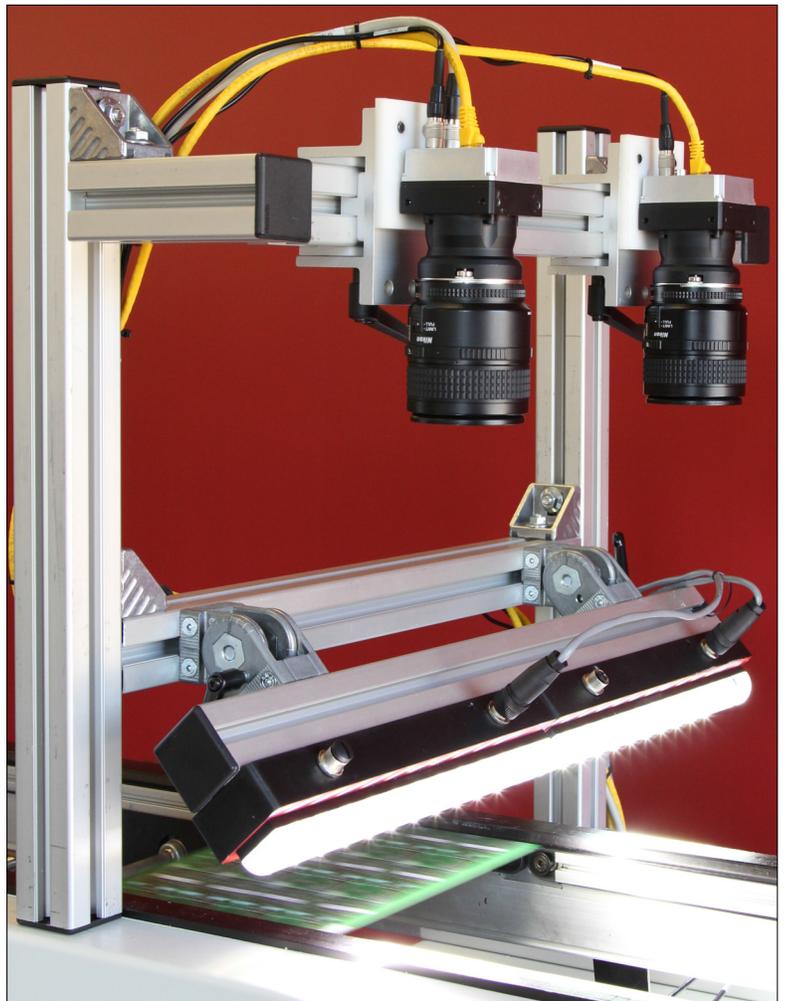


OMRON

MICROSCAN

PanelScan Integration Guide



Using the PanelScan Multi-Array PCB Traceability System

Overview

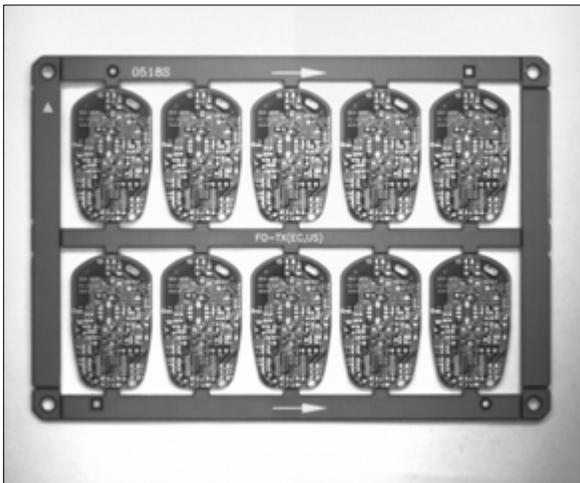
This document describes the configuration and use of PanelScan, a turnkey solution for large area imaging in electronics manufacturing and assembly applications. PanelScan is available as both a Standard one-camera solution and as a Wide two-camera solution. The PanelScan solution simplifies the error-prone and time-consuming process of capturing and associating traceability data or inspection data for multi-array printed circuit boards and component trays at the front-end assembly.

PanelScan is designed to perform array-based decoding within very large line scan images. PanelScan uses one or two Basler Racer 6K wide line scan cameras, which image a single row of pixels on a PC board as it moves under the camera on a conveyor. A special line scan line light is used to illuminate that line of the board with very bright light. As the board moves, the system builds a 6,144 x 13,824 pixel image (a 12,288 x 13,824 pixel image for Wide configuration).

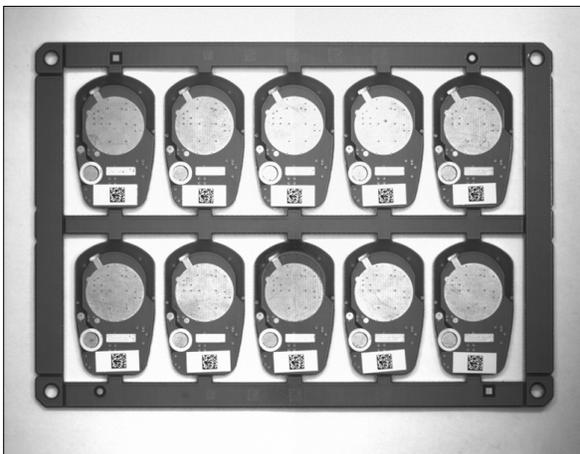
There are two applications involved. The first is the image acquisition application, called Basler Acquire. This software is installed automatically during PanelScan installation. Basler Acquire uses the Basler SDK to take images and place them in a **Memory Mapped File** or MMF. One instance of Basler Acquire runs per camera.

The second application is the PanelScan UI, which is based on Omron Microscan's AutoVISION Software. When triggered, it reads the images from the Memory Mapped File and processes them. The output from the system is a string of all decodes placed in a .csv or .xml log file.

Below are images of the front and back of a typical panelized printed circuit board. This panel has 2 rows and 5 columns of boards.



Front of a Typical Panelized Printed Circuit Board



Back of a Typical Panelized Printed Circuit Board

Specifications

PanelScan is available in two configurations: **Standard** and **Wide**.

- **PanelScan Standard** – PanelScan Standard uses a single 6,144-pixel-wide line scan camera. When the camera is placed at the specified distance from the part as shown in the drawing below, it has a field of view of **250 mm (10")** wide and can read symbols up to this panel width.
- **PanelScan Wide** – PanelScan Wide uses two 6,144-pixel-wide line scan cameras side-by-side with a 1 inch overlap to cover up to **450 mm (18")** of panel width.

Both PanelScan Standard and PanelScan Wide cover a panel length of up to 520 mm within a field of view of 570 mm (22.5").

- **X Resolution** – At the specified distance, the camera has a resolution of **0.00163"** per pixel, or **1.63 mils**.
- **Y Resolution** – PanelScan does not use an encoder to trigger each row of pixels in the image. Images are captured in a time-based mode where each line is acquired within a certain "exposure" time. The speed of the conveyor must be matched to the X Resolution of the system to make them both even. When the speed is matched to the X Resolution, a circle will show with an even width and height.

Note that the lack of an encoder makes the system more economical and easy to set up, but it also means that the panels must be moving at a **constant speed** under the PanelScan camera and they must not stop until the full board is read.

- **1D Symbol Reading Capability** – With this resolution, the system is capable of reading high quality 1D symbols down to 3.3 mils with 2 pixels across a thin bar.

Note that the system is able to read at this resolution for two reasons: the first is that it uses a high quality lens with a very good MTF ratio, and the second is that it uses a Rect Warp to magnify symbols by 200% before decoding, which helps the algorithm to decode. Symbols must be of very high quality to be read at these small sizes. Performance on DPM marks will be slightly lower.

- **Data Matrix Reading Capability** – With this resolution, the system is capable of reading high quality Data Matrix symbols down to 5 mils with 3 pixels per cell.

Note that the system is able to read at this resolution for two reasons: the first is that it uses a high quality lens with a very good MTF ratio, and the second is that it uses a Rect Warp to magnify symbols by 200% before decoding, which helps the algorithm to decode. Symbols must be of very high quality to be read at these small sizes. Performance on DPM marks will be slightly lower.

Required Hardware

The PanelScan kit consists of either one or two 6K Basler Racer cameras connected to an Intel NIC card on a PC. PanelScan also includes either one or two red or white line scan lights based on Omron Microscan's NERLITE MAX 300. PanelScan requires a custom trigger provided as part of the kit, and also requires a 24V power source split out to the cameras, lights, and trigger. Several variations of the full PanelScan kit are shown in the tables below. The PC and mounting must be provided by the user.

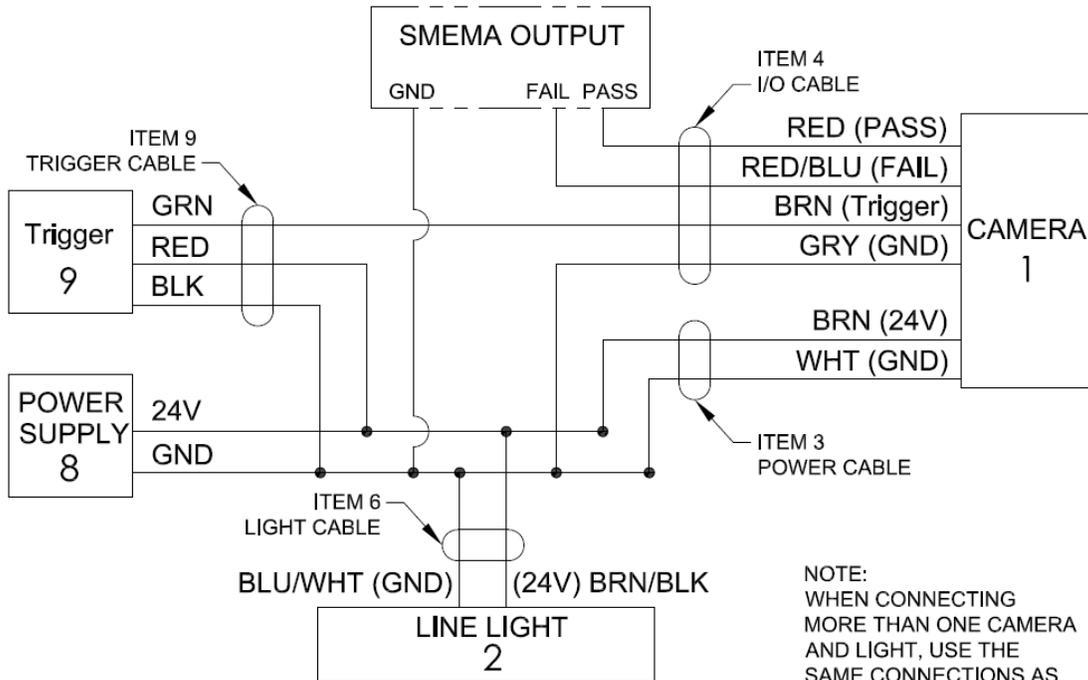
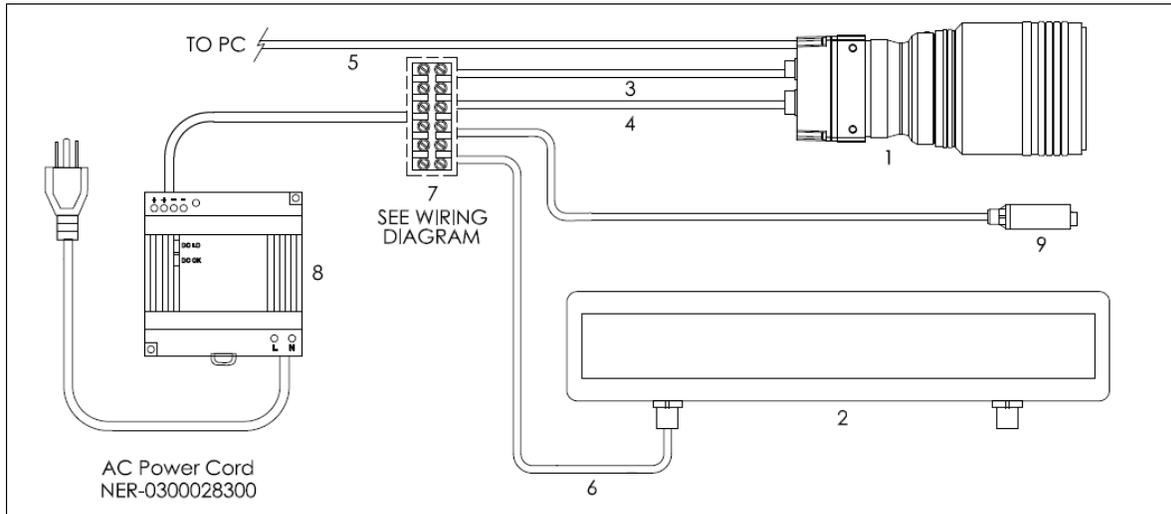
	Part Number	Qty. - Standard	Qty. - Wide	Description
		SLN-0001010	SLN-0001011	PanelScan Multi-Array PCB Traceability System
1	98-9000006-01	1	2	Camera, GigE, CMOS, Line Scan, 6K
	98-9000040-01	1	2	Lens, 50 mm, F2.2 F-Mount, Schneider, Xenon Emer, PS
	98-9000012-01	1	2	Lens Adapter, Line Scan Camera, F-Mount
2	NER-011661710G	1	2	Assembly, LL-300, White
3	98-9000018-01	1	2	Cable, Line Scan Camera, Power
4	98-9000017-01	1	2	Cable, Line Scan Camera, I/O, 3M
5	98-000134-02	1	2	CAT 6 Ethernet Cable, Jack Screw to RJ45, High Flex, 7M
6	61-000186-01	1	2	Cable, 5-Pin M12 Socket, Flying Lead, 3M, Shielded
7	98-9000016-01	1	1	Connector, Terminal Block, 2 Row, 6 Pole
8	97-000006-01	1	2	Power Supply, DSP100, 24VDC 4.2A, DIN Mount
9	99-9000007-01	1	1	Trigger, Assembly, 5VDC Converted, Flying Lead, 1M
10	NER-030028300	1	2	AC Power Cord, U.S., 1.8M (6.0 ft.), Flying Leads
11	98-9000019-01	1	1	Adapter, DIN Rail
12	37-9000016-01	1	1	Media, Product, USB Drive, PanelScan
13	GMV-VGL8-1DD1	1	1	GigE License, 32-Bit/64-Bit with IntelliFind, Supports up to 8 Cameras

	Part Number	Qty. - Standard	Qty. - Wide	Description
		SLN-0001110	SLN-0001111	PanelScan Multi-Array PCB Traceability System
1	98-9000006-01	1	2	Camera, GigE, CMOS, Line Scan, 6K
	98-9000040-01	1	2	Lens, 50 mm, F2.2 F-Mount, Schneider, Xenon Emer, PS
	98-9000012-01	1	2	Lens Adapter, Line Scan Camera, F-Mount
2	NER-011661700G	1	2	Assembly, LL-300, Red
3	98-9000018-01	1	2	Cable, Line Scan Camera, Power
4	98-9000017-01	1	2	Cable, Line Scan Camera, I/O, 3M
5	98-000134-02	1	2	CAT 6 Ethernet Cable, Jack Screw to RJ45, High Flex, 7M
6	61-000186-01	1	2	Cable, 5-Pin M12 Socket, Flying Lead, 3M, Shielded
7	98-9000016-01	1	1	Connector, Terminal Block, 2 Row, 6 Pole
8	97-000006-01	1	2	Power Supply, DSP100, 24VDC 4.2A, DIN Mount
9	99-9000007-01	1	1	Trigger, Assembly, 5VDC Converted, Flying Lead, 1M
10	NER-030028300	1	2	AC Power Cord, U.S., 1.8M (6.0 ft.), Flying Leads
11	98-9000019-01	1	1	Adapter, DIN Rail
12	37-9000016-01	1	1	Media, Product, USB Drive, PanelScan
13	GMV-VGL8-1DD1	1	1	GigE License, 32-Bit/64-Bit with IntelliFind, Supports up to 8 Cameras

Hardware Configuration and Wiring

Trigger and power wiring must be completed as shown below. A single 24 VDC power source can be used to power all elements of the system. A terminal block is provided with the system to aid in the wiring of all components. The diagram below shows wiring for the Standard system. For the Wide system, cables **3**, **4**, **5**, and **6** are duplicated and should be wired in parallel to power **(8)**, to the trigger **(9)**, and to the PC NIC card.

Note: Hardware configuration and wiring are the same for all Standard and Wide configurations.



NOTE:
WHEN CONNECTING MORE THAN ONE CAMERA AND LIGHT, USE THE SAME CONNECTIONS AS SHOWN.

WIRING DIAGRAM

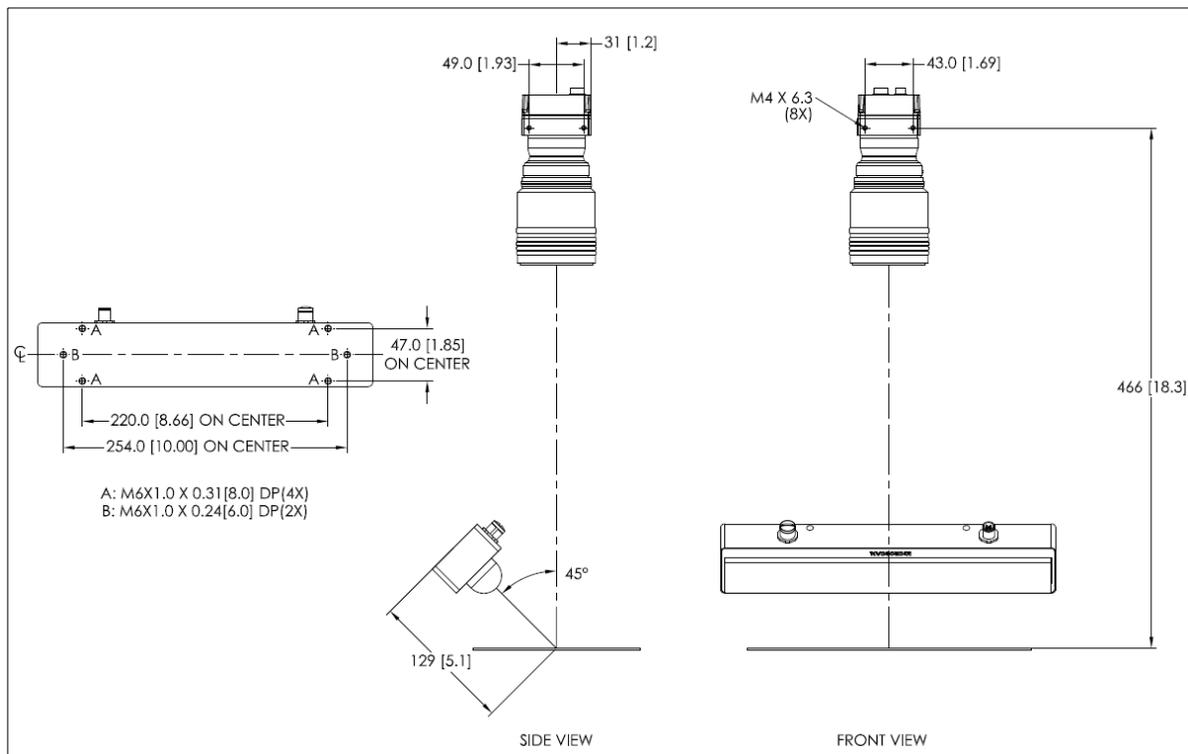
Camera and Light Mounting

The camera and light must be mounted as shown below for PanelScan Standard. The Wide system uses two lights side-by-side with the cameras separated by **200 mm (8")**.

Refer to the drawings provided to make a mount for the cameras and for the lights. The drawings show the recommended standoffs from the board and the angle for both the light and the camera. The camera is pointed straight down. The light is mounted at **45 degrees angling in** so that the light line intersects the line scan camera's viewing line at the board surface.

This type of mounting can generally be made from various kinds of structural tubing. Be sure to allow for side-to-side movement of the camera across the board so that it can be centered. Be sure to allow for angle adjustment of the light so that the center line of the light can be aligned to the center viewing line of the camera.

- Assemble the camera by attaching the lens F-Mount adapter using the screws provided.
- Screw on the lens provided.
- Mount the camera on the slide as described above.
- Mount the lights on the light mount as described above.
- Omron Microscan recommends that you include a lens clamp to prevent vibration and to lock down the lower focus ring.
- Omron Microscan also recommends a clear lens cover for any cameras mounted below the conveyor to keep dust off the lens.

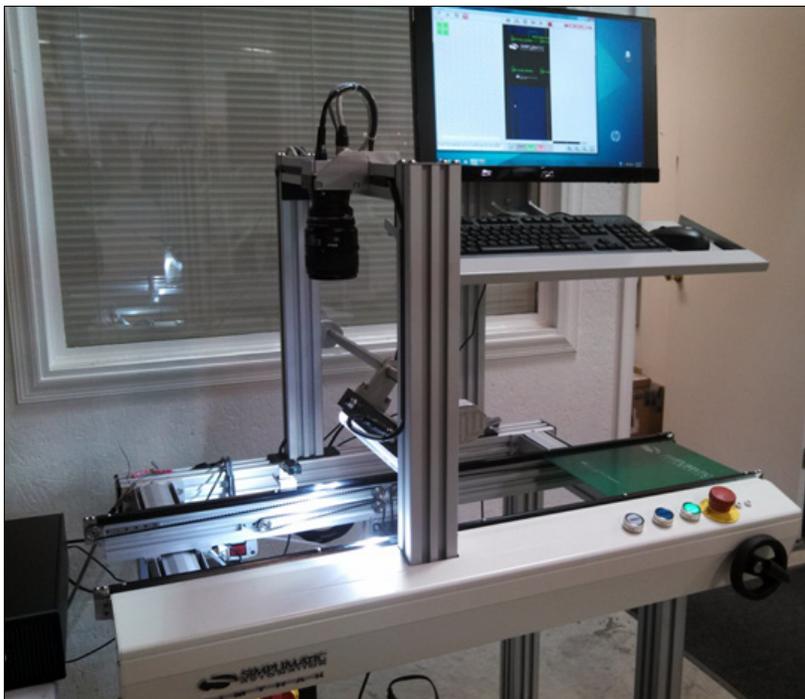


PanelScan Standard Configuration

Important: It is critical that the lights and cameras be mounted so that the axes of the lights and cameras are parallel to one another and perpendicular to the conveyor's axis of motion.

Two views of typical “over the belt” mounting setups constructed with aluminum extrusions are show below.

The cameras should be mounted on slides so they can be adjusted across the belt, and the lights should be mounted on adjustable angle mounts so the light line can be aimed exactly at the row of pixels that the camera views.



PanelScan Standard Configuration (One Camera)



PanelScan Wide Configuration (Two Cameras)

Trigger Mounting

A reflectance trigger is provided that will trigger one or two cameras when the board passes under them. The trigger must be mounted so that it sees the leading edge of the board just before it passes under the camera. The trigger should be mounted approximately **50 mm** up from the board looking down, and **25 mm** in front of the leading edge. The trigger should not block the light from illuminating the board.

Place the trigger near the edge of the board to ensure that no holes in the board pass beneath the trigger.

PC Requirements

The user must supply the PC for PanelScan operation. The following are the basic PC specifications required by the system.

- Modern Multicore PC
- Windows 7 64-Bit
- 6-8 GB of RAM
- Intel chipset-based NIC card, one channel for Standard and two channels for Wide.
- C-States should be turned off for optimum GigE performance. The option to disable C-States appears during AutoVISION installation.
- All other sleep and hibernate states should be disabled so the PC always operates at full power and capacity.
- Monitor Resolution of 1280 x 1024

Required Software

PanelScan requires that the four software elements shown below be installed before operation. All the required software is supplied on the USB drive that is included with the PanelScan kit:

- **Pylon 5 Camera Software Suite 5.0.5.8999** in the **BaslerPylonInstall** folder;
- **AutoVISION 4.0.3** in the **AutoVISION** folder;
- **PanelScan 1.5.1** in the **PanelScanInstall** folder.

Note: The USB drive also contains:

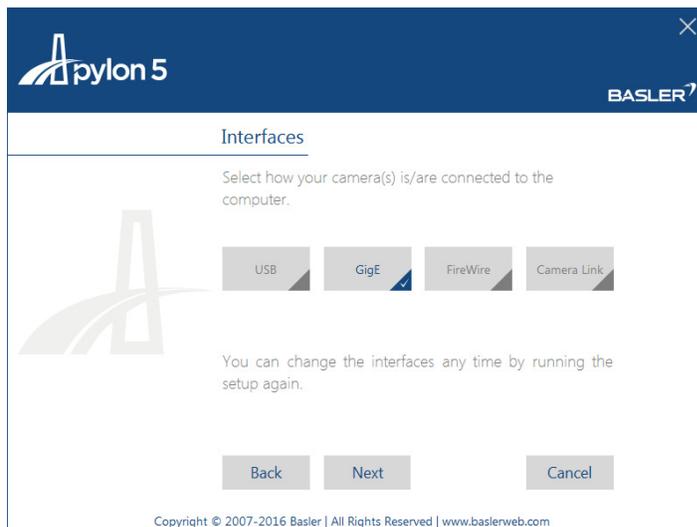
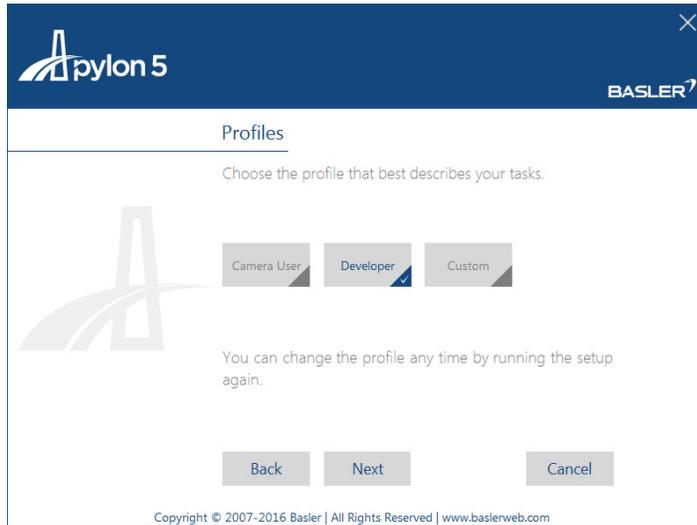
- **Microsoft .NET Framework** client installer in the **DotNetFX40Client** folder;
- A **Windows Update** package in the **WindowsInstaller3_1** folder.

These only need to be installed if they are not already present on the host PC.

Basler Software Installation

The Basler **Pylon 5 Camera Software Suite 5.0.5.8999** must be installed first. Double-click the **Basler_pylon_5.0.5.8999.exe** file located in the **BaslerPylonInstall** folder on the USB drive to start the installation process.

Pylon 5 has a streamlined and intuitive installation process. There are only two options the user has to select during installation: the **Developer** profile and **GigE** camera, as shown below.



PC and Camera IP Configuration

For the camera(s) to function, the PC and the camera(s) must be set up on the same network. These are the suggested network settings for both:

Computer IP Address – For the PanelScan Standard product, the NIC card must be set to static IP **192.168.254.2 (255.255.255.0)**.

Camera 1 IP Address – For the PanelScan Standard product, the single 6K line scan camera must be set to static IP **192.168.254.3 (255.255.255.0)**.

Camera 2 IP Address – For the PanelScan Wide product, the second 6K line scan camera must be set to static IP **192.168.254.4 (255.255.255.0)**.

The IP Address of the computer is set from the Control Panel.

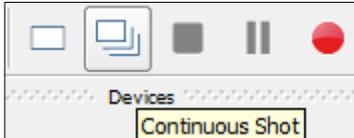
The IP Address of the cameras can be set from **Start > Basler > Pylon 5 Camera Software Suite > Pylon IP Configurator (x64)**.

Camera Testing

Once the Basler Software is installed and the IP addresses are set, the camera can be tested. Go to **Start > Basler > Pylon 5 Camera Software Suite > Pylon Viewer (x64)**.

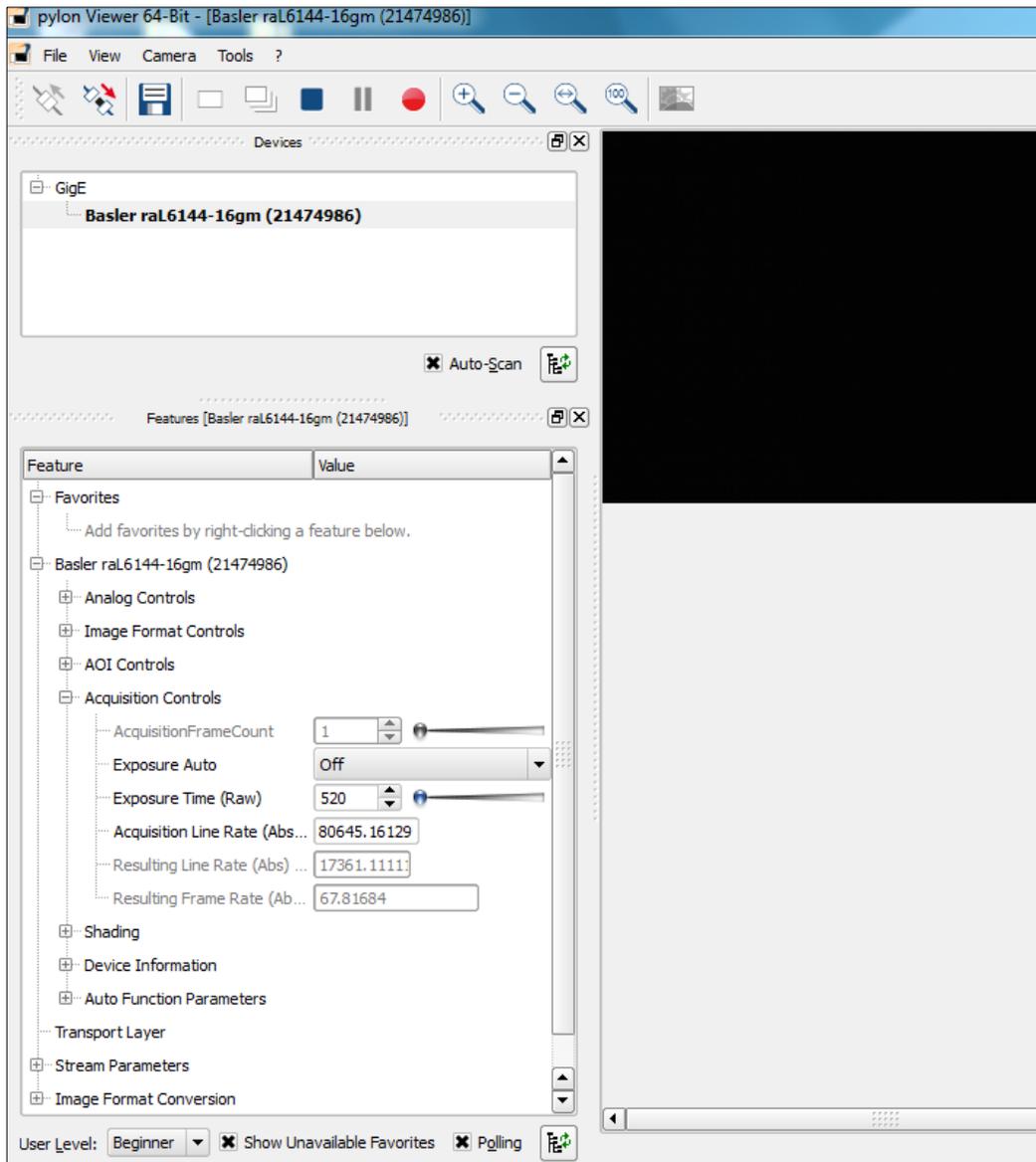
The cameras should automatically be detected by the software and show up in the camera list.

- Click each camera in turn.
- Click on the camera in the **Features** section.
- Navigate to **Acquisition Controls** and set the **Exposure Time (Raw)** to **1,700 μ s**.
- Set the camera lens aperture to **8.0**.
- Click the **Continuous Shot** button in the camera menu or in the menu toolbar.



- Zoom to fit so you can see entire 6K across of image buffer.
- Observe the image. Shine a light at the camera to verify that it is capturing images.

An example of the Pylon Viewer user interface is shown here:



AutoVISION Software Installation

- Double-click the **.exe** file in the **AutoVISION** folder.
- Follow the installation prompts.

PanelScan Software Installation

The final installation step is to install PanelScan software.

- Double-click the **setup.exe** file in the **PanelScanInstall** folder on the USB drive to run the PanelScan installer.
- Allow PanelScan to install the **Visual Basic Power Packs** if necessary.
Once the full PanelScan installation is complete, the software will start automatically.
- Close PanelScan by clicking the red **X**.
- Verify that PanelScan is shown in the Start menu and on the desktop.

Focusing the Camera

PanelScan is now ready for setup and operation. The first step is to get a good image by focusing the camera(s) and then aligning the camera(s) and light(s) so that they are all perpendicular to the axis of motion of the board. This can be accomplished by performing the following steps:

- Put a wide board on the conveyor beneath the camera(s). The board should have white barcodes all the way across the board. These are ideal features for focusing the camera.
- Run the **Basler Pylon Viewer (x64)** software from the Start menu.
- Select each camera in turn.
- Set the aperture of the lens to **8.0**.
- Set the camera **Exposure Time (Raw)** to **1700**. This can be found in the **Acquisition Controls** section.
- Enable live video by selecting the camera and clicking on the **Continuous Shot** button. This will show a **6,144 x 256** pixel image. Zoom out to see whole image.
- Change the tilt of the light so that the image is as bright as possible. Lock down the light.
- Move the board so that the barcode can be seen.
- Change the focus of the lens so that the black and white bars of the barcodes are as sharp as possible. Zoom in to get a better view.
- Move the scroll bars so you can see the far right and far left of the image. Be sure that both sides are in focus.
- If both sides of the picture are not in focus, verify that the camera face plane and the board plane are perfectly parallel.
- Adjust again.

Aligning the Light and Camera

The light line, the image line and the board edge must be exactly parallel to each other. The entire length of the board edge should be seen all at once, and the illumination should be perfectly even across the board. You can verify this by performing the following steps:

- Put a piece of white paper over the board aligned with the leading edge.
- Go into live video and zoom all the way out.
- Move the board and paper under the camera until it can just be seen.
- The whole width of the image should show the whole width of the white paper simultaneously. If it doesn't, adjust the camera, moving the paper in and out, until the leading edge is seen all at once.
- Now perform the same process for the light.
- Place the paper completely under the camera. Adjust the tilt of the light until the image is at its brightest.
- If one side of the image is less bright than the other, adjust the light until the paper is evenly illuminated across the board.

Fine Focus

In the following steps you will begin taking moving pictures with PanelScan. You will begin to see full X, Y images of the board. As the board moves under the camera you will be able to perform a fine focus to achieve the best possible images of the barcodes or Data Matrix symbols. The symbols should look like the ones shown at right. Zoom in to see real images. Cells as small as 3 pixels and narrow bars as narrow as 2 pixels should be readily distinguishable.



Setting Up the System

The system must be pre-configured for PanelScan Standard or PanelScan Wide. To do this:

- Start PanelScan.
- Ignore any error messages and select the menu item **Config**, and then **System Configuration**.
- The **System Settings** dialog will appear:

System Settings

PanelScan System Settings

Camera Settings | Work Order Settings | Communication Settings

Number of Cameras: 0

Camera1 Serial Number: 21474986 Camera2 Serial Number: 21732212

Camera 2 Overlap: 217 Camera 2 Y-Shift: -279

Exposure Time: 170 Search Width +/-: 200

Camera Gain: 1.75 Search Height +/-: 250

Digital Gain: 1

Camera Orientation

Wide

Independent

Set As New System Defaults Cancel

- Select the number of cameras in the system. Use **1** for PanelScan Standard, and **2** for PanelScan Wide.
- Next, enter the serial number for each camera. The serial numbers can be seen on the labels on the back of the cameras. Camera 1 is the camera on the left if looking down at the top of the board in the direction of board movement.
- Click the **Set As New System Defaults** button. This will write system settings data into a **systemsettings.ini** file in the **C:\PanelScan\systemsettings** directory. All new vision jobs will use this data as the default.
- Exit and restart PanelScan. It should now recognize the cameras.

All parameters in the System Settings dialog will act as default settings for any new PanelScan job that is created.

Note: The 10 **Work Order Label** fields are described in the [Work Order Info](#) section. **Camera 2 Overlap**, **Camera 2 Y-Shift**, **Exposure Time**, **Gain**, **Search Width +/-** and **Search Height +/-** are described in the [Vision Setup](#) section.

The parameters in this dialog are defaults for new jobs. If these parameters are changed in the actual job configuration dialogs, the job configuration settings will take precedence.

Serial and TCP/IP Communication

Serial Communication

To set up serial communication, enable **Serial Comm** in the **System Settings** dialog. Select the appropriate **Comm Port**. The port settings are in the **Comm Setup** tab on the **Multi-Scan Setup** dialog. The default output is the full results string (the same string shown in the PanelScan main screen and recorded to the log files).

A customized serial output can also be configured in the job setup. This includes options for preamble, postamble, and delimiter characters.

TCP/IP Communication

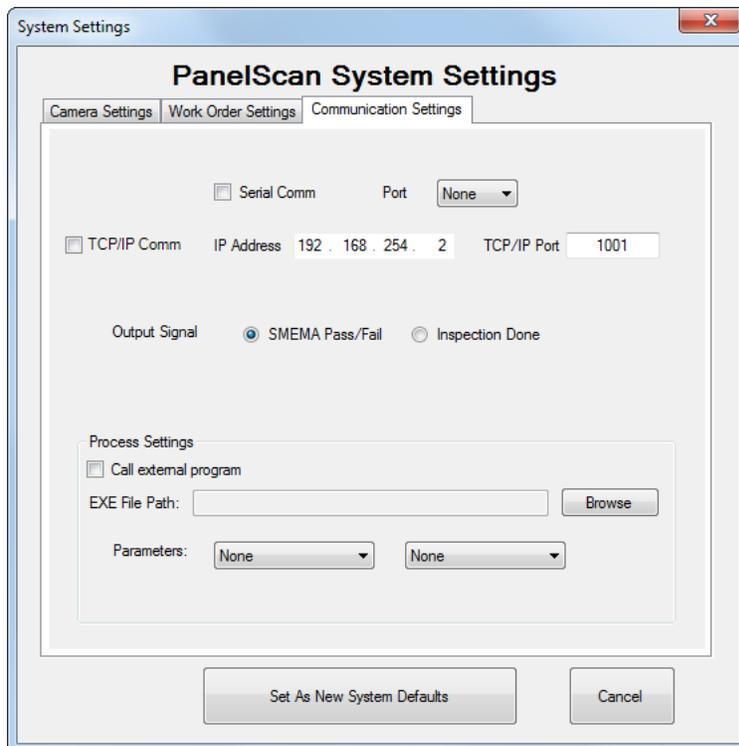
This communication option enables you to set the job remotely. TCP/IP gives you the ability to send the expected number of units in the lot. PanelScan will track this number and will be ready if a partial tray appears. For example, if the lot size is **50** but the tray size is **3 x 3**, PanelScan will determine that the 6th tray ($3 \times 3 = 9$, $50/9 = 5$, remainder 5) will only have 5 samples (4 empty slots) and will report accordingly. If the lot size function is not being used, **0** should be sent. This will tell PanelScan not to count trays.

Remote Job Protocol

PanelScan has the ability to use TCP/IP communication to set the job remotely. PanelScan acts as the server. The client sends commands to PanelScan.

PanelScan can create a **Product Table** that associates product names with the corresponding job file. This is used when there are multiple product names that use the same job. In this case, the TCP/IP client can send PanelScan the product name and PanelScan will load the correct job file.

TCP/IP Communication Setup



To use TCP/IP communication, enable it in PanelScan. This can be done in the **System Settings** dialog.

1. Mark the **TCP/IP Comm** checkbox.
2. Enter the **IP Address** of the PanelScan computer.
3. Enter the **TCP/IP Port**.
4. Click **Set as New System Defaults**.
5. Restart PanelScan.

TCP/IP Communication Setup (cont.)

Customer (Client)		PanelScan (Server)
*CONFIG(String1#;String2#;Product#;LotSize#)	→	(set Work Order, Family ID, and job file)
	←	*ACK(ReportFilePath#)
		(scan and process)
	←	*READ(String1#;String2#;Tray#)
*ACK	→	

- String1# = String to set the Work Order value in the job. Used in CSV export.
- String2# = String to set the Family ID in job. Used in CSV export.
- Product# = Job filepath to set in PanelScan. Entire path file. Example: C:\PanelScan\Jobs\Test.avp.
- LotSize# = Number of DUTs in the Lot. Default is 0. If set to more, PanelScan will look for partial trays at the end of the Lot.
- ReportFilePath# = Full file path of report folder created for this batch of trays.

Customer (Client)		PanelScan (Server)
*LOADJOB(String1#;String2#;ProductName#;LotSize#)	→	(set Work Order, Family ID, and job file)
	←	*ACK(ReportFilePath#)
		(scan and process)
	←	*READ(String1#;String2#;Tray#)
*ACK	→	

- String1# = String to set the Work Order value in the job. Used in CSV export.
- String2# = String to set the Family ID in job. Used in CSV export.
- ProductName# = Product name as used in the Product List shown on the following page. PanelScan will load the corresponding job file.
- LotSize# = Number of DUTs in the Lot. Default is 0. If set to more, PanelScan will look for partial trays at the end of the Lot.
- ReportFilePath# = Full file path of report folder created for this batch of trays.

Remote Job Setting: Product List

Product Name	Rows	Columns	JobFilePath
Test	1	1	C:\PanelScan\Jobs\night scan.avp
Example	1	3	C:\PanelScan\Jobs\Test.avp

This table is used as a lookup table for product names and corresponding jobs. This can be found and configured in the PanelScan user interface under **Menu > Config > Product Table Configuration**. If using the ***LOADJOB** command, the software will take the product name and load the corresponding job. Many products can be associated with the same job. All product names should be different. If two products share the same name, the first job path will be used.

Other Information

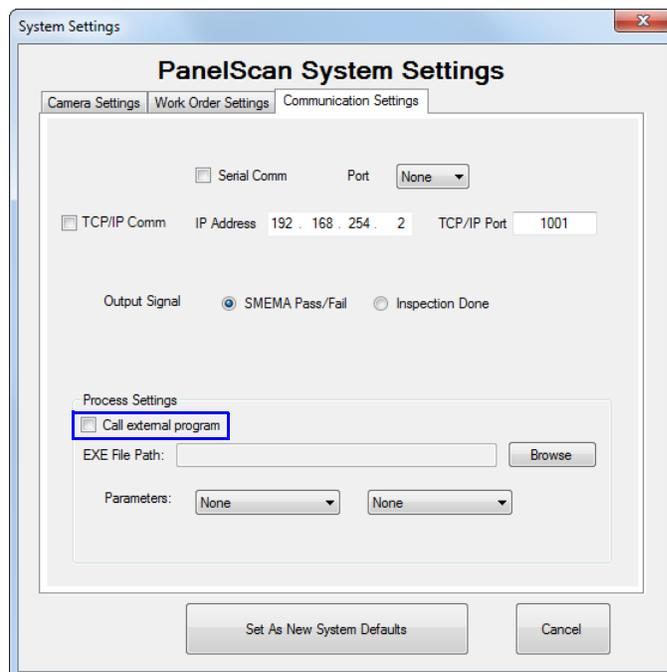
- PanelScan is the server. The user-created connection must be the client.
- The end of the command sent by PanelScan is a **CR (\x000d)**.

CSV Output

- When using TCP/IP, PanelScan will create a **“WorkOrder_FamilyID_DateTime”** folder for each Lot.
- Save all CSV files for the Lot with the naming scheme **“WorkOrder_FamilyID_TrayNo.csv”**.
- For each location in the tray, the CSV file will read either the data **“NO READ”** or **“EMPTY”**. **“EMPTY”** is used in the pre-determined slots of the partial tray.

Calling an External .exe

To call an external .exe file, check the box for **Call external program**, specify the file path for the .exe, and use the dropdown menus to select the optional parameters to send the program. The current options are **None**, **PanelID**, and **PassFail**. Contact Omron Microscan if additional parameter options are required.



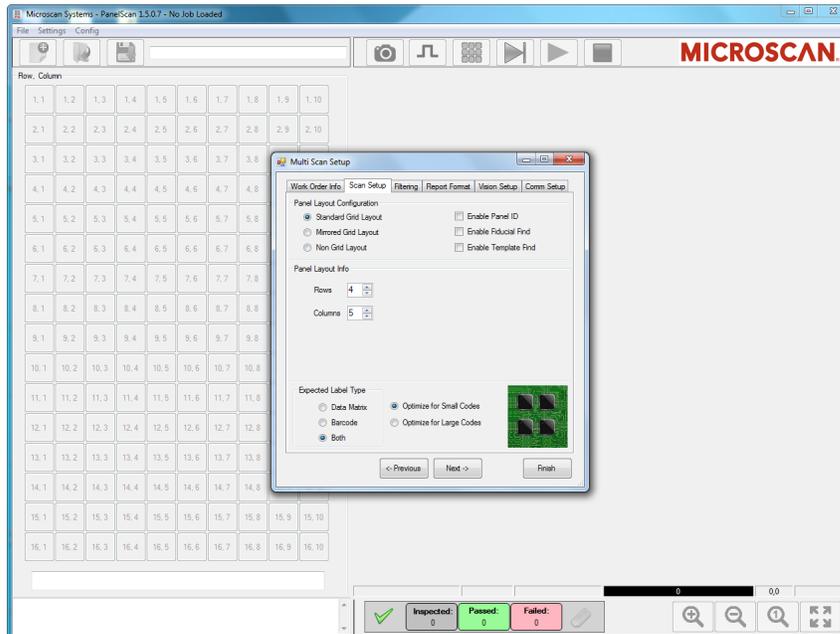
Getting Started – Create a Basic One-Camera PanelScan Job

The following example shows how use a one-camera **Standard** PanelScan system. If you have a two-camera **Wide** system, it is still useful to complete this exercise to familiarize yourself with the interface. The **Vision Setup** section describes how to align the two cameras to form a single wide image using the Vision Setup tab of the Multi-Scan Setup dialog. From the Vision Setup section, you can return here to run this exercise again.

Once system imaging is configured, you can begin to set up vision jobs and run board panels. Most panels are laid out with a certain number of rows and columns of boards. PanelScan makes it easy to train the system on these panels. This basic job example shows you how to train a panel laid out in a regular grid of **4 rows** and **5 columns** of boards. The symbols are a mix of barcode and Data Matrix. You can use any sample board to follow this example job.

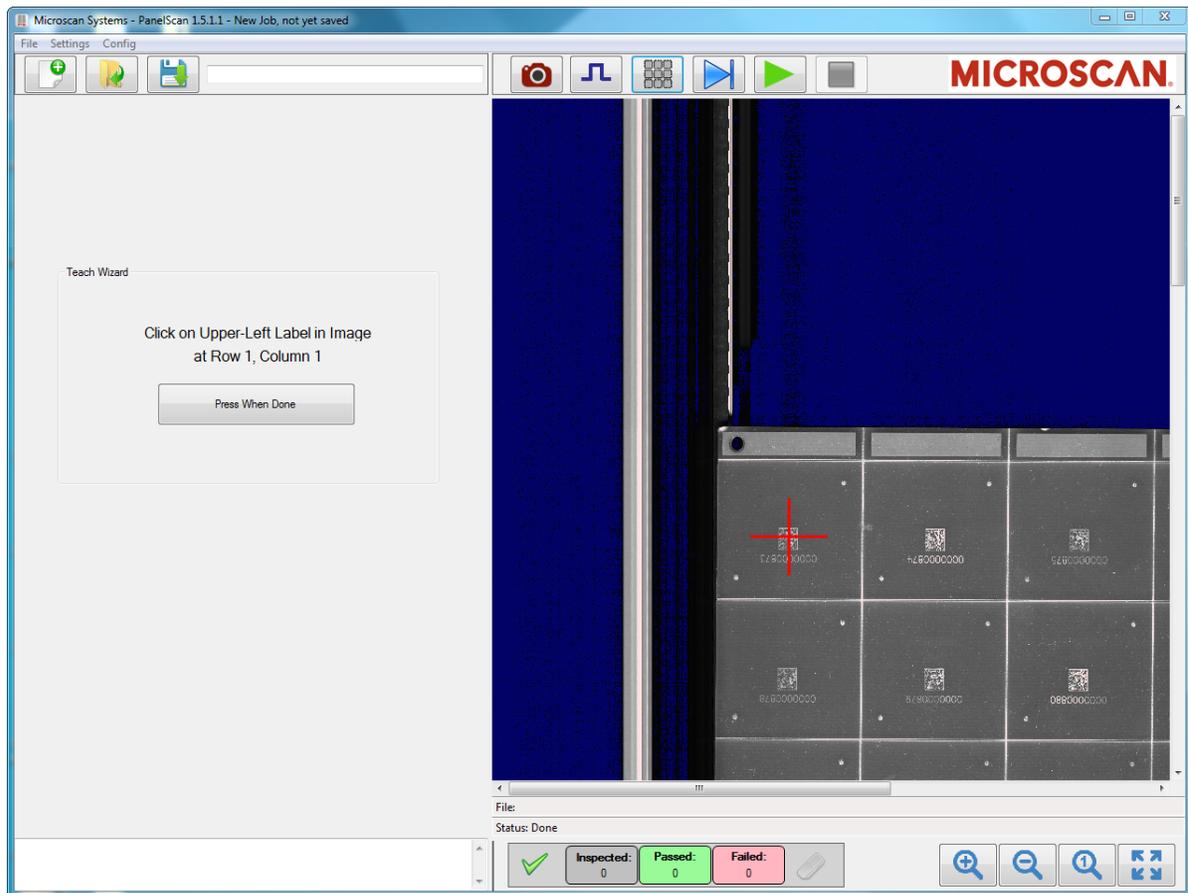
To train a new panel with PanelScan Standard:

- Start PanelScan.
 - Note:** If you have set up the previous configuration menu for two cameras, set the number of cameras back to **1** and re-start PanelScan.
- Click the **New File** button.
- Step through the dialogs with the **Next** button until you reach the **Scan Setup** tab.
- On this tab, choose **Standard Grid Layout, 4 Rows, 5 Columns** and **Both** for **Expected Label Type**.



- Click **Finish**.
 - The system now creates a new vision job containing all the required vision tools.
 - The system then helps you place these tools in the right locations.
- Click the **Take Picture** button. You will see that the camera is ready and waiting for a trigger.
- Place a board on the conveyor and run it under the camera. It should trigger the camera and then an image should automatically appear on the screen.
- Teach the system the layout of the boards on the panel by clicking the **Teach Layout** button to the right of the **Trigger** button.
 - The screen will automatically zoom in to the upper left corner and will prompt you to train the upper-leftmost symbol in the image at **Row 1, Column 1**.
 - You can scroll to this exact label and zoom in by clicking and rolling the mouse wheel, or by using the zoom buttons.
- When you reach the upper-leftmost symbol, left-click in the center of the symbol. A red **+** will appear over the symbol. You can click multiple times to position the **+** in the exact center of the symbol.

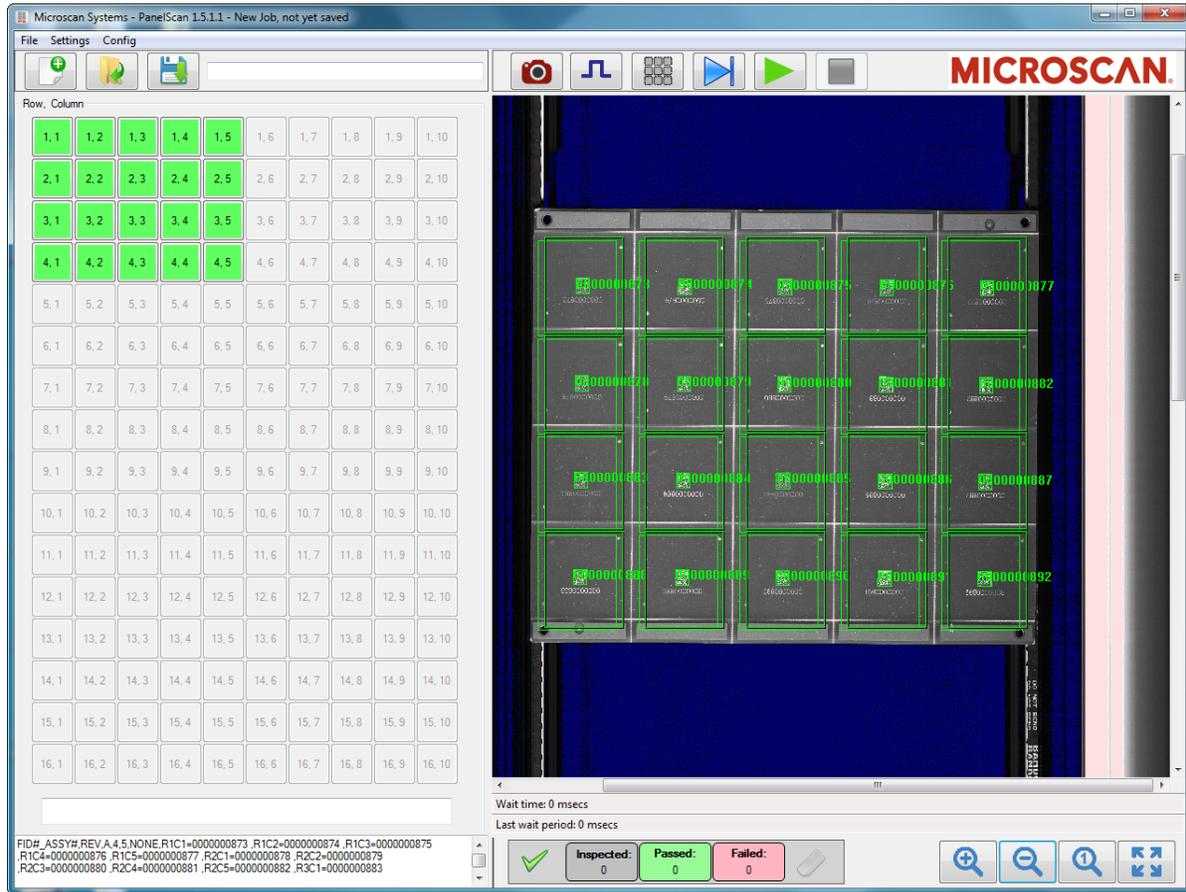
- Click the **Press When Done** button when the + is centered.



- The system then prompts you to click on the center of the lower-rightmost symbol. Zoom and scroll until it is in view, and then click on it.
- Click the **Press When Done** button.
If you were training a mirrored grid, you will be prompted to click the first mirrored symbol. If you were training a non-standard grid, you will be prompted to click each symbol in the order in which you want them to be reported until you have trained the entire set.
When the training process is done, the system will automatically lay out all the inspection regions again, and then it will run a test on the current image. Click the **Trigger** button to help the system complete the test.
- If you are not satisfied with the box layout, you can re-teach the system. If you are satisfied, enter Run Mode by clicking **Go To Run Mode**.

PanelScan Integration Guide

Once in Run Mode, simply feed boards into the conveyor. The camera will trigger and capture, process the panel, and write the read data to disk.



The resulting output string is shown in the lower left part of the user interface in the format in which it will be saved.

The grid array is shown on the left in gray, green, or red. **Gray** means “untrained”. **Green** means that the symbol was successfully decoded. **Red** means that the symbol was not successfully decoded.

You can click on any of these buttons and the system will zoom in to show that symbol. The decoded data is displayed in large bold letters in the text box below the buttons.

A pass / fail counter is visible at the bottom of the Run screen. This counter can be reset by clicking the **Erase** button.

The vision job can be saved to disk and opened again to run at a later time. The job will be saved in the **C:\PanelScan\Jobs** directory. Note that when you save a job, two files are created: the **.avp** file, which is the job itself, and the **.ini** file, which contains all the PanelScan-specific job data.

Because the layout of search windows is based on conveyor speed, it may be necessary to repeat the Teach process to ensure that regions of interest are centered on the barcode or Data Matrix areas when you open the job.

Fine Focus

At this point you can run boards back and forth beneath the camera and finely adjust the camera's focus.

PanelScan Details

Work Order Info

When setting up a new job, there are six tabs in the **Multi Scan Setup** dialog where you can enter data. The first tab is **Work Order Info**. This is a configurable dialog that allows input of information about the **Current Panel** and **Work Order** for processing that panel.

This data is used to name the standard log files for the current run of boards. Reporting can also be configured so that this data is prepended to each panel record saved in the log file, as described in the **Report Format** section.

The default names for the 10 data fields are **Work Order**, **Family ID**, **Assembly Number**, **Revision**, **Board Side**, **Factory**, **Route**, **Division**, **Customer**, and **Version**. If your application requires different names for these fields, they can be changed by entering the required label names into the **Work Order Label** fields in the **System Settings** dialog. The new field names will appear in the Work Order Info dialog box.

Once the Work Order Labels are defined, you can populate the text fields shown below with values that describe the panels being processed. The values you have entered can then be used in two different ways: fields **1–4** generate the file name for log files from the current run of panels, and fields **2–5** can be prepended to each record in the report.

The screenshot shows the 'Multi Scan Setup' dialog box with the 'Work Order Info' tab selected. The dialog has six tabs: 'Work Order Info', 'Scan Setup', 'Filtering', 'Report Format', 'Vision Setup', and 'Comm Setup'. The 'Work Order Info' tab contains ten text input fields with the following labels and values:

Field Label	Value
Work Order	WO#
Family ID	FID#
Assembly Number	ASSY#
Revision	REV
Board Side	A
Factory	
Route	
Division	
Customer	
Version	

At the bottom of the dialog are three buttons: '< Previous', 'Next ->', and 'Finish'.

Log file example: Given the above settings, a log file named **123~456_789_001.txt** would automatically be created in the **C:\PanelScan\Logs** folder. The file name is generated from the values entered in fields 1–4 above. An example of a record from the log file is shown below. Note that the values entered in fields 2–5 above, along with the number of rows and columns on the panel, are prepended to the record.

```
456_789,001,A,4,5,NONE,R1C1=FV011PE,R1C2=FV011PF,R1C3=FV011PG,R1C4=FV011PH,R1C5=FV011PJ,R2C1=FV011PZ,R2C2=NoRead,R2C3=FV011PX,R2C4=FV011PW,R2C5=FV011PV,R3C1=FV011PU,R3C2=FV011PT,R3C3=FV011PS,R3C4=FV011PR,R3C5=FV011PQ,R4C1=FV011PP,R4C2=FV011PK,R4C3=FV011PL,R4C4=NoRead,R4C5=FV011PN
```

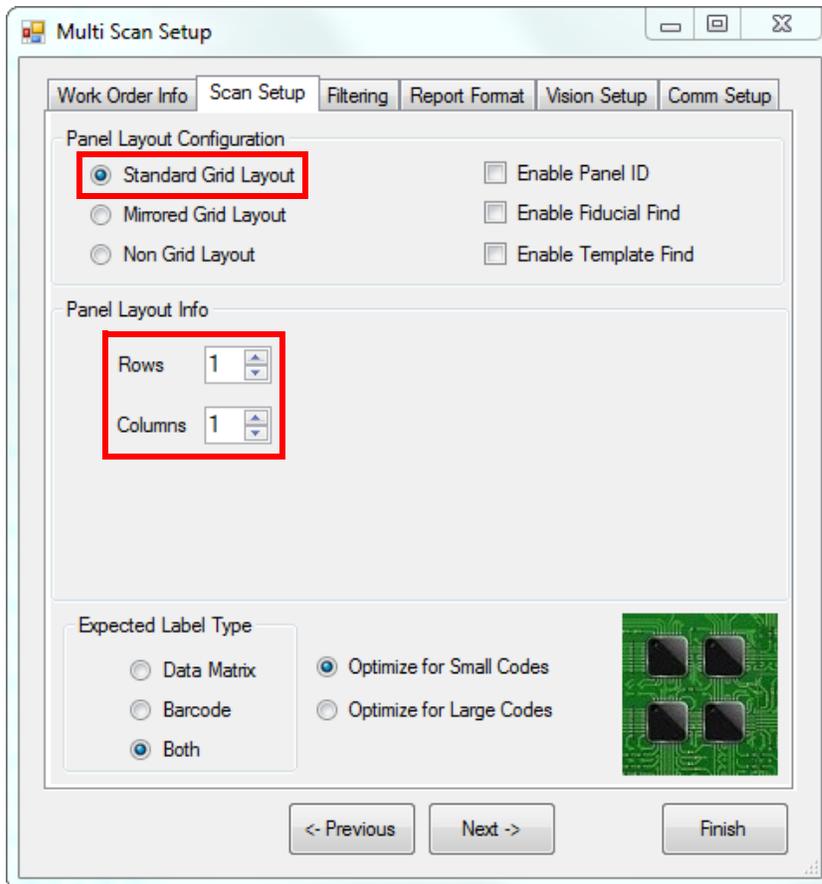
Scan Setup

Scan Setup is the second tab. It allows you to enter the type of grid on the panel, the number of rows and columns, and the types of symbols on the panel. These entries are described in the following pages.

Standard Grid Layout

Standard Grid Layout is used when there is a regular X, Y pattern of boards on each panel. Enter the number of rows and number of columns.

- **Rows** – This can be set for as many as **10**.
- **Columns** – This can be set for as many as **16**.



Mirrored Grid Layout

The boards on the panels in your application might be flipped 180 degrees to achieve a tighter fit. For these kinds of panels, enter the number of rows and columns of boards, and also enter which row and column has the first mirrored board. In the example below there are **4 rows** and **5 columns**, and the board at **Row 1, Column 2** is the first mirrored board. In this setup you will be prompted to click this first mirrored board label as well as the upper right and lower left board labels to complete the automatic board layout.

- **Rows** – This can be set for as many as **10**.
- **Columns** – This can be set for as many as **16**.
- **First Mirrored Row** – This is either **1** or **2**.
- **First Mirrored Column** – This is either **1** or **2**.



Non Grid Layout

Non Grid Layout is useful for when boards are not in a row and column configuration. This option allows you to point to each board individually during the teach process. In this field, simply enter the number of boards on the panel. Rows and columns can be added manually. This allows you to set the order of the ROI in any orientation and the UI will show a grid during run time.

Panel Layout Configuration

Standard Grid Layout Enable Panel ID

Mirrored Grid Layout Enable Fiducial Find

Non Grid Layout Enable Template Find

Panel Layout Info

Rows 4

Columns 1

Number of Boards on Panel 4

Manually Add Rows Cols

- **Number of Boards on Panel** – This is the number of boards on a non-grid panel from **1** to **160**.
- **Manually Add Rows Cols** – PanelScan sets the location and sizing of rows and columns based on where you click in the teaching setup. The option to add rows and columns manually is intended for cases in which the layout is grid-like but doesn't conform to the rigid structure of standard rows and columns. You will still manually add each ROI, but the UI will track the ROI as Row 1 Col 1, Row 2 Col 1, etc. The UI on the left side of the main screen will show the grid.

Enable Panel ID

Check the **Enable Panel ID** box when there is a singular Panel ID that must be read in addition to the labels on each board. During panel training, you will be asked to click on the location of the Panel ID. During runtime, the Panel ID is included with each panel report record.

Panel Layout Configuration

Standard Grid Layout Enable Panel ID

Mirrored Grid Layout Enable Fiducial Find

Non Grid Layout Enable Template Find

Enable Fiducial Find

Enable Fiducial Find adds additional **Find** and **Train** functionality related to fiducial marks on boards. Contact Omron Microscan helpdesk for additional information about this feature.

Panel Layout Configuration

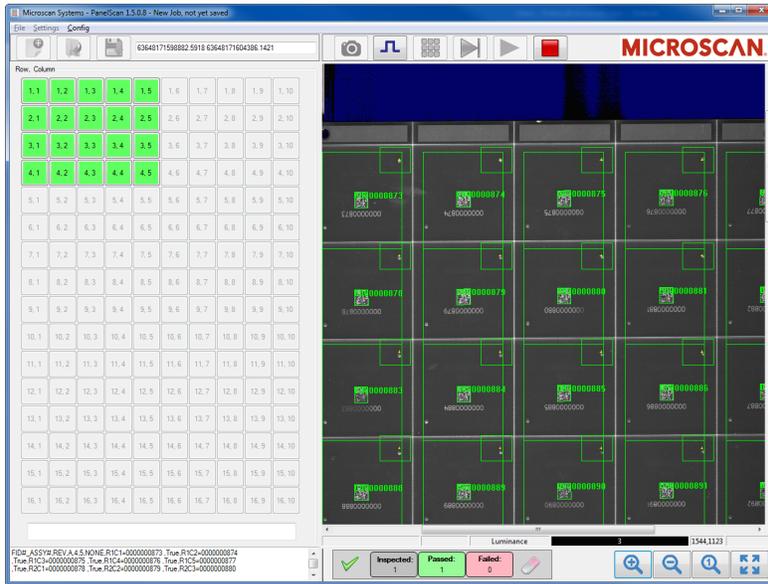
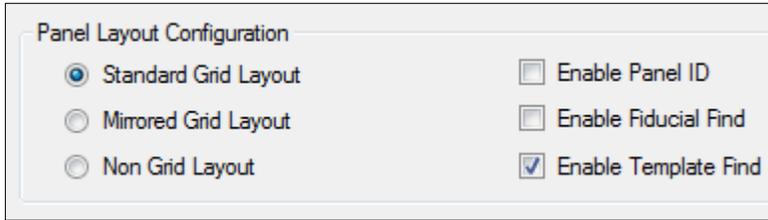
Standard Grid Layout Enable Panel ID

Mirrored Grid Layout Enable Fiducial Find

Non Grid Layout Enable Template Find

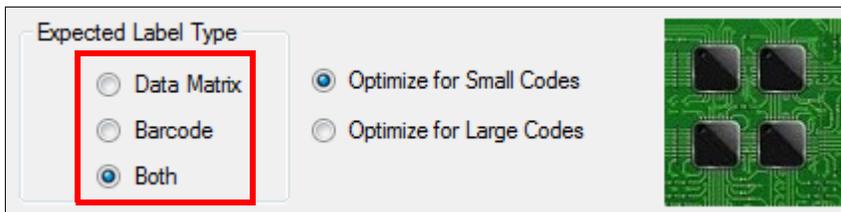
Enable Template Find

This allows the user to specify a non-barcode feature on each panel. PanelScan will perform a presence/absence test and output presence or absence in the report. Template training happens during the Teach Layout process.



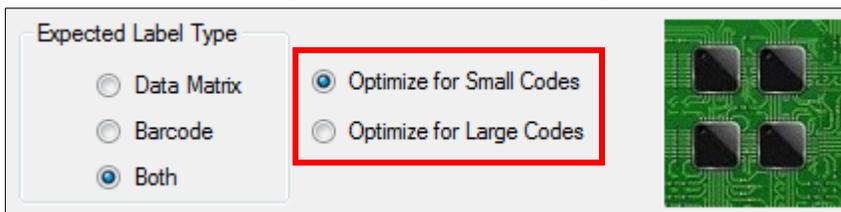
Expected Label Type

Select **Data Matrix** when only Data Matrix symbols are present on the panels. Select **Barcode** when only barcodes are present on the panels. Select **Both** when both symbol types are present on the panels.



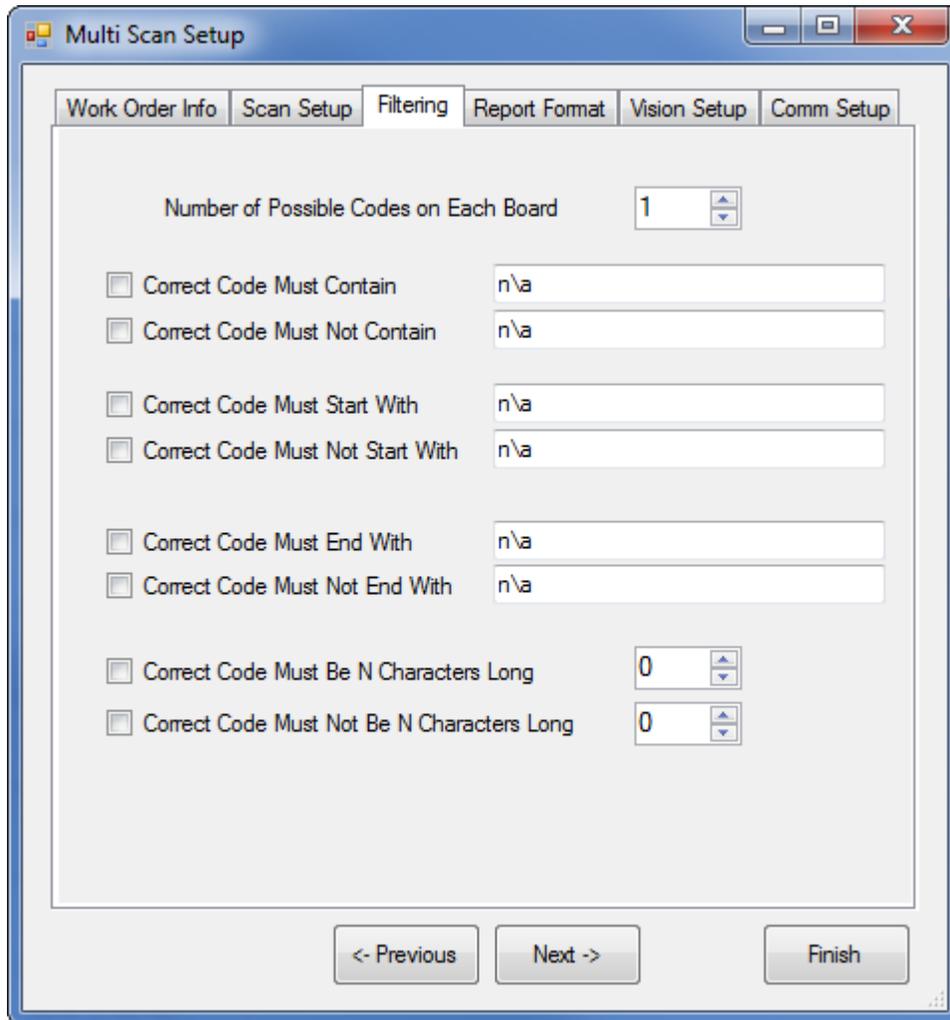
Code Element Size

The system can read barcodes down to 3.3 mil and Data Matrix symbols down to 5 mil. Select **Optimize for Small Codes** to enable a 2x digital zoom. When reading larger symbols (in the 15-20 mil range), select **Optimize for Large Codes** to remove the digital zoom.



Filtering

Some boards may have multiple symbols within the read area, but only one symbol is used for tracking. The **Filtering** dialog allows you to configure the system to report only the correct symbol in the output string.



Number of Possible Codes on Each Board – This tells the system that there could be multiple symbols on each board. This should be set to the maximum number of symbols so the system is sure to read all of them.

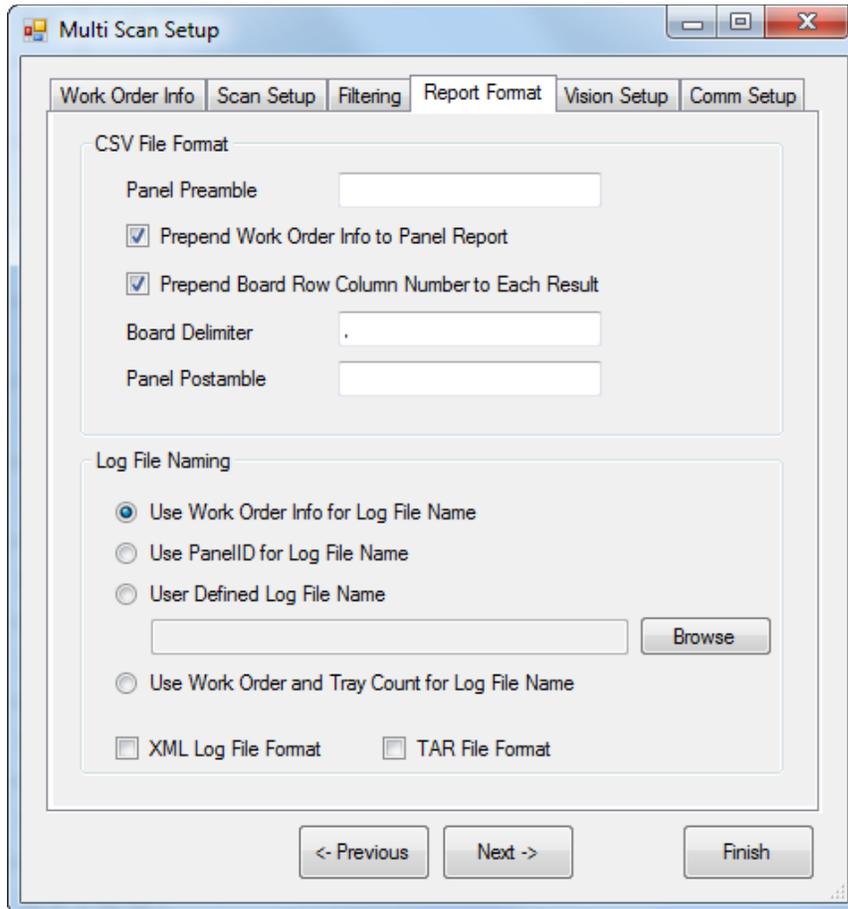
Filters – The eight check boxes represent the filters. You can apply multiple filters simultaneously. The filter must be checked and then configured as needed.

Filter example: If you know that the correct symbol data will always start with **FIS** and will always be **10 characters long**, you can check the boxes **Correct Code Must Start With** and **Correct Code Must Be N Characters Long**, and then configure them accordingly.

Report Format

When PanelScan runs, it reads all the barcodes or Data Matrix symbols on a board and concatenates their data into a single string. This string is saved to a log file in the **C:\PanelScan\Logs** directory. Each panel becomes a record in this file. Each record contains all codes from each board on the panel and the panel ID (if Panel ID is enabled).

The **Report Format** tab allows you to select the format of each panel's record, and to select the name and type of the log file.



Log File Formatting

Log files are saved in CSV (comma-separated value) format or in XML format.

Log files can be named with data from the Work Order Info tab, with the Panel ID, with a user-defined name, or with an XML file.

Log files can also be saved with work order and tray count. See **TCP/IP Communication** for information about tray count.

CSV File Format

When saving to a CSV file, you can configure the record string. The settings allow you to set a preamble and a postamble. The settings also allow you to determine whether Work Order Info is contained in the record, whether the board row and column number is included, and it enables you to set a specific board delimiter. These are described below.

Panel Preamble – When enabled, the preamble string is prepended to each record. The preamble is blank by default.

Prepend Work Order Info to Panel Report – When enabled, entries **2–5** from the Work Order Info tab are included in each record along with the number of rows and columns of boards on the panel. For example, the string **456_789,001,A,2,2,NONE** will be included based on Work Order settings. The string represents entries 2–5, the number of rows and columns of boards on the panel, and the word **NONE**.

Prepend Board Row Column Number to Each Result – By default, the row and column number is prepended to each board result on the panel. For example, **R1C1=FV011PE,R1C2=NoRead**. This can be turned off so that row and column indicators are not included in the report string.

Board Delimiter – This is the board separator character. It is set to **comma** by default.

Panel Postamble – When this is set, the postamble string is appended to each record. The postamble is blank by default.

Log File Naming

There are four naming conventions used for log files:

Use Work Order Info for Log File Name – When this selection is made, the file is stored to the **C:\PanelScan\Logs** directory. The name is composed of items **1–4** from the **Work Order Info** tab.

Use Panel ID for Log File Name – When this selection is made, the file is saved to the **C:\PanelScan\Logs** directory. The name is the Panel ID string. The file is a **.txt** file. This file is populated with a single record from each panel in the work order, given that each panel has a unique ID.

User-Defined Log File Name – When this selection is made, the file is saved to **C:\PanelScan\Logs** directory with a user-defined name. The file is a **.txt** file. This file is populated with all the records from each panel in the run until the name is changed.

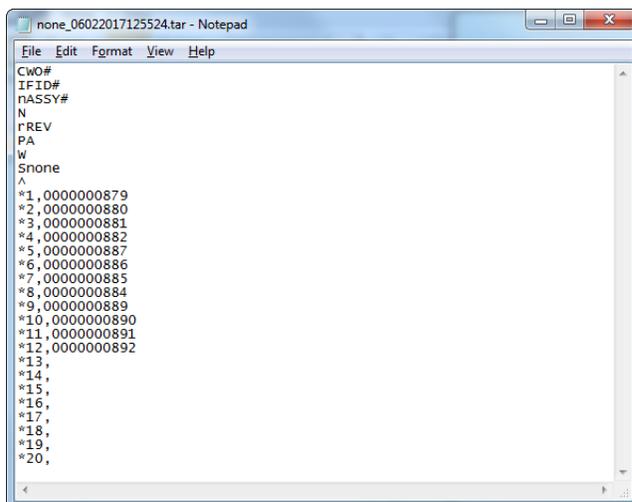
Use Work Order and Tray Count for Log File Name – When this selection is made, the file is saved to the **C:\PanelScan\Logs** directory. The name is the work order number and tray count. The file is a **.txt** file. This file is populated with a single record from each work order.

XML Log File Format – This file is overwritten each time a panel is run. When **XML Log File Format** is chosen, the data from the board is saved in a particular XML format. Each panel is written one at a time to this file. Below is an example of a file in this XML format. Omron Microscan recommends selecting **XML Log File Format** along with **User-Defined Log File Name** if your application requires XML.

```
<?xml version="1.0" encoding="UTF-8"?>
- <BarcodeList operator="Hal">
  - <Job assembly="" assemblyRev="" name="" batch="" lot="">
    - <Barcode scanTime="2014-06-20T11:19:55" id="123456883">
      <imageBarcode scanTime="2014-06-20T11:19:55" id="0014"/>
      <imageBarcode scanTime="2014-06-20T11:19:55" id="123456886"/>
      <imageBarcode scanTime="2014-06-20T11:19:55" id="123456884"/>
      <imageBarcode scanTime="2014-06-20T11:19:55" id="Test3mil"/>
    </Barcode>
  </Job>
</BarcodeList>
```

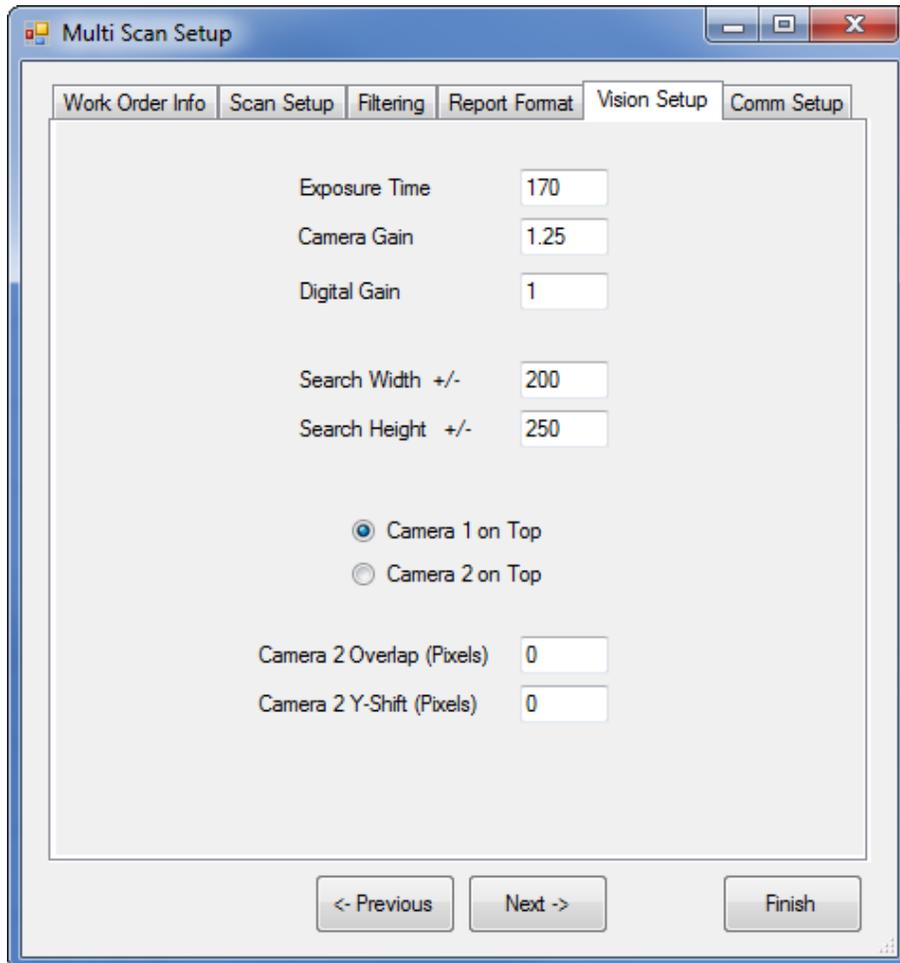
TAR File Format

TAR file format uses the additional Work Order labels in the format and creates a new file for each panel using the date/time code as a file name.



Vision Setup

This tab contains: settings for the camera's exposure time and gain, parameters that control the search area size for the marks on the boards, and information for setting up PanelScan Wide with two cameras.



Exposure Time – The camera is set to expose each line of the image for **170 μ s** by default. This matches the speed of about **9"** per second, achievable on most conveyors. This produces an image that has the same aspect ratio in X and Y. If the application requires that the conveyor run at a different speed, this value must be changed to achieve the proper aspect ratio. Note that significantly increasing or decreasing the exposure time will also significantly increase or decrease the brightness of the image. If the image becomes unusable, then Gain can be used to compensate.

Gain – This is set to **1.25** by default. The range of values for Gain are **0** to **2.5**. Increasing Gain makes the image brighter, and decreasing Gain makes the image darker.

Search Width +/-– This value represents the extra width in pixels the search window for each symbol becomes after training. If the symbol is found to be **300 pixels wide**, the search window will increase on each side by the amount defined on the Vision Setup tab. This adjustment can be used to compensate when you are unable to predict where labels will be positioned on boards and panels.

Search Height +/-– This value represents the extra height in pixels the search window for each symbol becomes after training. If the symbol is found to be **300 pixels high**, the search window will increase at the top and bottom by the amount defined on the Vision Setup tab. This adjustment can be used to compensate when you are unable to predict where labels will be positioned on boards and panels, and when there is any inconsistency in conveyor speed.

The remainder of the settings on the Vision Setup tab are for PanelScan Wide, which uses two cameras.

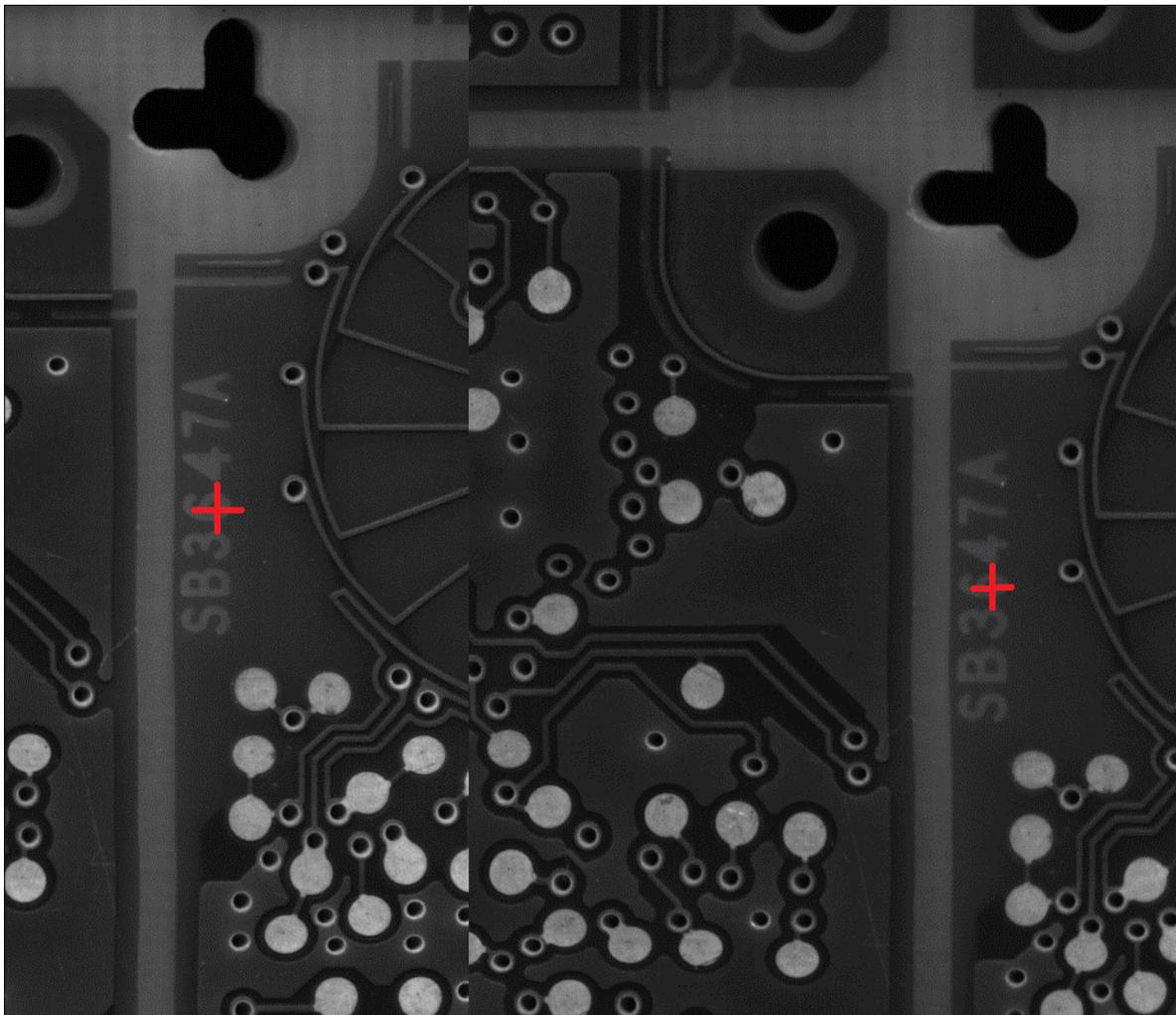
Camera 1 on Top; Camera 2 on Top – For PanelScan Wide, two cameras are used side-by-side. They are mounted so that there is a 1” overlap in what each one captures. If a symbol appears in this middle ground, you can choose which camera will view this overlap area. For example, if a symbol is cut in half when viewed with Camera 1, Camera 2 can be selected as the camera “on top” such that it has a full view of the symbol.

Camera 2 Overlap (Pixels) – The PanelScan user interface attempts to stitch the images from Camera 1 and Camera 2 into a single image. You can choose which camera is on top and is used for the overlap area. It is necessary, however, to determine the amount of overlap in pixels to achieve an image that is as seamless as possible. When this value is set to 0, the images from the two cameras are simply placed side-by-side. To determine the amount of overlap, it is useful to find a single feature on the panel that appears in the image from each camera. The pixel location for both instances of this feature can then be determined and the overlap amount can be calculated.

To do this, set **Camera 2 Overlap (Pixels)** to 0. Run a panel. Right-click the image and save it to disk. Open the image in any image viewing or editing program that provides X and Y cursor values. Find a feature that is duplicated in both images. Find the pixel coordinates of each instance. Compute the x offset.

In the example below, the number 6 appears in both the Camera 1 view on the left and the Camera 2 view on the right. Using the cursor, you can find pixel coordinates of an exact point – the center of the hole in the number 6, for example. Record the X and Y cursor values for this point in both images.

In the example below, Camera 1 shows the number 6 at **5945,2141**, and Camera 2 shows it at **6556,2204**. Compute the X coordinate value and enter it as the Camera 2 Overlap. In this example, the difference between **5945** and **6556** = **611 pixels**.

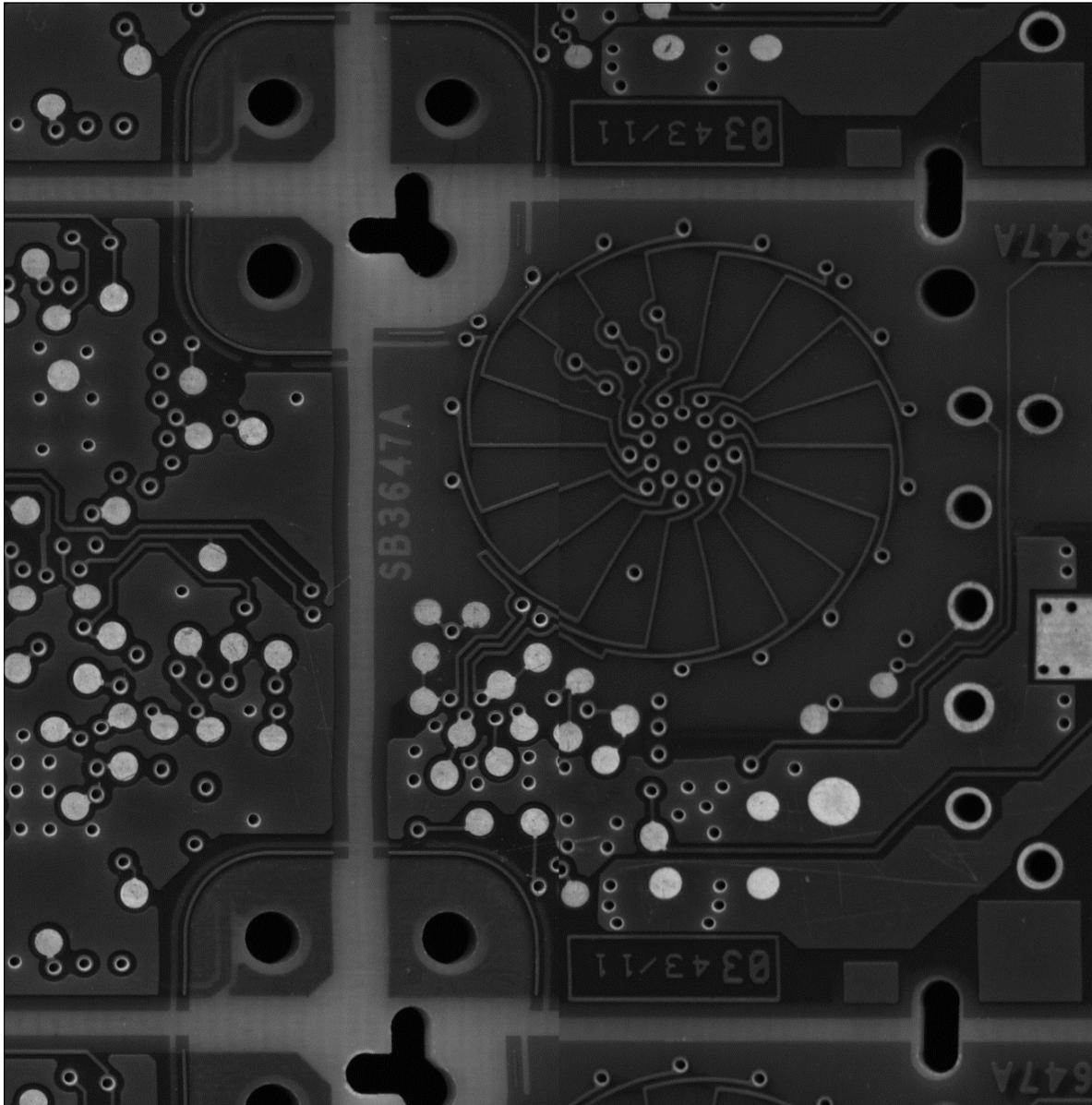


Camera 2 Y-Shift (Pixels) – The PanelScan user interface attempts to stitch the images from Camera 1 and Camera 2 into a single image. Depending on how cameras 1 and 2 are mounted, there may be a slight difference in the Y coordinates of the two. Camera 2 can be shifted to correct this Y difference and thereby produce a seamless image.

Find a feature that appears in both images. Use the Y cursor value of each to compute the Y camera shift of camera 2 from camera 1. If the left-hand image needs to be shifted upward, the Y-shift is a negative value. If it needs to be shifted downward, the Y-shift is positive. In this example, the Y-shift from Camera 1 to Camera 2 is **-63 pixels**.

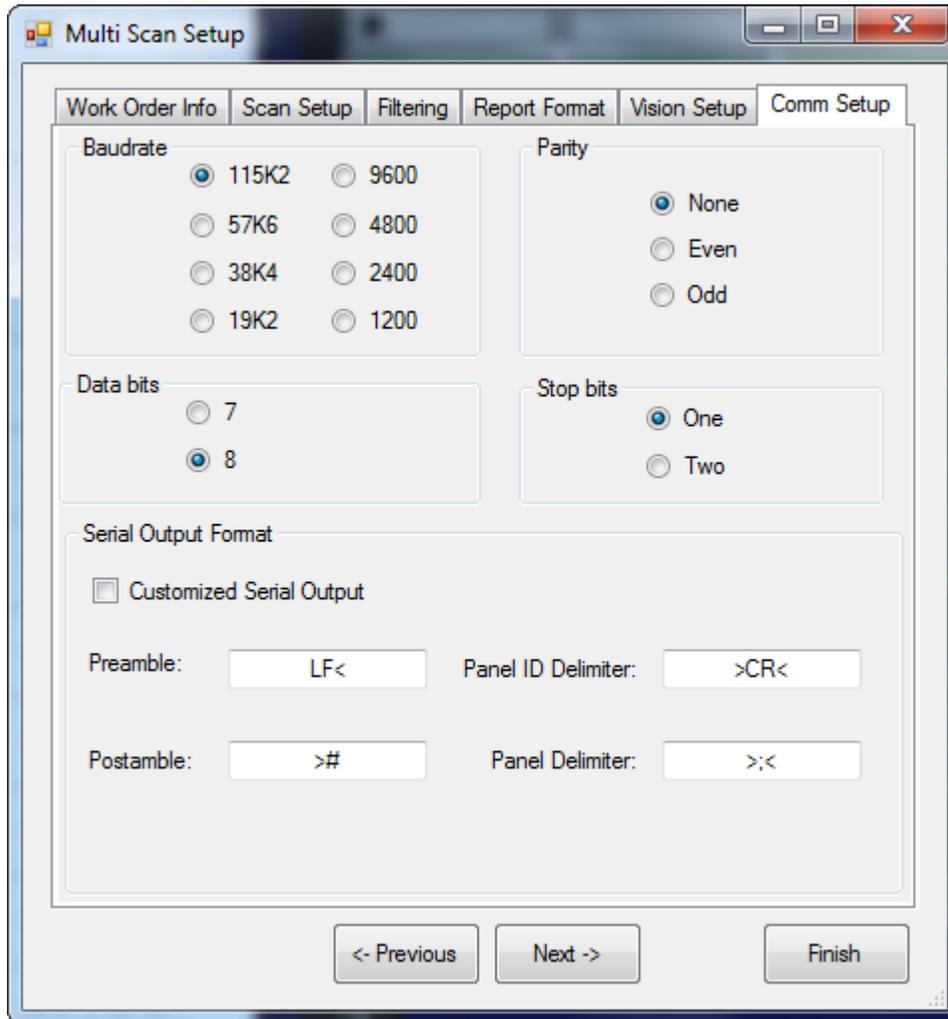
These values should first be entered in the **System Settings** dialog so they take effect for all jobs. If the values need to be overwritten for a particular job, they can be changed on the Vision Setup tab for the current job only. Note that when jobs are loaded from disk, the values from the **job.ini** file will be used – not the latest system settings.

The stitched image is shown below.



Comm Setup

This tab contains four groups of radio buttons to control **Baud Rate**, **Parity**, **Data Bits**, and **Stop Bits**.



Baud Rate – Sets the rate at which the system and the host transfer data back and forth. This setting can be used to transfer data faster or to match host port settings.

Parity – An error detection routine in which one data bit per character is set to **1** or **0** so that the total number of bits in the data field is either even or odd. This setting is only changed if necessary to match the host setting.

Data Bits – The number of bits in each character. This setting is only changed if necessary to match the host setting.

Stop Bits – One or two bits added to the end of each character to indicate the end of the character. This setting is only changed if necessary to match the host setting.

Customized Serial Output – Allows the user to define preamble, postamble, and delimiter characters.

SMEMA Signals

If PanelScan successfully reads all marks on a panel, it outputs a digital **PASS** signal. If it does not read all marks successfully it outputs a digital **FAIL** signal. These signals can be used with the conveyor to allow the board to move on to the next station or not.

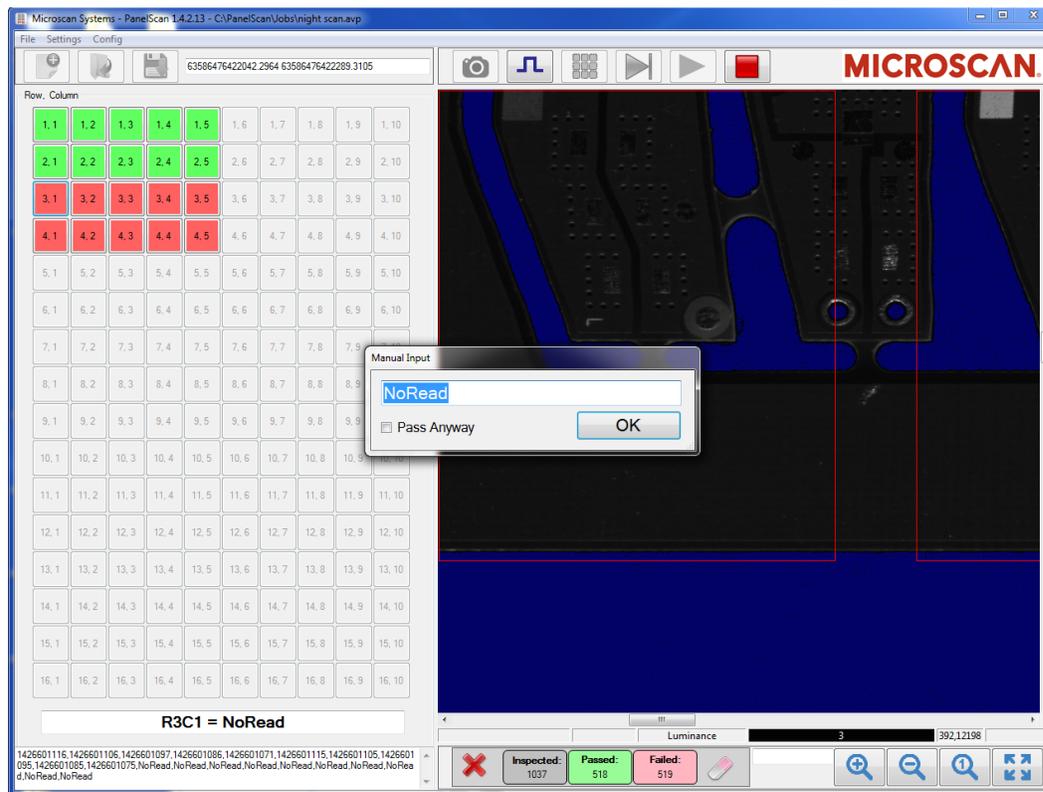
These signals come from the camera I/O cable (number **4** in the hardware configuration). The PASS signal is **Red** and the FAIL signal is **Red/Blue**. These are 3.5 volt signals. Ground is taken from the Power Supply (**8**).

Important: Most PLCs are not capable of handling 3.5 volt signals. If the application requires the use of a PLC, Omron Microscan recommends adding the **Crydom DRA1 MP Series OPTO for 3.5 volts** to the configuration.

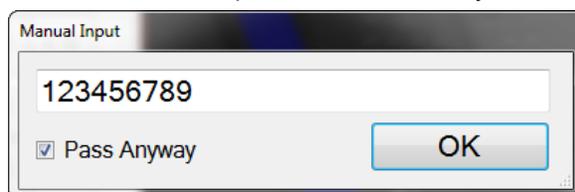
http://www.crydom.com/en/Products/Catalog/dr_a1_m_p.pdf

Manual Rescan

PanelScan allows you to manually rescan a No Read symbol. To enable this setting, go to **Settings > App Settings** and enable **Manual Rescan**. If the symbol failed during the initial run under the camera, the operator can click on the red button in the main screen corresponding to the row/column of the failed unit – **R3C1** in the example below. A **Manual Input** window appears. The operator can use a handheld reader (in keyboard mode) or type the symbol data in the text field.



By selecting **Pass Anyway** and clicking **OK** after entering the symbol data, the unit will pass even if it does not match the filtering in the **Job Setup**. After all the symbols are rescanned, click the **Trigger** button to rerun this panel with the new symbols.



Note: If Manual Rescan is enabled, no reports will be created until all No Reads have been resolved, either by entering the symbol data or selecting Pass Anyway.

Appendix A – Troubleshooting

Visionscape Emulator Test Job with Virtual I/O Trigger

PanelScan uses the Device Independent Visionscape Emulator. PanelScan also uses a separate Basler application for taking pictures, which in turn triggers Visionscape via **Virtual I/O Trigger 1**. Use the following procedure to test the functionality of Visionscape, Softsys1, and Virtual I/O.

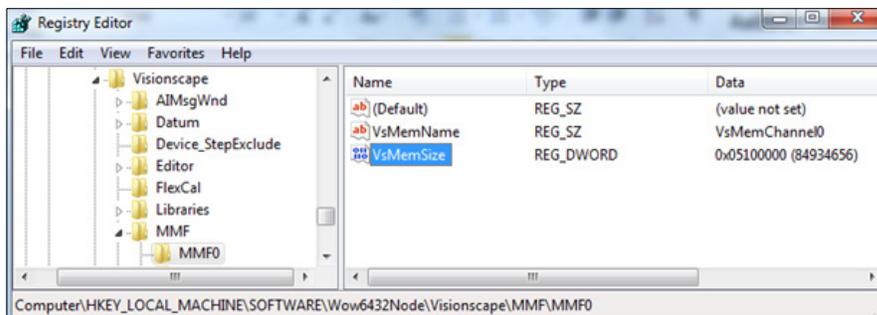
- Insert the Visionscape USB key. This is necessary to stay in **Run Mode** for more than 1 minute.
- Start **FrontRunner**.
- Create a job using the **Basler_raL6144-16gm_6144x13824_SoftSys.cam** camera definition file. **Be sure not to use the 12288x13824 version.**
- Set the **Buffer Count** for the camera to **3** to avoid using excess memory. All other camera Buffer Counts must be set to **1**.
- Set the job to load images from a file using the **test.tif** image.
- Verify that **GainOffset**, **Rectwarp**, and **Symbology Tools** can be inserted. **Symbology** goes in **Rectwarp**.
- Set these tools up on one of the symbols in **test.tif**. The Symbology Tool should be in Rectwarp. The Rectwarp should be set to magnify to **200%**.
- Verify that the job runs in setup.
- Verify that job runs in **Run Mode** and can be triggered with a **Virtual Trigger**.
- Close the program.
- Close the **AVP Backplane**.

Registry Setup for Device-Independent Visionscape

PanelScan uses Device Independent Visionscape when a separate program is used to take a picture and put it in a Memory Mapped File for Visionscape to access. This requires that a Memory Mapped File object be placed in the Registry.

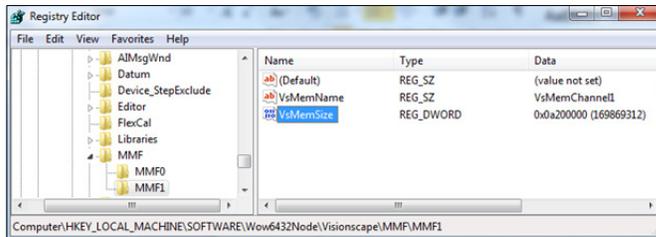
To set up the MMF for PanelScan Standard, follow this procedure:

- Set keys in the registry.
- Open the registry by navigating to **Start > Run**.
- Type **Regedit**.
- Navigate to **HKEY_LOCAL_MACHINE\SOFTWARE\Wow6432Node\Visionscape**.
- Create a **New Key** called **MMF**.
- Inside of MMF, create a **New Key** called **MMF0**.
- Inside of MMF0, create a **New String Value** called **VsMemName**.
- Modify the value of this string and insert **VsMemChannel0**.
- Inside of MMF0, create a **New DWord** (32-bit value) called **VsMemSize**.
- Modify the value of this DWord to **84,934,656** decimal (**0x05100000** hexadecimal). The registry should resemble the image below.
- Once finished verifying the settings, close the registry.



To set up the MMF for PanelScan Wide, follow this procedure:

- Set keys in the registry for the double wide buffer.
- Open the registry by navigating to **Start > Run**.
- Type **Regedit**.
- Navigate to **HKEY_LOCAL_MACHINE\SOFTWARE\Wow6432Node\Visionscape**.
- Create a **New Key** called **MMF**.
- Inside of MMF, create a **New Key** called **MMF1**.
- Inside of MMF1, create a **New String Value** called **VsMemName**.
- Modify the value of this string and insert **VsMemChannel1**.
- Inside of MMF1, create a **New DWord** (32-bit value) called **VsMemSize**.
- Modify the value of this DWord to **169,869,312** decimal (**0x0a200000** hexadecimal). The registry should resemble the image below.
- Once finished verifying the settings, close the registry.



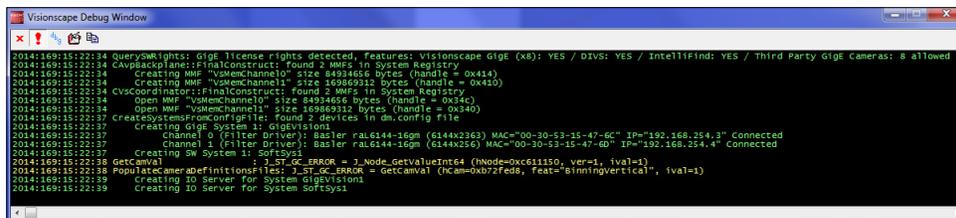
To use PanelScan as a two-camera system, put in both **MMF0** and **MMF1**.

Operation of Memory Mapped Files (MMFs)

Memory Mapped Files are created by Visionscape whenever the AVP Backplane runs. The AVP Backplane runs when you start FrontRunner or PanelScan.

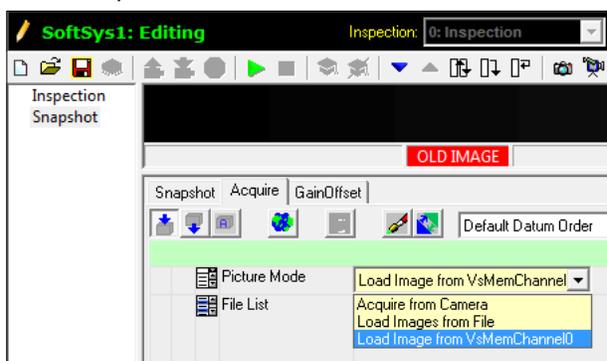
Important: You must have a Visionscape GigE license key, enabled for third party GigE cameras, installed in the system.

The creation of the MMFs is displayed in the Visionscape Debug Window. See the 2nd and 5th lines:



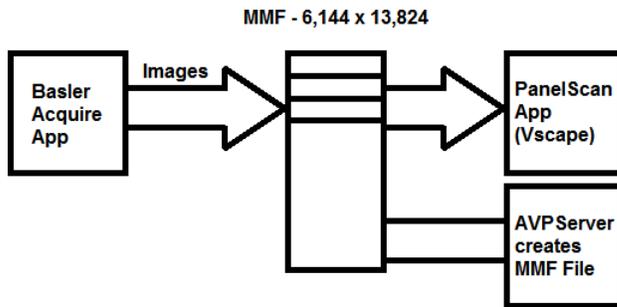
There are two ways to acquire an image whenever a new job is created in Visionscape, depending on the PanelScan configuration: **Load Image from VsMemChannel0** for PanelScan Standard and **Load Image from VsMemChannel1** for PanelScan Wide. The image below shows an example from Standard.

Note that you can create any number of Memory Mapped File channels in the registry so that you can have one per camera.



The diagram below shows how the components work together when the system is running.

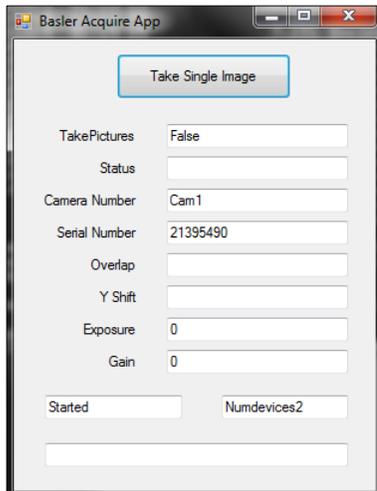
- **PanelScan** starts and in turn starts the **AVP Backplane**.
- The AVP Backplane launches and creates the **Memory Mapped Files**.
- When PanelScan launches, it automatically starts one instance of **Basler Acquire** for each camera.
- During PanelScan operation:
 - Basler Acquire takes pictures when the camera receives a hardware trigger.
 - Basler Acquire puts the acquired image into the MMF.
 - Basler Acquire then triggers PanelScan with Virtual I/O 1 to communicate that the new picture is ready.
 - PanelScan captures and processes the image.
 - PanelScan outputs the read results to file.



Basler Acquire Software Installation and Testing

Basler Acquire captures images and puts them in the shared memory file for Visionscape to read. This is a .NET program so it must be put on the system.

- Create a directory called **C:\PanelScan**.
- Create a subdirectory called **C:\PanelScan\BaslerApp**.
- Copy the **Debug** folder from the **BaslerAcquireInstall** directory directly into the **C:\PanelScan\BaslerApp** subdirectory.
- Perform the following steps to test the BaslerAcquire.exe installation file:
 - Open a command prompt.
 - Change the **Debug** directory by typing **cd c:\panelscan\baslerapp\debug**.
 - Start the program by typing **BaslerAcquire 1,SN,0,1,1** where **SN** is the serial number of the camera found on the camera label. The program should start automatically, but the window may be minimized.
 - Maximize the Basler Acquire window to verify that the software has been installed and runs correctly. If a camera is found, the user interface will show that the camera is **Started** and will show the **Serial Number**:



Close the BaslerAcquire program.