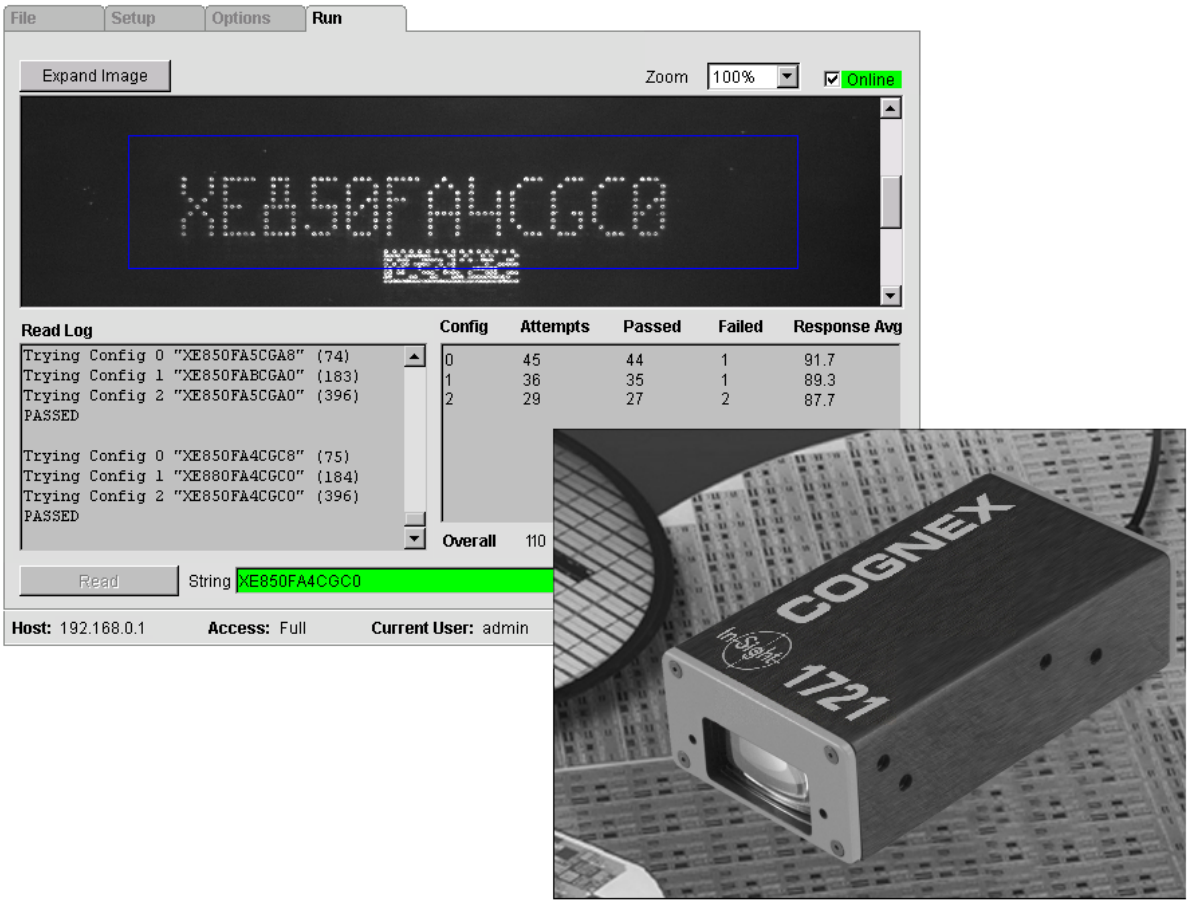
COGNEX
Vision for Industry®

In-Sight®

IN-SIGHT® 1700 SERIES WAFER READER USER MANUAL



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Revision 16
May 2006

The hardware and portions of the software described in this document may be covered by one or more of the following U.S. patents. Other U.S. and foreign patents are pending.

In-Sight	Patents pending
Hardware	4,972,359; 5,526,050; 5,657,403; 5,793,899; 5,861,910
Vision Tools	5,495,537; 5,548,326; 5,583,954; 5,602,937; 5,640,200; 5,717,785; 5,742,037; 5,751,853; 5,768,443; 5,796,868; 5,818,443; 5,825,483; 5,825,913; 5,845,007; 5,859,466; 5,872,870; 5,909,504

Regulations/Compliance

In-Sight 1721/1722 Wafer Readers

Declaration of Conformity	
Manufacturer	**Cognex Corporation** **One Vision Drive** **Natick, MA 01760 USA**
Declares this CE-marked Wafer Reader Machine Vision System Product	
Product Number	In-Sight 1721: P/N 800-5865-1; P/N 800-5865-1R (RoHS Compliant) In-Sight 1722: P/N 800-5865-2; P/N 800-5865-2R (RoHS Compliant)
Complies With	89/336/EEC Electromagnetic Compatibility Directive
Compliance Standards	EN 61000-6-4:2001 Class A EN 61000-3-2:2000 + A2:2005 EN 61000-3-3:1995 + A1:2001 EN 61000-6-2:2001
European Representative	Cognex France Immeuble le Patio 104 avenue Albert 1er 92563 Rueil Malmaison France
Safety	
c UL us	(UL 508:Standard for Industrial Control Equipment) CUL Certification marks are present on products
FCC	FCC Part 15, Class A
Class 1 LED Product	IEC 60825-1/A2:2001 EN 60825-1/A1:2002 CAN/CSA-E60825-1:2003
Compliance	
SEMI	This equipment conforms with the applicable requirements of SEMI S2-0703a

In-Sight 1701 Wafer Reader

Declaration of Conformity	
Manufacturer	**Cognex Corporation** **One Vision Drive** **Natick, MA 01760 USA**
Declares this CE-marked Wafer Reader Machine Vision System Product	
Product Number	In-Sight 1701: P/N 800-5797-1; P/N 800-5798-1
Complies With	89/336/EEC Electromagnetic Compatibility Directive
Compliance Standards	EN 55011:1998 + A1:1999 + A2:2002 EN 61000-3-2:2000 + A2:2005 EN 61000-3-3:1995 + A1:2001 EN 61000-6-2:2001
European Representative	Cognex France Immeuble le Patio 104 avenue Albert 1er 92563 Rueil Malmaison France
Safety	
c UL US	Information Technology Equipment (UL 1950) 51KJ CUL Certification marks are present on products
FCC	FCC Part 15, Class A

In-Sight 1700 Wafer Reader

Declaration of Conformity	
Manufacturer	**Cognex Corporation** **One Vision Drive** **Natick, MA 01760 USA**
Declares this CE-marked Wafer Reader Machine Vision System Product	
Product Number	In-Sight 1700: P/N 800-5748-10; P/N 800-5748-20
Complies With	89/336/EEC Electromagnetic Compatibility Directive
Compliance Standards	EN 55011:1998 + A1:1999 + A2:2002 EN 61000-3-2:2000 + A2:2005 EN 61000-3-3:1995 + A1:2001 EN 61000-6-1:2001
European Representative	Cognex France Immeuble le Patio 104 avenue Albert 1er 92563 Rueil Malmaison France
Safety	
c UL us	Information Technology Equipment (UL 1950) 51KJ CUL Certification marks are present on products
FCC	FCC Part 15, Class A

Precautions

Observe these precautions when installing the In-Sight wafer reader to reduce the risk of injury or equipment damage:

- The wafer reader is intended to be supplied by a Cognex power source (24V ±10%). Any other voltage creates a risk of fire or shock and can damage the In-Sight hardware.
- Do not install the wafer reader in locations that directly expose it to environmental hazards such as excessive heat, dust, moisture, humidity, impact, vibration, corrosive substances, flammable substances, or static electricity.
- To reduce the risk of damage or malfunction due to over-voltage, line noise, electrostatic discharge (ESD), power surges, or other irregularities in the power supply, route all cables and wires away from high-voltage power sources.
- Although the wafer reader is a Class 1 LED Product, it is not recommended to stare directly into the illumination LEDs when the wafer reader is receiving power. Note that the In-Sight 1722 wafer reader LEDs emit infrared light, therefore the illumination LED lights are not visible.
- Do not open the wafer reader. This device does not contain user-serviceable parts. Do not make electrical or mechanical modifications to the In-Sight hardware. The LED emitted light levels have not been tested when the wafer reader is open, therefore Class 1 LED Product certification is not guaranteed if the wafer reader is open. Unauthorized modifications violate your warranty.

Table Of Contents

1 Introduction

In this section…

1.1 In-Sight Wafer Reader Overview

The In-Sight® series of high performance vision sensors are image formation wafer readers for reading identification marks on silicon wafers. Featuring a vision processor, advanced lighting and optics, and built-in networking support and serial communications, the compact In-Sight wafer readers can be utilized in virtually any back-end wafer fab process.

The In-Sight wafer readers include the following models:

- In-Sight 1722: Infrared LED lighting, 1024 x 768 image resolution and variable working distance
- In-Sight 1721: Red LED lighting, 1024 x 768 image resolution and variable working distance
- In-Sight 1701: Red LED lighting, 1024 x 768 image resolution, variable working distance
- In-Sight 1700: Red LED lighting, 640 x 480 image resolution, fixed working distance

NOTE To install the In-Sight 1721 or 1722 wafer reader using In-Sight Explorer, refer to *Installing the In-Sight® 1720 Series Wafer Reader* hardware manual.

The In-Sight wafer reader is configured remotely over a network using a standard Internet browser. This browser interface also allows remote monitoring of the wafer reader's operation during runtime. The wafer reader may also be controlled remotely from users' custom application programs using In-Sight Native Mode commands to change settings and retrieve read results.

Unless otherwise specified, references to the In-Sight 1721 wafer reader in this document also apply to the In-Sight 1722, 1701 and 1700 models.

1.2 In-Sight Support

The following resources are available to assist you in using the In-Sight wafer readers and spreadsheet interface:

- *In Sight® Guide & Reference*, an on-line HTML Help file provided on the In-Sight CD-ROM.
- The In-Sight Online Support and Learning Center at: www.cognex.com/support/In-Sight.asp.

1.3 Networking an In-Sight Wafer Reader

The In-Sight wafer reader is designed to operate as a host system on an Ethernet TCP/IP network. For the purposes of the instructions in this manual, an In-Sight network exists whenever one or more wafer readers can be accessed remotely from another host on the network.

The wafer reader may be used in several possible network configurations. For each configuration, the wafer reader is configured using an Internet browser, which also provides the remote display for that wafer reader.

1.3.1 Standalone In-Sight Network Configurations

A standalone In-Sight network configuration includes a connection between an In-Sight wafer reader and a PC equipped with a network card. The In-Sight 1721 wafer reader has an Autosense capability, allowing the wafer reader to connect directly to a PC using either a standard CAT5 network cable or a CAT5 crossover cable. In this configuration, neither the PC nor the wafer reader is connected to the larger, fab floor network.

Please note that the In-Sight 1700 and 1701 wafer readers require a standard CAT5 network cable and crossover coupler or a CAT5 crossover cable in this configuration.

NOTE	If the Microsoft "Media Sense" feature, which automatically detects whether or not your network interface is linked to a network, is enabled when running Microsoft Windows 2000 or XP, communication with an In-Sight wafer reader may not be established. It is recommended to use a hub or switch with a standard Ethernet cable to configure the In-Sight wafer reader or configure your PC to disable the Media Sense feature. See Microsoft Knowledge Base article 239924 for details on this process.

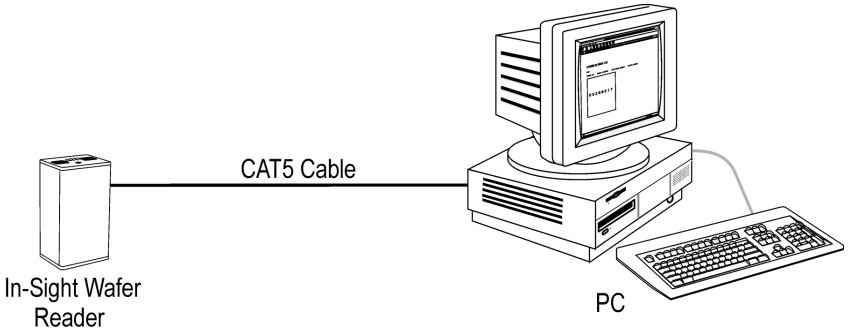


Figure 1-1: Standalone In-Sight Network

Configurations Using Switches/Routers

An In-Sight network may be extended to include multiple In-Sight wafer readers by using an Ethernet switch or network router. The only limit on the size of this type of network is the number of routers or switches connected and the number of connections they provide.

To install multiple wafer readers on a standalone In-Sight network, use a switch/router between the wafer readers and the remote host. Make all connections via standard, straight-pinned CAT5 cable (Figure 1-2).

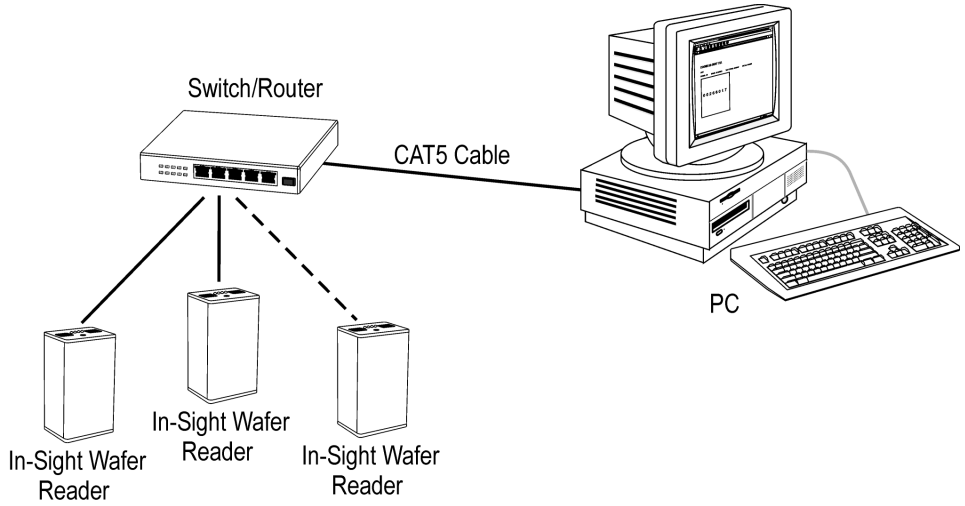


Figure 1-2: Standalone In-Sight Network With Ethernet Switch

1.3.2 Fab Floor In-Sight Network Configurations

To take full advantage of its networking capabilities, the wafer reader can operate as a host on the larger, fab floor network. The only physical difference between fab floor-networked wafer readers and a standalone wafer reader network is that the switch/router is connected directly to the network.

Groups of wafer readers connected to the fab floor network through a common switch/router are referred to as a local network. Figure 1-3 shows a subnet that includes several wafer readers and a PC.

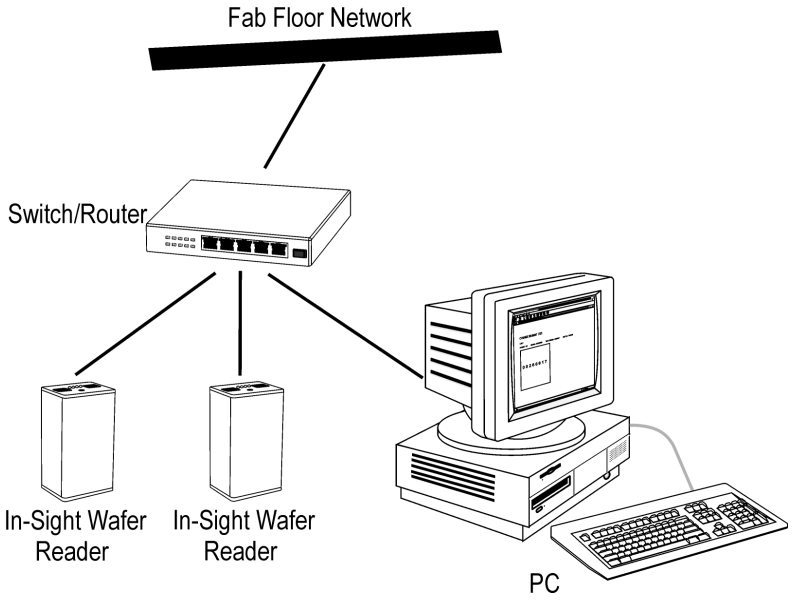


Figure 1-3: Fab Floor Network

2 Installing the Wafer Reader

In this section…

2.1 Connecting the In-Sight Wafer Reader

This section describes the connection of the wafer reader to its standard components. To connect the sensor to the optional 1350 Breakout Module, refer to Appendix C: Connecting the Breakout Module. For a complete list of options and accessories, contact your Cognex sales representative.

2.1.1 Connecting the In-Sight 1721/1722 Wafer Reader

The wafer reader has two RJ-45 connector ports: the Network Port and the Breakout Port (see Figure 2-1). The Network Port provides the Ethernet connection for network communications. The Breakout Port supplies connections for the 24VDC power source, I/O, acquisition trigger, and serial communications.

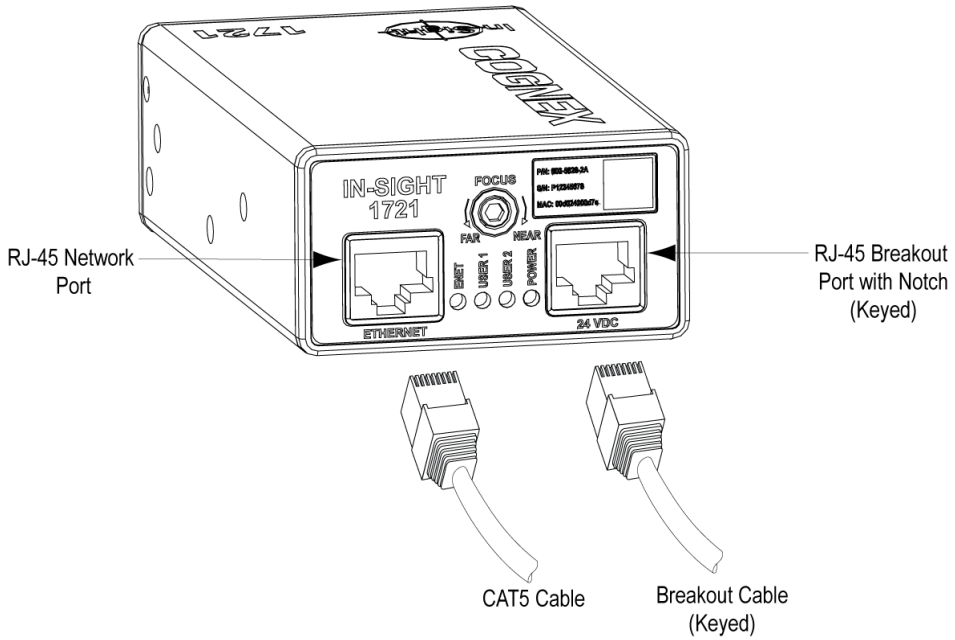


Figure 2-1: Location of RJ-45 Ports

2.1.2 Connecting the In-Sight 1700/1701 Wafer Reader

The In-Sight 1700/1701 wafer reader has two RJ-45 connector ports: the Network Port and the Breakout Port (see Figure 2-2). The Network Port provides the Ethernet connection for network communications. The Breakout Port supplies connections for the 24VDC power source, I/O, acquisition trigger, and serial communications.

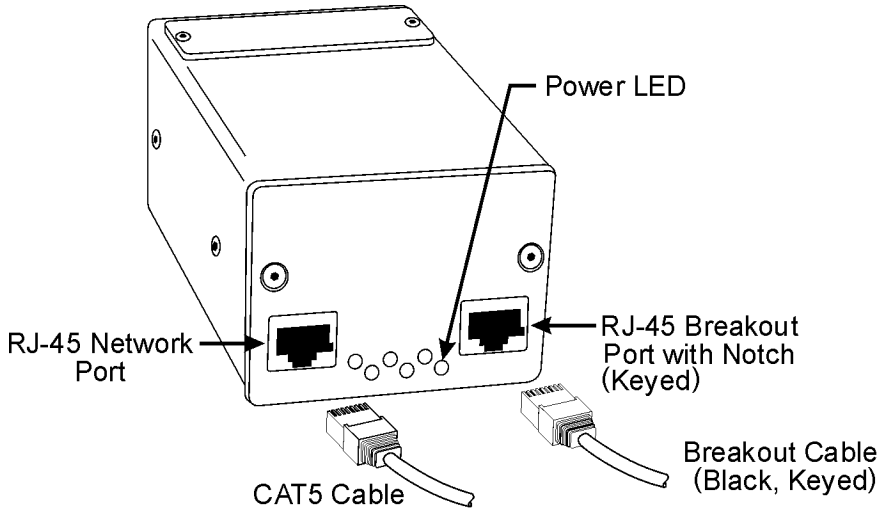


Figure 2-2: Location of RJ-45 Ports

2.1.3 Connecting the Network Cable

- **If you are connecting to an Ethernet switch,** plug one of the RJ-45 connectors of a CAT5 straight-pinned cable into the Network Port and plug the other end into an available port on the switch/router.

- **If you are connecting directly to an In-Sight sensor from a remote host,** plug one end of a CAT5 network cable into the wafer reader's Network Port; plug the other end into the remote host's Ethernet port.

NOTE The In-Sight 1700 and 1701 wafer readers require a standard CAT5 network cable and crossover coupler or a CAT5 crossover cable in this configuration.

2.1.4 Connecting the Breakout Cable

The breakout cable provides access to the wafer reader's power, serial communications, and I/O lines. The RJ-45 connector on this cable is "keyed" to the notch in the Breakout Port, and cannot be inadvertently plugged in to the Network Port. See Section 8.2.1: Breakout Port Pin Assignments on page 106 for the Breakout Cable's wiring details.

To connect the sensor using the optional 1350 Breakout Module, refer to Appendix C: Connecting the Breakout Module.

To Connect the Breakout Cable to the In-Sight Wafer Reader:

1. Verify the 24VDC power supply being used is switched off.
2. Attach the Breakout Cable's power (white-green wire) and ground (brown wire) to the corresponding terminals on the power supply.
3. Connect the wires for the acquisition trigger, discrete outputs, and serial communications to their corresponding terminals on remote devices.
4. Plug the RJ-45 connector into the wafer reader's Breakout Port (labeled 24VDC).
5. Restore power to the 24V supply. The green power LED will indicate that the wafer reader is receiving power.

2.2 Configuring the Internet Browser

The In-Sight wafer reader is platform and operating system independent and can be controlled using a standard, Java-enabled Internet browser. In most cases, a PC is needed to set up a wafer ID application but is not necessary to monitor its runtime operation.

When configuring the In-Sight browser interface to communicate with the wafer reader, there are two main requirements:

- The connection must be a local area network (LAN) connection (versus dial-up).
- The connection must not be routed through a proxy server, virtual private network (VPN), or similar gateway.

The In-Sight browser interface has been tested using Microsoft Internet Explorer versions 5.0.1 and later on Windows XP, 2000 and NT 4.0. Using a Windows XP/2000/NT PC running Microsoft Internet Explorer 6 (or later) is strongly recommended. If using Internet Explorer 6, the Java™ Virtual Machine is not installed as part of the typical installation, but is installed on demand when a page using a Java Applet is first encountered. The Sun Java virtual machine can also be used on a windows-based PC. For information regarding installation, upgrade and setup of these software packages, see *Tech Note: Browser Setup and Java Installation for the In-Sight 1700 Series Applet*, which is available on the In-Sight 1700 Series CD, or can be downloaded from the In-Sight Online Support & Learning Center at:

www.cognex.com/support/In-Sight.asp.

Whichever virtual machine is being used, it must be enabled for the In-Sight browser interface to execute.

To verify that a virtual machine is enabled:

1 Open Internet Explorer.

2 From the Tools menu select **Internet Options…**.

3 Click the **Advanced** tab.

If using the Microsoft Virtual Machine, under the Microsoft VM settings, verify that **JIT compiler for virtual machine enabled** is checked, as shown in Figure 2-3.

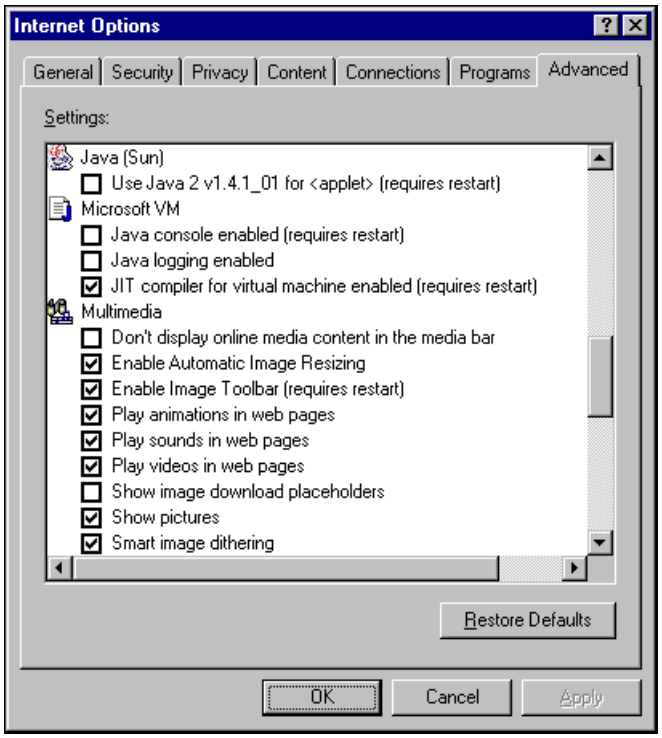


Figure 2-3: Internet Options Dialog – Microsoft Virtual Machine Enabled

OR

If using the Sun Java Virtual Machine, under the Java (Sun) settings, verify that **Use Java…** is checked, as shown in Figure 2-4.

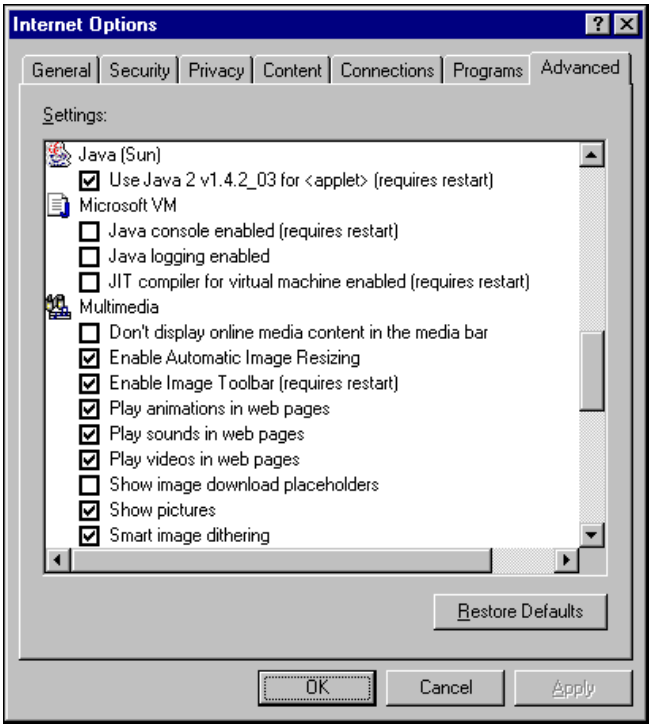


Figure 2-4: Internet Options Dialog – Java Virtual Machine Enabled

Also, if using the Sun Java Virtual Machine, verify that all browsers that will be running the In-Sight applet are enabled for use with the Java Plug-in, as shown in Figure 2-5. This can be verified from the Java Plug-in Control Panel. To open the Java Plug-in Control Panel, select Start > Settings > Control Panel > Java Plug-in. From the Browser tab, enable all applicable browsers.

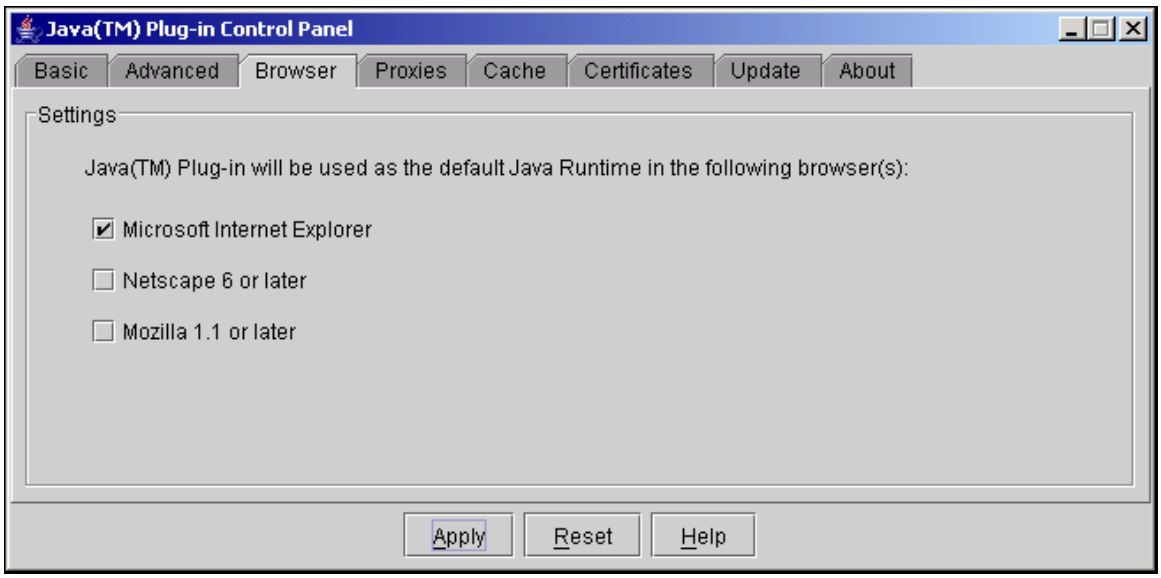


Figure 2-5: Browser Tab – Java Plug-in Control Panel

4 If a virtual machine was enabled, the browser must be restarted for the change to be applied.

2.3 Installing the In-Sight Software

A Microsoft® Windows®-based PC is required to run the In-Sight PC Host program and to add the wafer reader to the network. The following must be installed on the PC to load In-Sight PC Host Software:

- A Microsoft Windows XP, 2000 or NT 4.0 (with Service Pack 4 or later) operating system.
- Network Interface Card (at least 100Mbps) for connecting to In-Sight wafer readers
- In-Sight software (included on the CD-ROM shipped with your wafer reader).
- Internet Explorer 5.01 or higher to display the *In Sight® Guide & Reference.*

Perform the Following Steps to Install the In-Sight Software:

1. Shut down any applications on your PC.
2. Insert the In-Sight CD-ROM into your PC's CD-ROM drive. If Autoplay is enabled, the software should automatically launch the ISSetup.exe program.
3. Select the appropriate installation option; follow the setup dialogs as they appear on screen.
4. When the installation program is complete, remove the CD from the CD-ROM drive.

If the Install Program Does Not Start Automatically:

1. Click the Start menu, click Run, then click Browse.
2. In the browse window, select the PC's CD-ROM drive, then select the ISSetup.exe file.
3. Click Open, then click OK to begin the installation.
4. Select the appropriate installation option; follow the setup dialogs as they appear on screen.
5. When the installation program is complete, remove the CD from the CD-ROM drive.

Verify the In-Sight Software Installation:

1. Verify the In-Sight software installation by opening the Start menu and clicking *All Programs* > *Cognex* > *In-Sight* > *In-Sight Wafer ID (Java) 3.x.x* > *In-Sight PC Host.*
2. Verify the *In Sight® Guide & Reference* help file installation by opening the Start menu and clicking *All Programs* > *Cognex* > *In-Sight* > *In-Sight Wafer ID (Java) 3.x.x* > *In-Sight Help*.

NOTE From the Wafer ID (Java) 3.x.x program group, select the Release Notes for current information about In-Sight software, including new features, fixes and known issues. Registered In-Sight users can download updated versions of In-Sight documentation at: http://www.cognex.com/support/In-Sight.asp.

2.4 Adding the Wafer Reader to the Network

After the power and network connections to the wafer reader have been made and the In-Sight PC Host program has been installed to a networked PC, the wafer reader can be added as a host on the network.

NOTE	If the Microsoft "Media Sense" feature, which automatically detects whether or not your network interface is linked to a network, is enabled when running Microsoft Windows 2000 or XP, communication with an In-Sight wafer reader may not be established. It is recommended to use a hub or switch with a standard Ethernet cable to configure the In-Sight wafer reader or configure your PC to disable the Media Sense feature. See Microsoft Knowledge Base article 239924 for details on this process.

As previously described, there are many possible In-Sight network configurations. The specific procedure for adding wafer readers to a network depends on whether or not a ***Dynamic Host Configuration Protocol*** (DHCP) server is available. The DHCP server automatically assigns the wafer reader a network IP address and Subnet Mask.

NOTE	When installing the wafer reader to an existing network, consult your network administrator to determine whether a DHCP server is available.

2.4.1 Installing to a DHCP Network

The wafer reader is factory-configured for installation on an existing network with a DHCP server. After connecting the CAT5 network cable and the Breakout cable, the DHCP server will automatically detect the wafer reader, configure its settings, and install it on the network.

After adding a wafer reader to a network using DHCP, it is recommended that DHCP is disabled on the wafer reader and a static IP address is assigned.

NOTE	You will need to record the IP address to connect to the wafer reader from an Internet browser. To find the IP address that is assigned to the wafer reader, run the In-Sight PC Host program, then open the System menu and select **Settings** ▸ . From the Settings menu, select **Network**.

2.4.2 Installing to a Non-DHCP Network

A static IP address must be assigned to the wafer reader before the wafer reader will be recognized on a network where a DHCP server is not available.

To Install the In-Sight Wafer Reader on a Non-DHCP Network:

1 Supply power to a wafer reader, then open the In-Sight PC Host program.

2 From the In-Sight spreadsheet, press ***<ESC>*** to open the **System** menu.

Figure 2-6: PC Host System Menu

3 Select **Logon** to open the **Logon** dialog.

Figure 2-7: PC Host Logon Dialog

4 Click on the **Host Name** drop-down list to see the names of any In-Sight sensors already installed on the network.

5 Select **< New >** from the list to open the New Host Configuration dialog.

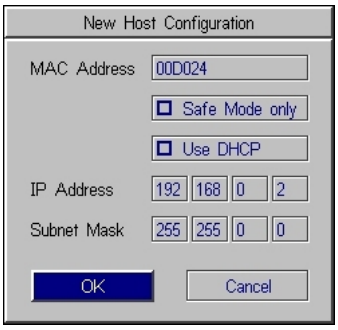


Figure 2-8: PC Host New Host Configuration Dialog

6 Enter the last six characters of the wafer reader's 12-character ***Media Access Control*** (MAC) address, without spaces or dashes. The first six characters are already entered, and should not be deleted or changed.

NOTE The MAC address is located on the serial number label affixed to the wafer reader. This identifier is factory-assigned, unique for every In-Sight wafer reader, and cannot be changed or deleted.

7 Verify that the **Use DHCP** checkbox is disabled.

8 Enter a valid **IP Address** for this wafer reader. Every wafer reader must be assigned a unique IP address consistent with the addressing scheme in use on the network. Refer to Appendix B for more information on assigning an IP address, or consult your network administrator.

9 Enter a **Subnet Mask** for the local network. The Subnet Mask specifies which parts of the wafer reader's IP address are the same for all hosts on the local network, and which are unique to each host. Refer to Section 6.3, or consult your network administrator for more information.

10 Click **OK**. The message box shown below appears.

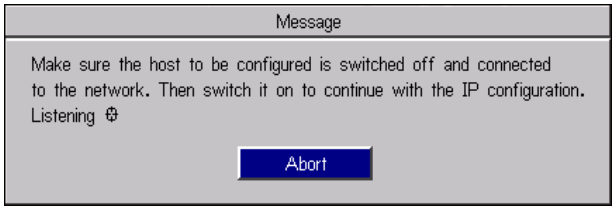


Figure 2-9: IP Configuration Message Box

11 Cycle power on the wafer reader by removing, then reinserting, the RJ-45 connector from the wafer reader's Breakout Port. When the wafer reader has been located on the network, the following message appears:

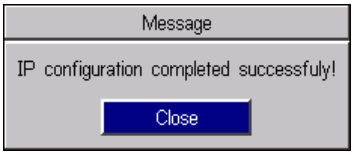


Figure 2-10: IP Configuration Completion Message Box

If this message does not appear within one minute of cycling power, click **Abort**. The New Host Configuration dialog will reappear. Verify that the IP address entered is valid and the Subnet Mask is appropriate for the local network. Make corrections as necessary, and repeat steps 1 through 11. Contact your network administrator if problems persist.

NOTE The wafer reader's network settings can also be modified (i.e., disable DHCP and assign a static IP) with HyperTerminal through the serial port using the SetNetwork extended Native Mode command. For more information on the command, refer to the *In Sight® Guide & Reference* HTML Help file.

This completes the basic installation procedure of an In-Sight wafer reader onto a network. Additional, optional network settings may be configured as described in Section 6.3.

2.5 Logging On to the In-Sight Wafer Reader

As described in the Introduction, a standard Internet browser is used to configure and monitor wafer ID applications on the wafer reader. When a connection to a wafer reader is made from a browser, the Java applet resident in the wafer reader flash memory automatically loads in the browser window.

NOTE Java virtual machine (JVM) software must be installed on the host platform and supported by the browser used to connect to the wafer reader. Many browsers automatically install Java support, but this option may not have been enabled when your browser was installed. For information regarding installation, upgrade and setup of JVM software packages, see *Tech Note: Browser Setup and Java Installation for the In-Sight 1700 Series Applet*, which is available on the In-Sight 1700 Series CD, or can be downloaded from the In-Sight Online Support & Learning Center at: www.cognex.com/support/In-Sight.asp.

To Open a Connection to an In-Sight Wafer Reader from an Internet Browser:

1 Enter the IP address of the wafer reader into the browser's Address Bar (for example, http://192.168.0.1). The HTTP Logon dialog (labeled Enter Network Password dialog when using Internet Explorer), opens.

Figure 2-11: Enter Network Password Dialog

NOTE	The IP address shown in Figure 2-11 is only an example. Every wafer reader installed on the same subnet must have a unique IP address, which must be consistent with the addressing scheme in use on that network.

2 In the HTTP Logon dialog, enter the default User Name **admin**.

Every wafer reader is pre-configured with three User Names: admin, operator, and monitor. Each User Name is assigned a specific Access level. The Access level controls how much interaction is allowed for the current user to prevent inadvertent or unauthorized changes to the configuration.

- Admin Level (Full): The user has complete, unrestricted access to the In-Sight wafer reader. Any job may be loaded, changed, and saved, and all menu selections are available.
- Operator Level (Protected): The user has limited access to the wafer reader, which runs only in the Custom View mode of the spreadsheet. A user in Protected mode can edit the values of all Graphics Controls functions visible in the Custom View, but cannot change the functions themselves. The System menu is available to toggle the wafer reader Online/Offline, access Live mode, Save & Load jobs (if permitted by their FTP Read/Write privileges), and Customize the appearance of the interface.
- Monitor Level (Locked): The most restrictive level of access available, a user in Locked mode can only monitor the operation of the current wafer reader in Custom View. The System menu is disabled.

NOTE	If you are connecting to a newly installed wafer reader, leave the Password field blank. If you are connecting to a previously installed wafer reader, you may need to enter a password.

3 Click **OK** to logon to the wafer reader. The In-Sight Home Page will begin loading automatically in the browser. Wait for the page to finish loading before making any further selections.

NOTE If there is no job loaded in the spreadsheet or the job is incompatible with the Java applet, an Invalid Job dialog appears. Click the **OK** button and open a compatible job. For more information on opening a job, see Section 4.3.

Figure 2-12: Invalid Job Dialog

To Suppress the HTTP Logon Dialog When Connecting to a Wafer Reader:

The user name and password can be specified as part of the address, allowing you to suppress the HTTP Logon dialog. The address must be typed using the following format into the browser's Address Box:

http://hostname/filename?isSL=username+password

NOTES

- "?isSL=username+password" is case sensitive; no spaces are allowed. If there is no password, leave it blank, without spaces. The "+" must be included, even if no password is entered.
- If no filename is specified, Index.htm will be opened in the browser.
- "hostname" can be either the Host Name or the IP address of the wafer reader.
- During a single HTTP session, do not connect to a wafer reader using both the HTTP Logon dialog and without.

Examples:

To log on to the wafer reader as **operator**, with no password and open the index.html file:

http://is1721_00060b/?isSL=operator+

To log on as **admin**, with the password **Cognex** and open the System Settings menu:

http://192.168.0.1/system.html?isSL=admin+Cognex

2.6 Communicating with the In-Sight Wafer Reader Over a Telnet Client

Telnet is a built-in Microsoft Windows client that can be used to remotely communicate with the wafer reader using In-Sight Native Mode commands.

NOTE By default, the Telnet system idle timeout is 5 minutes.

2.6.1 Logging On to the In-Sight Wafer Reader Using Telnet

The wafer reader allows for three active Telnet sessions. If a user attempts to log on to a wafer reader (with the same User Name as one of the sessions already open) and all three sessions are in use, the oldest session with the same User Name is closed and the new session is opened.

There are three possible session numbers. Each session number signifies the number of active Telnet and browser interface connections. There can only be one active browser interface connection at a time.
Session 0: There are no other active connections.
Session 1: There is one other active connection.
Session 2: There are two other active connections.

For example, there are three active connections: Session 0, Session 1 and Session 2. Session 0 and Session 2 are closed. The next connection will be Session 1 (since there is one other active connection).

1 Open the Telnet client application on the remote host.

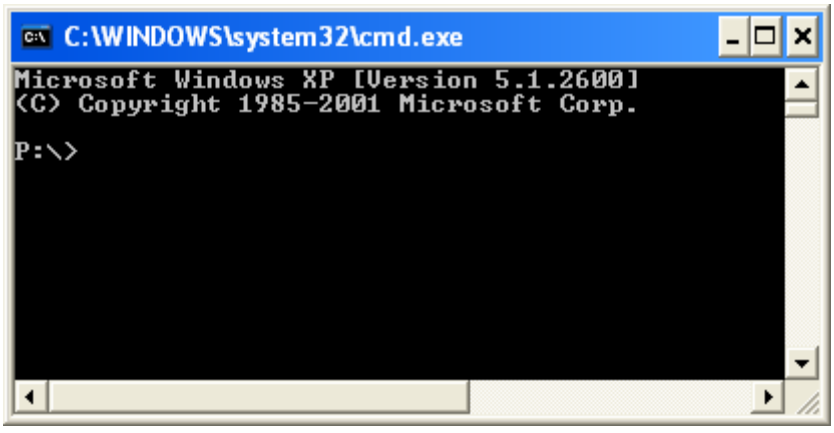


Figure 2-13

2 In the Telnet application, connect to the wafer reader by either its Host Name or IP address (for example: is1721_00060b or 192.168.0.1). If the connection is successful, a "Welcome to In-Sight(tm)" message appears, along with the hardware type (for example: 1722, 1721, 1701 or 1700), the session number and a prompt for “User:”.

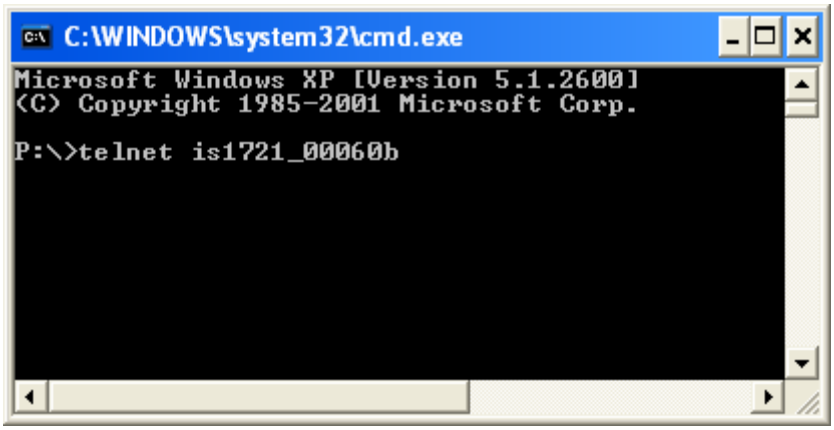


Figure 2-14

3 Enter a valid User name and Password for the In-Sight wafer reader. The User name and Password entered must exist in the User List for that wafer reader. If the log on is successful, the message "User Logged In" will appear.

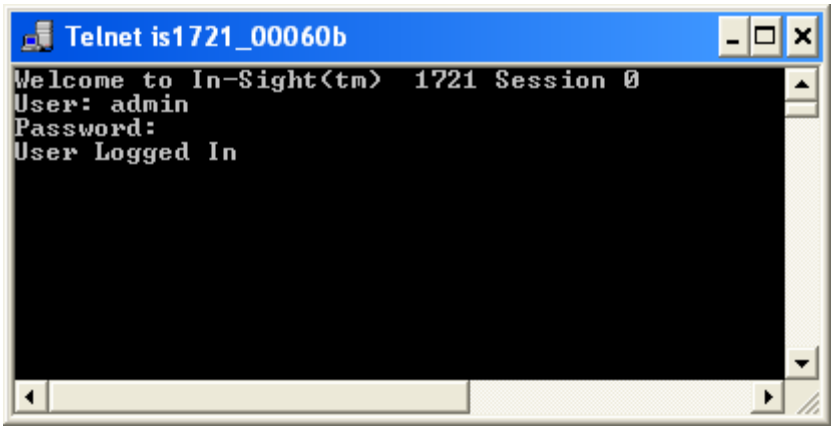


Figure 2-15

NOTE	When logging on to a wafer reader through Telnet from a Unix-based platform, the wafer reader’s Host Name (or IP address) and port number (usually 23) must be added to the command line. For example: >telnet is1721_00060b 23. Supplying the port number disables the Unix username/password authentication and forces the Unix system to prompt you for user name and password.

3 Configuring a Wafer ID Application

In this section…

3.1 SEMI® Wafer Marking Specifications

The In-Sight wafer reader identifies wafers marked according to the following specifications:

- **SEMI T7-0997 –** ***Specification For Back Surface Marking of Double-Side Polished Wafers With A Two-Dimensional Matrix Code*****.** Defines the characteristics and positioning of the rectangular 2D Data Matrix code symbol marked on the back surface of 300mm wafers.

- **SEMI M12-0998 –** ***Specification For Serial Alphanumeric Marking of the Front Surface Of Wafers*****.** Defines the characteristics and positioning of the 12-character alphanumeric string marked on the front surface of 100/125/150mm (flatted) and 150/200mm (notched) wafers.

- **SEMI M1.15-1000 –** ***Standard For 300mm Polished Monocrystalline Silicon Wafers (Notched).*** Combines elements of the SEMI T7 and SEMI M12 specifications for defining the characteristics and positioning of the rectangular 2D Data Matrix code symbol and the (optional) 12-character alphanumeric string marked on the back surface of 300mm wafers.

- **SEMI M13-0998 –** ***Specification For Alphanumeric Marking Of Silicon Wafers*****.** Defines the characteristics and positioning of the 18-character alphanumeric string marked on 100/125/150mm (flatted) and 150/200mm (notched) wafers.

- **SEMI T1-95 –** ***Specification For Back Surface Bar Code Marking Of Silicon Wafers*****.** Defines the characteristics and positioning of the barcode marked on the back surface of 125mm or larger wafers.

For copies of the complete specifications, visit the Semiconductor Equipment and Materials International (SEMI) organization at:
www.semi.org.

3.2 Basic Concepts

Wafer reading recipes created using In-Sight are called ***jobs***. Each job can contain up to 10 unique reading configurations, called ***Configs***. Each Config specifies a type of wafer mark, a checksum, the string fielding, light settings, and other information. An automatic ***tuning*** operation can be used to optimize Config settings for maximum reading reliability.

Jobs can run multiple Configs in a ***retry sequence*** until a successful read is achieved, or the mark cannot be read within the time permitted. Optionally, Configs can be tuned automatically during runtime if the retry sequence fails to report a successful read.

When a Config is tried, it reports a string of characters for successful reads, or a string of asterisks (***) or partially read characters and question marks for failed reads. In either case, a read score is reported.

All of the steps necessary to configure a standard wafer ID application are performed in the user interface that loads automatically when you connect to a networked wafer reader using a Java-enabled web browser, as described below.

3.3 GUI Overview

The user interface that loads in the web browser when connecting to a wafer reader is divided into five main areas:

- The **File** tab is used to open, save and delete job (.JOB) files. The File tab also provides quick File Transfer Protocol (FTP) access to files in the wafer reader's flash memory.

- The **Setup** tab is used to select Config settings, which can then be optimized through the automated tuning process.

- The **Options** tab is used to specify various runtime settings that determine how the job will execute. These settings include the source of the image acquisition/read trigger, the retry method to use for enabled Configs, and the data format and output destination of read results. The Options tab also provides a hyperlink to the System Settings page (see Section 6: System Settings).

- The **Run** tab is the runtime view of the wafer reader's operation, showing the most recent read results and statistics for the Configs enabled in the job. The Run tab is the default view whenever a wafer reader is accessed through a web browser, and is the only view allowed when a wafer reader is Online.

- **Status bar**. The **status bar** shows (from left to right) the **Host** (Host Name or IP Address) for the connected wafer reader, the **Access** level for the current user (Full, Protected or Locked), the name of the **Current User**, and the name of the user that is logged on with **Admin/Operator** privileges.

NOTE Only one Admin/Operator user at a time may log on to the browser interface.

3.4 Getting an Image

Before Config settings can be defined for reading wafer marks, a reasonable image of the mark is needed.

NOTE For specific information on setting the working distance and adjusting the focus of an In-Sight 1721 or 1722 wafer reader, see Appendix D: 1721/1722 Wafer Reader Installation Options. For specific information on setting the working distance and adjusting the focus of an In-Sight 1701 wafer reader, see Appendix E: 1701 Wafer Reader Installation Options.

1. In the **Run** tab, disable the **Online** checkbox.
2. Click the **Setup** tab.
3. Click the **Live** button. Position the wafer mark horizontally in the field of view (FOV), making sure that the entire mark is visible in the image.

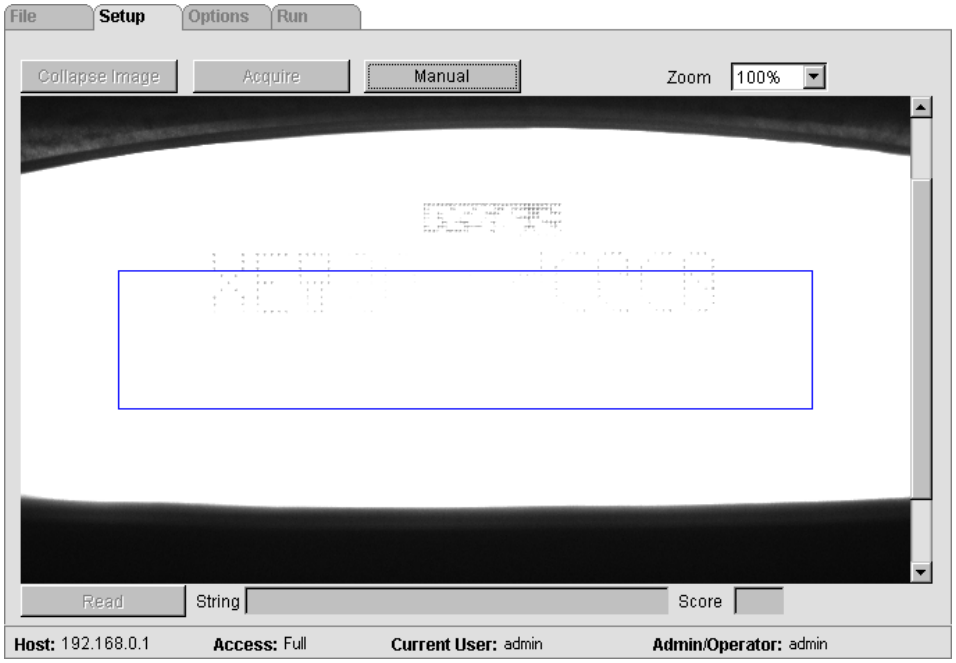


Figure 3-1: Position Mark Using Live Mode

4 When the mark is properly positioned in the image, double-click the image or click the **Manual** button to exit Live mode.

- If the image is too bright or too dark, adjust the **Light Mode** and **Light Power** slider controls until the mark can be seen against the wafer background.
- If the mark is inverted or mirrored in the image, select a different **Image Orientation** from the drop-down list.

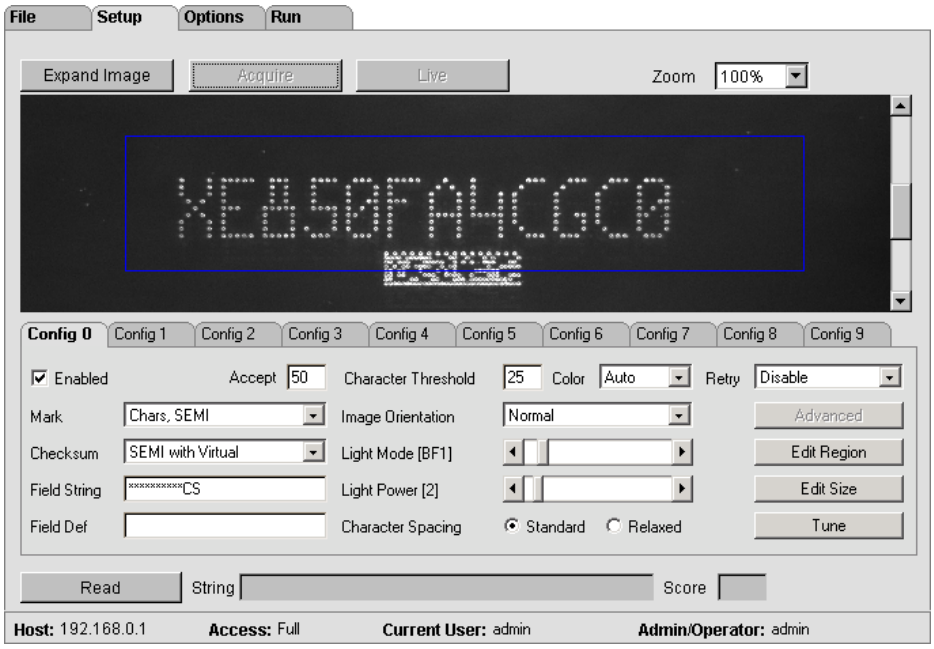


Figure 3-2: Adjusted Mark

Repeat steps 1 through 4 as necessary.

NOTE	The lighting does not need to be optimized at this stage; the wafer mark need only be visible in the image. Light optimization occurs during tuning.

When the mark is suitably imaged in the FOV, the first Config can be defined, as detailed in the following sections.

3.5 Defining Config Settings

The Setup view contains individual tabs for each Config, numbered 0-9 (see Figure 3-3). Each Config contains the same default settings. These settings can be customized according to the type and quality of wafer marks that will be read.

NOTE Settings can be copied between Configs. To copy settings from one Config to another, click and hold the left mouse button on the source Config tab then drag-and-drop on the tab of the target Config; select **OK** in the Copy Config dialog. When Configs are copied, the stats from the source Config are also copied to the target Config.

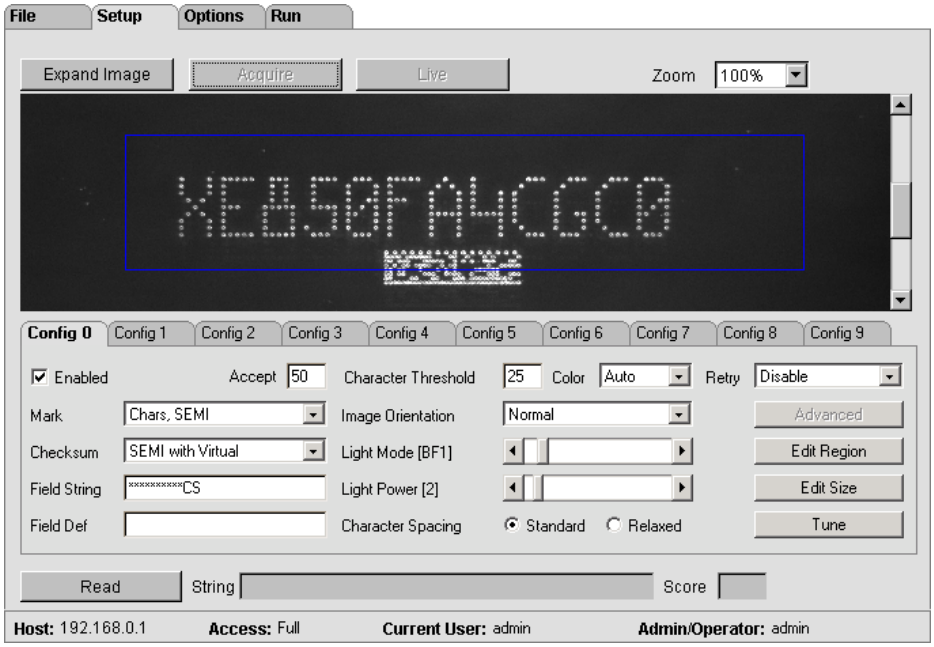


Figure 3-3: Config Settings

The following sections describe each of the settings and available selections in detail.

3.5.1 Expand Image

The **Expand Image** button allows you to increase the size of the image area. The Config settings are hidden while in Expanded mode. This mode is especially useful when properly positioning a mark in the image area.

3.5.2 Zoom

The **Zoom** drop-down list allows you to increase the magnification of the image area (63% to 1600% for the 1722, 1721 and 1701 wafer readers; 100% to 1600% for the 1700 wafer reader). This is especially useful when a high degree of precision is required in positioning graphics.

3.5.3 Enabled

The **Enabled** checkbox determines whether the Config will be used during the retry sequence at runtime. The retry order for Configs is specified in the Options tab (see Section 3.6). When Enabled is checked, the Config number on the tab appears in bold text.

NOTE All Config settings are saved with the job, even when the Config is disabled.

3.5.4 Mark

The **Mark** setting specifies the type of wafer mark the selected Config will read.

SELECTION	DESCRIPTION
2D Sym, T7 Data Matrix	Reads a SEMI T7 standard 2D Data Matrix symbol (ECC 200, 8 rows by 32 columns).
BC, BC 412	Reads a SEMI T1-95 standard barcode. (See Advanced section, below.)
BC, IBM 412	Reads an IBM 412 barcode. (See Advanced section, below.)
Chars, SEMI (default)	Reads SEMI M12, M13, and M1.15 standard alphanumeric character strings. (See Advanced section, below.)
Chars, IBM	Reads IBM Hexadecimal alphanumeric character strings.
Chars, Triple	Reads Triple Density standard alphanumeric character strings.

Advanced

Chars, SEMI Advanced Dialog

When 'Chars, SEMI' is the selected Mark, the Advanced dialog can be accessed from the Advanced button (see Figure 3-4).

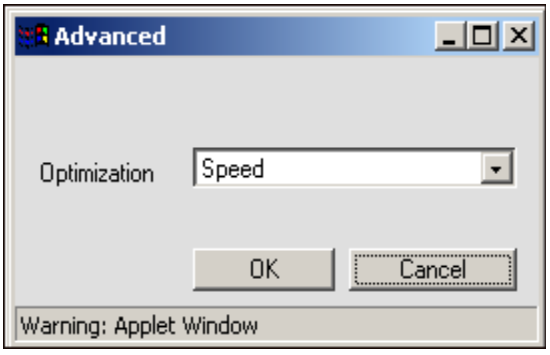


Figure 3-4: Chars, SEMI Advanced Dialog

The Optimization drop-down list specifies reading performance options for standard alphanumeric character strings. There are two Optimization options: Speed and Reliability. Speed reads the Mark faster, but may be less accurate. Reliability minimizes misreads by reading the Mark at a slower rate.

NOTES

- Speed is the default Optimization setting that is used for compatibility with all previous versions of the In-Sight wafer reader.
- The read score may vary depending on the Optimization setting; verify that the Accept and Char Threshold settings correspond to the selected Optimization setting.

BC, Compress Advanced Dialog

When 'BC, BC 412' or 'BC, IBM 412' is the selected Mark, the Advanced dialog can be accessed from the Advanced button (see Figure 3-5).

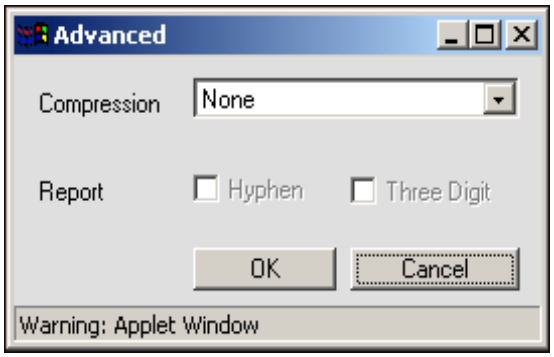


Figure 3-5: BC, Compress Advanced Dialog

The **Compression** drop-down list specifies options for decoding compressed barcodes, including Base 35 compression, as well as a selection for decoding a barcode with no compression.

When one of the Compressed options (Compressed 1 to Compressed 8) is selected, **Report** settings are also available. If **Hyphen** is enabled, the last two digits of the barcode string are separated by a hyphen. If **Three Digit** is enabled, the digits that are encoded for the wafer lot number are replaced by a three-digit number; zeros (0) are used as place-holders if the lot number is less than three digits. For example, if the encoded lot number is "12", the lot number would be reported as "012". Report settings are ignored if 'None' is the selected Compression.

NOTE For specific information on the customized decoding options, please contact your Cognex Sales Engineer.

3.5.5 Checksum

The **Checksum** setting selects the method by which the read result from a character string will be validated to ensure reliability, and establishes the scoring basis for determining the pass/fail status of the read.

NOTE The Checksum setting is enabled and used only when 'Chars, SEMI', or 'Chars, Triple' is the selected Mark. When any other Mark is selected, the Checksum setting is ignored.

In all cases, the raw read score of the character string must be higher than the specified Accept threshold before the checksum will be evaluated (see Section 3.5.7). Then if the character string passes its checksum, bonus points in increments of 100 and/or 200 are added to the raw reading score and the read passes. The number of bonus points added to the raw score depends on the Checksum selected.

When Virtual checksum is selected by itself, the Accept threshold should be increased, and the Field String & Field Definition should be made as specific as possible to limit the list of possible characters at each position in the string. These steps will increase reading reliability in the absence of a mathematical checksum.

SELECTION	DESCRIPTION
Virtual	The Cognex Virtual checksum attempts to validate the read result using multiple reading methods. If all methods read identical characters at each position in the string, the string passes the Virtual checksum and 100 points are added to the raw response score. This checksum should be used by itself only when the character string is known not to contain one of the other checksums, and then a higher Accept threshold is strongly recommended. Maximum score: 200 points Minimum passed score: 100 plus Accept threshold
SEMI	Applies the SEMI-standard checksum and the Cognex Virtual checksum. If the read result passes the SEMI checksum, 200 points are added to the raw score. If the read result also passes the Virtual checksum and the results from both checksums agree, an additional 100 points are added to the score. The read must pass the SEMI checksum to be successful; if Virtual checksum passes but the SEMI checksum fails, the entire read will fail. Maximum score: 400 points Minimum passed score: 200 plus Accept threshold
SEMI with Virtual (default)	Applies the SEMI-standard checksum and the Cognex Virtual checksum. If the read result passes the SEMI checksum, 200 points are added to the raw score. If the read result also passes the Virtual checksum and the results from both checksums agree, an additional 100 points are added to the score. The read must pass both the SEMI and Virtual checksums to be successful; if either checksum fails, the entire read will fail. The SEMI with Virtual checksum selection is the most reliable method of validating a character string containing a SEMI checksum. Maximum score: 400 points Minimum passed score: 300 plus Accept threshold
BC 412 with Virtual	Applies the SEMI-standard barcode checksum and the Cognex Virtual checksum. If the read result passes the BC 412 checksum, 200 points are added to the raw score. If the read result also passes the Virtual checksum and the results from both checksums agree, an additional 100 points are added to the score. The read must pass both the SEMI BC 412 and Virtual checksums to be successful; if either checksum fails, the entire read will fail. This selection is typically used when the character string is marked directly below the barcode on the wafer. Maximum score: 400 points Minimum passed score: 300 plus Accept threshold
IBM 412 with Virtual	Applies the IBM barcode checksum and the Cognex Virtual checksum. If the read result passes the IBM 412 checksum, 200 points are added to the Raw Score. If the read result also passes the Virtual checksum and the results from both checksums agree, an additional 100 points are added to the score. The read must pass both the IBM 412 and Virtual checksums to be successful; if either checksum fails, the entire read will fail. This selection is typically only used when the character string is marked directly below the barcode on the wafer. Maximum score: 400 points Minimum passed score: 300 plus Accept threshold

3.5.6 Field String and Field Definition

The **Field String** and **Field Definition** settings work together to define the format of the character string when 'Chars, SEMI', 'Chars, IBM', 'Chars, Triple', or one of the barcodes is the selected Mark type.

NOTES

- Both The **Field String** and **Field Definition** settings are case sensitive.
- When 'Chars, IBM' is the selected Mark, the only valid characters are Hexadecimal.
- When '2D Sym, T7 Data Matrix' is the selected Mark, the Field String and Field Definition settings are ignored.

Field String

The Field String specifies the characters, and number of characters, contained in the character string or encoded in a barcode, including alphanumerics (A-Z, 0-9), dashes (-), dots (.), and spaces.

Each character in the Field String corresponds to an indexed field position between 0 and 21. The Field String must contain the same number of positions as there are characters in the wafer mark for the read to pass.

NOTE For compressed barcodes, the field string is the actual number of encoded characters, not the number of characters that are expected to be returned. For example, a compressed barcode may contain 7 encoded characters, but return 11 characters when the barcode is read. Therefore, 7 characters would be entered in the field string.

By default, each position in the Field String is represented as an asterisk (*) character, or alphanumeric "wildcard." This means that any character A-Z or 0-9 is valid at any position in the string. However, an individual position in the Field String can be limited to consider only a subset of possible characters at that position. This increases overall performance and reliability because characters that are not possible at a position will not be considered during a read. The following table lists predefined "field definitions" that can be entered in the Field String:

FIELD STRING ENTRY	DEFINITION	VALID CHARACTERS
*	Alphanumeric wildcard	ABCDEFGHIJKLMNOPQRSTUVWXYZ 0123456789
A	Alpha	ABCDEFGHIJKLMNOPQRSTUVWXYZ
N	Numeric	0123456789
H	Hexadecimal	0123456789 ABCDEF
D	Decimal	0123456789 (.)
C	SEMI Checksum, alpha	ABCDEFGH
S	SEMI Checksum, numeric	01234567
X	Alphanumeric wildcard, alpha, numeric, hexadecimal, decimal, SEMI Checksum, dot and dash	ABCDEFGHIJKLMNOPQRSTUVWXYZ 0123456789 (.) (-)

FIELD STRING ENTRY	DEFINITION	VALID CHARACTERS
(.)	dot	(.)
(-)	dash	(-)
space	space	space

NOTE All characters that are not predefined or entered in the Field Definition are treated as an alphanumeric wildcard.

Example: The Field String entry for a SEMI M12 standard character string can be **********CS (the default Field String setting). Any alphanumeric character is valid in the first 10 Field String positions. But in the 11th position, only alpha characters A-H will be considered during the read. And in the 12th position, only numeric characters 0-7 will be considered.

Fielding Barcodes

When the selected Mark is a barcode, the Field String must be changed so that it is appropriate for the selected barcode mark.

To determine the barcode field string length and mark type, count the number of strokes in the barcode. Divide the number of strokes by 4 to determine the number of characters in the string. The remainder can be used to determine the barcode mark type.

REMAINDER	BARCODE MARK TYPE
0	Invalid mark type
1	'BC, IBM 412'
2	Invalid mark type
3	'BC, BC 412'

Example:

1 The barcode contains 29 strokes.

2 29 divided by 4 equals 7. Therefore, there are 7 characters in the string.

3 After dividing by 7, the remainder is 1. Therefore, the mark type is IBM 412.

Field Definition

Optionally, the **Field Definition** setting can be used to create user-defined entries for the **Field String** if **Mark** specifies a character string or barcode. When included in the Field String, these entries restrict the list of valid characters at the positions in which they are inserted.

- Multiple field definitions can be used, separated by a semicolon (;).
- Characters listed for a Field Definition entry must be contained in the font or barcode. For example: &=123 is valid, because 1, 2, and 3 are valid characters. However, 123=& is invalid because '&' is not included in the standard Semifont or barcode character sets.

NOTE	Using one of the predefined entries (*, A, N, H, D, C, S, X, dot, dash, space) in the Field Definition will remap the list of valid characters to the new definition. Therefore, it is strongly recommended that you do not use a predefined field definition.

Example: If the Field Definition is &=123;$=3456;%=789, and the Field String is &$%*******CS, then the only characters that will be valid in the first position will be 1, 2, or 3. The only valid characters in the second position will be 3, 4, 5, or 6. And in the third position, only 7, 8, or 9 will be valid.

3.5.7 Accept

The Accept value specifies the minimum response threshold for the raw reading score (40 to 100; default = 50). The meaning of the Accept value and its role in determining the pass/fail status of a read depends on the type of wafer mark.

In all cases, before a read can be considered successful, the raw score must exceed the Accept threshold. Only then will the bonus points for passing the checksum be added to the raw score, and the pass/fail status of the read determined.

- **Characters**. The response score for a character string is derived from the average of the individual scores for all characters in the string. Refer to Section 3.5.5 for a detailed explanation of how the raw score combines with a checksum to determine the total score and pass/fail status of the read.

NOTE	It is possible for the raw score to exceed the Accept value even when individual character scores fall below the specified threshold, as long as each individual character scores above the Character Threshold. This allows character strings where all but one or two characters score above the threshold to be read successfully.

- **2D symbol.** The response score for a 2D symbol is the score for locating the mark in the image. If the 2D mark cannot be located, the score will be 0 and the read fails. If the 2D mark is located and the mark is decoded, 300 bonus points are added to the raw score (passed scoring range: 340 – 400).

NOTE	Accept is ignored when '2D Sym, T7 Data Matrix' is the selected Mark type.

- **Barcode.** The response score for a barcode is the percentage of "scan lines" within the Region that correctly detect the length of the string encoded in the barcode. If at least three scan lines decode the same string that passes the checksum, 300 bonus points are added to the raw score (passed scoring range: 310 – 400).

NOTE	Accept is ignored when a barcode is the selected Mark type.

3.5.8 Character Threshold

When 'Chars, SEMI', 'Chars, IBM' or 'Chars, Triple' is the selected Mark, the Character Threshold value specifies the minimum response threshold for each individual character score (25 to 100; default = 25). Each individual character score must be greater than the Character Threshold or the read will fail.

3.5.9 Image Orientation

The Image Orientation setting selects the orientation of the wafer mark in the image. The default orientation is Normal.

SELECTION	DESCRIPTION
Normal (default)	Unmodified image acquired by the wafer reader.
Mirrored horizontally	Horizontally mirrors the acquired image.
Flipped vertically	Vertically flips the acquired image.
Rotated 180 degrees	Rotates the acquired image by 180 degrees.

3.5.10 Light Mode and Light Power

Each Config can have unique **Light Mode** and **Light Power** settings for optimizing the readability of the wafer mark in the image. In-Sight will automatically determine the optimal light settings for a mark during the tuning process if the Light checkbox in the Tune dialog is enabled.

Light Mode

The Light Mode setting specifies either a Bright Field or a Dark Field illumination effect on the mark. Each position on the Light Mode slider control enables specific groups of LEDs to achieve the intended effect in the image.

SELECTION	DESCRIPTION
Slider position 0	All lights are disabled. Use this mode only when an external light source is required in a specialized application.
Slider positions 1-3 (BF1–BF3)	The mark will appear dark on a light background. Default = BF1
Slider positions 4-12 (DF1–DF8)	The mark will appear light on a dark background.

Light Power

The Light Power setting controls the effective intensity of the LEDs on the mark by increasing the exposure time of the wafer reader's CCD imager, in increments of 0.167 milliseconds. Decrease Light Power for a darker image; increase it for a lighter image. Generally, use Light Power to maximize the contrast of the mark relative to the background on the wafer.

NOTE The effect of the Light Power setting is visible in the duration of the "strobed" light pulse as the wafer reader acquires an image.

3.5.11 Character Spacing

When 'Chars, SEMI', 'Chars, IBM' or 'Chars, Triple' is the selected Mark, the Character Spacing setting controls the tolerance of the spacing between adjacent characters and the vertical alignment of the characters.

NOTE The current Character Spacing setting is used during tuning (Section 3.5.16).

SELECTION	DESCRIPTION
Standard Spacing	Reads the characters using standard SEMI specifications for character spacing and vertical character alignment.
Relaxed Spacing	Reads the characters with more tolerance for deviations from the specifications for character spacing and alignment.

3.5.12 Color

The Color setting specifies the expected color of the wafer mark. In-Sight automatically determines the correct color of the mark as imaged during the tuning process if the Color checkbox in the Tune dialog is enabled.

SELECTION	DESCRIPTION
Black	Specifies a black mark on a light background. Use when Light Mode is set to Bright Field.
White	Specifies a light mark on a dark background. Use when Light Mode is set to Dark Field.

NOTE The Color setting is ignored when the selected Mark is a barcode.

3.5.13 Retry

The **Retry** drop-down list specifies the tuning behavior of the Config during the retry sequence at runtime. The retry order for Configs is specified in the Options tab (see Section 3.6).

SELECTION	DESCRIPTION
Disable (default)	The Config will be tried, but not fine tuned*; fine tuning differs from the more exhaustive tuning process during setup (see Section 3.5.16).
Enable	The Config will be tried, and fine tuned.
Enable & Apply	The Config will be tried and can be fine tuned. If tuned successfully the new settings will be applied to the Config, overwriting the previous settings.
*Fine tuning adjusts the Light Power by ± .5ms, in increments of .2ms. It also adjusts the Size region ± 1 pixel, both high and wide. This continues on all enabled Configs until there is either a read or the timeout is exhausted.	

NOTES

- Enabled must be checked for a Config to be included in the retry sequence, regardless of the Retry selection.
- If Retry is enabled for multiple Configs that have identical settings, only one Config will be retried.
- The Retry setting is ignored when the In-Sight protocol TUNE(<Config>) command is issued.

3.5.14 Region

The **Region** defines the area in which the wafer mark is expected to appear in the FOV. The mark must be sufficiently illuminated and entirely contained within the Region or the read will fail. Generally, the mark may be rotated as much as ± 5 degrees within the horizontal axis of the region without a significant decrease in readability. The image coordinates and the size of the region (row, column, height, width) are displayed below the box. If a rotation or curve is set for the Region, the Theta (rotation) and Phi (curvature) are also displayed.

To set the Region:

1 Click the **Edit Region** button. The image area will expand, and the interactive region box will appear (Figure 3-6).

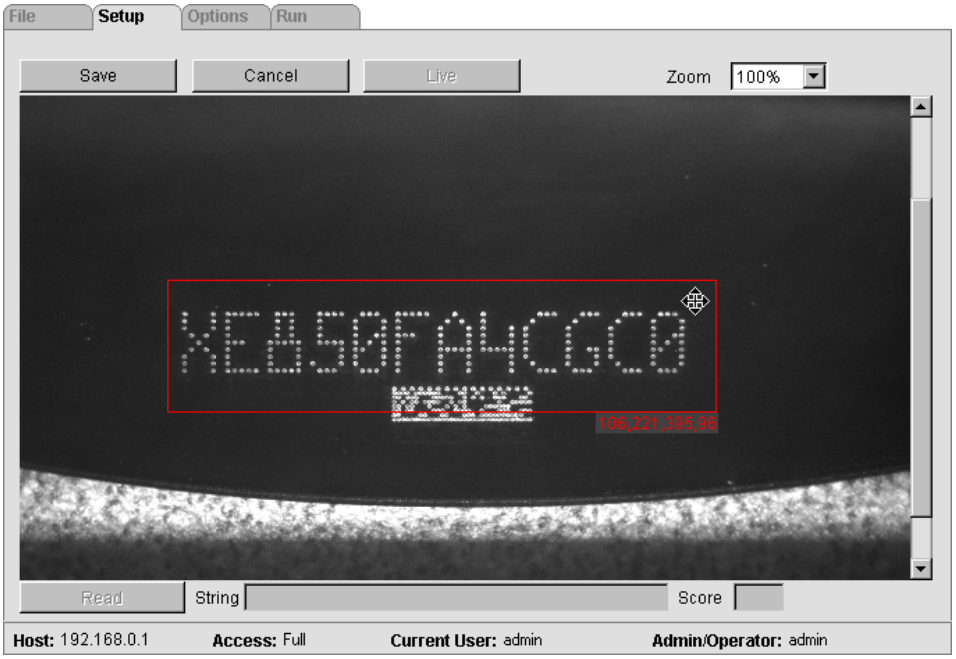


Figure 3-6: Editing the Region

2 Adjust the region as necessary to encompass the entire mark.

- To move the region, position the cursor anywhere inside the box, then click and hold the left mouse button while dragging. To move the region one pixel at a time, use the arrow keys on the keyboard.

- To resize the region, position the cursor over an edge or corner of the region, then click and hold the left mouse button while dragging. To resize the region one pixel at a time, use Shift-arrow keys.

- To rotate the region, press *CTRL+R* on the keyboard. In the upper left-hand corner of the region, the rotate region icon,  , will appear. When the cursor moves over the icon, it changes to the rotate region cursor,  . Click and drag the rotate region cursor with the left mouse button to rotate the region. To rotate the region one pixel at a time, use the *CTRL*+Left/Right arrow keys. The region can be rotated ±180 degrees. When rotating the region, the angle setting is displayed along with the other region settings. The mark must still be within ±5 degrees of the horizontal axis of the region.

- To curve the region, press *CTRL+R* on the keyboard. In the upper right-hand corner of the region, the curve region icon,  , will appear. When the cursor moves over the icon, it changes to the curve region cursor,  . Click and drag the curve region cursor with the left mouse button to curve the region. To curve the region one pixel at a time, use the *CTRL*+Up/Down arrow keys. The region can be curved ±360 degrees. When curving the region, the curve setting is displayed along with the other region settings. The mark must still be within ± 5 degrees of the horizontal axis of the region.

NOTES

- The Zoom function can be especially useful when setting the Size.
- When '2D Sym, T7 Data Matrix' is the selected Mark, the Region must be set no larger than 120 pixels high. If the Region height is set larger than 120 pixels, the read will fail. Also, setting the region to an angle other than zero may lower the accuracy of the read.
- Although the region can be rotated, it is strongly recommended that the wafer reader be mounted so the mark aligns parallel to the horizontal image axis. Setting the region to an angle other than zero will increase read time.
- If both the rotation and the curve of the region are set to zero, only the image coordinates and the size of the region (row, column, height, width) are displayed below the box.

To finish editing the region and accept the changes, double left-click anywhere in the image or click the **Save** button above the image area.

3.5.15 Size

Size defines the expected height and width of a 2D symbol or the characters in a string, as measured in pixels. The size (height, width) is displayed below the box.

NOTES

- When a BC 412 or IBM 412 barcode is the selected Mark type, Size is disabled.
- The location and rotation of the Size are used for positioning only; they do not effect the read. Also, the default rotation angle is set to the Region's rotation angle.
- The Zoom function can be especially useful when positioning the Size region.

To set the mark size:

1 Click the **Edit Size** button. The image will automatically expand.

2 To move the Size, position the ✥ cursor inside the size box, then click and hold the left mouse button while dragging. To resize the box, position the cursor over an edge or corner of the box, then click and hold the left mouse button while dragging. To rotate the Size, press *CTRL+R* on the keyboard. Click and hold the left mouse button while dragging the circle to rotate the region. The region can be rotated ±45 degrees

TIP To move the region one pixel at a time, use the arrow keys on the keyboard, to resize the region one pixel at a time, use Shift-arrow keys and to rotate the region one pixel at a time, use the CTRL+Left/Right arrow keys.

- If 'Chars, SEMI', 'Chars, IBM' or 'Chars, Triple' is the selected **Mark**, Size defines the height and width expected for each character in the string. To set the size for characters, position the Size box around a character so that its edges align with the centers of the strokes, as shown in Figure 3-7. "Square" characters with horizontal and vertical strokes — such as 0, 3, and Φ — are the best to use when setting the size, although any character can be used.

Figure 3-7: Editing Character Size (Enlarged)

- If '2D Sym, T7 Data Matrix' is the selected **Mark**, Size defines the height and width expected for the entire 2D symbol. To set the size for 2D symbols, position the Size box so that it aligns with the centers of the corner cells of the matrix, as shown in Figure 3-8.

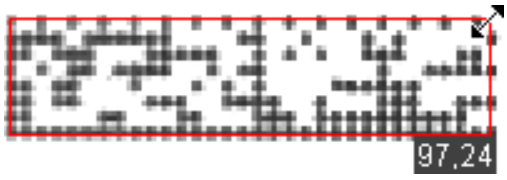


Figure 3-8: Editing 2D Data Matrix Size (Shown at 200% Zoom)

To finish editing the box and accept the changes, double left-click anywhere in the image, or click the **Save** button.

3.5.16 Tune

The **Tune** button accesses the automated tuning process used to optimize Config settings (see Figure 3-9). Unlike Retry tuning, standard tuning is performed on an individual Config prior to runtime.

During tuning, an exhaustive read test is performed on the mark using combinations of Color, Light Mode, Light Power and Size settings with the current settings for the Mark, Checksum, Accept, Character Threshold, Field String/Definition, Character Spacing and Region settings. After each iteration, the string and score results for the last read are displayed. The best string and score result achieved so far are shown, along with counts of the total number of reads attempted and the number of successful reads.

NOTES

- Either the Light or Size checkbox must be enabled to tune the Config.
- The image display is not updated during tuning.

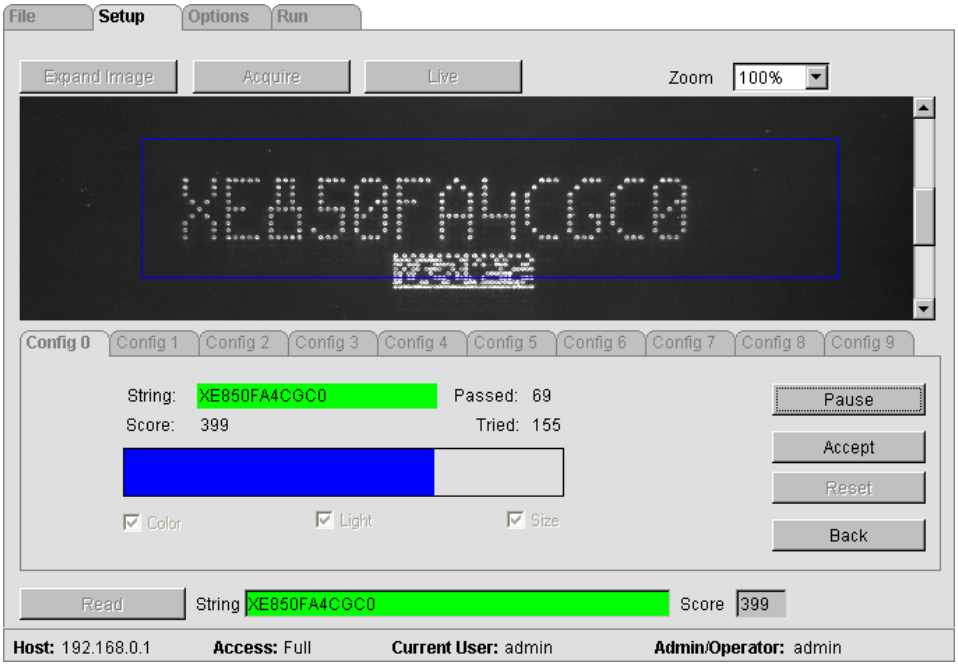


Figure 3-9: Tuning a Character String

When tuning is completed, the combination of settings that correctly read the mark with the highest score is retained, and can be applied to the Config or discarded.

To tune a Config:

Choose the tune options to try by enabling/disabling the checkboxes. By default, Color, Light and Size are enabled. Disabling a checkbox causes tuning to use the current definition for the corresponding setting in the Config.

- When the Color checkbox is enabled, both black and white mark colors are tried during the tuning process.
- Light Mode and Light Power are automatically tuned if the Light option is enabled. If the Light option is disabled, the current Config settings for Light Mode and Light Power are used.
- When the Size option is enabled, tuning will try sizes ± 10 pixels from the current Size setting in the Config.

During tuning:

- Click **Pause** to pause tuning. Click **Continue** to resume tuning from where it left off.
- Click **Accept** to stop tuning and update the Config with the settings of the best read so far (the Accept button will be grayed out until the first passed read).
- Click **Reset** to stop tuning and discard the tuning results.
- Click **Back** to stop tuning, discard the tuning results, and return to the Config settings.

After tuning is completed:

- Click **Accept** to apply the tuned settings to the Config.
- Click **Reset** to re-initialize all tuned settings. Select a different combination of tuning options, then click the **Start** button to tune again.
- Click **Back** to return to the Config settings. The Config will be updated with the tuned results if **Accept** was clicked previously. Otherwise, the tuned settings will be discarded.

TUNING TROUBLESHOOTING TIPS

- Make sure the Field String contains the correct number of characters, and any dots, dashes, and spaces are in the correct positions.
- Make sure the correct Checksum is selected (for Chars).
- Make sure Region and Size settings are reasonable before tuning.

3.5.17 Read

The **Read** button, below the Config settings, acquires an image and performs a “test” read on the wafer mark using the current Config. The String and Score results are reported to the right. If the read passes, the String appears on a green background; failed reads appear on a red background.

3.6 Setting Options

The selections in the **Options** tab (Figure 3-10) control how the configured wafer ID application will operate during runtime.

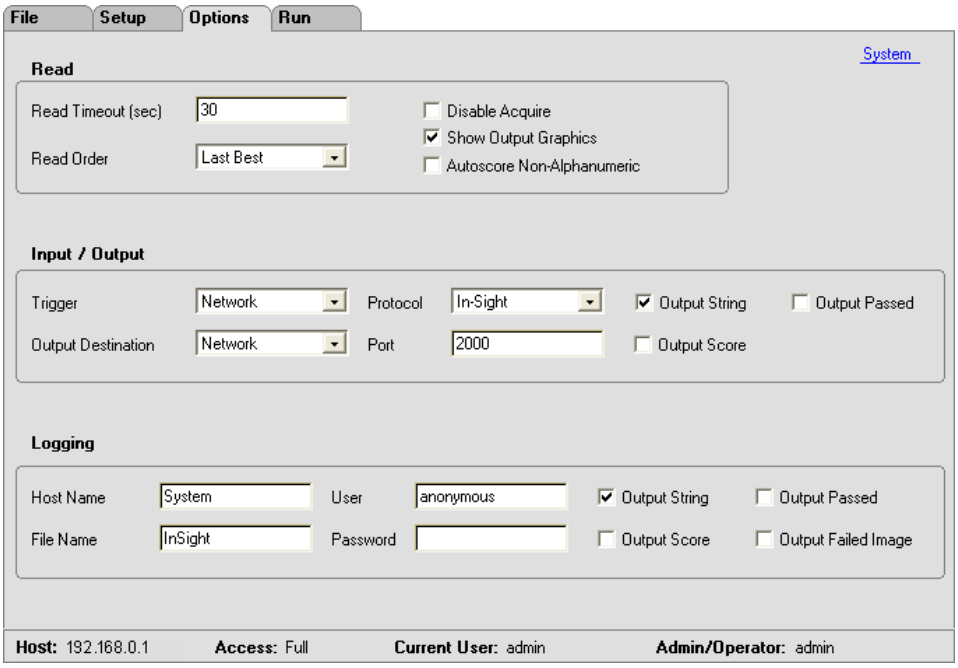


Figure 3-10: Options Tab

3.6.1 Read

Read options control the try sequence for enabled Configs. Optionally, image acquisition can be disabled to allow test reads from image files when the wafer reader is Offline.

Read Timeout & Read Order

Read Timeout specifies the total amount of time (up to 60 seconds) to allow for a read, including retries and tuning of enabled Configs. When the timeout limit is reached without a successful read, the read fails.

NOTE	Specifying a Read Timeout differs from terminating the execution of the read using the Abort Execution command. For more information on this command, refer to Section 7: Native Mode Commands.

Read Order Specifies the order in which enabled Configs will be tried until a successful read is obtained.

SELECTION	DESCRIPTION
Last Best (default)	Configs will be tried in the order they scored (from highest to lowest) during the last read until a passed score is read.
In Order	Configs will be tried in numerical order (0-9), regardless of how they scored during the most recent read.

Disable Acquire

Disables image acquisition to allow a test read from the last image acquired, or from an image file, when the wafer reader is Offline. The Light Mode and Light Power settings are disabled, as are the Acquire and Live buttons.

To Read from a Saved Image File:

1. Check the Disable Acquire checkbox.
2. Load a valid .BMP or .JPG image file (640 x 480, 8-bit) using one the following methods:
   - With the In-Sight PC Host open, drag-and-drop an image file onto the spreadsheet. Or, open the Save & Load dialog (System > Save & Load) and select an image from a different In-Sight host on the network.
   - Open an FTP connection to the wafer reader (for instructions see Appendix A: Updating the Wafer Reader's Firmware). Drag-and-drop the image file into the FTP window of the web browser, or use the **mput** command from an FTP prompt.

   NOTE You do not need to rename the image file before loading it on the wafer reader. The wafer reader will automatically copy the .BMP or .JPG file to the built-in file names, IMAGE.BMP or IMAGE.JPG, respectively.
3. Click the **Read** button on either the Setup or Run tab to read from the image file.
4. Repeat step 2 to read from a different image file, or uncheck Disable Acquire in the Options tab to return the wafer reader to normal operation.

Show Output Graphics

When the Show Output Graphics checkbox is enabled, the character's score, the read character, and the center coordinate of the character are displayed in the image area. If the mark passes, the output graphics are shown in green; if the score is below the Accept value, the output graphics are shown in red. If a character cannot be read, a question mark is displayed. If the mark fails, and the character's score is above the Accept value, the output graphics for the character are shown in green. An example with Output graphics enabled is shown in Figure 3-11.

NOTE	Output Graphics are only shown when the selected Mark is 'Chars, SEMI', 'Chars, IBM', or 'Chars, Triple'.

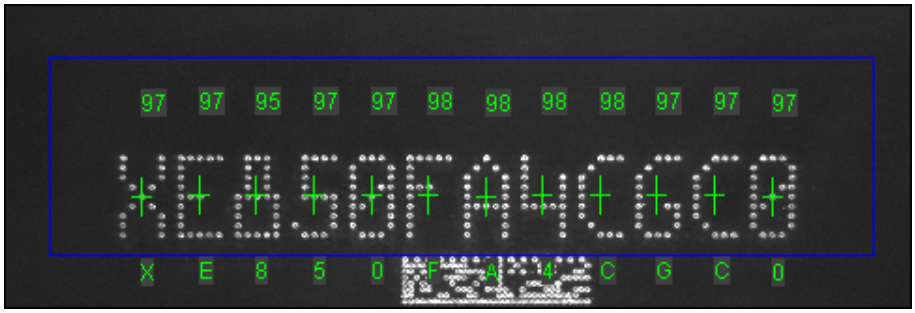


Figure 3-11: Output Graphics

Autoscore Non-Alphanumeric (In-Sight 1721/1722 Only)

When the Autoscore Non-Alphanumeric checkbox is enabled, character positions fielded as dashes (-), dots (.) and spaces automatically score 100 points, rather than a weighted score based on the quality of the read.

NOTE	The Autoscore Non-Alphanumeric option is only available for 'Chars, SEMI', 'Chars, IBM' and 'Chars, Triple' Marks.

3.6.2 Input/Output

Input/Output options control how reads are initiated on the wafer reader, and the data format of the output results.

Trigger

Selects the source of the trigger that acquires an image and initiates a read.

SELECTION	DESCRIPTION
Camera	Reads when the acquisition input on the wafer reader receives a pulse from an external trigger source.
Network (default)	Reads when the READ command is received from a remote network host through a TCP/IP device connection at the specified Port.
Serial	Reads when a READ command is received from a remote RS-232 serial device.

NOTE When 'Serial' is the selected Trigger, the Mode setting in the Serial tab on the System Settings page must be 'Text' (see Section 6.4: Configuring Serial Port Settings).

Output Destination

Determines where results are sent after each read.

SELECTION	DESCRIPTION
Network (default)	Sends read results to a remote network host through a TCP/IP device connection at the specified Port.
Serial	Sends read results to a remote RS-232 serial device.

NOTE When 'Serial' is the selected Output Destination, the Mode setting in the Serial tab on the System Settings page must be 'Text' (see Section 6.4: Configuring Serial Port Settings).

Protocol

Determines the command that a remote device sends, and the format for outputting the results data.

NOTE To trigger an event, the wafer reader must be Online.

Protocol commands can be used with either a TCP/IP or RS-232 connection, depending on the Protocol. If used with TCP/IP, a valid Port number must be specified. When using an RS-232 serial device, the settings in the Serial tab (see Section 6.4 Configuring Serial Port Settings) should be configured to correspond with the serial device the wafer reader will be communicating with. For example:

- Baud Rate = 115200
- Data Bits = 8
- Stop Bits = 1
- Parity = None
- Handshake = Xon/Xoff
- Mode = Text

NOTE If using the Send Message Native Mode command, the selected Mode must be Native. For more information on the Send Message command, refer to Section 7: Native Mode Commands.

Also, the Text Mode settings in the Text Mode Details dialog should be configured as shown in Figure 3-12. To access the Text Mode Details dialog, click on the Details button on the Serial tab.

- Fixed Input Length = 6
- Input Terminator = 13
- Output Terminator = 13

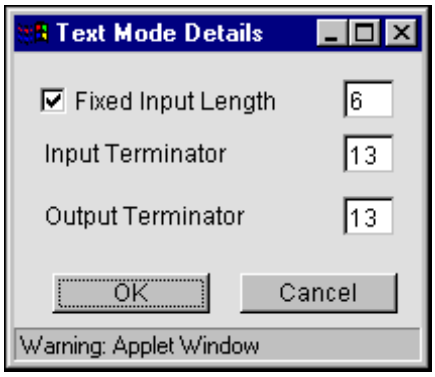


Figure 3-12: Text Mode Details Dialog

In-Sight Protocol

In-Sight is the default protocol for the wafer reader. This protocol can be used with either a TCP/IP or RS-232 connection.

COMMAND	DESCRIPTION	OUTPUTS
READ(<Config>)	Reads the specified Config (0 - 9). **Note**: To execute a read of all enabled Configs, send the READ command, setting the <Config> input to "-1".	For all In-Sight Protocol commands, the Output String is a character string for a successful read. For failed reads, the output is either a string of asterisks (***) or a partial read (where unreadable characters are returned as question marks). The type of output is dependent on the score (see Section 5.1.6: Score).
READ	Reads all enabled Configs. This command uses the Read Order selected in the Options tab. If the READ command needs to be terminated before the Read Timeout is exhausted, the Abort Execution Native Mode command can terminate the READ execution.	
TUNE	Tunes the specified Config (0 - 9). Each time the TUNE command is sent, the Power is adjusted by ± .5ms, in increments of .2ms, and the Size region is adjusted ± 1 pixel, both high and wide.	

An example of the outputs using the In-Sight protocol commands from Microsoft Windows' built-in Telnet client are shown in Figure 3-13.

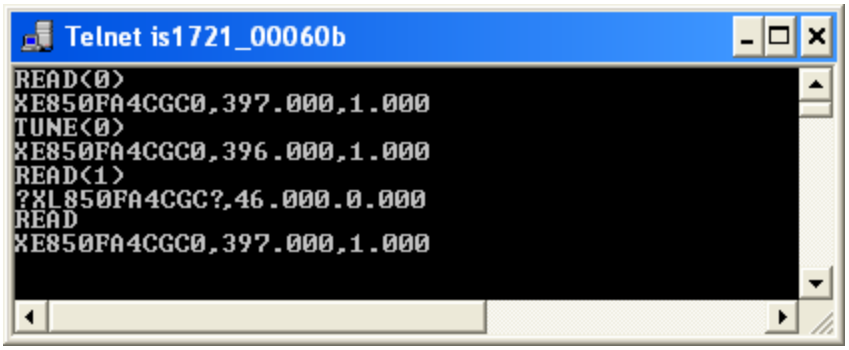


Figure 3-13: In-Sight Protocol Output Example

EG (Electroglas) Protocol

Protocol for use with an Electroglas, Inc. wafer prober. This protocol can be used with either a TCP/IP or RS-232 connection.

COMMAND	DESCRIPTION	OUTPUTS
ESC-y1wXON	Reads all enabled Configs. This command uses the Read Order selected in the Options tab. **Note**: "ESC" and "XON" are control characters.	The Output String will be either a character string for a successful read or a string of asterisks for a failed read. Partial reads are not returned, since any return other than a string of asterisks will be interpreted by the wafer prober as a successful read. The number of asterisks returned will be the same as the number of characters specified in the Field String (see Section 3.5.6: Field String and Field Definition).

An example of the outputs using the EG protocol commands from Microsoft Windows' built-in Telnet client are shown in Figure 3-14. The first Read command (entered as a sequence of ASCII characters) shows the output for a successful read; the second Read command shows the output for a failed read.

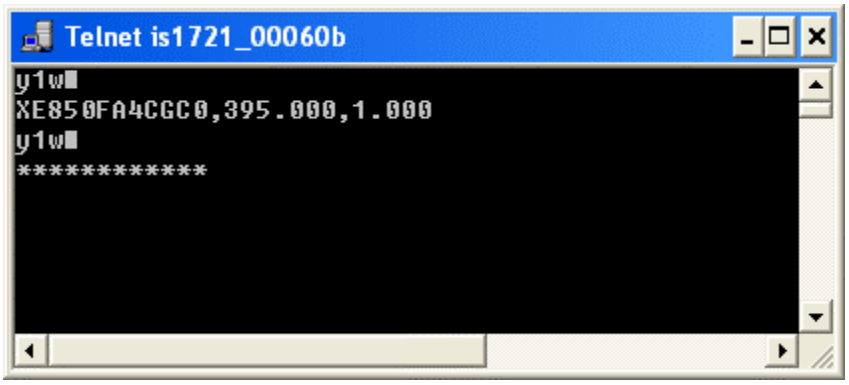


Figure 3-14: EG Protocol Output Example

LKx5 Protocol

The In-Sight wafer reader supports several Siemens LKx5 commands that allow the wafer reader to be controlled from users' custom application programs over an RS-232 connection.

COMMANDS	DESCRIPTION
BC	Request to read a barcode.
BC&OCR	Request to read both the barcode and OCR string.
BC|OCR	Request to read a barcode or OCR string.
DDM	Request to read the 2D mark.
DDM&OCR	Request to read both the 2D mark and OCR string.
DDM|OCR	Request to read the 2D mark or OCR string.
NBC	Request to read a barcode mark that does not match the OCR string.
NBC&OCR	Request to read a barcode mark and OCR string where the two differ.
OCR	Request to read an OCR string.
READ	Request to read any mark in this order: OCR, DDM, BC.
ROT_KOMPR	Request reading a barcode from right to left.
SET_HW	Echoes the input argument. This command is provided for compatibility only; it does not affect light settings.
VERS	Request the firmware version of the wafer reader.

Port

Assigns the TCP/IP port number to use when 'Network' is selected in the **Trigger** or **Output Destination** settings. This port number is where a TCP/IP connection is established between the wafer reader (a TCP/IP server waiting for communication) and a remote device (a TCP/IP client that initiates communication). The default port is 2000, but any unused number between 1 and 65535 may be used, excluding 21, 23, 68, 80, 502, 1069, 1070, 1212, 2222, 44818 and 50000 (reserved for In-Sight communications).

Output String, Output Score, Output Passed

These checkboxes select the results data that will be sent to the Output Destination after a read. By default, only the Output String box is checked. When the **Output Passed** checkbox is enabled, the resulting data is either a '1.000' if the read passes or '0.000' if the read fails.

3.6.3 Logging

Read results may be written to a log file saved on a network host. Logging options specify which results are written to the log file.

Host Name

The name or IP address of the remote host on the network where the log file will be created.

File Name

The name of the file on the specified host where log entries will be appended. The log file is an HTML document; the .HTM extension is automatically appended to the File Name.

This file is saved in the default FTP directory; subdirectories cannot be specified. The maximum File Name length is 64 characters.

User

A valid User name for the specified host.

Password

A valid password for the User on the specified host.

Output String, Output Score, Output Passed, Output Failed Image

These checkboxes select the results data that will be written out to the HTML file on the specified host. The following results can be logged:

- Output String
- Output Score
- Pass/fail status of the read
- The image, if the read failed

Data is appended to the specified log file. A bitmap file containing the failed image is also stored on the specified host. A hyperlink to the failed image is included in the log file.

The wafer reader must be Online for data to be appended to the log file. The log file must be reset manually by deleting, renaming or moving the current .HTM file, or by specifying a new file name for the log file. An example of the HTML log page, with all outputs selected, is shown below.

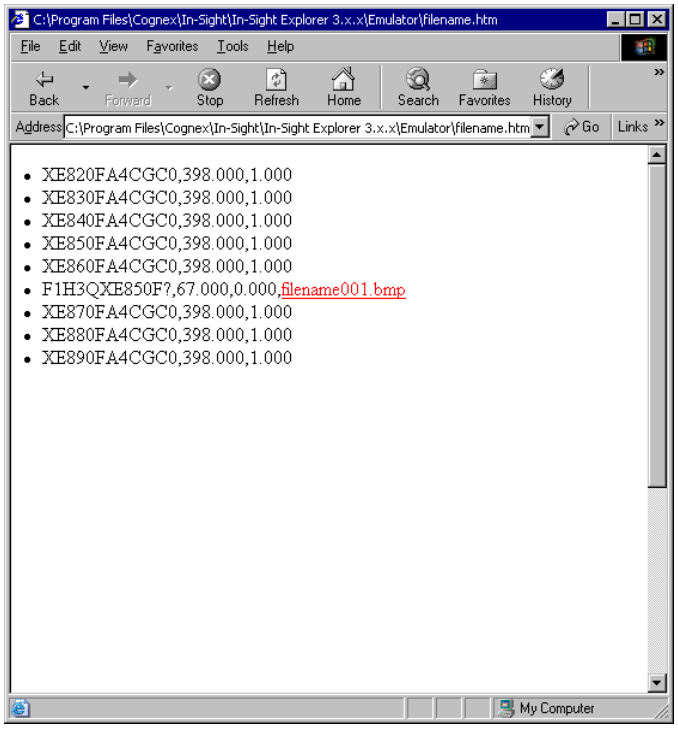


Figure 3-15: HTML Log Page Example

4 Managing Job Files

In this section…

4.1 About Job Files

The File tab (Figure 4-1) provides access to job files stored in flash RAM on the wafer reader.

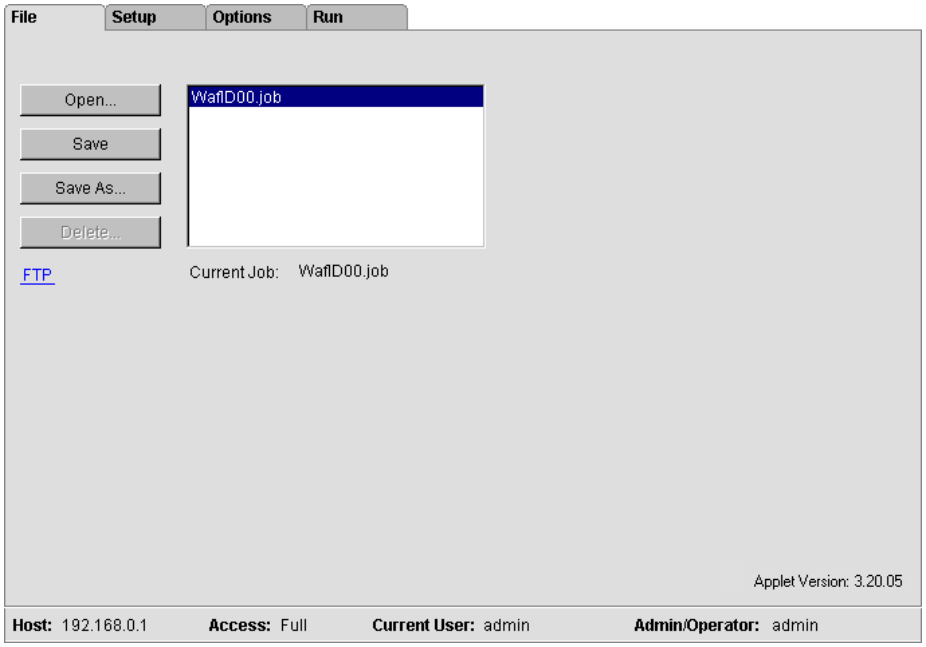


Figure 4-1: File Tab

The default job file is WAFID00.job. To use the browser interface, at least one job file must be stored on the wafer reader. This can be the default job or any compatible job that has been saved using the browser interface. The File tab also lists the job currently being used by the applet; this job cannot be deleted.

NOTE A WAFID00BC.job file is also loaded on the wafer reader. This job file is identical to the default WAFID00.JOB, except the default mark type is BC 412.

To connect to an In-Sight wafer reader from the browser interface, the wafer reader's Startup settings must be configured to automatically load the default job, or another job that has been previously saved using the browser interface.

Advanced users may customize some cells in the spreadsheet of a browser interface-compatible job. In general, cells may be safely added to the spreadsheet. However, the predefined functions and formulas in the spreadsheet must not be rearranged, deleted or otherwise changed in such a way as to break compatibility with the WAFID00.JAR Java applet. Under no circumstance should the cells in Rows 21 through 74 ever be modified. These rows are hidden by default.

4.2 Saving Jobs

Jobs must be saved on the wafer reader to preserve changes made to Config and Options settings. If the job is not saved, all settings changes will be lost when a new job is opened or the power is cycled on the wafer reader.

To save a new job:

1. Click on the **File** tab.
2. Click the **Save As…** button.
3. Enter a new file name (do not include a directory or subdirectory) in the **Save As…** dialog. Job file names can contain up to 15 characters (the .JOB extension will be added automatically).
4. Click **OK** to save the Current Job to a new job file, or **Cancel**.

To save changes to an existing job:

1. Click on the **File** tab.
2. Click the **Save** button.
3. Click **OK** to save the Current Job, or **Cancel**.

4.3 Opening Jobs

Only job files stored in the wafer reader's flash memory can be opened using the browser interface.

To Load an Existing Job from In-Sight Wafer Reader Memory:

1. Click on the **File** tab.
2. Save changes made to the Current Job, if needed.
3. Highlight a job file in the list.
4. Click the **Open** button.
5. Click **OK** in the Open File dialog to load the job, or **Cancel**.

4.4 Sharing Jobs Between Readers

A job file saved on one wafer reader may be shared with other wafer readers on the network using FTP to copy the file.

4.5 Changing the Startup Job

By default, the wafer reader is configured to load the WAFID00.JOB automatically after receiving power. However, after making changes to Config and Options settings and saving to a different job file, you will want to configure the wafer reader to automatically load and run that new job at startup.

To change the default startup job for the wafer reader:

1. Click on the **Options** tab.
2. Click on the System link in the upper-right to access the wafer reader's **System Settings**.
3. Click the **Startup** tab.
4. Select a new job file to load on startup from the **Job** list.
5. Click the **Save** button.

5 Running the Job

In this section…

5.1 The Run tab

The **Run** tab is the only view of the wafer reader available from the browser interface during runtime operation.

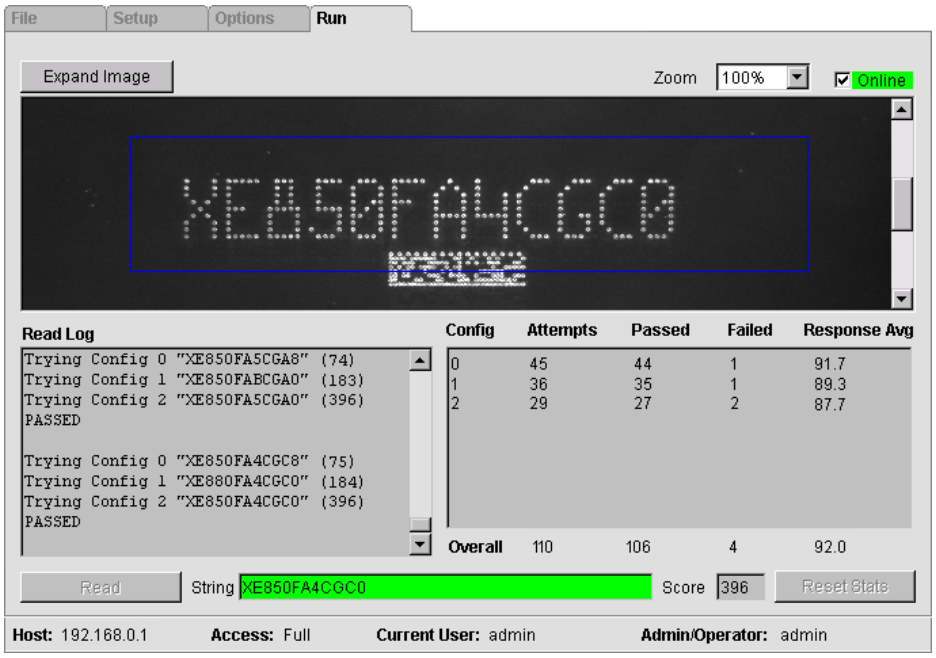


Figure 5-1: Run Tab

The following sections describe the information displayed in the Run tab.

5.1.1 Online Checkbox

The Online checkbox at the top-right of the Run tab switches the wafer reader between its Online and Offline modes of operation. When this checkbox is enabled (the default setting), the wafer reader is “Online”. The File, Setup, and Options tabs are grayed out, and the following operations are supported:

- Output read results data to the log file specified in the Options tab.
- Output read results over the serial port when Serial is the selected Output Destination in the Options tab.
- Respond to the protocol’s READ and TUNE commands.
- Respond to the camera, network, and serial acquisition Trigger selected in the Options tab.
- Send/receive data to and from the spreadsheet over the network or serial port using the Input/Output functions.

NOTE If the Online checkbox is enabled from the browser and a System Offline dialog appears, open the PC Host and verify that the PC Host’s status bar indicates the wafer reader is Online, then click **OK** to close the dialog.

When the Online checkbox is disabled, the wafer reader is “Offline”. When the wafer reader is Offline, the following actions are allowed:

- Edit settings in the Setup and Options tabs.
- Save and open jobs in the File tab.
- Manually acquire an image and read the wafer mark using the Read button.
- Clear all read results using the Reset Stats button.
- Execute Native Mode commands over telnet.

The wafer reader’s Online state is a combination of three independent flags:

- Spreadsheet flag – Set directly from the System menu’s Online checkbox in the In-Sight spreadsheet. This flag can also be controlled by the Online checkbox in the Startup tab (see Section 6.6). For the browser-based user interface to run properly, this flag should be enabled.
- Native Mode flag – Set from the Online checkbox in the Run tab or from the Set Online Native Mode command (see Section 7).
- Discrete I/O flag – Not used by the wafer reader; enabled by default.

The wafer reader is Online only when all three flags are enabled.

5.1.2 Read Log

A record of the most recent read results. This log returns the string, score, and pass/fail status of each Config that is read or retried.

NOTE If the wafer reader is Offline, a continuous log is displayed. If the wafer reader is Online, only the last read results are displayed.

5.1.3 Statistics Window

A statistical record of the read results.

NOTE Any changes to a Config's settings will reset the statistics for that Config, but do not change the overall statistics.

Config

The index of each enabled Config.

Attempts

The number of times the Config has been used during reading.

Passed

The number of times the Config read successfully.

Failed

The number of times the Config failed to read.

Response Avg

The average raw response score of all attempted reads for the Config.

Overall

The cumulative statistics from the results of all reads.

NOTES

- The Overall statistics are calculated independently of the statistics for the individual Configs.
- If Retry is enabled from the Setup tab, the Attempts, Passed and Failed statistics do not reflect any retries.

5.1.4 Read

The **Read** button acquires an image and reads the wafer mark. The String and Score results are reported to the right. The Read button is grayed out when the Online checkbox in enabled.

5.1.5 String

The character string result for the last read. If the read passes, the string appears on a green background.

Failed reads appear on a red background. If a failed read's score is above the minimum threshold for reporting results, individual string characters are displayed. Any character in the string that cannot be read is displayed as a question mark. If the failed score is below the minimum threshold, all characters are shown as asterisks. The number of asterisks returned will be the same as the number of characters specified in the Field String (see Section 3.5.6: Field String and Field Definition).

5.1.6 Score

The score for the last read. For more information on scoring, see Sections 3.5.5 and 3.5.7.

5.1.7 Reset Stats

The **Reset Stats** buttons clears all results in both the Read Log and Statistics windows. The Reset Stats button is grayed out when the Online checkbox in enabled.

6 System Settings

In this section…

6.1 About System Settings

Each wafer reader has its own system settings that control the wafer reader's networking configuration and serial port settings, the list of authorized users, and the startup behavior. These settings are stored in the wafer reader's PROC.SET file, and apply to all jobs.

To access a wafer reader's System Settings from the browser interface:

1 Click on the **Options** tab.

2 In the Options tab, click on the System hyperlink in the upper-right corner.

NOTE System Settings may also be configured using the In-Sight PC Host.

6.2 Version Information

The **Info** tab shows important information about your wafer reader and its current firmware and applet version. This information is needed if assistance is ever required from Cognex Technical Support. The Online checkbox at the top-right of the Run tab switches the wafer reader between its Online and Offline modes of operation. For more information about the Online checkbox, see Section 5.1.1. The Back hyperlink, located below the Online checkbox, returns you to the Run tab.

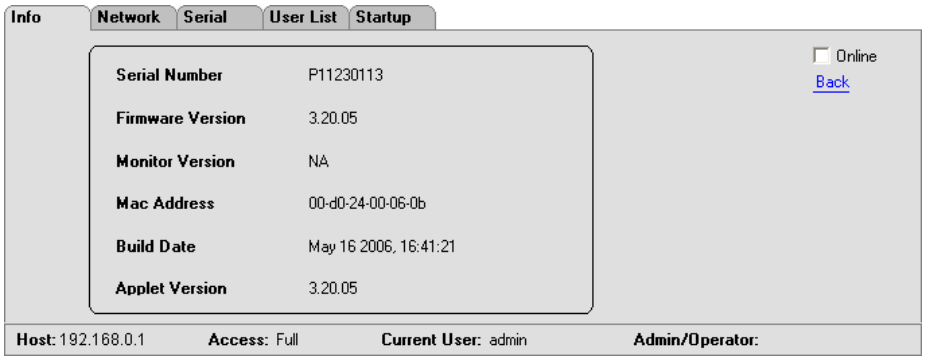


Figure 6-1: Info Tab

6.3 Configuring Network Settings

The **Network** tab (Figure 6-2) configures an In-Sight wafer reader to be used on a network.

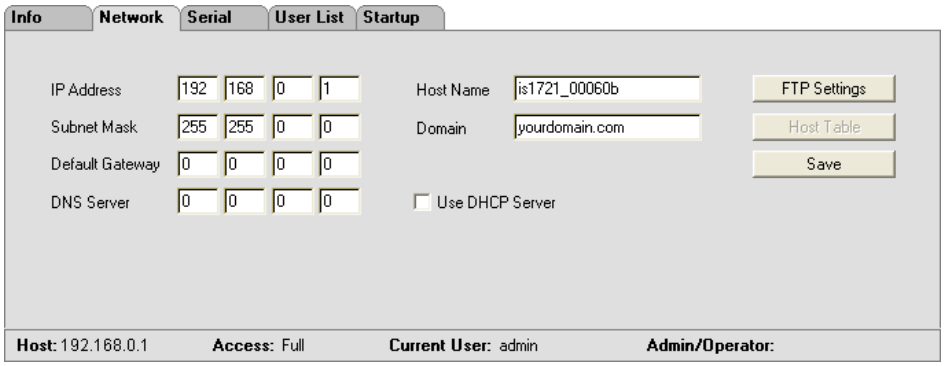


Figure 6-2: Network Tab

Use DHCP Server

The Use DHCP Server checkbox determines whether the wafer reader uses DHCP (Dynamic Host Configuration Protocol) on start up or if the values in the Network tab configure TCP/IP.

NOTE This box should be checked only if a DHCP server is running on the local network. If the box is checked and a DHCP server does not respond within 60 seconds, the wafer reader will boot without network support enabled.

All of the settings that can be configured in the Network tab depend on whether this checkbox is enabled. If enabled, the checkbox allows the wafer reader to be configured automatically by a DHCP server at startup. Optionally, a new Host Name may be assigned, but all other fields in the Network tab will be grayed out.

However, if the Use DHCP Server checkbox is disabled, the network settings for the wafer reader must be configured manually. If the wafer reader was previously assigned an IP address using DHCP, disabling the Use DHCP Server checkbox will use the same IP address.

In production environments, a static IP address should be used instead of DHCP. Using a static IP address removes the need for a DHCP server on the local network and eliminates extraneous DHCP traffic.

IP Address

Assigns a unique identifier for each wafer reader on the network, which must be consistent with the IP address-numbering scheme of the local network.

NOTE The IP Address setting is grayed out when the Use DHCP Server checkbox is enabled.

Unlike the factory-assigned MAC address, the IP address is assigned automatically by a DHCP server or must be manually assigned by the user. The following IP addressing schemes are recommended:

ADDRESSING SCHEME	DESCRIPTION
10.0.0.0/8	The 10.0.0.0/8 private network is a class A network ID that allows valid IP addresses from 10.0.0.1 to 10.255.255.254. The 10.0.0.0/8 private network has 24 host bits which can be used for any subnetting scheme within the private organization. The default Subnet Mask is 255.0.0.0.
172.16.0.0/12	The 172.16.0.0/12 private network can be interpreted either as a block of 16 class B network IDs or as a 20-bit assignable address space (20 host bits) which can be used for any subnetting scheme within the private organization. The 172.16.0.0/12 private network allows valid IP addresses from 172.16.0.1 to 172.31.255.254. The default Subnet Mask is 255.255.240.0.
192.168.0.0/16	The 192.168.0.0/16 private network can be interpreted either as a block of 256 class C network IDs or as a 16-bit assignable address space (16 host bits), which can be used for any subnetting scheme within the private organization. The 192.168.0.0/16 private network allows valid IP addresses from 192.168.0.1 to 192.168.255.254. The default Subnet Mask is 255.255.0.0

Subnet Mask

Defines which part of the wafer reader's IP address refers to the network and which part refers to the host.

NOTE When DHCP is enabled, this field is grayed out and displays the value assigned by DHCP.

The network part of the IP address is the same for all hosts on the same subnet, and the remainder is unique to each host. As shown in the table below, a Subnet Mask of 255.255.255.0 (a class C mask) identifies 24 bits for the network portion and 8 bits for the host portion.

CLASS	SUBNET MASK	NETWORK ADDRESS	HOST ADDRESS
A	255.0.0.0	8 bit	24 bit
B	255.255.0.0	16 bit	16 bit
C	255.255.255.0	24 bit	8 bit

Default Gateway

Specifies the IP address of the gateway host, if available on the network.

NOTE The Default Gateway setting will be grayed out when the Use DHCP Server checkbox is enabled. The value shown is the gateway assigned by the DHCP server.

The gateway host is responsible for sending and receiving data between hosts on different networks, routing data packets from a device on the local subnet to a device on another subnet.

For example, if a wafer reader will need to communicate with a remote host on a different subnet, enter the address of the gateway device in the Default Gateway field. However, if the wafer reader will need to communicate only with devices on the local subnet, do not enter an address for the Default Gateway (leave the field all zeros).

DNS Server

Specifies the IP address of the host on the network providing DNS resolution, if available.

NOTE The DNS Server setting will be grayed out when the Use DHCP Server checkbox is enabled. The value shown is the DNS Server assigned by the DHCP server.

A Domain name (i.e., yourdomain.com) is an alias for an IP address (i.e., 192.168.0.1). A DNS (Domain Name Server) maintains the data on corresponding domain names and IP addresses. The DNS Server setting determines which host is contacted (by IP address) in response to a given Domain Name.

Host Name

Assigns a name, or “alias” for the wafer reader, as it will appear when browsing the network using the In-Sight PC Host. Each wafer reader has its Host Name set automatically the first time it boots. For example, an In-Sight 1721 wafer reader's Host Name is "is1721_xxxxxx"; an In-Sight 1701 wafer reader’s Host Name is "is1701_xxxxxx". For every wafer reader, "xxxxxx" is given by the last 6 characters of the wafer reader's unique MAC address. For example, an In-Sight 1721 wafer reader with the MAC address 00-d0-24-00-06-0b will be assigned the Host Name, "is1721_00060b".

NOTE The Host Name setting is not automatically assigned by the DHCP server (if used) or referenced through the DNS server. If the Use DHCP Server checkbox is enabled and the DHCP server supplies the Host Name, it is ignored in favor of the default Host Name or the name entered by the user.

Domain

Specifies the wafer reader's Fully Qualified Domain Name (FQDN) for the network on which it is installed.

NOTE When the Use DHCP Server check box is enabled, this field is grayed out and displays the value assigned by the DHCP server.

The wafer reader must have a FQDN to be accessible from a remote host that is not part of the local network. The Domain setting sets the string that is appended to the Host Name to make a FQDN.

For example, setting Domain to **yourdomain.com** yields the following results:

- If a Host Name is **is1721_00060b**, the FQDN for lookup is **is1721_00060b.yourdomain.com**.
- If a Host Name is **is1721_00060b.yourdomain.com.** (notice the period at the end), the FQDN for lookup is **is1721_00060b.yourdomain.com**.

Appending the period to the end of the Host Name prevents redundancy in appending the Domain name to the FQDN. For example, if the period is omitted, **is1721_00060b.yourdomain.com** would become **is1721_00060b.yourdomain.com.yourdomain.com).**

FTP Settings

This button opens the FTP Settings dialog to configure the File Transfer Protocol (FTP). FTP Settings dialog controls include:

- **Idle Timeout**: The amount of time (in seconds) that a connection from another host may be left open without any activity. The default is 120 seconds.
- **Read Timeout**: The amount of time (in seconds) that FTP remains blocked in a read (or write). This value is used to recover from an unresponsive peer. The default is 120 seconds.
- **Connection Retry**: The number of times to try connecting to a peer. The default is 1 try.
- **Local Port**: The port address at which the local FTP server awaits connections. The default port is 21.
- **Remote Port**: The port address at which a remote FTP awaits connections. The default port is 21.
- **Passive Transfers**: This checkbox enables "passive" FTP client transfers, which may be required when In-Sight needs to access an FTP server through a firewall that does not allow connections to be initiated from the outside. The checkbox is OFF by default.

Host Table

This button opens the Host Table dialog to specify a local mapping of network Host Names to IP addresses. Host Table dialog controls include:

- **Favor Host Table over DNS**: When enabled, this checkbox specifies that the search order for In-Sight Host Names will be the host table, followed by the network browser, then DNS. When disabled, the Host Name search order is the network browser, followed by DNS, and then the host table.
- **Host Name**: The name of the networked In-Sight wafer reader to map (or assign) to the specified IP address. The Host Name entered will appear in any list of Host Names throughout the In-Sight interface.
- **IP Address**: The IP address of the networked In-Sight wafer reader to map to the specified Host Name.

6.4 Configuring Serial Port Settings

The **Serial** tab (Figure 6-3) configures the wafer reader's RS-232 serial port communications.

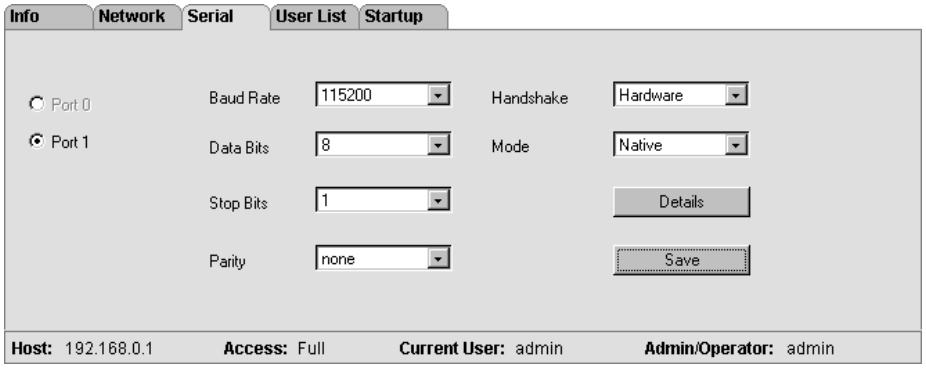


Figure 6-3: Serial Tab

Baud Rate

300, 600, 1200, 2400, 4800, 9600, 14400, 19200, 38400, 57600, or 115200 (default).

Data Bits

7 or 8 (default).

Stop Bits

1 (default) or 2.

Parity

None (default), Even, or Odd.

Handshake

None, Xon/Xoff, or Hardware (default).

Mode

Sets the serial protocol to use.

SELECTION	DESCRIPTION
Text	Standard ASCII protocol for sending/receiving text strings. To define the input and output terminator characters, press the Details button to open the Text Mode Details dialog. 'Text' must be the selected Mode when Trigger and Output Destination are set to 'Serial'.
Native (default)	Custom ASCII protocol for controlling In-Sight from any remote host. To define the input and output terminator characters, press the Details button to open the Native Mode Details dialog.
DeviceNet	Protocol for communicating with Allen-Bradley PLC (requires an optional, RS-232-to-DeviceNet Gateway adapter from Cognex). To define the input and output data packets sizes, press the Details button to open the DeviceNet Details dialog.
Motoman	Protocol for communicating with Motoman MRC, MRC-II, and XRC robot controllers operating in DCI mode.
Unused	Closes the serial port so that no commands or data can be received/sent.

Details

Opens the Details dialog for the selected Mode.

SELECTION	DESCRIPTION
Text Mode Details	The Text Mode Details dialog defines the terminator characters to use for Text Mode serial communications. Text Mode Details dialog controls include: ■ **Fixed Input Length**: Reads a fixed number of characters before triggering an event. ■ **Input Terminator**: The ASCII value interpreted by In-Sight as the end of an incoming string. The default is 13 (carriage return). ■ **Output Terminator**: The ASCII value that In-Sight adds to each output string to mark the end of the transmitted string. The default is 13 (carriage return), and 0 specifies "no terminator".
Native Mode Details	The Native Mode Details dialog defines the terminator characters to use for Native Mode serial communications. Native Mode Details dialog controls include: ■ **Fixed Input Length**: Reads a fixed number of characters before triggering an event. ■ **Input Terminator**: The ASCII value interpreted by In-Sight as the end of an incoming string. The default is 13 (carriage return), and 0 specifies "no terminator". ■ **Output Terminator**: The ASCII value that In-Sight adds to each output string to mark the end of the transmitted string. The default is 13 (carriage return), and 0 specifies "no terminator".
DeviceNet Mode Details	The DeviceNet Mode Details dialog defines the terminator characters to use for The DeviceNet Mode serial communications. DeviceNet Mode Details dialog controls include: ■ **Input Packet Size**: Sets the expected packet size to be received through the DeviceNet Interface Module, in bytes. The setting must agree with the MaxWidth value in the RS-232-to-DeviceNet configuration. ■ **Output Packet Size**: Sets the packet size to send out through DeviceNet Interface Module, in bytes. The setting must agree with the Transmit Width value in the RS-232-to-DeviceNet configuration. ■ **Trigger on First Byte**: Triggers an acquisition when the first byte is received.

6.5 Managing the User List

The **User List** tab (Figure 6-4) administers the access level and FTP read/write privileges for authorized users of a wafer reader. The User List settings determine which users may log onto a particular wafer reader using any of the available methods: browser interface (HTTP), In-Sight PC Host, Telnet, and FTP. The User List also specifies the types of configuration changes they can make. The User List is specific to each wafer reader and is not shared between wafer readers; if a user needs access to a particular wafer reader, they must know a User Name and Password that already exists in that wafer reader's User List.

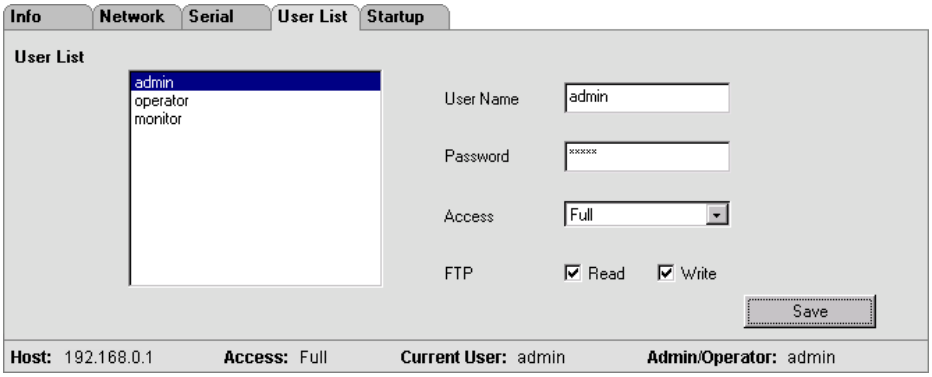


Figure 6-4: User List Tab

6.6 Startup Options

The **Startup** tab (Figure 6-5) specifies job-related startup options for a wafer reader, including the default job and Online/Offline status.

As described previously in Section 4.1, a wafer reader must have a job file loaded that is compatible with the default job, WAFID00.JOB.

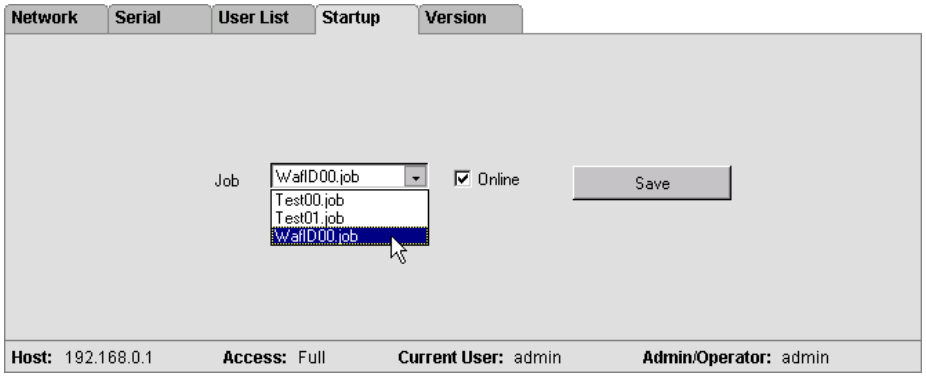


Figure 6-5: Startup Tab

7 Native Mode Commands

In this section…

The wafer reader supports many Native Mode commands that allow the wafer reader to be controlled from users' custom application programs over Ethernet or serial port.

The Native Mode protocol is divided into two sets of commands: Basic and Extended. Basic Native Mode commands are two characters long, plus parameters (if any) and a terminator character; Extended Native Mode commands include additional functions or commands. The commands are not case sensitive. The terminator is CR + LF (ASCII characters 13 + 10) when sending Native Mode commands using a Telnet connection. The default terminator is CR (ASCII character 13) when using Native Mode commands over a serial port.

When a Native Mode command is remotely issued to an In-Sight wafer reader, the In-Sight wafer reader processes the command and then returns a response, consisting of an ASCII string followed by the terminator character. Commands that set values return **1** for "success", **0** for "unrecognized command", or a negative number for "failure". Commands that get values return various values, depending on the command.

NOTES

- Changes made using Native Mode commands are not reflected in the browser interface.
- When logging on to an In-Sight wafer reader through Telnet from a Unix-based platform, the In-Sight wafer reader's Host Name (or IP address) and port number (usually 23) must be added to the command line. For example: >telnet is1721_00060b 23. Supplying the port number disables the Unix username/password authentication and forces the Unix system to prompt you for user name and password.

Below is a partial listing of the Native Mode commands typically used to remotely control the wafer reader.

BASIC NATIVE MODE COMMANDS	
Abort Execution	Terminates the current execution of the WafID function within the spreadsheet.
Send Message	Sends an ASCII string to an In-Sight spreadsheet over a Native Mode connection, and optionally, triggers a spreadsheet Event.
Set Online	Sets the In-Sight wafer reader into Online or Offline mode.

PUT EXTENDED NATIVE MODE COMMANDS	
Put Live	Turns live acquisition on/off.
Put Portnum	Specifies the Network Port used by In-Sight to transfer data and live images.
Put Watch	Returns the data contained in the specified cell when the cell is updated.

EVALUATE EXTENDED NATIVE MODE COMMANDS (ACTIONS)	
EV AcquireConfig	Acquires an image using a Config's light settings, but does not read.
EV CopyConfig	Copies all settings and read results from the source Config to the target Config.
EV ReadConfig	Reads using the specified Config.
EV TuneConfig	Tunes a specific Config and optionally, saves the optimized settings.
EV TuneConfigEx	Tunes a specific Config and optionally, saves the optimized settings. **Note**: The TuneConfigEx command is only supported on In-Sight 1721/1722 wafer readers with firmware version 3.20.05 and higher.
EV ResetStats	Reset all accumulated read statistics.

EVALUATE EXTENDED NATIVE MODE COMMANDS (GET AND SET)	
EV GetConfig EV SetConfig	Settings information for the specified Config.
EV GetConfigAccept EV SetConfigAccept	The threshold Accept setting for a Config.
EV GetConfigAvgScore	The average raw response score of all reads that passed for a Config.
EV GetConfigBCType EV SetConfigBCType EV GetConfigBCHyphen EV SetConfigBCHyphen EV GetConfigBC3Digits EV SetConfigBC3Digits	The index of the barcode setting for the specified Config.
EV GetConfigCharHigh EV GetConfigCharWide EV SetConfigCharSize	The settings information for the Size setting.
EV GetConfigChecksum EV SetConfigChecksum	The index of the Checksum selection for a Config.
EV GetConfigColor EV SetConfigColor	The index of the Color selection for a Config.
EV GetConfigEnable EV SetConfigEnable	The status of the Enabled checkbox for a Config.
EV GetConfigFieldDef EV SetConfigFieldDef	The contents of the Field Definition setting for a Config.
EV GetConfigFieldString EV SetConfigFieldString	The contents of the Field String setting for a Config.

EVALUATE EXTENDED NATIVE MODE COMMANDS (GET AND SET)	
EV GetConfigHigh EV GetConfigWide	The Size settings for a Config.
EV GetConfigLightMode EV SetConfigLightMode	The index of the Light Mode selection for a Config.
EV GetConfigLightPower EV SetConfigLightPower	The Light Power selection for a Config.
EV GetConfigMark EV SetConfigMark	The index of the Mark selection for a Config.
EV GetConfigNumFailed	The number of failed reads for a Config.
EV GetConfigNumPassed	The number of passed reads for a Config.
EV GetConfigNumTuneFailed	The number of failed reads during a tune for a Config.
EV GetConfigNumTunePassed	The number of passed reads during a tune for a Config.
EV GetConfigOrcChar	The ASCII value of the indexed character in a read string.
EV GetConfigOrcCol	The column coordinate of the indexed character in a read string.
EV GetConfigOrcRow	The row coordinate of the indexed character in a read string.
EV GetConfigOrcVal	The raw response score of the indexed character in a read string.
EV GetConfigOptimization EV SetConfigOptimization	The index of the Optimization setting for the specified Config.
EV GetConfigOrientation EV SetConfigOrientation	The index of the Img Orientation setting for the specified Config.
EV GetConfigPassed	The pass/fail status of the specified Config for the most recent read.
EV GetConfigRegionRow EV GetConfigRegionCol EV GetConfigRegionHigh EV GetConfigRegionWide EV GetConfigRegionTheta EV GetConfigRegionPhi EV SetConfigRegion	The settings information for the Region setting.
EV GetConfigResult	The results of the most recent read performed by the specified Config.
EV GetConfigRetry EV SetConfigRetry	The index of the Retry setting for the specified Config.
EV GetConfigScore	The score for a Config during the most recent read.
EV GetConfigString	The character results for a Config during the most recent read.
EV GetConfigStringLen	The number of characters contained in the result string.
EV GetConfigTheta	The orientation of the mark for a Config.
EV GetConfigThresh EV SetConfigThresh	The minimum response threshold for each individual character score.
EV GetConfigTryLog	The Retry status of the Config during the last read.
EV GetConfigTuneLog	The Retry and Tune status of the Config during the last read.
EV GetMSBuffer	The Machine Status data stored in one of 8 indexed buffers within the MachineStatus stack. If the index is 0, the current Machine Status is returned.
EV GetWaferAcqEnable EV SetWaferAcqEnable	The status of the Disable Acquire setting.
EV GetWaferAll	All results for the most recent read, and settings for all Configs.
EV GetWaferAllEx	All results for the most recent read, and settings for all Configs. **Note**: The GetWaferAllEx command is only supported on In-Sight 1721/1722 wafer readers with firmware version 3.20.05 and higher.
EV GetWaferAvgScore	The average raw response scores for all Configs that passed.
EV GetWaferBestConfig	The index of the Config that passed during the last read.
EV GetWaferFixCol	The column coordinate of the fixture.
EV GetWaferFixRow	The row coordinate of the fixture.

EVALUATE EXTENDED NATIVE MODE COMMANDS (GET AND SET)	
EV GetWaferFixTheta	The orientation of the fixture.
EV GetWaferNumFailed	The number of failed reads for all Configs.
EV GetWaferNumPassed	The number of passed reads for all Configs.
EV GetWaferOrder EV SetWaferOrder	The index of the Read Order setting.
EV GetWaferScoreAs100 EV SetWaferScoreAs100	The scoring method for character positions fielded as dashes (-), dots (.) and spaces.
EV GetWaferSummary	A summary of the results for the most recent read.
EV GetWaferTimeout EV SetWaferTimeout	The total amount of time (in seconds) to allow for a read.

For more information on these commands, refer to the *In Sight® Guide & Reference* HTML Help file, included in the installation package.

7.1 Basic Native Mode Commands

The following Native Mode commands are used to remotely control a wafer reader from user-designed software. Each command returns a Status Code, the number of characters (in bytes, including Carriage Returns and Line Feeds) in the output that follows, and the results.

7.1.1 Abort Execution

AE[2]

Terminates the current execution of the WafID function within the spreadsheet. Unlike most Native Mode commands, no status code is returned after the Abort Execution command is executed, but depending on the function that is terminated, other information may be returned.

Input: 2

Sample Input and Output

NOTE In this sample, Abort Execution causes the current read operation to terminate.

AE2

```
SM"READ"0
1
AE2
[UH587IX1CGC3,390.000,1.000]
```

7.1.2 Send Message

SM"*string*"[*Event*]

Allows In-Sight protocol commands (see Section 3.6.2: Input/Output) to be sent over a Native Mode connection to a wafer reader as a text string, and optionally, triggers a spreadsheet Event.

Inputs: String, Event (Optional).

The Event codes are:

EVENT CODE	DESCRIPTION
(0 to 7)	Specifies a soft trigger (Soft 0, Soft 1, ... Soft 7).
8	Acquire an image and update the spreadsheet. This option requires the AcquireImage function's Trigger argument to be External or Manual.

NOTE The string must be set off with quotations marks.

Output: Status Code, Read Result.

The status codes are:

STATUS CODE	DESCRIPTION
1	The command was executed successfully.
0	Unrecognized command.
-2	The command could not be executed.

NOTE The outputs for the read result depend on which of the Output String, Output Score, and Output Passed checkboxes are selected from the Options tab (see Section 3.6: Setting Options)

Sample Inputs and Outputs

SM"READ"0
1 [UH587IX1CGC3,398.000,1.000]
SM"TUNE(0)"0
1 [UH587IX1CGC3,391.000,1.000]

7.1.3 Set Online

SO[*int*]

Sets the In-Sight wafer reader into Online or Offline mode.

NOTE	This command cannot set the In-Sight wafer reader Online if it was previously set Offline manually through the user interface, or by a discrete input signal.

Inputs: **0** to set In-Sight Offline, and **1** to set In-Sight Online.

Output: Status Code.

The status codes are:

STATUS CODE	DESCRIPTION
1	The command was executed successfully.
0	Unrecognized command.
-1	The value given for ***int*** is either out of range, or is not a valid integer.
-5	The communications flag was successful but the wafer reader did not go Online because the wafer reader is set Offline manually through the user interface or the Discrete I/O setting is off.

Sample Input and Output

SO1
1

7.2 Put Extended Native Mode Commands

The following commands are used in conjunction with the Put extended Native Mode command to send information to the In-Sight spreadsheet and wafer reader. The information sent is dependent on the command and input that is specified.

Syntax: Put [command]

7.2.1 Put Live

Put Live(<Input>)

Turns live acquisition on/off.

NOTES

- The wafer reader must be Offline when using this command.
- The live image will not be displayed in the GUI or PC Host.

Inputs: **0** to turn off live acquisition mode, and **1** to turn on live acquisition mode.

Output: Status Code, # of bytes

The status codes are:

STATUS CODE	DESCRIPTION
1	The command was executed successfully.
0	Unrecognized command.
-1	The input is invalid.
-2	The command could not be executed, or the wafer reader is Online.

Sample Input and Output

NOTE In this sample, the first command puts the wafer reader into live acquisition mode, and the second command takes the wafer reader out of live mode.

PUT LIVE 1
1
PUT LIVE 0
1

7.2.2 Put PortNum

Put PortNum(<Input>)

Specifies the port that will be used by the In-Sight wafer reader for transferring data or images over the network.

NOTES

- The wafer reader must be Offline when using the Portnum command.
- The PortNum command must be executed before another device can connect to the specified port.

Inputs: **0 to 65535** to specify the port number.

NOTE A valid Port assignment is any unused number between 0 and 65535, excluding 21, 23, 68, 80, 502, 1069, 1070, 1212, 2222, 44818 and 50000 (reserved for In-Sight communications).

Output: Status Code

The status codes are:

STATUS CODE	DESCRIPTION
1	The command was executed successfully.
0	Unrecognized command.
-1	The port number is invalid.
-2	The command could not be executed, the wafer reader is Online, or the specified port is already in use.

Sample Input and Output

PUT PORTNUM 3001
1

7.2.3 Put Watch

Put Watch(<Column><Row><Input>)

Returns the data contained in the specified cell each time the cell is updated.

NOTE The PortNum command must be executed to specify a port where the information will be sent by the Watch command.

Inputs: Column, Row, Input

Output: Status Code

The status codes are:

STATUS CODE	DESCRIPTION
1	The command was executed successfully.
0	Unrecognized command.
-2	The command could not be executed.

Sample Input and Output

PUT WATCH A000 1
1

7.3 Evaluate Extended Native Mode Command Inputs and Outputs

The table below lists the possible values of the settings that can be input and possible values of the settings and results data returned by the Evaluate Extended Native Mode commands. These output values are enclosed in Extensible Markup Language (XML) tags. XML is a web document authoring language that allows users to create their own customized tags. For more information on the XML format, go to: www.w3.org/XML.

SETTING	DESCRIPTION
<Accept>	The minimum response threshold for the raw reading score. 40 – 100 (default = 50)
<AcqEnable>	The status of the Disable Acquire setting. 0 = Disable 1 = Enable
<AcquireFlag>	Determines whether an image will be acquired when a read is performed. 0 = A read will be performed on the last image acquired. 1 = A read will be performed after a new image is acquired.
<AvgScore>	The average raw response score of all reads that passed for a Config. 0 – 100
<BC3Digits>	The status of the Three Digits setting, when 'BC, BC 412' or 'BC, IBM 412' is the selected Mark. 0 = Disable 1 = Enable
<BCHyphen>	The status of the Hyphen setting, when 'BC, BC 412' or 'BC, IBM 412' is the selected Mark. 0 = Disable 1 = Enable
<BComp>	When 'BC, BC 412' or 'BC, IBM 412' is the selected Mark, an internally generated value is returned for the encoded state of the settings, from the Advanced dialog, for the barcode Compression option, Hyphen option and Three Digit option. For more information, see section 3.5.4: Mark. The values for the individual Advanced Dialog settings can be returned or set using: EV GetConfigBCType EV GetConfigBCHyphen EV GetConfigBC3Digits EV SetConfigBCType EV SetConfigBCHyphen EV SetConfigBC3Digits
<BCType>	The index of the Compressed Barcode type for the specified Config, when 'BC, BC 412' or 'BC, IBM 412' is the selected Mark. 0 = None 1 = Base 35 2 = Compressed 1 3 = Compressed 2 4 = Compressed 3 5 = Compressed 4 6 = Compressed 5 7 = Compressed 6 8 = Compressed 7 9 = Compressed 8
<BestConfig>	The index of the Config which returns the highest score. 0 – 9

SETTING	DESCRIPTION
<Bright>	Determines whether Bright Field Light Mode settings will be tried during tuning. 0 = Disable Bright Field tuning 1 = Enable Bright Field tuning (default)
<Char>	The ASCII value of the specified character in a read string.
<Char Index>	Specifies the position number (zero-based) of a character within a string.
<CharSize>	The settings information for the Size setting. High: 16 – 120 (default = 42) Wide: 8 – 480 (default = 20)
<CharSpacing>	The setting for the tolerance of the spacing between adjacent characters and the vertical alignment of the characters. 1 = Standard 2 = Relaxed
<CheckSum>	The method by which the read result from a character string will be validated to ensure reliability, and establishes the scoring basis for determining the pass/fail status of the read. 0 = Virtual 1 = SEMI 2 = SEMI with Virtual (default) 3 = BC 412 with Virtual 4 = IBM 412 with Virtual
<Col>	The column coordinate of the input region or the individual character in a string. 640 x 480 image resolution: 0 – 639 1024 x 768 image resolution: 0 – 1023
<Color>	The expected color of the mark to read. 0 = Black 1 = White
<Config>	The Config number (0-9).
<Dark>	Determines whether Dark Field Light Mode settings will be tried during tuning when using the TuneConfig command. 0 = Disable Dark Field tuning 1 = Enable Dark Field tuning (default)
<Enable>	The status of the Enabled setting for the specified Config. 0 = Disable 1 = Enable
<"FieldDef">	Specifies user-defined entries for the Field String. User-defined
<"FieldString">	The number of characters contained in the character string or encoded in a barcode. Alphanumerics (A-Z, 0-9), dashes (-), dots (.), spaces and entries from FieldDef.
<Fixture>	The coordinates and orientation of the fixture. Col: 4 to 640 Row: 4 to 480 Theta: -179 to 180
<Flag>	Specifies whether tuning will be performed on a Config when using the TuneConfig or TuneConfigEx extended native mode commands. 0 = Start tuning 1 = Continue tuning 2 = Accept current parameters
<High> (CharSize)	The height of a 2D symbol or the average height of the characters in a string, as measured in pixels. 16 – 120 (default = 42)
<High> (Region)	The height of the region (along the Y-axis) in which the wafer mark is expected to appear in the field of view. 4 – 240 (default = 100)
<Light>	Specifies whether lighting Mode and Power settings will be tried during the tuning process. 0 = Disable Light tuning 1 = Enable Light tuning (default)

SETTING	DESCRIPTION
<LightMode>	Determines either a Bright Field or a Dark Field illumination effect on the mark. 0 = All lights are disabled 1 – 3 = The mark will appear dark on a light background 4 – 11 = The mark will appear light on a dark background
<LightPower>	The exposure time of the wafer reader's CCD imager, in milliseconds. 0.000-33.000 (default = 2.000)
<Mark>	The type of wafer mark the selected Config will read. 0 = 2D Sym, T7 Data Matrix 1 = BC, BC 412 2 = BC, IBM 412 3 = Internal Use Only 4 = Chars, SEMI 5 = Chars, IBM 6 = Chars, Triple
<MarkColor>	Specifies whether Color settings will be tried during the tuning process. 0 = Disable Color tuning 1 = Enable Color tuning (default)
<NumFailed>	The number of failed reads for a Config. 0 – 99,999
<NumPassed>	The number of passed reads for a Config. 0 – 99,999
<NumTuneFailed>	The number of failed reads during a tune for a Config. 0 – 99,999
<NumTunePassed>	The number of passed reads during a tune for a Config. 0 – 99,999
<Optimization>	The index of the Optimization type for the specified Config, when 'Chars, SEMI' is the selected Mark. 0 = Speed (default) 1 = Reliability
<Order>	The order in which enabled Configs will be tried until a successful read can be obtained. 0 = Last Best (default) 1 = In Order (0-9)
<Orientation>	The index of the Img Orientation setting for the specified Config. 0 = Normal (default) 1 = Mirrored horizontally 2 = Flipped vertically 3 = Rotated 180 degrees
<Passed>	The pass/fail status of the specified Config for the most recent read. 0 – 99,999
<Phi> (Region)	The curve of the Config's region. -360 to 360
<ReadLog>	A record of the most recent read that passed. 0-9
<Region>	The region where the wafer mark is expected to appear in the field of view. Row: 640 x 480 image resolution: 0 – 479 1024 x 768 image resolution: 0 – 767 High: 640 x 480 image resolution: 4 – 240 (default = 100) 1024 x 768 image resolution: 4 – 240 (default = 100) Col: 640 x 480 image resolution: 0 – 639 1024 x 768 image resolution: 0 – 1023 Wide: 640 x 480 image resolution: 4 – 640 (default = 500) 1024 x 768 image resolution: 4 – 1024 (default = 600) Theta: -179 to 180 Phi: -360 to 360

SETTING	DESCRIPTION
<Retry>	The tuning behavior. 0 = Disable (default) 1 = Enable 2 = Enable & Apply
<Row>	The row coordinate of the input region or the individual character in a string. 640 x 480 image resolution: 0 – 479 1024 x 768 image resolution: 0 – 767
<Score>	The average raw response scores for all Configs that passed. 0 – 400
<ScoreAs100>	The state of the optional scoring setting for character positions fielded as dashes (-), dots (.) and spaces. This setting is only available for 'Chars, SEMI', 'Chars, IBM' and 'Chars, Triple' Marks. 0 = Each character receives a weighted score based on the quality of the read. 1 = Each character automatically scores 100 points.
<Size>	Specifies whether the mark size will be modified during tuning when using the TuneConfig or TuneCofigEx extended native mode commands. 0 = Disable Size tuning 1 = Enable Size tuning (default)
<State>	The scoring method for character positions fielded as dashes (-), dots (.) and spaces. This setting is only available for 'Chars, SEMI', 'Chars, IBM' and 'Chars, Triple' Marks. 0 = Each character receives a weighted score based on the quality of the read. 1 = Each character automatically scores 100 points. **NOTE** When the GetWaferAllEx command is issued, the <ScoreAs100> output returns the <State> value.
<String>	The character results from the read. alphanumerics (A-Z, 0-9), dashes (-), dots (.), and spaces
<StringLen>	The number of characters in the result string. 0 – 31
<Theta> (CharSize)	The orientation of a 2D symbol or of the characters in a string, as measured in pixels.
<Theta> (Fixture)	The orientation of the fixture. 0 – 359
<Theta> (Region)	The angle of the Config's region. -179 to 180
<Thresh>	The character threshold setting. 25 to 100 (default = 25)
<Timeout>	The total amount of time (in seconds) to allow for a read, including retries and tuning of enabled Configs. 0 – 60 (default = 30)
<TryLog>	The Retry status of the Config during the last read. 0 – 99,999
<TuneLog>	The Retry and Tune status of the Config during the last read. 0 – 99,999
<Value>	The raw response score of the specified character in a read string. 0 – 99,999
<WafID>	References the WafID data structure in spreadsheet cell A4.
<Wide> (CharSize)	The width of a 2D symbol or the average width of the characters in a string, as measured in pixels. 8 – 480 (default = 20)
<Wide> (Region)	The width of the region (along the X-axis) where the wafer mark is expected to appear in the field of view. 640 x 480 image resolution: 4 – 640 (default = 500) 1024 x 768 image resolution: 4 – 1024 (default = 600)

7.4 Evaluate Extended Native Mode Commands (Actions)

The following commands are used in conjunction with the Evaluate (EV) extended Native Mode command to remotely control a wafer reader from user-designed software. Each command returns a Status Code, the number of characters (in bytes, including Carriage Returns and Line Feeds) in the output that follows, and the results in XML format.

Syntax: EV [command]

The status codes for all Evaluate commands are:

STATUS CODE	DESCRIPTION
1	The command was executed successfully.
0	Unrecognized command.
-2	The command could not be executed.

7.4.1 EV AcquireConfig

EV AcquireConfig(<WafID>,<Config>)

Acquires an image using the light settings in the specified Config. This command does not read.

Inputs: WafID, Config

Output: Status Code, # of bytes

Sample Input and Output

EV ACQUIRECONFIG(A4,0)
1 0

7.4.2 EV CopyConfig

EV CopyConfig*(*<WafID>*,*<TargetConfig>*,*<SourceConfig>*)*

Copies all settings and read results from the source Config to the target Config.

Inputs: WafID, TargetConfig, SourceConfig

Output: Status Code, # of bytes

Sample Input and Output

EV COPYCONFIG(A4,0,1)
1 0

7.4.3 EV ReadConfig

EV ReadConfig(<WafID>,<Config>,<AcquireFlag>)

Reads using the specified Config.

NOTE To execute a read of all enabled Configs, send the READ command, setting the <Config> input to "-1".

Inputs: WafID, Config, AcquireFlag

Outputs: Status Code, # of bytes, Passed, String, Score, TryLog, TuneLog, LastRead, NumPassed, NumFailed, NumTunePassed, NumTuneFailed, AvgScore, High, Wide, Theta, Char, Value (Orc), Row (Orc), Col (Orc)

Sample Input and Output

EV READCONFIG(A4,0,0)

```
1
1702
<Result Id="0">
  <Passed>1</Passed>
  <String>6713H129S6A1</String>
  <Score>395</Score>
  <TryLog>0</TryLog>
  <TuneLog>0</TuneLog>
  <LastRead>10</LastRead>
  <NumPassed>10</NumPassed>
  <NumFailed>0</NumFailed>
  <NumTunedPassed>0</NumTunedPassed>
  <NumTuneFailed>0</NumTuneFailed>
  <AvgScore>95</AvgScore>
  <High>39</High>
  <Wide>20</Wide>
  <Theta>0</Theta>
  <Orc Id="0">
    <Char>54</Char>
    <Value>98</Value>
    <Row>52</Row>
    <Col>63</Col>
  </Orc>
  <Orc Id="1">
    <Char>55</Char>
    <Value>97</Value>
    <Row>51</Row>
    <Col>99</Col>
  </Orc>
  <Orc Id="2">
    <Char>49</Char>
    <Value>98</Value>
    <Row>50</Row>
    <Col>133</Col>
  </Orc>
  <Orc Id="3">
    <Char>51</Char>
    <Value>95</Value>
    <Row>52</Row>
    <Col>168</Col>
  </Orc>
  <Orc Id="4">
    <Char>72</Char>
    <Value>99</Value>
    <Row>51</Row>
    <Col>204</Col>
  </Orc>
  <Orc Id="5">
    <Char>49</Char>
    <Value>99</Value>
    <Row>51</Row>
```

EV READCONFIG(A4,0,0)

```
    <Col>240</Col>
  </Orc>
  <Orc Id="6">
    <Char>50</Char>
    <Value>91</Value>
    <Row>52</Row>
    <Col>274</Col>
  </Orc>
  <Orc Id="7">
    <Char>57</Char>
    <Value>93</Value>
    <Row>51</Row>
    <Col>310</Col>
  </Orc>
  <Orc Id="8">
    <Char>83</Char>
    <Value>92</Value>
    <Row>53</Row>
    <Col>344</Col>
  </Orc>
  <Orc Id="9">
    <Char>54</Char>
    <Value>96</Value>
    <Row>51</Row>
    <Col>381</Col>
  </Orc>
  <Orc Id="10">
    <Char>65</Char>
    <Value>93</Value>
    <Row>53</Row>
    <Col>415</Col>
  </Orc>
  <Orc Id="11">
    <Char>49</Char>
    <Value>96</Value>
    <Row>52</Row>
    <Col>452</Col>
  </Orc>
</Result>
```

Other EV ReadConfig Commands

EV GetConfigOrcChar(<WafID>,<Config>,<Char Index>)

EV GetConfigOrcRow(<WafID>,<Config>,<Char Index>)

EV GetConfigOrcCol(<WafID>,<Config>,<Char Index>)

EV GetConfigOrcVal(<WafID>,<Config>,<Char Index>)

7.4.4 EV TuneConfig

EV TuneConfig(<WafID>,<Config>,<Flag>,<Bright>,<Dark>,<Size>)

Tunes the specified Config.

NOTE This command does not do an exhaustive tune; it only does one iteration of settings. The command may need to be sent multiple times to obtain optimized settings.

Inputs: WafID, Config, Flag, Bright, Dark, Size

Outputs: Status Code, # of bytes, NumRead, Passed (Current), String (Current), Score (Current), Passed (Best), String (Best), Score (Best)

Sample Input and Output

EV TUNECONFIG(A4,0,1,1,1,1)

```
1
282
<TuneStep Id="0" Percent="1">
  <NumRead>1</NumRead>
  <Current>
    <Passed>1</Passed>
    <String>6713H129S6A1</String>
    <Score>396</Score>
  </Current>
  <Best>
    <Passed>1</Passed>
    <String>6713H129S6A1</String>
    <Score>396</Score>
  </Best>
</TuneStep>
```

Example:

1 To initiate tuning, send the TuneConfig command, setting the <Flag> input to "0".

2 To continue tuning, send the TuneConfig command, setting the <Flag> input to "1".

3 Reissue the TuneConfig command with the <Flag> input to set to "1" until an acceptable passing score is reached.

4 To accept the optimized settings when tuning is completed, resend the TuneConfig command a final time, setting the <Flag> input to "2".

7.4.5 EV TuneConfigEx

EV TuneConfigEx(<WafID>,<Config>,<Flag>,<MarkColor>,<Light>,<Size>)

Tunes the specified Config.

NOTES

- If Mark Color tuning is enabled and Light and Size tuning are disabled, tuning does not occur and the Percent output is equal to "100" the first time the TuneConfigEx command is issued.
- The TuneConfigEx command is only supported on In-Sight 1721/1722 wafer readers with firmware version 3.20.05 and higher.
- This command does not do an exhaustive tune; it only does one iteration of settings. The command may need to be sent multiple times to obtain optimized settings.

Inputs: WafID, Config, Flag, MarkColor, Light, Size

Outputs: Status Code, # of bytes, NumRead, Passed (Current), String (Current), Score (Current), Passed (Best), String (Best), Score (Best)

Sample Input and Output

EV TUNECONFIGEX(A4,0,1,1,1,1,1)

```
1
282
<TuneStep Id="0" Percent="1">
  <NumRead>1</NumRead>
  <Current>
    <Passed>1</Passed>
    <String>6713H129S6A1</String>
    <Score>396</Score>
  </Current>
  <Best>
    <Passed>1</Passed>
    <String>6713H129S6A1</String>
    <Score>396</Score>
  </Best>
</TuneStep>
```

Example:

1 To initiate tuning, send the TuneConfigEx command, setting the <Flag> input to "0".

2 To continue tuning, send the TuneConfigEx command, setting the <Flag> input to "1".

3 Reissue the TuneConfigEx command with the <Flag> input to set to "1" until an acceptable passing score is reached.

4 To accept the optimized settings when tuning is completed, resend the TuneConfigEx command a final time, setting the <Flag> input to "2".

7.4.6 EV ResetStats

EV ResetStats(<WafID>)

Reset all accumulated read statistics.

Inputs: WafID

Outputs: Status Code, # of bytes

EV RESETSTATS(A4)
1 0

7.5 Evaluate Extended Native Mode Commands (Get)

The following commands are used in conjunction with the Evaluate (EV) extended Native Mode command to retrieve settings and read results from the Configs in a wafer ID job. Each command returns a Status Code, the number of characters (in bytes, including Carriage Returns and Line Feeds) in the output that follows, and the results in XML format.

Syntax: EV [command]

The status codes for all Evaluate commands are:

STATUS CODE	DESCRIPTION
1	The command was executed successfully.
0	Unrecognized command.
–2	The command could not be executed.

7.5.1 EV GetConfig

EV GetConfig(<WafID>,<Config>)

Returns the current settings for a Config.

Inputs: WafID, Config

Outputs: Status Code, # of bytes, Mark, Checksum, LightMode, LightPower, Orientation, Row (Region), Column (Region), High (Region), Wide (Region), Theta (Region), Phi (Region), High (CharSize), Wide (CharSize), CharSpacing, FieldString, FieldDef, Color, Accept, Enable, Retry, BComp, Thresh, Optimization

Sample Input and Output

EV GETCONFIG(A4,0)

```
1
470
<Config Id="0">
  <Mark>4</Mark>
  <Checksum>2</Checksum>
  <LightMode>1</LightMode>
  <LightPower>2</LightPower>
  <Orientation>0</Orientation>
  <Region>
    <Row>280</Row>
    <Col>45</Col>
    <High>100</High>
    <Wide>500</Wide>
    <Theta>0</Theta>
    <Phi>0</Phi>
  </Region>
  <CharSize>
    <High>42</High>
    <Wide>22</Wide>
  </CharSize>
  <CharSpacing>1</CharSpacing>
  <FieldString>**********CS</FieldString>
  <FieldDef></FieldDef>
  <Color>2</Color>
  <Accept>50</Accept>
  <Enable>1</Enable>
  <Retry>0</Retry>
  <BComp>0</BComp>
  <Thresh>25</Thresh>
  <Optimization>0<Optimization>
</Config>
```

Other EV GetConfig Commands

EV GetConfigMark(<WafID>,<Config>)
EV GetConfigChecksum(<WafID>,<Config>)
EV GetConfigLightMode(<WafID>,<Config>)
EV GetConfigLightPower(<WafID>,<Config>)
EV GetConfigOrientation(<WafID>,<Config>)
EV GetConfigRegionRow(<WafID>,<Config>)
EV GetConfigRegionCol(<WafID>,<Config>)
EV GetConfigRegionHigh(<WafID>,<Config>)
EV GetConfigRegionWide(<WafID>,<Config>)
EV GetConfigRegionTheta(<WafID>,<Config>)
EV GetConfigRegionPhi(<WafID>,<Config>)
EV GetConfigCharHigh(<WafID>,<Config>)
EV GetConfigCharWide(<WafID>,<Config>)
EV GetConfigFieldStr(<WafID>,<Config>)
EV GetConfigFieldDef(<WafID>,<Config>)
EV GetConfigColor(<WafID>,<Config>)
EV GetConfigAccept(<WafID>,<Config>)
EV GetConfigEnable(<WafID>,<Config>)

EV GetConfigRetry(<WafID>,<Config>)
EV GetConfigBComp(<WafID>,<Config>)
EV GetConfigThresh(<WafID>,<Config>)
EV GetConfigOptimization(<WafID>,<Config>)

7.5.2 EV GetConfigResult

EV GetConfigResult(<WafID>,<Config>)

Returns the results of the most recent read performed by the specified Config.

Inputs: WafID, Config

Outputs: Status Code, # of bytes, Passed, String, Score, TryLog, TuneLog, LastRead, NumPassed, NumFailed, NumTunePassed, NumTuneFailed, AvgScore, High, Wide, Theta, Char (Orc), Value (Orc), Row (Orc), Col (Orc)

Sample Input and Output

EV GETCONFIGRESULT(A4,0)

```
1
1701
<Result Id="0">
  <Passed>1</Passed>
  <String>6713H129S6A1</String>
  <Score>396</Score>
  <TryLog>1</TryLog>
  <TuneLog>0</TuneLog>
  <LastRead>10</LastRead>
  <NumPassed>4</NumPassed>
  <NumFailed>0</NumFailed>
  <NumTunePassed>0</NumTunePassed>
  <NumTuneFailed>0</NumTuneFailed>
  <AvgScore>96</AvgScore>
  <High>40</High>
  <Wide>21</Wide>
  <Theta>0</Theta>
  <Orc Id="0">
    <Char>54</Char>
    <Value>96</Value>
    <Row>51</Row>
    <Col>25</Col>
  </Orc>
  <Orc Id="1">
    <Char>55</Char>
    <Value>96</Value>
    <Row>51</Row>
    <Col>65</Col>
  </Orc>
  <Orc Id="2">
    <Char>49</Char>
    <Value>98</Value>
    <Row>52</Row>
    <Col>105</Col>
  </Orc>
  <Orc Id="3">
    <Char>51</Char>
    <Value>97</Value>
    <Row>53</Row>
    <Col>145</Col>
  </Orc>
  <Orc Id="4">
    <Char>72</Char>
    <Value>99</Value>
    <Row>53</Row>
    <Col>187</Col>
  </Orc>
  <Orc Id="5">
```

EV GETCONFIGRESULT(A4,0)

```
    <Char>49</Char>
    <Value>99</Value>
    <Row>54</Row>
    <Col>228</Col>
  </Orc>
  <Orc Id="6">
    <Char>50</Char>
    <Value>94</Value>
    <Row>54</Row>
    <Col>269</Col>
  </Orc>
  <Orc Id="7">
    <Char>57</Char>
    <Value>98</Value>
    <Row>55</Row>
    <Col>309</Col>
  </Orc>
  <Orc Id="8">
    <Char>83</Char>
    <Value>88</Value>
    <Row>56</Row>
    <Col>350</Col>
  </Orc>
  <Orc Id="9">
    <Char>54</Char>
    <Value>98</Value>
    <Row>56</Row>
    <Col>391</Col>
  </Orc>
  <Orc Id="10">
    <Char>65</Char>
    <Value>93</Value>
    <Row>58</Row>
    <Col>431</Col>
  </Orc>
  <Orc Id="11">
    <Char>49</Char>
    <Value>98</Value>
    <Row>57</Row>
    <Col>471</Col>
  </Orc>
</Result>
```

Other EV GetConfigResult Commands

EV GetConfigPassed(<WafID>,<Config>)
EV GetConfigString(<WafID>,<Config>)
EV GetConfigScore(<WafID>,<Config>)
EV GetConfigTryLog(<WafID>,<Config>)
EV GetConfigTuneLog(<WafID>,<Config>)
EV GetConfigLastRead(<WafID>,<Config>)
EV GetConfigNumPassed(<WafID>,<Config>)
EV GetConfigNumFailed(<WafID>,<Config>)
EV GetConfigNumTunePassed(<WafID>,<Config>)
EV GetConfigNumTuneFailed(<WafID>,<Config>)
EV GetConfigAvgScore(<WafID>,<Config>)
EV GetConfigHigh(<WafID>,<Config>)
EV GetConfigWide(<WafID>,<Config>)
EV GetConfigTheta(<WafID>,<Config>)

7.5.3 EV GetMSBuffer

EV GetMSBuffer (<Index>)

Returns the Machine Status data stored in one of 8 indexed buffers within the MachineStatus stack. If the index is 0, the current Machine Status is returned.

Input: Index

Output: MachineStatus, TimeAndDate, HostName, InSightModel, FirmwareVersion, BootTime, ActiveJob, JobLoadTime, Online, OperationalStatus, UserName, UserHostName, UserData.

Sample Input and Output

EV GETMSBUFFER(0)

```
1
540
<MachineStatus>
  <TimeAndDate>>08/15/2002 13:06:02</TimeAndDate>
  <HostName>MyHost</HostName>
  <InSightModel>1000</InSightModel>
  <FirmwareVersion>2.40.01</FirmwareVersion>
  <BootTime>08/15/2002 11:00:05</BootTime>
  <ActiveJob>FTP://SYSTEM1/MyJob.job</ActiveJob>
  <JobLoadTime>08/13/2002 13:00:00</JobLoadTime>
  <Online>0</Online>
  <OperationalStatus>MAINTENANCE</OperationalStatus>
  <UserName>admin</UserName>
  <UserHostName>SYSTEM1</UserHostName>
  <UserData>PASS,SCORE=95,X=242,Y=348</UserData>
</MachineStatus>
```

7.5.4 EV GetWaferAll

EV GetWaferAll(<WafID>)

Returns all results for the most recent read, and settings for all Configs.

Inputs: WafID

Outputs: Status Code, # of bytes, BestConfig, Timeout, Order, AcqEnable, NumPassed, NumFailed, AvgScore Row (Fixture), Col (Fixture), Theta (Fixture), Mark, Checksum, LightMode, LightPower, Orientation, Row (Region), Col (Region), High (Region), Wide (Region), Theta (Region), Phi (Region), High (Char), Wide (Char), FieldString, FieldDef, Color, Accept, Enable, Retry, BComp, Thresh, Optimization, Passed, String, Score, TryLog, TuneLog, LastRead, NumPassed, NumFailed, NumTunePassed, NumTuneFailed, AvgScore, High, Wide, Theta, Char (Orc) Value (Orc), Row, (Orc), Col (Orc)

Sample Input and Output

EV GETWAFERALL(A4)

```
1
23626
<Wafer>
  <BestConfig>0</BestConfig>
  <Timeout>30</Timeout>
  <Order>0</Order>
  <AcqEnable>1</AcqEnable>
  <NumPassed>4</NumPassed>
  <NumFailed>0</NumFailed>
  <AvgScore>96</AvgScore>
  <Fixture>
    <Row>0</Row>
    <Col>0</Col>
    <Theta>0</Theta>
  </Fixture>
  <Config Id="0">
    <Mark>4</Mark>
    <Checksum>2</Checksum>
    <LightMode>1</LightMode>
    <LightPower>2</LightPower>
    <Orientation>0</Orientation>
    <Region>
      <Row>280</Row>
      <Col>45</Col>
      <High>100</High>
      <Wide>500</Wide>
      <Theta>0</Theta>
      <Phi>0</Phi>
    </Region>
    <CharSize>
      <High>42</High>
      <Wide>22</Wide>
    </CharSize>
    <FieldString>**********CS</FieldString>
    <FieldDef></FieldDef>
    <Color>2</Color>
    <Accept>50</Accept>
    <Enable>1</Enable>
    <Retry>0</Retry>
    <BComp>0</BComp>
    <Thresh>25</Thresh>
    <Optimization>0</Optimization>
  </Config>
  <Result Id="0">
    <Passed>1</Passed>
    <String>6713H129S6A1</String>
    <Score>396</Score>
    <TryLog>1</TryLog>
    <TuneLog>0</TuneLog>
    <LastRead>10</LastRead>
    <NumPassed>4</NumPassed>
    <NumFailed>0</NumFailed>
    <NumTunePassed>0</NumTunePassed>
    <NumTuneFailed>0</NumTuneFailed>
    <AvgScore>96</AvgScore>
    <High>40</High>
    <Wide>21</Wide>
    <Theta>0</Theta>
    <Orc Id="0">
      <Char>54</Char>
      <Value>96</Value>
      <Row>51</Row>
      <Col>25</Col>
    </Orc>
    <Orc Id="1">
      <Char>55</Char>
      <Value>96</Value>
      <Row>51</Row>
      <Col>65</Col>
    </Orc>
    <Orc Id="2">
      <Char>49</Char>
```

EV GETWAFERALL(A4)

```
      <Value>98</Value>
      <Row>52</Row>
      <Col>105</Col>
    </Orc>
    <Orc Id="3">
      <Char>51</Char>
      <Value>97</Value>
      <Row>53</Row>
      <Col>145</Col>
    </Orc>
    <Orc Id="4">
      <Char>72</Char>
      <Value>99</Value>
      <Row>53</Row>
      <Col>187</Col>
    </Orc>
    <Orc Id="5">
      <Char>49</Char>
      <Value>99</Value>
      <Row>54</Row>
      <Col>228</Col>
    </Orc>
    <Orc Id="6">
      <Char>50</Char>
      <Value>94</Value>
      <Row>54</Row>
      <Col>269</Col>
    </Orc>
    <Orc Id="7">
      <Char>57</Char>
      <Value>98</Value>
      <Row>55</Row>
      <Col>309</Col>
    </Orc>
    <Orc Id="8">
      <Char>83</Char>
      <Value>88</Value>
      <Row>56</Row>
      <Col>350</Col>
    </Orc>
    <Orc Id="9">
      <Char>54</Char>
      <Value>98</Value>
      <Row>56</Row>
      <Col>391</Col>
    </Orc>
    <Orc Id="10">
      <Char>65</Char>
      <Value>93</Value>
      <Row>58</Row>
      <Col>431</Col>
    </Orc>
    <Orc Id="11">
      <Char>49</Char>
      <Value>98</Value>
      <Row>57</Row>
      <Col>471</Col>
    </Orc>
  </Result>
  ... (<Config Id="1"> through <Config Id="9" omitted>)
</Wafer>
```

Other EV GetWafer Commands

EV GetWaferTimeout(<WafID>)

EV GetWaferOrder(<WafID>)

EV GetWaferAcqEnable(<WafID>)

EV GetWaferBestConfig(<WafID>)

EV GetWaferFixRow(<WafID>)

EV GetWaferFixCol(<WafID>)
EV GetWaferFixTheta(<WafID>)
EV GetWaferNumPassed(<WafID>)
EV GetWaferNumFailed(<WafID>)
EV GetWaferAveScore(<WafID>)
EV GetWaferString(<WafID>)

7.5.5 EV GetWaferAllEx

EV GetWaferAllEx(<WafID>)

Returns all results for the most recent read, and settings for all Configs.

NOTE	The GetWaferAllEx command is only supported on In-Sight 1721/1722 wafer readers with firmware version 3.20.05 and higher.

Inputs: WafID

Outputs: Status Code, # of bytes, BestConfig, Timeout, Order, AcqEnable, NumPassed, NumFailed, AvgScore, ScoreAs100, Row (Fixture), Col (Fixture), Theta (Fixture), Mark, Checksum, LightMode, LightPower, Orientation, Row (Region), Col (Region), High (Region), Wide (Region), Theta (Region), Phi (Region), High (Char), Wide (Char), FieldString, FieldDef, Color, Accept, Enable, Retry, BComp, Thresh, Optimization, Passed, String, Score, TryLog, TuneLog, LastRead, NumPassed, NumFailed, NumTunePassed, NumTuneFailed, AvgScore, High, Wide, Theta, Char (Orc) Value (Orc), Row, (Orc), Col (Orc)

Sample Input and Output

EV GETWAFERALLEX(A4)

```
1
23626
<Wafer>
  <BestConfig>0</BestConfig>
  <Timeout>30</Timeout>
  <Order>0</Order>
  <AcqEnable>1</AcqEnable>
  <NumPassed>4</NumPassed>
  <NumFailed>0</NumFailed>
  <AvgScore>96</AvgScore>
  <ScoreAs100>0</ScoreAs100>
  <Fixture>
    <Row>0</Row>
    <Col>0</Col>
    <Theta>0</Theta>
  </Fixture>
  <Config Id="0">
    <Mark>4</Mark>
    <Checksum>2</Checksum>
    <LightMode>1</LightMode>
    <LightPower>2</LightPower>
    <Orientation>0</Orientation>
    <Region>
      <Row>280</Row>
      <Col>45</Col>
      <High>100</High>
      <Wide>500</Wide>
      <Theta>0</Theta>
      <Phi>0</Phi>
    </Region>
    <CharSize>
      <High>42</High>
      <Wide>22</Wide>
    </CharSize>
    <FieldString>**********CS</FieldString>
    <FieldDef></FieldDef>
    <Color>2</Color>
    <Accept>50</Accept>
    <Enable>1</Enable>
    <Retry>0</Retry>
    <BComp>0</BComp>
    <Thresh>25</Thresh>
    <Optimization>0</Optimization>
  </Config>
  <Result Id="0">
    <Passed>1</Passed>
    <String>6713H129S6A1</String>
    <Score>396</Score>
    <TryLog>1</TryLog>
    <TuneLog>0</TuneLog>
    <LastRead>10</LastRead>
    <NumPassed>4</NumPassed>
    <NumFailed>0</NumFailed>
    <NumTunePassed>0</NumTunePassed>
    <NumTuneFailed>0</NumTuneFailed>
    <AvgScore>96</AvgScore>
    <High>40</High>
    <Wide>21</Wide>
    <Theta>0</Theta>
    <Orc Id="0">
      <Char>54</Char>
      <Value>96</Value>
      <Row>51</Row>
      <Col>25</Col>
    </Orc>
    <Orc Id="1">
      <Char>55</Char>
      <Value>96</Value>
      <Row>51</Row>
      <Col>65</Col>
    </Orc>
```

EV GETWAFERALLEX(A4)

```
    <Orc Id="2">
      <Char>49</Char>
      <Value>98</Value>
      <Row>52</Row>
      <Col>105</Col>
    </Orc>
    <Orc Id="3">
      <Char>51</Char>
      <Value>97</Value>
      <Row>53</Row>
      <Col>145</Col>
    </Orc>
    <Orc Id="4">
      <Char>72</Char>
      <Value>99</Value>
      <Row>53</Row>
      <Col>187</Col>
    </Orc>
    <Orc Id="5">
      <Char>49</Char>
      <Value>99</Value>
      <Row>54</Row>
      <Col>228</Col>
    </Orc>
    <Orc Id="6">
      <Char>50</Char>
      <Value>94</Value>
      <Row>54</Row>
      <Col>269</Col>
    </Orc>
    <Orc Id="7">
      <Char>57</Char>
      <Value>98</Value>
      <Row>55</Row>
      <Col>309</Col>
    </Orc>
    <Orc Id="8">
      <Char>83</Char>
      <Value>88</Value>
      <Row>56</Row>
      <Col>350</Col>
    </Orc>
    <Orc Id="9">
      <Char>54</Char>
      <Value>98</Value>
      <Row>56</Row>
      <Col>391</Col>
    </Orc>
    <Orc Id="10">
      <Char>65</Char>
      <Value>93</Value>
      <Row>58</Row>
      <Col>431</Col>
    </Orc>
    <Orc Id="11">
      <Char>49</Char>
      <Value>98</Value>
      <Row>57</Row>
      <Col>471</Col>
    </Orc>
  </Result>
  ... (<Config Id="1"> through <Config Id="9" omitted>)
</Wafer>
```

7.5.6 EV GetWaferScoreAs100

EV GetWaferScoreAs100(<WafID>)

Returns the state of the optional scoring setting for character positions fielded as dashes (-), dots (.) and spaces. This setting is only available for ‘Chars, SEMI’, ‘Chars, IBM’ and ‘Chars, Triple’ Marks.

Inputs: WafID

Outputs: Status Code, # of bytes, State

Sample Input and Output

EV GETWAFERSCOREAS100(A4)
1 18 <Float>0</Float>

7.5.7 EV GetWaferSummary

EV GetWaferSummary(<WafID>)

Returns a summary of the results for the most recent read.

NOTE A ConfigLog will be returned for all Enabled Configs.

Inputs: WafID

Outputs: Status Code, # of bytes, BestConfig, Passed, String, Score, Row (Region), Col (Region), High (Region), Wide (Region), NumPassed, NumFailed, AvgScore, ReadLog, Passed (ConfigLog), String (ConfigLog), Score (ConfigLog), TryLog (ConfigLog), TuneLog (ConfigLog), NumPassed (ConfigLog), NumFailed (ConfigLog), NumTunedPassed (ConfigLog), NumTuneFailed (ConfigLog), AvgScore (ConfigLog)

Sample Input and Output

EV GETWAFERSUMMARY(A4)

```
1
832
<WaferSummary>
  (
    <Row>0</Row>
    <Col>0</Col>
    <Theta>0</Theta>
  </Fixture>
  <BestConfig>0</BestConfig>
  <Passed>1</Passed>
  <String>6713H129S6A1</String>
  <Score>396</Score>
  <Region>
    <Row>280</Row>
    <Col>45</Col>
    <High>100</High>
    <Wide>500</Wide>
  </Region>
  <NumPassed>4</NumPassed>
  <NumFailed>0</NumFailed>
  <AvgScore>96</AvgScore>
  <ReadLog></ReadLog>
  <ConfigLog Id="0">
    <Passed>1</Passed>
    <String>6713H129S6A1</String>
    <Score>396</Score>
    <TryLog>1</TryLog>
    <TuneLog>0</TuneLog>
    <NumPassed>4</NumPassed>
    <NumFailed>0</NumFailed>
    <NumTunedPassed>0</NumTunedPassed>
    <NumTuneFailed>0</NumTuneFailed>
    <AvgScore>96</AvgScore>
  </ConfigLog>
</WaferSummary>
```

7.6 Evaluate Extended Native Mode Commands (Set)

The following commands are used in conjunction with the Evaluate (EV) extended Native Mode command to change Config settings in a wafer ID job. Each command returns a Status Code, and the number of characters (in bytes, including Carriage Returns and Line Feeds) in the output that follows.

Syntax: EV [command]

The status codes for all Evaluate commands are:

STATUS CODE	DESCRIPTION
1	The command was executed successfully.
0	Unrecognized command.
-2	The command could not be executed.

7.6.1 EV SetConfig

EVSetConfigAccept(<WafID>,<Config>,<Mark>,<Checksum>,<LightMode>, <LightPower>,<Orientation>,<Row>,<Col>,<High>,<Wide>,<Theta>,<Phi>,<High>, <Wide>,<CharSpacing>,<"FieldString">,<"FieldDef">,<Color>,<Accept>,<Enable>, <Retry>,<BComp>,<Thresh>)

Specifies all settings for the specified Config.

Inputs: WafID, Config, Mark, Checksum, LightMode, LightPower, Orientation, Row, Col, High, Wide, Theta, Phi, High, Wide, CharSpacing, FieldString, FieldDef, Color, Accept, Enable, Retry, BComp, Thresh

Outputs: Status Code, # of bytes

Sample Input and Output

EV SETCONFIG(A4,0,4,2,1,2,0,280,45,100,500,0,0,42,22,1,"**********CS","",2,50,1,0,0,25)
1 0

7.6.2 EV SetConfigAccept

EV SetConfigAccept(<WafID>,<Config>,<Accept>)

Sets the minimum response threshold for the raw reading score of the specified Config.

Inputs: WafID, Config, Accept

Outputs: Status Code, # of bytes

Sample Input and Output

EV SETCONFIGACCEPT(A4,0,50)
1 0

7.6.3 EV SetConfigBC3Digits

EV SetConfigBC3Digits(<WafID>,<Config>,<BC3Digits>)

When ‘BC, BC 412’ or ‘BC, IBM 412’ is the selected Mark, SetConfigBC3Digits specifies the status of the Three Digit setting for a compressed barcode.

Inputs: WafID, Config, BC3Digits

Outputs: Status Code, # of bytes

Sample Input and Output

EV SETCONFIGBC3DIGITS(A4,0,0)
1 0

7.6.4 EV SetConfigBCHyphen

EV SetConfigBCHyphen(<WafID>,<Config>,<BCHyphen>)

When 'BC, BC 412' or 'BC, IBM 412' is the selected Mark, SetConfigBCHyphen specifies the status of the Hyphen setting for a compressed barcode.

Inputs: WafID, Config, BCHyphen

Outputs: Status Code, # of bytes

Sample Input and Output

EV SETCONFIGBCHYPHEN(A4,0,0)
1 0

7.6.5 EV SetConfigBCType

EV SetConfigBCType(<WafID>,<Config>,<BCType>)

When 'BC, BC 412' or 'BC, IBM 412' is the selected Mark, SetConfigBCType specifies the index of the compressed barcode type.

Inputs: WafID, Config, BCType

Outputs: Status Code, # of bytes

Sample Input and Output

EV SETCONFIGBCTYPE(A4,0,0)
1 0

7.6.6 EV SetConfigCharSize

EV SetConfigCharSize(<WafID>,<Config>,<High>,<Wide>)

Sets the expected size of an individual character or 2D mark for the specified Config.

Inputs: WafID, Config, High, Wide

Outputs: Status Code, # of bytes

Sample Input and Output

EV SETCONFIGCHARSIZE(A4,0,40,20)
1 0

7.6.7 EV SetConfigCharSpacing

EV SetConfigCharSpacing(<WafID>,<Config>,<CharSpacing>)

When ‘Chars, SEMI’, ‘Chars, IBM’ or ‘Chars, Triple’ is the selected Mark, the Character Spacing setting controls the tolerance of the spacing between adjacent characters and the vertical alignment of the characters.

Inputs: WafID, Config, CharSpacing

Outputs: Status Code, # of bytes

Sample Input and Output

EV SETCONFIGCHARSPACING(A4,0,0)
1 0

7.6.8 EV SetConfigChecksum

EV SetConfigChecksum(<WafID>,<Config>,<Checksum>)

Selects the method by which the read result from a character string will be validated to ensure reliability, and establishes the scoring basis for determining the pass/fail status of the read.

Inputs: WafID, Config, Checksum

Outputs: Status Code, # of bytes

Sample Input and Output

EV SETCONFIGCHECKSUM(A4,0,1)
1 0

7.6.9 EV SetConfigColor

EV SetConfigColor(<WafID>,<Config>,<Color>)

Sets the expected color of the wafer mark.

Inputs: WafID, Config, Color

Outputs: Status Code, # of bytes

Sample Input and Output

EV SETCONFIGCOLOR(A4,0,1)
1 0

7.6.10 EV SetConfigEnable

EV SetConfigEnable(<WafID>,<Config>,<Enable>)

Specifies whether a Config is enabled or disabled, which determines if the specified Config will be used during the retry sequence at runtime.

Inputs: WafID, Config, Enable

Outputs: Status Code, # of bytes

Sample Input and Output

EV SETCONFIGENABLE(A4,0,1)
1 0

7.6.11 EV SetConfigFieldDef

EV SetConfigFieldDef(<WafID>,<Config>,<"FieldDef">)

Defines the Field String when Mark specifies a character string or barcode.

NOTE The FieldDef input must be set off with quotation marks.

Inputs: WafID, Config, FieldDef

Outputs: Status Code, # of bytes

Sample Input and Output

EV SETCONFIGFIELDDEF(A4,0,"A=A;B=B")
1 0

7.6.12 EV SetConfigFieldString

EV SetConfigFieldString(<WafID>,<Config>,<"FieldString">)

Specifies the number of characters contained in the character string or encoded in a barcode.

NOTE The FieldString input must be set off with quotation marks.

Inputs: WafID, Config, FieldString

Outputs: Status Code, # of bytes

Sample Input and Output

EV SETCONFIGFIELDSTRING(A 4,0,"**********")
1 0

7.6.13 EV SetConfigLightMode

EV SetConfigLightMode(<WafID>,<Config>,<LightMode>)

Specifies either a Bright Field or a Dark Field illumination effect on the mark.

Inputs: WafID, Config, LightMode

Outputs: Status Code, # of bytes

Sample Input and Output

EV SETCONFIGLIGHTMODE(A4,0,11)
1 0

7.6.14 EV SetConfigLightPower

EV SetConfigLightPower(<WafID>,<Config>,<LightPower>)

Controls the effective intensity of the LEDs on the mark by increasing the exposure time of the wafer reader's CCD imager.

Inputs: WafID, Config, LightPower

Outputs: Status Code, # of bytes

Sample Input and Output

EV SETCONFIGLIGHTPOWER(A4,0,25.123)
1 0

7.6.15 EV SetConfigMark

EV SetConfigMark(<WafID>,<Config>,<Mark>)

Specifies the type of wafer mark the selected Config will read.

Inputs: WafID, Config, Mark

Outputs: Status Code, # of bytes

Sample Input and Output

EV SETCONFIGMARK(A4,0,1)
1 0

7.6.16 EV SetConfigOptimization

EV SetConfigOptimization(<WafID>,<Config>,<Optimization>)

When 'Chars, SEMI' is the selected Mark, SetConfigOptimization sets the Optimization for the specified Config.

Inputs: WafID, Config, Optimization

Outputs: Status Code, # of bytes

Sample Input and Output

EV SETCONFIGOPTIMIZATION(A4,0,1)
1 0

7.6.17 EV SetConfigOrientation

EV SetConfigOrientation(<WafID>,<Config>,<Orientation>)

Sets the orientation of the image.

Inputs: WafID, Config, Orientation

Outputs: Status Code, # of bytes

Sample Input and Output

EV SETCONFIGORIENTATION(A4,0,0)
1 0

7.6.18 EV SetConfigRegion

EV SetConfigRegion(<WafID>,<Config>,<Row>,<Col>,<High>,<Wide>)

Sets the region where the wafer mark is expected to appear in the field of view for the specified Config.

Inputs: WafID, Config, Row, Col, High, Wide

Outputs: Status Code, # of bytes

Sample Input and Output

EV SETCONFIGREGION(A4,0,150,60,100,500)
1 0

7.6.19 EV SetConfigRetry

EV SetConfigRetry(<WafID>,<Config>,<Retry>)

Specifies how the Config will be used during the retry sequence at runtime.

Inputs: WafID, Config, Retry

Outputs: Status Code, # of bytes

Sample Input and Output

EV SETCONFIGRETRY(A4,0,1)
1 0

7.6.20 EV SetConfigThresh

EV SetConfigThresh(<WafID>,<Config>,<Thresh>)

Specifies the minimum response threshold for each individual character score. Each individual character score must be greater than the Character Threshold or the read will fail.

Inputs: WafID, Config, Thresh

Outputs: Status Code, # of bytes

Sample Input and Output

EV SETCONFIGTHRESH(A4,0,50)
1 0

7.6.21 EV SetWaferAcqEnable

EV SetWaferAcqEnable(<WafID>,<AcqEnable>)

Disables image acquisition to allow a test read from the last image acquired, or from an image file, when the wafer reader is Offline. The Light Mode and Light Power settings are temporarily disabled.

Inputs: WafID, AcqEnable

Outputs: Status Code, # of bytes

Sample Input and Output

EV SETWAFERACQENABLE(A4,0)
1 0

7.6.22 EV SetWaferOrder

EV SetWaferOrder(<WafID>,<Order>)

The order in which enabled Configs will be tried until a successful read can be obtained.

Inputs: WafID, Order

Outputs: Status Code, # of bytes

Sample Input and Output

EV SETWAFERORDER(A4,0)
1 0

7.6.23 EV SetWaferScoreAs100

EV SetWaferScoreAs100(<WafID>, <State>)

Specifies whether character positions fielded as dashes (-), dots (.) and spaces automatically score 100 points or receive a weighted score based on the quality of the read. This setting is only available for ‘Chars, SEMI’, ‘Chars, IBM’ and ‘Chars, Triple’ Marks.

Inputs: WafID, State

Outputs: Status Code, # of bytes

Sample Input and Output

EV SETWAFERSCOREAS100(A4,1)
1 0

7.6.24 EV SetWaferTimeout

EV SetWaferTimeout(<WafID>,<Timeout>)

Specifies the total amount of time (in seconds) to allow for a read, including retries and tuning of enabled Configs.

Inputs: WafID, Timeout

Outputs: Status Code, # of bytes

Sample Input and Output

EV SETWAFERTIMEOUT(A4,45)
1 0

8 Specifications

In this section…

8.1 General Specifications

Table 8-1: In-Sight 1721/1722 Wafer Reader General Specifications

Specification		Description		
Configurations		Vertical mount w/ factory-set 50.0mm working distance.		
		In-Sight 1721: P/N 800-5865-1; P/N 800-5865-1R (RoHS Compliant) In-Sight 1722: P/N 800-5865-2; P/N 800-5865-2R (RoHS Compliant)		
		Optional Horizontal Mirror Mount (800-5796-1)		
Firmware		In-Sight version 2.90 and later.		
Reading Capability		Supported Wafer Marks		Standards
		OCR	SEMI font	SEMI M12, M13, M1.15
			IBM font	N/A
			Triple font	N/A
		2D	Data Matrix™ (ECC 200, 8 x 32)	SEMI T7 and M1.15
		Barcode	BC 412 and IBM 412	SEMI T1-95
Memory	**Job/Program**	32MB non-volatile flash memory; unlimited storage via remote network device.		
	Image/Processing	32MB SDRAM		
Image	**Sensor**	1/3-inch CCD		
	Optical Properties	6.0mm diagonal, 4.65 x 4.65µm sq. pixels		
	Resolution	1024 x 768		
	Electronic Shutter Speed	64µs to 33ms; up to 18 frames per second.		
	Acquisition	Rapid reset, progressive scan (supports partial scan), full-frame integration.		
		256 gray levels (8 bits/pixel)		
		Gain controlled by software.		
Lighting/Optics		Working Distance: adjustable, w/ factory-set option of 50.0mm (Vertical).		
		Recommended working distance range: 1 to 80.0mm (Vertical); 1 to 56.0mm (Horizontal).		
		Illumination Area: 31.0mm (W) x 19.0mm (H) (nominal; depends on lighting Mode).		
		In-Sight 1721: Red LEDs, 630nm wavelength, with the ability to read bright field and dark field images. Variable exposure controlled through software. Maximum output power <40 microwatts. In-Sight 1722: Infrared LEDs, 880nm wavelength, with the ability to read bright field and dark field images. Variable exposure controlled through software. Maximum output power <60 microwatts.		
I/O	**Trigger**	1 opto-isolated, acquisition trigger input.		
		Remote software commands via Ethernet and RS-232.		
	Discrete Inputs	None built-in.		
		Unlimited inputs when using an Ethernet I/O system.		
	Discrete Outputs	None built-in.		
		Unlimited outputs when using an Ethernet I/O system.		
	Status LEDs	1 Network Traffic/Network Status, 2 User-Configurable, 1 Power		

Communications	**Network**	1 Ethernet port, 10/100 Base-T, TCP/IP protocol. Supports DHCP (factory default) or static IP address.
	Serial	1 RS-232C port (4800 to 115,200 baud rates).
	Protocols	In-Sight, Native Mode, Electroglas and LKx5.
Power		24 ±10% VDC; 140mA (illumination off) to 200mA (illumination on).
Mechanical	**Material**	Aluminum housing, black anodized with nickel-plated black end caps.
	Mounting	Eight 7.3mm deep M4 threaded mounting holes (four per side). Maximum torque 1.5 N-m (13.5 in-lb).
	Dimensions	125.8mm (4.95in) x 70.4mm (2.77in) x 36.9mm (1.45in) Horizontal configuration length: 151.2mm (5.95in)
	Weight	379.9 g (13.4 oz).
Environmental	**Temperature**	0 to 45°C (Operating), -10 to 65°C (Storage).
	Humidity	10 to 90%, non-condensing (Operating and Storage).
Certifications		CE, UL, CUL, FCC
		IEC 60825-1/A2:2001, EN 60825-1/A1:2002, CAN/CSA-E60825-1:2003 Class 1 LED Product
		This equipment conforms with the applicable requirements of SEMI S2-0703a

Table 8-2: In-Sight 1701 Wafer Reader General Specifications

SPECIFICATION		DESCRIPTION		
Configurations		• Vertical Mount w/ factory-set 10mm Working Distance (P/N 800-5797-1) • Vertical Mount w/ factory-set 50mm Working Distance (P/N 800-5798-1) • Optional Horizontal Mirror Mount (800-5796-1)		
Firmware		In-Sight version 2.40 – In-Sight version 2.70		
Reading Capability		Supported Wafer Marks		Standards
		OCR	SEMI font	SEMI M12, M13, M1.15
			IBM font	N/A
			Triple font	N/A
		2D	Data Matrix™ (ECC 200, 8 x 32)	SEMI T7 and M1.15
		Barcode	BC 412 and IBM 412	SEMI T1-95
Memory	**Job/Program**	8MB non-volatile flash memory; Unlimited storage via remote network device		
	Image/Processing	16MB SDRAM		
Image	**Sensor**	1/3-inch CCD		
	Optical Properties	6mm diagonal, 4.65 x 4.65µm sq. pixels		
	Resolution (pixels)	1024 x 768		
	Electronic Shutter Speed	64µs to 33ms; Up to 18 frames per second		
	Acquisition	Rapid reset, progressive scan (supports partial scan), full-frame integration		
		256 gray levels (8 bits/pixel)		
		Gain controlled by software		
Lighting/Optics		Working Distance: adjustable, w/ factory-set options of 10 or 50mm (Vertical). Recommended working distance range: 1 to 80mm (Vertical); 1 to 56.1mm (Horizontal) Illumination Area: 31mm (W) x 19mm (H) (Nominal; depends on Light Mode) Red LEDs, 626nm wavelength, w/ Bright Field and Dark Field modes Variable intensity controlled through software		
I/O	**Trigger**	1 opto-isolated, acquisition trigger input		
		Remote software commands via Ethernet and RS-232		
	Discrete Inputs	None built-in		
		Unlimited inputs when using an Ethernet I/O system.		
	Discrete Outputs	None built-in		
		Unlimited outputs when using an Ethernet I/O system.		
	Status LEDs	1 Network Traffic, 1 Network Status, 1 Network Speed, 2 User-Configurable		
Communications	**Network**	1 Ethernet port, 10/100 BaseT, TCP/IP protocol. Supports DHCP (factory default) or static IP address.		
	Serial	1 RS-232C port (1200 to 115,200 baud rates)		
	Protocols	In-Sight, Native Mode and Electroglas		
Power		24 ±10% VDC; 125mA (illumination off) to 200mA (illumination on)		
Mechanical	**Material**	Aluminum housing, black anodized		
	Mounting	Four 6.5mm deep M4 threaded mounting holes (two per side) Maximum torque 1.5 N-m (13.5 in-lb)		
	Dimensions	115.6mm (4.55in) x 69.9mm (2.75in) x 54.9mm (2.16in) Horizontal configuration length: 141.0mm (5.55in)		
	Weight	416.7 g (14.7 oz)		
Environmental	**Temperature**	10 to 45°C (Operating), -10 to 65°C (Storage)		
	Humidity	10 to 90%, non-condensing (Operating and Storage)		
Certifications		CE, UL, CUL, FCC		

Table 8-3: In-Sight 1700 Wafer Reader General Specifications

SPECIFICATION		DESCRIPTION		
Configurations		• Vertical Mount (P/N 800-5748-10) • Horizontal Mount (P/N 800-5748-20)		
Firmware		In-Sight version 2.13 – In-Sight version 2.70		
Reading Capability		Supported Wafer Marks		Standards
		OCR	SEMI font	SEMI M12, M13, M1.15
			IBM font	N/A
			Triple font	N/A
		2D	Data Matrix™ (ECC 200, 8 x 32)	SEMI T7 and M1.15
		Barcode	BC 412 and IBM 412	SEMI T1-95
Memory	**Job/Program**	4MB non-volatile flash memory; Unlimited storage via remote network device		
	Image/Processing	16MB SDRAM		
Image	**Sensor**	1/3-inch CCD		
	Optical Properties	6mm diagonal, 7.4 x 7.4µm sq. pixels		
	Resolution (pixels)	640 x 480		
	Electronic Shutter Speed	64µs to 33ms; Up to 30 frames per second		
	Acquisition	Rapid reset, progressive scan (supports partial scan), full-frame integration		
		256 gray levels (8 bits/pixel)		
		Gain controlled by software		
Lighting/Optics		Working Distance: 10mm (Vertical); 15mm (Horizontal) Depth of focus: ± 3mm Illumination Area: 25mm (W) x 10mm (H) (Nominal; depends on Light Mode) Red LEDs, 626nm wavelength, w/ Bright Field and Dark Field modes Variable intensity controlled through software		
I/O	**Trigger**	1 opto-isolated, acquisition trigger input		
		Remote software commands via Ethernet and RS-232		
	Discrete Inputs	None built-in		
		Unlimited inputs when using an Ethernet I/O system.		
	Discrete Outputs	None built-in		
		Unlimited outputs when using an Ethernet I/O system.		
	Status LEDs	1 Network Traffic, 1 Network Status, 1 Network Speed, 2 User-Configurable		
Communications	**Network**	1 Ethernet port, 10/100 BaseT, TCP/IP protocol. Supports DHCP (factory default) or static IP address.		
	Serial	1 RS-232C port (1200 to 115,200 baud rates)		
	Protocols	In-Sight, Native Mode and Electroglas		
Power		24 ±10% VDC; 125mA (illumination off) to 200mA (illumination on)		
Mechanical	**Material**	Aluminum housing, black anodized		
	Mounting	Four 6.5mm deep M4 threaded mounting holes (two per side) Maximum torque 1.5 N-m (13.5 in-lb)		
	Dimensions	116.7mm (4.55in) x 69.9mm (2.75in) x 54.9mm (2.16in)		
	Weight	416.7 g (14.7 oz)		
Environmental	**Temperature**	10 to 45°C (Operating), -10 to 65°C (Storage)		
	Humidity	10 to 90%, non-condensing (Operating and Storage)		
Certifications		CE, UL, CUL, FCC		

8.2 I/O Specifications

The In-Sight wafer reader features one built-in acquisition trigger input and two user-configurable LED outputs for general-purpose use.

8.2.1 Breakout Port Pin Assignments

Table 8-4 lists the pin assignment for each of the 8 signal lines of the Breakout Port (labeled “24VDC”) according to each method of access.

Table 8-4: Breakout Port Pin Assignments

IN-SIGHT BREAKOUT PORT PIN	SIGNAL	BREAKOUT CABLE WIRE COLOR	BREAKOUT MODULE* TERMINALS
1	+24VDC	White/Green	6, 8, 10, 12, 14, 15, 16 (+24V)
2	Trigger +	Green	5 (TRG+)
3	Trigger –	White/Orange	4 (TRG-)
4	CTS	Blue	RS-232 serial (9-pin DSUB connector)
5	RTS	White/Blue	RS-232 serial (9-pin DSUB connector)
6	Serial Receive	Orange	RS-232 serial (9-pin DSUB connector)
7	Serial Transmit	White/Brown	RS-232 serial (9-pin DSUB connector)
8	Ground	Brown	1, 2, 3 (GND)

* Refer to the *In-Sight Breakout Module Installation and Reference* (P/N 597-0008-xx) for more detailed information.

NOTE Unused bare wires can be clipped short or tied back using a tie made from non-conductive material. Keep all bare wires separated from the +24VDC (White/Green) wire.

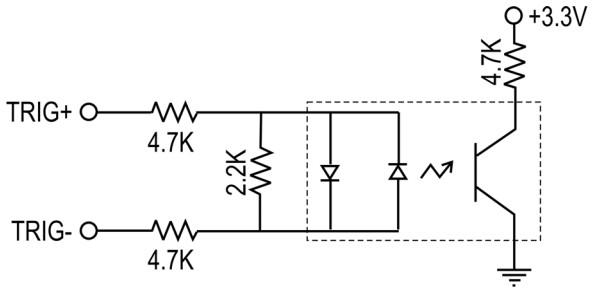
8.2.2 Acquisition Trigger Input

In-Sight 1721/1722 Acquisition Trigger Input Specifications

Table 8-5: Acquisition Trigger Input Specifications

SPECIFICATION		DESCRIPTION
VOLTAGE		ON 20 to 28V (24V nominal)
		OFF 0 to 3V (12V nominal threshold)
CURRENT		ON 2.0 to 2.9mA
		OFF <150μA
		Resistance ~10,000 Ohms
		For higher current add external resistor (for example, 2.2kΩ, 0.5W for 12mA) across inputs.
DELAY	In-Sight 1721/ In-Sight 1722	76 μSec latency between leading edge of trigger and start of acquisition. Input pulse should be minimum of 1ms wide.

The acquisition trigger input is opto-isolated. To trigger from an NPN (pull-down) type photo-detector or PLC output, connect pin 2 (TRG+) to +24V and connect pin 3 (TRG-) to the output of the detector. When the output turns ON, it pulls TRG- down to 0V, turning the opto-coupler ON. To trigger from a PNP (pull-up) photo-detector or PLC output, connect pin 2 (TRG+) to the output of the detector and connect pin 3 (TRG-) to 0V. When the output turns ON, it pulls TRG+ up to 24V, turning the opto-coupler ON.



28V Max. Across input pins - Transition approx. 12V (Min).

Figure 8-1: In-Sight 1721/1722 Acquisition Trigger Input Schematic

In-Sight 1700/1701 Acquisition Trigger Input Specifications

Table 8-6: Acquisition Trigger Input Specifications

SPECIFICATION		DESCRIPTION
VOLTAGE		ON 20 to 30V (24V nominal)
		OFF 0 to 3V (12V nominal threshold)
CURRENT		ON 0.9 to 1.3mA
		OFF <150μA
		Resistance ~22,000 Ohms
		For higher current add external resistor (for example, 2.2kΩ, 0.5W for 12mA) across inputs.
DELAY	In-Sight 1700/ In-Sight 1701	250 μSec latency between leading edge of trigger and start of acquisition. Input pulse should be minimum of 1ms wide.

The acquisition trigger input is opto-isolated. To trigger from an NPN (pull-down) type photo-detector or PLC output, connect pin 2 (TRG+) to +24V and connect pin 3 (TRG-) to the output of the detector. When the output turns ON, it pulls TRG- down to 0V, turning the opto-coupler ON. To trigger from a PNP (pull-up) photo-detector or PLC output, connect pin 2 (TRG+) to the output of the detector and connect pin 3 (TRG-) to 0V. When the output turns ON, it pulls TRG+ up to 24V, turning the opto-coupler ON.

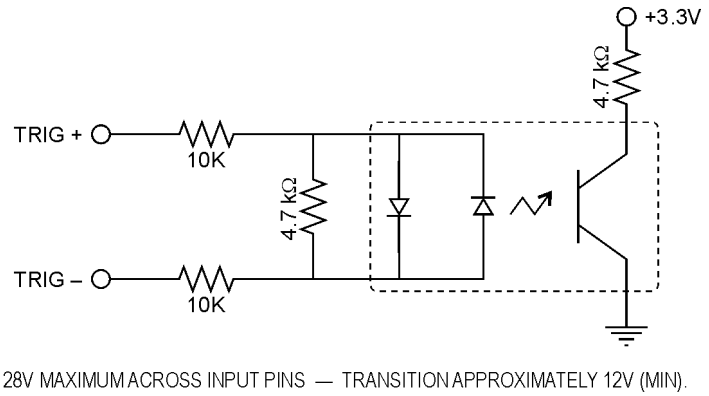


Figure 8-2: In-Sight 1700/1701 Acquisition Trigger Input Schematic

8.2.3 In-Sight 1721/1722 Status LEDs

As shown in Figure 8-3, the wafer reader provides four status LEDs; two LEDs are user-configurable outputs. The function of each LED is listed in Table 8-7.

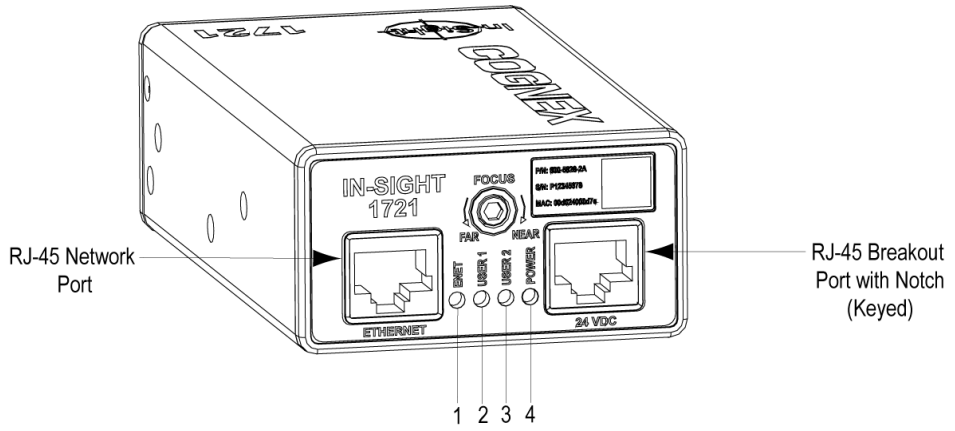


Figure 8-3: LED Outputs

Table 8-7: LED Function

LED NUMBER	LED COLOR	LED FUNCTION	DESCRIPTION
1	Green	Network Traffic/ Network Status	Flashes when receiving data and when connected to the network.
2	Green	User-Configurable	User-configurable using Discrete Output Line 4.
3	Red	User-Configurable	User-configurable using Discrete Output Line 5.
4	Green	Power	On when power is connected.

The WriteDiscrete function (Input/Output > Discrete) can be inserted in the spreadsheet job to control the state of the two user-configurable LEDs based on an event. The output Type can be specified in the **Discrete Output** dialog in the In-Sight PC Host (Figure 8-4).

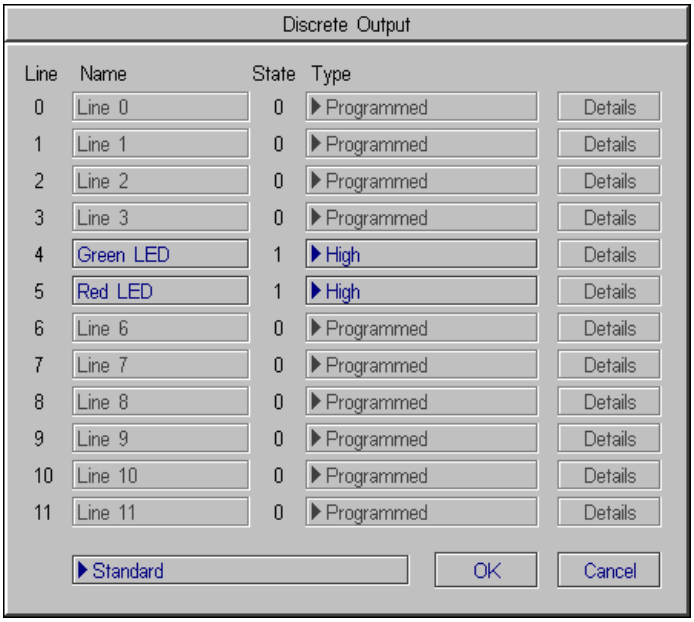


Figure 8-4: PC Host Default Discrete Output Dialog

8.2.4 In-Sight 1700/1701 Status LEDs

As shown in Figure 8-5, the In-Sight 1700/1701 wafer reader provides six status LEDs; two LEDs are user-configurable outputs. The function of each LED is listed in Table 8-8.

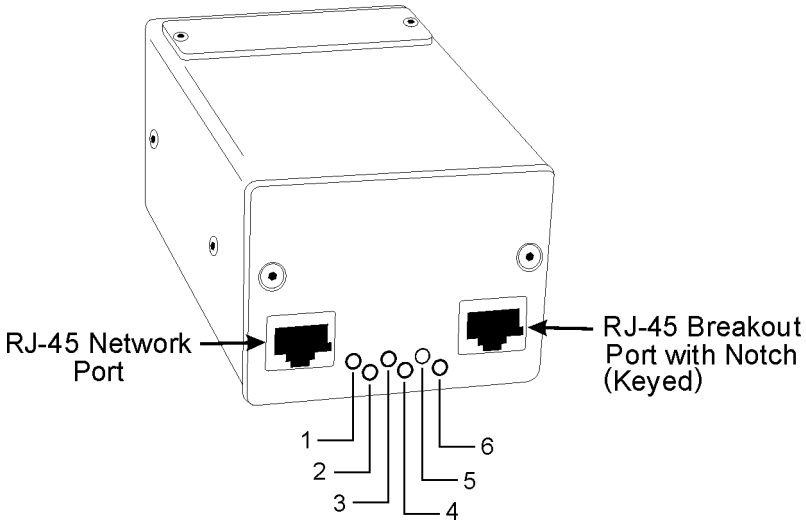


Figure 8-5: LED Outputs

Table 8-8: LED Function

LED NUMBER	LED COLOR	LED FUNCTION	DESCRIPTION
1	Red	Network Traffic	Flashes when receiving data.
2	Red	Network Status	On when connected to the network.
3	Red	Network Speed	On for 100Mbs network connection; off for 10Mbs.
4	Green	User-Configurable	User-configurable using Discrete Output Line 4.
5	Red	User-Configurable	User-configurable using Discrete Output Line 5.
6	Red	Power	On when power is connected.

The WriteDiscrete function (Input/Output > Discrete) can be inserted in the spreadsheet job to control the state of the two user-configurable LEDs based on an event. The output Type can be specified in the **Discrete Output** dialog in the In-Sight PC Host (Figure 8-6).

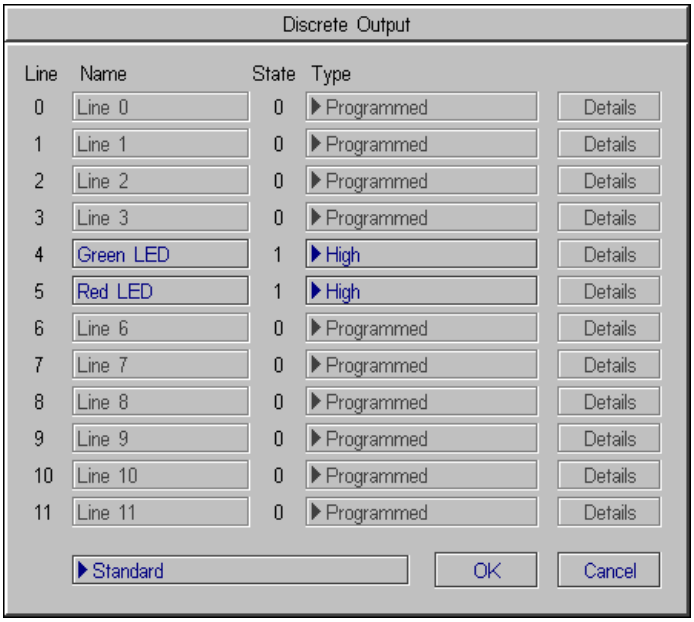


Figure 8-6: PC Host Default Discrete Output Dialog

8.3 CAT5 Network Cable Specifications

Cognex-supplied, straight-pinned and crossover network patch cables meet CAT5/CAT5e specifications using 568-B standard wire pairing.

Table 8-9: CAT5/CAT5e Network Cable Wiring

STRAIGHT-PINNED			CROSSOVER	
Signal Name	**RJ-45 Connectors**	**WIRE COLOR**	**Connector P1**	**Connector P2**
TPO+	1	White/Orange	1	3
TPO-	2	Orange	2	6
TPI+	3	White/Green	3	1
TRMA	4	Blue	4	5
TRMB	5	White/Blue	5	4
TPI-	6	Green	6	2
TRMC	7	White/Brown	7	8
TRMD	8	Brown	8	7

Table 8-10: CAT5/CAT5e Network Cable 568-B Wire Pairs

PAIR #	WIRE PAIRS
1	4 — 5
2	1 — 2
3	3 — 6
4	7 — 8

8.4 Mechanical Specifications

The following sections present dimensional drawings for the In-Sight wafer readers.

NOTE All dimensions are shown in millimeters (inches).

8.4.1 In-Sight 1721/1722 Wafer Reader Dimensions

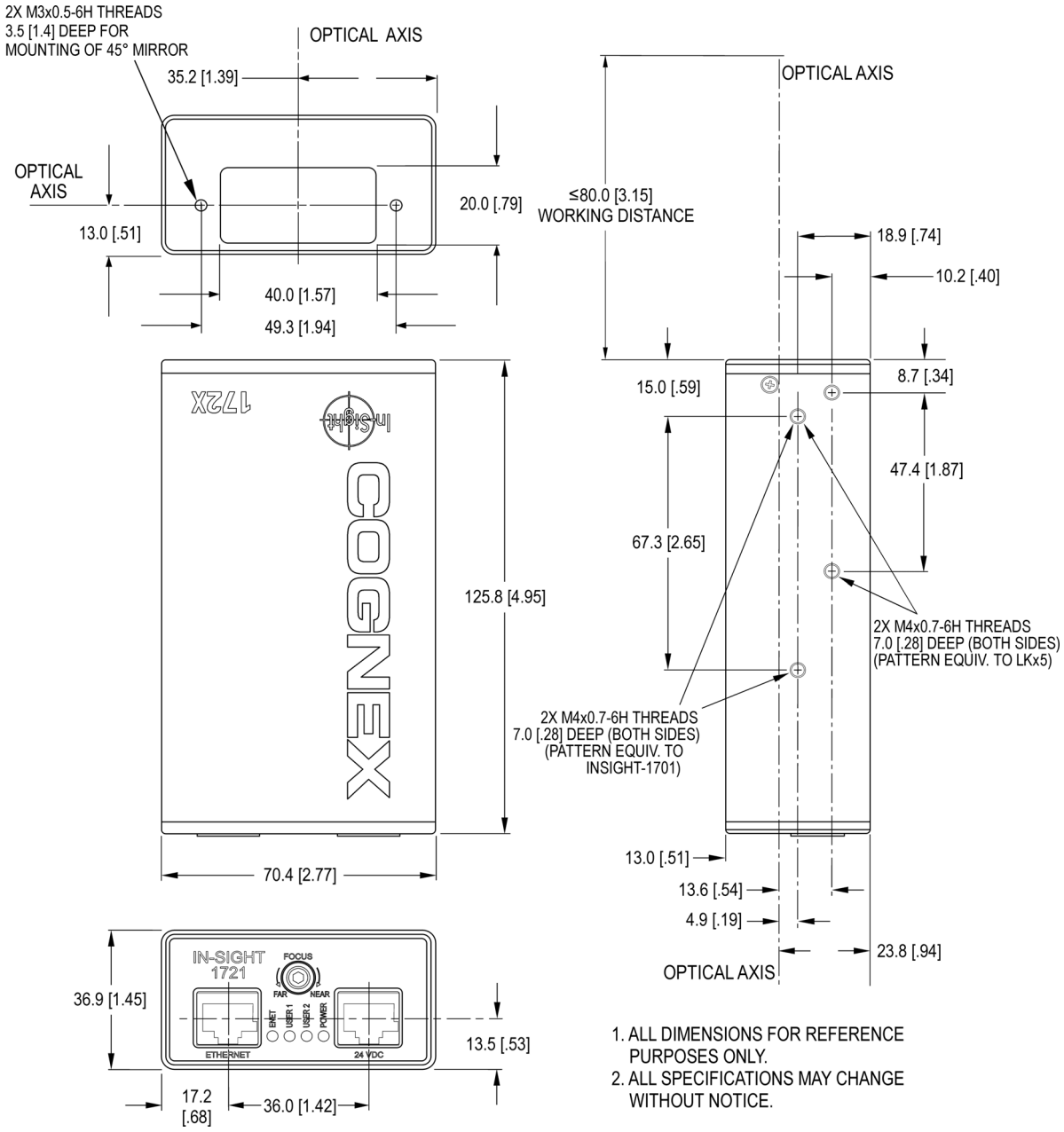


Figure 8-7: In-Sight 1721/1722 Wafer Reader Dimensions

CAUTION	The wafer reader must be mounted from only one side. Mounting the wafer reader from both sides may damage optical components. The maximum torque is 1.5 N-m (13.5 in-lb).

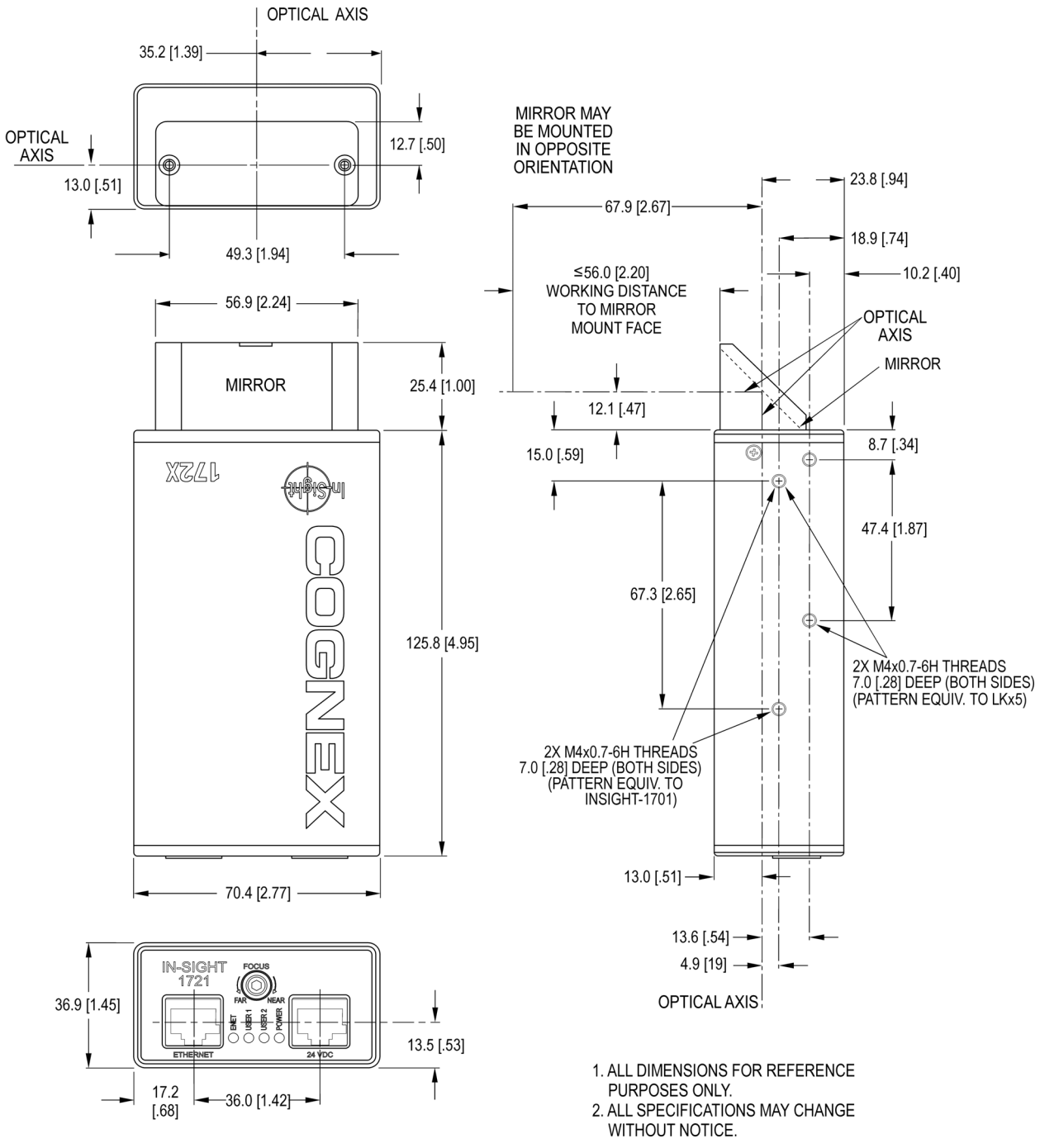


Figure 8-8: In-Sight 1721/1722 Wafer Reader Dimensions with Horizontal Mirror Mount (Recommended Configuration)

CAUTION	The wafer reader must be mounted from only one side. Mounting the wafer reader from both sides may damage optical components. The maximum torque is 1.5 N-m (13.5 in-lb).

8.4.2 In-Sight 1701 Wafer Reader Dimensions

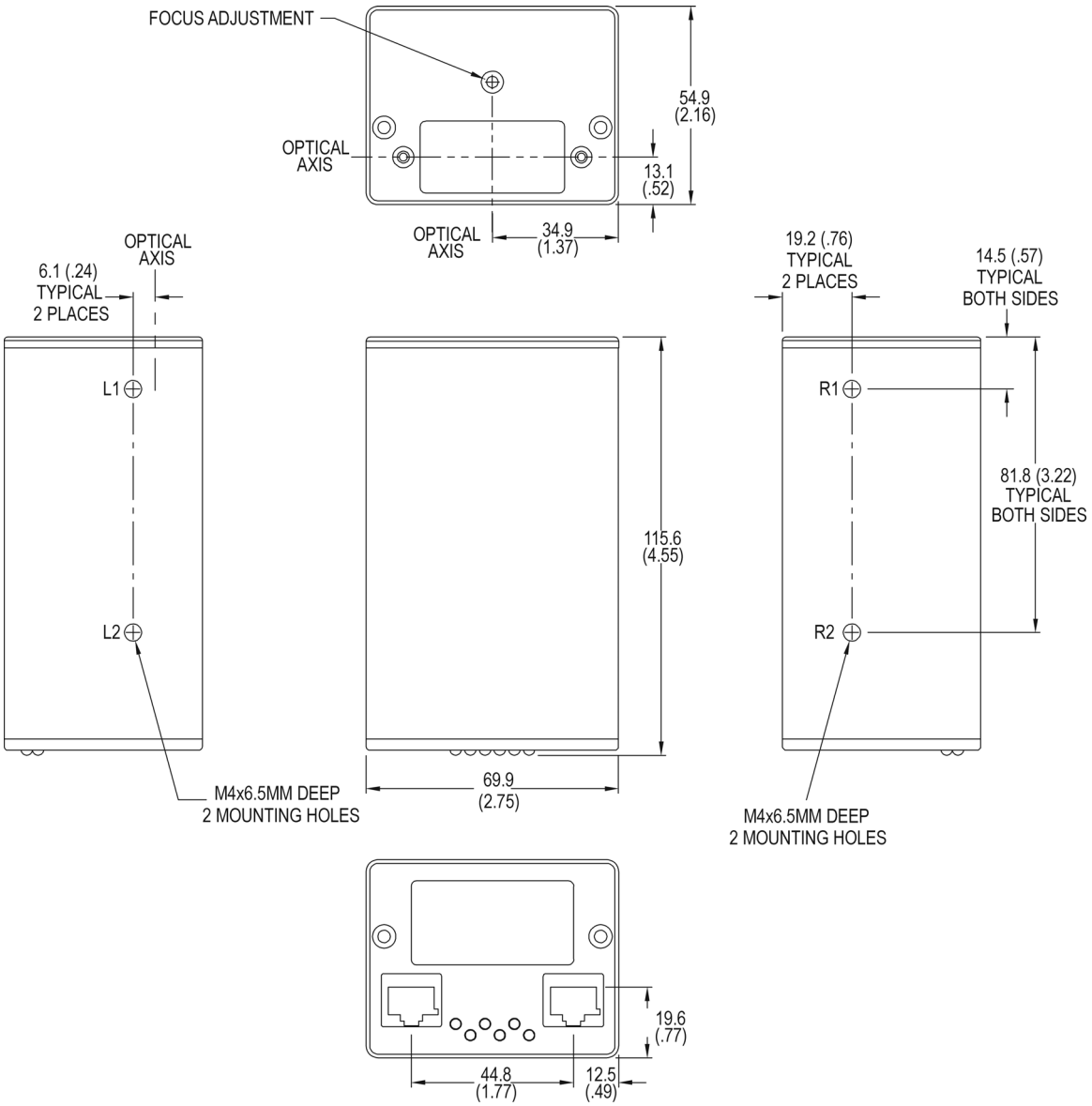


Figure 8-9: 1701 Wafer Reader Dimensions

CAUTION	The wafer reader must be mounted from only one side, using Positions L1 and L2 **or** Positions R1 and R2, as shown in Figure 8-9. Mounting the wafer reader from both sides may damage optical components. The maximum torque is 1.5 N-m (13.5 in-lb).

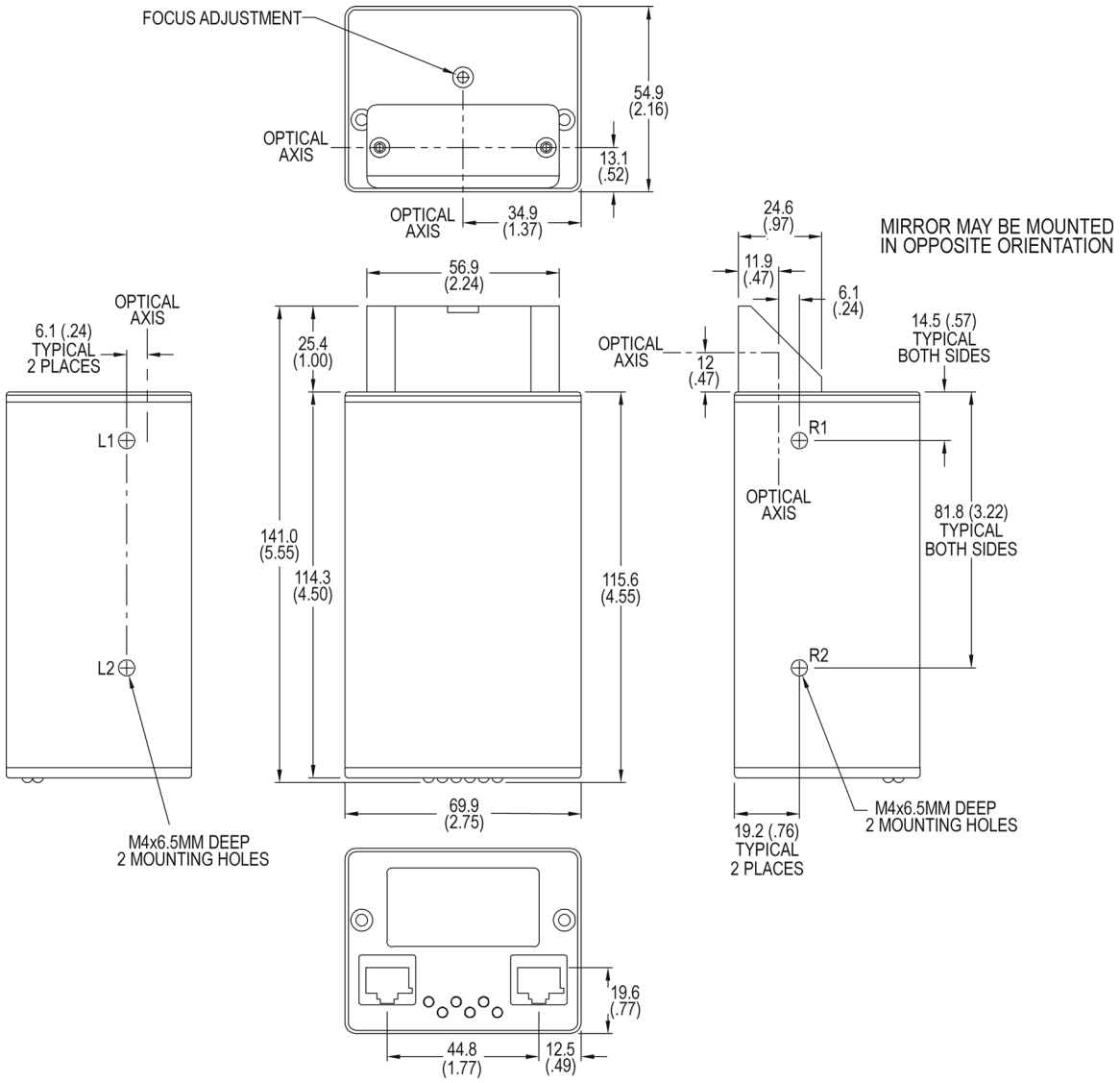


Figure 8-10: 1701 Wafer Reader Dimensions with Horizontal Mirror Mount

CAUTION	The wafer reader must be mounted from only one side, using Positions L1 and L2 **or** Positions R1 and R2, as shown in Figure 8-10. Mounting the wafer reader from both sides may damage optical components. The maximum torque is 1.5 N-m (13.5 in-lb).

8.4.3 In-Sight 1700 Wafer Reader Dimensions

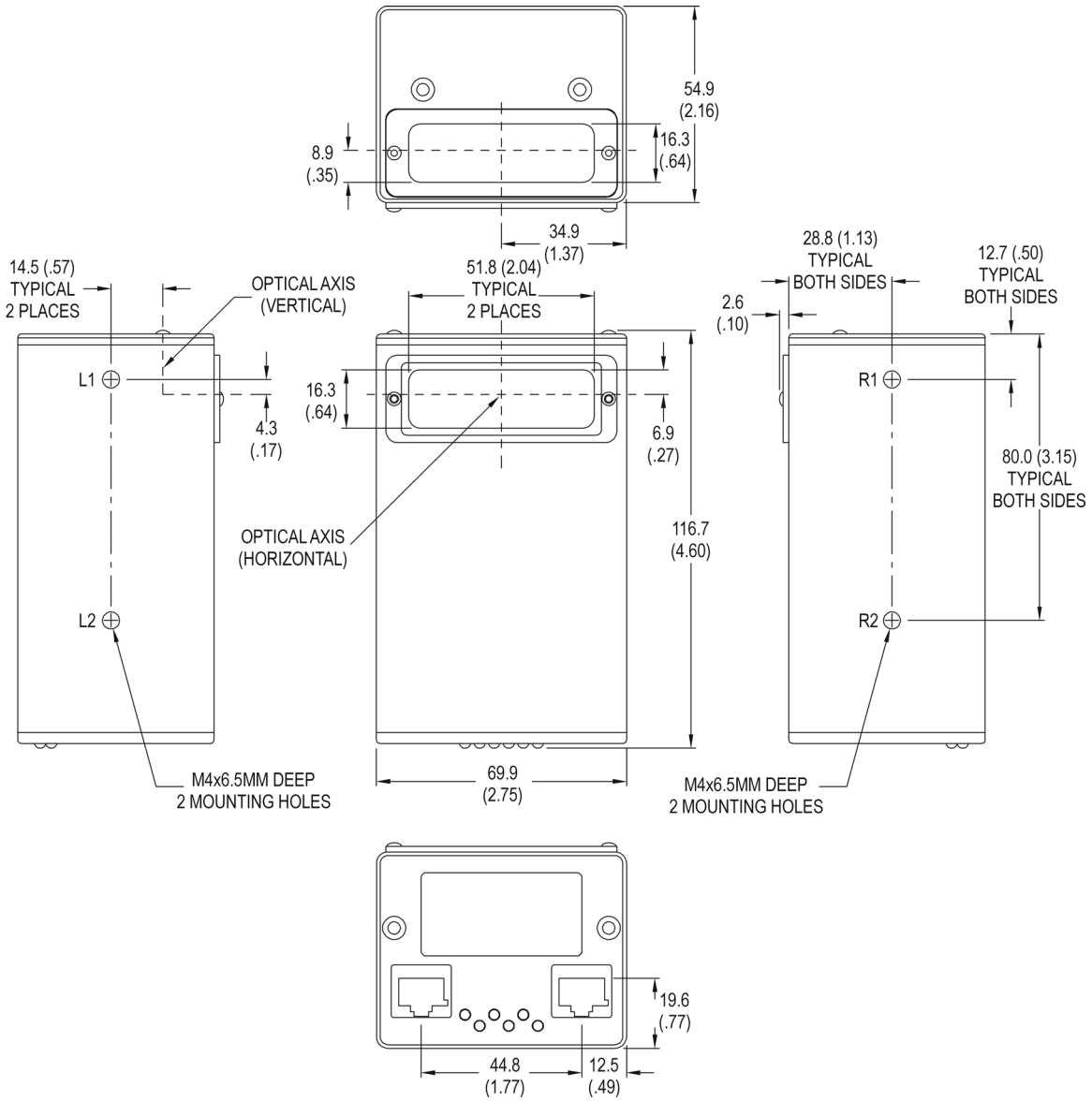


Figure 8-11: In-Sight 1700 Wafer Reader Dimensions

CAUTION	The wafer reader must be mounted from only one side, using Positions L1 and L2 **or** Positions R1 and R2, as shown in Figure 8-11. Mounting the wafer reader from both sides may damage optical components. The maximum torque is 1.5 N-m (13.5 in-lb).

Appendix A

Updating the Wafer Reader's Firmware

Install the In-Sight PC Host program, update the wafer reader's firmware, and then manually install the .JAR, .HTM, WafID00.JOB, and .SET files in flash memory.

After installing and running the In-Sight PC Host, as described in Section 2.3, follow these steps to update the wafer reader's firmware.

NOTE This update process will erase all jobs. Make sure that all jobs are backed up on the network prior to starting the firmware upgrade.

1. Open the **System** menu and select **Logon**.
2. In the Logon dialog, browse through the list of In-Sight Host Names on the network and select the name of the wafer reader to upgrade. Click **OK** to logon to the selected wafer reader.
3. While logged on to the wafer reader, open the **System** menu and select **Save & Load**.
4. In the Save & Load dialog, open the drop-down list of file types in the upper-left corner and select **Firmware**.
5. Click on **<Network>** to browse through the list of In-Sight Host Names on the network. Select the Host Name of the PC running the In-Sight PC Host program.
6. Select the **.UPD** filename.
7. Click the **Load** ← button to begin the firmware update process.
8. A Warning dialog will appear. Verify the versions of firmware, then click **Yes**.

After the update process is complete, the wafer reader will restart and the PC Host program will automatically log back on.

1. Open the System menu and select **Version** to confirm that the wafer reader now has the correct firmware version installed.
2. Open the System menu again and select **Settings** ▸.
3. From the Settings menu, select **Network**. Record the **IP Address** (you will need this to complete the steps in the following sections).
4. Close the In-Sight PC Host program and proceed to the next section (Install Files to the Wafer Reader Flash Memory).

Install Files to the Wafer Reader Flash Memory

After the wafer reader's firmware has been updated, the .HTM, .JAR, WafID00.JOB and .SET files included in the installation package must be copied to the wafer reader's flash memory before it can be accessed using a web browser. The required files can be copied into flash using a web browser or a command prompt. The files are copied to the sensor using an FTP session from a remote host on your network.

NOTE A WAFID00BC.job file is also included in the installation package. This job file is identical to the default WAFID00.JOB, except the default mark type is BC 412.

To Copy Required Files Using Microsoft Internet Explorer:

NOTE New wafer readers are shipped with a User List containing three standard accounts: admin, monitor and operator; each of these accounts is configured with a blank password.

1. Open the web browser.
2. Type `ftp://`, followed by the wafer reader's IP address or Host Name, into the web browser's Address bar (for example, ftp://192.68.0.1 or ftp://is1721_00060b). A Login As dialog appears (Figure A-1).

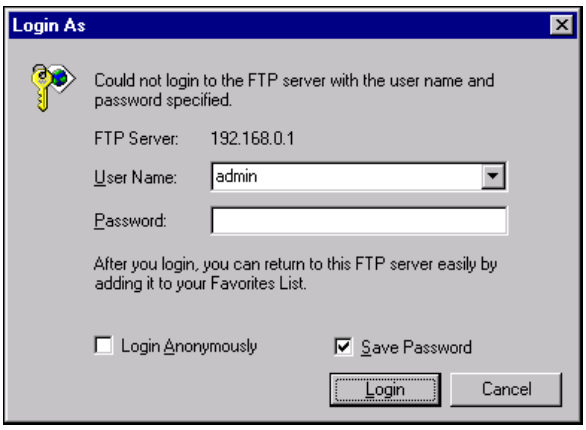


Figure A-1: FTP Login Dialog

3. Enter the In-Sight User Name. For example, the default In-Sight User Name is admin.
4. Enter the In-Sight Password. If the wafer reader has not been assigned a new User Name and Password, leave the Password field empty.

5 Click Login to log on to the In-Sight sensor's FTP file system. If the logon is successful, all of the files currently installed on the wafer reader are displayed in the Internet Explorer window, as shown in Figure A-2.

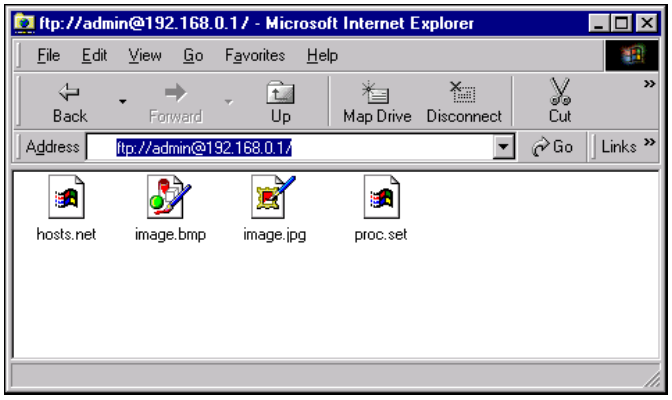


Figure A-2: Installed Wafer Reader Files

6 Open a separate Microsoft Windows Explorer window and locate the .HTM, .JAR, WafID00.JOB, and .SET files in the In-Sight PC Host installation directory. The default directory is: "C:\Program Files\Cognex\In-Sight\In-Sight Wafer ID (Java) 3.x.x".

7 Copy and paste (or drag-and-drop) the files located in the In-Sight PC Host installation directory to the wafer reader's FTP file system, refresh the view; the selected files have been copied to wafer reader flash memory and now appear in the browser window, as shown in Figure A-3.

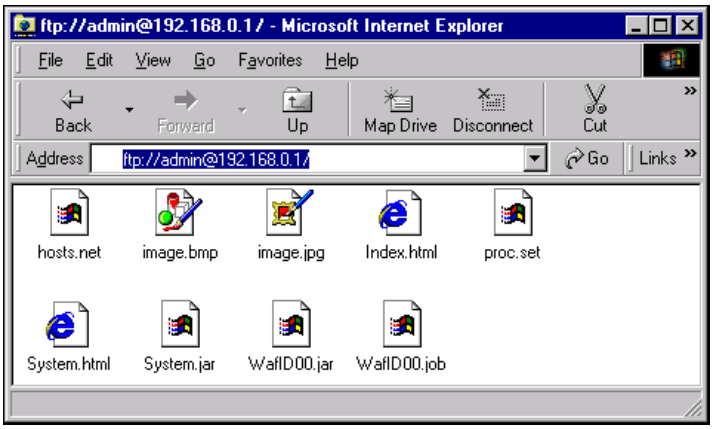


Figure A-3: Installed Wafer Reader Files

To FTP Files from a Command Prompt (in Windows):

1. Open a command prompt.
2. From the root directory, change the directory to the In-Sight PC Host installation directory (for example, `C:\Program Files\Cognex\In-Sight\In-Sight Wafer ID (Java) 3.x.x.`)
3. Open an FTP session and login to the target wafer reader by typing `ftp` followed by the wafer reader's IP address or Host Name (for example, `ftp 192.168.0.1` or `is1721_00060b`) as shown in Figure A-4.

> **NOTE** To connect to a wafer reader using FTP from a non-Windows host, first copy the required files from the C:\Program Files\Cognex\In-Sight\In-Sight\Wafer ID (Java) 3.x.x directory on the PC to the FTP server, then open the FTP session.

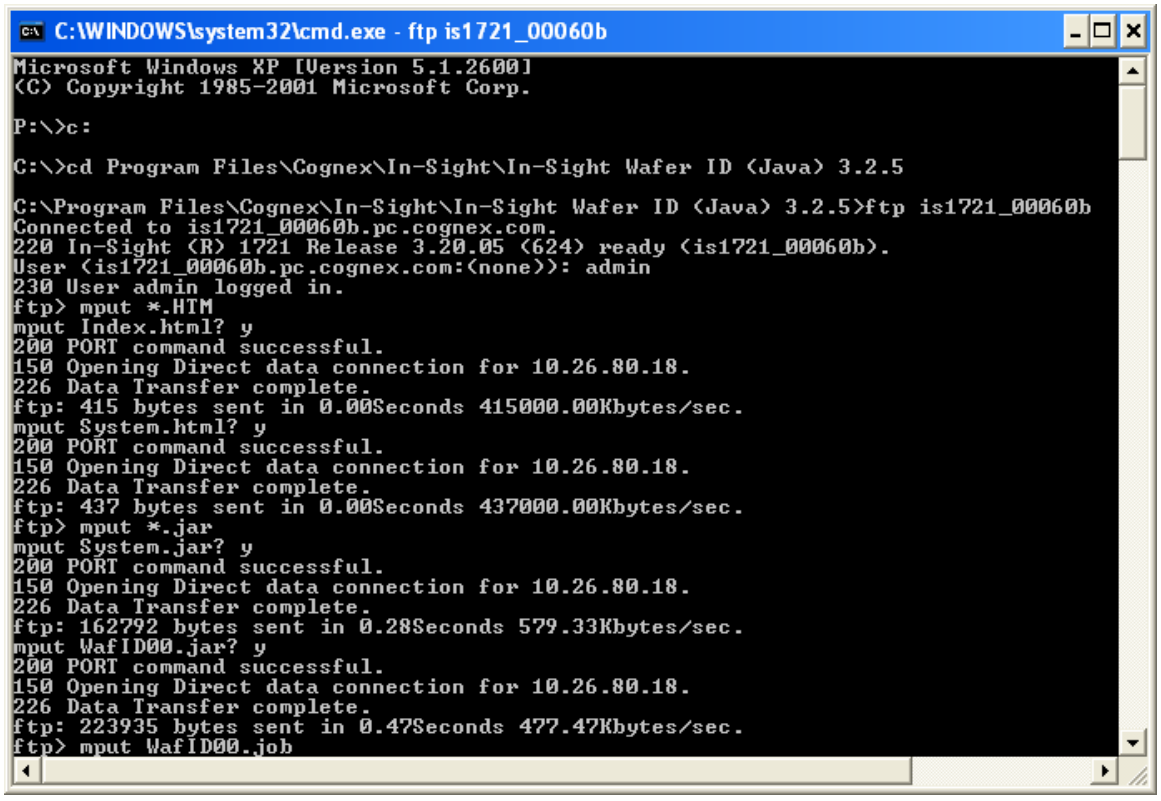


Figure A-4: FTP Command Prompt in Windows

4. When prompted for `User:`, enter the In-Sight User Name. For example, the default In-Sight User Name is `admin`.

5. If prompted, enter the In-Sight Password.

6. When logged in, copy the .HTM, .JAR, WafID00.JOB, and .SET files from their location on the FTP server to the wafer reader by typing `mput` followed by the name of the file (for example, `mput *.jar` copies the two .JAR files).

7. After all files have been copied, close the FTP prompt.

Once the files have been copied to the wafer reader's flash memory, load the default job into the spreadsheet using the PC Host's Save & Load dialog.

Appendix B

Configuring Microsoft Windows Network Settings

This section provides information on how to configure Microsoft Windows network settings to connect to a wafer reader using the In-Sight PC Host program. The steps listed below and the example dialogs are specific to Windows NT 4.0. The exact steps required may vary slightly in Windows XP, 2000, ME, and 98SE.

To configure Windows network settings:

1 Verify the PC has a TCP/IP protocol installed.

2 Close all programs on the PC except Windows NT.

3 Click **Start**, click **Settings**, and then click on the **Control Panel** shortcut to open the Control Panel icon group.

4 Click the **Network** icon to open the Network dialog.

5 Select the **Protocols** tab (Figure B-1). If TCP/IP Protocol appears in this list, skip steps 6 and 7.

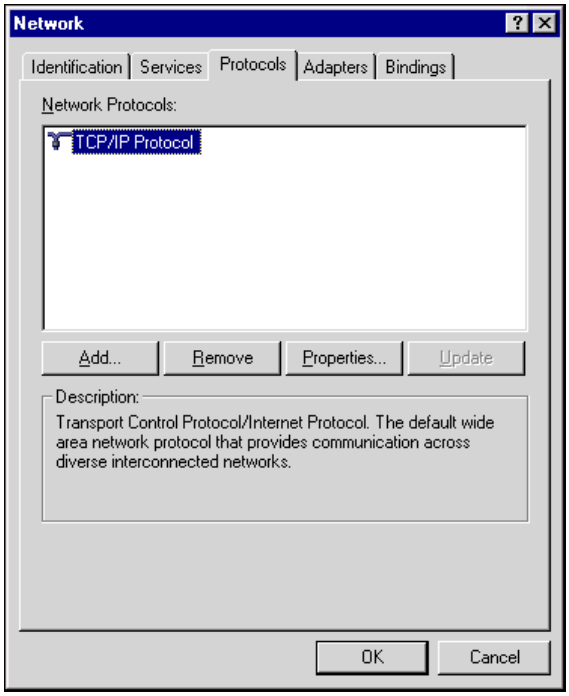


Figure B-1: Windows Network Dialog, Protocols Tab

6 If TCP/IP is not on the list of installed protocols, click **Add** to open the Select Network Protocol dialog (Figure B-2).

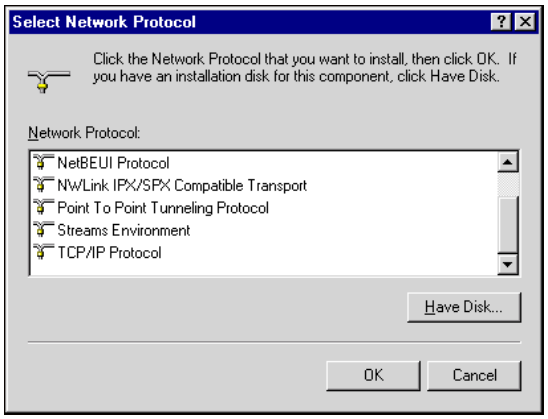


Figure B-2: Select Network Protocol dialog

7 Select **TCP/IP Protocol** and click **OK**. Windows NT will install the protocol and return to the Network dialog.

8 Configure the IP Address and Subnet Mask.

9 Highlight TCP/IP Protocol in the Protocols tab and click **Properties** to open the Microsoft TCP/IP Properties dialog (Figure B-3):

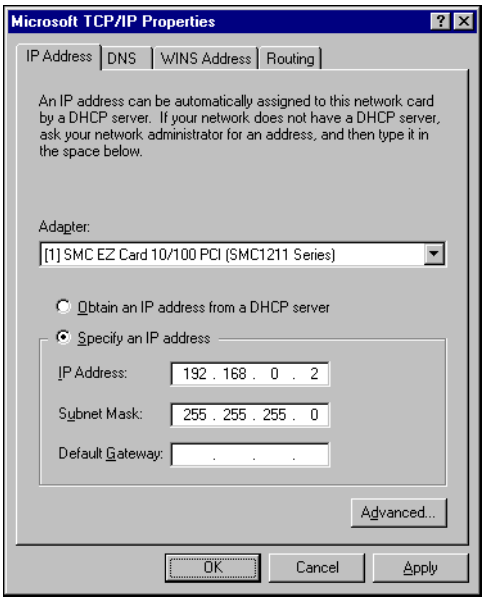


Figure B-3: Microsoft TCP/IP Properties Dialog

10 Click the Specify an IP address radio button. The IP Address and Subnet Mask fields, which are grayed-out when DHCP is enabled, become active.

11 Enter an appropriate Subnet Mask. The Subnet Mask defines which part of the wafer reader's IP address refers to the network and which part refers to the host. The network part of the IP address is the same for all hosts on the same subnet, and the remainder is unique to each host. The default Subnet Mask setting of 255.255.255.0 is usually appropriate.

12 Click OK twice, then restart Windows if prompted to do so.

Appendix C

Connecting the Breakout Module

The optional In-Sight Breakout Module (P/N 800-5743) is more convenient than using the standard Breakout Cable to connect the wafer reader's power, serial communications, and I/O lines.

For additional information on connecting a Breakout Module, see Section 8.2.1: Breakout Port Pin Assignments on page 106 or the *Breakout Module Installation and Reference* manual (P/N 597-0008-xx).

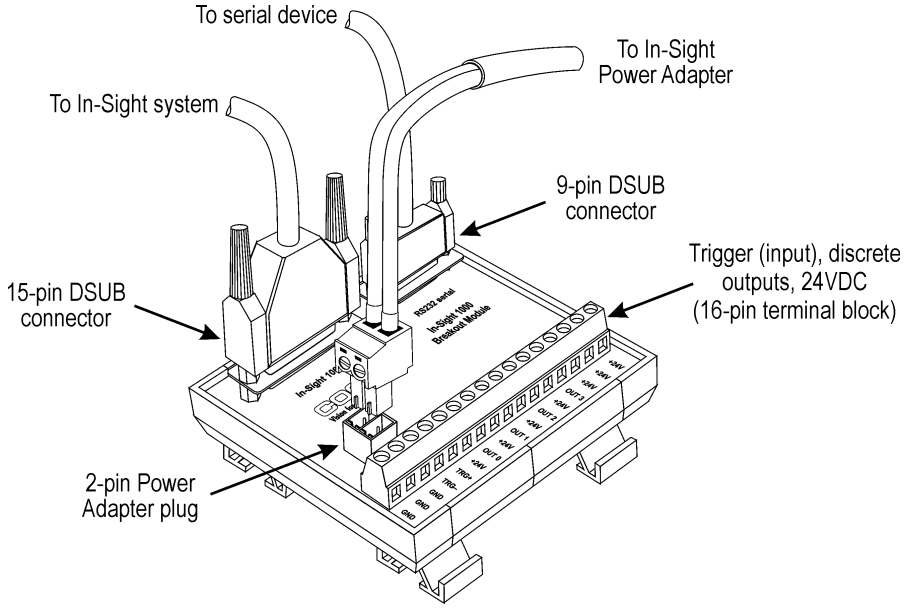


Figure C-1: Breakout Module Connections

To Connect the Breakout Module to the In-Sight Wafer Reader:

1. Verify the 24VDC power supply being used is switched off.
2. Optionally, connect the power and ground wires for the acquisition trigger input and the discrete outputs into their corresponding terminals on the Breakout Module.
3. Optionally, connect the 9-pin male DSUB connector of an RS-232 serial cable into the corresponding 9-pin female connector on the Breakout Module.
4. Plug the Breakout Cable's 15-pin male DSUB connector into the corresponding female connector on the Breakout Module.
5. Plug the RJ-45 connector of the Breakout Cable into the wafer reader's Breakout Port. The cable's connectors are "keyed" to the notch in the Breakout Port.
6. Plug the wire leads from a 24VDC supply for the +24V power and ground into the 2-pin terminal plug on the Breakout Module. Alternatively, remove the terminal plug and insert the 2-pin terminal plug attached to the In-Sight power adapter into the keyed power adapter port on the Breakout Module (Figure C-1).

7 Restore power to the 24V supply. The green power LED on the wafer reader and the orange +24V LED on the Breakout Module will indicate that the wafer reader and Breakout Module are receiving power.

Appendix D

1721/1722 Wafer Reader Installation Options

Horizontal Mirror Attachment

The optional horizontal mirror attachment (P/N 800-5796) allows the wafer reader to be installed in top or bottom-side reading applications where a low mounting profile is required.

To attach the mirror mount:

1. Align holes of the mirror attachment to holes on the front plate of the wafer reader.
2. Insert the two M3 X 14mm hex head screws (provided) through the mirror mount, into the front plate.
3. Tighten screws with a 2.5mm Allen wrench.

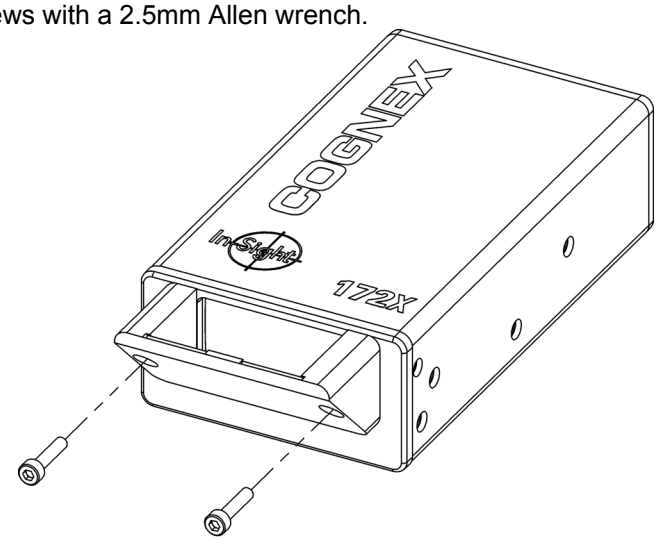


Figure D-1: Recommended Mirror Mounting Configuration

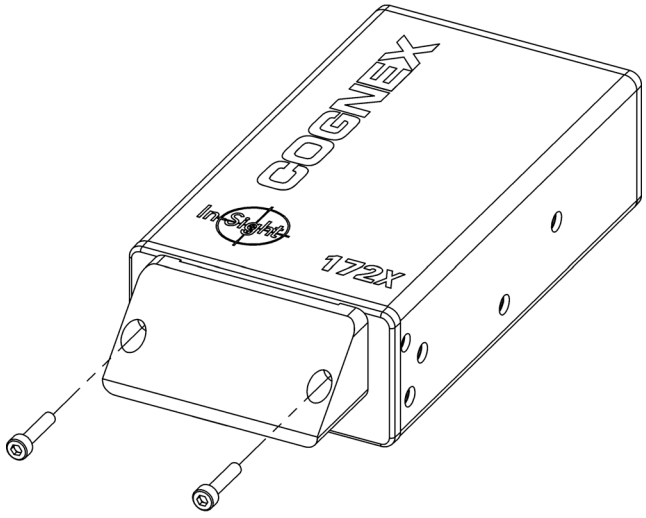


Figure D-2: Optional Mirror Mounting Configuration

The working distance is adjustable, with a factory-set option of 50.0mm when vertically mounted. The useable working distance range is 1 to 80.0mm for the wafer reader in the vertical position.

NOTE	The Image Orientation may need to be adjusted, depending on the configuration of the wafer reader and the mirror attachment installation.

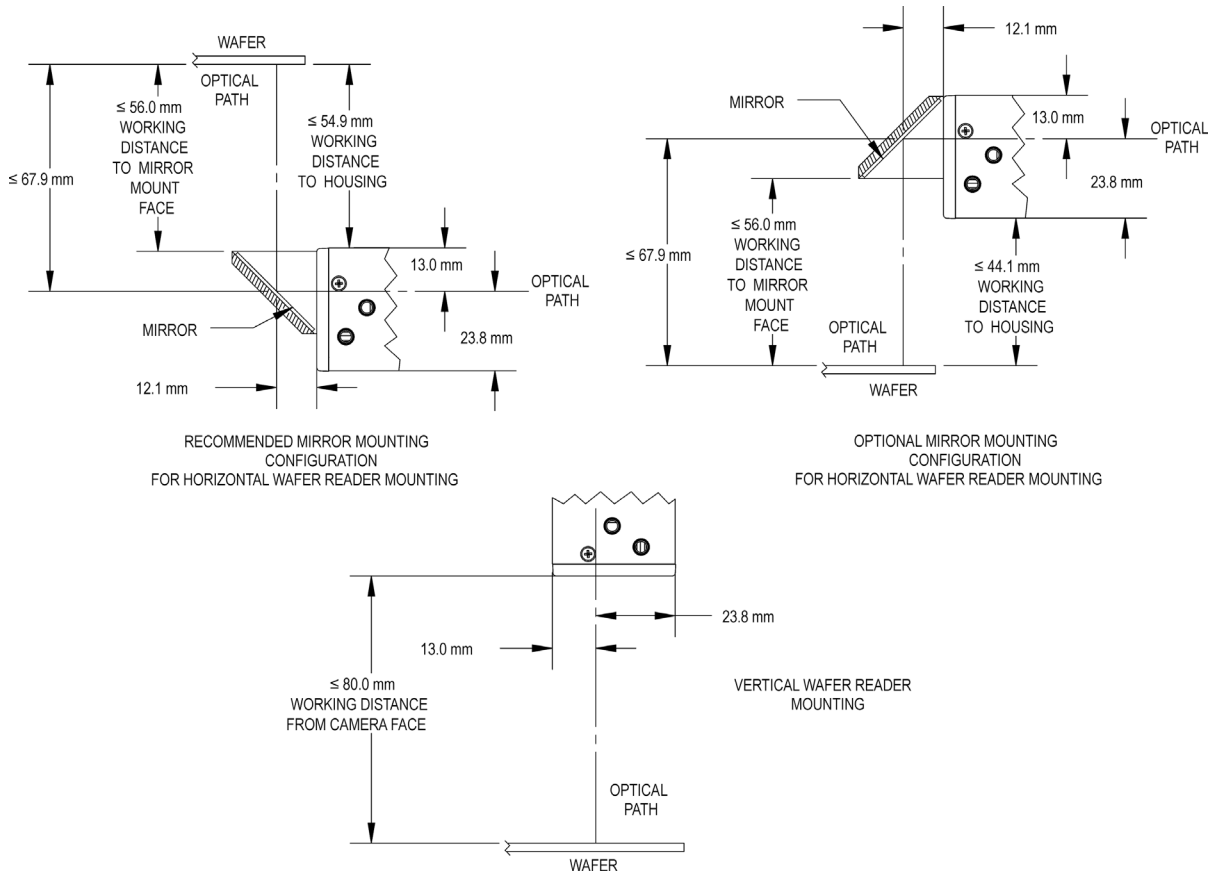


Figure D-3: Working Distances in Horizontal and Vertical Mounting Configurations

NOTE	The wafer reader can be mounted face-up or face-down in both horizontal mirror mounting configurations.

Table D-1 shows examples of the wafer reader's vertical working distances and the corresponding horizontal working distances required at the same focal setting.

Table D-1: Working Distances

Vertical Working Distance	Corresponding Horizontal Working Distance			
	Recommended Mirror Mounting		Optional Mirror Mounting	
	To Mirror Mount Face	To Housing	To Mirror Mount Face	To Housing
5.0mm	N/A	N/A	N/A	N/A
10.0mm	N/A	N/A	N/A	N/A
15.0mm	N/A	N/A	N/A	N/A
20.0mm	N/A	N/A	N/A	N/A
25.0mm	1.0mm	N/A	1mm	N/A
30.0mm	6.0mm	4.9mm	6.0mm	N/A
40.0mm	16.0mm	14.9mm	16.0mm	4.1mm
50.0mm*	26.0mm	24.9mm	26.0mm	14.1mm
60.0mm	36.0mm	34.9mm	36.0mm	24.1mm
70.0mm	46.0mm	44.9mm	46.0mm	34.1mm
80.0mm	56.0mm	54.9mm	56.0mm	44.1mm

* Indicates factory-set working distances

Adjusting the Focus on the 1721/1722

The recommended working distance range is 1 to 80.0mm for the wafer reader in the vertical position. If using the horizontal mirror mount, the recommended working distance range is 1 to 56.0mm.

Once the working distance is established and an image is acquired, the focus can be adjusted using the focus adjustment screw (M3 hex screw), located in the center of the wafer reader's front face-plate (see Figure D-4). To adjust the focus, use a 2.5mm Allen wrench. Turn the focus adjustment screw clock-wise if the wafer reader is moved closer to the wafer; turn the screw counter clock-wise if the wafer reader is moved farther away from the wafer.

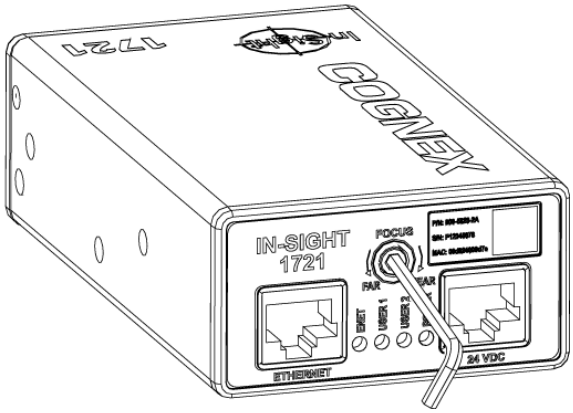


Figure D-4: Location of Focus Adjustment Screw

Image Artifacts

Under certain conditions, horizontal lines may be observed in the image (Figure D-5). These lines are artifacts of the wafer reader's optical design. They are most visible at a working distance of approximately 30.0mm, when the Light Mode setting is Dark Field (for more information of Light Modes, see Section 3.5.10). In most cases, these lines will have no impact on reading performance. If desired, position the mark in an area of the field of view that is free of artifacts. To reduce the intensity of the lines, the lighting can be optimized using the automated tuning process (Section 3.5.16).

Figure D-5: Image Artifact Example

Appendix E

1701 Wafer Reader Installation Options

1701 Horizontal Mirror Attachment

The optional horizontal mirror attachment (P/N 800-5796) allows the wafer reader to be installed in top or bottom-side reading applications where a low mounting profile is required.

The horizontal mirror attachment can be mounted face-down or face-up (see Figure E-1).

To attach the mirror mount:

1 Align holes of the mirror attachment to holes on the front plate of the 1701 wafer reader.

2 Insert the two M3 X 14mm hex head screws (provided) through the mirror mount, into the front plate.

3 Tighten screws with a 2.5mm Allen wrench.

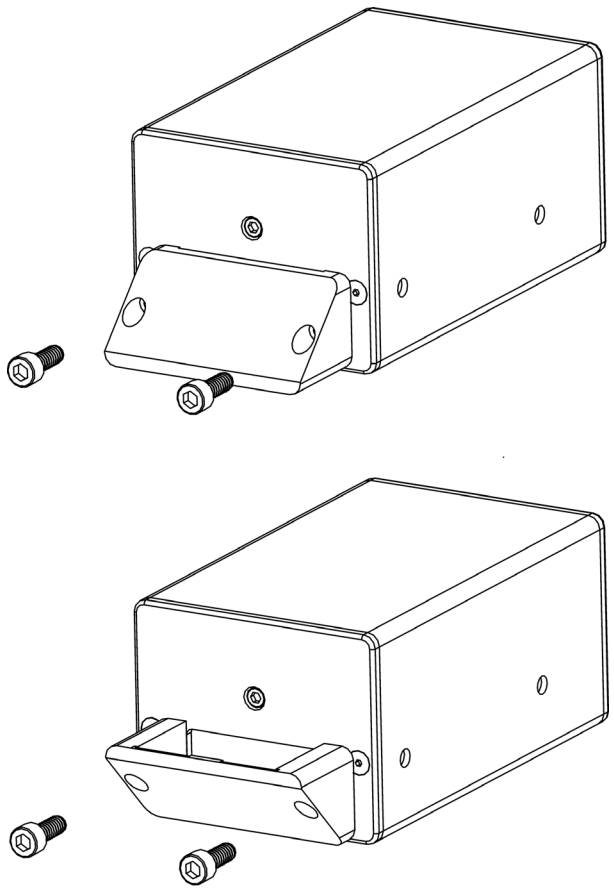


Figure E-1: Attaching the 1701 Horizontal Mirror Mount

As shown in Figure E-2, the horizontal mirror attachment lengthens the optical path by 23.9mm. To compensate, the working distance of the wafer reader in the horizontal configuration will be 23.9mm closer to the wafer than a wafer reader mounted vertically with the same focal setting. The working distance for the vertical configuration is measured from the bottom of the wafer reader to the top of the wafer.

NOTE The Image Orientation may need to be adjusted, depending on the configuration of the wafer reader and the mirror attachment sating. Refer to Section 3.5.9: Image Orientation for more information.

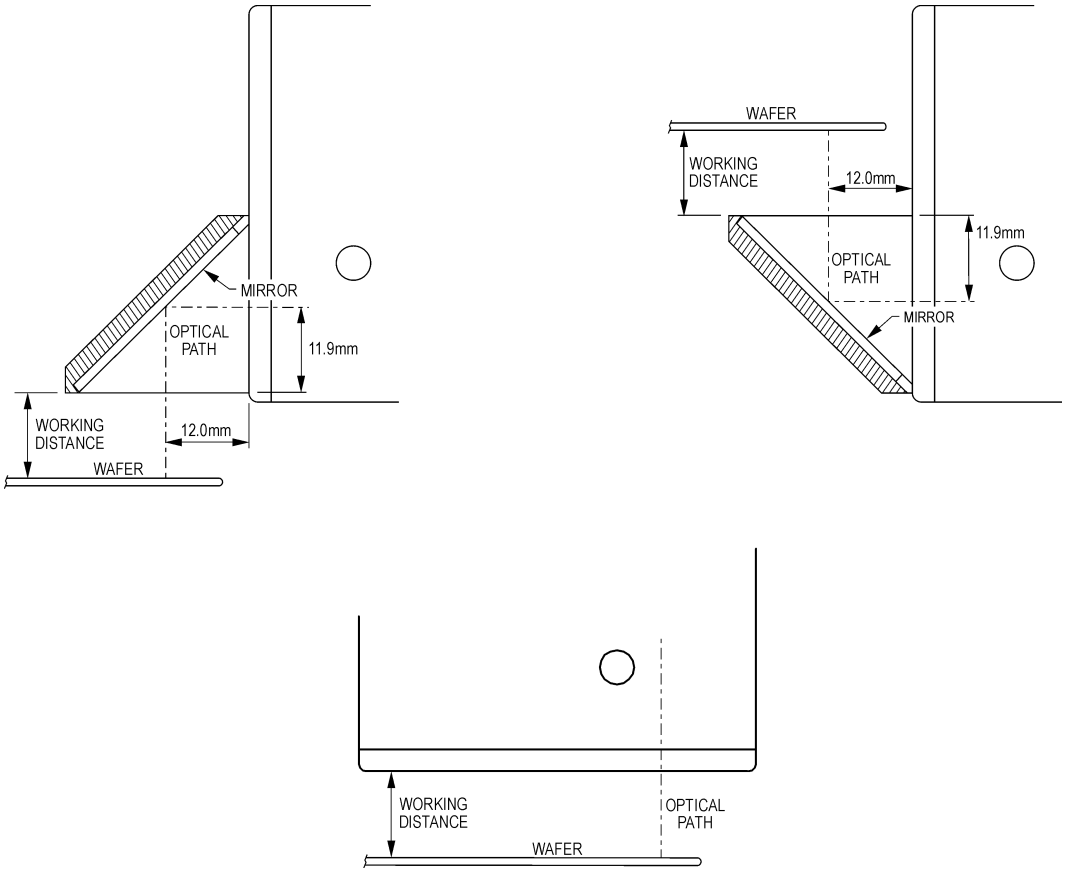


Figure E-2: Working Distances in Horizontal and Vertical Mounting Configurations

Table E-1 shows examples of the 1701 wafer reader's vertical working distances and the corresponding horizontal working distances required if no focal adjustment is made.

Table E-1: Working Distances

VERTICAL WORKING DISTANCE	CORRESPONDING HORIZONTAL WORKING DISTANCE
5mm	N/A
10.0mm*	N/A
15.0mm	N/A
20.0mm	N/A
25.0mm	1.1mm
30.0mm	6.1mm
40.0mm	16.1mm
50.0mm*	26.1mm
60.0mm	36.1mm
70.0mm	46.1mm
80.0mm	56.1mm

* Indicates factory-set working distances

Adjusting the Focus on the 1701

The recommended working distance range is 1 to 80.0mm for the 1701 wafer reader in the vertical position. If using the horizontal mirror mount, the recommended working distance range is 1 to 56.1mm.

Once the working distance is established, the focus can be adjusted using the focus adjustment screw (M3 hex screw), located in the center of the 1701 wafer reader's front face-plate (see Figure E-3). To adjust the focus, use a 2.5mm Allen wrench. Turn the focus adjustment screw clock-wise if the wafer reader is moved closer to the wafer; turn the screw counter clock-wise if the wafer reader is moved farther away from the wafer.

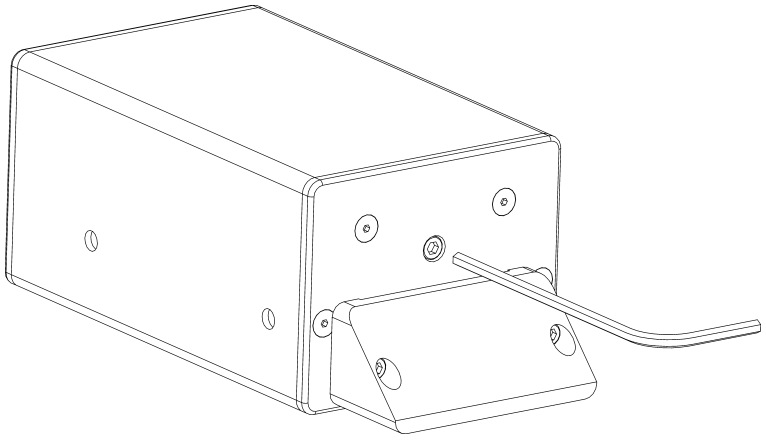


Figure E-3: Location of Focus Adjustment Screw

Image Artifacts

Under certain conditions, horizontal lines may be observed in the image (Figure E-4). These lines are artifacts of the wafer reader's optical design. They are most visible at a working distance of approximately 30.0mm, when the Light Mode setting is Dark Field (for more information of Light Modes, see Section 3.5.10). In most cases, these lines will have no impact on reading performance. If desired, position the mark in an area of the field of view that is free of artifacts. To reduce the intensity of the lines, the lighting can be optimized using the automated tuning process (Section 3.5.16).

Figure E-4: Image Artifact Example

Appendix F

In-Sight 1700 Wafer Reader Mount Conversion

The In-Sight 1700 wafer reader can be mounted either horizontally or vertically depending on the positions of the read window and light trap (see Figure F-1). The In-Sight 1700 wafer reader can be easily converted from one mounting configuration to the other. In the following example, a horizontal mount In-Sight 1700 wafer reader is converted to a vertical mount.

NOTE If possible, perform these steps within a cleanroom environment (Class 1000 or better) at an electrostatic discharge (ESD)-safe workstation. Use cleanroom-approved gloves to avoid fingerprints on the read window. If the conversion is not done in a cleanroom, there is a possibility of introducing "artifacts" on the optics. Also, depending on the Class of the cleanroom where the wafer reader will be used, the wafer reader may no longer meet Class specifications after the conversion has been done.

To convert the mount configuration:

1 Using a .050 inch Allen wrench, remove the two 2-56 x 3/16" button head screws that attach the light trap, and the two screws that attach the read window.

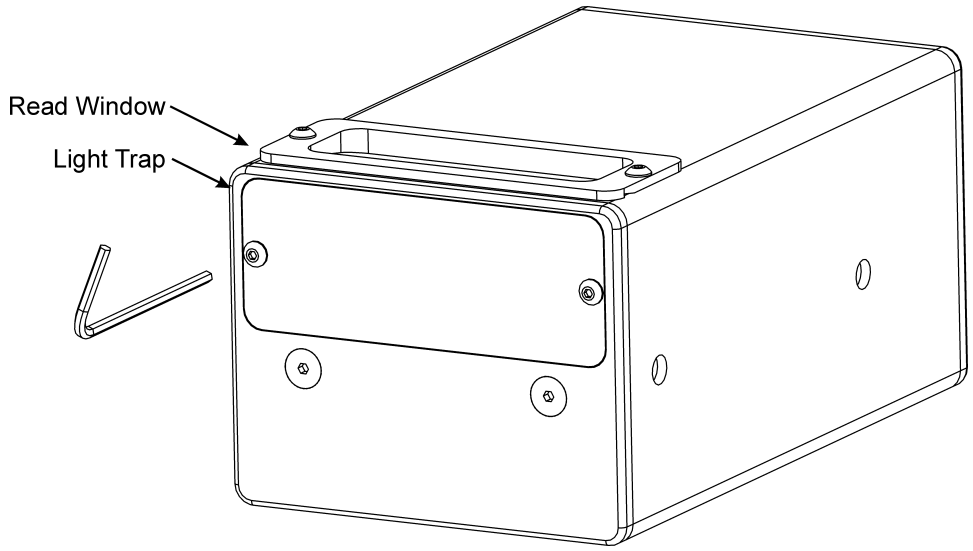


Figure F-1: Location of Light Trap and Read Window (Horizontal Mount Configuration)

2 Remove the light trap and read window from the In-Sight 1700 wafer reader case.

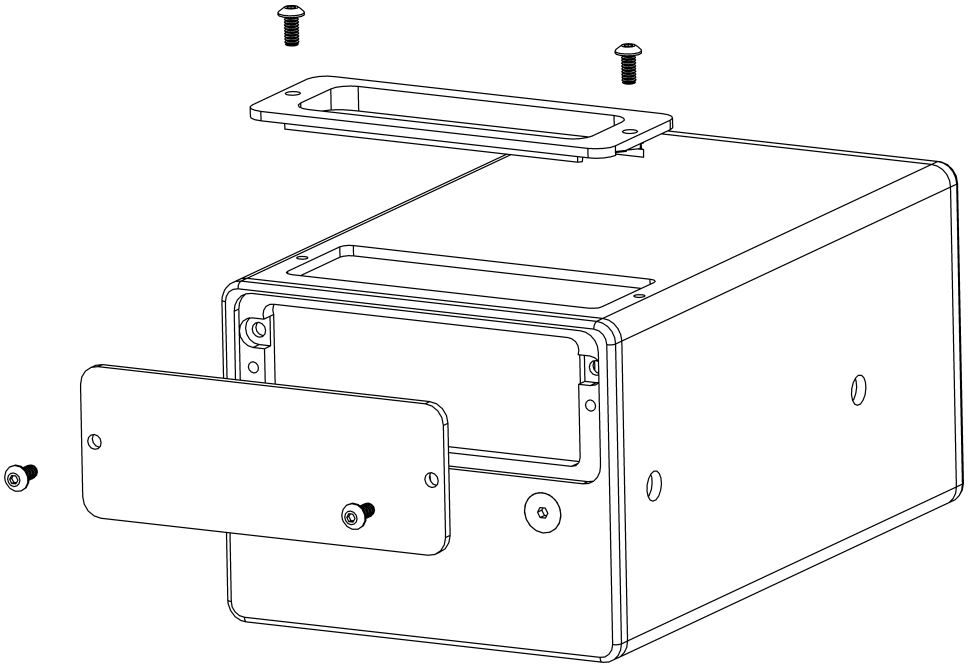


Figure F-2: Removing the Light Trap and Read Window

3 Place the read window, with the top of the frame (thick edge of wedge) facing down, in the opening that was occupied by the light trap; place the light trap, with the top nearest to the back of the wafer reader, in the other opening.

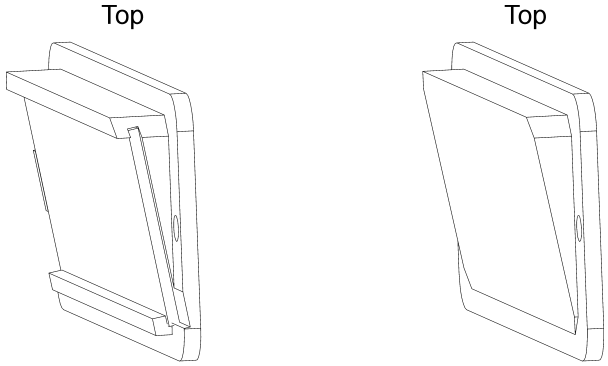


Figure F-3: Read Window and Light Trap Orientation

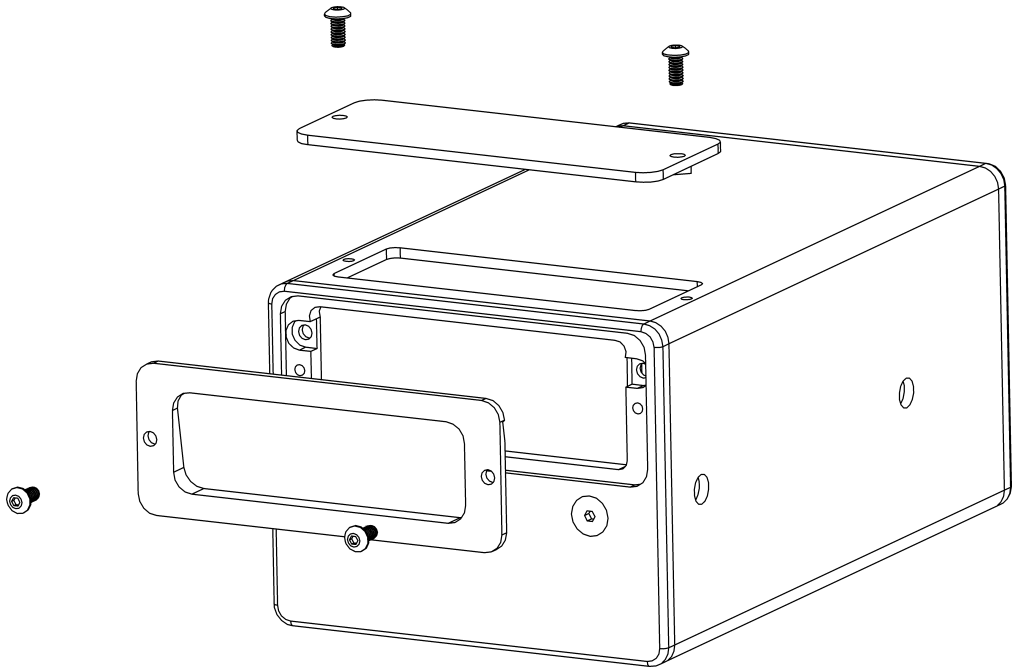


Figure F-4: Reattaching the Read Window and Light Trap

4 Tighten all four screws, with a maximum torque of 2 inch-lbs.

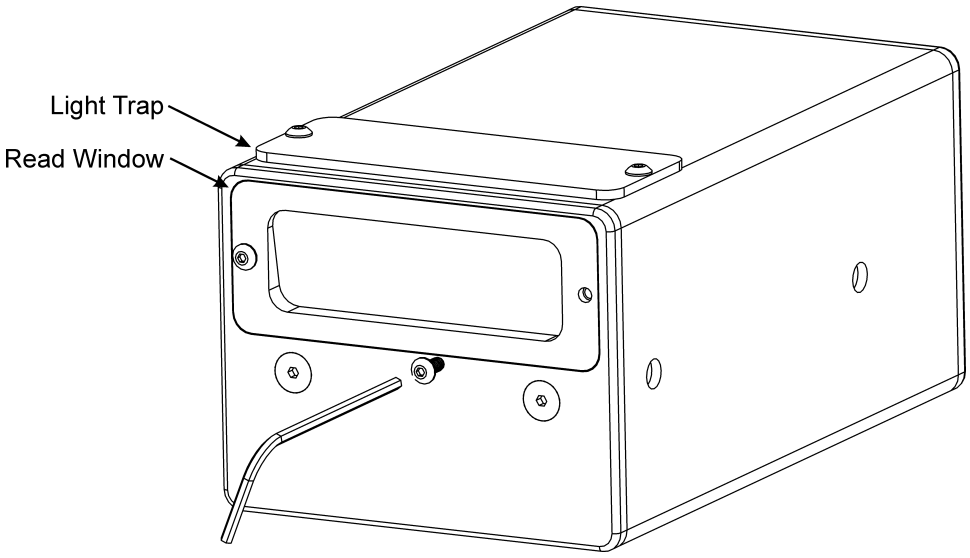


Figure F-5: Vertical Mount Configuration (Shown Horizontally)

Appendix G

Cleaning the Reader

To maintain optimal imaging and reading performance, keep the glass read window free of dust and fingerprints. To remove dust, use a pressurized air duster. If the window needs cleaning, use a lens cleaning cloth or a cleaner approved for use on coated optics. Do not spray water or cleaning fluids directly onto the glass window, which could allow moisture to enter the case.

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