How Impact Software Connecting Works

A30, P-Series, and T4x-Series

Connecting to a camera

The A30, P-Series, and T4x-Series camera physically connects to the client PC with an Ethernet cable between the client PC's Local Area Network (LAN) port and the camera. When you click the connect button in Settings, this LAN connection is used to communicate with the camera. Each camera has a unique IP Address. See "IP Address Configuration" on page 53 for more details.

When you connect to a camera, you can work with either live images or previously captured images (File Camera). When the camera is set to File camera mode, images and Vision Programs are stored on the camera.

Multiple users can connect to a camera, but only one user at a time can edit programs or change data on the camera.

Connecting to an Emulator

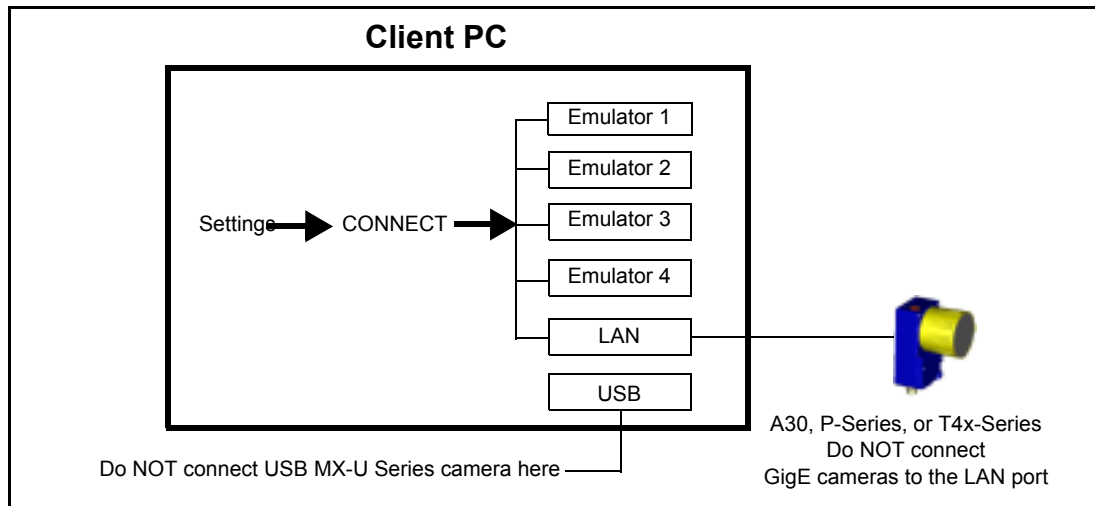
NOTE: When you are using multiple Emulators with ActiveX applications, you can only use the port numbers from 9933 to 10032 in ActiveX.

The Emulator uses the PC to emulate a camera.

When you connect to a Local Emulator, if it is not already running it is started automatically on the client PC. Settings then uses an internal software connection to communicate with it. Up to four Emulators can be running and connected at a time. The IP Addresses 127.0.0.1 through 127.0.0.3 are associated with the Local Emulators.

You must already have suitable images saved in order to use the Emulator since it is intended for creating vision programs without a camera. Emulator images and Vision Programs are stored on the client PC.

Multiple users can connect to one Emulator, but only one user at a time can change data on the Emulator.



M-Series and MX-E Series

Connecting to a camera

The M-Series and E-Series cameras physically connect to the processor with an Ethernet cable between the processor's CAM port and the camera. An "interface" software program (called Vision Device) runs on the processor. Each vision device is automatically assigned to a CAM port to provide communication with and control of a camera. If no camera is physically connected to the CAM port, the vision device acts as a Local Emulator.

Click the connect button in Settings to connect to the selected vision device. The number of vision devices (and the processor's camera capacity) is determined by the processor type and number of licenses. Each vision device has a unique IP Address. See "IP Address Configuration" on page 53 for more details.

When you connect to a camera, you can work with either live images or previously captured images (File Camera). When the camera is set to File camera mode, Vision Programs are stored on the processor.

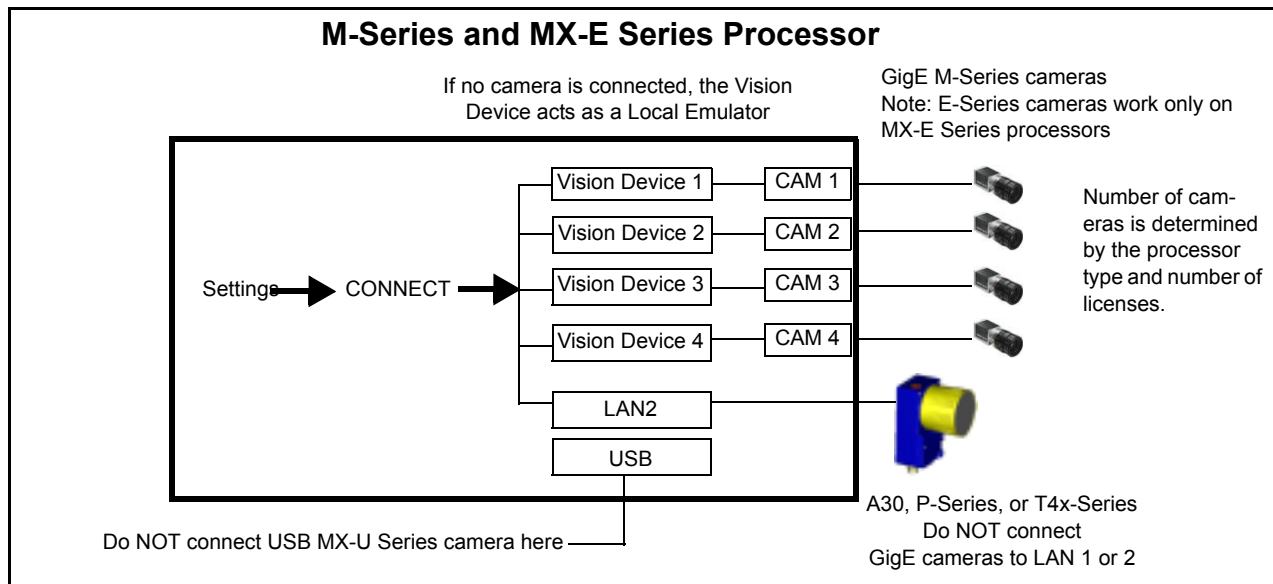
Multiple users can connect to a camera, but only one user at a time can edit programs or change data on the camera.

Connecting to an Emulator

When you connect to a vision device that has no camera connected to its CAM port, the vision device acts as a Local Emulator.

You must already have suitable images saved in order to use the Emulator since it is intended for creating vision programs without a camera. Images and Vision Programs are stored on the processor.

Multiple users can connect to one Emulator, but only one user at a time can edit programs or change data on the Emulator.



MX-U Series

Connecting to a camera

The MX-U Series camera physically connects to the MX-U Series processor using a USB cable between the processor's USB 3.0 port and the camera. An "interface" software program (called Vision Device) runs on the processor and provides communication with and control of a camera. A vision device is not initially associated with a USB port. If no camera is physically connected to the USB port, or assigned to the port, the vision device acts as a Local Emulator. See "Assign Tab (USB Cameras Only)" on page 29.

Click the connect button in Settings to connect to the selected vision device. The number of vision devices (and the processor's camera capacity) is determined by the processor type and number of licenses. Each vision device has a unique IP Address. See "IP Address Configuration" on page 53 for more details.

When you assign a camera, you can work with either live images or previously captured images (File Camera). When the camera is set to File camera mode, images and Vision Programs are stored on the processor.

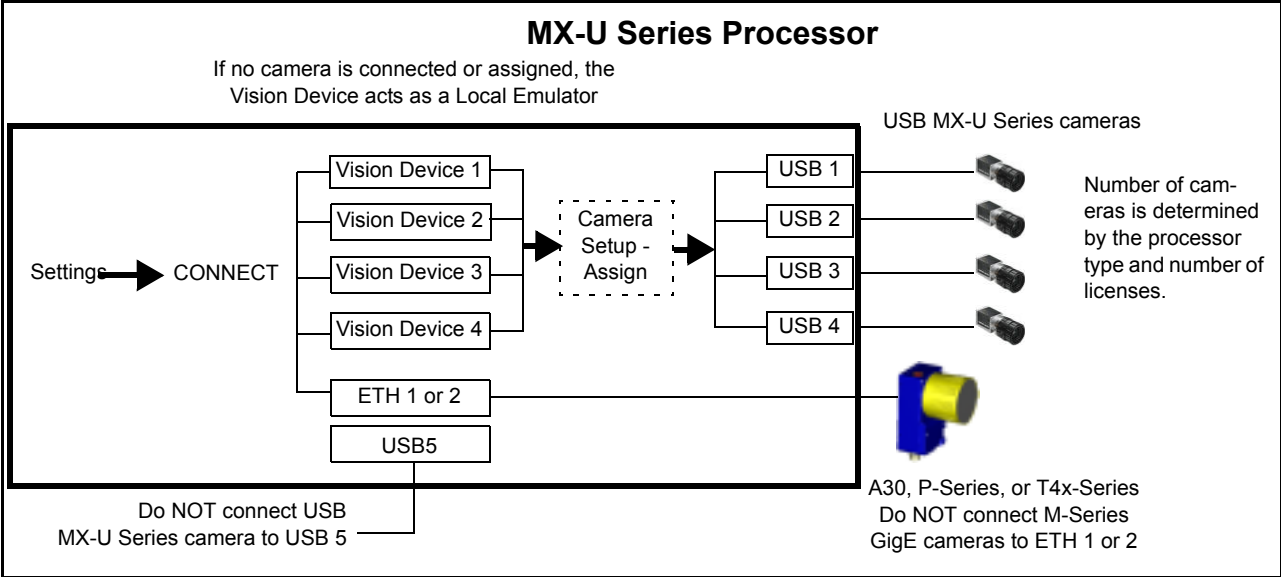
Multiple users can connect to a camera, but only one user at a time can edit programs or change data on the camera.

Connecting to an Emulator

When you connect to a vision device that has no camera connected to, or assigned to, its CAM port, the vision device acts as a Local Emulator.

You must already have suitable images saved in order to use the Emulator since it is intended for creating vision programs without a camera. Images and Vision Programs are stored on the processor.

Multiple users can connect to one Emulator, but only one user at a time can edit programs or change data on the Emulator.



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