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> Fly Elise-ng Immersive Calibration PRO Step-By-Step Guide Calibration without a camera

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1 Introduction

This is a step-by-step guide for setting-up a seamless immersive projection using cylindrical projection screen with overlapping projectors.

The calibration produces a perfectly aligned and geometrically correct image by taking into account the projector positions and the screen shape.

At the end of the calibration, Immersive Calibration PRO exports the perspective camera frustum settings (position, orientation and field of view), which can be used directly in the game or other 3D engine to produce the images for each projector.

Immersive Calibration PRO also exports the warping and blending configuration to be loaded and used in Immersive Display PRO for warping and blending the projected image to get a seamless display.

For this calibration no camera is needed. The calibration process involves only manual mapping of the projector image to the screen. The manual mapping is supported by 3 steps approach (very coarse, coarse and fine) making the calibration process as quickly as possible. The needed steps for the calibration will be explained further in this step-by-step- guide.

For the purpose of this step-by-step guide we will use a cylindrical projection screen with the following parameters: horizontal angle 200 degrees, height 1.8 meters and radius 1.7 meters (diameter 3.4 meters). The 3 projectors are positioned in such a way that the complete projection screen is covered by a projection images from projectors and that the projector images overlap by about 15%.



Note: For the best calibration results with this camera less calibration method it is important that the projectors are positioned in such a way that the complete projector image "overshoots" the screen top and bottom edges.

Before we continue with the calibration we will need to divide the screen in equidistant horizontal and vertical sections (columns and rows). Those sections will be used as a reference for mapping the projectors images to the screen.

For this calibration we will divide the screen in 6 rows and 20 columns. Because there is no screen curvature along the vertical axis, the number of divisions in rows can be smaller than the number of columns.

Depending on the curvature of the screen, the number of columns division can be increased or decreased. Generally, for cylindrical screens a number between 20 and 30 columns is enough.

For this screen dimensions we can calculate: The height of a single row section is:

1.8 m/6 = 0.3m.

The length of a single column section (along the screen edge arc) is: ((200 deg/360 deg) * 2 * Pl * 1.7m) / 20 = 0.296m



The columns sections are numbered from left to right starting from 1. Rows sections are numbered from top to bottom starting from 1. This numbering is important later when we define the views.

Note that the numbers on the image above are for illustrative purposes. Users can use different methods to mark the rows and columns, including stickers or other temporary markers.

Measure the edges of the screen and put physical markers on the screen edges to mark the rows and columns. A UV pen and UV light can be used to mark the screen with invisible markers that can be made visible with UV light during calibration.

We will use two computers to perform the calibration:

One PC has at least 3 outputs connected to the 3 projectors. The simplest configuration is to have one wide display (3x1) created either by using Matrox TripleHead 2 Go or ATI Display Group or NVidia SLI Surround. The graphical program (ex FSX, Prepar3D, X-Plane, etc) will run on this display.



Note: When using the latest version of P3D v3.3+ with ViewGroups.xml, make sure that the displays are not grouped as one single display. P3D v3.3+ with ViewGroups.xml require ungrouped displays in extended desktop mode.

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The name of this PC is **WIN7** and will be used as **Rendering Client** during the calibration.

The second PC will be used as **Controller Server**. It can be any PC with a moderate graphical card and connected in a network with the Rendering Client WIN7 PC. The Name of the Controller Server PC is **SERVER**.

The **SERVER** PC is needed only during the calibration and can be removed after the calibration is completed and calibration results are saved.

2 First time Bonjour installation

In order to automatically recognize and connect the client and the server PC on the network, a zero-configuration service is used. For this purpose the Bonjour service needs to be installed on both the client and the server PC. From the Immersive Calibration PRO locate and double click on the INSTALL_FIRST_BONJOUR.bat script. This will start the installation of Bonjour. This installation step is needed only once and should be performed the first time Immersive Calibration PRO is used on the PC.

Follow the installation steps of Bonjour install script and finish the installation.



Note: If using firewall, make sure that the firewall is disabled on both the client and the server PC in order to allow the client and the server PC to connect to each other without being blocked by the firewall.

3 Start and configure the Rendering Client

On the rendering client PC, start the Client.exe program from Immersive Calibration PRO installation folder. Immersive Calibration PRO will start in client mode and will show the available displays. Initially projector configuration for each display is "None".



Right-click on the display that is connected to the projectors and select projector configuration 3x1 from the popup menu.

No projectors		
💭 No projectors		
📫 1 projector	►	
📖 2 projectors	►	\\\DISPLAY1 Intel(0) HD Graphics 4600
🞫 3 projectors	►	=0 3x1
🐖 4 projectors	►	ọ 1x3
🚎 5 projectors	►	Projectors 0x0
≓ 6 projectors	►	
≓ 7 projectors	►	
≓ 8 projectors	►	
≓ 9 projectors	►	
≓ 10 projectors	►	
📖 11 projectors	►	
📖 12 projectors	►	
📫 📫 💭 13 projectors	►	
🛑 🐖 14 projectors	Þ	

The selected display will be configured with projector configuration 3x1 and the rendering client will be prepared to be connected to the server.

Note: When using the latest version of P3D v3.3+ with ViewGroups.xml, there will be 3 separate displays available. Right-click on each display and select projector configuration 1×1 from the popup menu.

A tray icon will be shown on the system tray to indicate that the client is running.



Press the "Hide" button to minimize the client window. When the server is connected to the client, the client window will be opened in full screen mode on the 3x2 display.

Note: The projector configuration will be automatically saved. The next time Client is started, it will automatically use the saved projector configuration.

4 Start and configure the Controlling Server

On the controlling server PC, start the Server.exe program from Immersive Calibration PRO installation folder. Immersive Calibration PRO will start in server mode.



When starting for the first time, select "Create new project". Once the project is saved, the project can be loaded by selecting "Load project file.

For this setup we do not use multiple projectors layers (multi-stacking). So from the projection stacking screen select "Tiled" projectors alignment. Select the "Cylinder" screens shape and make sure the "Map to projector" is selected. Press the "Create" button.

Projector arangement	Stacked			
Screen type				
General	Full Dome (Fisheye)	l - Toggle Info R - Reset View		
Cylinder	Multi-Plane			
Partual Dome	Cone Cave		ξ.	
Horseshoe (Single)	External Mesh			
Map on camera	EO Map on proje	ector		
				Create

We will enter the size and the divisions of the projection screen later.

The Controller Server window will be started that shows the "Virtual Display".

File Workflow	Tools Camera	Scanners Or	n projectors Help					
1. Projectors	2. Screen	J. Views	4. Map/Scan views	5. Edge blend	6. Perspective	7. Export		:
Available client proj Fly-Elise-ny Projec Projec	jectors g 0_0_3072_768 tor1 [1024x768] tor2 [1024x768] tor3 [1024x768]	Columns X Rows 3	: ĴX1ĴSelec	t projector(s) resolu	tion 1024x768			
			SERVER (DISCONNECTE) SERVER Projectori [1024x768]	D)	SERVER (DISCONNECT SERVER Projector2 [1024:768	red) 2 1	SERVER (DISCONNECTED) SERVER Projector3 [1024x766]	
	Display : Resolution 3072x768 : Projectors 3x1 0 of 3 projector(s)) connected

The virtual display is initially not configured. Set the projector configuration to 3x1 and select the individual projector resolution.

Select single projector resolution								
1600x1200 [UXGA]								
1440x960 [FWXGA+]								
1440x900 [WXGA+]								
1280x1024 [SXGA]								
1280x960 [SXGA-]								
1280x800 [WXGA]								
1280x768 [WXGA]								
1280x720 [HD/WXGA]								
1024x768 [XGA]								
800x600 [SVGA]								
3070x4096 [HXGA	portrait]							
2400v3840 [WOII]	(CA nortrait)	•		1				
Width	1024	Teight 💭	768	•				
		🔀 Cancel	✓ Select					

A pop window shows a list of standard resolutions per projector. Select the projector resolution from the list of available resolutions or select "Custom resolution" and enter the projector resolution.

The virtual display will be configured with projector configuration 3x1. The individual projectors are not "assigned" and not connected yet to the projectors defined in the "Rendering Client". The available projectors from the client(s) are shown in the left panel.

Double click on each projector to connect to a projector defined in the "Rendering Client". If the "Rendering Client" successfully connected to the "Controller Server", a list of the projectors will be presented. Select a projector from the right list to "assign" the projector. This will assign and connect the virtual display projector to a remote projector.

-		
▼ ⋥ Fly-Elise-ng-192.168.1.22:55555 0_0_3072_768 (3x1)		
Projector1-(1x1) [1024x768]		
EO Projector2-(2x1) [1024x768]		
EO Projector3-(3x1) [1024x768]		
	X Cancel	Select
	ov cancer	- Jelett

Repeat this step for all projectors. When all projectors are assigned click the "Screen" button to configure the screen.

Select remote projector

5 Screen settings

Before we continue with the calibration we have to enter all calibration settings needed for successful calibration. This is one of the very important steps for achieving first-time-right calibration.

In the screen settings window enter the screen dimensions, the angles and the number of rows and columns sections.



Our screen has an angle of 200 deg, height of 1.8 m and radius of 1.7 m. As the reference point is in the middle of the screen, and the height axis points to up, we enter the values -100 deg as begin angle and 100 deg as end angle. Similarly for the height, we enter -0.9 m as vertical begin and 0.9 m as vertical end. The radius is 1.7 m.

Because we divided the screen in 20 columns and 6 rows, we enter the Columns and Rows values respectively 20 and 6.

After that click on the "Views" button to configure the Views.

6 Views settings

In the views tab, there is already a view created for each projector. For each view we will have to enter the screen sections (rows and columns) that are visible in this view.

In this type of calibration a view is defined as part of the screen covered by the projected image from a single projector. When entering the screen rows and columns for a view, we will count all the rows and columns that are covered by projected image from this projector.

Note: The red markers on the images below represent the visible or invisible markers put on the screen. The numbers are for illustrative purposes to make it easier to count the columns.

So, let's start with the first view (View1). This view is defined by projector1 (left projector) image on the screen.



Looking at the screen we can see that the projected image begins at row 1 and covers in total 6 rows (1, 2, 3, 4, 5, 6). The image starts at column 1 and covers in total 9 columns (1, 2, 3, 4, 5, 6, 7, 8, 9).

We enter the values for View1 accordingly: Begin column 1, Number of columns 9, Begin row 1 and Number of rows 6.



Select the second view (View2). This view is defined by projector2 (center projector) image on the screen.



Looking at the screen we can see that the projected image begins at row 1 and covers in total 6 rows (1, 2, 3, 4, 5 and 6). The image starts at column 6 and covers in total 10 columns (6, 7, 8, 9, 10, 11, 12, 13, 14 and 15).

We enter the values for View2 accordingly: Begin column 6, Number of columns 10, Begin row 1 and Number of rows 6.



Select the third view (View3). This view is defined by projector3 (right projector) image on the screen.



Looking at the screen we can see that the projected image begins at row 1 and covers in total 6 rows (1, 2, 3, 4, 5 and 6). The image starts at column 12 and covers in total 9 columns (12, 13, 14, 15, 16, 17, 18, 19 and 20). We enter the values for View3 accordingly: Begin column 12, Number of

columns 9, Begin row 1 and Number of rows 6.

File Workflow Tools Camera Scanners On projectors Help							
1. Projectors 2. Screen 3. Views 4. Map/Scan views 5. Edge blend 6. Perspective	:						
Number of views 3 View1 View2 View3 Mapping View 3 Mapped to screen grid View1 Advanced							
Columns/Rows Projectors in view [3]							
Begin row 1 2 Number of rows 6 2							
I - Toggle Info R - Reset View							
I - Toggle Info R - Reset View							

This finishes the configuration of the calibration settings. The next steps will describe the mapping of the projectors in the screen.

Use the File/Save menu to save the calibration project.

7 Map views screen

Press the "Map/Scan Views" button to map each projector on the screen. Each projector image will be mapped on the screen using the screen rows/columns and the projected images on the screen.

First, from the "On projector" menu select "Black/All projector". This will project black images on all projectors.



Now select "View1" button.

This will enter the screen-mapping mode to map the projector image on the screen.

We will use the automatic screen mapping based on at least 6 points mapped to the screen rows/columns. Make sure that the "Automap" option is enabled.

Note: The auto-mapping function is dependent on accurate measurements of the screen dimensions and accurate position of the screen markers for the rows and columns).



Select at least 6 points as a reference (mapped) points that can be mapped to the screen visually. When a point is selected, press "Space" (or CTRL + Left Mouse) to toggle the point as a mapped point. The mapped points will change the color and the shape.

Select the edge points of the mapping grid that can be mapped visually to the screen. For View1 we will use 3 points on the top and 3 points on the bottom.



While looking into the screen drag the mapped points and move them on the screen markers so that the screen sections will match with the screen. A visual marker colored magenta will show the current moving control point. Use the Left mouse button to drag the point. Use the Right mouse button to drag the point with subpixel resolution. Set the points on the screen markers as accurately as possible.



Now press the "Auto map screen 3D" button, to map the rest of the screen grid to the screen.



The grid will be automatically mapped to the screen. If more accuracy is needed, create more mapped points and move them on their corresponding markers on the screen.



Repeat the same steps for the rest of the projectors:

From the "On projector" menu select "Black/All projector". This will project black images on all projectors. Now select "View2" button.

Define mapped points in the same way as for View1, and use Automap function to map the screen grid.

This is the result for View2.









Do the same for View3. This is the result for View3.



After all individual views are mapped, from the "On projectors" menu select "Screen grid/All projectors". This will project the screen mapping images on all projectors. Now we can evaluate the initial mapping and perform some fine-tuning when needed to align the images perfectly.

File Workflow	Tools Camera	Scanners	On projectors	Help					
F I			Black	►	1	A	à		
1. Projectors	2. Screen	3. Views	Identity	►	5. Edge blend	6. Perspective	7. Export		•
Marrow	View 1	View 2	Markers	►					212
Scieen		-	Reconnized	hlohs 🕨				Images	Calculate
	Info Align all I	Move Single [F	Screen grid	•	All projector	s			conconorce
			warped sing	ie view P	😐 Ргојестог г	-17-0318-03			
			Warped mul	ti view 🕨	📫 Projector 2				
			e		🐖 Projector 3				
			-E			_ ⊕ _ ⊕ _ ⊕	2		



If we look into the overlap between the second and the third projector we can see that we can do some manual adjustments of the grid to align the images better.



Click on the "View3" button and move the corresponding left points until they align with the points from the second projector. Look at the projection screen visually confirm the alignment.

Do the same fine adjustment for the other views is needed.



When projecting static images, video, of games that do not support multiple perspective views, Immersive Display PRO will calculate the warping and blending to map this single virtual camera view to the projection screen. The actual (real) field of view will be determined by the field of view of this single virtual camera.

Press the "Calculate" button to calculate the geometrical correction, autoalignment and edge blending.

File Workflow	Tools Camera Scanners	On projectors Help				
1. Projectors	2. Screen 3. Views	4. Map/Scan views 5. Ed	dge blend 6. Perspective	7. Export	_	:
Screen	View 1 🗖 View 2	View 3				nagesCalculate
	Info Align all Move Single [f	:7 C:4] [px:0.282 py:0.853] #6				مسارد
		Zoom x 0.7				
	Off Lock grid				Q •	
			C[12:9] R[1:6]	ે 🕻 🗧	}	. ₩.
	On 🔵 Automap 🔨 🧍	k 🕲 💭 🕐	On 😑 Lock Sub: C 0 🗘 R 0 🕻	•		Projectors 💷 [3]

After calibration finished, the geometrical correction and the soft-edge blending will be calculated and send to the Rendering Client PC. A test image will be projected on the screen from multiple projectors.

Optionally, change the images to preview the alignment.

Immersive Calibration PRO Step-By-Step Guide



8 Edge – blend

Click the edge-blend button to fine tune the edge blend if needed. The default settings give the best results for most of the projectors. If the projectors have different gamma profile, do a slight change to the gamma value to achieve the best edge blend. Use different images to verify the blending.



When the result is satisfactory Save the selected settings in a ".project" file using the File/Save menu.

9 Perspective projection

When projecting the content of a 3D application (Games, Simulators, CAD, etc.) that have support for multiple cameras, each projector can project image from a single virtual camera. The total projected image will not be constrained by a single camera field of view but it will match the projection screen field of view.

Before calculating the perspective mapping, make sure that the previous steps are performed successfully. Those steps will perform projectors mapping to screen mapping which is a basis for the perspective mapping.

Select the "Perspective" button to enter the perspective configuration screen. First press the "Find frustums" button. This will find the perspective frustums for all projectors. Note: When using the latest version of P3D v3.3+ with ViewGroups.xml, the asymmetric frustums option can be used to calculate the frustums to fit optimally and to maximize the pixel usage.

Most of the game engines do not support asymmetric frustums so make sure the symmetric frustum option is enabled.



Then press "Calculate perspective" button. This will calculate the perspective correction and the edge blending for each projector.

After calibration finished the results are send to the Rendering Client PC. A test 3D mesh scene or a tunnel scene that corresponds to the screen shape will be projected on the screen from multiple projectors.

Use the available perspective scenes to verify the calculation.



10 Export the calibration result

The calibration can be exported to a file that can be used inside Immersive Display PRO. Also a set of virtual camera parameters (frustums) will be exported that can be used directly or indirectly in to position and orient the cameras in the game or other 3D engine software.

Press the "Export" button to enter the export screen.

File W	orkflow	Tools Camera	Scanners	On projectors Help			Mem: Heap [132.3 /	MB] Phys [126.9 MB]	mg [4/3.7 MB MAX 5/3.7 MB
1. Projec	tors	2. Screen	3. Views	4. Map/Scan views	5. Edge blend	6. Color correction	7. Perspective	8. Export	:
									Export data
Export folde	er .\expor	t							
On 🥪	Procalib	Warp & Blend				On 🥝 Single frustum	(single.procalib)		
8 Off	2D Media	1				On 🥑 (Perspective) M	Iulti frustums (multi.pr	ocalib)	
On 🤗	P3D/FSX								
On 🥪	X-Plane								
8 Off	DCS								
8 Off	Frustums								
× Off	Projector	map							
× Off	View map	D.							
8 Off	WaveFro	ntObj							
8 Off	OpenWA	RP2							
8 Off	Barco Pu	lse							
8 Off	Barco Wa	arpBox							
8 Off	VESA MP	CDI							
8 Off	EasyBlen	d							

Select the needed additional exports and press the "Export data" button. Several .procalib files will be exported with the filename selected from the export dialog. The .procalib files can be imported in Immersive Display PRO.

Note: When asymmetric frustums are used, some of the export options are not available because the corresponding software does not support asymmetric frustums. Disable the asymmetric frustum option in the "virtual camera configuration window" to enable those export options.

F	export							
ب ا	Burn	New folder						
	Name	~						
	3x1.frustums							
	3x1.fs	x						
	📄 3x1_n	nulti.procalib						
	📄 3x1_s	ingle.procalib						

The _single.procalib file should be used when projecting a single virtual camera content (video, desktop, etc). The _multi.procalib file should be used when projecting multiple virtual cameras content (games, simulators, 3d engines, etc).



11 Prepar3D v3.3+ camera settings

Prepar3D v3.3 introduced a feature named View Groups. On multi display systems, View Groups can be created to easily configure views across multiple displays using the View Group Management window.

http://www.prepar3d.com/SDKv3/LearningCenter/getting_started/view_syst em/display_configuration.html

There is no more need for modifying the flight files (fxml files) for creating correct geometry for multi-projection systems.

One important feature of View Groups is the possibility for asymmetric frustums (camera). This allows Immersive Calibration PRO to calculate the best frustum fit and ensure minimum pixel loss and minimum image stretching. In Immersive Calibration PRO make sure that the option "Asymmetric frustum" is enabled when before pressing "Find frustums".



When using asymmetric frustums, the calculation of the frustums will be optimized to minimize the pixel loss and maximize the projector image usage on the screen. This will export a file ViewGroups.xml that can be copied into the P3D configuration folder.

Open the folder "%APPDATA%\Lockheed Martin\Prepar3D v3". The easiest way is to press WIN + R keys, type %APPDATA% and press enter. This will open the "%APPDATA%\ folder. Open the underlying Lockheed Martin\Prepar3D v3 folder.



Rename/backup the existing ViewGroups.xml file and copy the exported ViewGroups.xml file in this location.

I Image: Constraint of the state of the											
Pin to Quick Copy Paster	e [¥ Cut ≌ Copy path ₽ Paste shortcut	Move Copy to *	elete Rename	New folder	v item ▼ y access ▼	Propertie	Edit Edit History	Select all Select none		
	Thie		Ucorr > Ely Elico n	e a > AnnData	Popping A	Lockhood	Martin 1	Droppr2D v2	Select	Casaah Daamaa2D v2	0
← → * ↑ <u>1</u>	The	SPC > US(C;) >	osers > Fiy Elise-fi	g > AppUata	> Koaming >	LOCKNEEd	viarun >	Preparso vs	~ 0	Search PreparsD V3	Q
V 📥 Ouick access		Name		Di	ate modified	Туре		Size			
Develoads		Controls		4/	20/2016 11:29 PM	File fold	er				
- Downloads	7	SimObjects		4/	20/2016 11:29 PM	File fold	er				
Desktop 🤅	*	Substitutions		4/	20/2016 11:28 PM	File fold	er				
Google Drive	*	cameras.cfg		4/	20/2016 10:14 PM	CFG File		11 K	B		
Documents	*	DefaultRecord	dAndPlayback.xml	4/	20/2016 10:14 PM	XML Do	cument	16 k	B		
Pictures 3	*	DISConfigurat	tion.xml	8/	16/2016 4:04 PM	XML Do	cument	1 K	B		
Photos1		Displays.xml		7/	25/2016 7:46 PM	XML Do	cument	1 K	B		
Putty		dxdiag.txt		4/	20/2016 11:34 PM	Text Do	cument	60 k	B		
resources		fdr.dat		4/	20/2016 11:34 PM	DAT File		1 K	В		
TOPRINT		Logbook.bin		5/	12/2016 7:39 PM	BIN File		2 K	(B		
		LWcfg.xml		4/	20/2016 10:14 PM	XML Do	cument	771 K	B		
> 🐔 OneDrive		MonitoringSy	stemProfiles.xml	6/	2/2016 8:56 PM	XML Do	cument	3 K	B		
> This PC		Multichannel	.xml	6/	2/2016 8:51 PM	XML Do	cument	1 K	B		
		Prepar3D.cfg		8/	16/2016 4:04 PM	CFG File		8 K	В		
> 💣 Network		Prepar3D.cfg.	bd	4/	20/2016 11:33 PM	I Text Do	cument	3 K	B		
> 🔩 Homegroup		SimDirector.la	iyout	6/	2/2016 8:56 PM	LAYOU	File	3 K	B		
		SimDisplay.xn	חו י	4/	20/2016 10:14 PIV	XIVIL DO	cument	17.6	.B		
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		VeniclePavori	ies.xmi	7/	71/2010 10:50 PIV	VML De	cument	1 1	.D		
		ViewGroups.x	orig yml	5/	2.3/2010 7:40 PIVI	XML Do	cument	2 1	'P		
		WaterConstar	ntsV3 Xml	0/	16/2016 A-04 DM	XML Do	cument	2 1	'R		
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		wastationiistat	200	0/	10/2010 4:04 PIVI	DINTIC		201			

23 items

When P3D is restarted it will load the exported ViewGroups.xml. Open the P3D View menus and select View Group Management.

Note: The latest versions of P3D v3 moved the configuration data to the global location C:\ProgramData\ Lockheed Martin\Prepar3D v3. If this folder exists, copy the exported ViewGroups.xml file in this location.

Note: The latest versions of P3D v4 moved the configuration data to the global location C:\ProgramsData\ Lockheed Martin\Prepar3D v4. If this folder exists, copy the exported ViewGroups.xml file in this location.



Just make sure that the enumerated displays and graphics cards on your system match the DisplayID exported in the ViewGroups.xml file. If they do not match, assign them the correct DisplayID using the View Group Management window.

	View Group Management	
Configuration	Displays Configuration 1 Intel(R) HD Graphics 4600.0.0	
 Displays 	Name Intel® UD Complete 4600.0.0	
Configuration 1	DisplayID	
Intel(R) HD Graphics 4600.0.1	2	•
Intel(R) HD Graphics 4600.0.0	4 AdapterIndex	
 View Groups 	1	-
LCD Designer PRO	MachinelD	A
GridSetup	Plugin	
LCDLanelLEFT	ADD REMOVE	
ViewFrustum	Name	-
LCDLanelCENTER		
LCDLanelRIGGH		î
and the second second second		
and the second se		4

	View Gr	oup Manager	ment	
Configuration	View Groups	LCD Designer PRO	LCDLanelCENTER	
 Displays Configuration 1 Intel(R) HD Graphics 4600.0.1 	Name LCDLanel_CENTER DisplayID 2			¢
Intel(R) HD Graphics 4600.0.0 View Groups LCD Designer PRO	• Viewport Left: 0.000 Right: 0.000 Top: 0.000 Bottom: 0.000			4 7 4 7 4 7 4
GridSetup	 EdgeOverlap Left: 0.000 Right: 0.000 Top: 0.000 Bottom: 0.000 			4 Þ 4 Þ
▶ LCDLanelRIGGH	 ViewFrustum 	⊗ REMO	DVE EDIT	

Now you can start any flight in cockpit mode or virtual cockpit mode.

Use the right button and click on the current view (not the View Menu) and select View Groups, then click on Immersive Calibration PRO. This will create the position the views on the corresponding projectors.



Note: When using the ViewGroups.xml file, there is no need to update the flight fxml files. The ViewGroups.xml file will make sure that the view are positioned on the correct projector.

Start Immersive Display PRO. For each ungrouped display, click on the display, select external calibration and chose the exported _multi.procalib file. Now restart P3D and select the View Groups/Immersive Calibration PRO.

(i) Info	🕫 Displays 📴 Preferences	🖉 License 🕘 About	
	\\.\DISPLAY1 NVIDIA GEForce GTX 970 S211HL (HDMI) Position 0,0 Resolution 1920x1080 Projectors 1x1	1 \\.\DISPLAY3 NVIDIA GEForce GTX 970 S211HL (HDMI) Position 1920,0 Resolution 1920x1080 Projectors 1x1	1 \\.\DISPLAY2 NVIDIA GEForce GTX 970 S211HL (HDMI) Position 3840,0 Resolution 1920x1080 Projectors 1x1
	Desktop warping		

12 FSX/Prepar3Dv2 configuration

FSX and Prepar3D provide a mechanism to create one or more windows inside the simulator and define the camera parameters (position, rotation and zoom) per window.

Next to the .procalib file Immersive Calibration PRO will export also a .fsx file. This file contains the windows and camera configuration files that can be copied in the FSX/Prepar3D .flt file.



Open the FSX/Prepar3D .flt file and delete all [Window.x] and [Camera.x.x] sections. Copy the content of the .fsx file inside the .flt file at the same place as the original [Window.x] and [Camera.x.x] sections.

Make Note: Make sure that the file %APPDATA%\Microsoft\FSX\fsx.cfg contains the following entry: WideViewAspect=True

Also make sure that the model.cfg file of the aircraft that is used does not contain the interior. Comment out the interior part by putting // before the interior section in the file.

```
| AGL
 [Window.1]
Order=0
 Active=True
Undocked=False
Maximized=False
 ScreenUniCoords=4, 4, 1, 1
 CurrentCamera={B1386D92-4782-4682-A137-738E25D1BAB5}
 [Camera.1.1]
Guid={B1386D92-4782-4682-A137-738E25D1BAB5}
Zoom=255
 Translation=0, 0, 0
 Rotation=-90, 0, 0
 [Window.2]
Order=2
Active=False
Undocked=False
Maximized=False
 ScreenUniCoords=0, 0, 2731, 6144
 CurrentCamera={B1386D92-4782-4682-A137-738E25D1BAB5}
 [Camera.2.1]
Guid={B1386D92-4782-4682-A137-738E25D1BAB5}
```

Note: Prepar3D v2 uses a fxml file instead of .flt file. The exported .fxml file can be integrated in the Prepar3D v2 in the similar way.

Start Immersive Display PRO select external calibration and chose the exported _multi.procalib file.

🚺 Info 😐 Displays 🙆 Preferences	P License I About
1	2 3
External calibration	
📮 No projectors	
📪 1 projector	
📪 2 projectors	► \\.\DISPLAY1
📖 3 projectors	Intel(R) HD Graphics 4600 Graphic Pab Monitor
🧔 4 projectors	Position 0,0
💭 5 projectors	Resolution 1920x1080
💭 6 projectors	External calib export_multi.procalib
💭 7 projectors	kternal calib desktop export_single.procalib
💭 8 projectors	•
💭 9 projectors	
🐢 10 projectors	
💭 11 projectors	
🚥 12 projectors	•
💭 13 projectors	·
De 💭 De 💭 14 projectors	·
📫 15 projectors	
Conf 🥶 16 projectors	🛃 Load 🔹 💾 Save 🔹 🕑 Hide 🛛 🗳 Quit

Start FSX in full screen mode. FSX will open 3 internal windows and each window will show part of the scene.



Projection screen will show perfectly aligned and soft-edge blended image.



13 Other 3D game engines configurations

We also offer a plug-in for X-Plane 9 and X-Plane 10 to enable the MultiView settings in X-Plane. By checking the X-Plane (.settings) file in the export dialog, a multiview.settings file will be exported that can be directly copied in X-Plane plugins folder.

For all other 3D game engines we also export a generic .frustums file that can be used to configure the games virtual cameras.

The .frustums file contains 3 sections per virtual camera (FieldOfView, Lens/Frustum and Offset.) Those can be used directly in OpenGL or DirectX programming code.

The general frustums configurations is also exported in an xml file and contains information for left hand and right hand based graphics coordinate systems

```
export.frustums
     Camera Row 1 Column 1
  1
  2 {
  3
        FieldOfView
  4
        -{
           AspectRatio 1.25;
  5
           VerticalFOV 71.5863;
  6
  7
           HorizontalFOV 84.0568;
  8
       }
  9
        Lens
 10
        {
           Frustum -0.00901301 0.00901301 -0.00721041 0.00721041 0.01 100;
 11
 12
        }
  13
        Offset
  14
        {
           RotateX(Pitch) -0.0092392; // Positive pitch Up
 15
 16
           RotateY(Yaw) 67.5016; // Positive rotation Left
 17
           RotateZ(Bank) 0; // Positive bank Left
           Position 0 0 0;
 18
 19
        }
 20 }
```