



APPLICATION NOTE 54854

# AMD Eyefinity Technology

By Simsun Hong, Customer Applications Engineering Manager  
AMD Embedded Solutions

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**Abstract:** This application note provides an overview of AMD Eyefinity Technology, lists the AMD embedded devices that support this feature, and describes the supported features.

## Introduction

### What is AMD Eyefinity technology?

AMD Eyefinity is the technology to combine multiple monitors into a Single Large Surface (SLS), thereby allowing the Operating System and Applications to utilize all displays in the SLS as one large display.

### Why is AMD Eyefinity needed?

AMD Eyefinity technology is beneficial in consumer applications (e.g., 3D Games, videos, images, etc.) where content may be uniformly spanned across multiple displays to provide a surround effect of the displays.

AMD Eyefinity technology is also beneficial in embedded market applications where content may be both segmented and dynamically spanned across one or more displays in the Single Large Surface(SLS) mode, thus allowing unique use cases for static content as well as video or gaming content.

### How does AMD Eyefinity technology work?

AMD Eyefinity technology requires both hardware (GPU) and software (AMD video drivers) in order to function. On the hardware side, the number of display output pipelines represents the number of physical displays that can be enabled simultaneously. On the software side, once AMD Eyefinity technology is enabled the AMD video drivers combine the display output pipelines into a single pipeline, thereby making it a single large surface.

Once the Display output pipelines are combined into a single pipeline by the AMD video driver, the operating system and applications now see the single pipeline and interpret it as one large display. The overall resolution of the SLS will be the combined total of each individual display's resolution.

### Supported SLS Modes

The configuration and orientation of the AMD Eyefinity technology mode is called the SLS grid. Table 1 on page 2 shows the supported SLS grid configurations for AMD embedded products.



**Table 1. Supported AMD Eyefinity Technology Modes**

Number of Displays (pipelines)	Grid Configuration	Supported <sup>1, 2</sup>
6	6 x 1 Landscape	No
6	6 x 1 Portrait	No
6	1 x 6 Landscape	No
6	1 x 6 Portrait	No
5	5 x 1 Landscape	Yes
5	5 x 1 Portrait	Yes
5	1 x 5 Landscape	Yes
5	1 x 5 Portrait	Yes
4	4 x 1 Landscape	Yes
4	4 x 1 Portrait	No
4	1 x 4 Landscape	No
4	1 x 4 Portrait	Yes
6	2 x 3 Landscape	No
6	2 x 3 Portrait	Yes
6	3 x 2 Landscape	Yes
6	3 x 2 Portrait	No
4	2 x 2 Landscape	Yes
4	2 x 2 Portrait	Yes
3	3 x 1 Landscape	Yes
3	3 x 1 Portrait	Yes
3	1 x 3 Landscape	Yes
3	1 x 3 Portrait	Yes
2	2 x 1 Landscape	Yes
2	2 x 1 Portrait	Yes
2	1 x 2 Landscape	Yes

**Notes**

1. *The Number of Displays (Pipelines) will vary based on the Embedded Product. Entries in this table represent the entire list to ensure coverage for all embedded products (e.g., for a given GPU that supports up to four displays, any grid configuration for five and six displays is invalid).*
2. *Some unsupported Eyefinity modes can be enabled under special circumstances. For more details on this, please consult your AMD Embedded marketing manager.*

Referring to Table 1 on page 2, the Grid Configuration column shows the ‘first value’ x ‘second value’ (e.g., 1 x 2) represents ‘Columns’ x ‘Rows’.

As shown in Figure 1, the 1 x 2 Landscape mode grid configuration uses one column with two display rows. Similarly, the 2 x 1 Portrait mode grid configuration uses two columns, each with one display row.



**1x2 Landscape Display Group**



**2x1 Portrait Display Group**

**Figure 1 Landscape and Portrait Display Groups**

For additional examples please see the AMD Eyefinity Technology Display Configurations in the References Section of this document.

### AMD Embedded Products that Support Eyefinity Technology

AMD embedded products support from two to six displays as shown in Table 2.

**Table 2 Supported AMD Eyefinity Technology Modes**

Product	Maximum Number of Displays
AMD G-Series SOC (FT3, FT3b)	2
AMD Embedded R-Series APU (FP3 Processor)	4
E6460	4
E6760	6
E8860	6
HD 7970M	6
HD 6970M	6
HD 7850	6
HD 5770	3

**Note:** Some Products may have a limited number of display connectors so it is critical to select the product that meets your needs while also considering the Tuning and Customer Recommendations section.

## Enabling AMD Eyefinity Technology

This section provides an overview of the following components:

- AMD Catalyst™ Control Center
- AMD Display Library SDK
- ADL Control Center

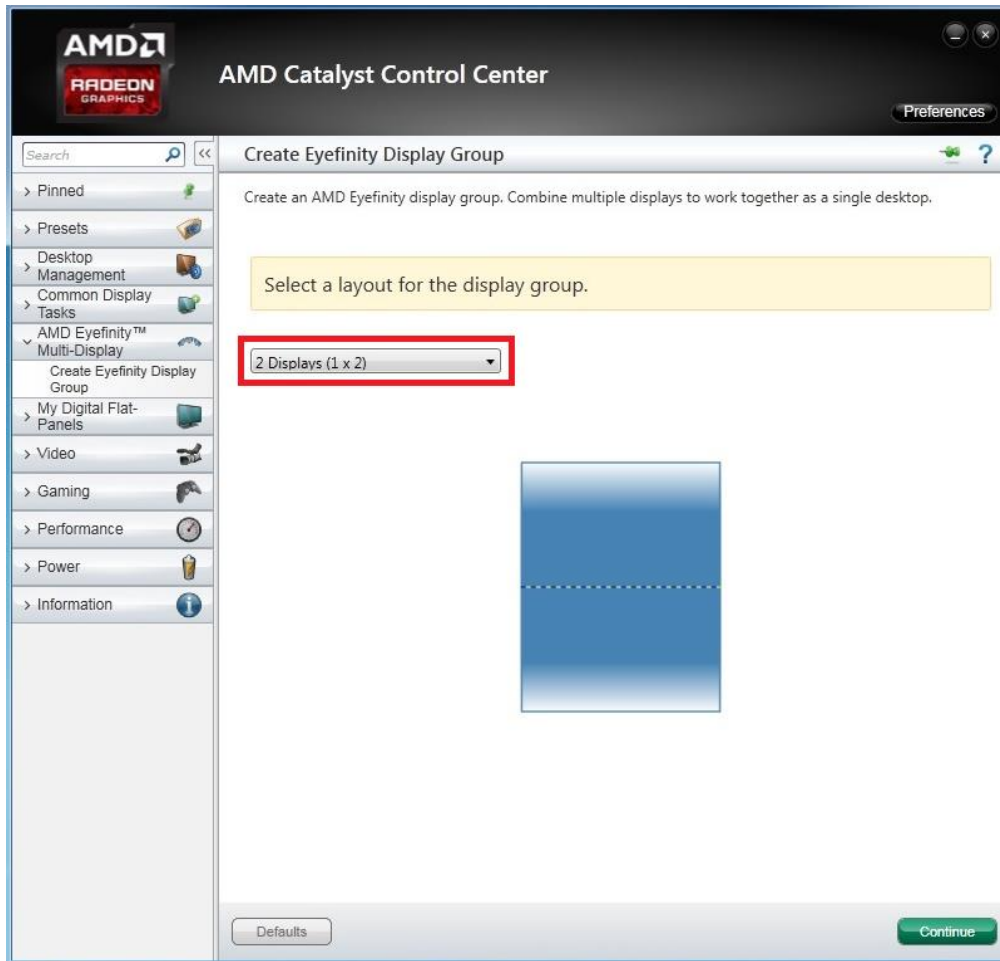
### AMD Catalyst™ Control Center

The AMD Catalyst™ control center is used to create an Eyefinity display group as shown in the following steps. Two or more monitors must be connected in order for the AMD Eyefinity Multi-Display tab to appear. This example uses two monitors.

1. Open Catalyst Control Center.
2. Click on the AMD Eyefinity Multi-Display button
3. Click the **Create Eyefinity Display Group** button.



4. Select the layout for the display group from the dropdown menu, then click **Continue**.



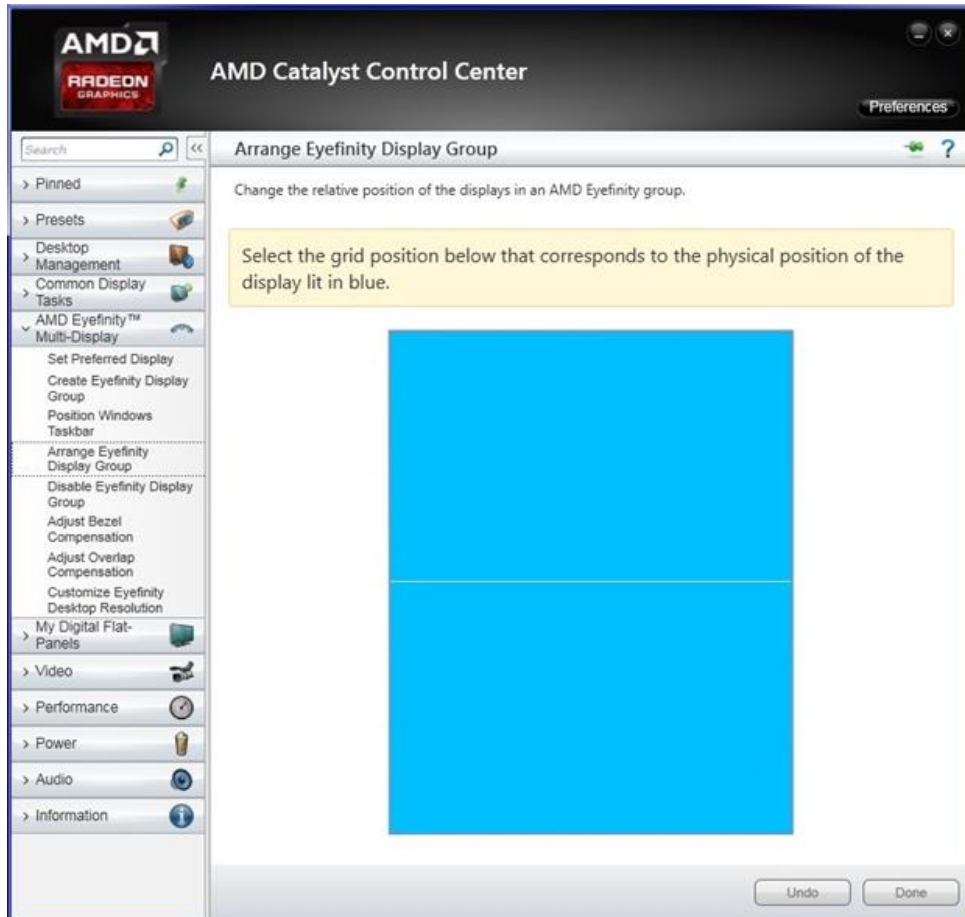
5. Select the desktop you want to start for the Eyefinity display group.



6. Now that the display group is created, the displays can be arranged as needed.



- Click the **Arrange** button. Each display will now show a blue background. Select the Display Icon which matches the Physical arrangement shown in the CCC Physical Position. This process will continue until the last display is reached. Click **Done** when complete. You can now use all displays within the group as a Single Large Surface (SLS). Additional tuning may be required as described later in this document.



### AMD Display Library SDK

AMD provides a software development kit (SDK). AMD Display Library (ADL) SDK that includes an Application Programming Interface (API) for the graphics driver.

The ADL SDK download link is provided in the References section of this document. Example AMD Eyefinity technology code is also provided in the ADL SDK download.

### ADL Control Center

As mentioned in the previous section, ADL SDK provides an API to the Graphics Driver. The AMD Embedded group has written an example utility, ADL Control Center, which includes various functions for the ADL SDK. Two of these functions are Create SLS (Eyefinity), and SLS Re-Arrangement. The download link to ADL Control Center is provided in the References section of this document.



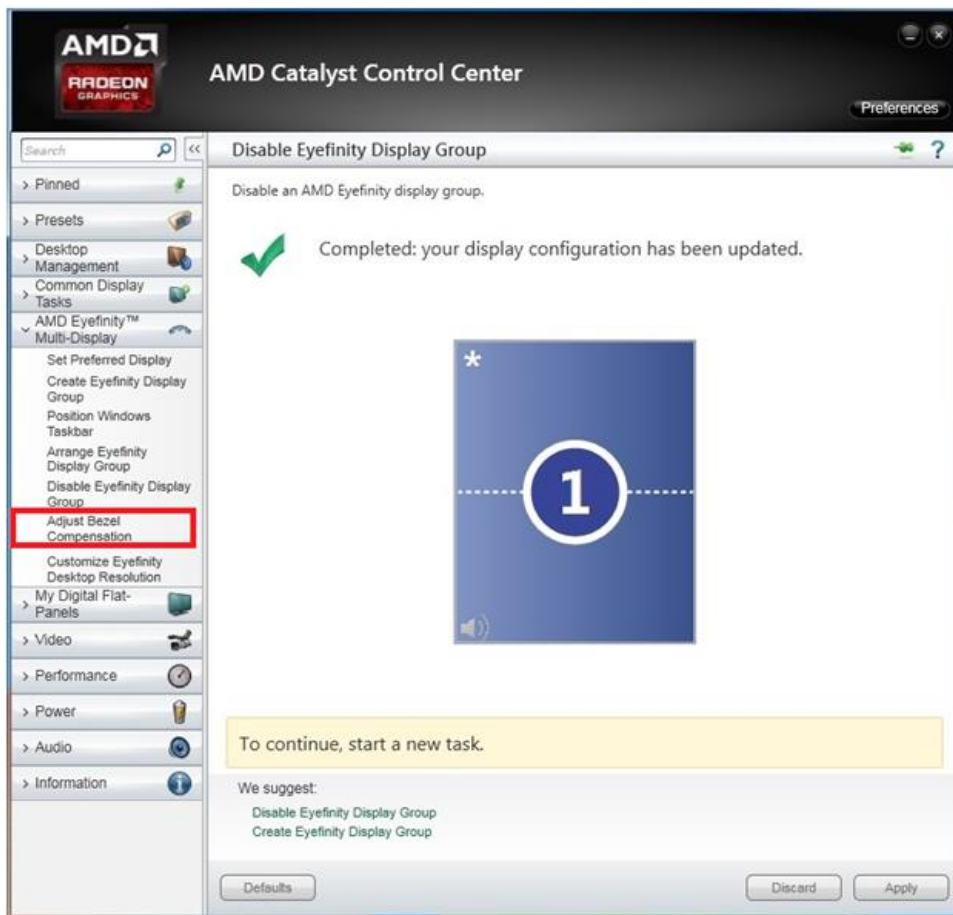
## Tuning and Customer Recommendations

This section describes the tuning options available in CCC. Information on avoiding screen tearing is also included. Before creating the initial Eyefinity Display Group, AMD recommends enabling all Displays in Clone (Duplicate) mode.

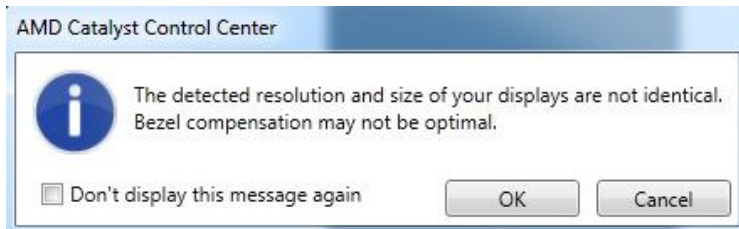
### Adjust Bezel Compensation

Once the Eyefinity Group is created, you may notice that images are not properly aligned between the displays within the Group. The Adjust Bezel Compensation tool in CCC can be used to correct this using the following steps.

1. In CCC, click the **AMD Eyefinity Multi-Display** tab. After an Eyefinity SLS is created, additional options appear as shown. Select **Adjust Bezel Compensation**.



**Note:** If the monitors are not identical, the following dialog appears:

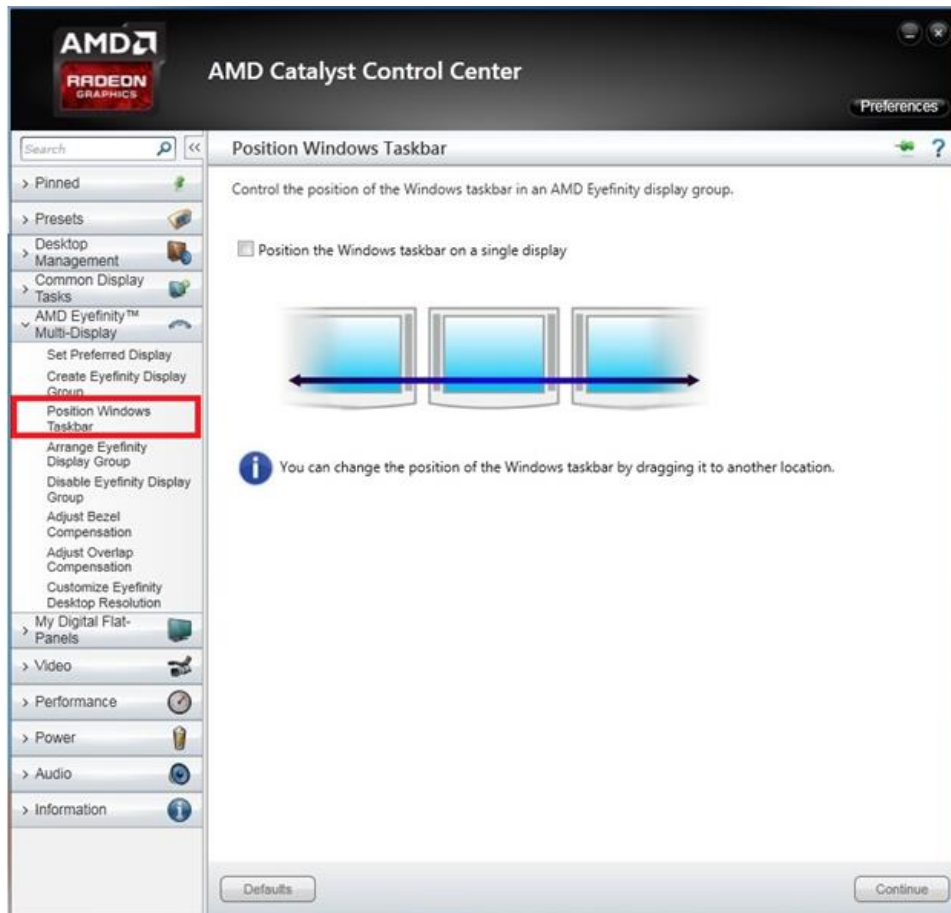


2. A Triangle image appears centered across all displays in the SLS. Click on the adjustment arrows until the triangle image appears aligned for your SLS monitor arrangement. Click the checkmark when done.

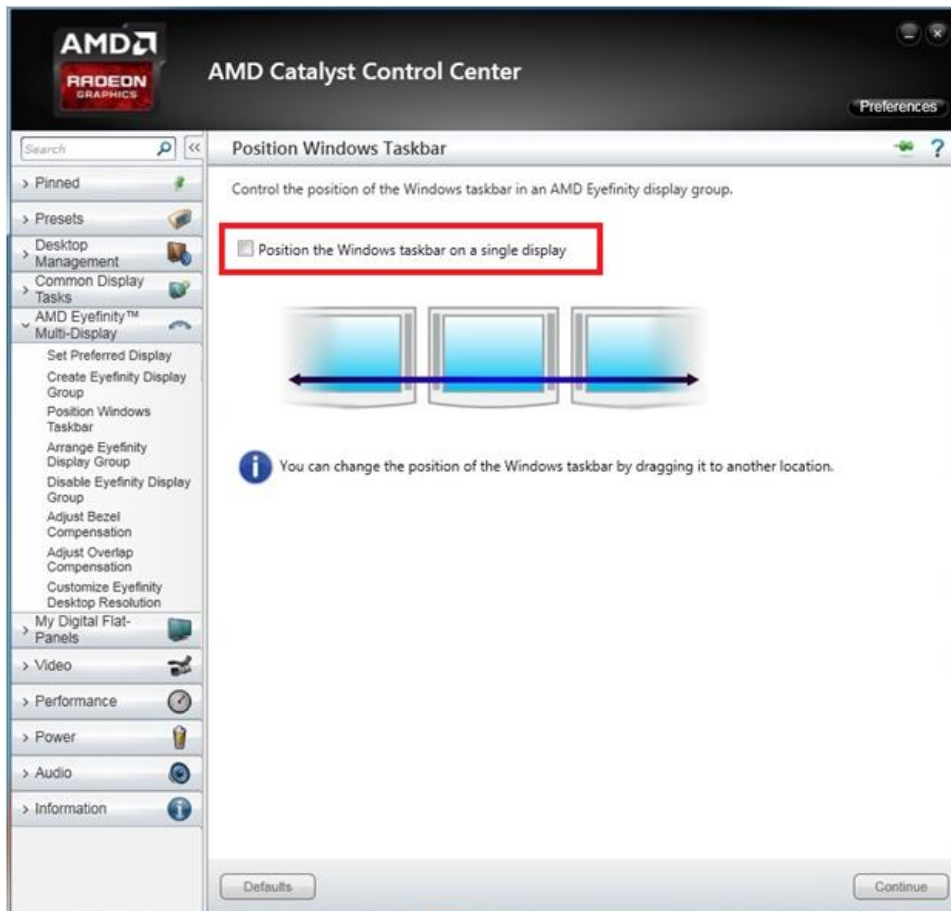
**Note:** When Bezel Compensation is performed, the reported resolution will be different by the number of pixels used in the adjustment. Each click of the Arrow is equivalent to 2 pixel shifts. For example, in a case where the resolution is 1920 x 2500, a bezel adjustment of 10 pixels (5 clicks of the arrow in either direction), will cause the resolution to be reported as 1920 x 2510 or 1920 x 2490.

Once the Eyefinity Group is created, you may notice that the Windows® Taskbar is not in the desired position. The Position Windows Taskbar feature can be used to modify this.

1. In CCC, under the AMD Eyefinity Multi-Display Tab, select Position Windows Taskbar.



2. Select whether you prefer to have the taskbar span across multiple displays within your SLS, or position it on a single display. Click **Continue** when done.



## Set Preferred Display

Once the Eyefinity Group is created, you optionally change your initial selection for the preferred display. The Set Preferred Display command can be used to modify your initial setting.

1. In CCC, click the **AMD Eyefinity Multi-Display** tab, then select **Set Preferred Display**.



2. Optionally, you can choose which display you want to act as the preferred desktop, then click **Apply**. The preferred desktop is considered the principal display.

## Customize Eyefinity Desktop Resolution

Once the Eyefinity Group is created, you may choose to change the SLS desktop resolution. The Customize Eyefinity Desktop Resolution control can be used to select a custom resolution.

1. On the CCC AMD Eyefinity Multi-Display tab, Select **Customize Eyefinity Desktop Resolution**.



2. Optionally, you can choose a custom resolution for your Eyefinity SLS. Available resolutions appear in the Custom Resolution list. Click **Apply** when done.

**Note:** Bezel compensation may need adjustment after changing resolution.

## Screen Tearing

In some Eyefinity SLS setups, users may experience screen tearing. This is the behavior where any fast moving objects, videos, or applications, show a visual “tear” somewhere within the image. Screen tearing can look something like the horizontal section (shown below) that is misaligned with the rest of the image.



Figure 2. Screen Tearing Example



Figure 3. Magnified Area of Screen Tear

Tearing can be attributed to a few different factors:

- Vertical synchronization is not enabled
- Windows® 7 Aero Theme is not selected
- Monitors from different vendors with different timings are used in the SLS
- Different display connectors are used in the SLS

To avoid tearing, it is advised that these factors be taken into account.

## Vertical Synchronization

In CCC, the default setting for Wait for Vertical Refresh is Off unless application specifies. To avoid tearing in all situations, change Wait for Vertical Refresh to Always on, then click **Apply**.



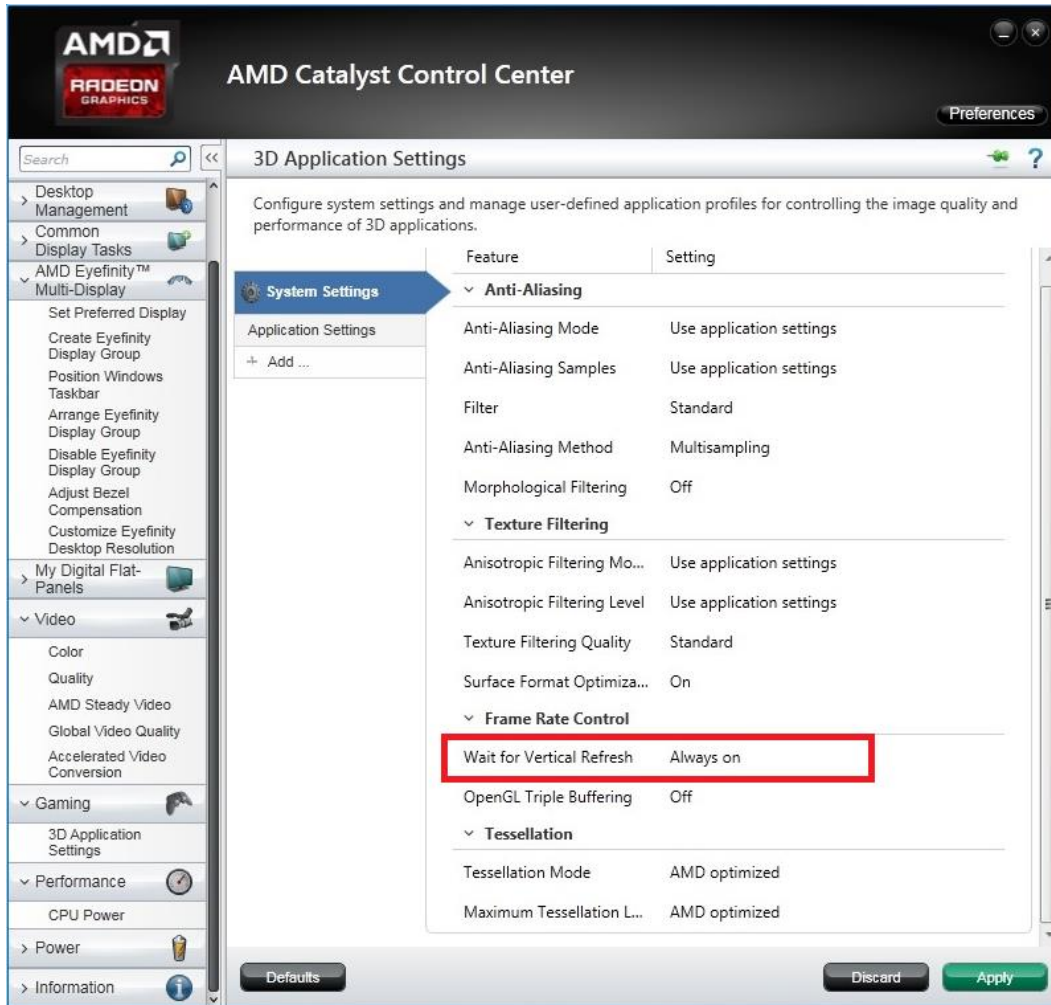
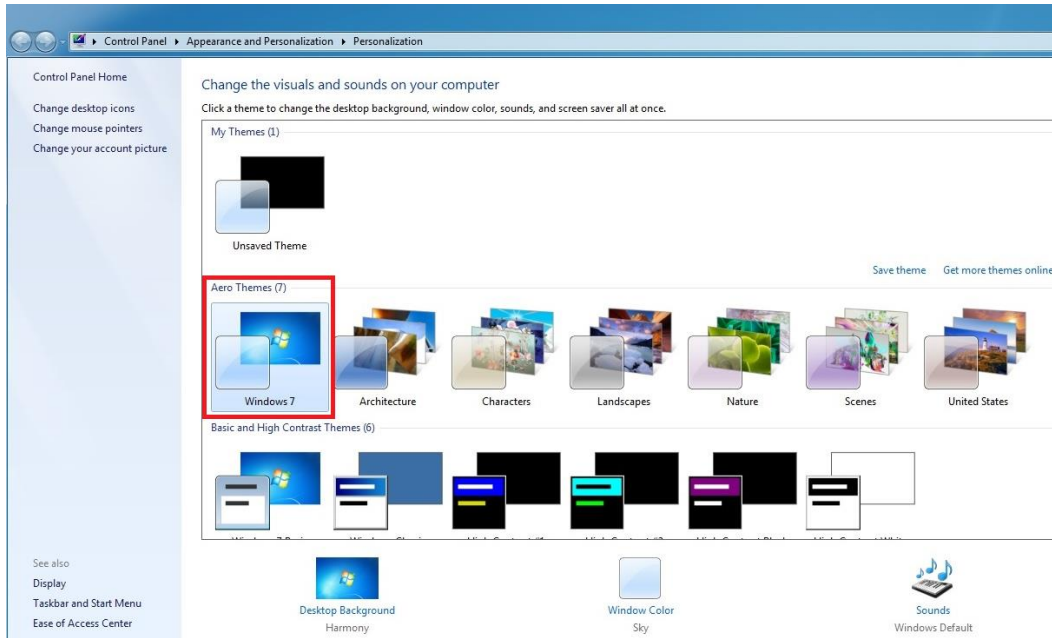


Figure 4. Vertical Refresh Control

### Setting Windows Aero Theme

The default setting for the Windows 7 may be set to Basic. To change this setting, open **Control Panel > Appearance and Personalization > Personalization**, then select an Aero theme as shown in the following figure.



**Figure 5. Setting Windows® 7 Aero Theme**

### Using Different Monitor

As described in the introduction, when an Eyefinity SLS is created the AMD video driver combines the display output pipelines into a single pipeline. When operating as a single pipeline, the display output timings are all synchronized to a single timing, which matches the timing of the preferred display.

When monitors from different vendors with different timings are used in the SLS, tearing can occur. The reason behind this is because of the timing is synchronized to the preferred display, thereby causing the non-identical display to synchronize to a timing that is non-native to its own preferred timing.

In order to avoid tearing, it is recommended that only monitors from the same vendor with the same timing are used in the Eyefinity SLS. Alternatively, if the Monitor can accept non-native timings for specific resolutions, tearing may be avoided if the specific resolution selected can be synchronized by the specific monitor.

Changing the Preferred Display setting to another Monitor can also help avoid tearing as long as the preferred display's timing can be accepted by the other monitor(s).

### Using Different Display Connectors

Similar to the monitor timing problems described previously, when different (mixed) display interface connector types (i.e., DVI, HDMI, DP, VGA) are used, the expected timing for each display connector will also vary. Since the display timing is set to utilize the preferred timing of the preferred display, all other displays that are using different display interface connectors will synchronize to a timing that is non-native to their own preferred timings for their specific interface connector input.

In order to avoid tearing, the same interface display connector must be used across all displays in the Eyefinity SLS. Alternatively, if the monitor can accept non-native timings for specific resolutions on specific display interface connectors, tearing may be avoided if the specific resolution selected can be synchronized by the specific monitor.

Changing the Preferred Display setting to another monitor that is using a different display connector can also help avoid tearing as long as the preferred display's timing can be accepted by the other monitor(s) input.





## References

ADL Control Center:

<https://wwwd.amd.com/amd/devsite.nsf/softwarepages/ToolsbyOSAMD64?OpenDocument>

AMD Display Library Software Development Kit:

<http://developer.amd.com/tools-and-sdks/graphics-development/display-library-adl-sdk/>

AMD Eyefinity Technology Display Configurations:

<http://support.amd.com/en-us/kb-articles/Pages/gpu50-ati-eyefinity-display-configs.aspx>

AMD Eyefinity FAQs:

<http://support.amd.com/en-us/kb-articles/Pages/AMDEyefinityFAQs.aspx>

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