

# **AB300-Series**

## **Automated Filter Wheel**

### **USB 2.0**

## **User Manual**

Ver.1.0

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 **SPECTRAL PRODUCTS**

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The staff at Spectral Products will be happy to answer any questions about our products and our services. For immediate assistance, please contact the Spectral Products Group directly at (505) 343-9700, by fax (505) 343-9705, or by e-mail at [sales@spectralproducts.com](mailto:sales@spectralproducts.com)

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## **1. DESCRIPTION**

### **1.1. General Description**

The AB300-Series Automated Filter Wheels consist of a motor driven wheel, a computer based controller, a power supply, one RS-232 cable, one USB cable.

Filter wheel control is provided via USB from a host computer to the AB300-Series controller.

### **1.2. Detailed Operation Description**

The filter wheel assembly has a stepper motor and a position sensing device. The motor drives the filter wheel via a belt. The position sensing device allows the filter wheel to determine a “home” position during a reset. This home position is some number of steps ( the “offset”) away from the filter 1 position. After home is found, the wheel automatically moves to the filter 1 position.

The relative position of filter 1 is determined by the Filter 1 Offset, stored in non-volatile memory. From the filter 1 position, all other positions are reached by a fixed number of steps and are not individually programmable. If fine tuning of each position is desired, the Step Up and Step Down commands may be used. This fine adjusting will not be saved however, and subsequent moves to each position will require re-adjusting.

The filter wheel controller responds to USB commands and requires software to control its operation. An optional manual mode uses a push-button switch to step sequentially through the filter positions.



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## 2. OPERATION

### 2.1. Mounting

Mounting of the wheel itself is via 1/4-20 threaded holes (if provided) located on the sides of the filter wheel housing or via a mounting flange (or flanges) on the front and/or back of the housing.

Due to the vast possibilities of mounting arrangements, custom modification of the filter wheel housing may be necessary. Modified hardware will not be accepted by Spectral Products for full refund. If replacement is deemed necessary, Spectral Products will try to re-use modified parts, but is under no obligation to duplicate customer custom modifications. Mounting hole patterns and flange dimensions are provided in *Specifications; Mechanical*.

### 2.2. Filter Installation

Access to the filters is provided by removing four screws to remove the cover of the filter wheel housing.

Filters will be held in place by threaded inserts included in package.

### 2.3. Connections

The filter wheel housing to filter wheel controller connection is made via a DB9-F to DB9-M cable (Spectral Products pn: DK12AT, provided.) The connection is from the controller port “*To Filter Wheel*” to the filter wheel housing.

The host computer to filter wheel controller connection is made via a standard USB cable to the USB Connector on the filter wheel controller.

The power supply connects to the filter wheel controller at the “*Power*” jack.





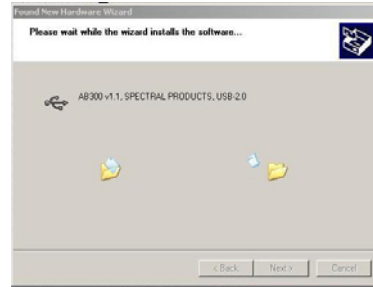
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## 3. USB INSTALLATION

After connecting the USB AB300 controller to a computer for the first time the following windows will be displayed if using Windows XP.



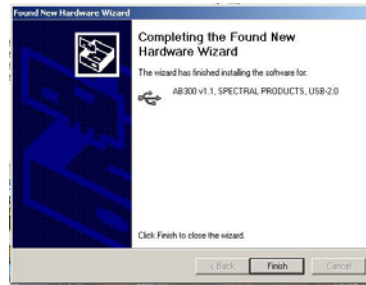
1. Welcome to the Found New Hardware Wizard  
Click 'Next' to continue



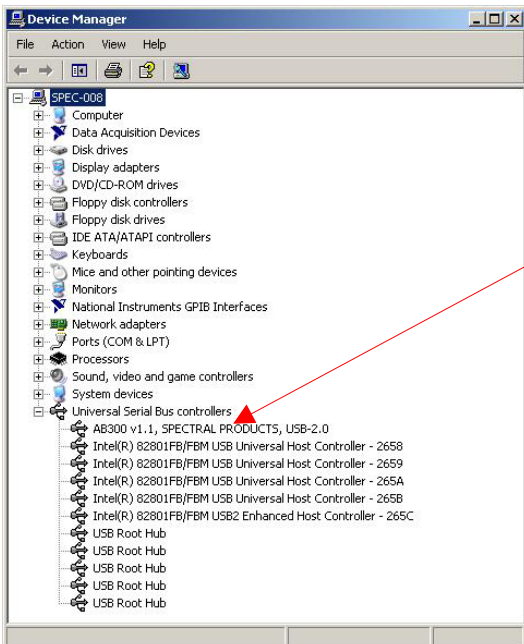
2. Found New Hardware Wizard  
Do nothing



3. Hardware Installation  
Click 'Continue Anyway'



4. Found New Hardware Wizard  
Click 'Finish'



To check the installation, open the Windows Device Manager window. The line 'AB300v1.1, SPECTRAL PRODUCTS, USB 2.0' should appear under Universal Serial Bus Controllers.

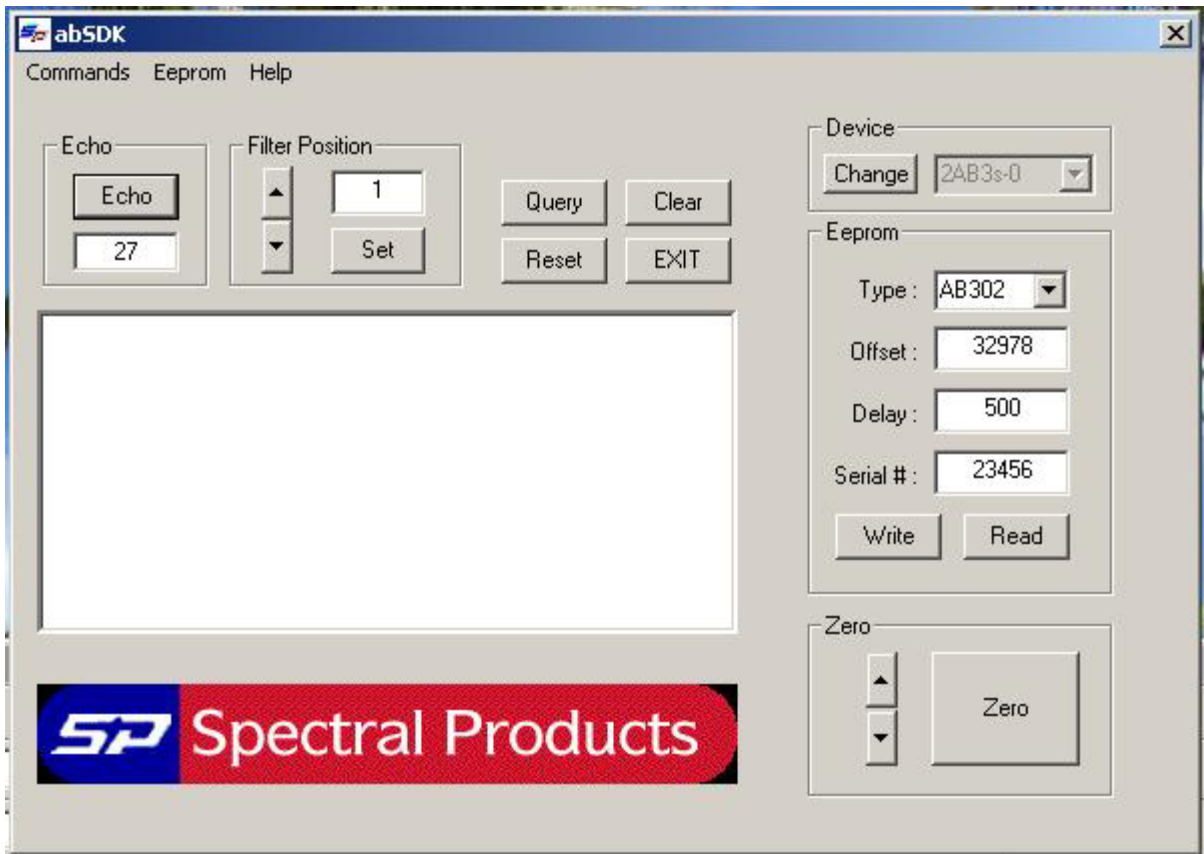
If the AB300 is not listed, unplug the power supply and USB cable to AB300 controller and then plug back in the two cables.

If the AB300 is still not listed call Spectral Products for support.

## 4. Getting Started

### 4.1. Main Screen

The default screen of the abSDK Executable program (**abSDK.exe**) consists of a display area with active buttons and a menu bar across the top. This program is written in Visual C++ 6.



**Figure 1.** AB300 Series Filter Wheels main screen.

- **Echo:** verifies the communication.
- **Filter Position** rotates the filter wheel to a specified position. Valid positions are 1-6 (AB301), 1-5 (AB302), or 1-12 (AB303). Click 'Set' to position the wheel to a defined position, or use arrow up/down to rotate the wheel.
- **Query:** shows the DC Power status, Firmware version, Offset value, and Model number.
- **Reset:** re-homes and goes to filter position 1.
- **Clear:** clears the edit box.
- **Exit:** exits the abSDK software.
- **Device:** sets the device number to communicate with the software. It default to device 0
- **Write:** writes the values in 'Type', 'Offset', 'Delay', and 'Serial #' boxes into the NOVRAM non volatile memory.
- **Read:** reads the values in the NOVRAM non-volatile memory into 'Type', 'Offset', 'Delay', and 'Serial #' boxes.
- **Zero:** sets the current filter to the filter one default location. Use up/down arrow to rotate one motor step toward the next higher/lower position.



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## 4.2. Menus

### 4.2.1. File Menu

- **Test** runs through all filter position at a setup time.
- **Exit** exits the program.



### 4.2.2. Eeprom Menu

- **Save Setup** saves Model, Offset, Delay, Serial, Firmware version into a specified file..

### 4.2.3. Help Menu

- **About AB.Usb** – About window.





### 5. SDK FUNCTIONS

Function Name	Description	RETURN when successful	RETURN when unsuccessful
<b>abQuery</b> short abQuery ( short *sQueryB )	Returns the power status, filter number, model, offset, and firmware version. <i>sQueryB[0]</i> is the DC voltage status, where 0: not DC, 1: yes DC. <i>sQueryB [1]</i> is the current filter number. <i>sQueryB [2,3]</i> is the AB300 model, where model = sQueryB[2]*256 + sQueryB [3]. <i>sQueryB [4,5]</i> is the offset, where offset = sQueryB[2]*256 + sQueryB [3]. <i>sQueryB [6,7]</i> is the firmware version in the format of “sQueryB [6]. sQueryB [7]”.	Zero	A non-zero number
<b>abEcho</b> short abEcho ( short sByte, short *sEcho )	Is used to verify communication. <i>sByte</i> is the byte sent out <i>*sEcho</i> points to the echoed byte.	Zero	A non-zero number
<b>abStepUp</b> short abStepUp ( )	Steps the filter position #1 to filter position #2 in one motor step.	Zero	A non-zero number
<b>abStepDn</b> short abStepDn ( )	Steps the filter position #1 away from the filter position #2 in one motor step.	Zero	A non-zero number
<b>abGoto</b> short abGoto ( short sFilterN )	Turns the wheel to the ‘sFilterN’ position if the position is valid. <i>sFilterN</i> can be from (1-6) for AB301, (1-5) for AB302, (1-12) for AB303, ...	Zero	A non-zero number
<b>abReset</b> short abReset ( )	Re-homes and goes to the filter position #1.	Zero	A non-zero number





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## 6. OPERATION HINTS

**Using RESET to close the loop on position:** As part of the power on reset the filter wheel finds home by sensing a switch closure. This switch sensing is the only feedback the controller gets regarding actual physical position. From that point on the wheel is controlled “open loop.” If for any reason the wheel loses its position (e.g. the wheel jams or becomes disconnected), the controller will not be able to tell a problem exists.

It may be desirable or at least reassuring to “close the loop” by having the wheel re-find its home position. This is done by issuing the RESET command.

**Using QUERY position:** After power on or the RESET command a filter wheel goes to the filter one position. All subsequent movements from there are done by issuing FILTER commands. So, theoretically at least, the controlling software should always know the current filter position of any filter wheel.

Still, it may be reassuring to query the filter wheel controller to verify what it thinks is the current position matches what the controlling software thinks. This is done with the QUERY command. Note, the filter wheel is positioned “open loop” and cannot tell if a malfunction has prevented the wheel from reaching its desired target. For example, if a wheel became unplugged from the controller, no error would occur using FILTER commands, and a QUERY would return the intended position, not the actual filter position (which is long lost.) Only the RESET command will detect the problem by failing to home.

If the optional manual advance switch has been used, QUERY will return the correct current filter position, barring any problems as described above. Therefore the controlling software may be re-synchronized to the correct position.

**Fine tuning each position:** Only the filter one position has a programmable “fine tuning” adjustment that is saved. For filter one position only, this is done by using STEP UP and STEP DOWN, then issuing a ZERO command to store the setting. All other filter positions are a fixed number of steps from the filter one position.

Fine tuning of each filter position may be accomplished using software techniques. The process is to go to a filter position, then issue STEP UP/DOWN commands to fine tune the position. The number of STEP UP/DOWN commands needed must be handled (saved) by the controlling software. Each time that position is to be recalled, a FILTER # and the appropriate number of STEP would be issued.

Note: Adjusting a position using STEP does not affect the “base” position of subsequent positions (E.g.: Using 3 step up commands for filter 2 does not make the subsequent filter 3 position off by 3 steps.)



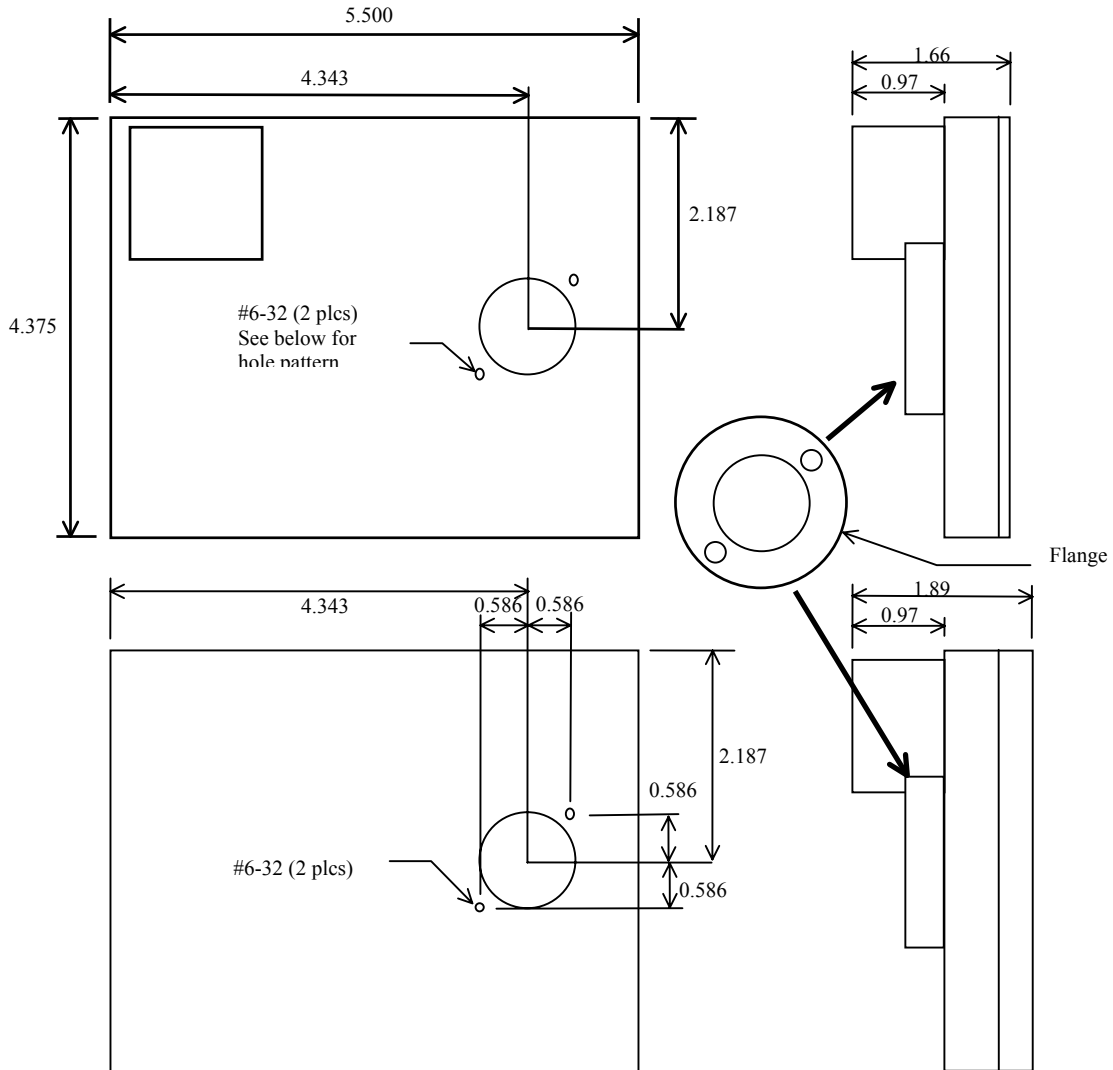


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### 7. SPECIFICATIONS

#### 7.1. Mechanical

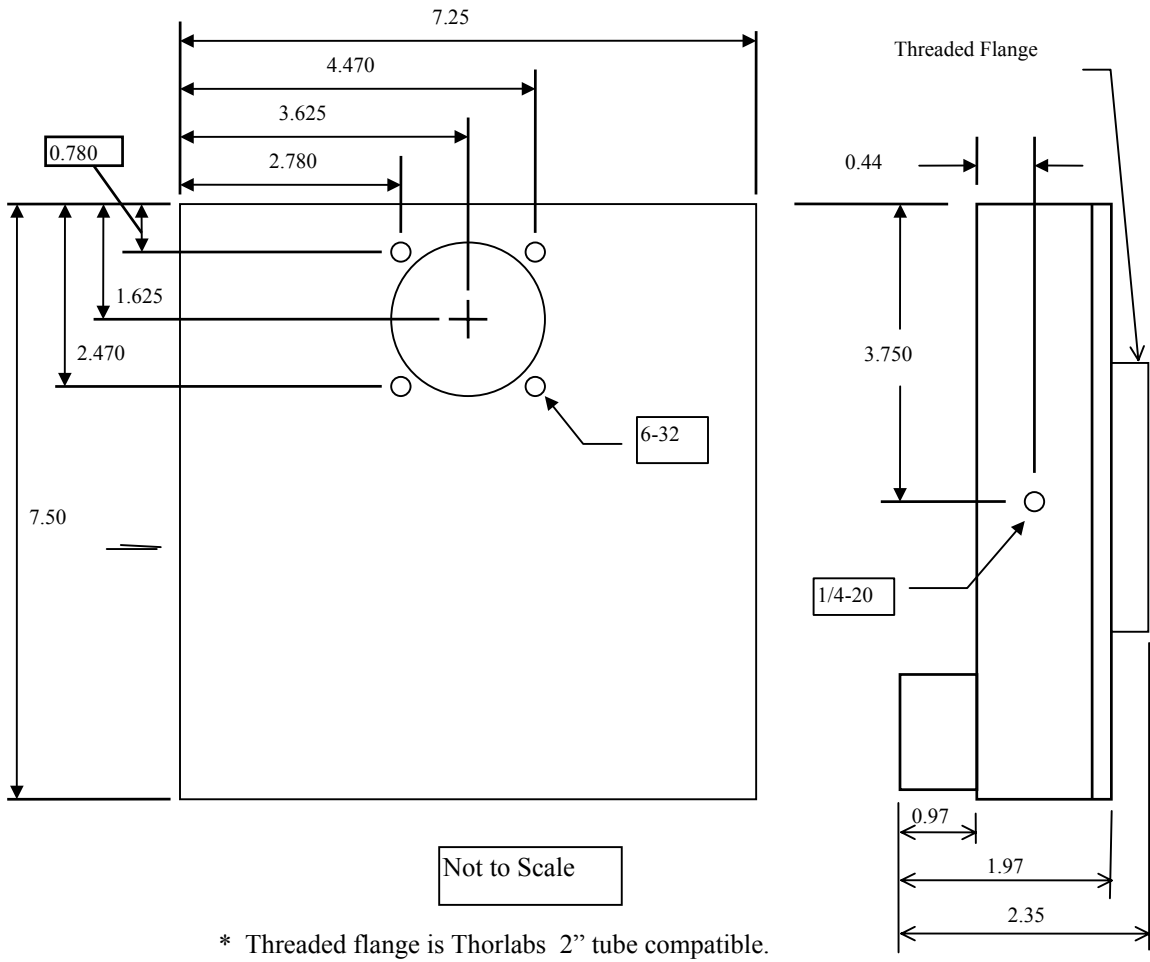
##### 7.1.1. AB301, 1 Inch Aperture, 6 Position



Not to Scale

\* Flange is compatible with Spectral Products' Digikröm monochromators.

7.1.2. AB302, 2 Inch Aperture, 5 Position

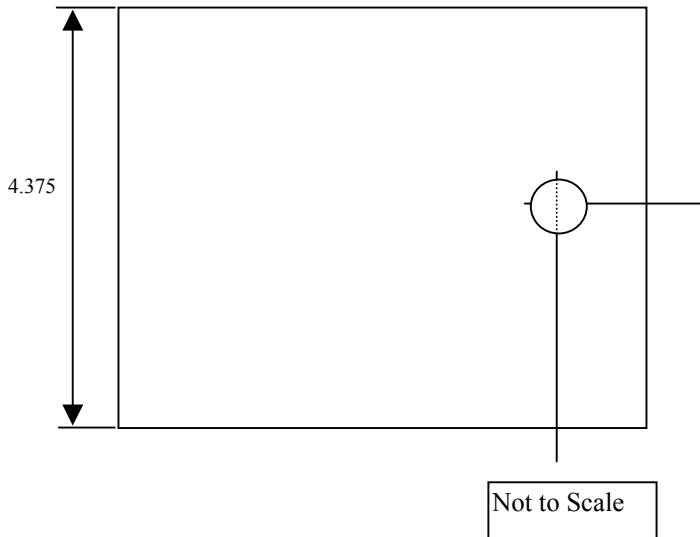
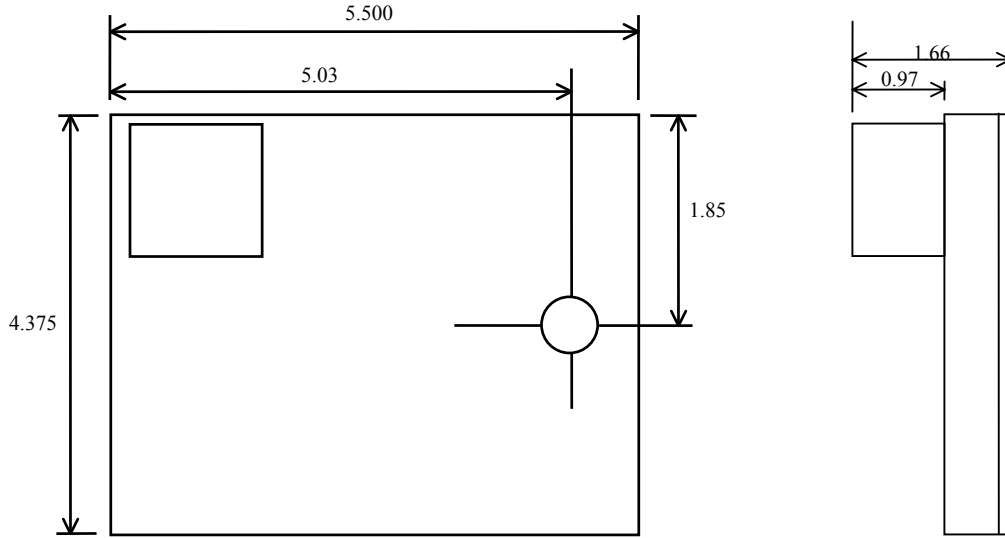




# SPECIFICATIONS

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## 7.1.3. AB303, 1/2 Inch Aperture, 12 Position

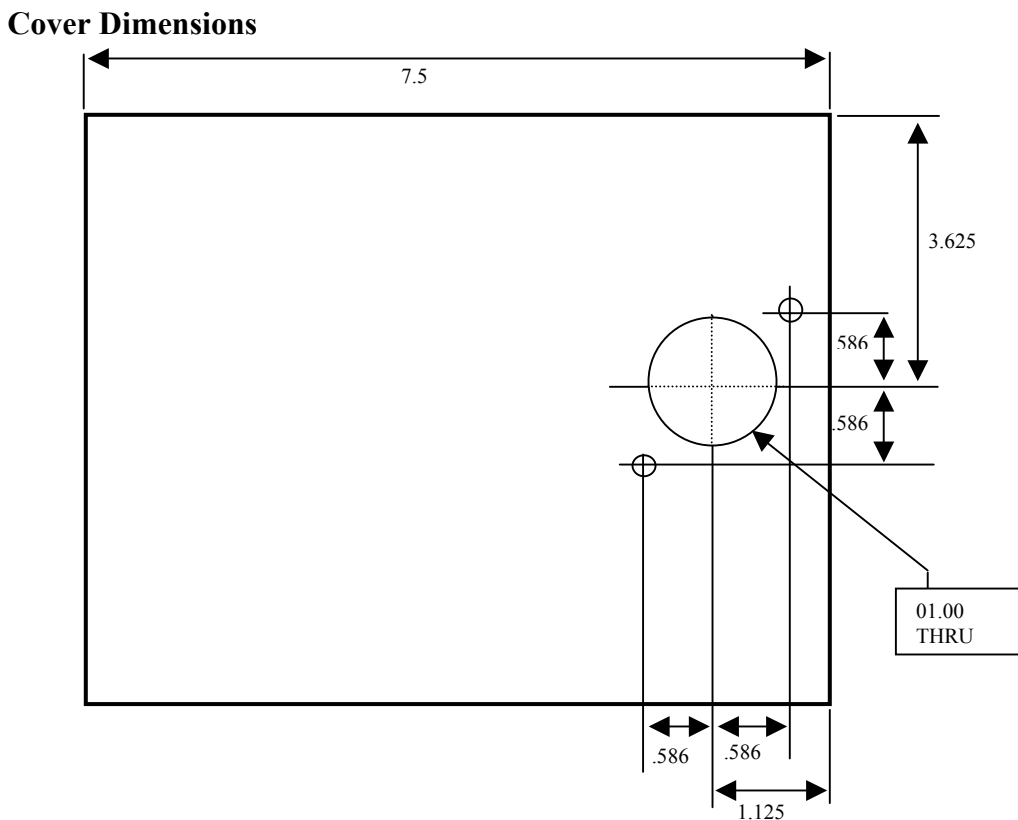
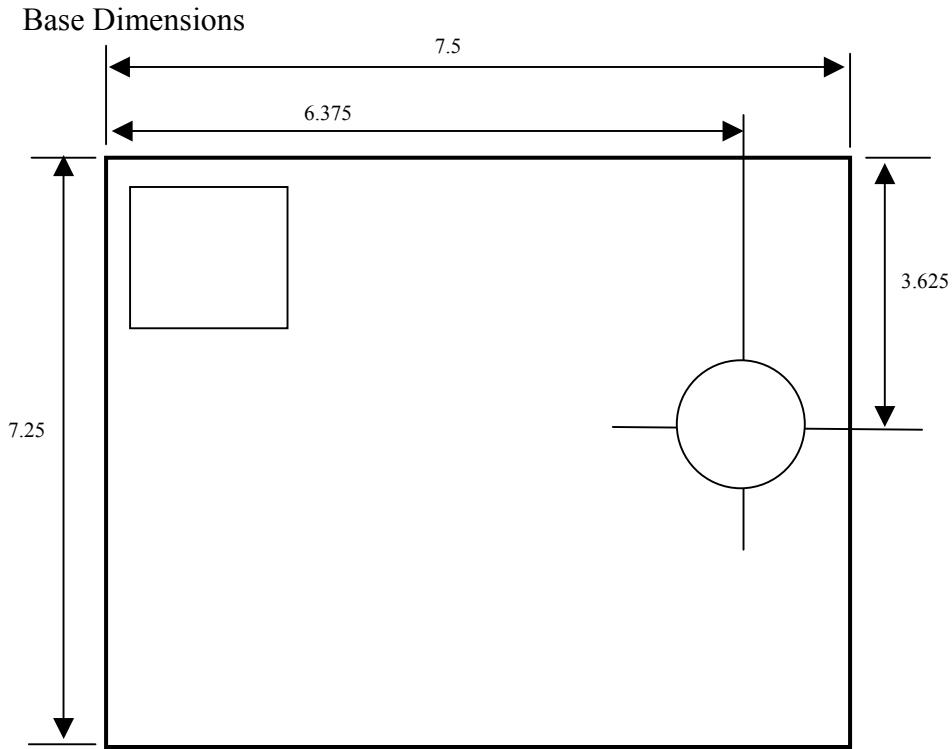




SPECIFICATIONS

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7.1.4. AB304-T, 1 Inch Aperture, 12 Position



**7.2. Electrical**

7.2.1. USB 2.0 Port

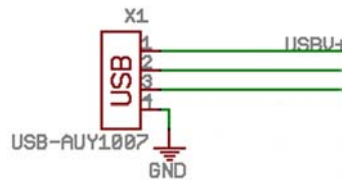
USB2.0 PINOUT

The USB connection requires a cable with a USB type B connector at the filter wheel controller and a computer USB port type A. Spectral Products supplies a USB 2.0 plug type A to plug type B cable for connecting to AT, PS2, and MAC style computers.

**Pin Assignments for the USB Connector at one end of AB300 controller**

**Table 1.** USB Pin Function

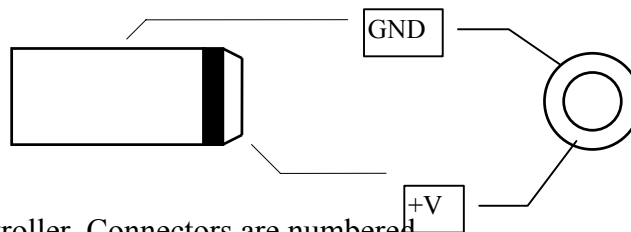
Pin	Function
1	USB Power
2	Data out
3	Data in
4	GND



**Figure 1.** USB Pinout

7.2.2. Power

Tip: +12 VDC, 800mA max  
 Shaft: Ground return



7.2.3. Filter Wheel

Pinout applies at wheel assembly and controller. Connectors are numbered.

DB9 Pin	Function
1	Motor Coil; Yellow
2	Motor Coil; Brown
3	Motor Coil; Red
4	Motor Coil; Black
5	Motor Coil; White
6	Motor Coil; Orange
7	Home Contact
8	Home Contact
9	N/C





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## SPECIFICATIONS

### 7.2.4. Filter wheel assembly to filter wheel controller

Spectral Products PN DK12AT, motor drive cable for AB300-Series

From DB9-F pin	To DB9-M pin
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9

If the Spectral Products-supplied cable is not used, we recommend that the cable use 26 AWG or larger wire, be shielded, and not exceed 12 feet in length.



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