PPT Wand User Guide

WorldViz
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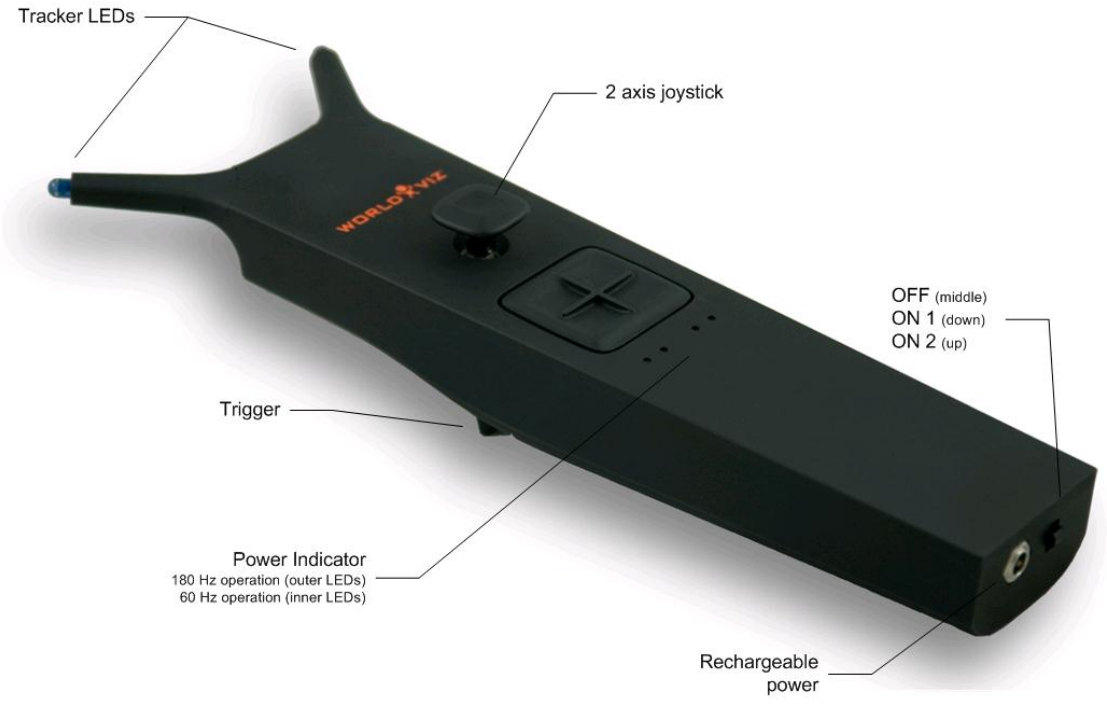
PREFACE

Thank you for purchasing your wireless PPT Wand. Designed to work in conjunction with a WorldViz Precision Position Tracker (PPT), this hand-held tracking device is equipped with dual tracker LEDs for optical orientation assist, an internal high-quality inertial sensor for continuous orientation response, and ergonomic trigger, joystick, and D-pad buttons. The machine aluminum housing is both rugged and elegant in design. The internal rechargeable battery is powerful enough to provide a full working day of tracking performance.

SPECIFICATIONS

OPERATION DIAGRAM



Default marker ID values

By default, your wand has been assigned marker ID values that correspond to a right-hand by the Vizard VR Toolkit (preset ID 3 for left LED & ID 8 for right LED). This impacts default behavior only and you can change the ID settings for any purpose. If you plan to use two wands in the same PPT tracking arena and ordered them together, you'll find that one wand is labeled "R" and then other "L" (preset left hand IDs are 2 for left LED & 7 for right LED).

Switch positions

- Center: OFF
- Down: (standard operation) Single left wing tracked IR LED activated, either left or center left (depending on H or X system) green indicator LED turns on.

- Up: (for calibration of magnetic distortions) Both wing tracked IR LEDs activated, two green indicator LEDs left and right turn on, indicating X mode or H mode.

In addition to the indicator LEDs, the IR LEDs are illuminated by a dim blue light for better identification.

Function of the green indicator LEDs:

- **Left:** H system ID activated for left IR LED (tracked wing LED)
- **Center Left:** X system ID activated for left IR LED (tracked wing LED)
- **Center Right:** X system activated for right IR LED (tracked wing LED)
- **Right:** H system ID activated for right IR LED (tracked wing LED)

The individual programming for the indicator LEDs and IR tracking LEDs are done by WorldViz. The LEDs are factory preset to a specific ID; contact WorldViz support for reprogramming information or more advanced use cases.

On the bottom of the wand are the charging jack and the mode switch. The wand can be charged with the included charger which indicates the charging mode (red) and the fully charged mode (green). The operating time for a wand is approximately 8 hrs and its charging time is approximately 2 hrs.

TECHNICAL PERFORMANCE

Degrees of Freedom	6 (X, Y, Z, yaw, pitch, roll)
Angular Range	Full 360 deg – all axes
Precision	Position: < 0.25 millimeters over 3 x 3 x 3 m volume Rotation: 0.03 degree
Accuracy	Position: <0.25 centimeter over 3 x 3 x 3 m volume Rotation: 1 degree RMS yaw, .25 degree RMS in pitch & roll
Update Rate	180 Hz (PPT H series)
Latency	20 ms (PPT H series)
Range	33 m
Battery	Type: Rechargeable Lithium Ion Endurance: 8 hours typical usage
Weight	460 g
Dimensions	26 cm x 6cm (including the joystick height) x 10cm
LED Mode	Passive & Active (PPT Marker ID); both LEDs can be individually programmed with IDs 1 thru 8
Protocols	TrackD, VRPN, PPT Studio 2008/2010

INCLUDED COMPONENTS

- Wand (wireless)
- USB base station (connects to host PC)
- 8.4 VDC universal charger
- Storage case

RECHARGEABLE BATTERY

Battery specifications:

Capacity	2200mAh
Voltage	7.2V (peak at 8.4V)
Dimensions	2.63 x 1.45 x 0.7 inch
Weight	3.2 oz
Max. charge current	1C (2.0A)
Max. discharge current	2.5C (5A)
Cut off voltage	6V

CONFIGURATION

PPT WAND & RECEIVER SETUP

Standard check list:

- Recharge wand batteries prior to use (4 hours minimum initial charge time)
- Choose to use 1 or 2 tracker LED mode (switch DOWN position:1-light mode is standard; switch UP position: 2-light mode is for optical assist and is only needed in environments that have magnetic interference disrupting the performance of the internal orientation sensor)
- Connect the wand's USB receiver to the PPT computer and be sure the receiver has line-of-sight exposure to the wand's usage area

Pairing a wand with its receiver

If you are using a wand that has never been used on a PPT system before, then you need to follow the "Pairing a wand with its receiver" instructions found under the Support section of the manual. This step is not necessary if you purchased your wand at the same time as you purchased your PPT. After this step is completed initially, this step does not need to be repeated.

Installing receiver drivers

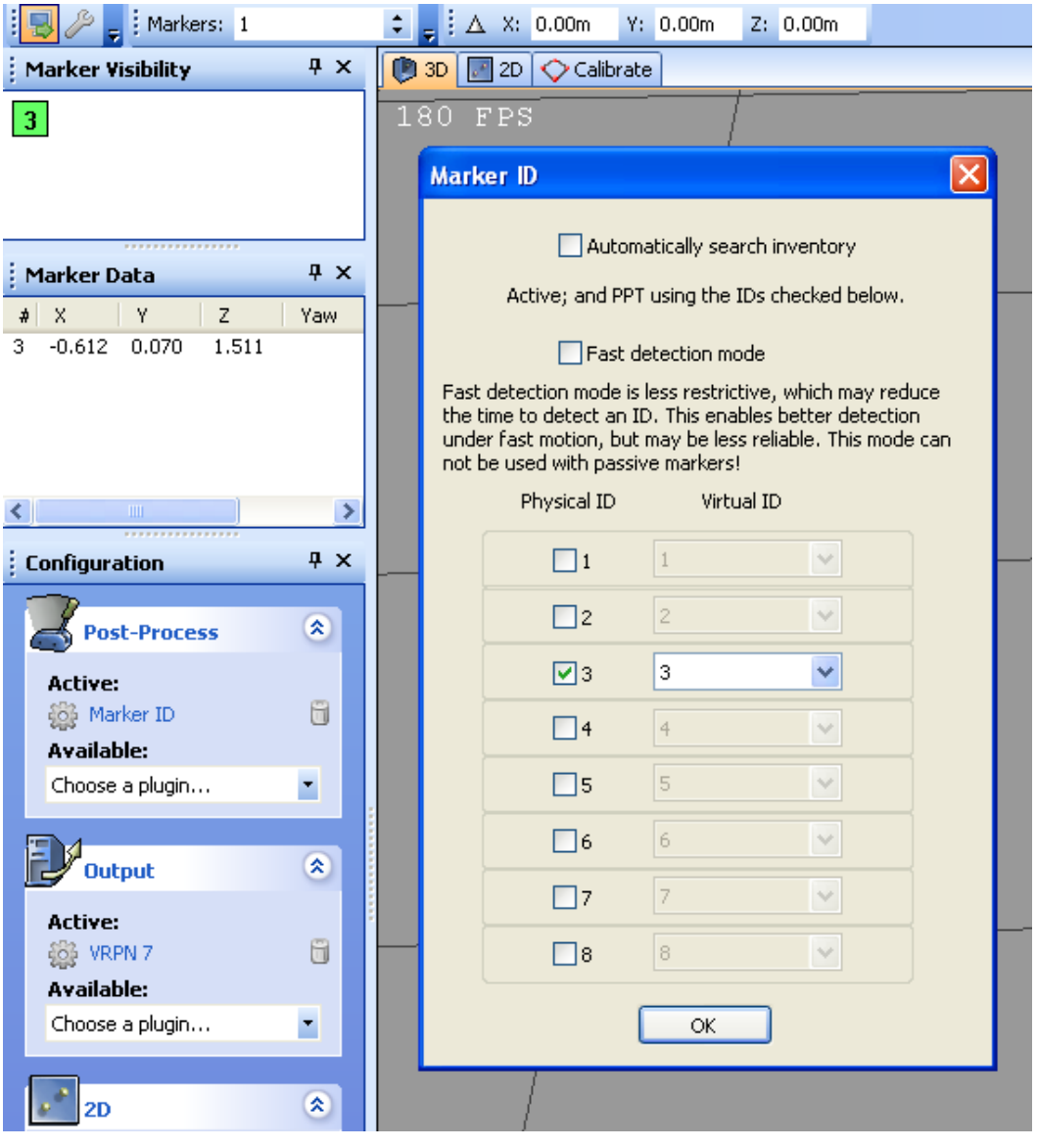
The drivers for wand receiver should be pre-installed on your PPT computer. If you are attempting to use your wand connected directly to a non-PPT computer (e.g., a computer that is used for rendering), or if you have conducted a field upgrade of your PPT to a different machine, then you need to follow the "Installing wand receiver drivers" instructions found under the Support section of the manual.

CONFIGURING WORLDVIZ PPT SYSTEM FOR WAND USE

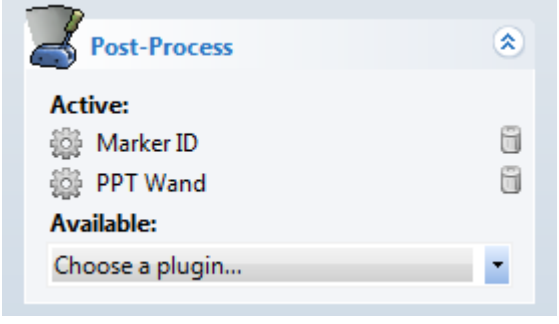
Enabling the wand using a single light with Marker ID

1. Turn the wand on (1 light mode is switch down position) before starting PPT Studio (because PPT Studio automatically attempts to connect to the wand if it was last used with a wand connected)
2. Place the wand on a stable, non-metallic surface with joystick pointing up
3. In the Configuration pane, add "Marker ID" under Post-Process options if it's not already added using the dropdown menu. Note: if you have PPT Studio version that is older than 3.21.5791 (press the "Help" and choose "About PPT" to check the version), the Marker ID plug-in must be topmost in your list of plug-ins (drag to reorder if necessary). If you have a factory configured wand, its Marker ID is 3 for single light use (right hand).

4. Click on the Marker ID plug-in and uncheck "Automatically search inventory" if it is currently selected. Now check 3 under Physical ID and verify that 3 is selected under Virtual ID. NOTE: If you're also tracking other markers in your scene, i.e. PPT Eyes, you must now use the Marker ID plug-in to establish the number and ID of the other markers. For example, click ID 1 and 2 for the PPT Eyes and 3 for the PPT Wand. See your PPT manual for details about Marker ID. Hit "OK" when you complete the selections.



5. In the Configuration pane, add "PPT Wand" under Post-Process options if it's not already added using the dropdown menu. It might take few seconds to load. For PPT Studio version older than 3.21.5791, this plug-in must be beneath Marker ID in your list of plug-ins.



6. Click on Post-Process / PPT Wand, and add an orientation sensor if none is presently added. To add a sensor, press the "Add" button and enter the specific port number (you can check it through Windows' Control Panel / System / Device Manager / Ports / USB Serial Port (COM X), where the X is the port number), or you may also type 0 (zero; auto-detect) for the port number if you have only one wand and no other intersense device. Also select the proper light number and hit "Add" in the end.
7. If for any reason that you want to change the light number, you can configure the light number (in Post-Process / PPT Wand) by right-clicking the row showing the wand data and choose Set light. Under normal circumstances, this will be 3 (the marker ID of your wand). Hit "OK".
8. The current screen should be similar to the one shown below and finally hit "Close" to complete the PPT Wand configuration.

NOTE: For magnetic compensation (2 light) mode of the PPT Wand, please refer to section "Compensation for magnetic distortion" for further details.

Below are the explanations of the parameters shown in the columns of the Sensor Option window (figure is shown below):

Port: The USB port number for the connection of the base station

Light: The marker ID number (work with Marker ID plug-in)

Yaw, Pitch, and Row: The orientation data of the PPT Wand

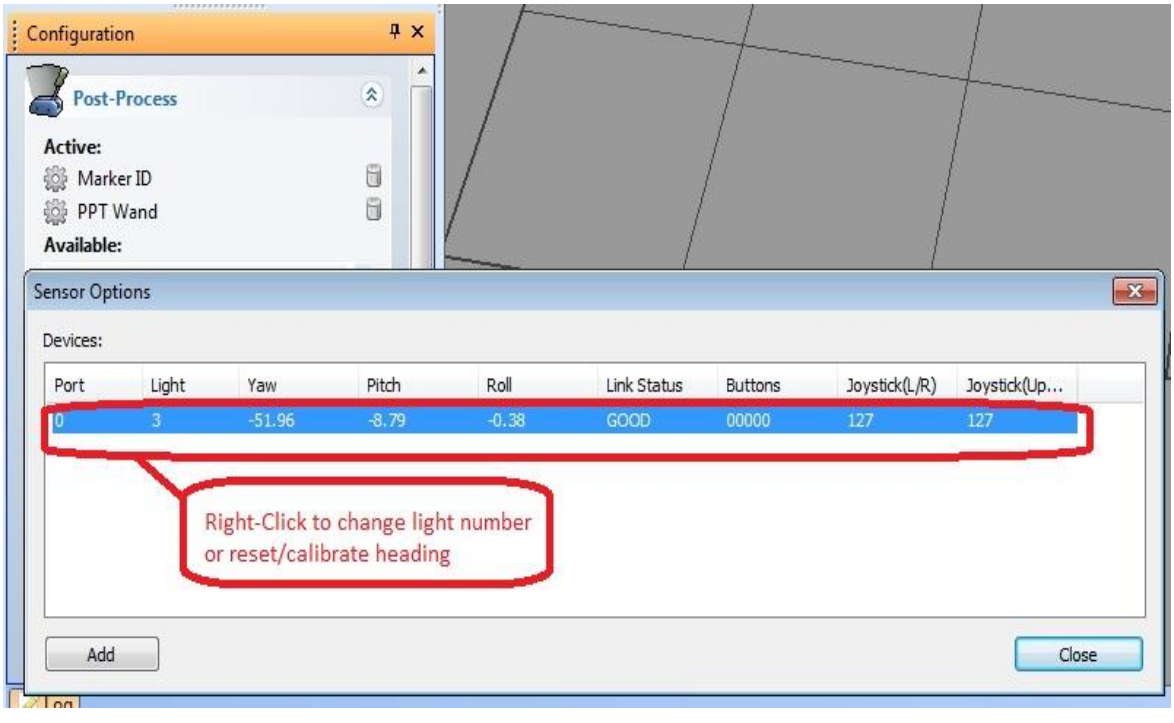
Link Status: GOOD/BAD/NONE, 3 different link status. GOOD means the connection is stable enough to provide the optimal data transmission speed. BAD means the

connection is not stable and data might be lost during operation. NONE means no data is transmitted between base station and wand. This happens when PPT wand is out of receiver's detection range or turned off during the operation (or out of battery).

Buttons: 5 binary digits represent 5 different buttons individually. Each digit will show 1 when the corresponding button is pressed, otherwise, it shows as 0 (zero).

Joystick(L/R): The normal value is around 127. The value ranges from 0 to 255 when the joystick is moved from left to right.

Joystick(Up/Down): The normal value is around 127. The value ranges from 0 to 255 when the joystick is moved from bottom to top.



Reset/Calibrate wand's virtual North

1. Since the wand uses a magnetic sensor in the standard 1 light mode, you need to reset the straight ahead or North direction.
2. Click on Post-Process / PPT Wand
3. Right-click on the row showing the Wand data and select "Reset"
4. By either holding the wand or putting it on a flat surface, you want to make sure the wand is pointing toward the virtual North (usually the same as the

+Z-direction you used for PPT calibration). Follow the Reset Wizard to completely calibrate your wand
5. Hit "Close." Your calibration is now complete and is stored; the next time you run PPT you do not need to reset the wand

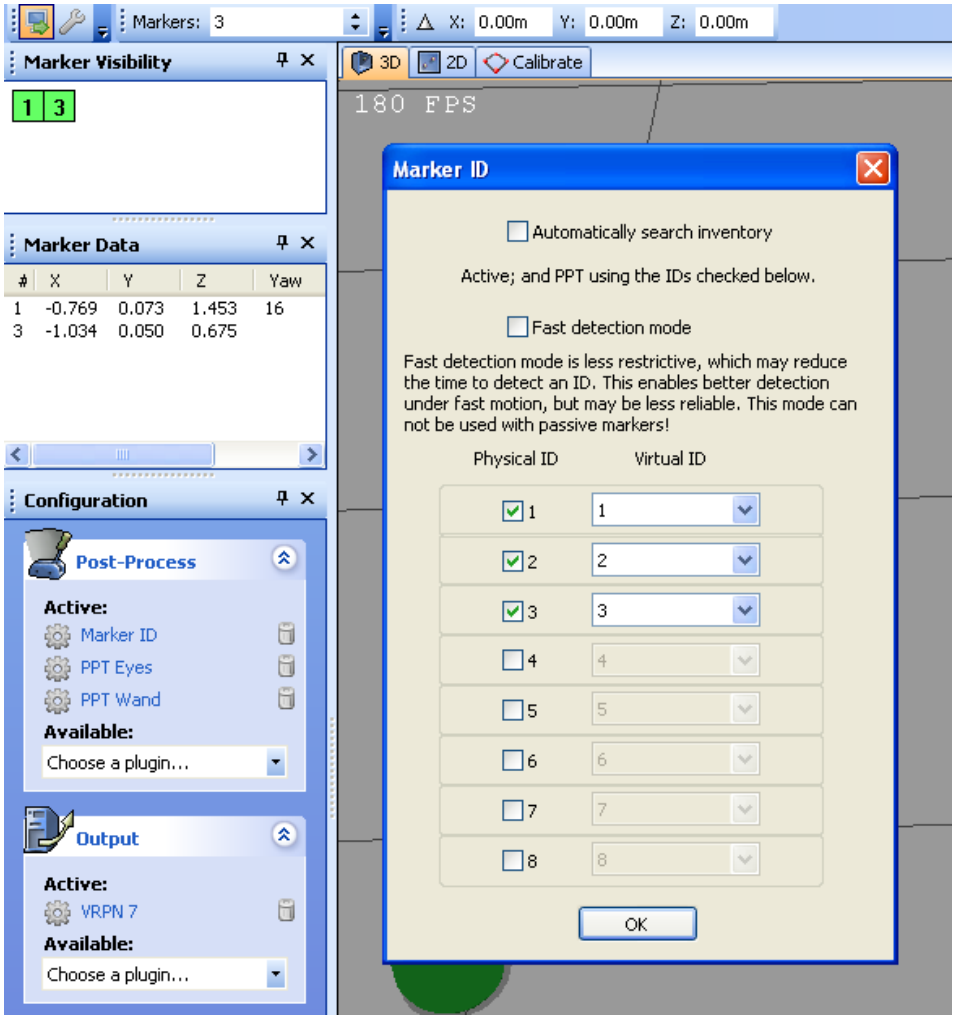
PPT WAND WITH PPT EYES

PPT Eyes is a device that provides position and orientation tracking of a user's head and is typically mounted onto a pair of 3D glasses for viewing a 3D projection screen. PPT Eyes is designed to work in conjunction with PPT Wand, and together they provide a rich head and hand interactive solution for CAVE and powerwall environments.

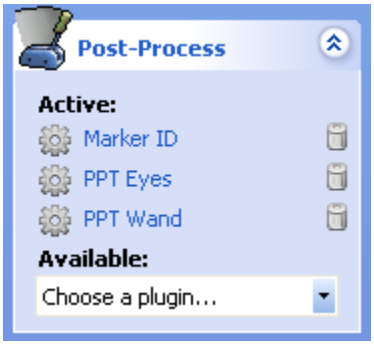
Using PPT Eyes in conjunction with PPT Wand is as simple as combining the configuration for the two stand-alone devices. Below the configuration technique for PPT Eyes is provided. If the Marker ID and PPT Wand plug-ins have not been set up, it is recommended to follow section 2.2 "Configuring WorldViz PPT system for wand use" at this stage. For PPT Studio version older than 3.21.5791, while PPT Eyes do not need to be configured first, its plug-in should always be moved to below the "Marker ID" and above the "PPT Wand" in the Post-Process stack (drag to reorder).

Configure PPT Eyes

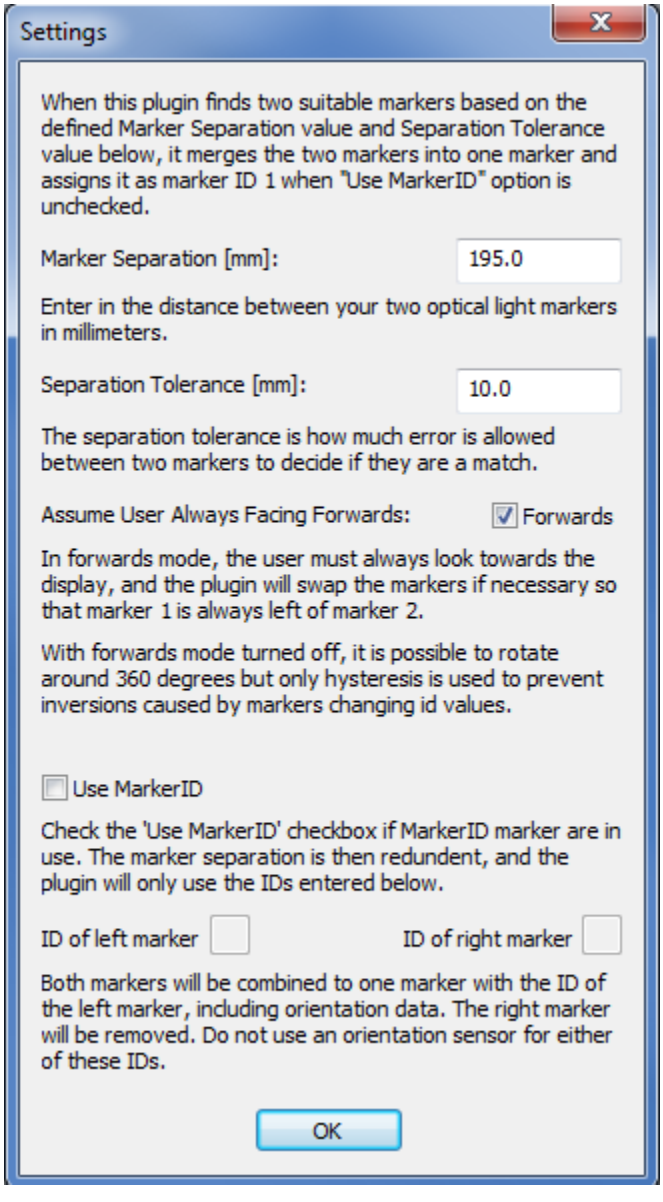
1. Assuming the PPT Wand has been setup followed by the instructions on previous section, "Configuring WorldViz PPT System for Wand Use."
2. Turn on PPT Eyes (slide the micro-switch on the back to the top)
3. Place PPT Eyes in the tracking field where both LED markers can be seen.
4. Correctly set PPT Studio number of markers (the Eyes count as 2 additional markers so adjust accordingly)
5. With standard PPT Eyes and Wand configuration, you would have 3 markers in total. Remember to select additional 2 marker IDs in the Marker ID plug-in. Normally, we uncheck the "automatically search inventory" and manually select physical ID 1, 2, and 3 for the PPT eyes and wand. Add "Marker ID" under Post-Process options if it's not already added. NOTE: It is not necessary to add Marker ID plug-in if you use PPT Eyes alone.
6. In the Configuration pane, add "PPT Eyes" under Post-Process options if it's not already added using the dropdown menu.



7. For PPT Studio version older than 3.21.5791, drag to re-order PPT Eyes so that it is below "Marker ID" and above "PPT Wand" in the Post-Process.



8. You should not need to configure the PPT Eyes plug-in as its default settings are correct for nearly all uses. The default value is shown below.
9. You should now see orientation data shown for marker ID # 1. This is the ID data computed from the PPT Eyes' two LED markers.



CONFIGURING VIZARD VR TOOLKIT

This section describes how to use with wand with Vizard VR Toolkit. This usage described here bases the Vizard side connection on the viztracker utility. This is the recommended method because it provides considerable functionality without any required Vizard-side programming. To use the wand without viztracker, please see "Advanced usage" further in next section of the manual.

Configure viztracker

Viztracker is a module in Vizard that abstracts the functionality of trackers and various inputs sensors from the hardware implementations. To use viztracker, a Vizard application needs to call the appropriate functions, which in turn will use your stored viztracker configuration settings to activate the appropriate hardware devices. Configuring viztracker is accomplished by running the viztracker_setup.py script which should be included in your local installation of Vizard (you can expect to find this here: C:\Program Files\WorldViz\Vizard4 [or Vizard30]\python\viztracker.py).

To properly configure viztracker for a PPT Wand, use the following settings:

- **Display:** any setting—does not affect Wand
- **Tracker:** set to WorldViz / PPT *
- **Input:** set to WorldViz / VRPN Wand * (any option for hands)
- **Avatar**: any setting—does not affect Wand

These are recommended settings; using these settings allow for all wand configurations to be stored on PPT and be removed from the rendering application. The data are transmitted from PPT thru VRPN to the Vizard application.

NOTE: If you set viztracker to connect to a right hand, then you need to have PPT configured with marker ID set to 3. For the left hand, you set it to 2 instead.

Vizard and viztracker together

To test out your wand in a Vizard-based application that uses the viztracker configuration that you created above, please run the script called "WandTester.py" that can be found in your "WorldViz / PPTStudio / Vizard Examples" program files folder.

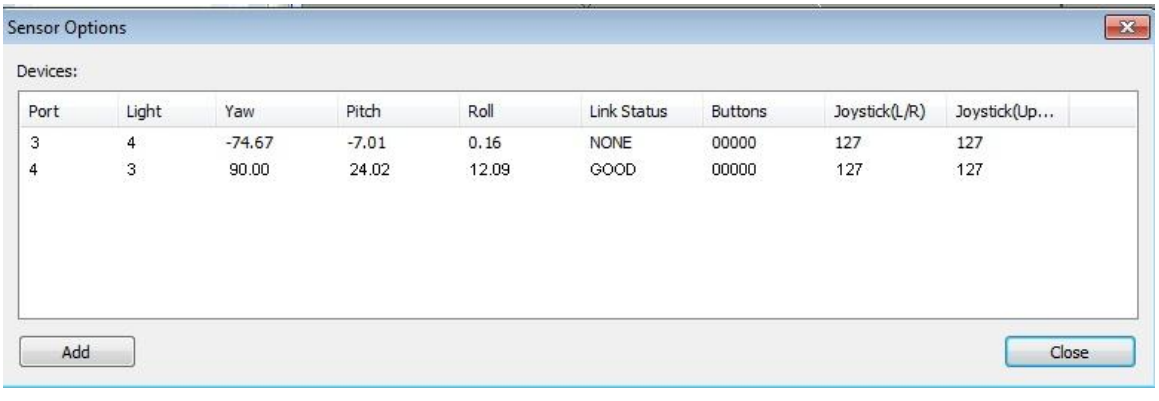
When you run this program, its default view will be to center the tracked hand on the screen. You can use the onscreen control buttons to swap the view to that of the PPT tracker.

CONFIGURING MULTIPLE PPT WANDS OR WITH IC2 DEVICES

PPT Studio supports up to maximum of 4 PPT wands per receiver operating simultaneously. The configuration is similar to the single wand set up except for that the marker ID of the wands need to be adjust accordingly. For example, if you have 3 wands working at the same time, you may have one wand with default marker ID 3 (assume operating at one-light mode) and the other 2 wands with the other 2 unused marker ID (ie. 4 and 5.) However, each wand has to go through the pairing process with its receiver. If you have a wired IC2 connected instead, there is no pairing process needed. Please read the "Pairing a Wand with its receiver" section for detail.

CONFIGURING MULTIPLE WANDS

Please first try to follow the previous section "Configuring WorldViz PPT System for Wand Use" and repeat the procedure for the additional wands you intend to use. The final Sensor Option window will look like below.



CONFIGURING PPT WAND WITH IC2

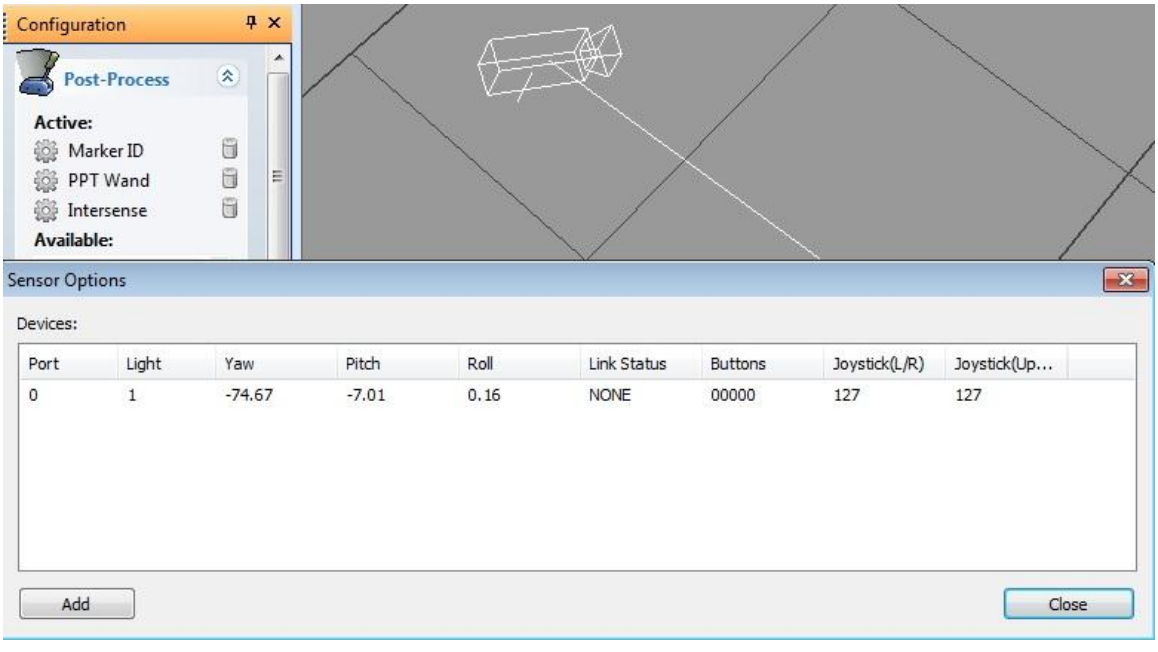
Once you have the wand(s) setup correctly (follow the "Configuring WorldViz PPT System for Wand Use"), follow the procedure below.

1. Select the "Intersense" plug-in in the Post-Process section under the Configuration panel.

2. Click on the Intersense plug-in and click on "Add" button in the Sensor Option Window.

3. Similar to adding a PPT wand, fill out the port number for the IC2 device and choose light number as 1 (in most of cases, we use IC2 for a HMD which has the head tracking light number 1.) You may choose the other light number for combining the orientation data of IC2 with different Marker ID.

4. Hit "Close" once you finish adding the IC2 device.



ADVANCED USAGE

RETRIEVING WAND DATA

VIZARD DATA ACCESS (DIRECT WITHOUT VIZTRACKER)

Use the sample Vizard scripts to connect to your PPT Wand. These samples demonstrate how to connect and obtain wand data without using the viztracker configuration system provided in Vizard R4.

Sample Code: Use this for wands connected via PPT Studio

```
#first add the intersense
isense = viz.add('intersense.dle')

#create a tracker object - *note port number(0 is auto scan and can be slow )
wandTracker = isense.addTracker(port=0)

#euler angle of the wand
eul = wandTracker.getEuler()

#analog joystick data
xy = wandTracker.getJoystickPosition()

#callback function for buttons
def onSensorDown(e):
      if e.object is wandTracker:
            print 'Button', e.button, 'down'
viz.callback( viz.SENSOR_DOWN_EVENT, onSensorDown )

#or in a timer function you can see if a certain number is down
wandTracker.isButtonDown(1) #checks to see if button 1 is down

#you have to get position data from PPT
vrpn = viz.add('vrpn7dle')

#define markerID of Wand in PPT
markerID = 3
posTracker = vrpn.addTracker('PPT0@localhost',markerID-1)

#now you can merge the isense tracker and the posTracker to create a 6DOF tracker
finalTracker = viz.mergeLinkable( posTracker, wandTracker )
```

Sample Code: Use this for wands connected directly to Vizard

```
#add the vrpn extension
vrpn = viz.add('vrpn7dle')

#define Machine Address of PPT machine
hostname = 'localhost'

#define markerID of Wand in PPT
markerID = 3

#create a tracker object for the 6DOF data
tracker = vrpn.addTracker('PPT0@'+ hostname, markerID-1)

#create analog device for the joystick
analogDev = vrpn.addAnalog('PPT_WAND%d@%s:%d' % (markerid, hostname,
8945))

#create button device for the buttons
buttonDev = vrpn.addButton('PPT_WAND%d@%s:%d' % (markerid, hostname,
8945))
```

VIZARD DATA ACCESS (VIA VIZTRACKER)

Sample Code: Use this for wands configured with viztracker

```
Import viztracker
Viztracker.go()

# for the wand associated with the right hand
myWand = viztracker.get('righthand').wand

#this will return a vizwand.Wand object
```

Sample Code: Use this for wands configured with viztracker

```
import vizwand

# create a vizwand.Wand object by passing the hostname of the PPT computer and
the marker ID associated with the wand.
```

```
# If hostname is left blank it'll default to 'localhost'. If id is left blank, it will automatically check IDs 1 through 8 for a valid wand.
myWand = vizwand.Wand( hostname='PPT-MACHINE', id=3)

# if connecting directly to the Vizard machine and not through PPT, pass the port number as well. You will still need the hostname and id of the wand if you're receiving position data from PPT.
myWand = vizwand.Wand(hostname='PPT-MACHINE', id=3,port=1)

# myWand has two objects myWand.tracker and myWand.button
# myWand.tracker can return 6DOF tracker information using getPosition(), getEuler(), getMatrix(), etc and is a linkable object.
# myWand.tracker can also return joystick information [x,y,0] using getJoystickPosition()
# callbacks for button events
def onButtonDown(e):
     if e.object is myWand.button:
          print e.button
viz.callback( viz.SENSOR DOWN EVENT, onButtonDown )

def onButtonUp(e):
     if e.object is myWand.button:
          print e.button
viz.callback( viz.SENSOR UP EVENT, onButtonUp )

# print tracker and joystick information.
def show6DOFandJoy():
     print '6DOF:', myWand.tracker.getPosition(),
     myWand.tracker.getEuler()
     print 'Joystick:', myWand.getJoystickPosition()
vizact.onkeydown(' ', show6DOFandJoy )
```

VRPN (GENERIC)

The Virtual-Reality Peripheral Network (VRPN) is the preferred method of connecting to your host application. The Ethernet-based network connection is versatile and offers lower latencies than serial communication, especially for large numbers of markers and high update rates. If your host application does not currently support a VRPN connection, adding this functionality is straightforward. Both VRPN6 and VRPN7 are supported.

Instructions:

1. Please make sure you have a calibrated PPT system and have the PPT Studio running.

2. In PPT Studio settings, select the correct number of markers for tracking and select the VRPN 7 plugin as the Output plugin in the Configuration panel.

3. If PPT Wand is used, please make sure you have both MarkerID and PPT Wand plugins selected. For the MarkerID plugin, make sure the PPT wand is detected by the PPT with the correct ID (default ID number 3 for single LED mode [power switch DOWN]). For the PPT Wand plugin, please make sure the light number showing in the Sensor Option window is corresponding to its marker ID number and is in connected mode (if you can see the dynamically updated yaw, pitch, and roll data).

4. Press the TALK button (top left corner of the PPT Studio window) if it is not ON.

5. You should be able to access the PPT data through VRPN from your own application by using the sample code below. In the following sample C++ code, you can retrieve the position, orientation, button, and joystick data of a PPT Wand. Similarly, you can just keep the tracking related functions if it is only for regular marker tracking.

    a. You'll need the VRPN library (header files) from this site.

    http://www.cs.unc.edu/Research/vrpn/index.html
    Or download directly from
    ftp://ftp.cs.unc.edu/pub/packages/GRIP/vrpn

    b. the Wand address for the analog and button data: The address format is "PPT_WANDX@MachineAddress:8945" where X is the marker ID number assigned to the Wand in PPT (ID is 3 in our sample code) and MachineAddress is the IP or computer name of the PPT machine. You must specify port **8945** since the Wand data is sent through a different port than the default VRPN port. In PPT again, VRPN7 output must be selected under the output plugin of the configuration pane.

    c. 6DOF info is sent as "PPT0@MachineAddress"

Code Sample for VRPN connecting to PPT Studio

```
#include <stdio.h>
#include <conio.h>
#include <vrpn_Analog.h>
#include <vrpn_Button.h>
#include <vrpn_Tracker.h>
#define ANALOG_ADDRESS "PPT_WAND2@10.24.5.240:8945"
#define BUTTON_ADDRESS "PPT_WAND2@10.24.5.240:8945"
#define TRACKER_ADDRESS "PPT0@10.24.5.240"

static void VRPN_CALLBACK handle_analog(void *userdata, const
vrpn_ANALOGCB a)
{
      for(int i = 0; i < a.num_channel; ++i) {
            fprintf(stdout,"channel %d: %.2lf\n",i,a.channel[i]);
      }
}

static void VRPN_CALLBACK handle_button(void *userdata, const
vrpn BUTTONCB b)
{
      fprintf(stdout,"button %d: %d\n",b.button,b.state);
}

static void VRPN_CALLBACK handle_tracker_pos_quat(void *userdata, const
vrpn_TRACKERCB t)
{
     fprintf(stdout,"tracker %d pos: %.2lf %.2lf
     %.2lf\n",t.sensor,t.pos[0],t.pos[1],t.pos[2]);
     fprintf(stdout,"tracker %d quat: %.2lf %.2lf %.2lf
     %.2lf\n",t.sensor,t.quat[0],t.quat[1],t.quat[2],t.quat[3]);
}

int main( int argc, char **argv )
{
     vrpn_Analog_Remote *analog = new
     vrpn_Analog_Remote(ANALOG_ADDRESS);
     analog->register change handler(0,handle analog);
     vrpn_Button_Remote *button = new
     vrpn_Button_Remote(BUTTON_ADDRESS);
     button->register_change_handler(0,handle_button);
     vrpn_Tracker_Remote *tracker = new
     vrpn_Tracker_Remote(TRACKER_ADDRESS);
     tracker->register_change_handler(0,handle_tracker_pos_quat);
     while(!kbhit()) {
          analog->mainloop();
          button->mainloop();
```

```
            tracker->mainloop();
        }
        return 0;
}
```

For **TechViz** users, under the VRPN tracking section of TechViz configuration file, the sample setting below allows you connect a PPT Wand and head tracker through VRPN.

```
##########################################################################
#           4.1.f : vrpn tracking
##########################################################################

vrpn\number of devices=2
vrpn\device 0\device name=PPT0@192.168.0.1:3883
vrpn\device 1\device name=PPT WAND3@192.168.0.1:8945

# Modification of tracking information to comply TechViz setup
coef tracker to univ\x=1
coef tracker to univ\y=1
coef tracker to univ\z=1
tracker axe in univ\x=x
tracker axe in univ\y=y
tracker axe in univ\z=-z
offset tracker to univ\x=0
offset tracker to univ\y=0.725
offset tracker to univ\z=1.675

# Head configuration
number of head=1
head\0\device num=0
head\0\sensor=0

# Wand configuration
number of wand=2

# wand positioning
wand\0\device num=0
wand\0\sensor=2

# wand interaction
wand\1\device num=1
wand\1\sensor=2
button mapping\flystick=Flystick2
```

TRACKD

PPT Studio includes a plugin for use with the TrackD software. The plugins are ppt-trackd.dll and pptwand-trackd.dll, and are located in C:\Program Files\WorldViz\PPTStudio32(or PPTStudio31).

Instructions:

1. Please make sure you have a calibrated PPT system and have the PPT Studio running.

2. In PPT Studio settings, select the correct number of markers for tracking and select the VRPN 7 plugin as the Output plugin in the Configuration panel.

3. If PPT Wand is used, please make sure you have both MarkerID and PPT Wand plugins selected. For the MarkerID plugin, make sure the PPT wand is detected by the PPT with the correct ID (default ID number 3 for single LED mode [power switch DOWN]). For the PPT Wand plugin, please make sure the light number showing in the Sensor Option window is corresponding to its marker ID number and is in connected mode (if you can see the dynamically updated yaw, pitch, and roll data).

4. Press the TALK button (top left corner of the PPT Studio window) if it is not ON.

5. Copy ppt-trackd.dll and pptwand-trackd.dll from ..\WorldViz\PPTStudio32 (installation folder), and put them into your trackd\bin directory (which may reside on a different machine).

6. In the TrackD configuration file, include the following lines for a standard PPT tracking system:

```
DefineDevice ppt ppt-trackd
DeviceOption ppt address 127.0.0.1
```

7. If you have a PPT wand connected, then you will need to add the following extra lines:

```
#Define PPT Wand-can optionally specify number of wands, defaults to 1
DefineDevice pptwand pptwand-trackd

#Specify PPT Wand address(Device ID, PPT hostname/IP address, PPT Wand
light number)
DeviceOption pptwand address 127.0.0.1
```

8. The above is written assuming TrackD is installed on the PPT machine. If TrackD is running elsewhere, then 127.0.0.1 should be replaced with the IP address of the PPT machine.

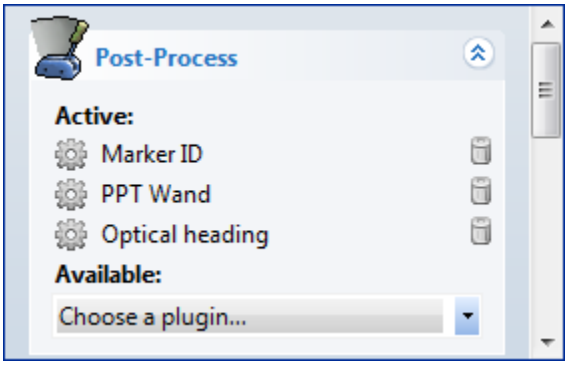
9. Start up TrackD using the configuration file just written and test the output.

COMPENSATION FOR MAGNETIC DISTORTION

There may be scenarios where the internal wand orientation sensor is affected by magnetic interference in your environment. If this is the case, then the PPT Optical Heading plug-in will help to correct this for you using the two lights on the PPT Wand.

Before proceeding, verify that your Wand has a unique Marker ID value that does not interfere with any other markers you plan to use. If you're using your wand in conjunction with PPT Eyes, then this is not an issue because the Eyes module uses passive LEDs which do not transmit ID signals.

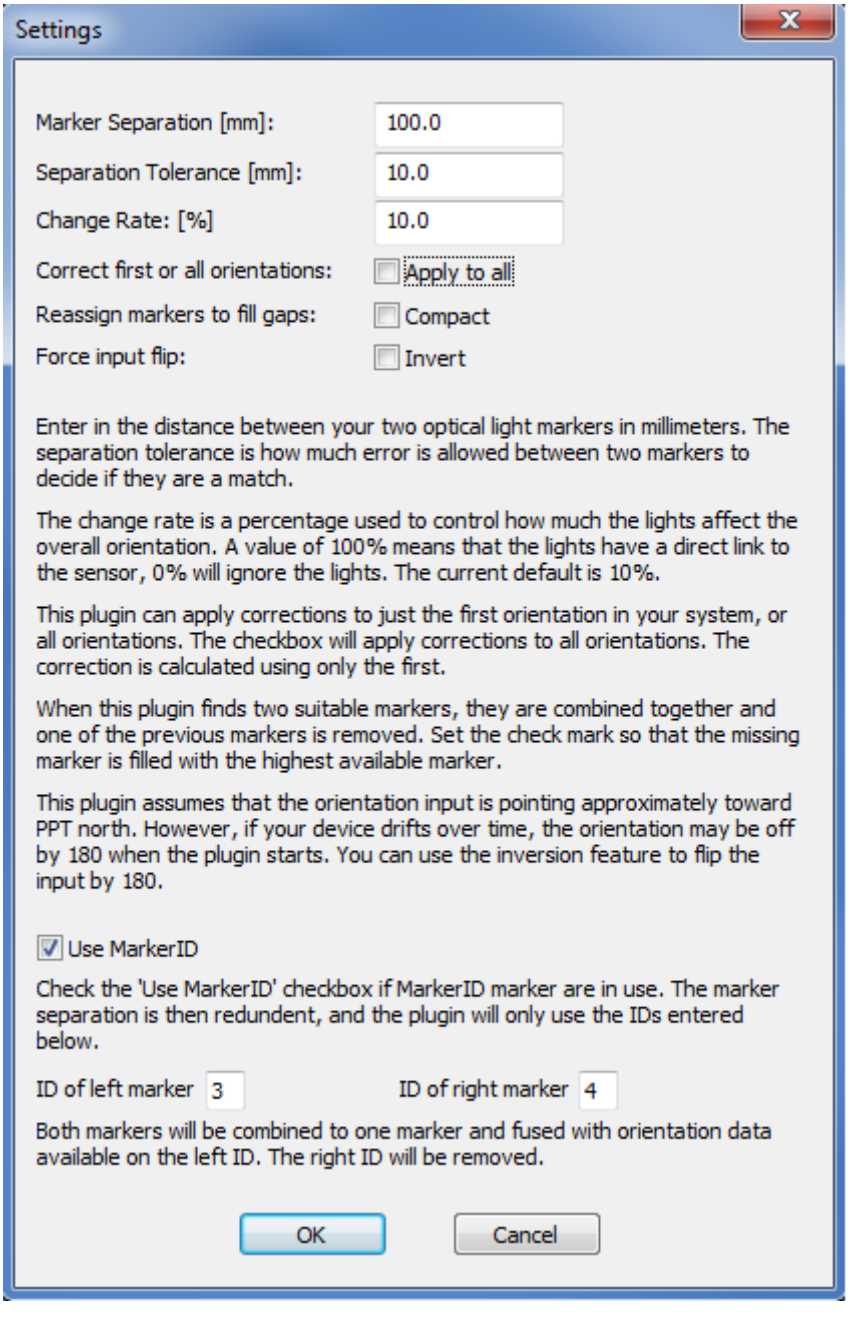
For this operation, you need to have 3 Post-Process plug-ins set up and ordered exactly as you see below. If they are not in the correct order, you can drag and re-arrange them. The instructions below explain how to properly configure each.



NOTE: If you have PPT Eyes post-plugin in addition to the above plugins, you should place the PPT Eyes plugin below the Marker ID and above the PPT Wand.

1. Set the wand to dual light operation (switch UP position)
2. **Marker ID:** add this plug-in if not already in Post-Process and configure it for normal operation. If you assign virtual ID values to any of the wand markers, you'll need to use those virtual ID values in the next step.
3. **PPT Wand:** add this plug-in if not already in Post-Process and configure the PPT Wand plug-in and assign the orientation to the left ID value (the result of merging the two IDs from previous step).
4. **Optical Heading:** add this plug-in if it's not already in Post-Process and configure it with the following settings:

a. Configure the marker separation based on the wand light spacing, which is 100 millimeters.
b. Make sure that the plug-in only applies the correction to the first orientation. Uncheck “Apply to all” if it is currently checked.
c. Check the “Use MarkerID” box, and type in the IDs (for example 3 and 4) for the two wand marker ids used above.
d. The change rate field is a percentage that controls how much of the new distortion correction should be added to the current correction. This helps to smooth out optical jitter and transitions during occlusion, but does not affect tracking latency.


Settings
Marker Separation [mm]:
100.0
Separation Tolerance [mm]:
10.0
Change Rate: [%]
10.0
Correct first or all orientations:
Apply to all
Reassign markers to fill gaps:
Compact
Force input flip:
Invert
Enter in the distance between your two optical light markers in millimeters. The separation tolerance is how much error is allowed between two markers to decide if they are a match.
The change rate is a percentage used to control how much the lights affect the overall orientation. A value of 100% means that the lights have a direct link to the sensor, 0% will ignore the lights. The current default is 10%.
This plugin can apply corrections to just the first orientation in your system, or all orientations. The checkbox will apply corrections to all orientations. The correction is calculated using only the first.
When this plugin finds two suitable markers, they are combined together and one of the previous markers is removed. Set the check mark so that the missing marker is filled with the highest available marker.
This plugin assumes that the orientation input is pointing approximately toward PPT north. However, if your device drifts over time, the orientation may be off by 180 when the plugin starts. You can use the inversion feature to flip the input by 180.
Use MarkerID
Check the 'Use MarkerID' checkbox if MarkerID marker are in use. The marker separation is then redundent, and the plugin will only use the IDs entered below.
ID of left marker
3
ID of right marker
4
Both markers will be combined to one marker and fused with orientation data available on the left ID. The right ID will be removed.
OK
Cancel

CHANGING LED ID VALUES

Each PPT Wand has two separately programmable tracker LEDs that can be configured to ID values 1 – 8. These steps explain how to change either LED.

1. Identify the micro-button (accessible through the small holes) on the back of the PPT Wand which is on the same side as the tracker LED you wish to reconfigure. You'll need a small paperclip that can be inserted into that hole.
2. Next, while depressing the micro-switch through the back of the case using the paperclip, turn the wand's power on and watch the green power indicator lights. You'll see a medium flash followed by a number of short flashes. The number of short flashes corresponds to the current ID value.
3. To change ID, again depress the micro-switch and let go. Repeat this quickly until you've reach the ID value you desire. When you have reached the desired ID value, do nothing for 2 sec and the ID will be stored (indicated by a steady ON power light).

Remember, only ID values 1 – 8 are available as configurations. Configurations modes 9 – 12 have other purposes as described in the table below.

Number of flashes	Configuration mode
1	ID code 1
2	ID code 2
3	ID code 3
4	ID code 4
5	ID code 5
6	ID code 6
7	ID code 7
8	ID code 8
9	Switch between X and H modes (does nothing if already in mode 10-12)
10	Continuous mode, no ID, intensity 1
11	Continuous mode, no ID, intensity 2
12	Continuous mode, no ID, intensity 3

SUPPORT

PROPER WAND HANDLING

You should avoid dropping your PPT Wand or allowing either of the two LED to impact a hard surface. If cleaning is necessary, a lightly damp cloth with mild soap can be used, but generally the anodized finish is very resistant to permanent scratches or discolorations.

The inertial sensors within the wand are delicate instruments and therefore you should always be careful not to drop the wand.

PAIRING A WAND WITH ITS RECEIVER

The steps described in this section are only necessary if you are installing a PPT Wand on a machine where it has never been used on before. Under normal use, you do not need to pair the wand to its receiver as this information is stored.

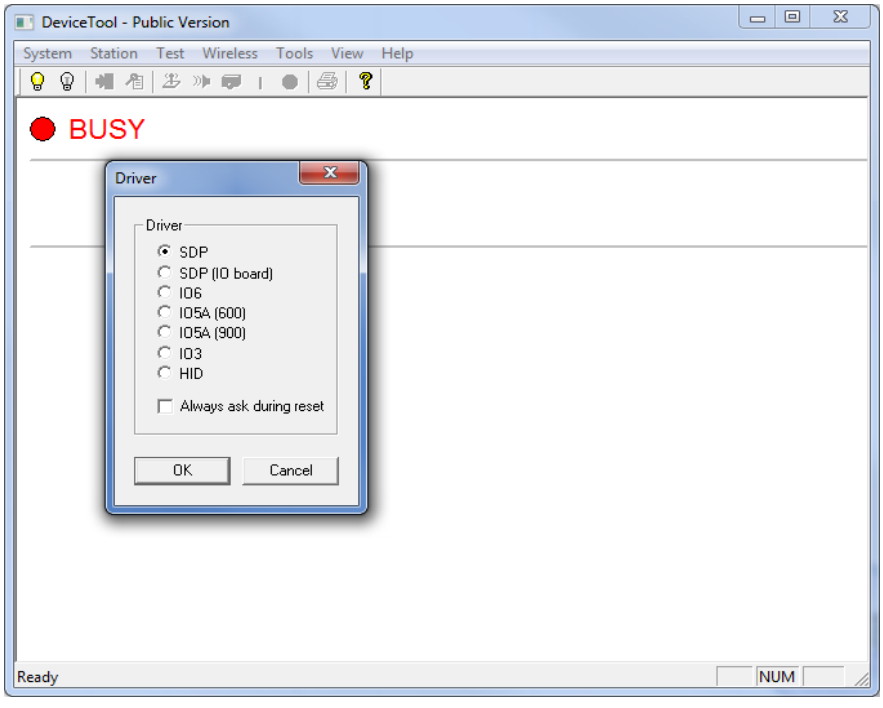
Running Device Tool

Pairing the wand with its receiver is done with the help of a program on your PPT computer called "DeviceTool.exe" which can be found in your start menu under WorldViz / PPTStudio. Launch this tool and then follow the steps below. If your version of PPT does not contain this tool pre-installed, then download a copy here using "worldviz" as the password:
http://www.worldviz.com/download/index.php?id=16

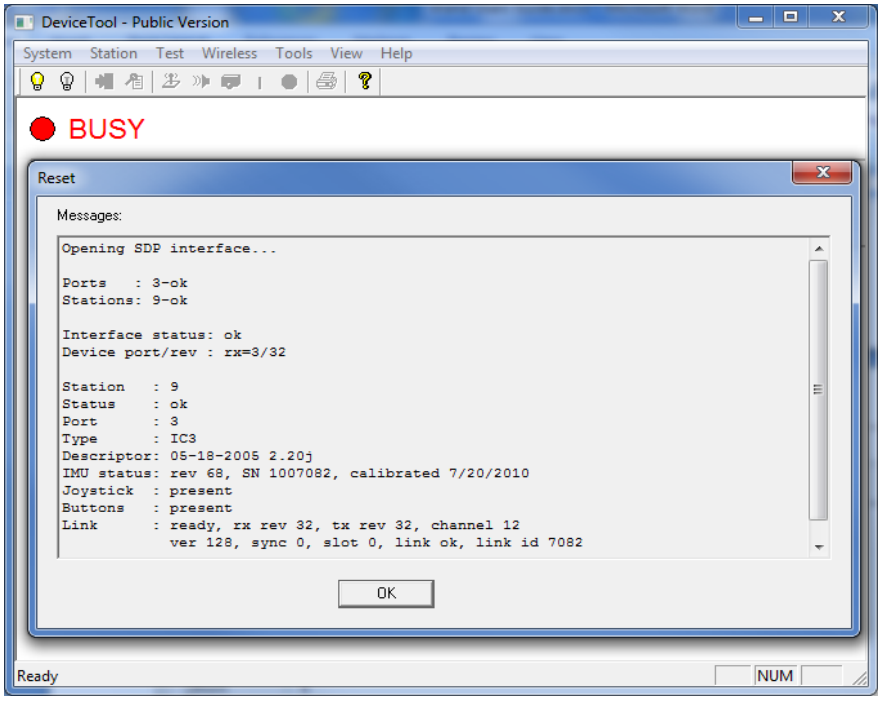
Resetting the Link

Turn on the PPT Wand and make sure it has a visible path to the receiver.

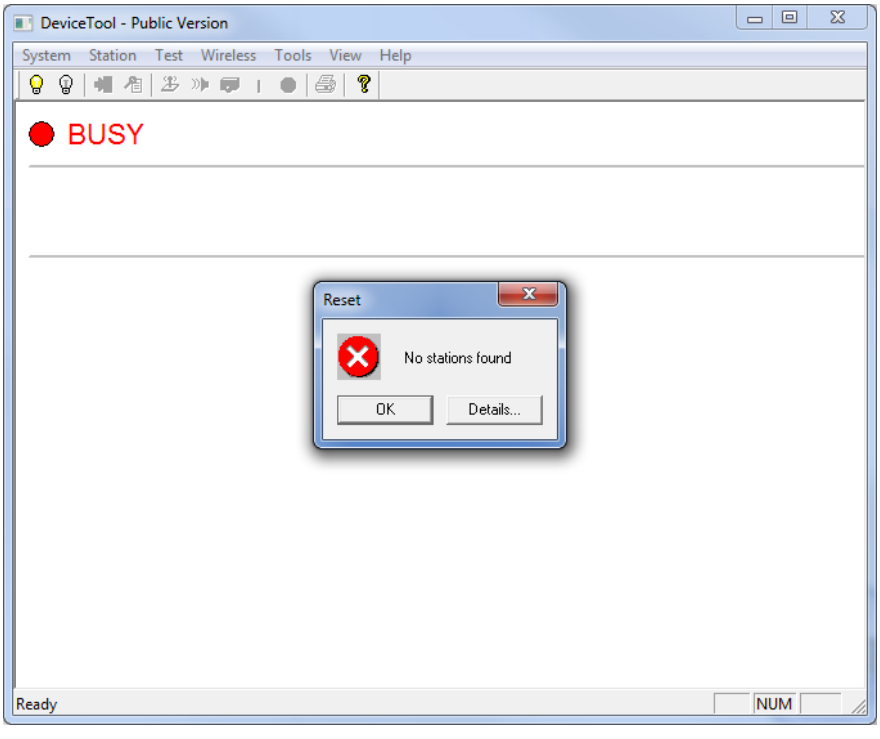
Within Device Tool, go to System – Reset, under Driver choose SDP, and hit OK. (If you want to choose the SDP option for every reset, uncheck the "Always ask during reset" option)



If everything is successful, you should see a screen similar to the following:

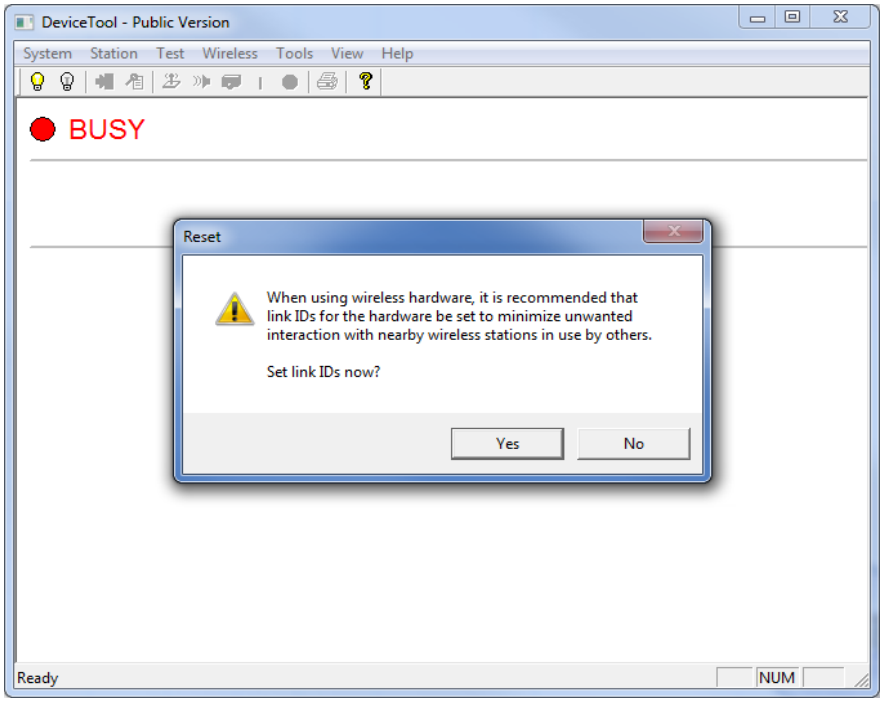


If this fails and you see the following screen that no stations were found, then there are two steps to correct this. First, try power-cycling the Wand, waiting 10 sec, and redo "Resetting the link" step. If that too fails, then the next step to try is moving the receiver to a different USB port. In the unlikely event that two steps do not solve the problem, contact WorldViz technical support (see Support in the user manual).

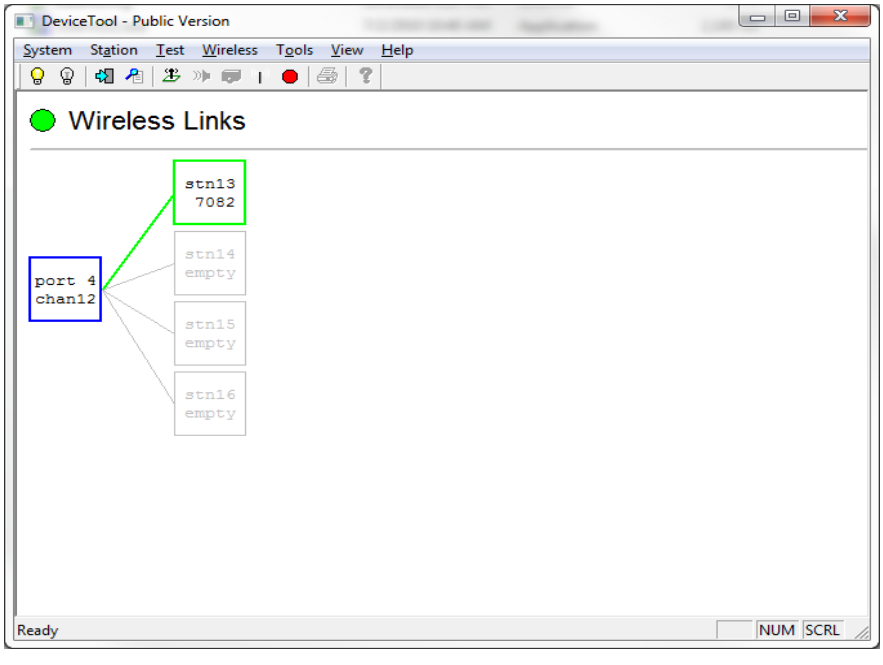


Establishing the link

After resetting, you should see the pop-up below which asks if you would like to set the link ID. Press "No" because we recommend doing this step further below. This should take you to a screen that shows a green ready light.



Next, we need to now establish the link between the receiver and the wand. Go to Wireless – Search for Stations and hit "Yes" on the prompt. If this step succeeds you will see a screen as shown below (or similar).



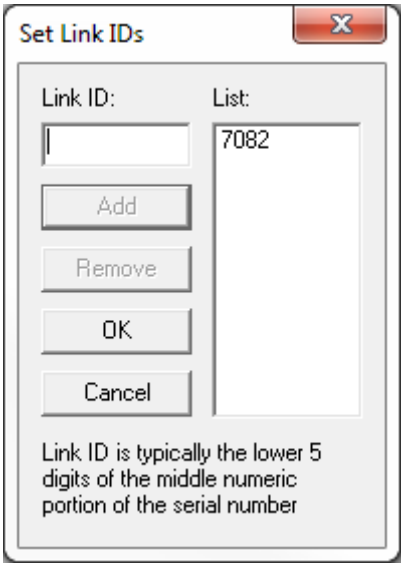
If this step fails, power-cycle your wand and start again with "Resetting your link" above.

In this example screen, we see that the receiver (Blue square) on port 4, channel 12, sees and is linked with wand station 13 with ID 7082.

NOTE: Sometimes, the receiver detects the wand but doesn't form a link, then you might see the stn13 7082 box in grey instead of green next to the column of 4 boxes. If you see that, click on the stn box and drag it into the top empty box in the row.

Setting link ID

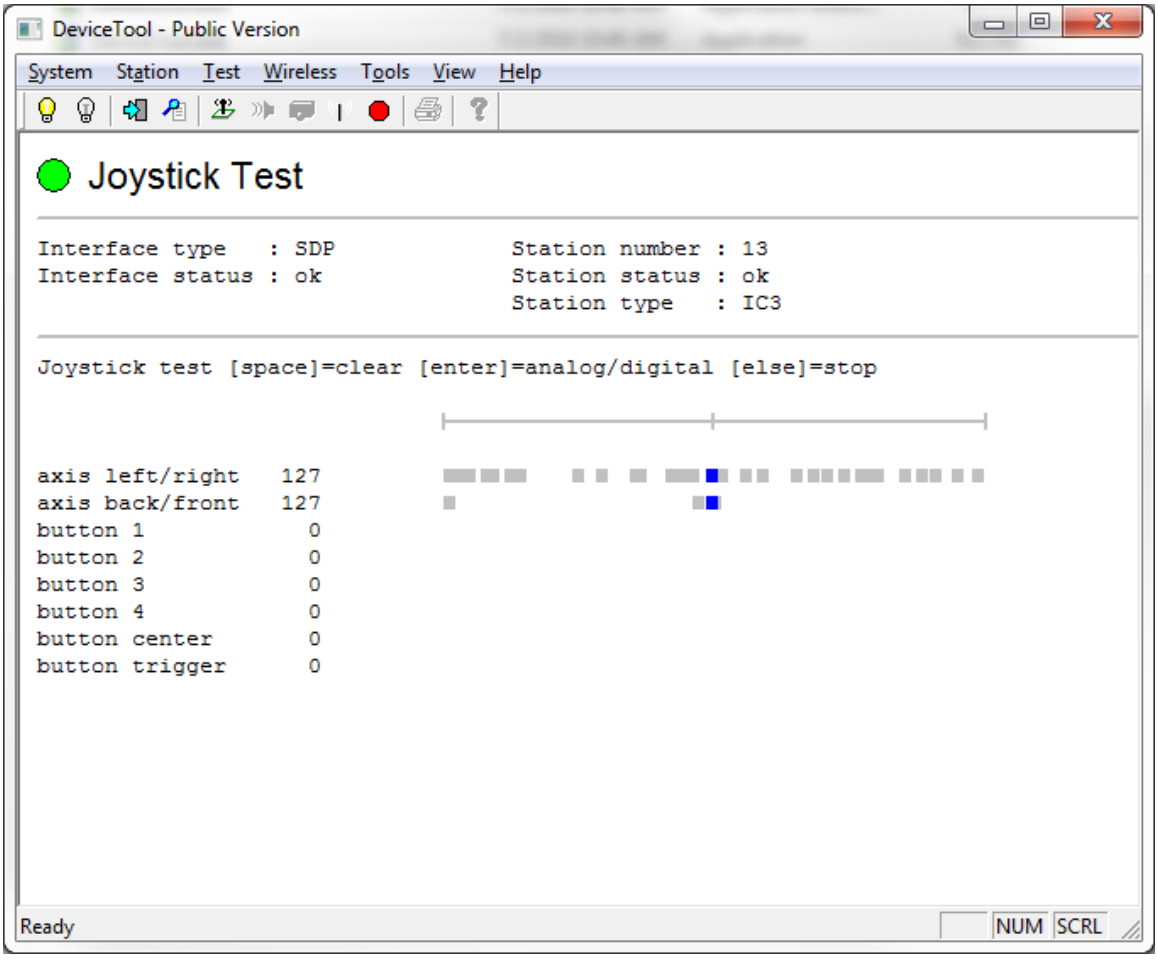
Now we should set the link IDs. This helps to reduce interference with other wireless devices and also it enables you to communicate with multiple wireless intersense sensors (up to 4) through the same receiver and keep the same order each time. Go to Wireless – Set Link IDs and type in the link ID (7082) and add it to the List. Hit "OK".



Verifying wand functionality

Now we can test the wand's joystick and 5 buttons. Select Test – Test Joystick and the screen should resemble the image below.

Verify the joystick motion and the button clicks which all register as appropriate changes on the test screen.



Closing the tool

Be sure to close the Device Tool before attempting to connect to the wand with PPT software. Otherwise, the Device Tool will hold its connection and not allow PPT to form a connection.

INSTALLING WAND RECEIVER DRIVERS

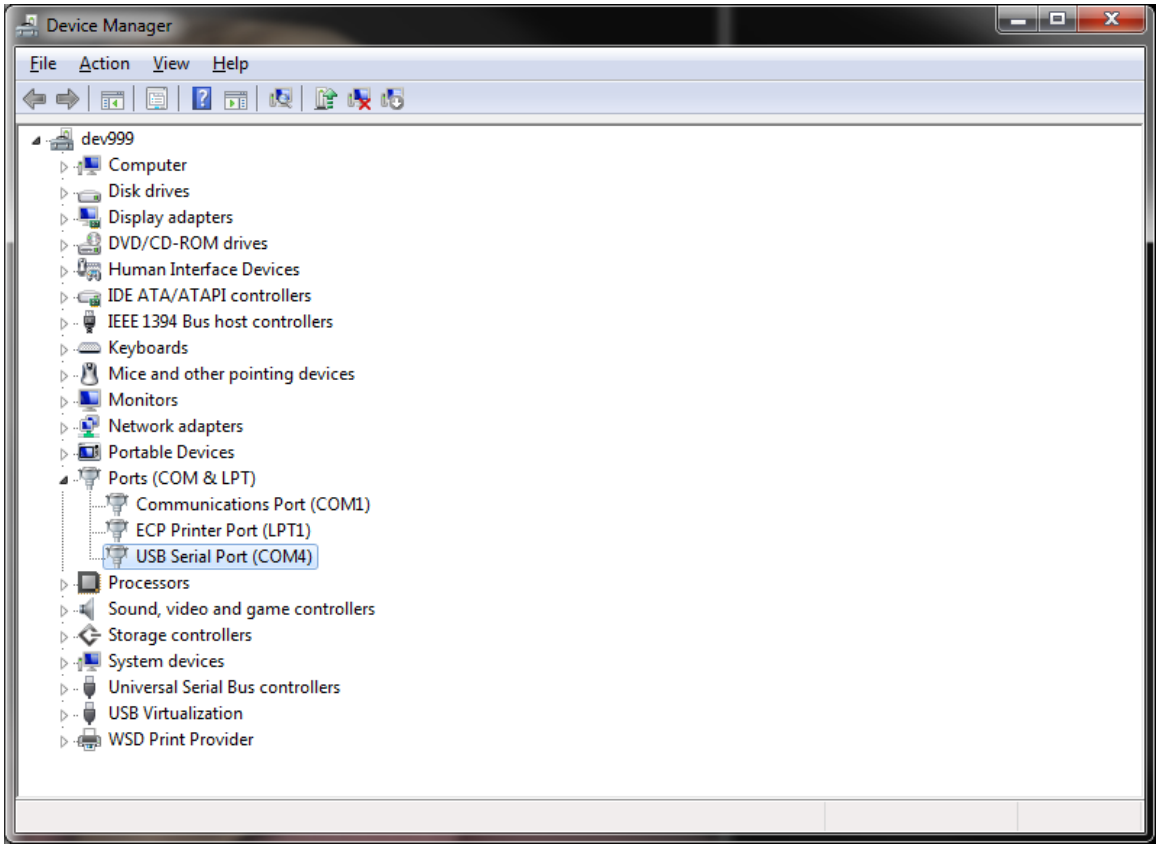
If on Windows XP, you have to first install the FTDI drivers if it's not already installed – you may not have to do it for Windows 7. These drivers enable the USB connection of the wireless Intersense receivers. When you plug the wireless Intersense receiver

into a USB port, it will ask you to install the drivers. You can find the drivers under Worldviz PPT folder (32 and 64bit) at:

For example:

C:\Program Files\WorldViz\PPTStudio32\FTDI USB Drivers

Windows will ask you to install two different drivers, this is normal. After that is done, go to your Device Manager and make sure under Ports (COM & LPT) you see USB Serial Port(COMX) where X is the port number you have to enter in your script, viztracker, etc.



Now, on the receiver, you should see a single LED turned ON.

FREQUENTLY ASKED QUESTIONS

When should I re-charge the wand?

When you see the LED indicator on the front panel is flashing, it shows that the battery is in low power condition and needs to be recharged. Operating the wand under the low battery condition may affect the connection stability and data transmission rate. It is always suggested to operate the wand with sufficient power condition to achieve the reliable performance.

When I use the PPT Wand plugin in PPT Studio, I cannot connect my PPT wand to the base station. What should I do?

First, check if the wand is in the low battery condition (LED indicator will be flashing). Make sure you have the wand driver installed correctly (follow through the "Installing Wand Receiver Drivers"). You can check it by going to Windows' Device Manager and see if there is a USB Serial Port item listed under the Ports category. Next you want to go through the section, "Pairing a Wand with its receiver." After this step, you should be able to connect your wand by following through the regular procedure.

When I connect the PPT Wand from PPT Studio to Vizard through VRPN, I cannot get it to work properly in Vizard. What is the problem?

Make sure you have Marker ID plugin turned on in PPT and have the ID in the marker ID plugin match to the physical ID of the Wand (by default, it is ID 3 for a single light mode). You can verify it by looking at the Marker Data Panel. You should be able to see the position X, Y, and Z values and the orientation data, Yaw, Pitch, and Roll values for the wand are in the same row with the correct ID number. By default, Vizard is using marker ID 3 as the right hand.

What happens if the LED on the Wand is broken or the blue LED does not light up anymore? What should I do?

A physical broken LED will affect the quality of detection by the PPT. However, the non-functioning blue LED may or may not affect the functionality. If the PPT can not track the Wand LED, then it is suggested to send the Wand back to WorldViz for repairing. It is not recommended to disassemble the device yourself as it might also damage the other parts of the device and invalidate the warranty.

CONTACT WORLDVIZ

If you need further support, you may contact WorldViz by phone at +1(805)-966-0786 or at support@worldviz.com.