



**Series 600 SmartImage Sensor Installation Guide**

October 1999

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# Table of Contents

<b>1</b>	<b>INTRODUCTION TO THE SERIES 600</b>	<b>1</b>
<b>2</b>	<b>SERIES 600 SPECIFICATIONS</b>	<b>1</b>
2.1	Series 600 Components	1
2.2	Additional Components	2
2.3	Series 600 System Specifications	3
2.4	Dimensions	4
2.5	Model Numbers	5
2.6	Power & Digital I/O (15-pin Connector)	6
2.6.1	Wiring	6
2.6.2	Configuration	6
2.7	Ethernet Communications (RJ-45 Jack)	7
2.7.1	WIRING	7
2.7.2	Configuration	8
2.8	RS-422 Communications (RJ-11 Jack)	15
2.8.1	WIRING	15
<b>3</b>	<b>HARDWARE INTEGRATION</b>	<b>16</b>
3.1	Typical Inspection Sequence	16
3.2	Configuring Digital Inputs	17
3.2.1	Input Function	17
3.2.2	Invert Polarity	17
3.2.3	Debounce Times	17
3.3	Switching Products for Inspection	17
3.3.1	What is a Product?	17
3.3.2	Product ID & Digital Selection	18
3.3.3	Confirmation of Product Selection	19
3.4	Starting Inspections on Power-Up	19
3.5	Inspection Trigger Source	20
3.5.1	Delaying Image Acquisition After a Trigger Signal is Sent	20
3.6	Image Exposure Time	21
3.7	Configuring Digital Outputs	22
3.7.1	Output Function	22
3.7.2	Invert Polarity	22

3.7.3	Timing	22
3.8	Typical I/O Configuration	24
<b>4</b>	<b>TROUBLESHOOTING/FREQUENTLY ASKED QUESTIONS</b>	<b>25</b>
4.1	Series 600 System LEDs	25
4.2	Verifying Electrical Connections	25
4.3	Checking Timing Signals Using the Digital I/O Graph	26
4.3.1	Configuring the Digital I/O Graph	26
4.3.2	Using the Digital I/O Graph for Typical Testing Procedures	28
4.4	Communications Troubleshooting	29
	<b>APPENDIX A SERIES 600 STROBE LIGHT</b>	<b>30</b>
	<b>APPENDIX B SERIES 600 RING LIGHT</b>	<b>31</b>
	<b>APPENDIX C SERIES 600 MOUNTING BRACKET</b>	<b>32</b>
	<b>APPENDIX D SERIES 600 STROBE LIGHT BRACKET</b>	<b>33</b>
	<b>APPENDIX E SERIES 600 I/O BREAKOUT BOARD</b>	<b>34</b>
	<b>APPENDIX F ADVANCED ETHERNET &amp; TCP/IP</b>	<b>35</b>

# 1 Introduction to the Series 600

The *Series 600 SmartImage* Sensor is an on-line inspection device used for a variety of industrial applications.

The *Series 600* utilizes DVT's *FrameWork* software user interface. The *FrameWork* software is used to configure inspection applications with the aid of a PC. Once all of the inspection applications have been defined the *Series 600* will run as a stand-alone system and the PC may be removed.



Figure 1.1 The Series 600 SmartImage Sensor

This guide covers hardware installation, hardware integration and includes sections on Troubleshooting and Frequently Asked Questions.

- **Installation:** If you are physically installing and wiring the *Series 600 SmartImage* Sensor see Chapter **Error! Reference source not found.** The hardware installation section covers system specifications, mounting, pin-outs and wiring information.
- **Integration:** If you are integrating the *Series 600* into a manufacturing line see Hardware Integration, Chapter 3. The hardware integration section covers issues related to integrating the *Series 600* into the manufacturing line.
- **Troubleshooting:** If you have any problems integrating the *Series 600*, see Troubleshooting / Frequently Asked Questions, Chapter 4. The Troubleshooting section covers communications, imaging and conditions that make Products fail when they should not be failing.

## 2 Series 600 Specifications

### 2.1 Series 600 Components

The components that come with the **Series 600** vary depending on which model you receive. The model number indicates the configuration for a specific system. The following components come with a typically configured **Series 600 SmartImage** Sensor package:

- *Series 600 SmartImage* Sensor Unit
- Dedicated illumination source (the default is an LED strobe light)
- Lens adapter (CS mount to C mount converter)
- CS Mount, 8mm lens (default selection)
- DVT *Series 600* Installation Guide
- DVT *FrameWork* User Guide
- *FrameWork* on CD-ROM

Depending on your ordering options, the Series 600 may come equipped differently. The lens and illumination source might be different than those listed above.

## 2.2 Additional Components

To use the Series 600 system, a few additional components are required. The following additional equipment is also necessary:

### System

- **Power Supply:** Regulated 15-28V DC, 5 W. Supplying 210mA @ 24Volts.
- **Dedicated illumination:** Standard LED strobe light or optional light source. (Additional power is required for LED strobe illumination, description covered in a separate document.)
- **Inspection trigger source:** photoelectric sensor, proximity switch, programmable logic controller (PLC) etc.

### Cables

- **15-pin high density D-Sub:** Carries the Digital I/O and power lines. A fully populated, double shielded cable should be used. See Section 2.6 for more information on this connector wiring.
- **RJ-45 Ethernet cable:** Carries the Ethernet communications. A Category 5, 4 twisted pair, shielded (STP), EIA-568 cable should be used. Use straight through-type if connecting the Series 600 to a hub, then a PC. Use a crossover cable or connector if connecting the Series 600 directly to a PC. (See Section 2.7)
- **RJ-11 cable:** Carries the RS-422 communications. A Category 5, 2 twisted pair, shielded, USOC cable should be used. (optional, See Section 2.8)
- **Strobe Illumination Cable:** Connects an optional strobe light to the Series 600 system. Available from DVT in various lengths.

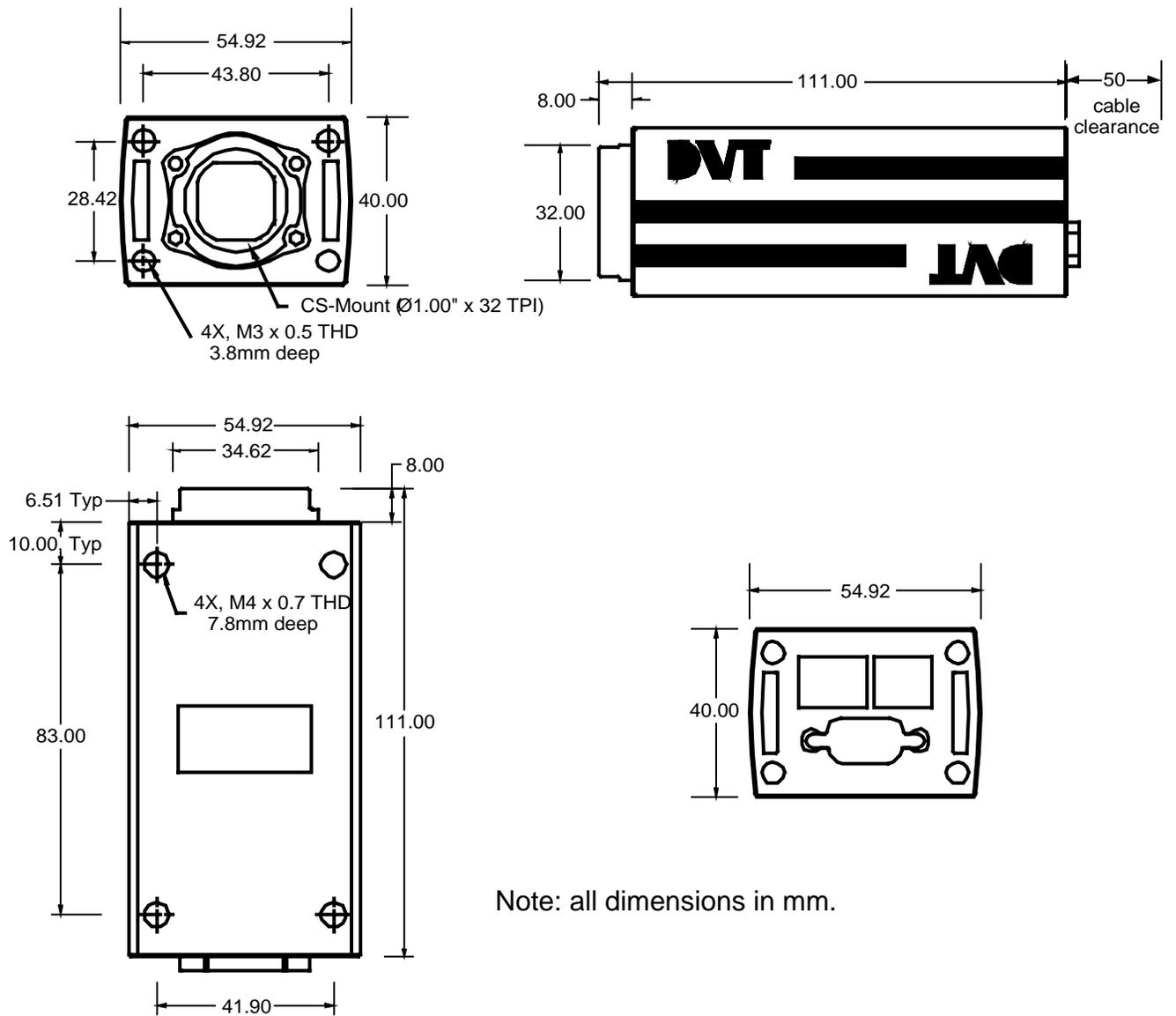
### PC Requirements

- **Pentium PC:** With **FrameWork** software installed, running Windows 95, Windows NT 3.5 or more recent release.
- **FrameWork Software:** PC must have the **FrameWork** software installed (requires 20 MB free disk space and 16 MB RAM).
- **Ethernet Card:** Use a 10/100 megabit Ethernet card with RJ-45 jack.

## 2.3 Series 600 System Specifications

<b>Mechanical</b>	Size: 114mm x 55mm x 40mm (not including lens) + add'l 50mm cable clearance		
	Mounting: Four M4 threaded holes (on bottom of unit), 7.9mm depth		
	Weight: 170g / 6 oz. (without lens)		
<b>Power Requirements</b>	24 Volts DC, 210 mA at 24 Volts (or minimum 5W supply), Regulated and Isolated ( <i>sold separately</i> ) <i>Additional 30W required per DVT LED array light used</i>		
<b>Operating Temperatures</b>	Maximum 50° C / 122° F		
<b>Image Sensor</b>	4.8mm x 3.6mm (1/3" format) CCD		
	Electronic Shuttering (10µs – 1s exposure times)		
	640 x 480 pixel resolution		
	7.4 µm x 7.4 µm, square pixels		
<b>Optics</b>	CS mount standard		
	C mount-capable with included adapter		
<b>External Ports</b>	15 pin high density D-Sub	RJ-45	RJ-11
	<i>Power and Digital I/O</i>	<i>Ethernet communications</i>	<i>RS-422 serial communications</i>
<b>Digital I/O</b>	24 Volts DC optically isolated		
	12 configurable inputs & outputs		
	NPN (current sinking) inputs, PNP (current sourcing) outputs, active high signals		
	Input can sink up to 1.5mA and outputs source a maximum of 200mA <i>Connect with a fully populated, double shielded, 15-pin high density D-Sub Cable (sold separately)</i>		
<b>Port A (RJ-45)</b>	Ethernet communications		
	10/100 megabit Ethernet		
	TCP/IP protocol		
	<i>Connect with a Category 5, shielded twisted pair (STP), EIA568 cable (sold separately)</i>		
<b>Port B (RJ-11)</b>	RS-422 serial communications		
	Up to 115.2k baud rate		
	<i>Connect with a Category 5, 2 shielded twisted pair (STP), USOC cable (sold separately)</i>		
<b>Certifications</b>	CE Approval pending		
<b>Inspection Speed</b>	6 to 6000 inspections per minute		
<b>Image Acquisition</b>	200µs - 28 ms (partial to full image acquisition)		
<b>Product Storage</b>	Up to 300 (depending on file size)		

## 2.4 Dimensions



Note: all dimensions in mm.

# 2.5 Model Numbers

The Series 600 model number is located on the back of the Series 600 unit.

**630 - C 3 E 4 0**

**Model Number**  
630: Resolution: 640 x 480

**Optics**  
C = CS/C lens mount

**Number of Connectors**  
3 = 3 connectors on Series 600 unit

**Communications Port A**  
E = Ethernet

**Communications Port B**  
4 = RS-422

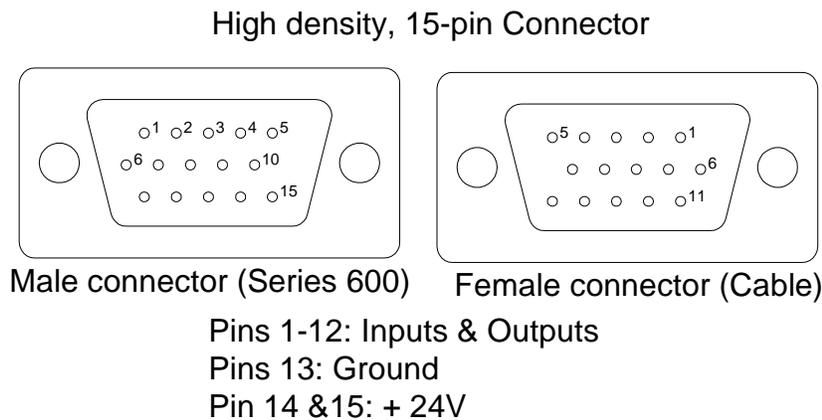
## 2.6 Power & Digital I/O (15-pin Connector)

On the **Series 600**, the 15-pin high density D-Sub connector carries the system's power connections and digital input/output lines. Inputs and outputs on the **Series 600** share twelve lines. Each I/O line is user-selectable as an input or output. Inputs for the **Series 600** are current sinking (NPN-type) and outputs are current sourcing (PNP-type). When viewing the **Series 600** system from the rear, the 15-pin connector is below the other two connectors (RJ-45 & RJ-11). The cable used for this port is a double shielded, 15-pin (fully populated), high density D-Sub cable. DVT supplies this cable in various lengths.

The cable can also be purchased off the shelf at many computer stores. Look for a **VGA monitor extension cable**. Extension cables are typically not fully populated (pin 9 is usually missing) or shielded. A standard VGA computer monitor cable (used to connect a monitor to a PC) cannot be used because multiple pins are missing, including the one carrying power (VP+, pin 15).

### 2.6.1 WIRING

To use the 15-pin D-Sub (high density) connector please refer to the following diagram:



**Figure 2** Power and Digital I/O connections are found on the 15-pin connector.

Inputs for the **Series 600** are current sinking (NPN-type) and outputs are current sourcing (PNP-type). Both inputs and outputs are active in the high state. That is, switching any I/O line to 24 V is read as an active signal. The following table summarizes this information about inputs and outputs:

	Signal Type	Inactive State Voltage	Active State Voltage	Current Limits
<b>Inputs</b>	Current sinking	0.3 V	14 V min. to activate	1.5 mA to activate
<b>Outputs</b>	PNP	0.3 V	22 V	100 mA maximum

When connecting DVT digital inputs and outputs to industrial devices, use current sinking input modules and PNP output modules.

### 2.6.2 CONFIGURATION

Within **FrameWork**, the user may select from many functions for each input/output line. To configure I/O lines in **FrameWork**, select the **I/O** menu and click on the **I/O Parameters** selection. Please refer to Section 3.7 for more information on how to configure the **Series 600** input and output lines.

- **Inputs:** Some I/O lines will be designated as inputs. One example of the use of an input line is the trigger signal. Typically, integration will use a digital triggering signal for inspections.

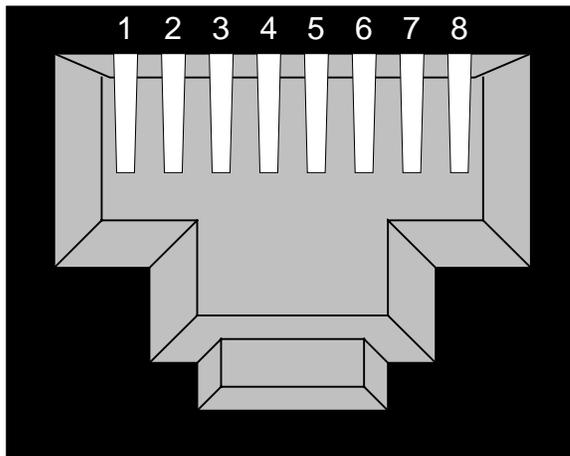
- **Outputs:** The I/O lines not already designated as inputs can be used as outputs. The fail signal is an example of a commonly used output. This signal flags flawed parts and could be used to activate a rejection mechanism.

## 2.7 Ethernet Communications (RJ-45 Jack)

The RJ-45 jack for Ethernet communications is found on the back of the **Series 600** system, just above the 15-pin connector and to the right of the RJ-11 jack.

### 2.7.1 WIRING

To make use of the RJ-45 jack for Ethernet communications, use a 10 Base T Category 5 network cable. DVT recommends using a shielded (STP) cable to guard against electrical noise. The cable should be wired according to the EIA 568 standard. The cable can be either straight through or crossover. If connecting through a hub, a straight-through cable is used. If connecting directly to a PC's Ethernet card, use a crossover cable. Cables purchased through DVT are straight through and when purchased with a crossover converter (part #CON-RJ45N), can be used in exactly the same manner as a crossover cable.



RJ-45 Jack

Pin	Function
1	TX+
2	TX-
3	RX+
4	NC
5	NC
6	RX-
7	NC
8	NC

*Note: DVT recommends using Category 5 shielded cables with molded connectors for the best performance.*

**Figure 3 RJ-45 Wiring.**

## 2.7.2 CONFIGURATION

The RJ-45 connection is designed to communicate between the **Series 600** and a PC running **FrameWork**. To do this, the PC must have an Ethernet network card running the TCP/IP protocol.

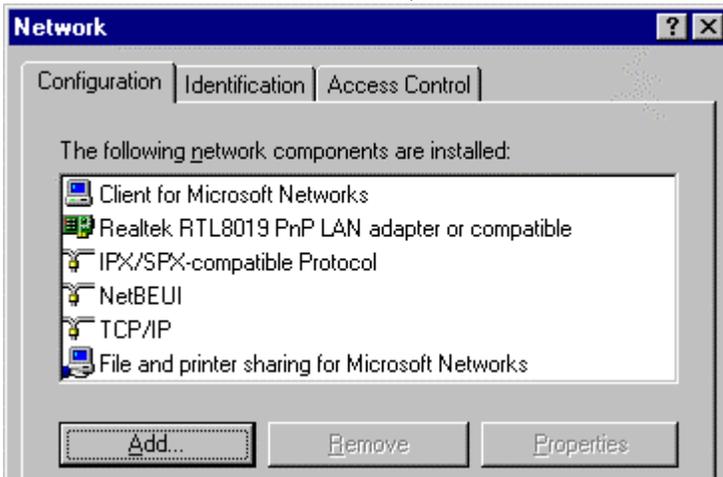
### TCP/IP Setup

In this section, we will step through setting up the TCP/IP protocol on a PC. TCP/IP stands for Transmission Control Protocol / Internet Protocol and is based on identifying elements on a network by unique numbers, called IP numbers.

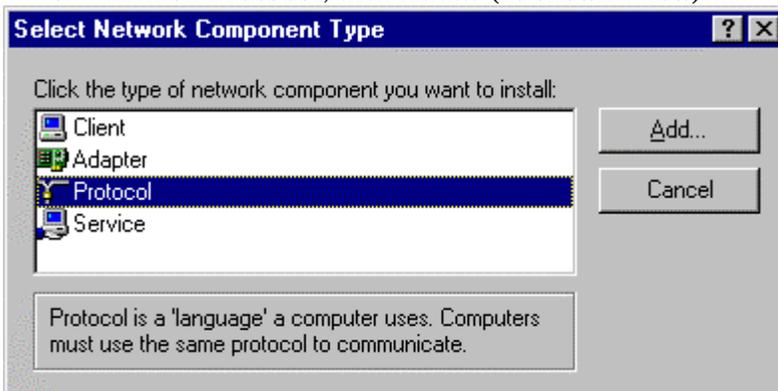
In our use, we will be identifying our PC with one IP number and any Series 600 systems with another. There are several methods of connecting PCs and Series 600 systems. In the following sections, after configuring TCP/IP on our PC, we will move on to these various methods.

For setup on a PC running Windows 95 (NT and Win98 systems may appear differently):

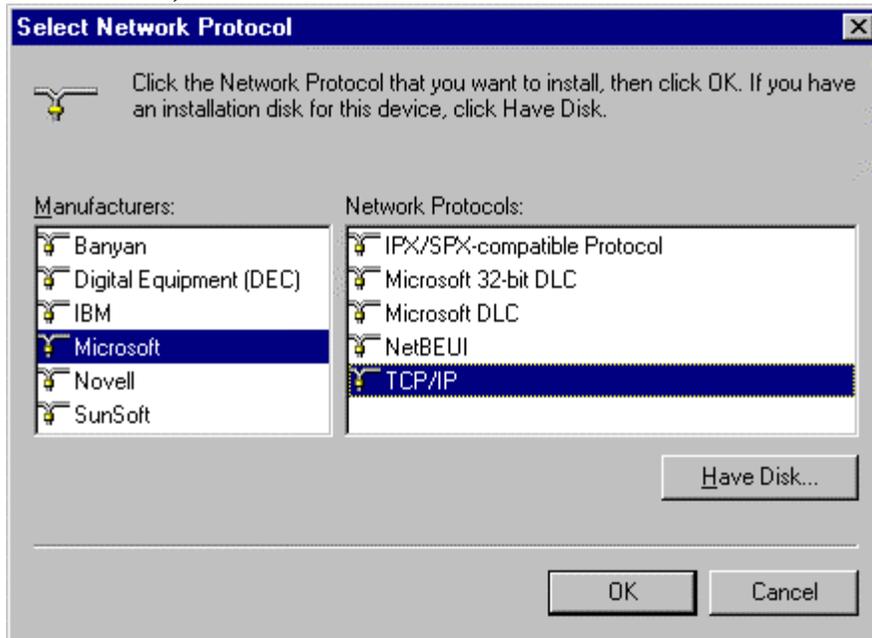
1. Click on the **Start** menu in Windows, select **Settings**, then **Control Panel**.
2. Double click on the **Network** Control Panel icon (shown above right).
3. Check the list of installed network components for TCP/IP (as shown at right). If TCP/IP is on the list, click **Cancel** and skip to the end of this list.
4. If TCP/IP is not on the list, click the **Add** button.



5. Click on **Protocol**, then **Add...** (as shown below).



6. Under Manufacturer, click Microsoft and under Protocol, click TCP/IP then click **Ok** (see below).



7. Windows will then install the protocol and return you to the Network control panel. During this installation process, the PC may ask for the Windows 95 CD-ROM and will copy relevant files to the PC's hard drive. After this is done, the PC must be restarted.

## Connecting One PC to One Series 600

To communicate with the **Series 600** system directly, you will need an Ethernet crossover cable (or a straight through cable with a crossover converter on one end) with RJ-45 plugs on each end. The diagram below shows an example of this connection. This section enables users to directly connect one PC and one Series 600 system. In this scenario, no other networks are involved (the PC is not otherwise networked). Typically, computers on a network will obtain IP numbers from a server. However, when connecting a PC and Series 600 directly, no network is involved. So, in Step 5, the user will name an IP number to identify the PC being used. All Series 600 systems arrive pre-programmed with an IP number. That number is 192.168.0.242. The connecting PC must use an IP number different than the Series 600 system.

The diagram below shows a typical installation using a single PC and one Series 600 unit. IP addresses given in the diagram are for demonstration purposes (the user has flexibility in assigning IP addresses to both the PC and Series 600 unit).

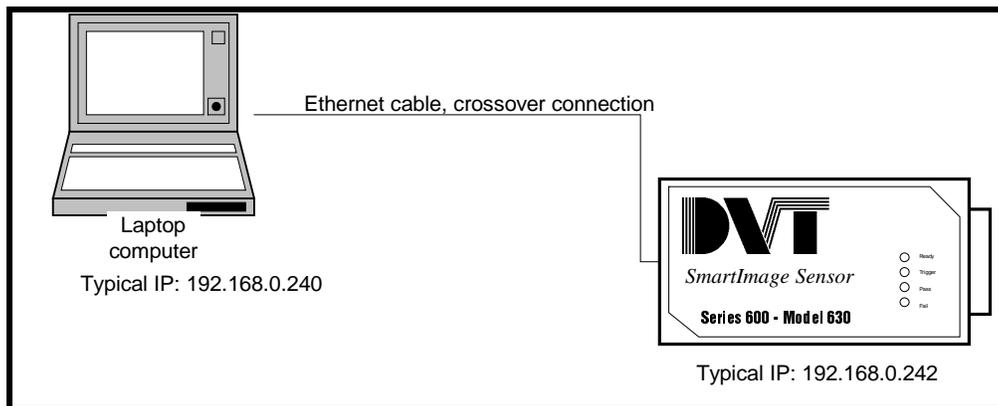


Figure 4 Connecting 1 PC and 1 Series 600 system.

### To connect:

1. Make a crossover RJ-45 connection between the PC and Series 600. Plug the cable into the RJ-45 jack on the rear of the **Series 600** and the Ethernet card in your PC.
2. Click on the **Start** menu, choose **Settings**, then **Control Panel**.
3. Double-click on the Network Control Panel icon.
4. Select the TCP/IP protocol and click on the **Properties** button.
5. Click on the radio button for "Specify an IP address:" and type an IP address of 192.168.0.240 to identify your PC. Also, type a subnet mask of 255.255.255.0.
6. Click **Ok** to close the TCP/IP Properties dialog box.
7. Click **Ok** to close the Network Control Panel.
8. Start **FrameWork**.
9. In the **PC Communications** dialog box, expand the "Ethernet" tree, select "Default Series 600" and click the **Connect** button.

**Note:** IP numbers for the Series 600 system and PC should start out exactly the same (i.e. 192.168.0.xxx). Only the last numbers should be different.

For more information about IP addressing, please see Appendix C, beginning on page 33.

## Connecting One PC to Multiple Series 600s

In this scenario, a lone PC (not otherwise networked) is communicating with multiple Series 600 units. In addition to a PC and the Series 600 units, the user will need to supply a hub and Ethernet cables. All cables used for this scenario are the straight-through type, because the hub will handle the crossover function. The diagram below shows a typical layout of the PC and Series 600 network. All IP addresses given are typical of an installation.

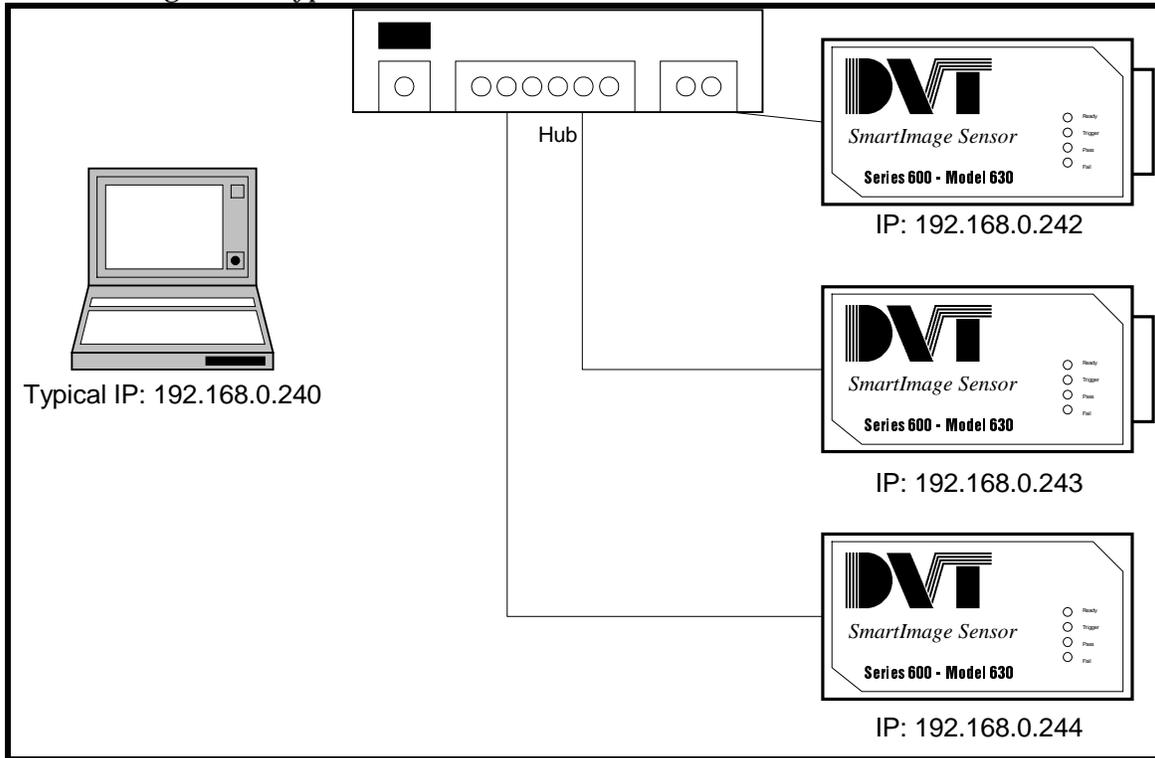


Figure 5 Connecting 1 PC to a network of Series 600 systems.

If a network of Series 600 systems is to be connected to a single PC (non-networked), follow these steps:

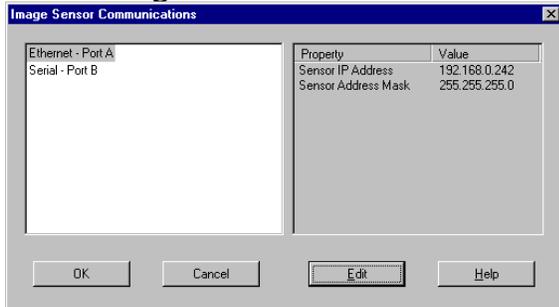
### Re-designating the IP address of a PC:

1. Connect one end of a straight through Ethernet (RJ-45) cable to the RJ-45 jack on the rear of one Series 600 system and the other end to a 10 or 100 megabit hub. Repeat for all Series 600 systems to be networked.
2. Connect a PC with an Ethernet card to the hub.
3. Click on the **Start** menu, choose **Settings**, then **Control Panel**.
4. Double-click on the Network Control Panel.
5. Select the TCP/IP protocol and click on the **Properties** button.
6. Click on the radio button for "Specify an IP address:" and type the IP address 192.168.0.240 to identify your PC. Also, type the subnet mask 255.255.255.0.
7. Click **Ok** to close the TCP/IP Properties dialog box.
8. Click **Ok** to close the Network Control Panel.
9. Restart the PC.

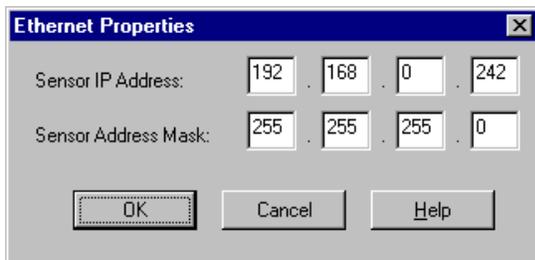
At this point, your PC should have the IP address of 192.168.0.240. Now, we need to assign unique IP addresses to the Series 600 systems.

### Re-designating the IP address of a Series 600:

1. Temporarily connect an RJ-11 cable to Port A of the Series 600 system and use the RS-422 / RS-232 converter (DVT part CON-4T2) to connect to a serial port on the PC.
2. Start **FrameWork**.
3. Select “Serial” and the appropriate COM port (usually “COM 1”) from the **PC Communications** dialog box and click **Connect**.
4. After communications are started with the Series 600, select the **Comm** menu and click **Image Sensor Communications** (below).



5. Click on “Ethernet – Port A” and click the **Edit** button and **Ethernet Properties** will appear (below).



6. Type a new IP address next to “Image Sensor Address”. This address is for the Series 600 unit to which you are currently connected. This value should begin the same as the IP address for your PC (the first three sections should be identical, i.e. 192.168.0).
7. Type the “Sensor Address Mask” of 255.255.255.0.
8. Click **Ok** twice.
9. Click on the **Comm** menu and choose **PC Communications**. Click the **Disconnect** button.
10. Power-down the Series 600 unit. The next time the system powers up, the new IP address will be used. Label the system with its unique IP address.

Repeat these steps for each Series 600 system you have. When complete, the PC and all Series 600 systems will have unique IP addresses. Connect all of the systems to a hub (or multiple hubs) and the hub to your PC. You now have a “DVT network.”

**Notes:** These instructions suggest connecting serially to the Series 600 in order to change the IP address of the **SmartImage Sensor**.

This is recommended to avoid IP addressing conflicts between the PC and Series 600. An Ethernet connection could be made and the same should be followed to change a Series 600’s IP address. Remember, though, to communicate over Ethernet set your PC to have an IP address of 192.168.0.240 (The Series 600’s factory assigned IP address is 192.168.0.242).

Power must be cycled to the Series 600 before the new IP address will take effect.

For more information about IP addressing, please see Appendix C, beginning on page 33.

## Connecting a Networked PC to One or more Series 600s

The first two scenarios describe a lone PC connecting to one or more Series 600 systems. If a plant-wide Ethernet network is in place (using TCP/IP), then any Series 600 systems attached to that network via a hub can be addressed. In addition to the Series 600 units and at least one PC, users will need to supply a hub and Ethernet cabling.

In the following diagram, an example is shown of connecting several Series 600 units into an existing network. Here, the existing network is using 192.168.0.xxx type IP numbers. For other networks, change the IP address of the Series 600 to match the IP addressing scheme (consult with the Network Administrator for valid IP addresses).

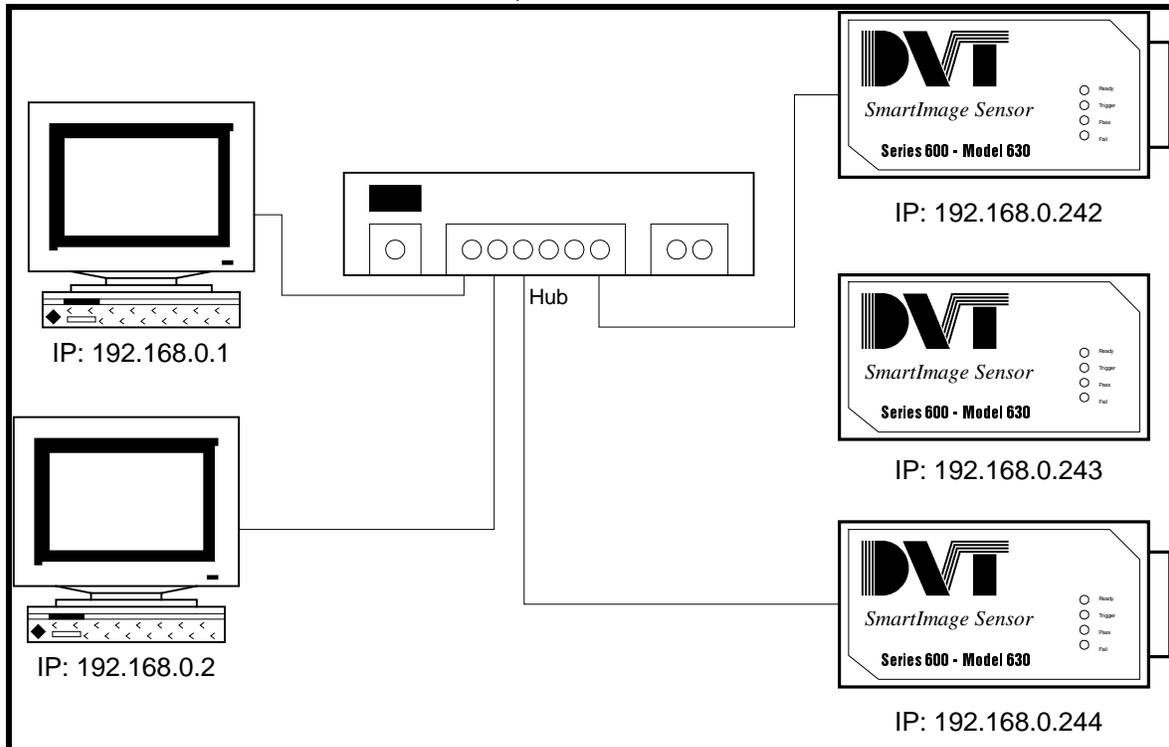
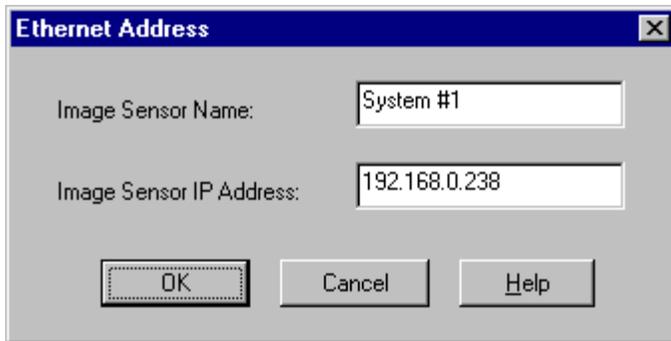


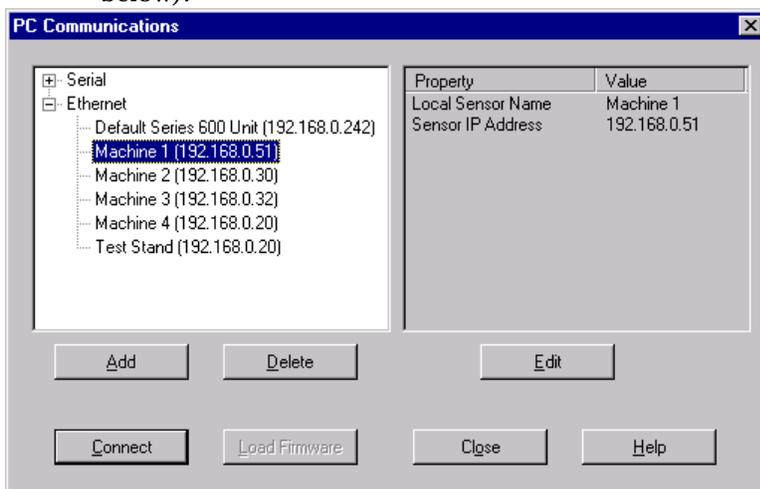
Figure 6 Connecting networked PC9s) to Series 600(s).

### Instructions:

1. Contact your network administrator regarding IP addresses for the Series 600 units, then re-designate the IP number for the Series 600 systems (see steps 1-10 on page 12). All Series 600 systems leave the factory pre-programmed with the IP number 192.168.0.242. In order for the PC to address each Series 600 individually, they will require unique IP addresses that are valid on your company's network.
2. Use a straight through Ethernet cable to connect the Series 600 to a hub on the network.
3. Start **FrameWork**.
4. In the **PC Communications** dialog box select "Ethernet"
5. Click on the **Add** button.
6. Next to "Image Sensor Name" type any name to help identify the Series 600 unit. The name is not actually used by **FrameWork**, but is provided to help tell systems apart (see below).



7. Next to “Image Sensor Address”, type the IP address assigned to that system (see above).
8. Click the **Ok** button.
9. Select the Image Sensor from the list under Ethernet and click the **Connect** button (see below).



**Notes:** Whenever connecting a node to an existing network, please exercise extreme caution. Connecting a Series 600 system onto a network without the Network Administrator’s knowledge is not recommended.

A general rule of thumb about IP addresses is that with the PC and Series 600 address masks set to 255.255.255.0, both PC and 600 IP addresses should start with the same three numbers.

Series 600 systems ship from the factory with the IP address 192.168.0.242. To attach the Series 600 to an existing network, you will need to change that IP to match the IP addressing used in your company’s network.

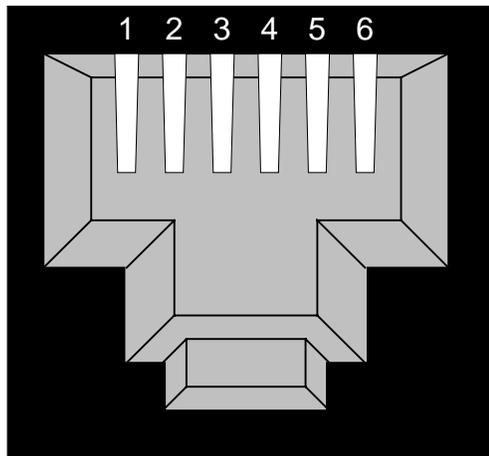
For more information about IP addressing, please see Appendix C, beginning on page 33.

## 2.8 RS-422 Communications (RJ-11 Jack)

Serial communications over an RS-422 protocol are accomplished via the RJ-11 jack on the Series 600. With an RS-422 to RS-232 converter (DVT Part CON-4T2), the RS-422 protocol can be converted to RS-232 on a 9-pin D-Sub connector.

### 2.8.1 WIRING

To use the RJ-11 jack for RS-422 communications, use a 2 twisted pair, Category 5 cable. DVT recommends using a shielded (STP) cable to guard against electrical noise. The cable should be wired according to the USOC standard.



RJ-11 Jack

Pin	Function
1	+5 V
2	TX+
3	RX-
4	RX+
5	TX-
6	GND*

\* connection to ground is optional

*Note: DVT recommends using Category 5 shielded cables with molded connectors for the best performance.*

**Figure 7 RJ-11 Jack.**

# 3 Hardware Integration

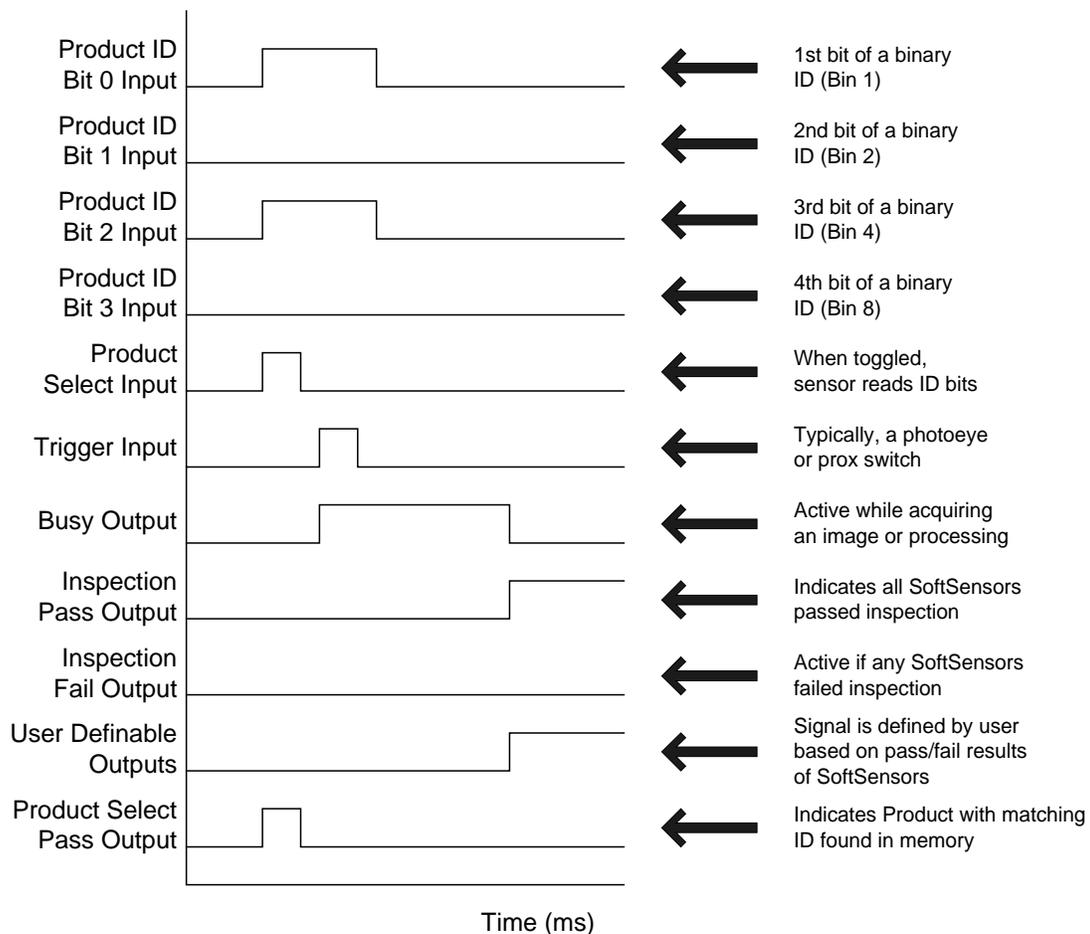
The Hardware Integration section includes information on using the *FrameWork* software to configure your Series 600 system. This section mainly deals with setting up digital I/O.

*FrameWork* is the software that is used to configure the *Series 600 SmartImage* Sensor for inspections. Once installed, *FrameWork* actually exists in two places: the software resides on a PC, and the firmware resides in the *Series 600*. Inspections are set up using both the PC and the *SmartImage* Sensor. Once the inspection process has been set up, the *FrameWork* firmware will control the DVT *SmartImage* Sensor independently of the PC. A PC can be used to monitor inspection results if desired, but the *SmartImage* Sensor is designed to operate without the need for a PC. For detailed information on *FrameWork*, see the DVT *FrameWork* User Guide.

The *FrameWork* software provides many tools designed to aid in the integration process. Let's look at a typical inspection sequence, and then discuss software integration issues related to the inspection process.

## 3.1 Typical Inspection Sequence

For each part to be inspected, the SmartImage Sensor must take an image, process that image for inspection, and set outputs. The following diagram shows the interaction with I/O lines to take an inspection of a part. In Figure 3.1, a Product with an ID of 5 is selected and inspected. The Product passes inspection.



**Figure 3.1 Typical inspection timing diagram.**

## 3.2 Configuring Digital Inputs

Inputs on the *Series 600* are configured from *FrameWork*'s **I/O** menu, **I/O Parameters** selection, **Inputs** tab. On the *Series 600* system, 12 multipurpose I/O lines may be configured as inputs or outputs.

### 3.2.1 INPUT FUNCTION

Inputs on the *Series 600* can serve one of three functions. The following table summarizes these functions:

Input Functions	Purpose
Product ID Bits	Binary equivalent of an assigned <i>Product ID</i> for a Product.
Product Select	Toggled when <b>Product ID</b> bits are active to select a Product.
Inspection Trigger	Toggled to start acquisition of an image for inspection.

For each input line, a function may be assigned from the drop down list of functions.

### 3.2.2 INVERT POLARITY

Input signals on the *Series 600* are active high (switching to 24V). Check "Invert Polarity" for any input, and that input will read active when at 0V.

### 3.2.3 DEBOUNCE TIMES

The debounce time parameter allows the *Series 600* to stop accepting signals for a specified period of time after a signal is received. This is essential where the signal is noisy, for instance if a mechanical device is involved that produces extraneous electric noise. Noisy signals are often a problem with the use of mechanical relays. Debounce time can be configured for three types of signals: trigger signals, select signals, and input signals.

*FrameWork*'s solution for noisy trigger signals is found in the Inputs tab of the I/O Parameters dialog box. Click **I/O** | **I/O Parameters** and choose the **Inputs** tab.

Debounce time is set for a signal at the beginning of the signal (active edge) and at the end of the signal (inactive edge). All signal edges after the first edge will be ignored for the amount of the debounce time.

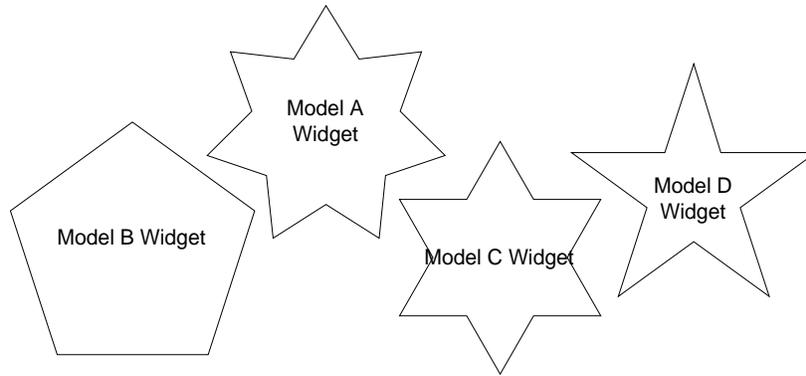
That is, if a 10 ms debounce time is set for the active edge, the *Series 600* will not accept another signal for 10 milliseconds after the signal is first received.

## 3.3 Switching Products for Inspection

### 3.3.1 WHAT IS A PRODUCT?

The Product is *FrameWork*'s term for all of the criteria defined by a user to inspect a single type of part. Depending on the requirements of an installation, users will need to switch Products quickly, without the interaction of a PC running *FrameWork*. The *Series 600* allows you to digitally select up to 256 different Products.

Figure 3.2 shows an example of a family of widgets manufactured by one facility. For each widget, a different set of inspection parameters must be applied. In this case, the user would need to create 4 different Product files. Four inputs are necessary in order to switch between these four Products: 1) Trigger, 2) Product Select, 3) Product ID Bit 0, and 4) Product ID Bit 1. For more information on configuring input lines, please refer to Section 3.2.



**Figure 3.2 A family of parts requires separate Products within FrameWork in order to inspect for different types of flaws.**

### 3.3.2 PRODUCT ID & DIGITAL SELECTION

Products are identified by the SmartImage Sensor using an identification (ID) numbering scheme. In turn, these ID numbers can be signaled using the Series 600 digital inputs. When using digital inputs, the ID number must be transformed into a binary number. Each input bit is actually a binary value (bit 0 is the least significant).

*Series 600* systems can digitally identify a large number of Products. This is because all 12 I/O lines are selectable as inputs or outputs. In order to configure the I/O lines, click on the **I/O** menu and choose the **I/O Parameters** option. Mapping I/O line functions is a system-wide parameter, meaning that all Products on the system will share this setting. Because configuring lines as inputs means limiting the number of outputs, before committing to a certain number of input lines, give some thought as to which outputs are needed. Refer to Section 3.7 for further information on configuring the digital outputs.

- ◆ 4 Product ID Bits =  $2^4$  Products = 16 Product IDs
- ◆ 5 Product ID Bits =  $2^5$  Products = 32 Product IDs
- ◆ 6 Product ID Bits =  $2^6$  Products = 64 Product IDs
- ◆ 7 Product ID Bits =  $2^7$  Products = 128 Product IDs
- ◆ 8 Product ID Bits =  $2^8$  Products = 256 Product IDs

A common configuration for I/O setup involves designating 4 lines as Product ID bits (bits 0 through 3). The following table reviews the binary combinations for 16 Product ID numbers (binary 0-15) using these 4 input bits:

Product ID	Binary Pattern (Bit 3, Bit 2, Bit 1, Bit 0)	Product ID	Binary Pattern (Bit 3, Bit 2, Bit 1, Bit 0)	Product ID	Binary Pattern (Bit 3, Bit 2, Bit 1, Bit 0)
0	0,0,0,0	6	0,1,1,0	11	1,0,1,1
1	0,0,0,1	7	0,1,1,1	12	1,1,0,0
2	0,0,1,0	8	1,0,0,0	13	1,1,0,1
3	0,0,1,1	9	1,0,0,1	14	1,1,1,0
4	0,1,0,0	10	1,0,1,0	15	1,1,1,1
5	0,1,0,1				

The user may assign Product ID numbers in *FrameWork* from the **Products** menu, **Product Management** selection. Please refer to the *FrameWork* User Guide for more information on assigning Product ID's.

Digitally selecting a Product is a two step process. First, set the binary bit pattern of a Product's ID number on the "Product ID Input" lines. Next, toggle the Product Select input line. The following diagram shows the relative timing of this procedure for a Product with an ID number of 5.

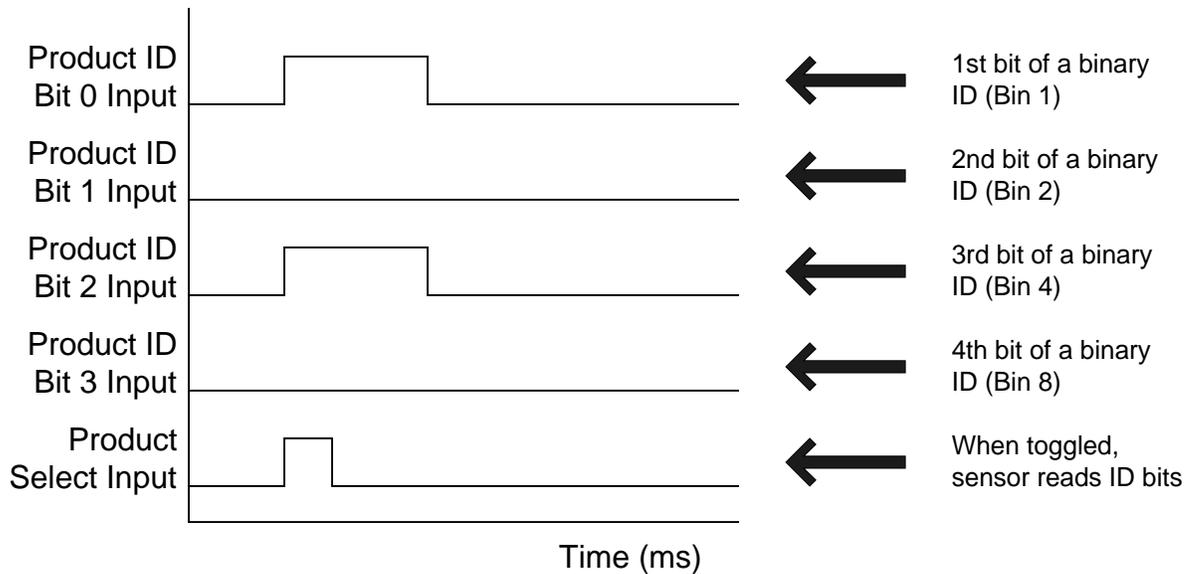


Figure 3.3 Select a Product using the digital inputs.

### 3.3.3 CONFIRMATION OF PRODUCT SELECTION

Two outputs are dedicated to alerting the user to the success or failure of the digital selection process.

**Product Select Pass:** The *Series 600* provides a Product Select Pass signal to verify that the Product Select signal is being received correctly. While the Product Select signal is held active, the Product Select Pass line will also be active if the *Series 600* is receiving a valid Product ID signal. A Product ID must be assigned to the Product being selected and the Product Select signal must be received in order for the Product Select Pass signal to go active.

**Product Select Fail:** The *Series 600* provides a Product Select Fail signal to warn that the Product Select signal is being received incorrectly. While the Product Select signal is held active, the Product Select Fail line will also be active if the *Series 600* is receiving an invalid Product Select signal. If no Product ID exists for the Product ID number selected or the Product Select signal is not received the Product Select Fail signal will go active.

## 3.4 Starting Inspections on Power-Up

The Power-on Product allows the system to begin running inspections at power-up. The Power-on Product is the Product used for inspection when the *SmartImage Sensor* is powered up. The Power-on Product is assigned in the Product Management dialog box. To open this dialog, go to **Products | Product Management**.

Only Products which have been saved to flash memory may be assigned as Power-on Products. The Power-on Product assignment is critical where the *SmartImage Sensor* is used as a stand-alone system. Once the system is configured with a PC, the Power-on Product must be assigned in order for the sensor to signal digital outputs (known as *running inspections*).

In selecting the Power-on Product at start-up, the *SmartImage Sensor* actually completes 2 tasks. First, the system selects the named Product for inspections (called the Current Inspection Product). This same function can be accomplished using the Product Selection process described in section 3.3.2. Second, in naming a Power-on Product, the *SmartImage Sensor* sets the Inspection State to Running.



**Figure 3.4 Inspection State, as shown on the Standard Toolbar (left) and Expanded Toolbar (right).**

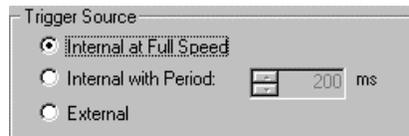
The *SmartImage* Sensor must have Inspections Running (radio button on the right side of the Standard Toolbar) to output the results of an inspection. When an inspection application is being developed with the PC, Running Inspections mode can be toggled on and off. Inspections must be set to Running in order for the *SmartImage* Sensor continue running after the *FrameWork* software has been exited.

The Inspection State is a system-wide setting. That is, Products are not stored with the last Inspection State. Therefore, at Power-on, in order for the SmartImage Sensor to be placed in Running mode (and thus display inspection results over digital outputs), a Power-on Product *must* be named.

## 3.5 Inspection Trigger Source

The inspection trigger signal is used to begin an inspection. The trigger signal should be sent after the Product has been selected. The *Series 600* begins the inspection process at the beginning of the trigger signal, and does not begin an inspection again until a new trigger signal is received.

A trigger signal is generated either externally or internally. The *Trigger Source* section of the Image Parameters dialog box is used to determine whether an internal or external trigger is used to begin inspections. To bring up the Image Parameters dialog box, click the **Images** menu and choose the **Image Parameters** selection.



**Figure 3.5 Trigger Source Options.**

Basically, the user may choose from three options in naming the triggering source:

- ◆ **Internal At Full Speed:** Internal triggers are generated by the SmartImage Sensor. That is, *FrameWork* controls the taking of inspections. Normally internal triggering is used only when initially setting up an inspection. Internal triggers are timed so that no inspection functions are overlapped (the image acquisition and image inspection).
- ◆ **Internal with Period:** Similar to the internal trigger described above, *FrameWork* signals the beginning of the image acquisition process. In this case, however, the user may pre-define the rate of trigger signals. Be careful, however, in setting the trigger period too low. If a trigger time is lower than the overall inspection time, then all inspections will not be taken and resource conflicts will occur. Communications between the PC and Series 600 may encounter difficulties as well if the period is set too fast.
- ◆ **External:** External triggering is normally used once an inspection has been defined, and the external trigger comes from a PLC or a photoelectric cell, or some other external device. External triggers require a minimum pulse width of 2 milliseconds.

### 3.5.1 DELAYING IMAGE ACQUISITION AFTER A TRIGGER SIGNAL IS SENT

*FrameWork* provides a way to delay image acquisition after a trigger signal is received by the *Series 600* in the Image Parameters dialog box. This feature is useful on manufacturing lines when it is necessary to trigger an inspection at a point on the line preceding the point at which image acquisition takes place. To bring up the Image Parameters dialog box, click **Images** | **Image Parameters**.

To delay image acquisition after the trigger signal, simply enter the millisecond time delay in the Delay After Trigger edit box, or use the spin buttons to set the delay.

## 3.6 Image Exposure Time

Exposure time refers to the time that the charged-coupled device (CCD) in the image sensor head is exposed to light during image acquisition. The longer the exposure time, the more light enters the CCD. The exposure time you set will depend on the demands of the inspection and available lighting. Two factors will determine the exposure time you set for an inspection. First, consider the overall speed of the parts. For high speed parts, short exposure times will be necessary to minimize blur within the images. Second, consider the overall inspection rate (parts per minute). In situations where the overall part rate is high, you should try to reduce exposure time. In both cases, you will want to reduce the exposure time to optimize the inspection.

You have the following options where you must reduce exposure time and maintain overall image intensity:

- ◆ Increase the light aimed at the inspection area.
- ◆ Increase the gain on the CCD. Increasing the gain makes the CCD more sensitive to light. The greater the gain, the grainier the image. Higher sensor gains may affect the inspection.
- ◆ Use a lens with an adjustable aperture. Many C and CS mount lenses have aperture controls. An *aperture* is the hole which lets light through the lens onto the imaging surface. The larger the hole, the more light is allowed to strike the CCD.

Increasing exposure time slows down the image acquisition process and may increase image blur for moving inspections.

## 3.7 Configuring Digital Outputs

The timing and the duration of the digital outputs can be setup using the DVT *FrameWork* interface. For information on interfacing with these output lines, please consult Section **Error! Reference source not found.**

### 3.7.1 OUTPUT FUNCTION

The 12 multipurpose I/O lines on the *Series 600* system are configurable as inputs or outputs. The following table summarizes the available output functions. Any function may be assigned to any output line. This assignment is made from the **I/O Parameters** dialog box on the **I/O** menu.

Output Functions	Purpose
Pass	After inspection is completed, <b>Pass</b> is set to show that <i>all</i> SoftSensors within the Inspected Product passed inspection.
Warn	After inspection is completed, <b>Warn</b> is set to show that <i>any</i> SoftSensor within the Inspected Product met its warn condition.
Fail	After inspection is completed, <b>Fail</b> is set to show that <i>any</i> SoftSensor within the Inspected Product failed inspection.
Busy	<b>Busy</b> is set after <b>Inspection Trigger</b> is read until the inspection result ( <b>Pass</b> or <b>Fail</b> ) is signaled.
Strobe	When active, any connected strobe light source will be on during image exposure.
Resource Conflict	Signals some conflict with using the system resources. Typically, signals that an <b>Inspection Trigger</b> was received while the system was acquiring another image.
Select Pass	While <b>Select</b> input is active, <b>Select Pass</b> signals that the <b>Product ID</b> bits signaled a Product ID found in the system.
Select Fail	While <b>Select</b> input is active, <b>Select Fail</b> signals that the <b>Product ID</b> bits signaled an invalid Product ID.
Acquiring	Signaled after <b>Inspection Trigger</b> is read, during <i>exposure time</i> and <i>image digitization</i> . Another <b>Inspection Trigger</b> cannot be signaled while <b>Acquiring</b> is active. ( <i>Note: Acquiring + Inspecting = Busy</i> )
Inspecting	Signaled after the <b>Acquiring</b> signal while an image is being processed for inspection. ( <i>Note: Acquiring + Inspecting = Busy</i> )
Inspection Toggle	Changes state once with each inspection performed.
User Definable	Multiple outputs defined on the <b>I/O Parameters</b> dialog, <b>User</b> tab.

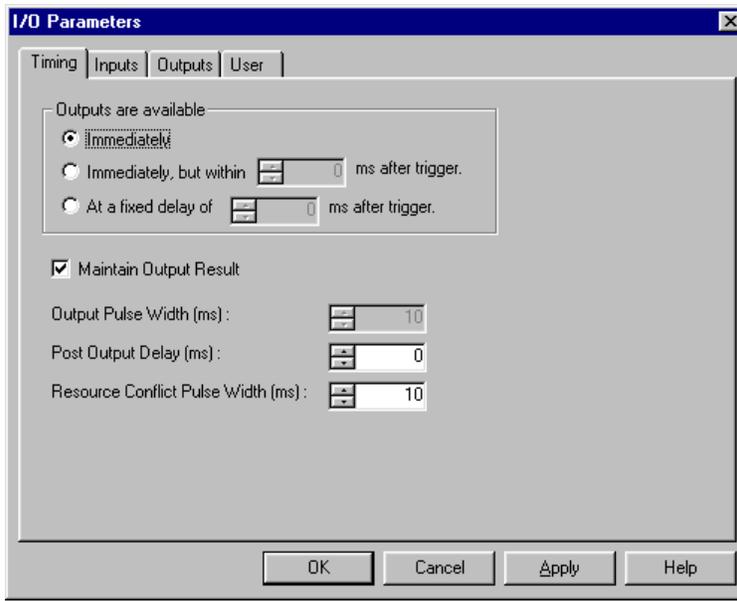
In addition to the digital output lines, all *Series 600* systems include 4 LED indicators. Each LED can show 2 colors (Red and Green). On the front of the system, these LEDs are labeled, “Ready”, “Trigger”, “Pass”, and “Fail.” The Pass and Fail LEDs may be assigned any **Output Function** from the corresponding drop down list.

### 3.7.2 INVERT POLARITY

Any line configured as an output on a *Series 600* system is active in the high state. Check “Invert Polarity” to read 0 volts in the active state.

### 3.7.3 TIMING

Output timing is controlled in the Timing tab of the I/O Parameters dialog box. Click **I/O | I/O Parameters** and then click the **Timing** tab. Figure 3.6 shows the Timing tab of the I/O Parameters dialog box.



**Figure 3.6: Set the output timing in the I/O parameters dialog.**

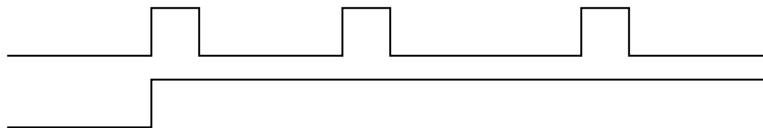
The *Outputs are available* section of the Timing tab allows you to control when the output signal is sent:

**Immediately:** Outputs are sent immediately after inspection processing is complete. Typically the busy signal is monitored by a PLC for correct signal timing

**Immediately, but within \_ ms after trigger:** Outputs are sent immediately after the inspection is complete, but if the inspection is not completed within the time allotted, the inspection will fail. This is useful if you are using a rejection station and you wish to ensure the result is available in time to reject the part.

**At a fixed delay of \_ after trigger:** Outputs are sent at the delay you specify after the trigger signal is received. If inspection has not occurred within the time allotted, the inspection will fail. Typically the PLC uses a timer so that it knows when to look for outputs.

**Maintain Output Result:** If you wish the output signal to remain on after an inspection is completed, the Maintain Output Result box should be checked. If you wish the output to remain on for a specific length of time after the inspection takes place, uncheck the Maintain Output Result box and then specify the output pulse width. The output pulse width is the length of time that the output signal remains on after inspection.



**Figure 3.7 Top: Pulsed outputs vs. Bottom: Maintained outputs.**

## 3.8 Typical I/O Configuration

The following table outlines the typical configuration of inputs and outputs on a Series 600 system:

Pin	Input Function	Invert Polarity	Active Debounce Time (ms)	Inactive Debounce Time (ms)
Pin 1:	Trigger	<input type="checkbox"/>	10	10
Pin 2:	Product Select	<input type="checkbox"/>	10	10
Pin 3:	Product ID Bit 0	<input type="checkbox"/>	10	10
Pin 4:	Product ID Bit 1	<input type="checkbox"/>	10	10
Pin 5:	Product ID Bit 2	<input type="checkbox"/>	10	10
Pin 6:	Product ID Bit 3	<input type="checkbox"/>	10	10
Pin 7:	(None)	<input type="checkbox"/>	10	10
Pin 8:	(None)	<input type="checkbox"/>	10	10
Pin 9:	(None)	<input type="checkbox"/>	10	10
Pin 10:	(None)	<input type="checkbox"/>	10	10
Pin 11:	(None)	<input type="checkbox"/>	10	10
Pin 12:	(None)	<input type="checkbox"/>	10	10

Pin	Output Function	Invert Polarity	Pin	Output Function	Invert Polarity
Pin 1:	(None)	<input type="checkbox"/>	Pin 9:	User1	<input type="checkbox"/>
Pin 2:	(None)	<input type="checkbox"/>	Pin 10:	User2	<input type="checkbox"/>
Pin 3:	(None)	<input type="checkbox"/>	Pin 11:	Busy	<input type="checkbox"/>
Pin 4:	(None)	<input type="checkbox"/>	Pin 12:	Strobe	<input type="checkbox"/>
Pin 5:	(None)	<input type="checkbox"/>	Fail (Red LED):	Fail	<input type="checkbox"/>
Pin 6:	(None)	<input type="checkbox"/>	Fail (Green):	(None)	<input type="checkbox"/>
Pin 7:	Pass	<input type="checkbox"/>	Pass (Red LED):	(None)	<input type="checkbox"/>
Pin 8:	Fail	<input type="checkbox"/>	Pass (Green LED):	Pass	<input type="checkbox"/>

## 4 Troubleshooting/Frequently Asked Questions

The DVT *FrameWork* User Interface contains many useful tools for diagnosing many types of problems. The major tools for diagnosing problems are the LED indicators on the outside of the system case and the Digital I/O tools within *FrameWork*.

### 4.1 Series 600 System LEDs

The *Series 600* provides LED function codes and a diagnostics mode for hardware diagnostics. The *Series 600* provides several LEDs which show various system states. Each LED on the Series 600 is software configurable. That is, each LED can be set up to display a specific I/O line. In addition, the LEDs are bi-color (red/green). By default, the LEDs are configured to display the following information:

Function Name	Description
Ready	Glows green if system is powered and ready to inspect. Flashes red once per second if in diagnostics mode.
Trigger	Glows green if system is currently receiving an external trigger signal.
Pass	Glows green if system has completed a passed inspection.
Fail	Glows red if system has completed a failed inspection.

### 4.2 Verifying Electrical Connections

The *FrameWork* software has an I/O Diagnostics feature which allows the user to explicitly set the state of the digital output pins and to monitor the signal on the input pins. This feature is used to debug the physical connections between the *Series 600* and external devices connected to the system. To open the I/O Diagnostics dialog box in *FrameWork*, click **I/O | I/O Diagnostics**.

This dialog box is divided into two sections, Digital Output State and Digital Input State. For the *Series 600*, there are 12 input / output lines. From the I/O Parameters dialog box (**I/O** menu, **I/O Parameters** selection), the user may define which of the 12 I/O lines are inputs and which are outputs. Also, the active state for all I/O lines can be configured as high or low.

After the outputs have been configured to your satisfaction, open the I/O Diagnostics dialog and toggle the outputs between high and low. Monitor your external device (PLC, multimeter) according to the following table to see if the output signal is received. After toggling the outputs between high and low, the outputs will remain in the last state set by the user until cleared out by the results of an inspection or by a new Product selection.

Voltmeter	Series 600 system	High/Low Readings
+ (Red) Lead	Output 1, etc.	18-23 volts / 0.7 volts
- (Black) Lead	Ground	

To test an input, hold the input signal active for two to three seconds and monitor the I/O Diagnostics dialog to see if the state changes. (*Note:* inputs must be held for two to three seconds because the I/O dialog box is updated every 2 seconds.)

## 4.3 Checking Timing Signals Using the Digital I/O Graph

*FrameWork* provides a Digital I/O Graph as a diagnostic tool to monitor system timing. The Digital I/O Graph is used to display a time history of a total of eight outputs and/or inputs. Eight traces are displayed which indicate changes in state for the assigned I/Os within a specified range of time. The *FrameWork* Digital I/O graph is a System Graph located in the Graphs menu. To open the Digital I/O Graph, click **Graphs | System Graphs** and choose **Digital I/O** from the System Graphs dialog box. Figure 4.1 displays the Digital I/O Graph.

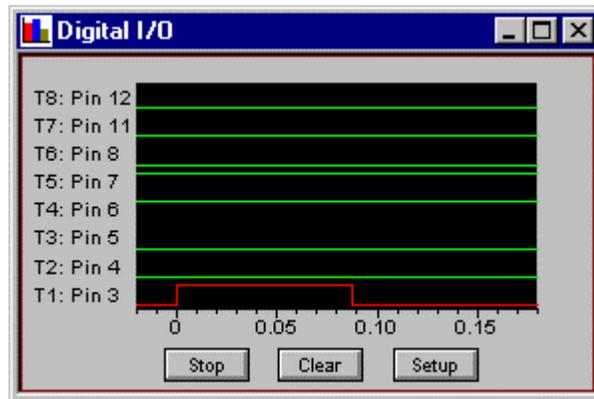


Figure 4.1: Output timing can be check using the I/O graph.

This time history can be used to tune the timing of various events taking place during the inspection process. The time history graph can also be used to look for signal noise by using the Enable Memory Mode feature.

The graph snaps to one millisecond time segments. If a change in state occurs between milliseconds, the graph will round to the nearest millisecond, displaying the change in state at that point.

### 4.3.1 CONFIGURING THE DIGITAL I/O GRAPH

To configure the Digital I/O Graph, click the **Setup** button on the graph. The Digital I/O Graph Configuration dialog box will appear (see Figure 4.2).

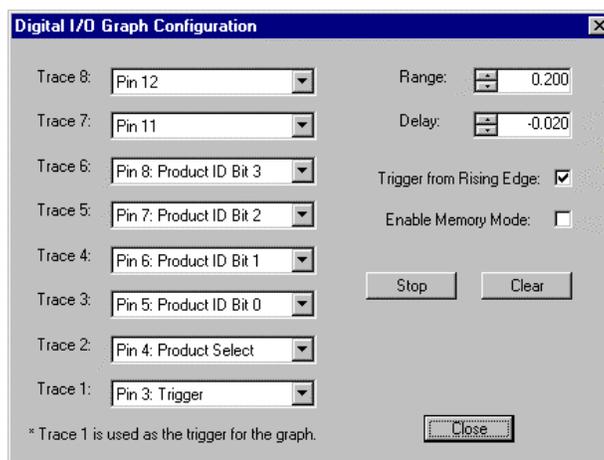


Figure 4.2: The I/O timing graph can be configured for different inputs and outputs.

*Configuring I/O trace selection for the Digital IO Graph*

Both inputs and outputs can be assigned to the eight traces available in this graph. To assign a trace to an input or output, click on the arrow in the drop down box to the right of the trace you wish to configure and select an available input or output.

### ***Time History Synchronization***

The beginning of the time history, or time zero, is synchronized to Trace 1. Trace 1 is assigned to the Busy output by default. Since the busy light is activated at the beginning of each inspection, the assignment of Trace 1 to the busy light allows the beginning of the time history to be synchronized to the beginning of the processing of an image. You may assign Trace 1 to another output or input as needed in the context of your testing procedures

### ***Range: Setting the range of time displayed***

To set the amount of time displayed on the Digital I/O Graph, click the up or down spin buttons in the Range section of the configuration dialogue box. You can display up to ten seconds worth of data at a time. The graph is updated approximately every three seconds and the most recent 50 transitions are displayed. A transition is defined as a change in state for a trace, from high to low or low to high.

### ***Delay: Controlling where the graph begins to display data***

To control where the graph begins to display data, click the spin buttons in the Delay section of the configuration dialogue box. Decreasing the delay value will allow you to display transitions which occurred before time zero, and increasing the delay value will allow you to display more data after time zero. Time zero is synchronized to Trace 1 (see Time History Synchronization above).

### ***Trigger from Rising Edge: Starting at a rising or a falling edge***

The Trigger from Rising Edge check box is checked by default. If checked, the graph will begin at time zero at a rising edge for the output or input assigned to Trace 1. For example, if the busy line is assigned to Trace 1 and the Trigger from Rising Edge check box is checked, then time zero will begin when an inspection begins. If the check box is unchecked the graph will begin at a falling edge for the output or input assigned to Trace 1. In this case, if the busy signal is assigned to Trace 1 graphing would begin at the end of the inspection processing.

### ***Enable Memory Mode: Capturing streaming historical data***

The Digital I/O Graph normally shows one range of historical data at a time. If the range is set for 3 seconds, data for the last three seconds will be displayed as it is reported to the PC. Data previous to the specified range is not displayed. If the Enable Memory Mode check box is checked, all the historical data is displayed, each trace overlapping the traces from previously reported historical ranges. This feature allows the user to see fluctuations in the timing of each trace. If a trace changes state irregularly, the traces will not overlap perfectly. Data refreshes very quickly on this graph and noise in a particular trace may be hard to see on the graph if it does not occur regularly within the time history range. Enable Memory Mode will allow the user to see any noise occurring in a trace since all data is captured permanently to the graph until memory mode is disabled.

## 4.3.2 USING THE DIGITAL I/O GRAPH FOR TYPICAL TESTING PROCEDURES

The Digital I/O Graph configuration will depend on what you are interested in observing. The most critical trace to configure is Trace 1, since the rest of the graph is synchronized to Trace 1. There are typically four cases of interest:

- ◆ Debug the Product Selection process.
- ◆ Where a fixed delay after trigger is used, verify that the Trigger signal sent from a PLC is received by the *Series 600*, and check the time between the external trigger and the inspection output results.
- ◆ Where results are generated immediately after inspection, check when the output results are available.
- ◆ Determine the overall inspection times.

**Checking Product Selection Timing:** In this case you are determining whether Product Selection occurs correctly.

Set the Product Select signal to trace 1.

Set Product ID bits to traces 2 through 7. These inputs are used to digitally set the input bits for the Product ID.

Set the Product Select Pass signal to trace 8.

Verify that the input bits are held active when the Product Select signal is active.

Verify that the Product Select Pass signal is active while the Product Select signal is active.

**Checking External Trigger Signal and Inspection Timing:** In this case, a fixed delay after trigger is used. You wish to verify that the trigger signal sent from a PLC is received by the *Series 600*, and you wish to check the time between the external trigger and the inspection output results. For more information on using a fixed delay after trigger, see Section 3.5.1.

Set Trace 1 to the trigger signal. The Trigger from Rising Edge check box should be checked, since you will be interested in what happens after a trigger signal is received. The *Series 600* begins the inspection process at the beginning (rising edge) of the trigger signal. Verify that the Trigger signal sent from a PLC is received by the *Series 600*.

Set the output signals to traces 2 - 4. The outputs you will be primarily interested in are Pass, Fail, and the User outputs. Set any other outputs of interest to the remaining traces.

The graph will indicate the length of time between activation of the trigger signal and activation of the outputs.

**Checking Output Result Timing:** In this case, inspection outputs are generated immediately after inspection. You wish to verify when the output results are available. For information concerning inspection timing, see Section 3.7.3.

Set Trace 1 to the Busy signal or to the inspection trigger signal if external triggering is being used. The Trigger from Rising Edge check box should be *unchecked* since inspections end at the same time that the Busy signal goes off.

Set the output signals to traces 2 - 4. The outputs you will be primarily interested in are Pass, Fail, and the User outputs. Set any other outputs of interest to the remaining traces.

The graph will indicate the length of time between the busy signal going inactive and the outputs going active.

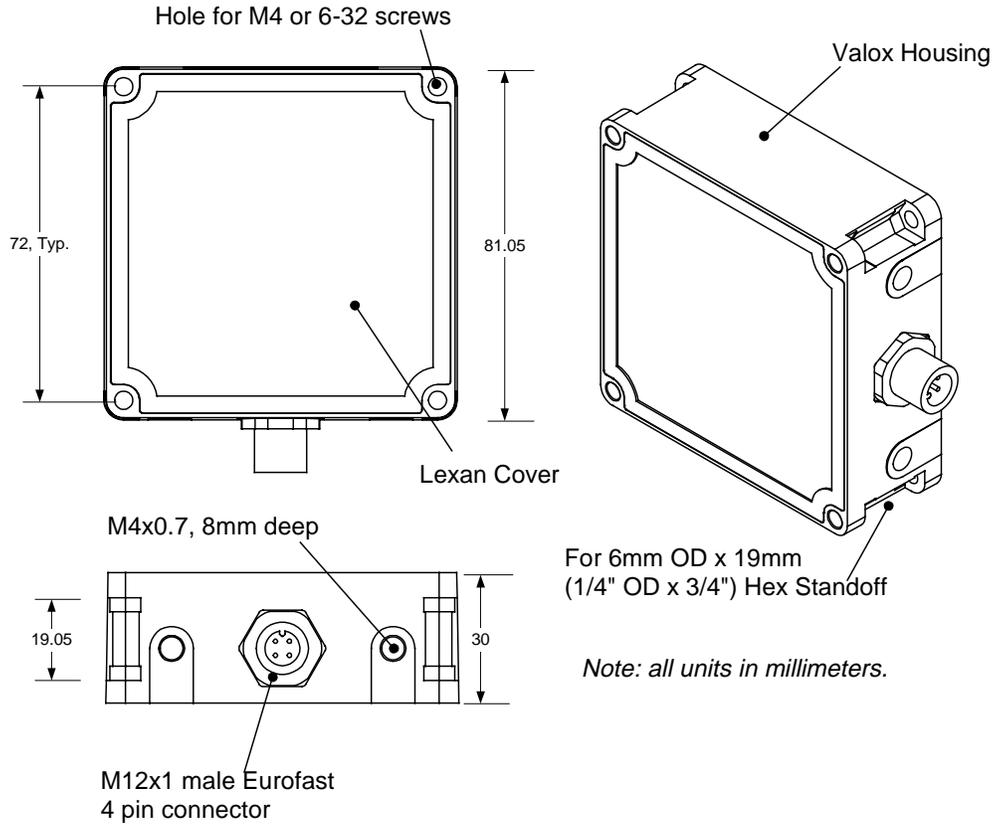
## 4.4 Communications Troubleshooting

Communications between a PC and *SmartImage Sensor* can be tricky at times. To make finding problems and conflicts easier, a troubleshooting guide has been included in the on-line help shipped with FrameWork. Click on the **Help** menu and choose **Help File Index**. From the table of contents, double click **Troubleshooting**, then double click **Troubleshooting Communications**. The guide will walk the user through the troubleshooting process. Basically, with any communications problem, users should try to isolate all of the following:

- **Physical Connection:** no matter what communications protocol is being used (Ethernet, Serial, etc.) make certain all physical connections are in working order and are properly implemented. For Ethernet connections, this includes making certain the connection is “crossed” at some point. Ethernet connections can be tested by “pinging” a known IP address. Simply connect the Series 600 to a PC, go to the DOS prompt and type ‘ping 192.168.0.242’ (substituting the appropriate IP address).
- **IP Addressing for the PC:** this point is specific to troubleshooting Ethernet communications. The PC being used must have a valid IP address. Generally speaking, the PC and Series 600 should have IP addresses that start out with the first three numbers identical to each other. The PC’s IP address is set under the **Network** control panel.
- **IP Addressing for the Series 600:** this is specific to Ethernet communications. The Series 600 IP address is 192.168.0.242 as shipped from the factory. If using a direct PC connection (no other network involved), the PC should be set to 192.168.0.240 or similar. If connecting the 600 into a network, work with the Network Administrator to choose an appropriate IP address for the 600. To assign a new address to the 600, first connect to the system (over a serial cable or Ethernet – isolated from the existing network), then choose **Comm, Image Sensor Communications**. Use the **Edit** button to edit the IP address. The new IP address will not take effect until the Series 600 is powered down then powered up.
- **Subnet and Address Masks:** For most applications, the PC and Series 600 systems should use the 255.255.255.0 subnet mask. For the PC, check on this value by opening the **Network** control panel and double clicking on the TCP/IP protocol. The Series 600 mask can be checked by connecting to the system and choosing **Comm, Image Sensor Communications**. When using this subnet mask, the PC and Series 600 IP addresses *must* be common to the first three places (i.e. in this IP: xxx.xxx.xxx.yyy, the PC and 600 must have the same thing for the x’s).
- **Diagnostics Mode:** diagnostics mode communications are supported only on the RS-422 serial port (Port B on the Series 600). Ethernet communications are not possible when the Series 600 is in diagnostics mode. Diagnostics mode is signified by the “Ready” LED flashing red once per second on the Series 600 unit. Please refer to the on-line help documentation for instructions on how to place the Series 600 into diagnostics mode.

# Appendix A Series 600 Strobe Light

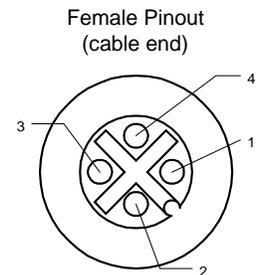
This appendix covers the *Series 600* Strobe lights (Part numbers: IDRA-6, IDIA-6, IDRA-6D, and IDIA-6D). To determine if the strobe light you have is one of these, look at the part number on the rear. A drawing of this case follows:



To use the Series 600 Strobe light, start FrameWORK and connect to the Series 600 system. Open **I/O Parameters** from the **I/O** menu. Click on the “Outputs” tab and select “Strobe” for I/O 12 (pin 12). Click **Ok**. Next, wire the light according to the following table:

Wire Color	Pin Number*	Function	Breakout Board
Brown	1	+ 24V	16: V+
White	2	No connection	No connection
Blue	3	Ground	15: GND
Black	4	Strobe Output signal	14: or 17-20: IO12

\* See figure at right for this numbering scheme.

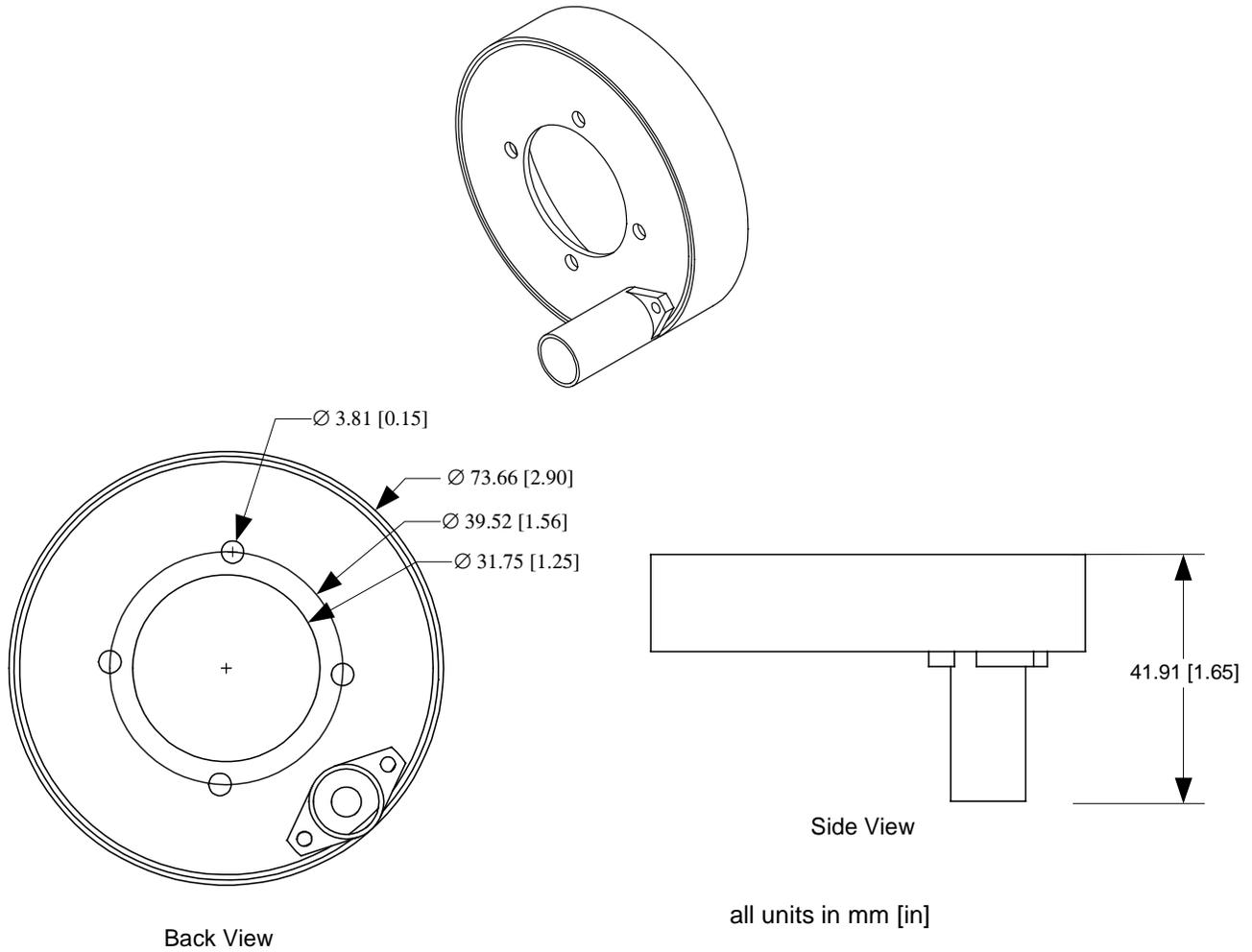


LED Color	Light Part Number	Max Current	Max Duty Cycle	Max Average Current
Red	IDRA-6 & IDRA-6D	1.25 A	15%	188 mA
Infrared	IDIA-6 & IDIA-6D	4.5 A	5%	225 mA

\*General characteristics: Voltage Supply = 24V, Trigger Voltage = 15V, Max single pulse = 50 ms

# Appendix B Series 600 Ring Light

This appendix covers the *Series 600* ring light (IDRR-6T & IDIR-6T). To determine if the strobe light you have is one of these ring lights, look at the part number on the side. This *Series 600* strobe light uses the same case as the *Series 800* and *Series 700* ring lights (parts IDRR-8 and IDRR-7). Drawings (not to scale) of this case follow:

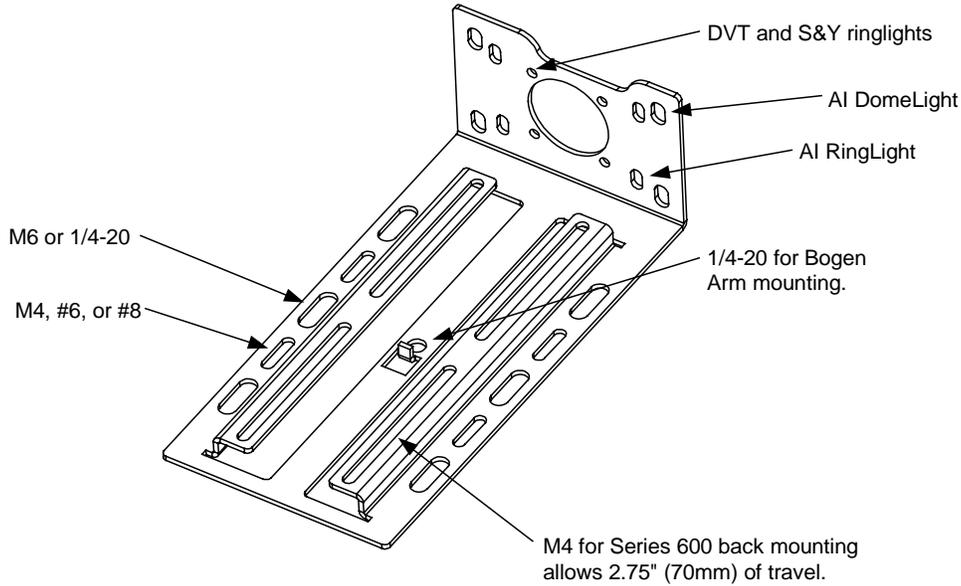


To use the IDRR-6T & IDIR-6T lights, start FrameWork and connect to the Series 600 system. Open **I/O Parameters** from the **I/O** menu. Click on the “Outputs” tab and select “Strobe” for I/O 12 (pin 12). Click **Ok**. Next, wire the light according to the following table:

Wire Color	Function	Breakout Board
Red	+ 24V	16: V+
Green	Ground	15: GND
White	Strobe Output signal	14: or 17-20: IO12

# Appendix C Series 600 Mounting Bracket

This appendix covers the *Series 600* mounting bracket (ID0R-6B). A drawing (not to scale) of this bracket follows:



**Overall Dimensions for the  
Series 600 Mounting Bracket:**

<b>Width</b>	90 mm
<b>Length</b>	187.8 mm
<b>Height</b>	60 mm

The mounting bracket is designed for a number of applications. Primarily, however, the bracket provides a means to attach different illumination sources to the Series 600 SmartImage Sensor. The following table summarizes the light sources that will attach directly to the Series 600 mounting bracket.

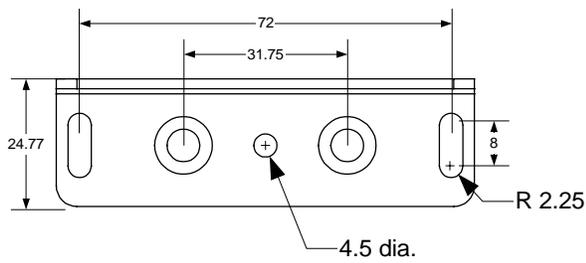
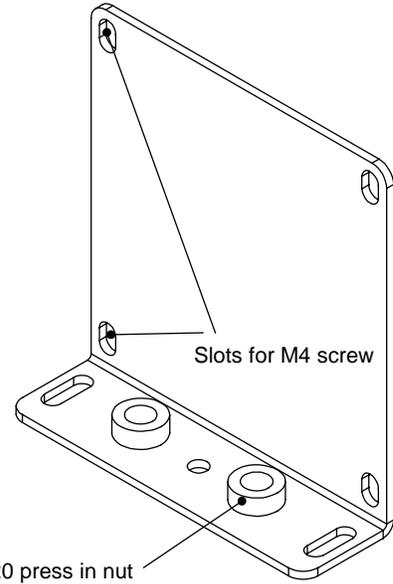
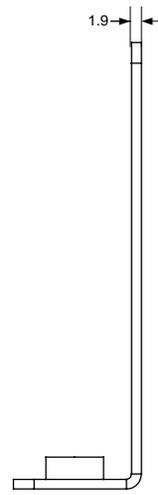
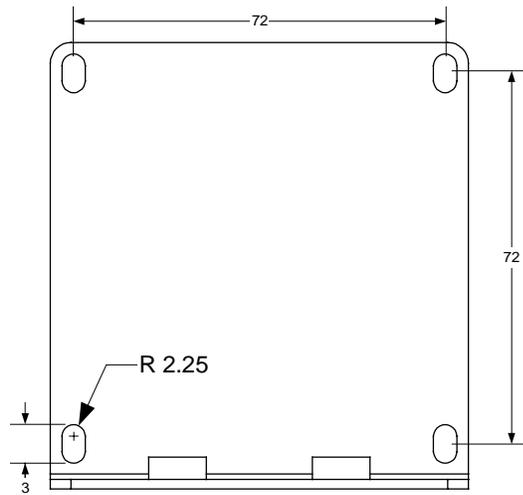
<b>Illumination Source Description</b>	<b>DVT Part Number(s)</b>
Ring Lights (both fluorescent and LED based) from DVT and Stocker & Yale	IDRR-6T, IDIR-6T, ISFR-1
LED based DiffuseLite from Advanced Illumination	IARD-5
LED based ring light from Advanced Illumination (4" model)	IARR-4

In addition, the mounting bracket provides a means to easily affix the Series 600 to another surface. The slots on the extreme edges of the bracket (labeled as “M6 or 1/4-20” and “M4, #6, or #8”) provide several options for mounting.

At the center of the mounting bracket is a hole labeled as “1/4-20 for Bogen Arm mounting.” This hole and the accompanying retaining tab are used to attach the Series 600 easily and readily to an adjustable arm for laboratory use. The Bogen Arms used by DVT provide a 1/4-20 threaded receptacle on one end of the arms. With a short 1/4-20 bolt through the hole in the mounting bracket, any user can affix the Series 600 to a Bogen Arm. The Bogen Arm is sold under DVT part number ACC-MA.

# Appendix D Series 600 Strobe Light Bracket

This appendix covers the *Series 600* strobe light bracket (ID0A-BR). This part is designed to adapt the IDRA-6 series lights to mount in the same manner as the IDRA-6T lights. Drawings (not to scale) of this bracket follow:

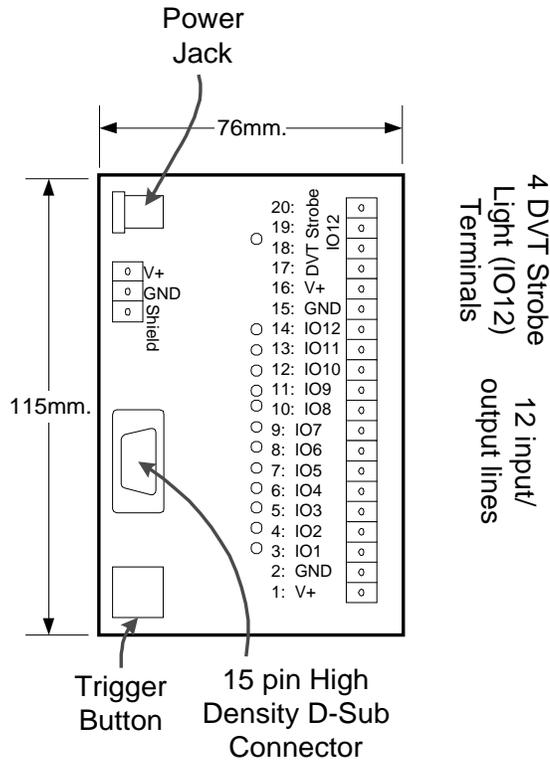


*Note: All units in millimeters.*

# Appendix E Series 600 I/O Breakout Board

The Series 600 I/O Breakout Board (CON-600) provides an easier way to interface digital I/O, power, and strobe illumination lines. The board is housed in a plastic DIN Rail-mountable case. The Breakout Board is 75mm wide by 115mm high by 155mm deep (including all necessary cable clearances).

Feature	Purpose
Power Jack	<i>For demonstration purposes only.</i> Use a 24V @ 1.42 A wall-mount power supply.
15 pin high density D-sub plug	Series 600 Digital I/O and Power lines. The board breaks these lines out on screw down terminals.
Trigger Button	Connected to IO1. If configured as a Trigger Input in FrameWork, this button will trigger inspections.
Power Terminals	3 terminals on left side of board (V+, GND, Shield) provide connections for an industrial power supply.
I/O Terminals	Individual screw-down terminals for all 12 I/O lines, V+, and GND.
Strobe Terminals	Four screw-down terminals, tied to IO12. If IO12 is configured in FrameWork as the Strobe Output, these terminals will be activated during image exposure time.



# Appendix F Advanced Ethernet & TCP/IP

The Series 600 *SmartImage Sensor* runs TCP/IP over an Ethernet (RJ-45 only) connection. This Appendix provides some advanced information about this setup that may be useful to Network Administrators.

- Series 600 IP address is 192.168.0.242 (factory programmed),
- The Series 600 does not support DHCP,
- When dealing with multiple Series 600 units, beware that all units are shipped with the *same* IP address: 192.168.0.242. To use these systems on either an existing network or to create a new network of just DVT Series 600 systems, you'll need to assign new IP addresses to these units.
- IP address can be changed from *FrameWork* software (**Comm** menu, **Image Sensor Communications** selection),
- IP addresses should not use 0 or 255 as the last value (these are reserved and have special meaning on some networks),
- With both PC and Series 600 using the Subnet (or, Address) mask of 255.255.255.0, the IP addresses of PC and 600 must be identical for the first three values and unique in the fourth value. **Example:** Series 600 (IP: 192.168.0.242) & PC (IP: 192.168.0.240)
- *FrameWork's* **PC Communications** dialog box gives the PC (host) IP address when **Ethernet** is highlighted in the left pane,
- Query the Series 600 for its IP address in two places. 1) Run *FrameWork*, click **Comm, Image Sensor Communications**, select "Ethernet – Port A" in the left pane and view the IP address in the right pane. 2) From a terminal command line (serial communications, HyperTerminal @ 38400 baud, 8-N-1, no flow control), the '#Cn' command queries the Series 600 for its IP address and address mask,
- Type 'ping ###.###.###.###' (replacing # with numbers) to check if an IP address is connected to the network. This command can be useful in determining if a node is powered up, operational, and physically connected to the network,
- Type 'arp -a' from a DOS prompt to view the ARP (Address Resolution Protocol) table. The response should look something like this:

```
C:\WINDOWS>arp -a
```

```
Interface: 192.0.0.111
```

Internet Address	Physical Address	Type
192.0.0.211	00-90-68-00-00-42	dynamic
192.0.0.212	00-90-68-00-00-42	dynamic
192.0.0.253	00-60-97-4f-c0-45	dynamic

The "Internet Address" column refers to the IP addresses you've recently communicated with. The "Physical Address" column contains the corresponding Ethernet Addresses for the IP's in column 1. DVT Series 600 systems will have Physical Addresses starting with "00-90-68". In the case above, 192.0.0.253 is not a Series 600, but another PC on the same network as the named Interface. The ARP table is cleared approximately every two minutes. The 'arp' command is useful in determining if an IP address belongs to a Series 600 system or other node on the network.

# Glossary

Category 5	Standard for the networking cable used most commonly. Category 3 & 4 have maximum data rates around 20 MHz while Category 5 cables can operate at 100 MHz or higher.
crossover cable	Unlike the <i>straight through cable</i> , this one crosses receive and transmit and positive and negative (i.e. RX+ connects to TX-). This cable would be used any time a direct connection between two devices is used (instead of through a hub). The cable itself does the crossing, instead of a hub.
EIA-568	The wiring standard used in most Ethernet networking situations. EIA568A and B contain the same twisted pairs but the wire colors used are slightly different. USOC is another standard which pairs different wires together.
Ethernet	One type of network cabling and signaling developed by Xerox in the late 1970s. As it applies to the <i>Series 600</i> , Ethernet is the <i>physical</i> connection used to communicate data with a PC. Ethernet is typically communicated over RJ-45 or coaxial cables.
RJ-45	Also called a 'network' cable. RJ-45 is an 8 wire (4 twisted pairs) cable with a connector slightly larger than a common telephone jack. RJ-11 is the style used for telephone service.
RS-422	A serial communications standard typically used to communicate ASCII data between devices. The <i>RJ-11</i> jack on a <i>Series 600</i> uses RS-422 communications. RS-422 specifies 4 lines for communication: RX (receive) +, RX-, TX (transmit) +, and TX-.
Shielded Twisted Pair (STP)	<i>Twisted pair</i> refers to the fact that the cable is made of 4 pairs of wires, twisted together. <i>Shielded</i> refers to electrical shielding for resistance to electrical noise. DVT recommends using only STP type cables for Ethernet and RS-422 communications.
Straight through cable	All pins on the cable are carried straight through. That is, the RX- on one end is pinned through to RX- on the other end. For communication to occur; transmit and receive, positive and negative must be crossed. Typically, a hub does the crossing.
TCP/IP	<b>Transmission Control Protocol/Internet Protocol.</b> The dominant protocol used for communication over the internet. Relating to the <i>Series 600</i> , TCP/IP is the protocol run over the Ethernet/RJ-45 connection for communications with a PC.
Unshielded Twisted Pair (UTP)	<i>Twisted pair</i> refers to the fact that the cable is made of 4 pairs of wires, twisted together. <i>Unshielded</i> refers to electrical shielding for resistance to electrical noise. Most cables sold at computer stores for common networking environments are UTP and not suitable for permanent installation in a factory environment.
USOC	The wiring standard used in telephone cables. USOC twisted pair cables should be used with the RJ-11 jack for RS-422 communications.

# Index

- A**
- Acquiring output, 22
  - aperture, 21
  - arp command, 35
- B**
- binary Product IDs, 18
  - Busy output, 22
- C**
- cables, 3
  - Category 5, 3, 36
  - CCD, 3, 21
  - charged coupled device, 21
  - crossover cable, 36
- D**
- debounce time, 17
  - delay after trigger, 20
  - Delaying Image Acquisition, 20
  - diagnostics mode, 25
  - Digital I/O Graph Configuration, 26
  - dimensions, 4
- E**
- EIA-568, 36
  - Ethernet, 3, 36
  - exposure time, 21
  - External Trigger Signal Timing, 28
- F**
- Fail LED, 25
  - Fail output, 22
  - FrameWork, 1, 16, 18, 26
  - FrameWork Software Diagnostics, 25
- I**
- I/O, 24
    - electrical diagnostics, 25
    - graph, 26
    - inputs, 17
    - outputs, 22
    - strobe light pinout, 30, 31
    - timing, 17, 22
    - typical configuration, 24
    - typical use, 16
  - I/Os, debugging, 25
  - illumination
    - DVT strobe light, 36
    - Inspecting output, 22
    - Inspection Timing, 28
    - Inspection Toggle output, 22
    - IP address. *See* subnet mask
      - default assigned to Series 600, 35
- L**
- LED Function Codes, 25
  - LED strobe light, 30, 31, 32, 33
    - output signal, 22
- M**
- maintain output result, 23
- O**
- output pulse width, 23
  - Output Result Timing, 28
- P**
- Pass LED, 25
  - Pass output, 22
  - ping command, 35
  - Power-on Product, 19
  - Product, 17
    - changing, 17
    - digital selection, 18
    - ID, 18
  - Product Select Pass, 19
  - Product selection, 17
  - Product Selection Timing, 28
  - pulsed outputs, 23
- R**
- Ready LED, 25
  - relays, 17
  - resolution, 3
  - Resource Conflict output, 20, 22
  - RJ-45, 36
  - RS-422, 36
  - running inspections, 19
- S**
- Select Fail output, 22
  - Select Pass output, 22
  - Shielded Twisted Pair (STP), 36
  - Straight through cable, 36
  - strobe light, 30, 31, 32, 33
  - Strobe output, 22
  - subnet mask, 35. *See* IP address

system timing, 26

## **T**

TCP/IP, 36

timing

inputs, 17

outputs, 22

trigger, 20

delay, 20

Trigger LED, 25

trigger source

external, 20

internal, 20

## **U**

Unshielded Twisted Pair (UTP), 36

User Definable outputs, 22

USOC, 36

## **W**

Warn output, 22