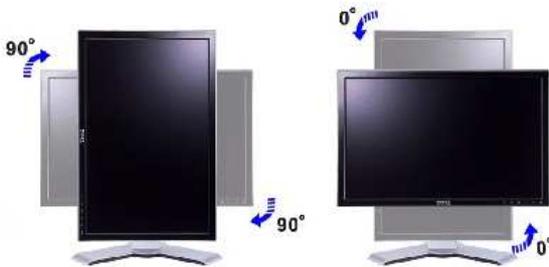


The normal orientation of computer screens is generally horizontal (also known as landscape) but monitors can also be placed vertically (also known as portrait mode - where height becomes greater than the width). Landscape can be either 0 or 180 degrees and Portrait can be either 90 or 270 degrees. Switching computer screen orientation is commonly known as video or desktop rotation.

Rotate is particularly required for monitors that can physically be rotated, such as in these examples:



When rotation occurs in a touch screen environment there are a number of issues that need to be considered:

1) Touch screen calibration must cater for rotated desktops

As a minimum the driver and calibration procedure should be able to cater for desktops that are rotated 90°, 180° and 270°.

2) Touch screen calibration is automatically synchronized with the degree of rotation

When rotation takes place with a touch screen it is desirable that the touch screen calibration is automatically synchronised with the degree of orientation. Most rotations are between 0° (landscape) and 90° (portrait) but others may rotate between 0°, 90°, 180° and 270°.

3) The touch screen can be used to initiate rotation.

The utilities supplied to perform rotation may not be appropriate for a touch interface and therefore it may be more desirable to initiate rotate via a touch control.

This document describes the rotation support offered by UPDD in the main operating systems.

## Calibration synchronisation

### Windows

Although UPDD has specific rotational API calls it should not be necessary for end users to make these calls as they are handled by UPDD when the desktop resolution changes from portrait to landscape **or** a supported rotate method is identified and rotate occurs.

Under Windows, UPDD implements a number of methods to automatically recognize that rotate has occurred. Rotate methods have been added over time since 3.8.x and depending on the version in use not all rotate methods will be available unless the latest release is in use.

Rotate method	Description
<a href="#">OS based</a>	The OS supports rotate, such as Windows 7, and UPDD recognises when rotate takes places.
<a href="#">Hardware based</a>	UPDD recognizes the hardware chip and is able to determine when the chips or its associated utilities rotate the video.
<a href="#">Software based</a>	Recognised software rotation utilities are used and UPDD is able to determine when rotated occurs.
<a href="#">UPDD API based</a>	Applications or rotate utilities can directly call UPDD rotate api function to inform UPDD that rotate has occurred.
<a href="#">Video resolution based</a>	If none of the above methods are utilised then UPDD may be able to detect that the screen resolution has changed from a Landscape resolution to a Portrait resolution.

#### 1. Video resolution change detection

***This method is only utilised if no other supported method is detected as it only supports two orientations. It can also be manually disabled with a UPDD setting as detailed below.***

The [UPDD Windows daemon process](#) hooks Windows display resolution change messages and calls the UPDD rotate API calls when the display switches between landscape and portrait.

When the system rotates from landscape to portrait the UPDD daemon process automatically sees the desktop resolution change (Y becomes > X, e.g. 1024 x 768 becomes 768 x 1024) and adjusts the calibration accordingly via a UPDD API call. By default, portrait orientation is assumed to be 90° and this value is used in the UPDD rotate API call. However, if the portrait orientation is actually 270° the UPDD setting PortraitAngle should be created as follows:

```
TBUPDD.INI file entry
Section: [updd/parameters],
PortraitAngle=0x0000010e
```

should be set to 270 (10e Hex)

**In some circumstances it may be desirable to disable resolution change detection by setting the UPDD**

**global setting "NoAutoRotate" = 1 in UPDD setting file tbupdd.ini**

i.e  
**[updd]**  
**noautorotate=0x00000001**

**Stop tbupddwu process (net stop tbupddwu) before editing this file and start (net start tbupddwu) afterward. If required we can provide an installer with this as the default.**

This may be required if using a vertical span tool to switch to an extended desktop across 2 monitors such that the Y resolution is > than the X resolution, e.g. 1280x2048.

**2. Application broadcasting UPDD API rotate messages**

The application that performs the video rotation should send a Windows registered broadcast message WM\_UPDDRotateEvent with lParam=nnn where nnn=desired rotate angle. If this message is seen then UPDD automatic rotation detection is disabled (see important note below) and so the user must send messages each time the rotation changes.

To register your app to use WM\_UPDDRotateEvent

```
UINT upddrotatemsg = ::RegisterWindowMessage("WM_UPDDRotateEvent");
```

To set the screen rotation angle

```
::PostMessage(HWND_BROADCAST, upddrotatemsg,0,N);
```

where n is the angle (0, 90, 180, 270)

e.g. to indicate screen is inverted.

```
::PostMessage(HWND_BROADCAST, upddrotatemsg,0,180);
```

Important Note: The driver retains the rotation information across a reboot and therefore it is necessary for the application to send a WM\_UPDDRotateEvent, stating the startup rotate angle, if rotate is not maintained over a reboot (i.e the system starts in landscape mode). Further, if the application is uninstalled and no longer used to rotate but another method is employed to rotate between landscape and portrait then UPDD must be reinstalled to reset rotate method flag settings.

**3. Utilise an existing rotation method that is recognized by UPDD**

This section describes the current software and hardware rotate implementations detected by UPDD:

**Software based**

- **Pivot from Portrait Displays**

One of the most common software rotational products 'Pivot', is developed by Portrait Displays Inc and available on the web at [www.portrait.com](http://www.portrait.com).

Pivot version 6.04 and above

UPDD version 3.4.x and above

OS - ALL Windows OS

Since version 6.04 the Pivot software sends out a Windows message when rotation takes place. This message is intercepted by the UPDD daemon task and calls the UPDD rotate API calls as appropriate.

- **iRotate from EnTech Taiwan**

One of the most common hardware rotational products 'iRotate', is developed by EnTech Taiwan and available for free on the web at [www.entechtaiwan.net/util/irotate.shtm](http://www.entechtaiwan.net/util/irotate.shtm).

iRotate version 1.04 and above

UPDD version 3.4.x and above

OS - Windows 98 thro XP with appropriate video chipsets and drivers (i.e ATI, nVidia, Intel, S3, XGI and others)

Since version 1.04 the iRotate software sends out a Windows message when rotation takes place. This message is intercepted by the UPDD daemon task and calls the UPDD rotate API calls as appropriate.

With this utility rotate is supported on all monitors. However, in our latest tests (Oct 2008) we have seen that with the 2<sup>nd</sup> and subsequent monitors the tracking is inaccurate and we will investigate this as and when required.

**Hardware based**

- **Silicon Motion Graphics**

Starting with UPDD version 3.8.42 integral support for the Silicon Motion Graphics chipset is provided. The UPDD software automatically recognizes the presence of this chipset and enables the interface so no user action is required other than to select the rotation mode using the standard SM interface. This interface is understood to work with all current SM chipsets including the SM712, SM722, SM731, SM500 and Lynx (including Lynx EM) products; however we have only verified this with the Lynx chipset.

- **ATI video chipsets**

Latest ATI video chips, with rotation capabilities are supported.

- **Mobile Intel Rotate enabled Chipset Family**

Starting with UPDD version 4.0.2 integral support for the Intel rotate enabled chipset is provided. The UPDD software automatically recognizes the presence of this chipset (via an undocumented method, which may be subject to change) and enables the interface so no user action is required other than to select the rotation mode using the standard Intel interface *Note that the UPDD rotate interface requires the Intel rotate software to be present, which may not always be the case.* It is possible that the recognition method will also recognize other Intel chipsets, however we have only verified that this method of recognition identifies the 915GM/GMS, 910GML, 855GME and

Extreme Graphics 2 (Ver. 6.14.10.4497) chipset but it may recognize others.

- **DisplayLink USB video software interface**

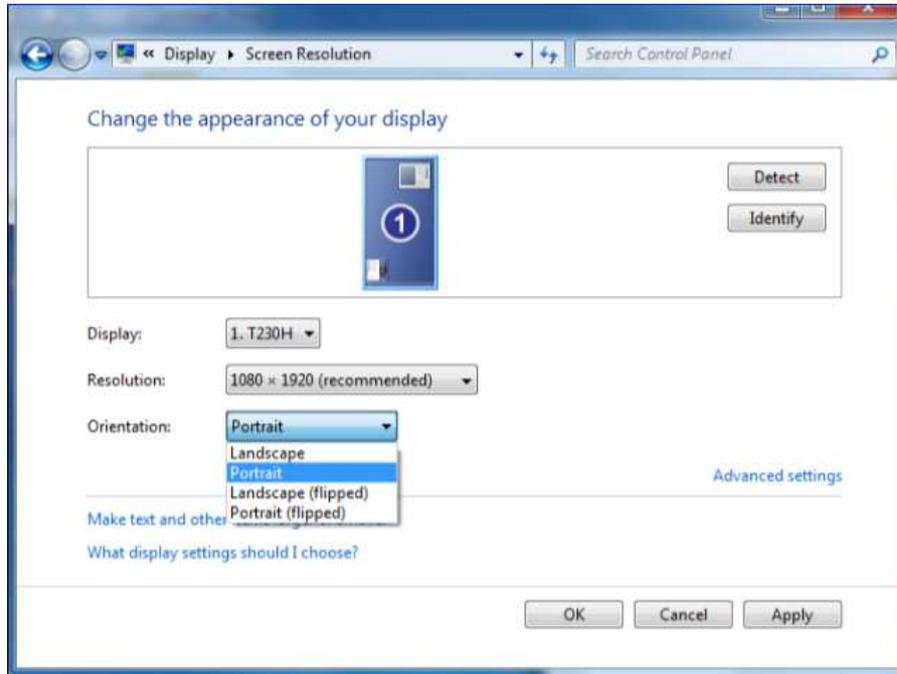
Starting with UPDD version 4.1.6, build 1099, integral support for the [DisplayLink USB video software interface](#) is provided. The UPDD software automatically recognizes the presence of this software and enables the interface so no user action is required other than to select the rotation mode using the standard DisplayLink rotate utility.

#### 4. Operating System based rotate

Some operating systems offer rotate functionality as part of the OS and where possible UPDD supports these inbuilt rotate methods as follows:

##### Windows 7

This operating system offers a rotate function as part of the display properties:



The screen can be set to 1 of 4 orientations, Landscape -0°, Portrait - 270°, Landscape (flipped) – 180° and Portrait (flipped) - 90°. Keystrokes Ctrl Alt and any of the arrow keys will also perform the rotation (unless graphics hotkeys have been disabled). With UPDD version 4.1.8 and above the UPDD daemon process monitors the orientation and calls the UPDD rotate API function as appropriate.

##### Rotate Method Identification

To identify rotate methods that are supported by UPDD and exist on the system, UPDD performs the following:

Rotation method	Identification
Window 7 native	Recognise Windows 7 OS
Portrait	[windows]\system32\wpfb.dll
iRotate	HKLM\SOFTWARE\EnTech\iRotate
Silicon Motion Cougar	[windows]\ system32\3drapi.dll
Silicon Motion Lynx	[windows]\ system32\smhook.dll
ATI chips	[windows]\ system32\atipdlxx.dll
Intel chipset	HKLM\SYSTEM\CurrentControlSet\Services\ialmdevice0
DisplayLink USB video	HKLM\Software\DisplayLink\Core

##### Important Notes

- 1) **Please note, that for automatic calibration adjustment to work correctly it is important that the initial calibration made on a monitor that can rotate is performed when the monitor is in landscape mode (i.e. not rotated)**
- 2) **UPDD supports automatic rotate recognition on all connected monitors for the Intel video graphics chipset, iRotate and DisplayLink. In all other interfaces rotate is only supported on the primary monitor.**
- 3) **Direct video chipset support may be dependent on the correct video driver being installed. We have had situations where a newer driver has broken our direct video chipset support and we have had to make changes to cater for the differences introduced with the new driver. To this end we recommend the usage of the software utility [irotate](#) which offers our software a common interface to a rotate utility that is responsible for the video chipset rotation process. We believe that irotate is kept current with any driver changes and therefore offers a future proof rotate solution.**

**Last time we looked (Aug 2007), irotate supported; ATI Radeon, Intel Extreme Graphics, Matrox Parhelia, Nvidia GeForce, S3 DeltaChrome, VIA Unichrome, XGI Volari, Some Rage128 Mobility and SIS drivers.**

4) On systems that have both hardware and software UPDD supported rotate options then the software interface (i.e iRotate or Pivot) will take priority.

5) iRotate and pivot are mutually exclusive and only one should be used.

6) UPDD registry setting *extinsvc (extensions in NT service)* should not be set for UPDD rotate procedures to work

## Mac OS X

Mac OS/X version 10.4 (Tiger) introduced video rotation where the video hardware supports it. UPDD version 4 and above will work with rotated video in 2 scenarios.

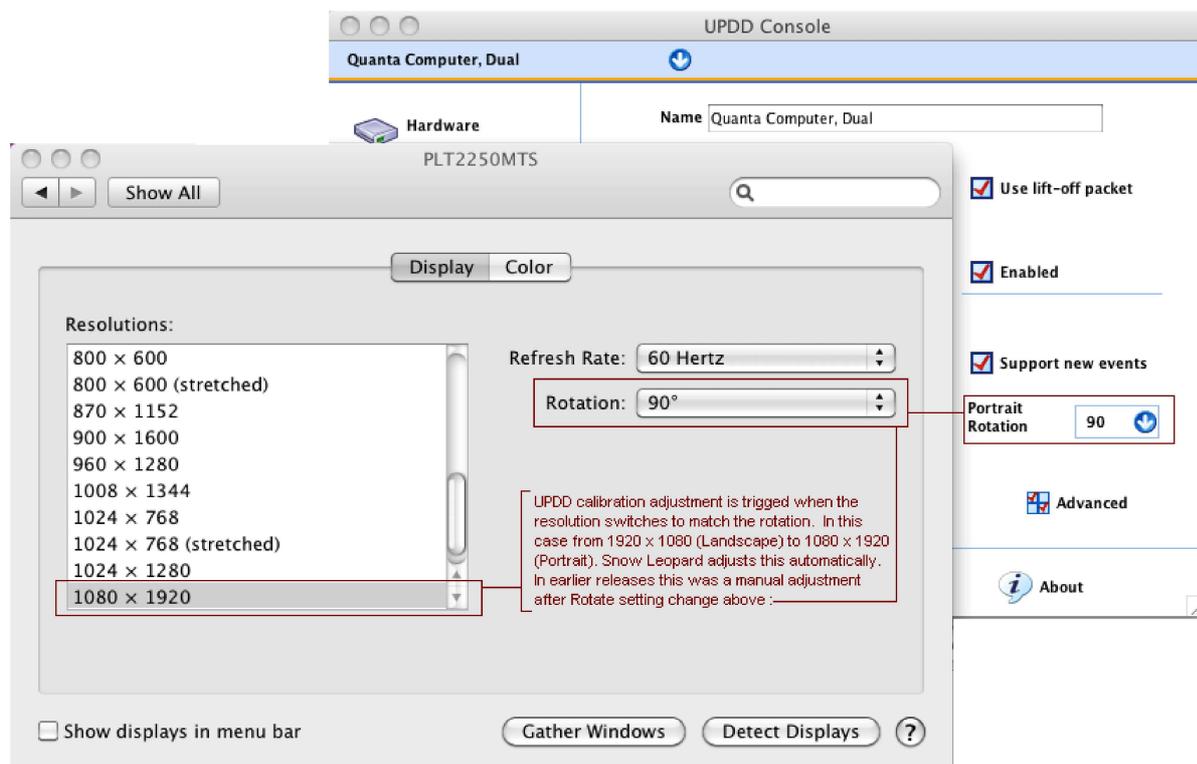
1) **Automatic when switching between landscape and a defined portrait mode.** Available from UPDD 4.1.10 onwards.

With UPDD version 5.0.2 the software automatically determines the degree of rotation and adjusts calibration accordingly. **Only supports rotate on a single monitor system. Version 5.1.0 (due April 2013) will support any number of monitors and/or touch devices.**

With UPDD 4.1.10, where the system is switched between landscape and portrait modes UPDD will automatically adjust calibration to match a defined degree of rotation. **Only supports rotate on the primary monitor.**

Switching between landscape and portrait mode is performed in the System Preferences, Display dialog. First you need to select the degree of portrait rotation angle, either 90° or 270°. This will rotate the screen. In Snow Leopard it will also adjust the video resolution. Early versions of OS X will require that the resolution is set manually. Once the resolution change is made the screen will be calibrated as the UPDD rotate adjustment is triggered on the video resolution change. This is because we have not found a way to programmatically determine the degree of rotation selected in the Display dialog, only to determine that the video resolution change represents a 'portrait' rotation ( $X < Y$ ). Given that the driver cannot determine the rotation angle it has to be manually set in UPDD Console, Properties dialog, Portrait Rotate option to define what rotation angle (90° or 270°) is being used in Portrait mode. This restricts automatic calibration working to one defined portrait angle.

In this example the user is switching between 0° and 90°:



2) **Manual when using any rotation angle**

Any combination of any video rotation and screen size can be used so long as:

1. 4 or more points are used for calibration
2. The screen is recalibrated after the video display preferences are changed. Note that the UPDD Console, Properties, "Portrait" setting is irrelevant in this situation.

**UPDD only supports rotate on the primary monitor in Mac OS X.**

## Linux

Under Linux you can rotate the video in a number of ways, such as predefined in the X configuration file using the X directive *Option "Rotate" "[rotate]"*, using the [xrandr command](#) or using the rotate request in the display console – should one exist.

e.g. Option "Rotate" "CCW" or /usr/bin/xrandr -o left

UPDD supports these rotation methods as discussed below:

#### Automatic calibration adjustment

Calibration is automatically adjusted to take into account the degree of rotation.

UPDD adjusts calibration accordingly when a rotate is initiated. This may be due to the direct use of the xrandr command or a rotate request in the display console, should one be available.

If, after a rotate has occurred, the calibration is not automatically adjusted then it should be possible to conduct a manual calibration on the rotated screen to restore calibration, see below:

#### Manual calibration adjustment

This requires that calibration is performed every time the system is rotated to a different rotation.

If using Option "Rotate" "[rotate]" check whether your card is supported then look at the appropriate release notes found at <http://xfree86.org> or <http://www.x.org> respectively. If your card supports the "Rotate" option as mentioned in the release notes then it is compatible with UPDD. Supported rotations in X-Windows are 90 and 270 degrees. As mentioned in the documentation for your video card, the device section in the X config file should be either configured for Option "Rotate" "CW" (clockwise) or Option "Rotate" "CCW" (counter-clockwise). An example of a Device section set up for rotation is below:-

```
Section "Device"
    Identifier "VideoCard0"
    Driver "nv"
    VendorName "Videocard vendor"
    BoardName "VESA driver (generic)"
    Option "Rotate" "CCW"
EndSection
```

**Early versions of 5.0.2 UPDD only supported rotate on the primary monitor in Linux. Since April 2013 5.0.2 now supports rotate on all monitors.**

#### Win CE

UPDD has been updated for specific devices to support rotate in CE but this will be implementation specific. Please [contact](#) us to discuss your requirements.

#### Rotate utility - Invoke video rotation via touch

This utility is currently only available for Windows systems and only invokes rotation on the primary monitor.

Using rotate services offered by software rotate utilities or rotate enabled video chips, desktops can be rotated through various rotation angles, normally 0° to 90°/270° (Landscape to Portrait) or 0° to 180° for systems that can be viewed from top or bottom. Software is often supplied that can be used to switch to the desired degree of rotation and the method employed does not always lend itself to quick selection in a touch only environment.

The section describes how we have implemented a touch method to perform graphical rotation that uses a [toolbar](#) and system tray utility to initiate rotation.

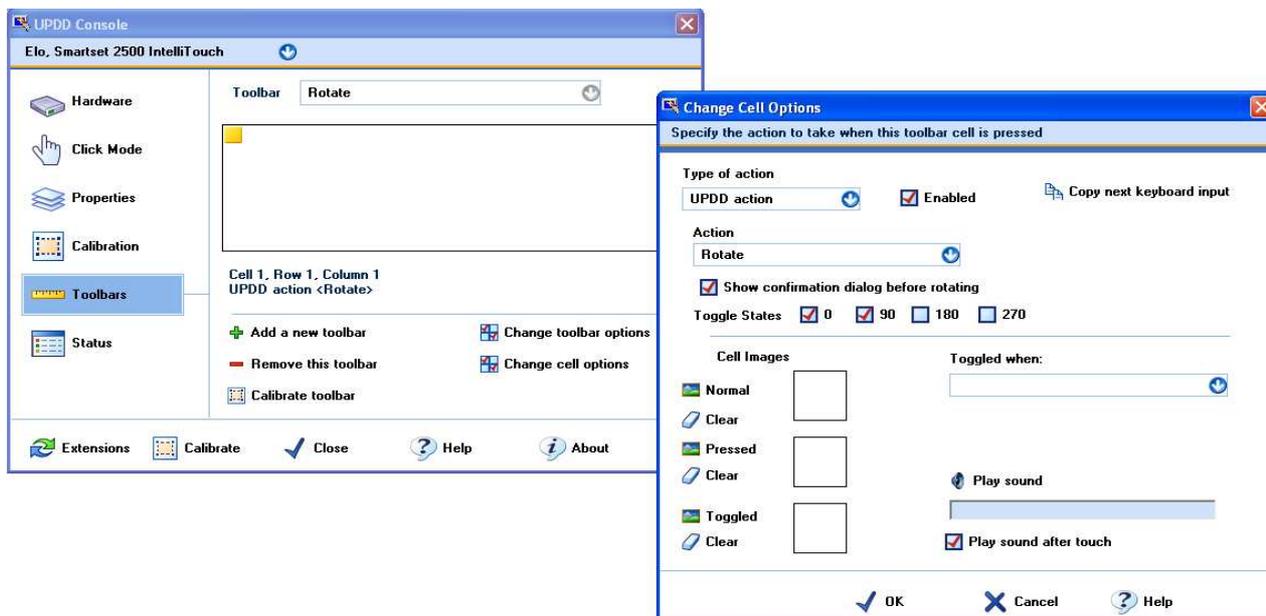
*Please note - these touch rotation methods can only be employed if UPDD detects a rotation method that it supports to initiate rotate. At the time of writing UPDD Rotate initiation will only work with iRotate and Silicon Motion chip sets as shown in the [UPDD Extension, Video Rotation dialog](#), Touch Control column; e.g.*

Supported rotation methods detected on system	Auto Calib	Touch Control
Intel based rotation	✓	✗
Silicon Motion "Linx" chipset based rotation	✓	✓

*Unless there is a green tick in the Touch Control column UPDD rotate utilities cannot be used to rotate the video!*

#### Toolbar

In UPDD Version 4 toolbars can be associated with UPDD specific functions which include a rotate action. To create a rotate toolbar you can use the standard toolbar dialog and associate a rotate function, as shown below:



In this Windows example a toolbar, Rotate, has been created with the 'Add a new toolbar' function. Using the 'Change cell options' a the UPDD Rotate Action has been associated with the toolbar to rotate between 0° and 90°. Thereafter the 'Calibrate toolbar' is used to calibrate the toolbar on the touch screen. The toolbar can also be associated with a Toolbar image if required so that the user can have a visual reference to the rotate toolbar. The UPDD rotate action can be used to rotate through any combination of degrees of rotation or associated to one specific rotation angle by only enabling the checkbox next to the required rotation angle.

Once the Rotate toolbar is created and calibrated, touching the rotate toolbar on the touch screen will rotate the display using one of the supported rotate methods which caters for external rotation requests.

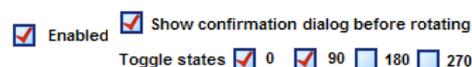
The [UPDD Extension, Video Rotation dialog](#) offers a quick link to create and calibrate a rotate toolbar used to initiate rotation, as shown:



By default this rotate toolbar will rotate between 0° and 90° but can be changed as required. If more than one method is found then rotation could cause an issue. In this situation, if you have a supported hardware chip consider uninstalling the software methods.

**System Tray rotate utility**

When a rotate interface is identified that can support rotate requests from UPDD, as shown in the [UPDD Extension, Video Rotation dialog](#) and if the system tray rotate utility is enabled then a UPDD Rotate system tray icon will be shown that can also be used to rotate the screen though the enabled Rotate states.



**Rotate confirmation**

If either the rotate system tray utility or the rotate toolbar is set to confirm before rotation the following dialog is shown:



**Initial Rotation Mode**

At system startup most systems will power up in landscape mode (0° rotation) although some can power up in the previous rotated mode. For calibration accuracy it is important that the driver knows the initial rotation mode. If, prior to reboot, the previous Windows session was rotated using Pivot software, one of the supported video chipsets, or the WM\_UPDDRotateEvent message it is important that the driver is informed of the initial rotate state at start up using the same method. Automatic detection is deliberately disabled in the assumption that one of these methods will be used at startup to inform of the start up rotation angle and to ensure there is no conflict between one of these methods (which can identify and inform of all 4 rotation angles and auto-detection that can only identify 2 rotation angles).

If none of the above methods were used to perform rotation the UPDD daemon process will auto-detect rotation but only be able to inform the driver of landscape (0°) or Portrait (90°/270°) initial rotation (depending on the UPDD PortraitAngle registry setting \*\*).

It is important that correct orientation settings (swap X/Y) are set if the system is starting in a rotated mode. If the number of calibration points is 4 or more then the calibration procedure will automatically calculate the orientation and therefore it is highly recommended that in this environment 4 calibration points or more are used. If this is not the case and orientation is incorrectly set the calibration may be incorrect when starting with a rotated desktop.

**Toolbar Considerations**

UPDD Toolbars are described in the [Toolbar document](#). Toolbars are either associated with a physical area on the pointer device **or** associated with a position on the desktop. Toolbars can also have associated images that are displayed on the

desktop at the position of the toolbar. When a display rotates the position of the toolbar is recalculated if the toolbar is associated with the desktop. If the toolbar is associated to a physical area on the pointer device and has an associated image then the image position is recalculated.

**Contact**

For further information or technical assistance please email the technical support team at [technical@touch-base.com](mailto:technical@touch-base.com)