

# **Instruction Manual**

## **Installation and Operation Guidelines for DWL5000XY and DWL5500XY Tilt Sensor Modules**

**(Version 2.0)**

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Digi-Pas® Products were manufactured under ISO9001 & ISO14001 standards, tested to comply by the followings certification bodies:



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# 1. Introduction

## 1.1 Overview

Digi-Pas® DWL5000XY and DWL5500XY are 2-Axis Precision tilt Sensor Modules that specifically designed to be integrated into a machine/equipment/structure for real-time simultaneous monitoring, data acquisition & logging of a plane levelling state, 2D tilt angles & vibration measurements.



Figure 1. (a) DWL5000XY tilt sensor module (b) DWL5500XY tilt sensor module

## 1.2 Technical Specification

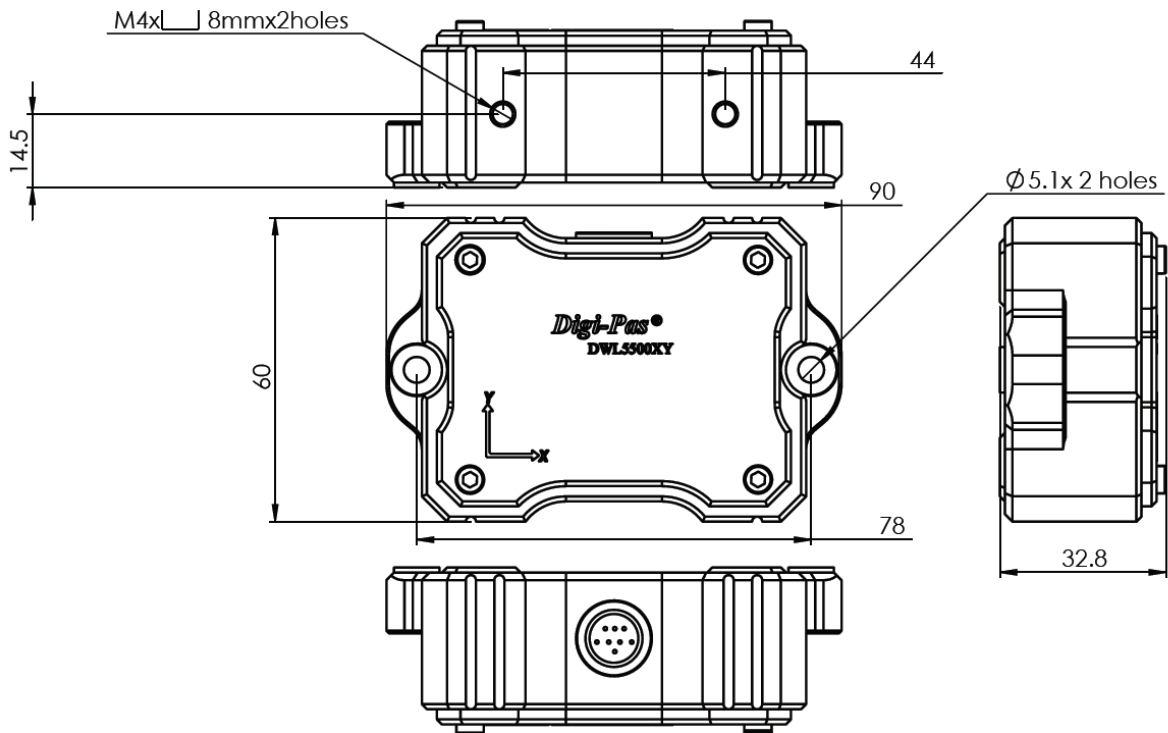
	DWL5000XY	DWL5500XY
Dimension	90mm × 60mm × 30mm	
Weight (Approx.)	400g	600g
Measuring Range	0° ~ ±90.00° (Single-Axis) 0° ~ ±15.00° (Dual-Axis)	0° ~ ±10.000° (Single-Axis) 0° ~ ±5.000° (Dual-Axis)
Resolution	0.01° (175 µm/M) (0.002 in/feet)	0.001° (18 µm/M) (0.0002 in/feet)
Accuracy	± 0.01° at 0° to 2.00° ± 0.03° at other angles	± 0.001° at 0° to 2.000° ± 0.003° at other angles
Vibrometer (Relative g)	1.0g	2.0g
Input Voltage Range	Regulated 9V - 12V DC	
Maximum Load Current	150mA	
Output Mode	RS485 *USB, RS232, RS485 and SPDT Relay *Wireless Bluetooth connectivity (optional)	
Waterproof Rating	IP65	
Operating Temperature	-20°C to +70°C	
Storage Temperature	-30°C to +80°C	

Notes:

- Product specification and appearance are subject to change for product improvement without prior notice.
- \*Control Box is required

Table 1. Technical specification of DWL5000XY and DWL5500XY tilt sensor module

### 1.3 Dimension of the Tilt Sensor Module



\*\*All dimensions are in mm

## 1.4 Pinout of the Tilt Sensor Module and Sensor Cord

Pinout of the circular multipole connector from tilt sensor module is shown in Figure 2.

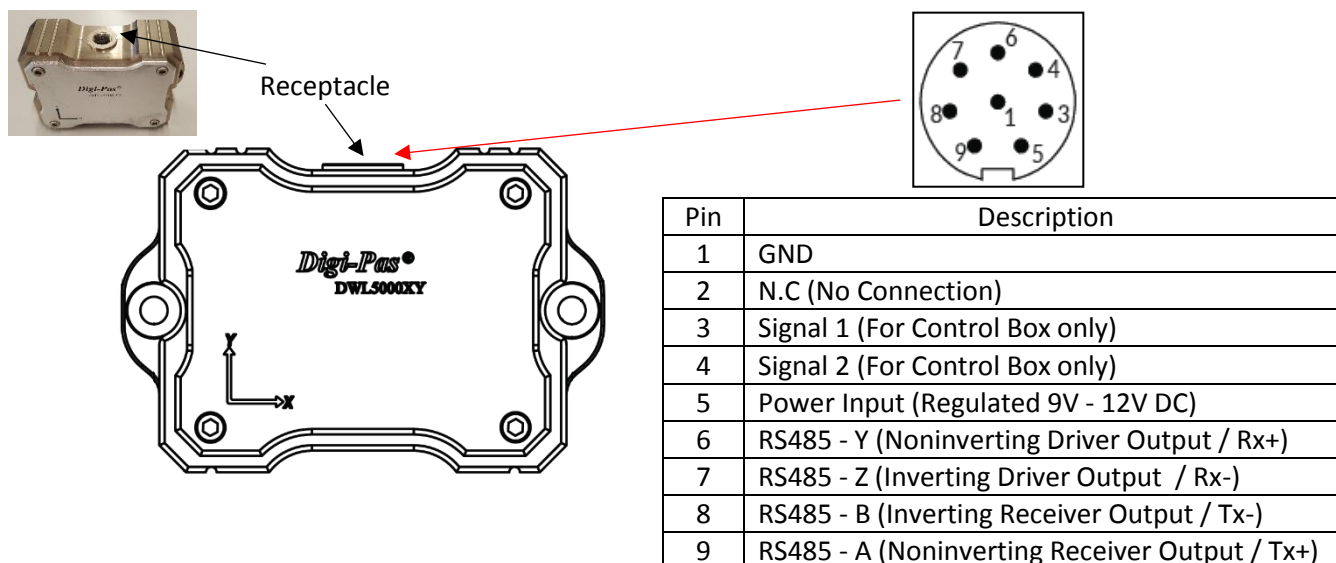


Figure 2. Pinout of the circular multipole connector of the tilt sensor module

Pinout of the sensor cord is shown in Figure 3.

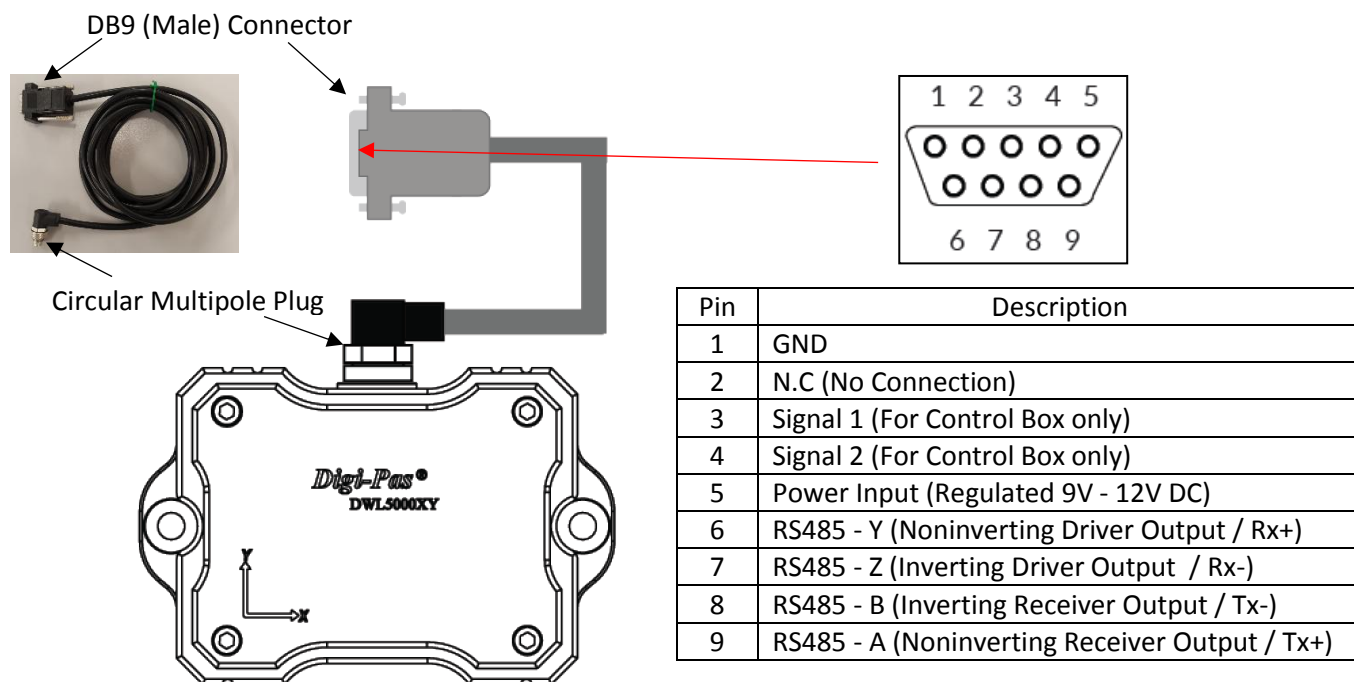


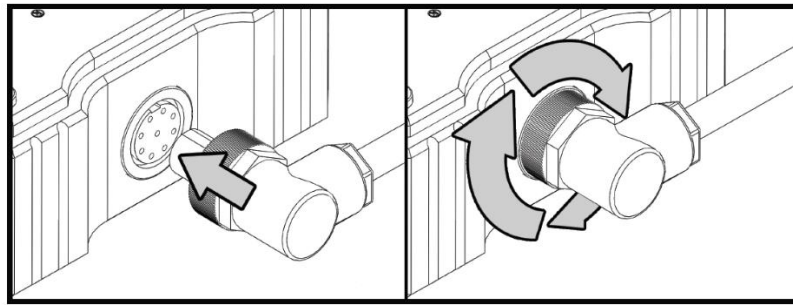
Figure 3. Pinout of the sensor cord

\*Please verify the connection before power on the device. Wrong connection will lead to device failure and may void your warranty.

## 2. Installation

### 2.1 Securing Tilt Sensor Module with Sensor Cord

1. Ensure the circular multipole connector is aligned to the receptacle on the sensor module as illustrated on Figure 4(a).
2. Secure the rotatable ring by turning it clockwise as in Figure 4(b).



(a) (b)  
Figure 4. Steps to secure the tilt sensor module with sensor cord

### 2.2 Mounting the Tilt Sensor Module

1. Two threaded holes (M4) are provided to mount the tilt sensor module in **Single Axis** onto user-defined fixtures/machinery.

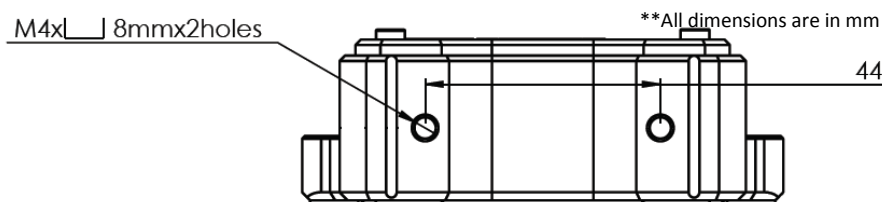


Figure 5. Two threaded holes (M4) is provided to mount the tilt sensor module in Single Axis

2. Two 5.1mm diameter holes are provided to mount the tilt sensor module in **Dual Axis** onto user-defined fixtures/machinery.

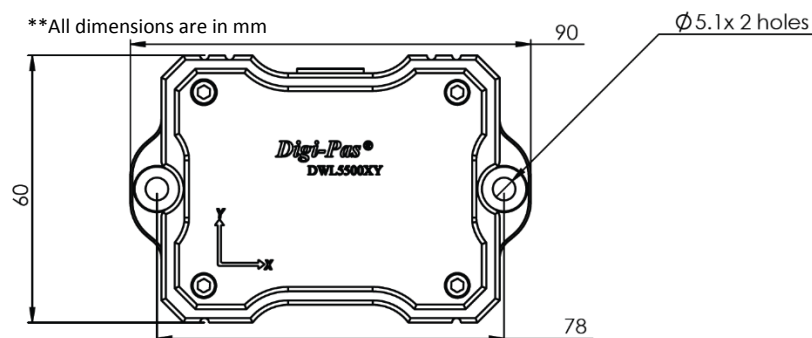


Figure 6. Two 5.1mm diameter holes is provided to mount the tilt sensor module in Single Axis

## 3. Configuration

This section deliberates how to configure the tilt sensor module to communicate with PC, machine or equipment. To configure the tilt sensor module with RS485 converter, user can refer to [3.1 Configuration of Single Tilt Sensor Module with Converter](#). To configure the tilt sensor module with DigiPas Control Box, user can refer to [3.2 Configuration of Sensor Module\(s\) with Control Box](#).

### 3.1 Configuration of Single Tilt Sensor Module with Converter

#### 3.1.1 Materials for the Configuration

- 1 × DWL5000XY or DWL5500XY tilt sensor module secured with sensor cord
- 1 × RS485 converter (4 wires)  
In this example, EasySync Converter (Model number: ES-U-3001-M) is used.
- 1 × 9-12V Power Source
- 1 × custom cable with DB9 (Female) connector

#### 3.1.2 Configuration Setup Procedure

1. Prepare the custom cable. The constructed custom cable and the pinout of the DB9 (Female) connector is shown in Figure 7.

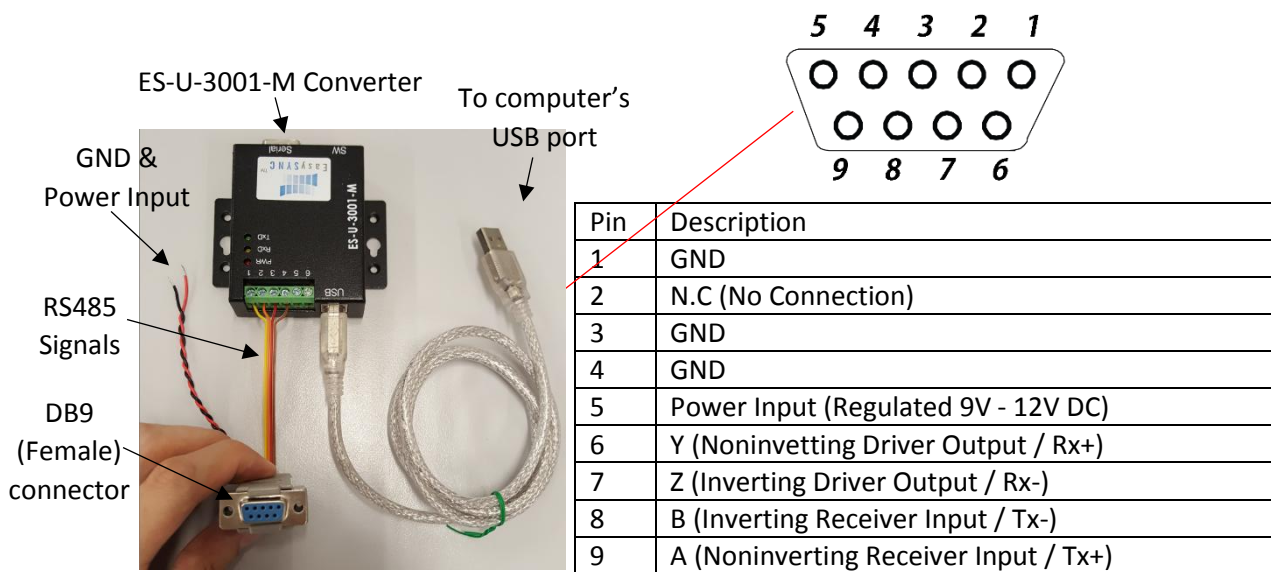


Figure 7. Constructed custom cable and pinout of the DB9 (Female) connector



2. Connect the custom cable with sensor cord and ES-U-3001-M converter as in Figure 8. The connection pinout is illustrated in Figure 9.

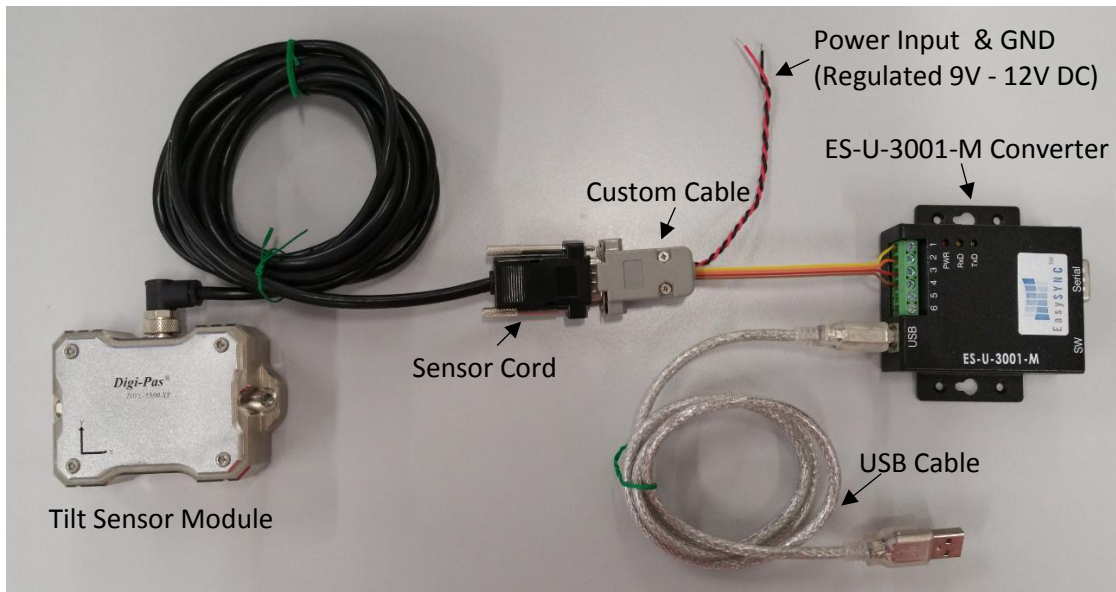


Figure 8. Connection of the tilt sensor module, custom cable and ES-U-3001-M converter

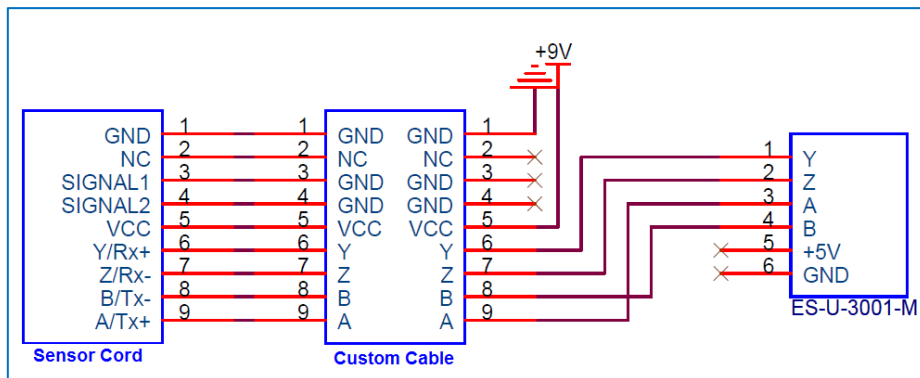


Figure 9. Connection pinout of the sensor cord, custom cable and ES-U-3001-M converter

3. Adjust the 4 selectors on the DIP switch from ES-U-3001-M converter to ON position as shown in Figure 10. Source in regulated 9VDC to 12VDC to the power input. Connect the USB cable to PC, machine or equipment.
4. The configuration is then completed. Proceed to [4. Operation](#) to link up the PC with tilt sensor module.



Figure 10. Connection pinout of the sensor cord, custom cable and ES-U-3001-M converter

## 3.2 Configuration of Sensor Module(s) with Control Box

### 3.2.1 Materials for the Configuration

- 1 × DWL5000XY or DWL5500XY tilt sensor module secured with sensor cord
  - 1 × 12-20VDC Power Source
  - 1 × DigiPas DWL5000XY/DWL5500XY control box
  - 1 × USB cable or 1 × RS232 converter or 1 × RS485 converter
- In this example, EasySync Converter (Model number: ES-U-3001-M) is used.

### 3.2.2 Configuration Setup Procedure

1. Secure the sensor cord with tilt sensor module as stated in [2.1 Securing Tilt Sensor Module with Sensor Cord](#).
2. Connect the sensor cord to the sensor input on the DigiPas DWL5000XY/DWL5500XY control box as shown in Figure 11.
3. Source in regulated 12VDC to 20VDC to the power supply input.
4. The Power LED (PWR) of the control box lights in orange colour. Once the initialization between the sensor module and the control box is completed, the Power LED turns to yellow colour. The Sensor LED (SEN 1, SEN 2, SEN 3, SEN 4) on respective sensor lights up in green colour. If the connection between the tilt sensor module and control box is lost, the Power LED lights up in red colour.

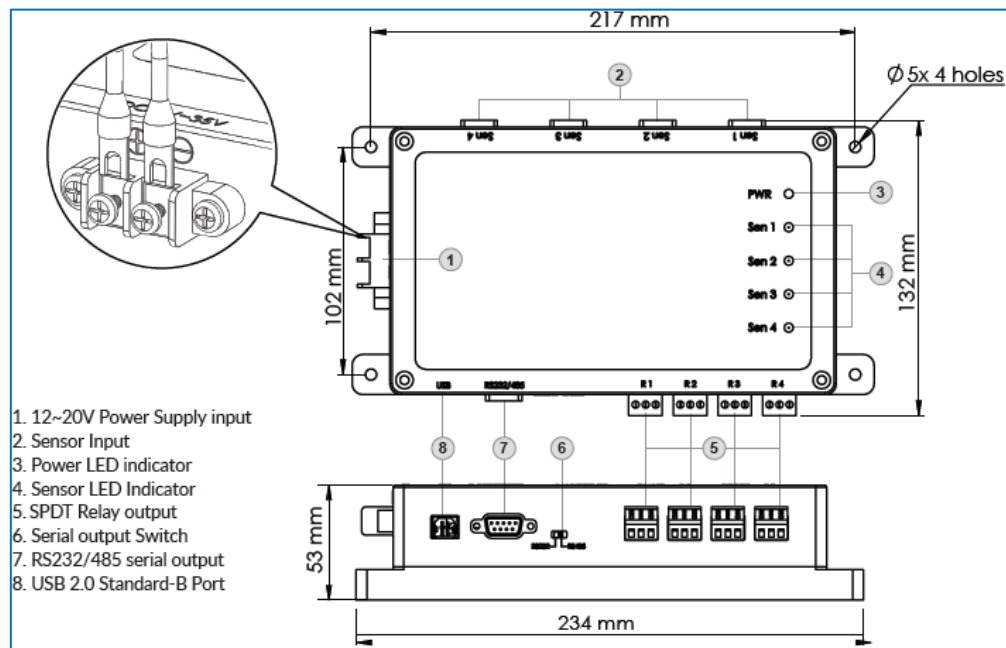


Figure 11. Overview of the Control Box

## 5. Connection Modes

- **USB mode:**
  - a) Connect the USB cable from USB2.0 Standard-B Port on the control box to PC as shown in Figure 12(a).
- **RS232 mode:**
  - a) Select the Serial output Switch on the control box (refer to Figure 11) to RS232.
  - b) Set Pin 1 of the DIP Switch on ES-U-3001-M converter to OFF position.
  - c) Connect cable from RS232/485 serial output on the control box to ES-U-3001-M converter as in Figure 12(b).
  - d) The connection pinout of the RS232/485 serial output is illustrated in Figure 13. The connection pinout of RS232/485 Serial Output with ES-U-3001-M converter is illustrated in Figure 14(a).
- **RS485 mode:**
  - a) Select the Serial output Switch on the control box (refer to Figure 11) to RS485.
  - b) Set Pin 1 of the DIP Switch on ES-U-3001-M converter to ON position.
  - c) Connect cable from RS232/485 serial output on the control box to ES-U-3001-M converter as in Figure 12(c).
  - d) The connection pinout of the RS232/485 serial output is illustrated in Figure 13. The connection pinout of RS232/485 Serial Output with ES-U-3001-M converter is illustrated in Figure 14(b).
- **Bluetooth mode:**
  - a) No physical connection is required to be established.

6. The configuration is then completed. Proceed to [4. Operation](#) to link up the PC with tilt sensor module and control box.

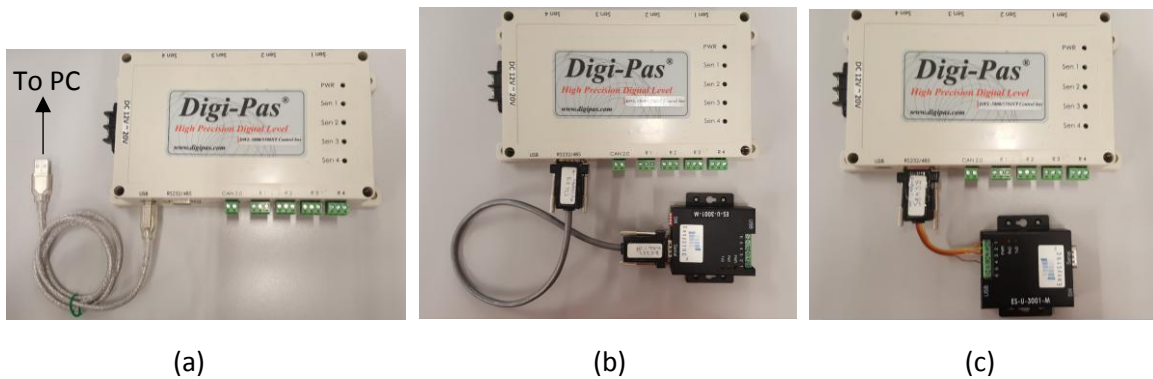
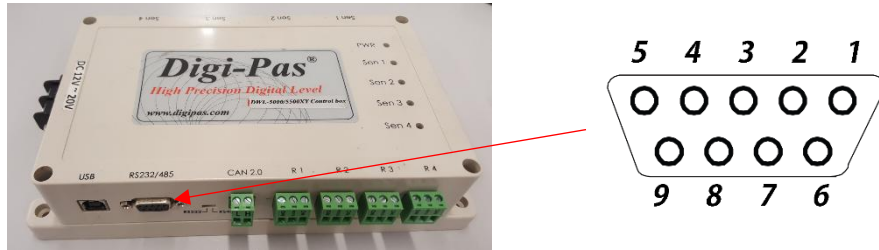
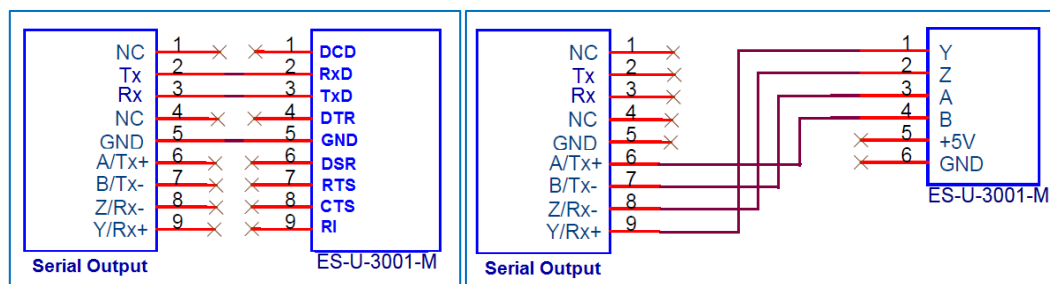


Figure 12. Connection of the control box in (a) USB mode (b) RS232 mode (c) RS485 mode



Pin	Description
1	N.C (No Connection)
2	Transmitter Output (Tx)
3	Receiver Input (Rx)
4	NC
5	GND
6	A (Noninverting Receiver Input / Tx+)
7	B (Inverting Receiver Input / Tx-)
8	Z (Inverting Driver Output / Rx-)
9	Y (Noninverting Driver Output / Rx+)

Figure 13. Connection pinout of the RS232/485 serial output port



(a)

(b)

Figure 14. The connection pinout of RS232/485 Serial Output with ES-U-3001-M converter in  
(a) RS232 mode (b) RS485 mode

## 4. Operation

### 4.1 Installation of the DWL5000XY or DWL5500XY PC Sync Software

1. DWL5000XY or DWL5500XY PC Sync Software Basic Edition CD comes together with the tilt sensor module package. Insert the PC Sync Software CD to the PC, auto-run screen appears as in Figure 15. Click on “Windows OS 64 Bit Install Only” button to start the installation.

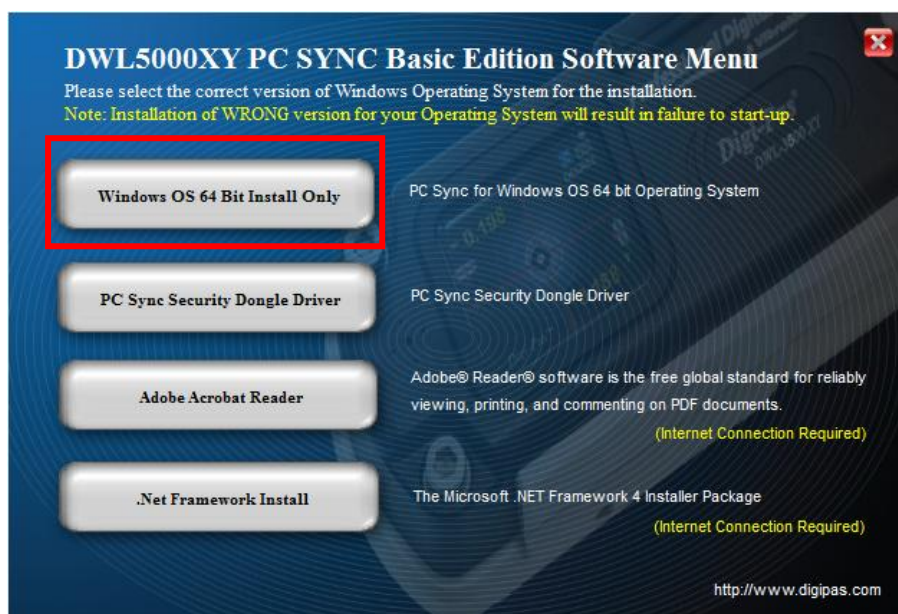


Figure 15. Interface of the software installation page

Alternatively, DWL5000XY or DWL5500XY PC Sync Software Basic Edition can be downloaded from <http://www.digipas.com/firmware-download>. Once downloaded, extract the downloaded ZIP file and click on “DWL5000.msi” to start the installation as shown in Figure 16.



 DWL5000.msi	Windows Installer Package	15,572 KB	No
 setup.exe	Application	185 KB	No

Figure 16. Screen after extraction of the downloaded ZIP file

2. Follow the instructions on the screen, once the installation is completed, shortcut of the DWL5000XY icon will be appeared in desktop as shown in Figure 17. The PC is now ready to connect with the tilt sensor module or control box.



Figure 17. Shortcut of the DWL5000XY PC SYNC

## 4.2 Operation of Single Tilt Sensor Module with Converter

1. Assuming steps stated in [3.1 Configuration of Single Tilt Sensor Module with Converter](#) and [4.1 Installation of the DWL5000XY or DWL5000XY PC Sync Software](#) have been done in this stage. Open PC SYNC software and select RS485 from the drop down menu as shown in Figure 18.

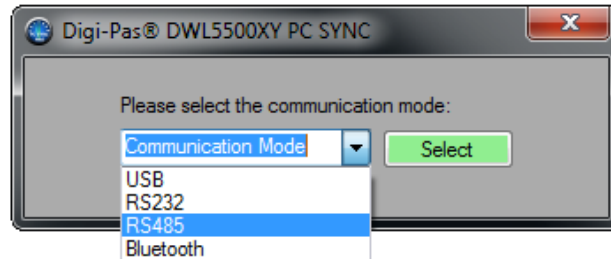


Figure 18. Select RS485 Mode from the drop down menu

2. Next, click "No" button as in Figure 19.

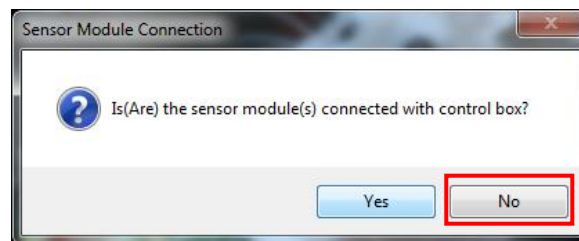


Figure 19. Select RS485 from the drop down menu

3. Select the COM port.

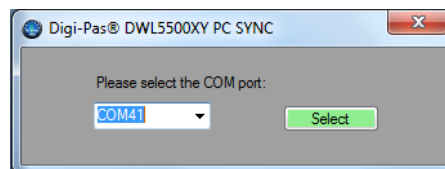


Figure 20. COM port selection

4. Screen as illustrated in Figure 21 appears. The feature icons are enabled and ready for selection (e.g. Single Angle Meter, Dual Angle Meter...). Following is an example when Single Angle Meter feature icon is clicked.

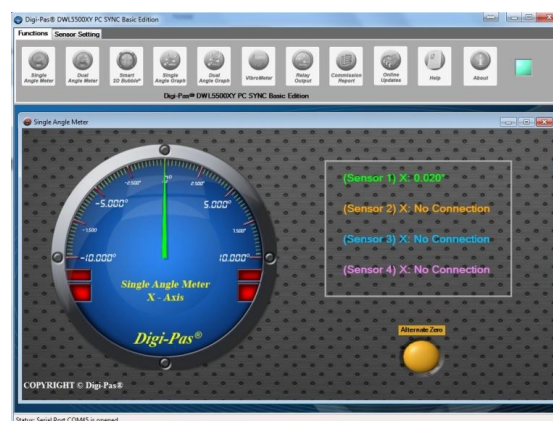
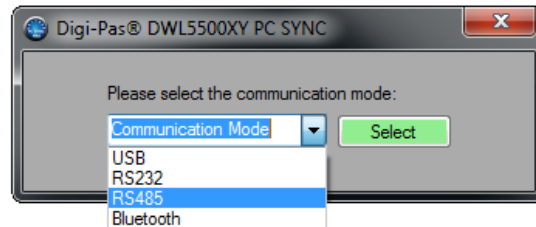


Figure 21. Interface of the PC SYNC software with Single Angle Meter feature



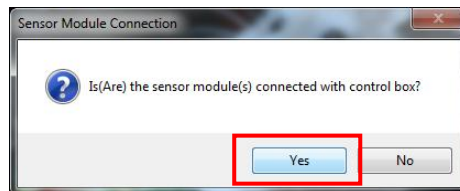
### 4.3 Operation of Sensor Module(s) with Control Box

1. Assuming steps stated in [3.2 Configuration of Sensor Module\(s\) with Control Box](#) and [4.1 Installation of the DWL5000XY or DWL5500XY PC Sync Software](#) have been done in this stage. Open PC SYNC software and select the desired mode from the drop down menu as shown in Figure 22. In this example, RS485 is selected.



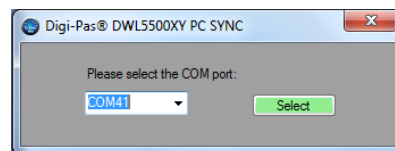
**Figure 22. Select mode from the drop down menu**

2. Next, click "Yes" button as in Figure 23.



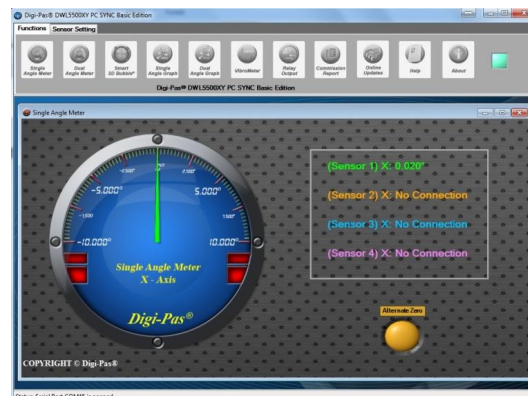
**Figure 23. Select RS485 from the drop down menu**

3. Select the COM port.



**Figure 24. COM port selection**

4. Screen as illustrated in Figure 25 appears. The feature icons are enabled and ready for selection (e.g. Single Angle Meter, Dual Angle Meter...). Following is an example when Single Angle Meter feature icon is clicked.



**Figure 25. Interface of the PC SYNC software with Single Angle Meter feature**

#### 4.4 Direction of the Single-Axis and Dual-Axis Measured Angle

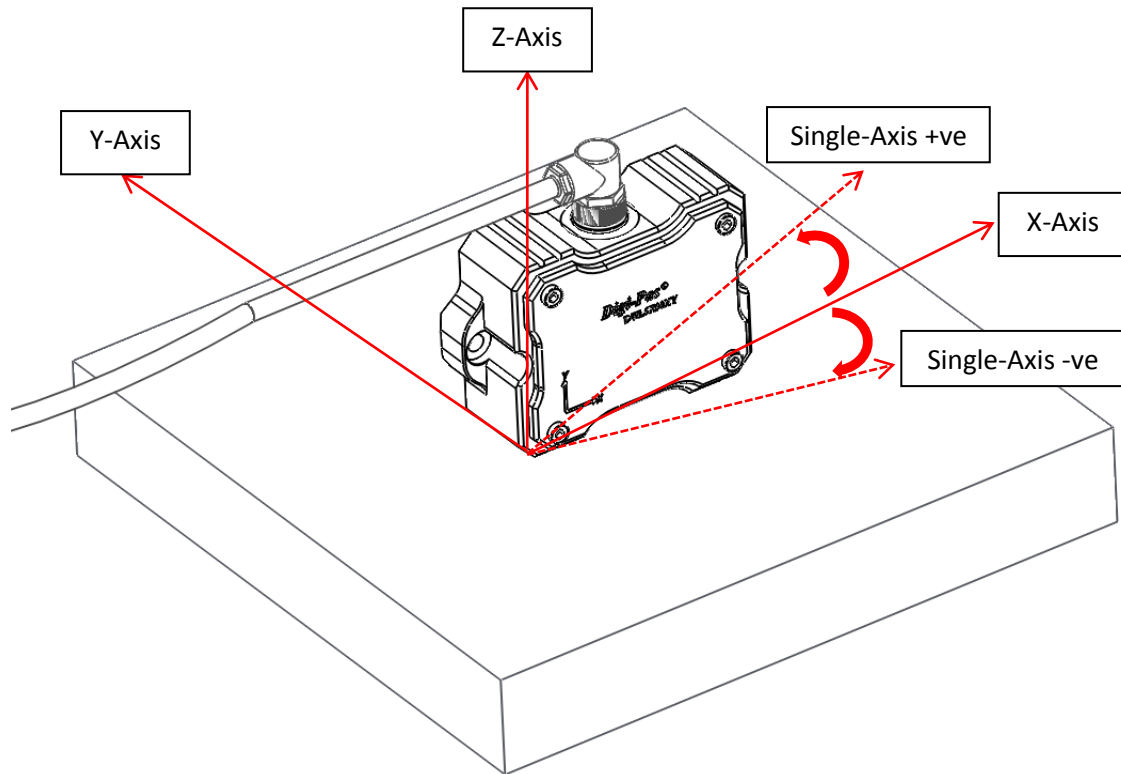


Figure 26. The direction (+ve or – ve) of the Single-Axis measured angle value is indicated as in figure above.

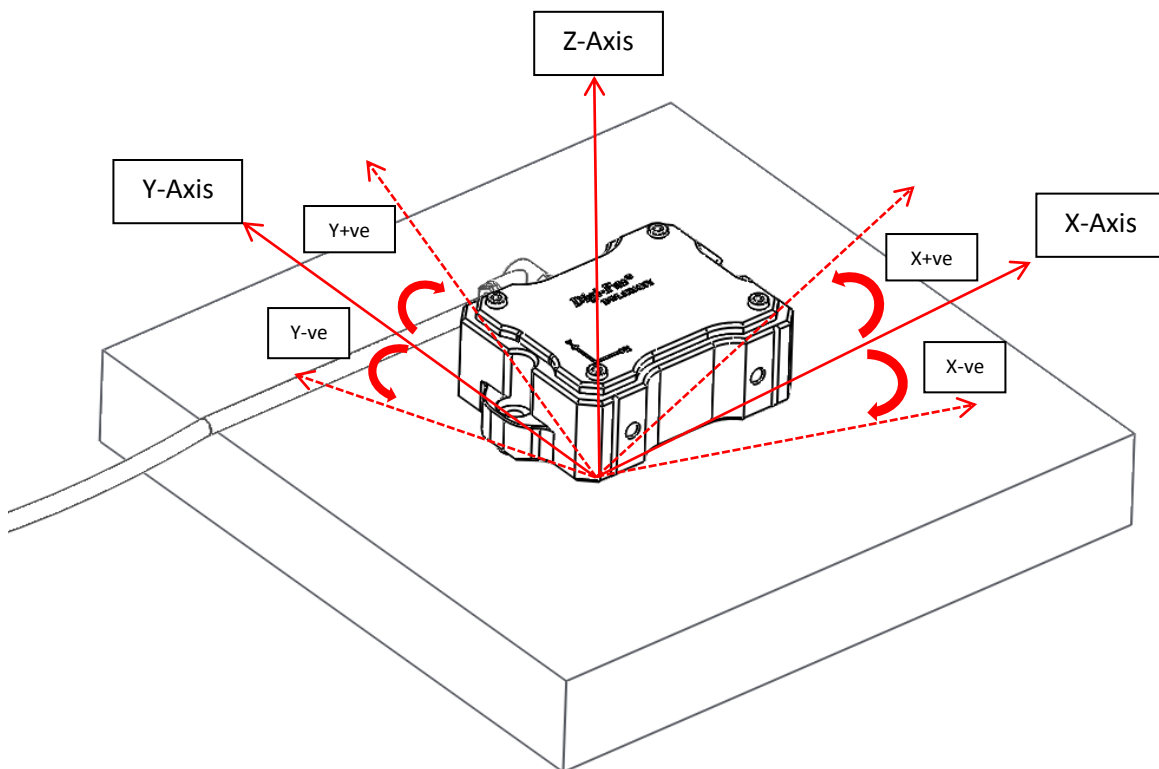


Figure 27. The direction (+ve or – ve) of the Dual-Axis measured angle value is indicated as in figure above.



## 5. Application Notes

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Following Application Notes are useful for user who wish to develop self-configured program.

- Application Notes (1): Dynamic-Link Libraries for DWL5000XY / DWL5500XY Tilt Sensor Module
- Application Notes (2): Serial Communication for DWL5000XY / DWL5500XY Tilt Sensor Module

Above Application Notes are available for download from <http://www.digipas.com/dwl-5000xy> or <http://www.digipas.com/dwl-5500xy>.

## 6. Warranty

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Digi-Pas® 2-Axis Inclination sensor module is warranted to the original purchaser to be free from defects in workmanship and material. JSB Tech will, at its option, repair or replace any defective part which may malfunction under normal and proper use within a period of 2 (two) years from the date of purchase. The forgoing warranty shall not apply to defects resulting from misuse, abuse, assignment, or transfer by the Buyer. Buyer-supplied software or interfacing, unauthorized modification or operation outside of environment specifications for the product. JSB Tech does not warrant that the operation of instrument software, or firmware, will be uninterrupted or error free. The exclusive remedy under any and all warrants and guarantees, expressed herein, and we shall not be liable for damages from loss or delay of equipment uses, consequential, or incidental damage. No other Warranty is expressed or implied. JSB Tech specifically disclaims the implied warranties of merchantability and fitness for a particular purpose.

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