

# Welch Allyn ® SCANTEAM® 6100 WAND

## Digital Bar Code Wand

### Introduction

Welch Allyn SCANTEAM® 6100/6200/6300s are hand-held wands designed for contact scanning. With the lateral scan motion provided by the user, the quality bar code symbology is reliably converted into an analog and/or digital signal representation. Welch Allyn's consistent wand performance is critical to a successful data acquisition solution.

The performance attributes of the wands support many applications including point of sale, ticket reading, time and attendance, document tracking, blood sample handling/sorting, and asset tracking. Our customers include manufacturers of portable data collection terminals, shop floor control terminals, point of sale terminals, lottery terminals, laptop and portable computers, personal computers, and blood analysis equipment.

For those original equipment manufacturers looking to add bar code capability, Welch Allyn offers decode integrated circuits. Our decode integrated circuits coupled with the SCANTEAM wands provide an extremely cost effective data acquisition and data processing solution.

The SCANTEAM 6100 Series contact wands provide cost effective scanning technology without compromising the required contact performance and reliability standards. Welch Allyn's quality contact wand products are designed to be tailored to each application for optimal performance, efficiency, and reliability.

### Features and Benefits

- *Depth of field* An optical depth of field is required to consistently read quality bar codes as well as quality codes protected with laminates. Optical depth of field contributes to a high first read rate, thus increasing productivity.
- *Auto Enable* Auto Enable is an enhancement to a power conservation technique known as pulsing designed to conserve battery life for portable decoders. The battery life is conserved since power to the wand is only provided when necessary to scan.
- *ASIC based circuitry* Welch Allyn wands have a custom ASIC (Application Specific Integrated Circuit) resulting in fewer components and increased product reliability. Wand size remains compact for ease of use and product returns are reduced.
- *Field Replaceable Tip* The wand tip is designed to be removed and replaced with a new tip, saving the customer money by replacing the tip rather than replacing the entire wand.

Figure 1 SCANTEAM 6100

- *Variety of Aperture Diameters* The aperture is configured to match the X-dimension (narrowest element width) of the symbology. The wand's performance is optimized for each application. This feature contributes to a high first read rate, thus increasing productivity.
- *Visible or Infrared Illumination* The visible red illumination is suitable for most applications, but the infrared is available for applications using colored security laminates or reading codes through smudges, oils, and grease. Infrared illumination used where needed enhances productivity through consistent first read rates.
- *Ergonomic Design* The wand is designed to emulate the familiar feel and grip of a pen or pencil. It is lightweight and easy to use for extended periods of time without operator fatigue or injury.
- *Metal or Polycarbonate Barrel* The wand's metal outer tube is selected for many applications for its rugged qualities. Polycarbonate is available to meet environmental requirements such as ESD protection. The wand's housing materials provide greater reliability reducing product returns.
- *Strong, Flexible Cord* The scanner cord strain relief will withstand in excess of 1 million flexures, providing greater reliability thus reducing product returns.
- *Optional Inverted Digital Signal* The wand digital signal can be inverted to black low and white high. This is a factory set feature. This feature provides greater hardware interface capability.
- *"Black High" Idle State* The Welch Allyn wands can be factory selectable to remain in a known state (Black High) when not scanning.

## Optical Operation

The optical elements of the bar code wands are an illumination LED (light emitting diode), an aspherical lens, a window, an aperture and a photodiode. The LED illuminates the bar code symbol through the aspherical plastic lens. A portion of the LED illumination is returned from the bar code back to the center receive portion of the same lens and is ultimately focused on the

aperture. The photodiode located behind the aperture generates a signal current and is subsequently amplified and digitized prior to being routed to the decoder. The diameter of the aperture determines the effective scanning aperture for the wand. Figure 2 shows the basic concept of the optical system operation.

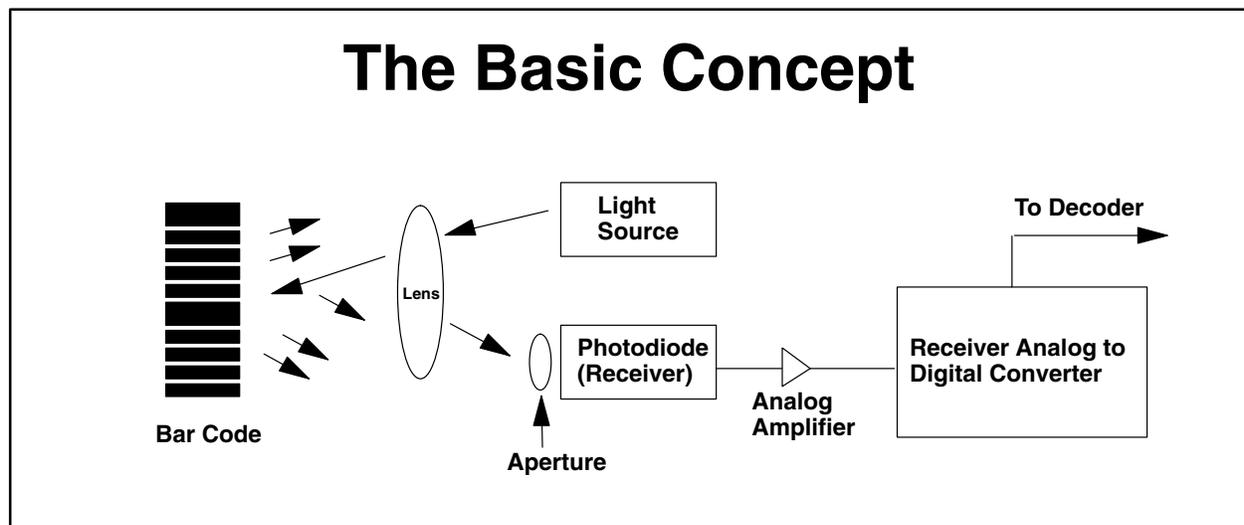
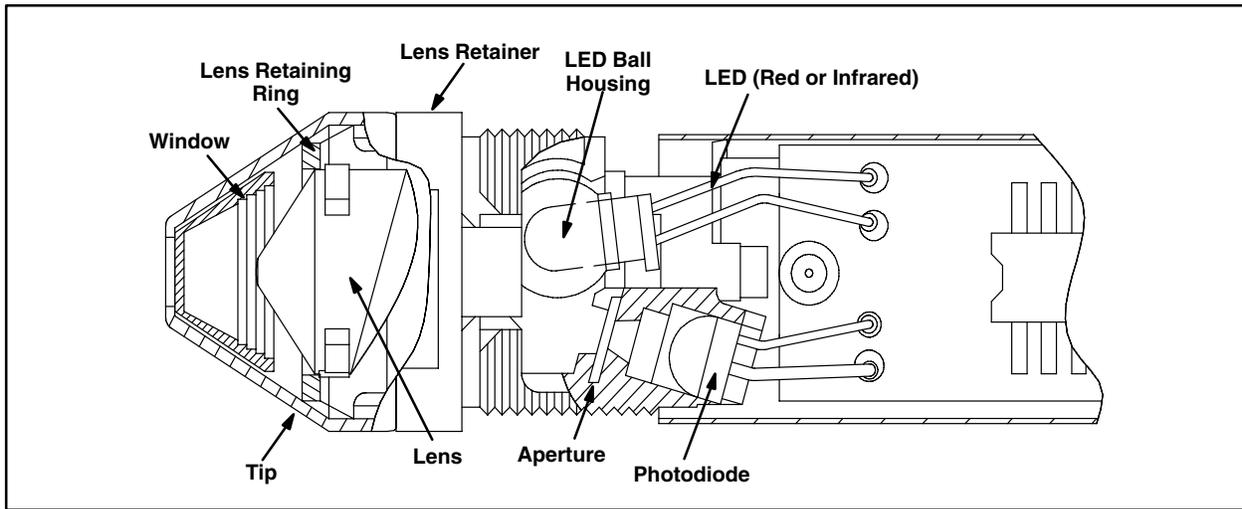


Figure 2 Optical Path



**Figure 3 Optics**

### **LED (light emitting diode)**

The wand's illumination is performed through the use of a tightly controlled quality LED for consistent performance. The LED provides flood illumination through the lens. A portion of this light is scattered backward from the bar code being scanned to the receive optics. The configurable illumination wavelengths are:

\* Visible Red Wavelength, 660nm

Suitable for most bar code applications. Supports bar codes printed with dye-based ink and bar codes printed on thermal paper stock.

\* Infrared Wavelength, 880nm

Suitable for applications that require reading code through smudges, oils and grease, as well as reading code through blackened security laminates. Supports bar codes printed with carbon-based ink and bar codes printed on select thermal stock.

### **Aspheric Lens**

The aspheric lens is a multi-surface lens that is a proprietary design to Welch Allyn. The lens actively functions in both the illumination and receive paths of the optical system. Its custom design is critical to LED light focused on the bar code as well as the received light focused back through the aperture to the photodiode.

### **Aperture**

The aperture is essentially the "eye" of the optical system. It is the opening in the optical system that establishes the field of view. One important element of the wand's performance is matching the size of the aperture image to the symbology's X-dimension (smallest element width). When selecting the correct wand aperture, it is a good rule of thumb to use the next smallest aperture size as compared to the X-dimension. A 6 mil aperture size is proportionately correct for a quality printed code with a 7.5 mil X-dimension and greater.

### **Photodiode**

The photodiode produces an electrical current when exposed to light. The photodiode receives the returned bar code light through the aperture. This reflected light creates a very low level current in the photodiode which is then amplified and further processed by the ASIC functions to achieve a digital level signal.

### **Window**

The tip window is designed to protect the sensitive optical surfaces from environmental contamination by either fluids or dust. The window satisfies very stringent optical requirements for flatness and perpendicularity. The less expensive recessed plastic window is adequate for normal applications whereas the sapphire window is available for more rugged environments.

## Optical Specifications

Parameter	Specification
LED Wavelength	Visible Red, 660nm Infrared, 880nm
Selectable Apertures	.004" – .010" diameter (.004" diameter not available in infrared wavelengths)
Scan Rate	3 IPS – 30 IPS (inches/second)
Tilt Angle (Scan Angle)	0–35 degrees range (See Table 2)
Depth of Field	0–.065" (4 mil = 0–.040)
Minimum Reflective Difference (MRD)	MRD is 37.5% or greater with minimum space reflectance greater than 90%, independent of power supply voltage and temperature.

**Table 1 Optical Specifications**

### Tilt Angle

The scanner models will operate and meet the specified tolerance over tilt angles when in contact with the appropriate bar code symbol. (See Table 2.) The device

will be insensitive to rotation about the axis defined by the scanner outer tube.

SCANTEAM Product	Aperture	Specified Minimum X-Dimension	Tilt Angle
63XX	4 mil*	4.9 mil	10° to 30°
61XX/62XX	6 mil	7.0 mil	0° to 35°
61XX/62XX	8 mil	8.9 mil	0° to 35°
61XX/62XX	10 mil	10.9 mil	0° to 35°

\* Due to 6300/4 mil sensitivity to substrate noise and printing/code defects, it is only recommended for use in rare applications where the 6100/6 mil is not effective. Although the 6100/6 mil is specified for 7.0 mil X-Dimension, it will read codes with X-Dimensions smaller than 7.0 mil. The 6100/6 mil depth of field and scan angle may be negatively affected with X-Dimensions less than 7.0 mil.

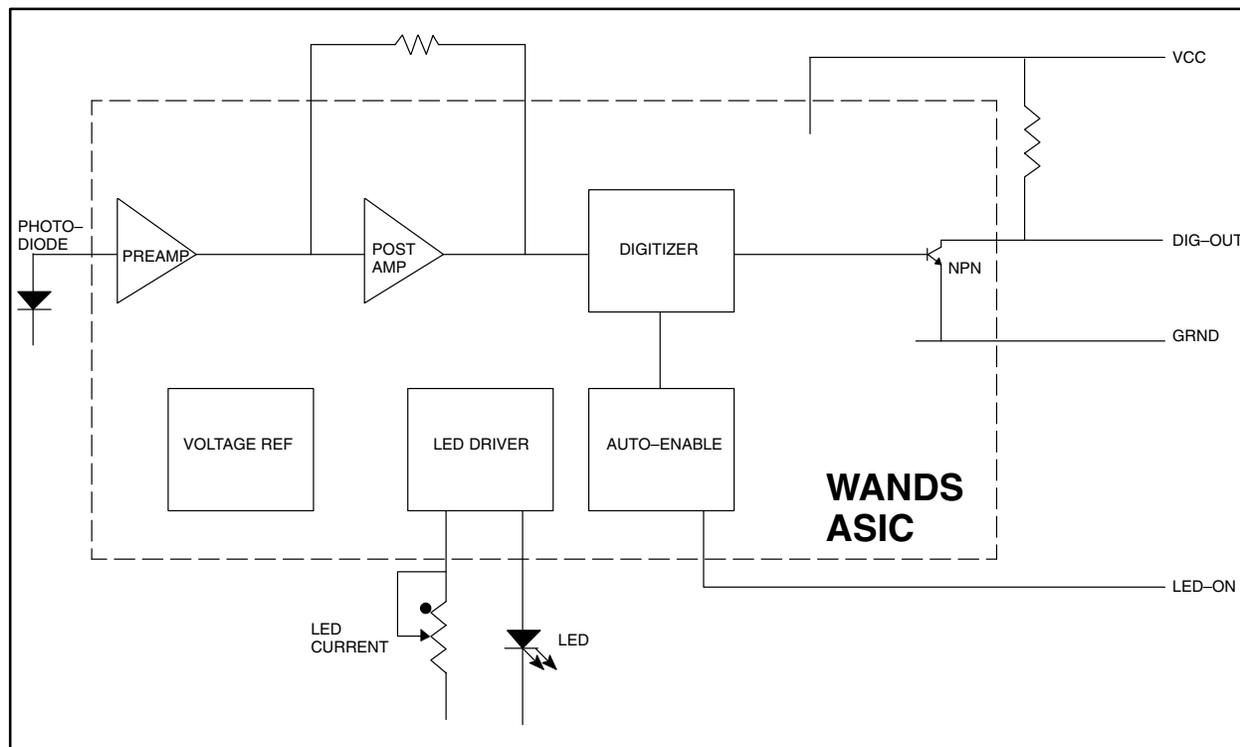
\*There is a price premium associated with the 6300/4 mil. Please contact your local Welch Allyn sales office for available 6300 configurations and leadtimes.

**Table 2 Wand Performance Guide**

## Electrical Description

The SCANTEAM 6100/6200/6300 wands operate with a custom amplifier-digitizer circuit to reliably create a bit serial digital representation of the bar code symbol being scanned. This amplifier-digitizer circuitry is contained

in a custom mixed-mode ASIC (Application Specific Integrated Circuit). All of the operational amplifiers and other active components are implemented in the ASIC. A block diagram of this circuit is shown in Figure 4.



**Figure 4 Wands Implemented with ASIC**

The reflected light from the bar code is received by the photo diode and converted to a signal current. This very low level signal current enters the ASIC circuitry and is amplified through two amplifier stages and converted to a digital signal by the digitizer. This digitizer has been specifically optimized to retain the timing of the edge transition established by the original analog bar code scan. The output of the digitizer is connected to an open collector NPN transistor implemented with an optional, factory selectable 2.2kOhm pull-up resistor in order to achieve TTL compatibility.

The digital output is an amplified signal indicative of the bars and spaces in the scanned symbol. Welch Allyn standard wands will transmit black (absorbing) bar as high output level and white (reflecting) bar as low output level. The wands can be custom ordered as Inverted Output to achieve black as low and white as high. The output is also available factory selectable as TTL compatible or TTL open collector. The TTL compatible version contains an internal 2.2kOhm pull-up resistor between the +5V and the output. See Figure 5 for a graphic representation of the digital image.

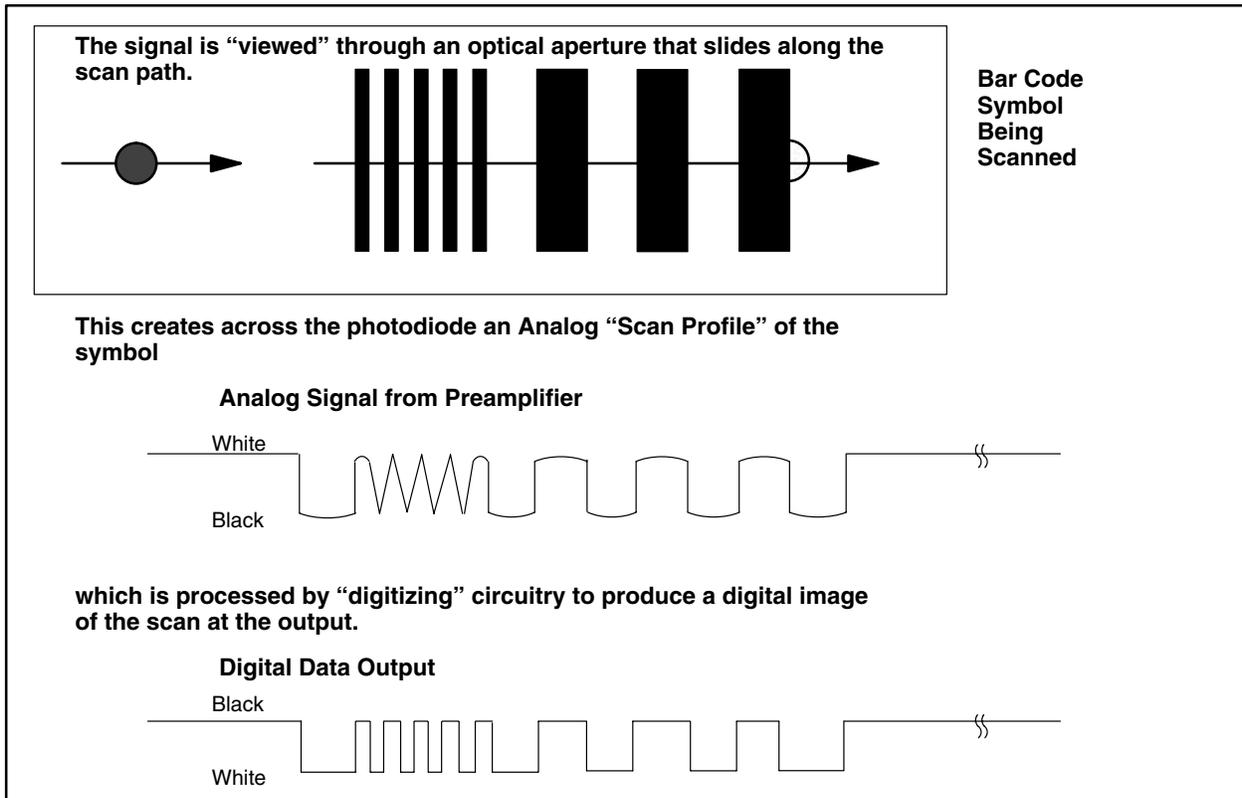


Figure 6 The Digital Signal

### Auto Enable For Pulse Mode

Welch Allyn has implemented an electrical feature known as Auto Enable specifically for wands used in power pulsing applications. Pulsing was originally designed into portable terminals to conserve battery life. Power is intermittently supplied by the decoder to the scanner to detect if reflected light is present. Most decoders pulse the VCC line of the wand approximately 10 times per second. If no light is present, the scanner is most likely looking into space and will remain in the black state. If light is detected, the scanner is most likely looking at the quiet zone directly preceding the bar code and will be fully powered up by the terminal to scan the bar code. This is where Auto Enable becomes an

important feature. In order for the decoder to provide full power to the wand, it must recognize a logic state (Welch Allyn standard for white is logic low). The Auto Enable circuitry assures that the LED's are turned on after the electronic circuitry has stabilized approximately 1.5 ms after the power is applied to the wand. (Refer to Figure 6.) This stabilization provides adequate time for the wand to set itself to a low logic state, thus providing the capability for the decoder to turn on. The benefit of the auto enable feature is that battery life is conserved through the use of successful pulsing, thus allowing greater mobility for the workforce.

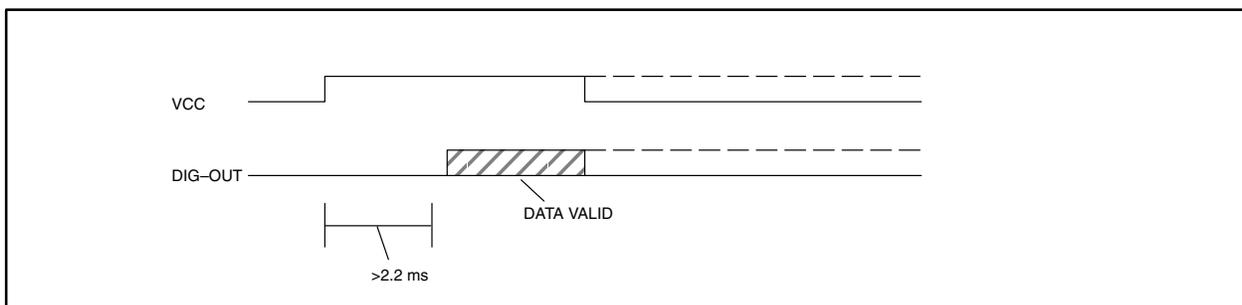


Figure 6 Pulse Timing with ASIC

## Electrical Specifications

Parameter	Specification
<b>Operating Voltage Range</b> <ul style="list-style-type: none"> <li>Model 6100/6200/6300 Non-Switched</li> <li>Model 6102/6202 Switched</li> </ul>	4 mil aperture = 4.5V–5.5V 6–10mil aperture = 4.3V–6.0V  6–10mil aperture = 4.5V–6.0V for 3–6 feet cable lengths only
<b>Operating Current</b> <ul style="list-style-type: none"> <li>Model 6100/6200/6300 Standard Current</li> <li>Model 6100/6200/6300 Reduced Current</li> </ul>	5V scanners = 45mA Max., 35mA Typ  5V scanners = 22mA Max., 16mA Typ
<b>Power Supply Noise Rejection</b>	Withstands up to 100mV pp noise and ripple on the power supply lead
<b>Digital Output</b>	TTL compatible or TTL open collector
<b>Digital Signal Level</b>	<ul style="list-style-type: none"> <li>White gives output low and black gives output high.</li> <li>With a 2.2kOhm pull-up resistor and the output transmission line capacitance less than or equal to 75pf, the rise/fall times are less than or equal to 3us.</li> <li>Without pull-up, current sink capability: <math>I_{\text{sink}} &lt; 2.2\text{mA}</math>; <math>I_{\text{reverse}} &lt; 1\mu\text{A}</math> at 15V.</li> </ul>
<b>Electrostatic Discharges</b>	>15kv

**Table 3 Electrical Specifications**

### Reliability

The calculated mean time between failure (MTBF) is in excess of 22,000 hours. This is based upon the part count calculation using MIL–HDBK–217D for ground mobile (GM) environment conditions and commercial components. Using ground benign (GB) environmental conditions, the calculated MTBF is in excess of 220,000 hours.

### ESD Sensitivity

The scanner models with metal handles will continue to meet the specified tolerances after receiving a total of fifty (50) discharges from a 15KV ESD simulator.

### Shield Isolation (Metal Outertube Only)

The resistance between the shield and the power supply common termination will be in excess of 1 meg ohm and the flashover voltage will be in excess of 40VDC. A 10KHz AC signal with an amplitude of 1.0V p–p placed between the shield and the common termination will have no operational effect.

## Mechanical Description

The Welch Allyn Series SCANTEAM 6100 digital and analog wands consist of an optical assembly, amplifying circuit, digitizing circuit (for digital wands only), printed circuit board mounted to a conductive platform, electrical shield, replaceable tip, outer tube, cord and a connector. The mechanics of the available wand models vary.

The SCANTEAM 6100/6200/6300 are digital output wands with the above mentioned hardware and a metal outer tube as the discerning feature. The SCANTEAM 6120/6220 are analog output wands with metal outer tubes. See Figure 7 for mechanical dimensions. The optional Welch Allyn logo can be etched onto the metal outer tube or a custom logo may be requested. Welch Allyn must quote the leadtime and cost to implement custom graphics. The customer is responsible for supplying camera-ready artwork.

The SCANTEAM 6101/6201 are digital output wands with the molded polycarbonate outer tube. See Figure 7 for dimensions. An optional Welch Allyn logo or custom logo can be molded into the polycarbonate housing. Welch Allyn must quote the leadtime and cost to implement custom graphics. The customer is responsible for supplying camera-ready artwork.

The SCANTEAM 6102/6202/6302 are digital output wands with a metal outer tube and manual switch to power the wand on and off. See Table 4 for switch specifications and Figure 7 for dimensions.

Parameter	Specification
Switch Pressure	Pressure required to activate switch is 5–9 ounces (140–260 grams)
Switch Sense Signal	Current draw must not exceed 1.0mA.
Switch Life	In excess of 5,000,000 actuations
Ultraviolet Sensitivity	The switch will not be degraded by exposure to direct sunlight within specified temperature range.
Switch Boot Adhesion	The boot will withstand a 10 pound downward force for 5 minutes.

**Table 4 Switch Specifications**

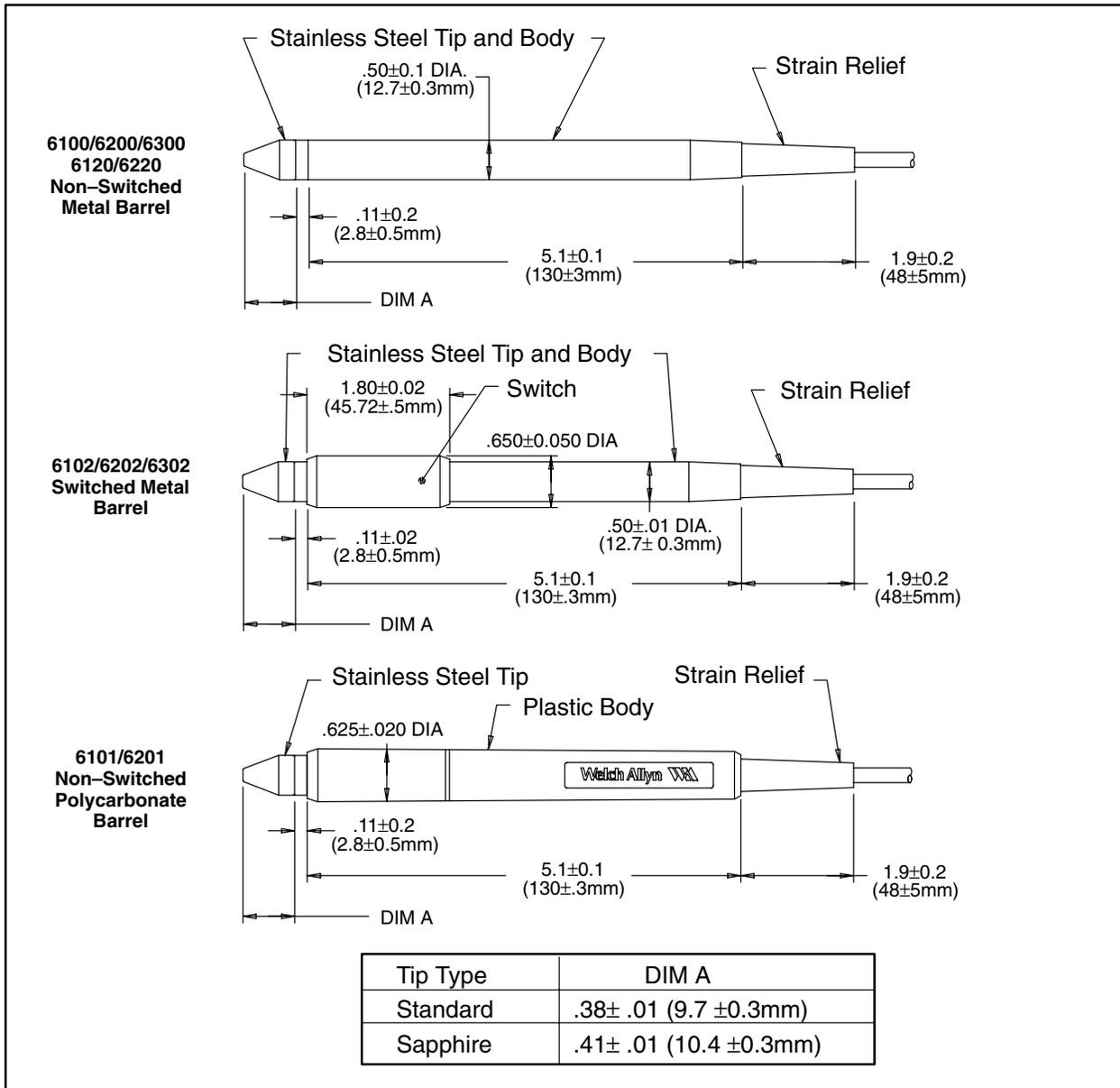


Figure 7 Scanner Dimensions

Parameter	Specification
Weight	3.5 oz. (0.1 kg) with standard 6 foot coil cord
Length	7.5 inches (19.1 cm)
Diameter	Metal – 0.50 inches (1.3 cm) Polycarbonate – 0.63 inches (1.6 cm)
Scanner Tip	Field Replaceable sapphire or plastic window
Cord	Standard 6 foot coil cord (1.83 meters) (Custom straight lengths and coil lengths available.)

Table 5 Mechanical Specifications

## Operational Environment

The SCANTEAM 6100 series contact wands have been designed to operate under harsh environmental conditions representative of many actual applications. The outer tube designs provide protection against dirt, dust and splashing liquids. However, the wands **will not withstand immersion**. The outer tubes are also designed to survive severe shock and vibration to ensure longevity in the field.

The SCANTEAM 6100 contact wand series are available with two choices of tips, the standard stainless steel tip with a recessed plastic window or the optional sapphire tip. Both are made of durable materials to support a wide range of applications.

The recessed plastic tip's surface quality is strictly specified to comply with the performance specification for the optical system. The window of the stainless steel tip must be kept clean to assure high first pass reading capability. A dirty window can impair the wand's ability to scan effectively. Whenever the scanning performance begins to degrade, the window should be examined for dirt or dust contamination. If the window becomes dirty, it may be blown clean with filtered, compressed air. A fine lens tissue may also be used to wipe away the dirt. However, **DO NOT USE ABRASIVE TISSUES OR**

**WIPES AS THESE WILL SCRATCH THE WINDOW. NEVER USE SOLVENTS (i.e., ALCOHOL OR ACETONE) ON THE WINDOWS SINCE SOLVENTS MAY DAMAGE THE FINISH OF THE WINDOW.** Check the tip for scratches or damage. The tip may be replaced if damaged. If cleaning of the window or tip replacement does not correct the scanning ability of the wand, the wand can be returned for service.

The synthetic sapphire tip is also designed to comply with the optical performance specification. The sapphire tip is considered to be maintenance free. The window protrudes above the metal housing. This protruding, flat surface enables the window to push through lint and dust rather than allowing dirt to accumulate on its surface. If the sapphire tip does require cleaning, use the guidelines noted above for the standard tip.

Both tips can be removed by inserting a thin coin in the provided slot at the base of the tip and twisting. When the tip is removed, **DO NOT TOUCH** or make contact with the exposed lens surface as damage to the scanner may result.

Welch Allyn recommends keeping a supply of spare tips on hand for replacement of worn or damaged tips.

## Environmental Specifications

Parameter	Specification
<b>Temperature Range</b>	Operating -4° F to +122° F (-20° C to +50° C) Storage -40° F to +158° F (-40° C to +70° C)
<b>Ambient Illumination</b>	Fluorescent 3,000 lux on the bar code Incandescent 1,500 lux on the bar code
<b>Relative Humidity</b>	0 to 95% non-condensing (Operational and Storage)
<b>Altitude</b>	Sea level to 15,000 ft [4600 m] (Operational and Storage)
<b>Shock</b>	50 drops to the tip from 3 ft [91 cm] to a concrete surface
<b>Cord Flexure with strain relief</b>	In excess of 1,000,000 flexures for ±90° flexure

**Table 6 Environmental Specifications**

## Scanner Wiring

Figure 8 illustrates the wiring for the SCANTEAM 6100 Series Scanner. Other connector options are available. Contact Welch Allyn Sales for additional information.

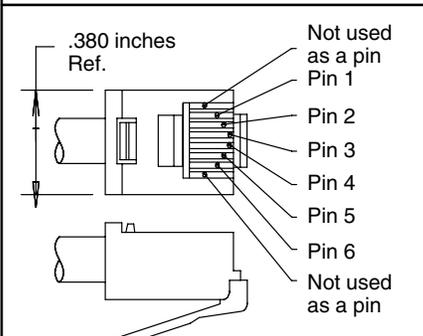
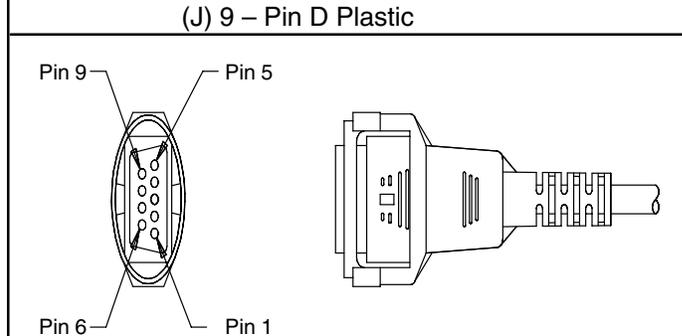
(4) No Connector Option	(G) 8 – Pin Modular		
	Standard Wire Color Functions	Standard Wiring	Switch Scanner Wiring
Red – +5V Blue – Switch Sense for Switch Scanners only White – Ground Black – Digital Output Drain – Shield		Pin 1 – Shield Pin 2 – Ground Pin 3 – +5V Pin 4 – N/C Pin 5 – Digital Output Pin 6 – N/C	Pin 1 – Shield Pin 2 – Ground Pin 3 – +5V Pin 4 – Switch Sense Pin 5 – Digital Output Pin 6 – N/C
(J) 9 – Pin D Plastic	Standard Wiring	Switch Scanner Wiring	
	Pin 1 – N/C Pin 2 – Digital Output Pin 3 – N/C Pin 4 – +5 volts Pin 5 – N/C Pin 6 – N/C Pin 7 – Ground Pin 8 – Shield Pin 9 – N/C	Pin 1 – N/C Pin 2 – Digital Output Pin 3 – Switch Sense Pin 4 – +5 volts Pin 5 – N/C Pin 6 – N/C Pin 7 – Ground Pin 8 – Shield Pin 9 – N/C	

Figure 8 Scanner Wiring

## Welch Allyn Wand Holder

Welch Allyn offers a wand holder designed to accommodate both the metal outer tube and the polycarbonate outer tube (see dimensions in Figure 9). The wand holder provides a convenient receptacle for the contact wands when not in use. It allows easy operator access and protection from inadvertent damage.

The holder is designed to be mounted on any flat surface

with either an adhesive pad or self-tapping mounting screws. The rugged design and attractive appearance make this wand holder suitable for both factory and office environments. The holder comes in both black and beige polycarbonate.

NOTE: The wand holder diameter is not large enough to accommodate the switched wand.

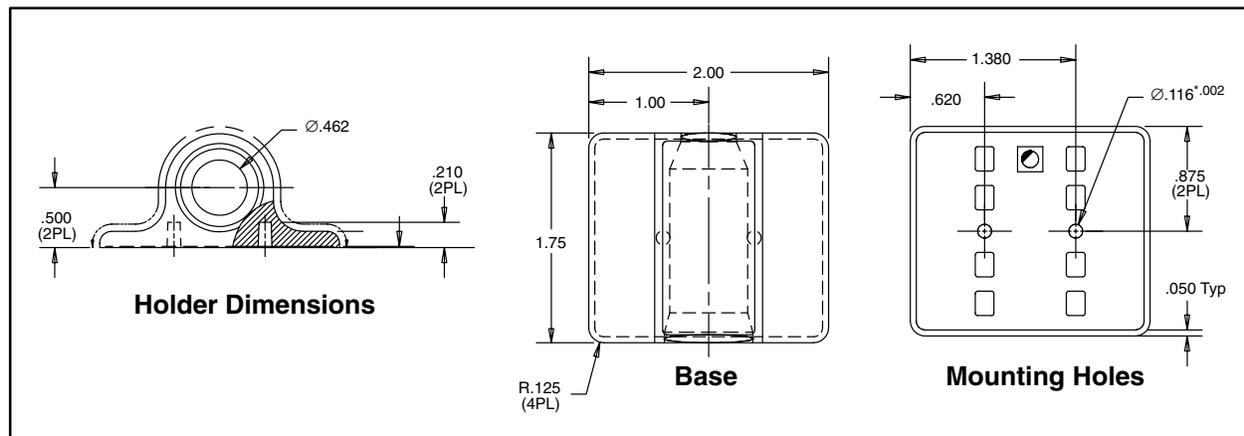


Figure 9 Wand Holder

## Welch Allyn Configuration Options

To configure and order Welch Allyn wands, please contact a Welch Allyn sales office for assistance. Welch Allyn offers contact LED-based scanning technology as well as CCD and laser options.

### Ordering Information

Welch Allyn offers sales and service world-wide. The factory is based in Skaneateles Falls, New York, USA. A list of the Welch Allyn sales offices is detailed below:

Welch Allyn, Inc.  
4619 Jordan Road  
Skaneateles Falls, New York 13153-0187  
USA  
Tel: 315-685-8945  
Fax: 315-685-3172

### Welch Allyn Ltd

20 Sandyford Office Park  
Foxrock  
Dublin 18  
Ireland  
Tel: Int+353 1 295 0750  
Fax: Int+353 1 295 6353

### U. K. Offices

#### Northern Office

The Lodge, Tanners Lane  
Warrington, Cheshire WA2 7NA  
England  
Tel: Int+44 1925 240055  
Fax: Int+44 1925 631280

#### Southern Office

Aston Abbotts  
Buckinghamshire HP22 4ND  
England  
Tel: Int+44 1296 682140  
Fax: Int+44 1296 682104

For service in Asia, please contact your Welch Allyn representative (at address below) or your local distributor.

### Welch Allyn, Hong Kong Office

10/F Tung Sun Commercial Centre  
194-200 Lockhart Road  
Wanchai, Hong Kong  
Tel: Int+852-2511-3050 or 2511-3132  
Fax: Int+852-2511-3557

## Obtaining Factory Service

To obtain warranty or non-warranty factory service, the SCANTEAM 6100 Series contact wands must be returned to Welch Allyn, Inc., postage paid, with a copy of the dated purchase record enclosed. Before returning the wands, the Welch Allyn Product Service Department must be contacted to obtain a Return Material Authorization (RMA) number. The USA Product Service Department can be reached at:

### Welch Allyn, Inc.

Data Collection Division  
*Product Service Department*  
4619 Jordan Road  
P.O. Box 187  
Skaneateles Falls, NY 13153-0187

### *Product Service Department*

315-685-4278 or 685-4360  
Fax: (315) 685-4156

For service outside the United States, please contact your local Welch Allyn office or distributor.



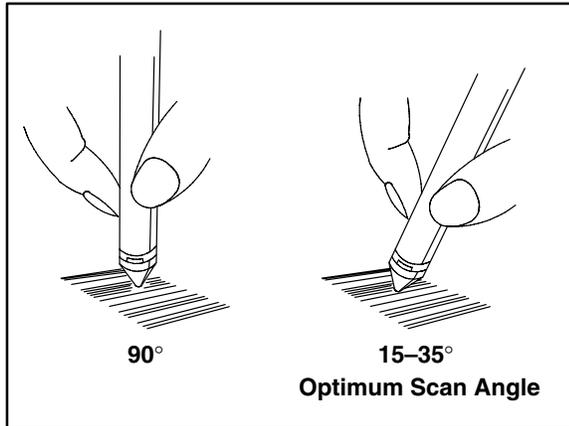
The CE mark on the product indicates that the system has been tested to and conforms with the provisions noted within the 89/336/EEC Electromagnetic Compatibility Directive and the 73/23/EEC Low Voltage Directive.

European Contact: European Regulatory Manager  
Welch Allyn Ltd.  
28 Sandyford Office Park  
Foxrock, Dublin 18  
Ireland  
**or**  
Welch Allyn Ltd.  
The Lodge, Tanners Lane  
Warrington, Cheshire WA2 7NA  
England

Welch Allyn shall not be liable for use of our product with equipment (i.e., power supplies, personal computers, etc.) that is not CE marked and does not comply with the Low Voltage Directive.

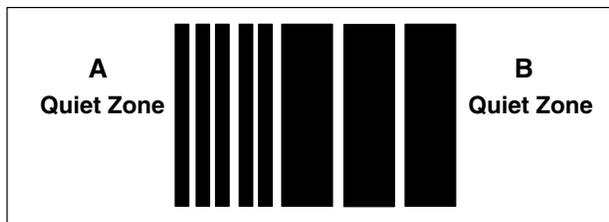
## Scanning Tips

1. Be sure the wand is correctly configured for the application (i.e., aperture size, wavelength, connector wiring, etc.).
2. Hold the wand similar to the grip of a pencil. The optimum scan angle is typically in the range of 15 degrees to 35 degrees from upright position (90°). Refer to Figure 10.



**Figure 10 Scanning Angle**

3. Bring the wand down onto the white space approximately 1/4" in front of the first black bar of the code (Point A). The wand tip must physically make contact with the bar code.



4. To scan, gently and steadily glide the wand across the bar code as if drawing a line with a pencil. Maintain contact throughout the entire scan.

5. Scan the entire code and do not lift the wand from the substrate until the last black bar and 1/4" of quiet zone directly following the last black bar (Point B) has been scanned. Always include in the scan the white area (quiet zones) before and after the bar code. These quiet zones are critical to a successful read. Scanning is bi-directional with Welch Allyn wands (left to right or right to left).

## Welch Allyn SCANTEAM 6100 Warranty

Welch Allyn, Inc., hereby warrants its products to be functional and free from manufacturing defects at the time of delivery. Welch Allyn, Inc. further warrants that it will replace or repair, at its option, any unit that fails to perform according to Welch Allyn's published specifications during a period of one (1) year from the time of shipment by Welch Allyn, Inc. to the user or the time it is purchased from any of Welch Allyn Inc.'s authorized distributors. Any attempt on the part of the user to disassemble or service the equipment shall void the warranty.

The warranty does not apply to products which have been damaged by improper handling, shipping or misuse. The warranty does not apply, if, in the sole opinion of Welch Allyn, Inc., the unit has been damaged by accident, misuse, neglect, improper shipping or handling. Since the unit is sensitive to static, the responsibility to protect it from static damage is solely that of the user. The warranty is valid only if the unit or scanner has not been tampered with or serviced by any party unauthorized by Welch Allyn, Inc. as a repair facility.

THE WARRANTIES SET FORTH HEREIN ARE IN LIEU OF ANY AND ALL OTHER WARRANTIES EXPRESSED OR IMPLIED INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE BUYER ACKNOWLEDGES THAT NO OTHER REPRESENTATIONS WERE MADE OR RELIED UPON WITH RESPECT TO THE QUALITY AND FUNCTION OF THE SCANNER HEREIN SOLD.

In no event shall Welch Allyn, Inc. or its resellers be liable for any loss, inconvenience or damage whether direct, incidental, consequential or otherwise, and whether caused by negligence or other fault resulting from the breach of any express warranty except as set forth herein. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you.

This warranty gives you specific legal rights and you may also have other rights which vary from state to state or country to country.

## Related Bar Code Publications

### Automatic ID Resource Catalog

AIM USA Publications  
634 Alpha Drive  
Pittsburgh, PA 15238-2802  
Fax: 412-963-8753  
Phone: 412-963-8588

### Reading Between the Lines: An Introduction to Bar Code Technology

Craig K. Harmon and Russ Adams  
© 1989 Helmers Publishing Inc.  
174 Concord Street  
Peterborough, NH 03458  
(603) 924-9631

### The Bar Code Book: Reading, Printing, and Specification of Bar Code Symbols

Roger C. Palmer  
© 1989 Helmers Publishing Inc.  
174 Concord Street  
Peterborough, NH 03458  
(603) 924-9631

### Handbook of Bar Coding Systems

Harry E. Burke  
© 1984 NCR Corporation  
Van Nostrand Reinhold Company, Inc.  
115 Fifth Avenue  
New York, New York 10003



6100/TRG Rev C



**Welch Allyn**

Data Collection Division  
4619 Jordan Road  
P.O. Box 187

Skaneateles Falls, New York 13153-0187