

ARFX Pro Plugin User Manual for HTC Vive Tracking
Hardware
Version 7

November 2022

Table of Contents

Section 1: Introduction.....	3
Section 2: General Computer Set Up	3
Section 2.1 Computer and Hardware Requirements	3
Section 2.2 Boot Up Computer	4
Section 2.3 Password Protection.....	4
Section 2.4 Prerequisite Software Installation.....	4
Section 2.5 SteamVR Software Set Up	7
Section 3: HTC Vive Motion Tracking Hardware Set Up	8
Section 3.1 HTC Vive Motion Tracking Hardware.....	8
Section 3.2 Connect Base Station	9
Section 3.3 Connect Multiple Base Stations	10
Section 3.4 Base Station Placement	11
Section 3.5 Connect Vive Tracker	13
Section 3.6 Identify and Label Vive Tracker Serial Numbers via USBDeview.....	15
Section 4: Adding ARwall ARFX Pro Plugin to Unreal Engine 4/5	16
Section 4.1: Installing the ARwall ARFX Pro Plugin	16
Section 5: ARwall Setup and Settings within Unreal Engine 4/5	22
Section 5.1: ARwall ARFX Pro Plugin Setup.....	22
Section 5.2: ARwall ARFX Pro Plugin UI.....	28
Section 5.3: Physical Camera and Hero Tracker Offset Setup	33
Section 5.4: Change ARwall Camera Settings.....	34
Section 5.5: Adding ARwall Bookmark Cameras	37
Section 5.6: Changing ARwall Bookmarks Order	38
Section 6: Calibration and Virtual Camera Control	42
Section 6.1: XR Sync Calibration.....	42
Section 6.2: Calibration Puck Tracker Offset Setup	45
Section 6.3: Virtual Camera Control.....	46
Section 6.4: Input Scale	51
Section 6.5: Near Clipping Distance	52
Section 7: ARFX Options Menu	54
Section 7.1: ARFX Options Menu Sub Menus for use in Real-Time.....	54
Section 8: Troubleshooting.....	65
Section 8.1: Adjust Vive Trackers	65
<i>USBDeview</i>	65
<i>SteamVR</i>	66
Section 8.2: Tracking and Jittering Issues	67
Section 8.3: Recommended Wires	67
Section 8.4: Unreal Engine System Issues	68
Section 8.5: Project File Issues.....	68
Glossary.....	69
Default Hotkey Layouts for Keyboard and Xbox Controller	70

Section 1: Introduction

ARwall creates augmented reality technology that captures live, in-camera VFX composites. Geared toward film productions, **ARwall** provides a viable alternative to the green screen process and continually works to advance virtual production technologies for all creators.

This product guide details the **ARwall ARFX Pro Plugin** product and describes how to use it.

For more information on **ARwall**, visit: <http://arwall.co>
To contact **ARwall**, send an email to: support@arwall.co

Section 2: General Computer Set Up

This section describes how to set up your computer for use with the **ARwall ARFX Pro Plugin**.

Section 2.1 Computer and Hardware Requirements

Before you get started, ensure that you have the hardware components listed in Table 1 below for the most optimal performance for the **ARwall ARFX Pro Plugin**.

Table 1: Main Components and Accessories

Main Component	Accessories
Windows PC machine with recommended Nvidia GeForce RTX 2080 graphics card or better (minimum GTX 1080)	<ul style="list-style-type: none">• 1 x Keyboard• 1 x Mouse• Optional: 1 x USB Hub• Optional: 1 x Xbox Controller and USB Dongle
Vive Pro Tracking Hardware (<i>see section 3, Motion Tracking Hardware for further information</i>)	<ul style="list-style-type: none">• Minimum: 2 x 2.0 Base Stations• 2 x AC power supplies for Base Stations• 1-2 x 2.0 or 3.0 Vive Tracker(s)• 2 x USB cable for each tracker• 2 x USB Wireless Dongle for each tracker (label each dongle to coincide with corresponding tracker)
Optional Peripherals	<ul style="list-style-type: none">• 2 x ¼ inch ball mount adapter and stand (1 per Base Station or use an equivalent ¼ inch clamp or

	peripheral for mounting base stations) • 2 x USB extension cable (1 for each tracker)
License	• Activation Code (provided by ARwall) • Steam (click link to create free account) • Epic Games (click link to create free account)

Section 2.2 Boot Up Computer

If you are using your own computer

To boot up the computer, do the following:

1. Plug in all accessories, including:
 - a. Mouse
 - b. Keyboard
 - c. Monitor/Screen/Projector/LED wall
 - d. USB Hub
 - e. Any additional cables
2. Turn on the computer

Section 2.3 Password Protection

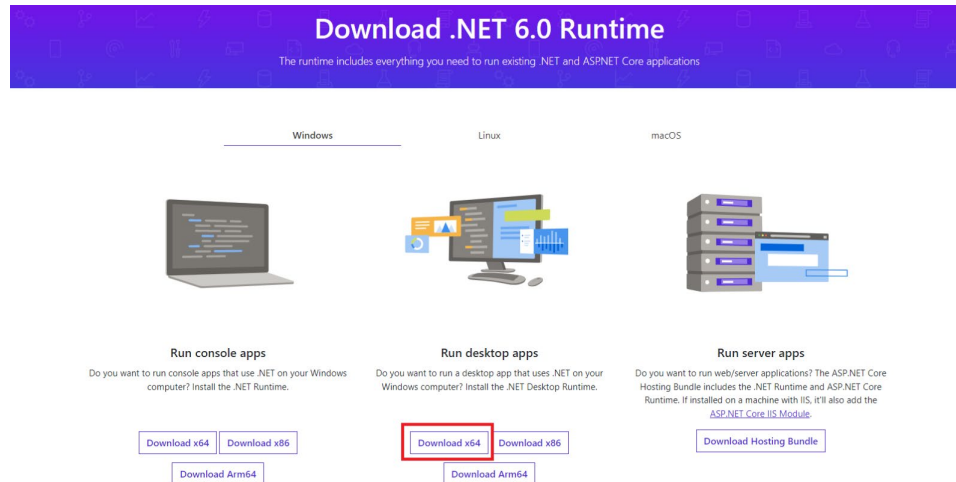
ARwall should have provided you with an **Activation Code** to access the **ARFX Pro Plugin**. We will discuss where to enter this activation code in section [Section 4.1: Installing the ARwall ARFX Pro Plugin](#). This product is for a **SINGLE** seat license on a single machine. If you would like to purchase additional seats, move to another machine, or misplace your activation code, please contact your **ARwall** representative or email support@arwall.co and we will provide it to you.

NOTE: According to the Terms of Sale, it is the responsibility of the purchaser to secure all ARwall IP to the best of their ability. This includes, but is not limited to, keeping your passwords secure, system password protection, and physical security locks when appropriate.

Section 2.4 Prerequisite Software Installation

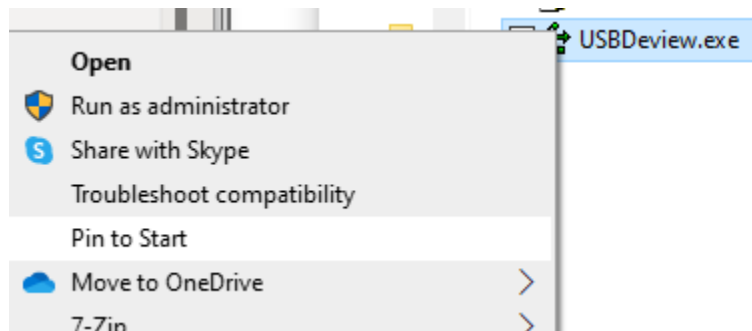
If **ARwall** did not build and issue a computer, be sure to install the following to make sure your **ARFX Pro Plugin** runs seamlessly:

- Unreal Engine 4.27 and/or Unreal Engine 5
 - Steam
 - SteamVR
 - USB Deview
 - .NET6 Runtime
 - 7-zip
1. Install Epic Unreal Engine 4.27 and/or Unreal Engine 5:
 - a. Instructions here: <https://docs.unrealengine.com/en-US/GettingStarted/Installation/index.html>
 - b. Be sure to create your own free account and have that login password available.
 - c. When selecting the version to install, be sure to select 4.27 and/or 5.
 2. Install SteamVR:
 - a. Install Steam:
 - i. Instructions here: https://support.steampowered.com/kb_article.php?ref=3046-ECVN-3712
 - ii. Be sure to create your own free account and have that login password available for your team.
 - b. Install SteamVR:
 - i. Within Steam, search for SteamVR and install (or use this external link: <https://store.steampowered.com/app/250820/SteamVR/>)
 - ii. This will assist you by showing you which Vive Pro devices are connected or not. Great for trouble shooting!
 3. Install USB Deview:
 - a. After installing SteamVR, USB Deview should be found at the following location: C:\Program Files (x86)\SteamVR\tools\USBDeview\win32\USBDeview.exe
 - b. If not found, follow the steps below to install USB Deview separately:
 - i. Download file from here: <http://www.nirsoft.net/utils/usbdeview-x64.zip>
 - ii. Unzip the file in your desired location & install the software.
 - iii. This will assist you in finding your HTC Vive Serial numbers.
 4. Install 7-zip:
 - a. If your machine does not have 7-Zip, please download and install it from here: <https://www.7-zip.org/>
 5. Install .NET6 Runtime:
 - a. Download .NET6 Runtime here: <https://dotnet.microsoft.com/en-us/download/dotnet/6.0/runtime>

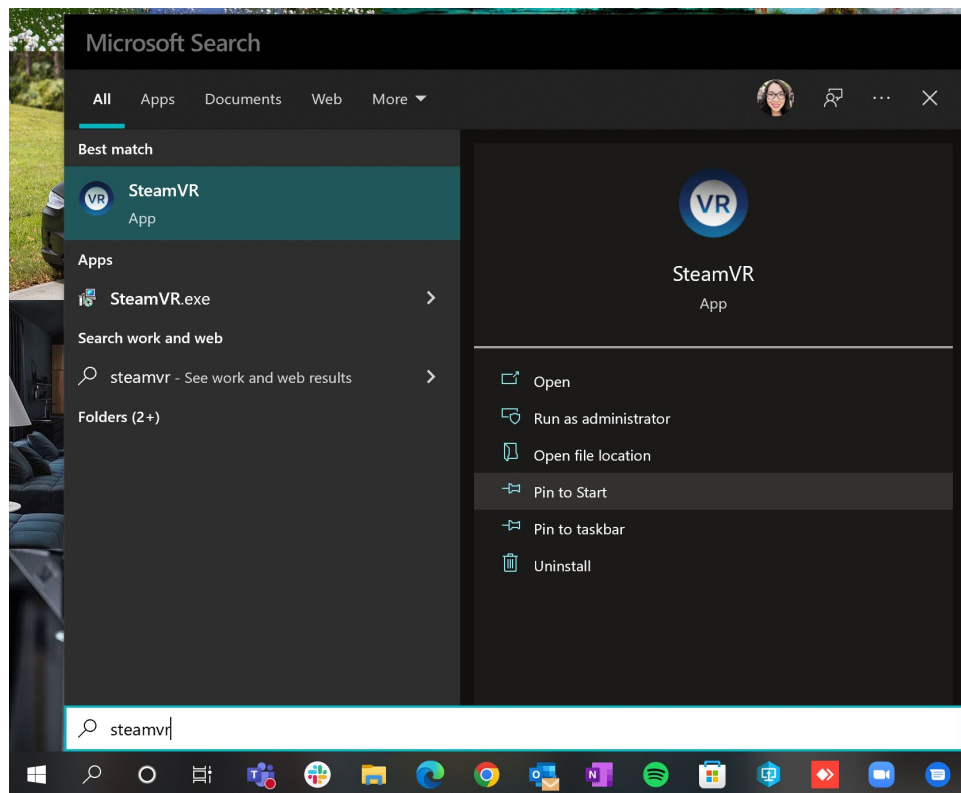


- b. Choose Run Desktop apps > Download x64 and install
 - i. This installation is necessary for our login system to work correctly.

BEST PRACTICE: It is recommended to pin SteamVR and USB Deview to the Windows Start Menu for ease of opening the software when needed later. To do so, right click on the EXE file and select “Pin to Start.”



Alternatively, SteamVR can be added by clicking Windows button, searching for “SteamVR” using Microsoft Search and selecting “Pin to Start”



Section 2.5 SteamVR Software Set Up

After starting up SteamVR, if it asks you to plugin in your VR headset or HMD and does not let you see the attached Vive Trackers or Base Stations without a headset attached, do the following:

1. Navigate to the drive that SteamVR is installed in on Windows and locate the default.vrsettings file. It is usually located on the C Drive at C:\Program Files (x86)\SteamVR\resources\settings\default.vrsettings
2. Open the default.vrsettings file with Notepad or equivalent software.
3. Locate the line "requireHMD": true,

```

"vr": {
  "these defaults": {
    "requireHmd": true,
    "forcedDriver": "",
    "forcedHmd": "",
    "displayDebug": false
  }
},
"steamvr": {

```

4. Change the word "true" to "false" and make sure the comma after the word is still present.

```

},
"steamvr": {
  "requireHmd": false,
  "forcedDriver": "",
  "forcedHmd": "",

```

5. Save the file and close.

NOTE: If SteamVR updates, these steps may need to be repeated as SteamVR may ask for the VR headset/HMD again.




Section 3: HTC Vive Motion Tracking Hardware Set Up


This section describes how to connect your [Base Station](#) and [Vive Tracker](#) equipment.

Section 3.1 HTC Vive Motion Tracking Hardware

In Table 2 below, you will find a list of the *Motion Tracking Hardware* components.

Table 2: Motion Tracking Hardware Components

Name	Information	Quantity	Image
<i>2.0 Base Station</i>	Rectangular boxes with motion-sensing capabilities	2 (minimum), 4 or more for larger spaces	
<i>AC Power Cable</i>	Base Station power supply	1 per base station	
<i>2.0 or 3.0 Vive Tracker</i>	Puck-shaped device used to calibrate and track motion within the range of the motion-sensing Base Stations	2	

<i>Vive Tracker Dongle</i>	Provides a wireless connection for <i>Vive Trackers</i> , but it is recommended to connect trackers with cables and dongle for best tracking results. (Each <i>Vive Tracker</i> comes with a <i>Vive Dongle</i> , please label the dongle and trackers that belong to each other for ease of use.)	2	
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Section 3.2 Connect Base Station

Two (2) *Base Stations* are the minimum requirement to work with ARFX, but up to 16 *Base Stations* can be used at a time. It is recommended to use around 4-6 *Base Stations* around the intended play area where the physical camera will be tracked for optimal tracking. To turn on a *Base Station*, connect an AC power supply to each *Base Station* and plug into the correct power outlet. Initially the *Base Station* will display a blinking blue light.

Figure 1: Base Station On



It will then turn into a white or green light to indicate that the Base Station is active.

Figure 2: Base Station Active

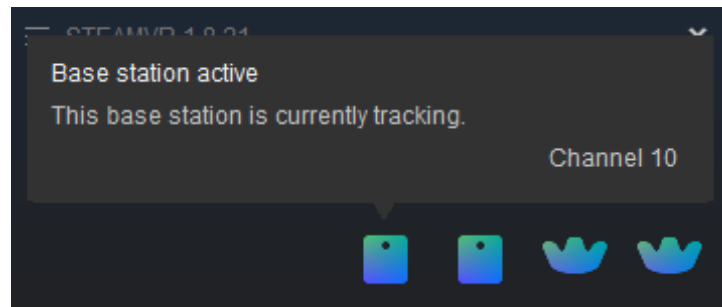


NOTE: *There is minimal power draw per Base Station which makes it easy to share power with on set film lights as needed.*

BEST PRACTICE: *Turn off /unplug the Base Stations when not in use to prevent overheating and preserve the operating lifetime of the device. Each Base Station has a little running motor inside that will eventually wear down the device over time. Having a few backup Base Stations are recommended when preparing for a film production shoot in case an older Base Station stops working on set.*

Section 3.3 Connect Multiple Base Stations

To connect more than two *Base Stations*, you will need to make sure each *Base Station* has its own unique channel number and *SteamVR* is tracking the correct *Base Stations*.



NOTE: Newly purchased *Base Stations* will have default channels that might be the same as existing *Base Stations'* channels, usually channel 1. Make sure to test and set *Base Stations'* channels before mounting them.

BEST PRACTICE: *If only two Base Stations are being used in your system, there is no need to change the Base Stations' channels. The system should work fine without changing the channels from 1. However, if issues arise or more Base Stations are added, be sure to change each Base Station to be on its own unique channel.*

To set each *Base Station* with its own unique channel, do the following:

1. Locate the *SteamVR App* on the Computer and open it.
2. Connect a *Vive Tracker* to your machine via USB cables.
3. Plug in one *Base Station*.
4. Place the *Vive Tracker* in view of the *Base Station*. Each *Base Station* has a 120-degree field of view. This step can sometimes take several seconds before the *SteamVR* recognizes the *Base Station* but moving the tracker in front of the *Base Station* can help the system recognize it faster.
5. Hover over the (newly turned on) *Base Station* icon tracked on *SteamVR* to record which channel is taken.

6. Plug in another *Base Station* and repeat step 4 and 5.
7. If any *Base Station* is set to the same channel as the other *Base Station(s)*, use a paperclip or thumbtack and press the Channel button at the back of the *Base Station* to set a different channel. There is a total of 16 channels to pick from.



8. Make sure the new *Base Station's* channel does not overlap with existing *Base Stations'* channels.
9. Repeat steps 4-7 until all *Base Stations* have their own channels and are tracked by *SteamVR*.

BEST PRACTICE: *It is recommended to label the back of a Base Station the channel that is assigned to that Base Station for ease of use and troubleshooting on set.*

NOTE: *For convention or XR heavy settings, there could be neighbors that are also using Base Stations that could interfere with ARFX's tracking. It is best to talk to them about their Base Station setup and adjust channels and Base Station field of views accordingly.*

Section 3.4 Base Station Placement

Optimal *Base Station* considerations:

1. Goal is to make sure the *Trackers* will always be seen by at least one *Base Station* regardless of where it is in the intended tracking/play area.
2. Each *Base Station* should be placed at a height of around 2 meters/6.5 feet tall (light stands with proper adapters are recommended, but *Base Stations* can be attached directly to higher walls, ceilings, or set pieces if needed).

3. Each *Base Station* field of view should be tilted slightly down towards the intended tracking/play area.
4. Each *Base Station* field of view should slightly overlap other *Base Station* field of views and all *Base Stations* together should cover the tracking area that you expect the *Trackers* to be active in. Keep in mind that each *Base Station* has a 120-degree field of view, but with creative daisy-chaining, a few *Base Stations* can create a sizeable play area for the tracked camera.
5. Be sure that at least one *Base Station* can see the screen that you are using (mainly the center of the screen, where you will be calibrating with a *tracker*).
6. Make sure that *Base Stations* and tracking/play areas are away from sun light or other reflective surfaces such as mirrors or glass if possible. These factors can affect tracking and should be minimized as much as possible on set.
7. Some on set lights can cause IR radiation to interfere with tracking stability with *Base Stations*. It is recommended to turn one light on at a time while testing tracking to test if lights are causing tracking issues. Most common lights that cause issues are older.

HTC Vive offers best practices for *Base Station*/*Base Station* placement here:
<https://www.vive.com/eu/support/vive/category/howto/tips-for-setting-up-the-base-stations.html>

Sample ARFX with HTC Vive Tracking Hardware Setup (Base Stations are identified as “Lighthouses” in the below image)



Section 3.5 Connect Vive Tracker

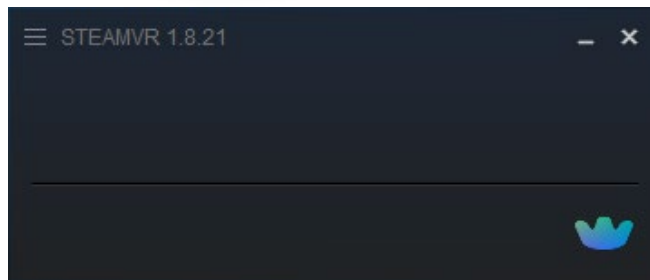
To connect the *Vive Tracker*, do the following:

1. Locate the *SteamVR App* on the Computer and open it.
2. Plug in a *Vive Tracker* to the machine with USB cables and place it within view of at least one *Base Station* that is powered on. If the *Vive Tracker* is plugged in, you should be able to see the tracker on the *SteamVR* app.

BEST PRACTICE: If *SteamVR* asks for an HMD to be connected, refer to [Section 2.5 SteamVR Software Set Up](#) on how to turn this off.

NOTE: Ensure that the *Vive Tracker* is inside the range and within the 120-degree field of view of at least one *Base Station*.

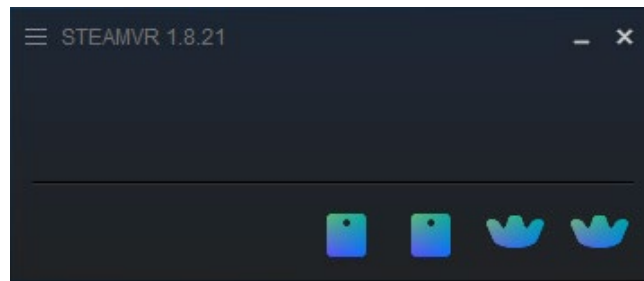
3. To pair the *Vive Tracker*, press the middle button on the *Vive Tracker*.



4. The light on the *Vive Tracker* should turn green or amber once it is paired.

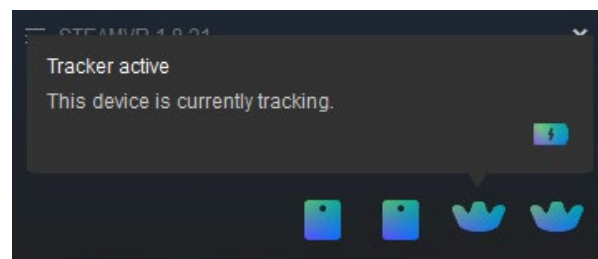
NOTE: A green or amber light should show once the middle button is pressed. Do not hold the middle button.

Figure 3: Tracker Pairing



Check the *SteamVR* app after the pairing is complete. The tracker and any *Base Stations* that can see the tracker(s) should appear. Hover over the tracker icon; if “Tracker Active” displays, the pairing was successful.

Figure 1: Tracker Connected and Tracking



If the tracker pairing was not successful, restart the *SteamVR* app, check cable connections, and redo step 3.

NOTE: *If the Base Stations are not reading, contact support@arwall.co.*

BEST PRACTICE: *Always charge the tracker when you are finished using it. To display the battery life, hover over the tracker icon in the *SteamVR* app. It is recommended to keep the trackers plugged in to the machine to keep the trackers always charged.*

BEST PRACTICE *While trackers can be used wirelessly (if the specified tracker’s dongle is plugged into the computer or USB dongle), it is also recommended to keep the trackers plugged for optimal tracking, especially if there are potential interference such as neighboring AR/VR experiences or lots of cell phones in the tracking/play area.*

The blinking light will change colors to indicate different statuses, as described in Table 3 below.

Table 3: Light Indicator

Color	Description
Blinking Red	Low Battery
Amber while plugged in	Charging, but paired/active
White while plugged in	Fully Charged, but not paired/active
Green	Paired/active

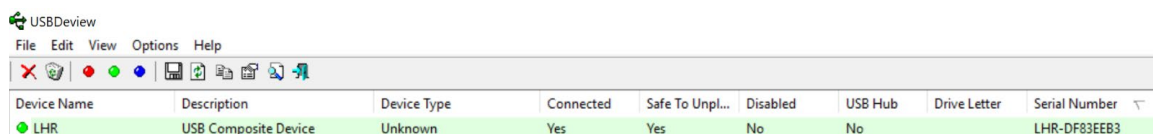
Section 3.6 Identify and Label Vive Tracker Serial Numbers via USBDevice

To obtain each Vive Tracker serial numbers, do the following:

1. Connect the *USB-A to Micro USB* (for Tracker 2.0) or *USB-A to USB-C* (for Tracker 3.0) cable from the computer to the *Vive Tracker*.
2. Open the *USBDevice* on your desktop.



3. In the *USBDevice*, under the Serial Number column, look for something that starts with *LHR*. It will be listed with a serial number. If it displays as green, this means it is active and connected to the machine.
 - a. To differentiate between the two trackers, connect only one tracker at a time and see what shows up in *USBDevice*.



BEST PRACTICE: It is recommended to label your trackers with their unique Serial Number for ease of identification on set. It is also recommended to label which wireless USB Dongle belongs to which tracker by identifying them as A, B, etc. for ease of future identification and troubleshooting.

NOTE: A two-Vive Tracker system is generally recommended, with a *Calibration Vive Tracker* and a *Hero Vive Tracker*, but if only one tracker is available, please be sure to use the same Serial Number of your one *Vive Tracker* for both *Calibration Tracker* and *Hero Tracker* fields.

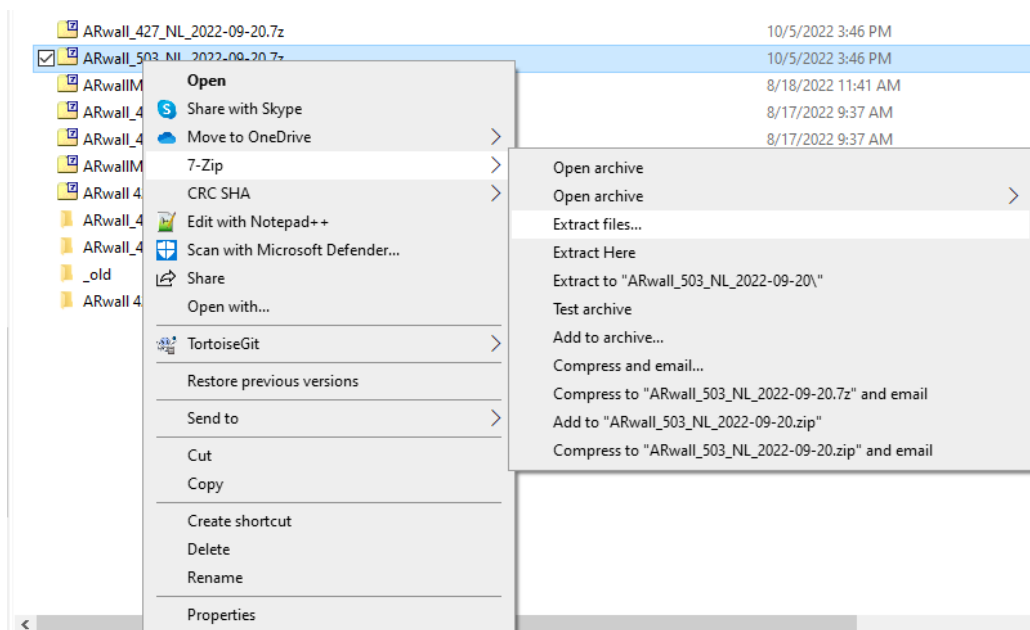
Section 4: Adding ARwall ARFX Pro Plugin to Unreal Engine 4/5

This section describes how to install the **ARwall ARFX Pro Plugin** and add new maps to an existing *Unreal Engine 4/5* Project.

Section 4.1: Installing the ARwall ARFX Pro Plugin

This section explains the process of installing the **ARwall ARFX** plugin to an existing *Unreal Engine 4/5* project.

1. Extract the ARwall Plugin file (ie. ARwall_427_NL_2022-10-26.7z, ARwall_503_NL_2022-10-26.7z, etc.) using 7-Zip by right clicking the file and selecting 7-Zip > Extract Files....



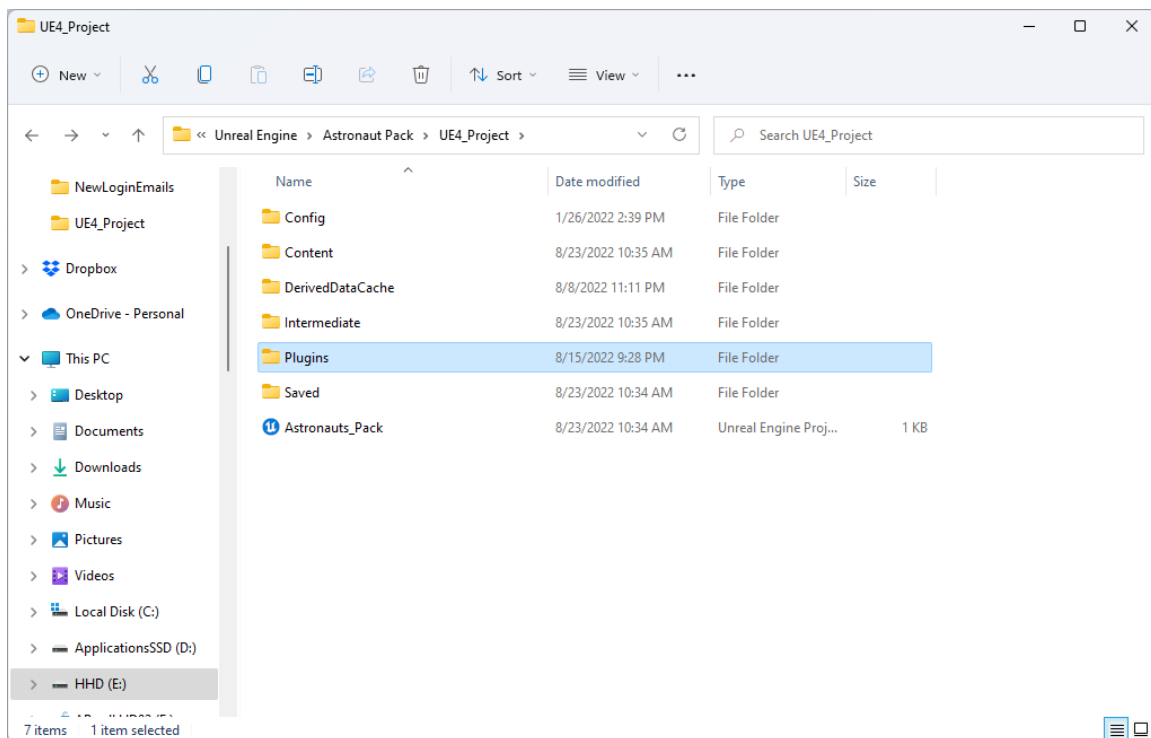
NOTE: If your machine does not have 7-Zip, please download it and install it from here: <https://www.7-zip.org/>

2. Choose where you want to extract to, then Click "OK"
3. Once extracted, locate your extracted folder, open it, and locate **ARwall** folder. This will be the ARFX Plugin folder.
4. Copy the ARwall Plugin folder into an existing Unreal Engine 4/5 project's **Plugins** folder.

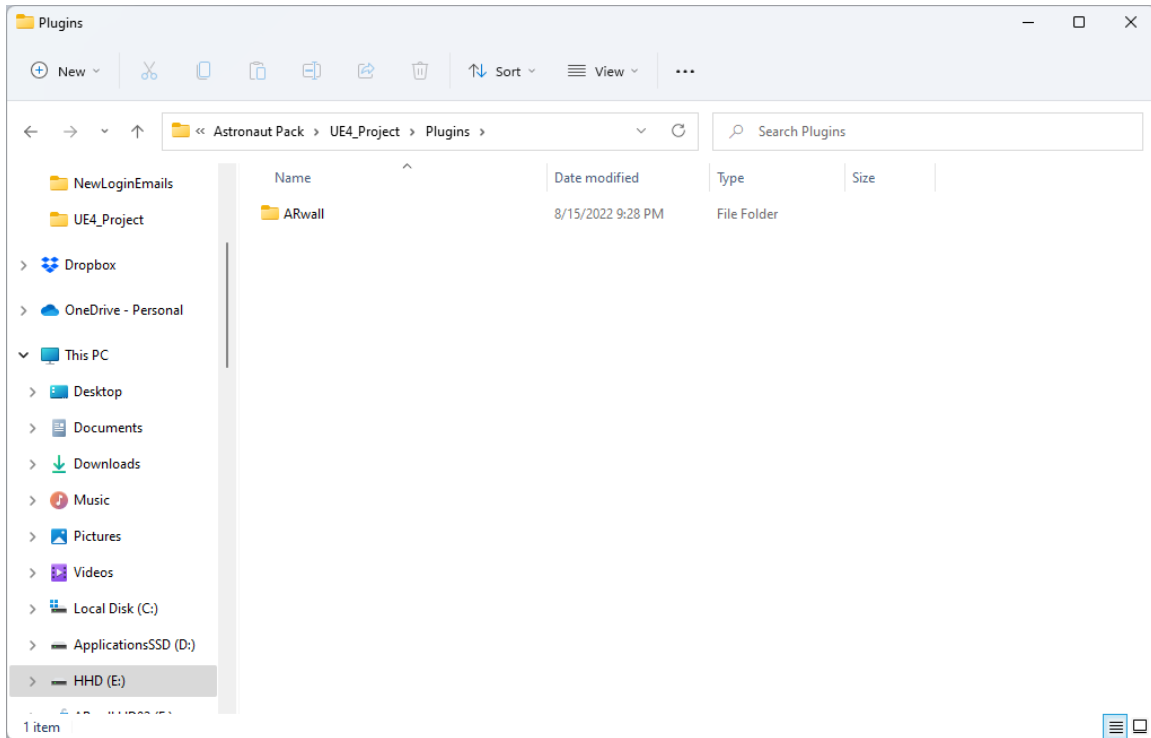
BEST PRACTICE Be sure to use the Unreal Engine 4.27 plugin with an Unreal Engine 4.27 project file and use the Unreal Engine 5 plugin with an Unreal Engine 5 project file. Using the wrong plugin version will prevent you from starting up the project. It is recommended to organize your plugins with an exterior folder clearly identifying the version of the plugin to copy into Plugins folders. Be sure not to change the name of the actual Plugin folder of “ARwall” or else it will not work properly within Unreal Engine.

This PC > ARwall HD (D:) > ARFX Plugins > ARwall_503_NL_2022-09-20 > ARwall >

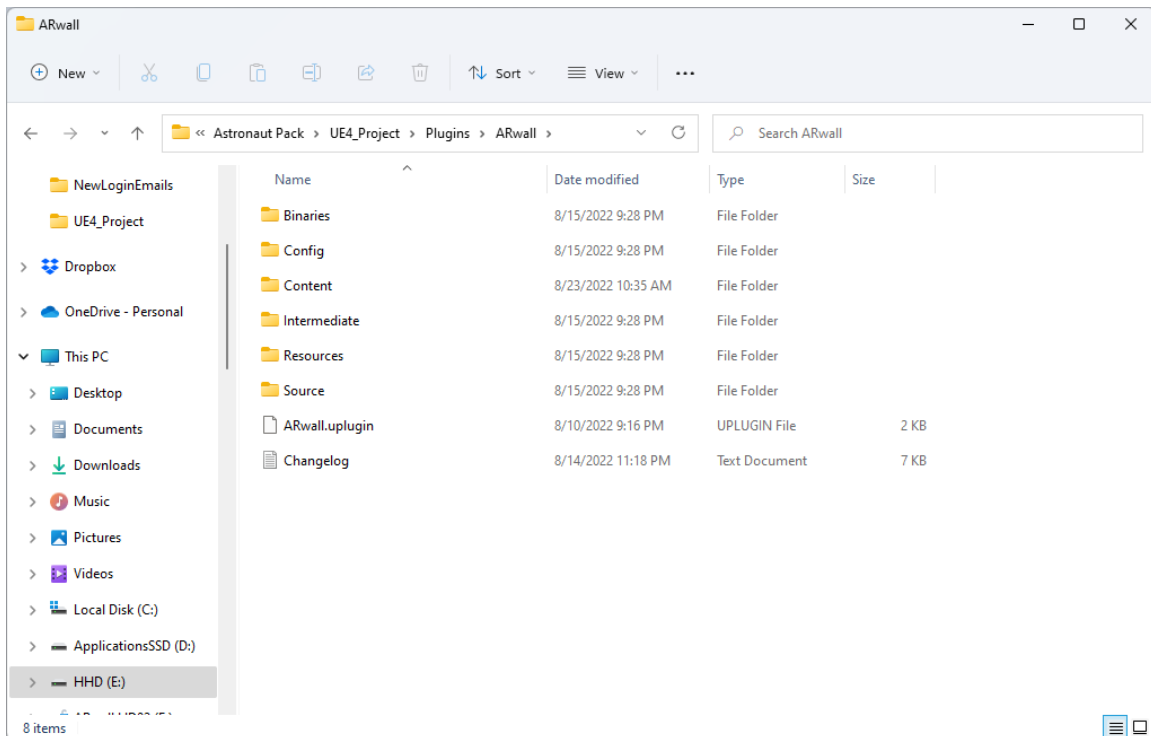
NOTE: If your project does not have a Plugins folder yet, please make one.



Note: How it should look inside the Unreal Engine 4/5 Project Plugins folder after copying the plugin there.



Note: What it should look like inside the ARwall Plugins folder.



5. Open the *Unreal Engine 4/5* project containing the ARwall plugin.

Note: Make sure that the Unreal Engine 4/5 project is set to open correctly as a 4.27 or 5 project file. Otherwise, there will be an error upon opening the project.

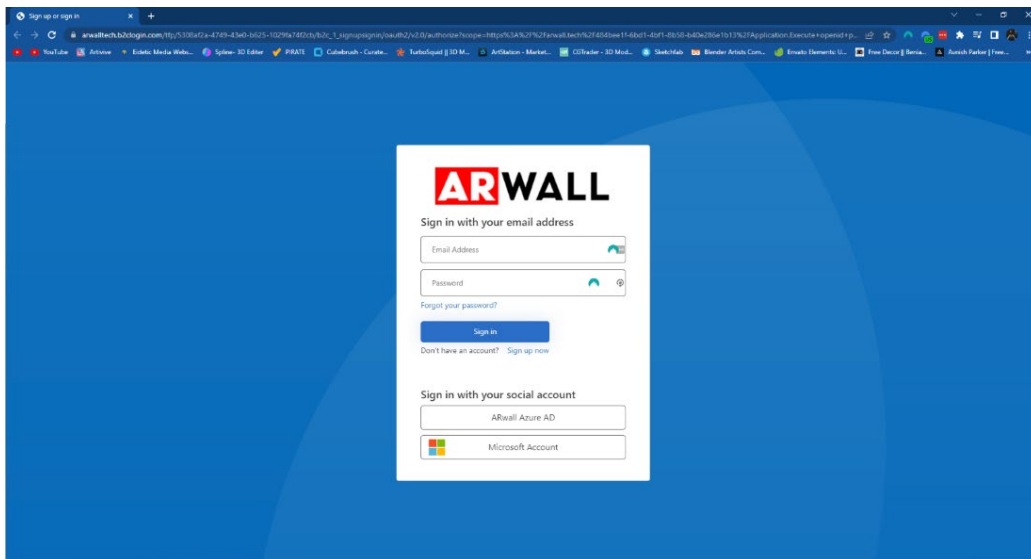
6. Once you launch the uproject file and it reaches 75%, you will be greeted with two pop-up windows. One will prompt you to enter your Activation Code provided by ARwall and the other will open a browser window requesting you to login.

Note: If this is your first time using the ARwall Plugin this pop-up might be hidden under the Unreal Engine interface or the login screen. Please use ALT-TAB (hold down ALT button and tap TAB button to cycle through to the correct window) to select the Activation Code and Login screens if they are hidden behind other windows.



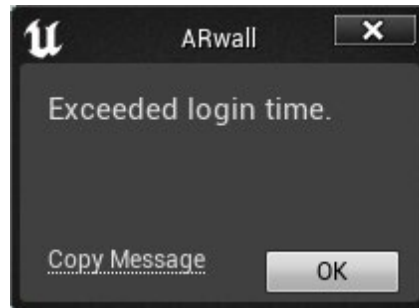
7. Once you have entered your Activation Code, click OK. Navigate to the ARwall Login screen.

Note: ARwall Login screen



8. Please log in using your existing login email and password.

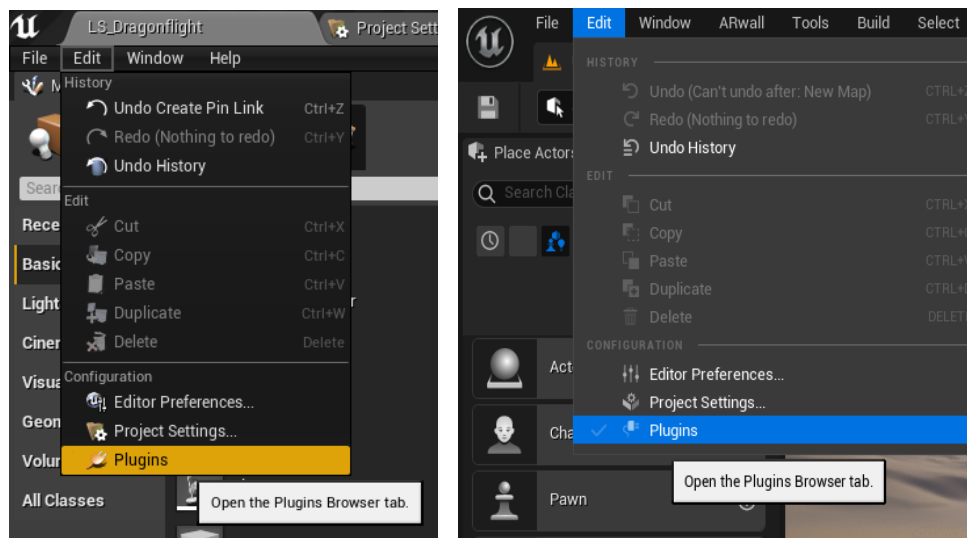
- a. If this is your first-time logging in, click “Sign up now” to create a new email/password account. Be sure to use this same account for all future logins.
- b. If your email is a Microsoft related account, please use the “Microsoft Account” button to login.
- c. You will have 90 seconds to enter your login information, otherwise this will appear and ARFX will close. If this happens, click OK and launch the uproject file again.



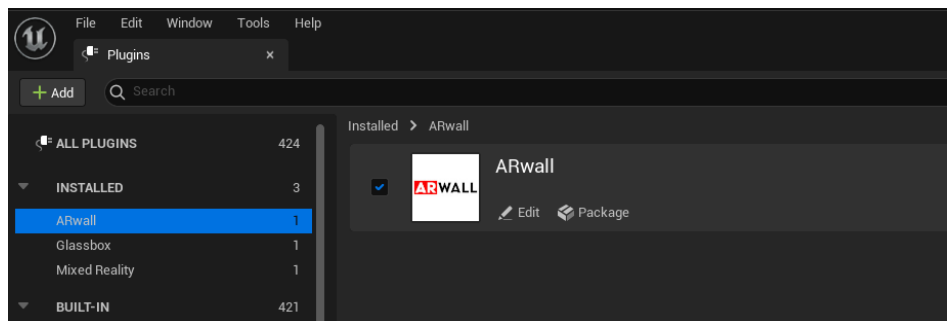
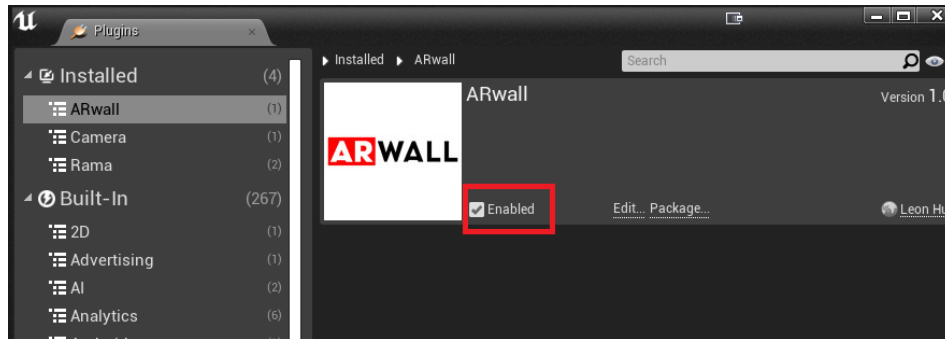
9. Once you have logged in successfully, an authentication window should appear.



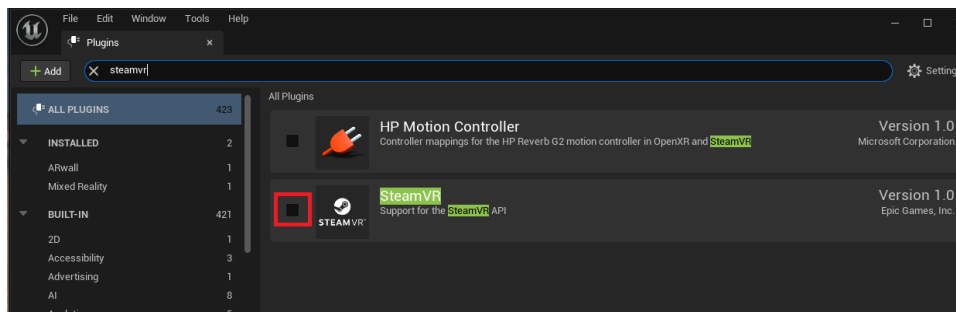
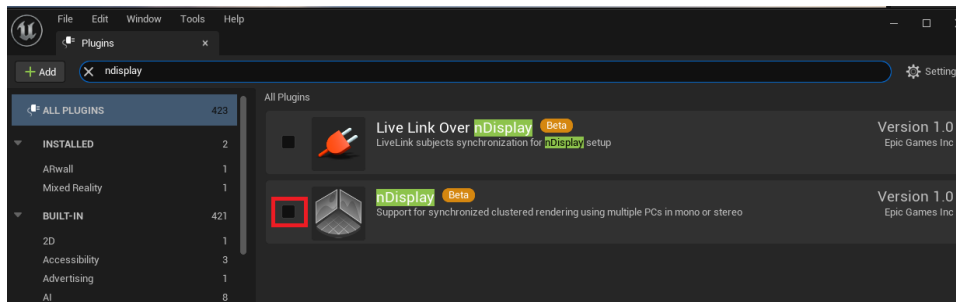
10. Once you have successfully logged in, navigate to the Plugins window located at the top left section under the Edit tab.



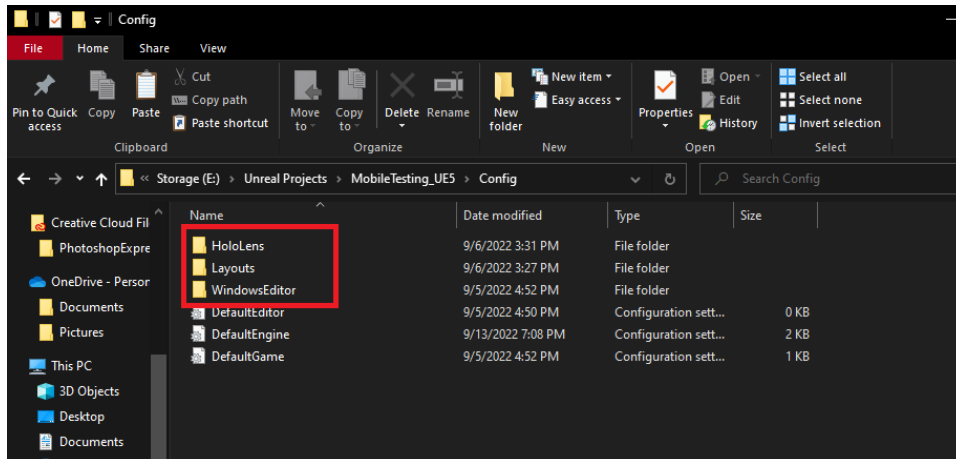
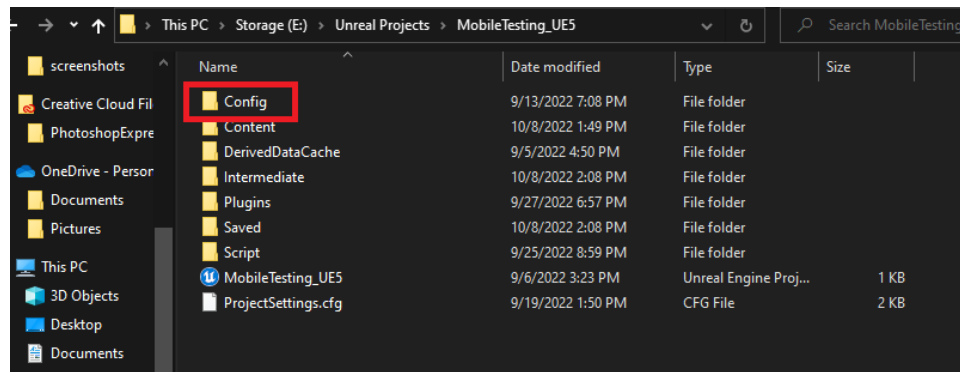
11. If the ARwall plugin is not enabled, click the *Enabled* option and the ARwall plugin should now be activated. Before restarting Unreal we need to check a few more Plugins for the ARwall Plugin to work properly.



12. Start by searching for nDisplay plugin and disable it, if enabled. Then search for SteamVR plugin and disable it, if enabled. Now you may proceed with restarting Unreal Engine.



BEST PRACTICE *If starting up the Unreal Engine project shows any errors, navigate to project's "Config" folder and delete any subfolders within that folder. Then proceed to launch the uproject file again.*



Section 5: ARwall Setup and Settings within Unreal Engine 4/5

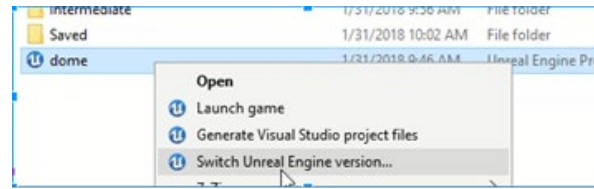
This section describes how to set up **ARwall ARFX Pro Plugin**, use the ARwall ARFX Pro Plugin UI menu system, adjust the **ARwall** camera settings, set calibration, and use bookmarked cameras.

Section 5.1: ARwall ARFX Pro Plugin Setup

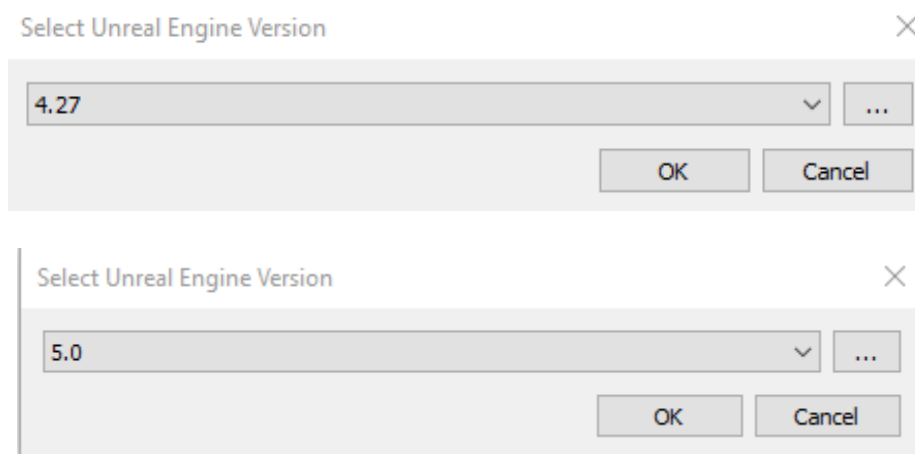
To set up **ARwall ARFX Pro Plugin**, do the following:

1. Open the *Unreal Engine 4/5* project in *UE 4.27* or *UE 5*. Be sure to match the version of the plugin to the version of the UE project file.

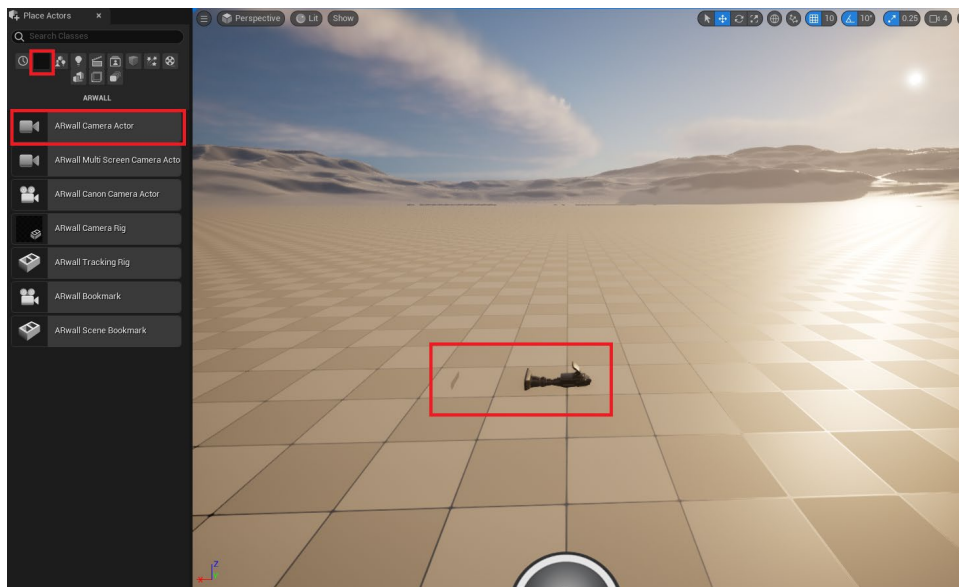
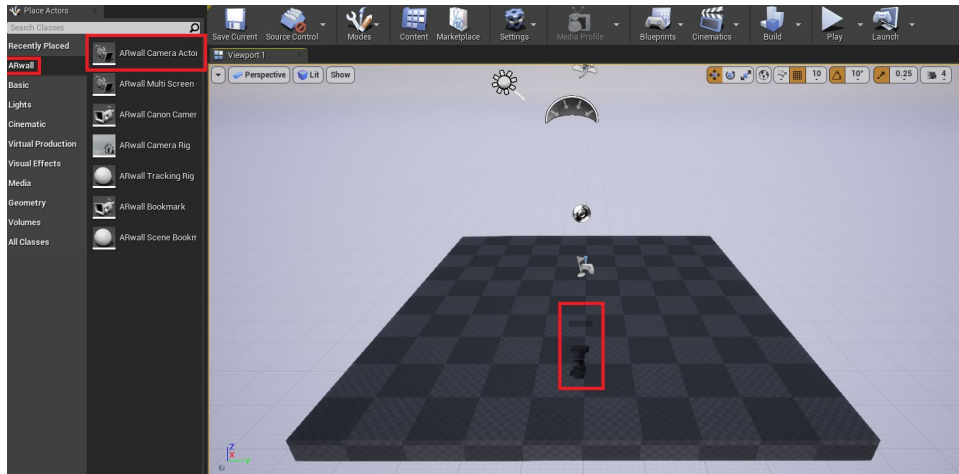
2. To check that the *Unreal Engine* project file opens in the right version or to change the version of the *Unreal Engine* project, do the following:
 - a. Right-click on the *.uproject* file and select *Switch Unreal Engine version*.



- b. Select 4.27 or 5 and click *OK* to set the version.

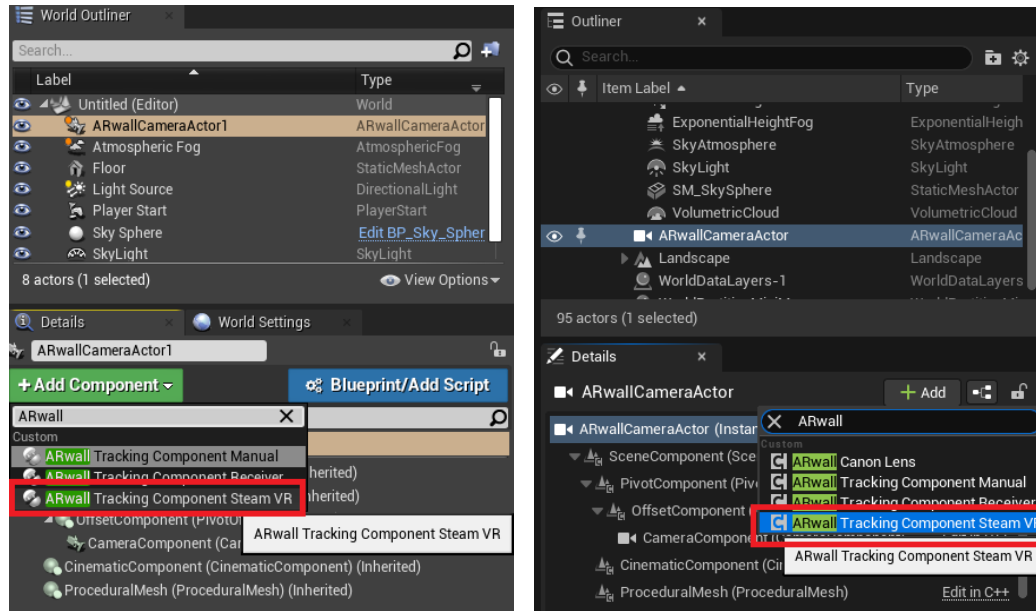


3. Once the project opens, navigate to the 'Place Actors' tab. If this is not present when you open the project, it can be found in Windows > Place Actors.
4. Select the ARwall subsection and drag and drop an *ARwallCameraActor* to the scene for each required level *.umap*.
 - a. Add the *ARwallCameraActor* to the scene by dragging it from the Place Actors tab window (which is located on the left-hand side of the *Unreal Engine* GUI images below) into the viewport window.
 - b. It does not matter too much where you drop the *ARwallCameraActor* in the viewport window, but this will be where the scene starts when you launch the scene. Feel free to move/adjust it to your preferred starting location in your scene.



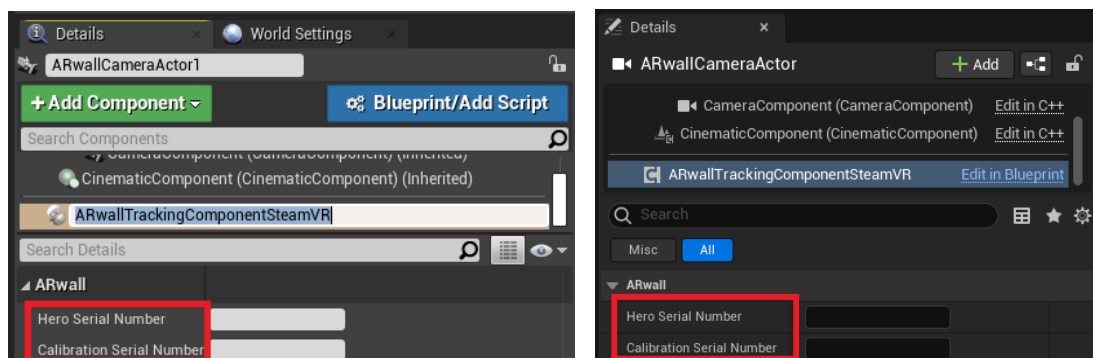
NOTE: Make sure to delete any other existing cameras or "Player Start" objects in the scene.

5. Navigate to the Details panel for the newly added *ARwallCameraActor*. If this panel is not active, please enable it by going to the Windows menu and selecting Details.
 - a. Select the *ARwallCameraActor* within the Outliner
 - b. Navigate to the Details panel and click the big green button '+Add Component' in UE4 or the '+Add' in UE5 drop down.
 - c. Type in *ARwall* and select the *ARwallTrackingComponentSteamVR*. The *ARwallCameraActor* object should appear in the *World Outliner* window.



6. Under *ARwallTrackingComponentSteamVR*, assign serial numbers for the *HTC Vive Trackers*.
 - a. Entry 0: will be the *Hero Vive Tracker*, which is the main tracker on the camera.
 - b. Calibration Serial Number: will be for the *Calibration Vive Tracker*

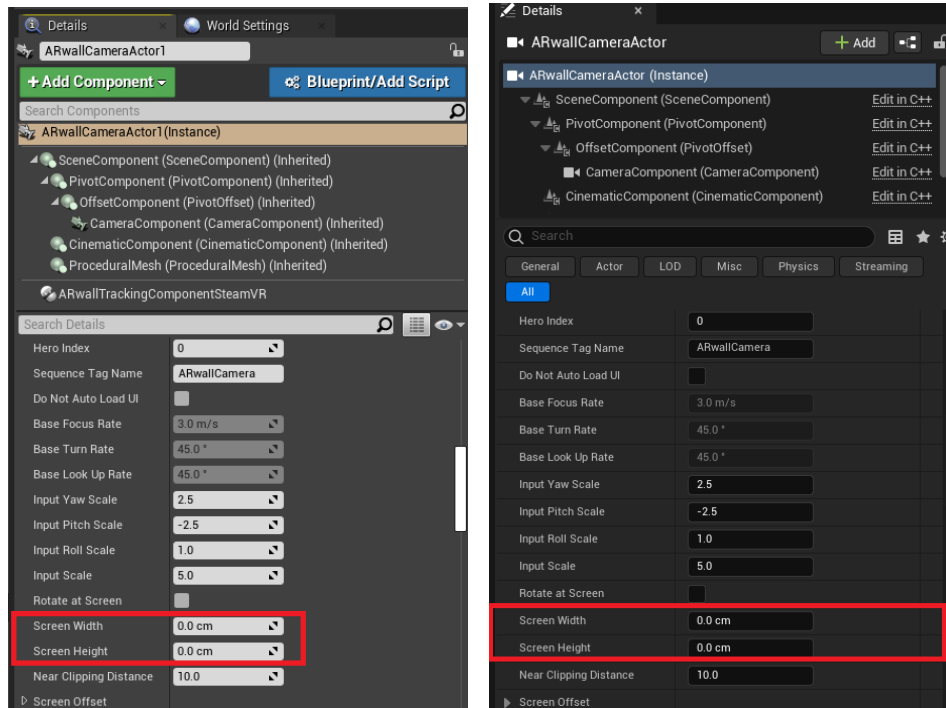
NOTE: To find the Serial Numbers for each tracker, refer to [Section 3.6 Identify and Label Vive Tracker Serial Numbers via USBDevice](#).



BEST PRACTICE: You can also access the *ARFX Pro Plugin UI*, where everything is conveniently located in the same window without having to search for them throughout Unreal Engine. Refer to [Section 5.2: ARwall ARFX Pro Plugin UI](#) for more information.

7. Physically measure the width and height of your physical screen. Be sure to start and end from the pixel edge to pixel edge, not including the bevel frame, if any.

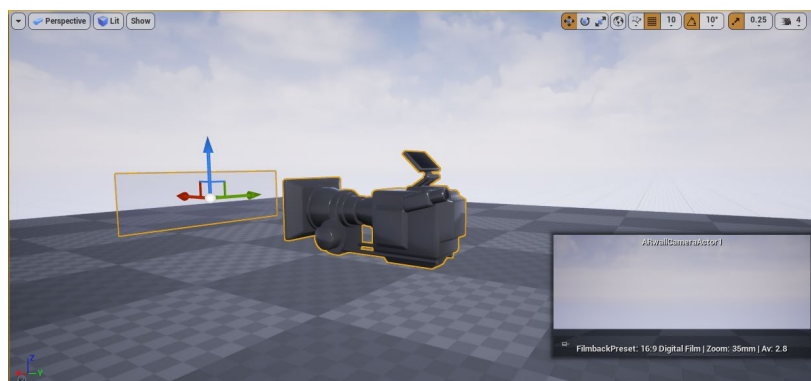
- a. Enter the screen width and height under *Screen Width* and *Screen Height* sections. Be sure to input them in centimeters.

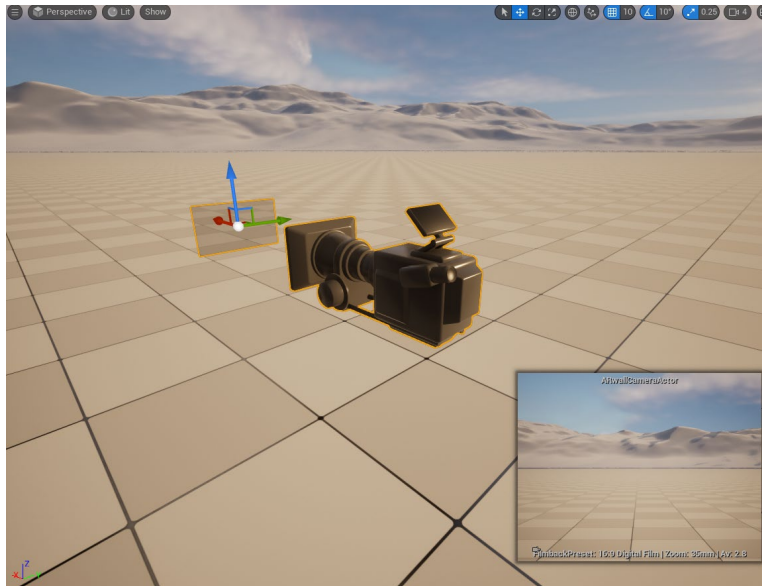


BEST PRACTICE: *It is recommended to write down the width and height of your physical screen in centimeters on a text document and save it somewhere easy to find on your machine. This will make it easy to input these numbers again for future projects.*

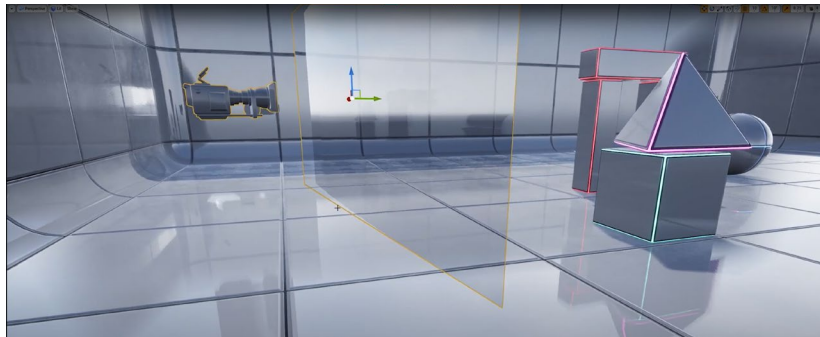
8. In the editor window, move the *ARWallCameraActor* to its desired location to correspond to the real world. This will be where the scene starts at launch.

NOTE: *By default, the UE4/5 units are displayed in centimeters.*

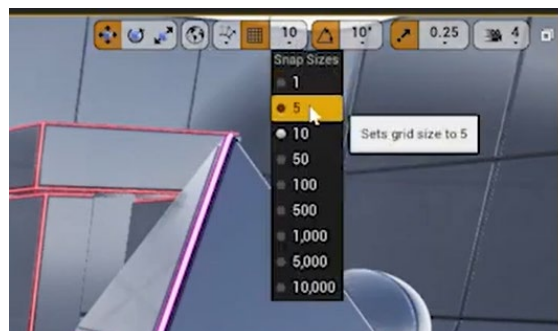




BEST PRACTICE: For best experience when launching a scene, align the camera to the floor after dropping in ARwallCameraActor. This is especially important if you're trying to match the virtual scene as an extension of the physical set. Adjust the ARwallCameraActor until you see the bottom of the screen match the bottom of the virtual map (the bottom yellow line helps show if you're on, below, or above the map floor).



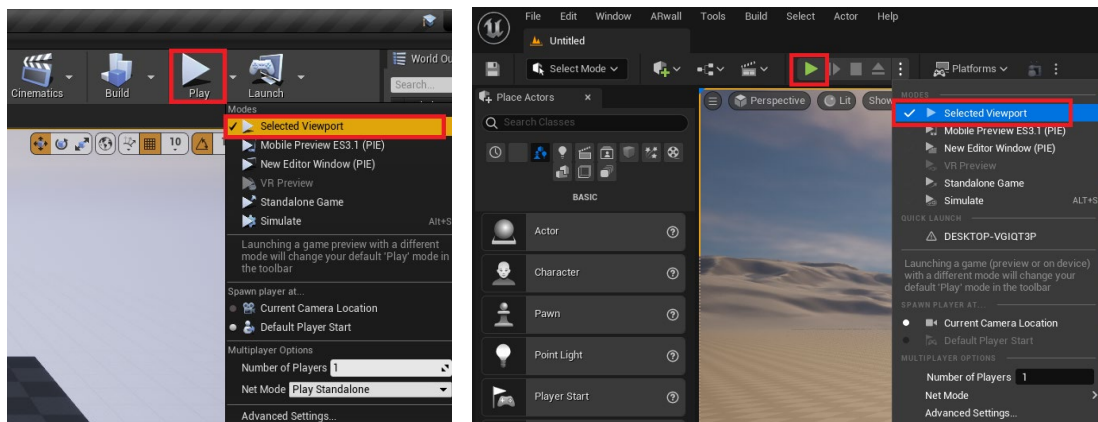
Changing snap size can help make micro-adjustments to align the bottom of the ARwallCameraActor to the map floor.



NOTE: Be sure to create your scene to match world scale 1:1, or else the sizing of objects will look very off when the scene is launched with camera tracking.

9. To launch the scene, click the *Play* button or use the hotkey Alt-P.
 - a. It is recommended to play the scene in *Selected Viewport* to allow manipulation of the scene, within the Unreal Engine editor, while in play mode. Before clicking *Play* click on the drop-down icon next to the *Play* button and select *Selected Viewport*. This will ensure that all future play sessions will open in a viewport.
 - b. If using multiple viewports, make sure to select your intended viewport before pressing Play or using hotkey Alt-P. The scene will play in the last selected viewport.

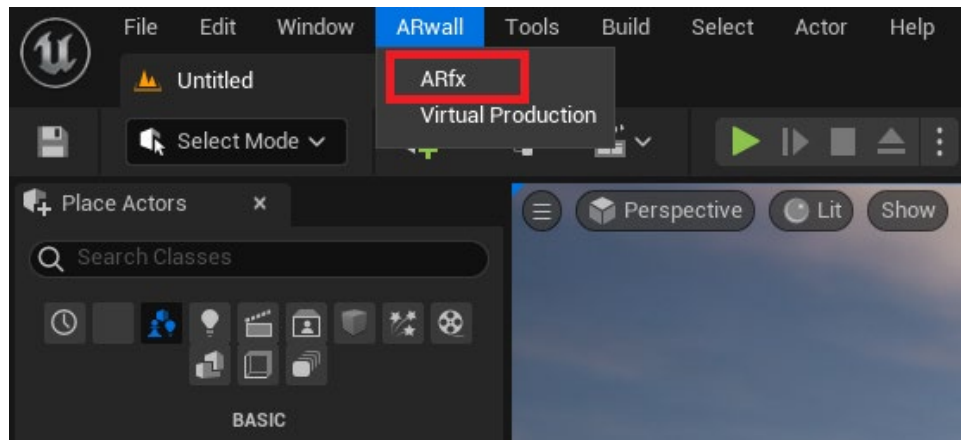
BEST PRACTICE: *It is recommended to full screen your viewport on your intended backdrop screen by pressing F11 on your keyboard when that viewport is selected. If needed, also hide the taskbar to use the entire screen with ARFX backdrop.*



Section 5.2: ARwall ARFX Pro Plugin UI

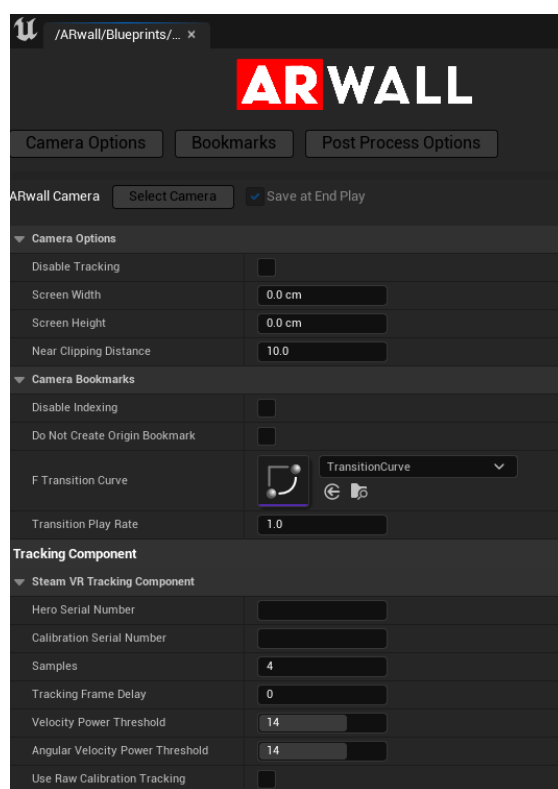
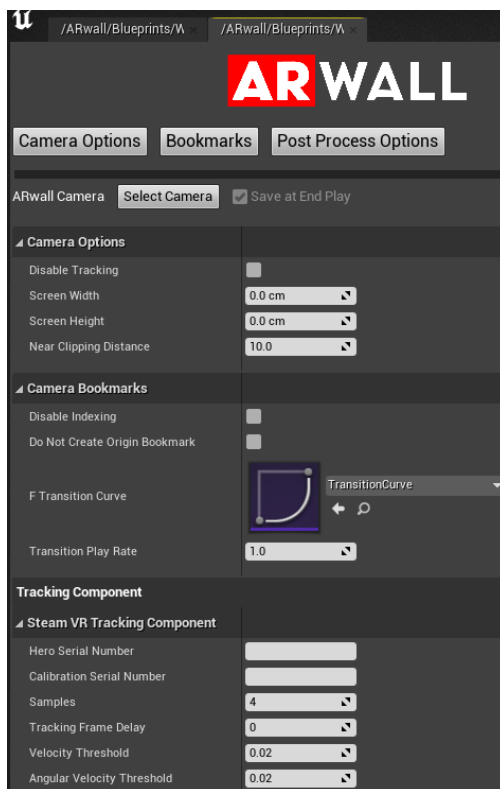
You can access the ARFX Pro Plugin User Interface (UI), where everything is conveniently located in the same window without having to search for them throughout Unreal Engine. Follow the steps below to open the UI menu:

1. Click the ARwall menu option, next to the Windows menu option in the upper left-hand corner of Unreal Engine and select ARFX.



2. This will open a new window where you can input all necessary information to get Virtual Production and tracking working in one place. There are three tabs to choose from:

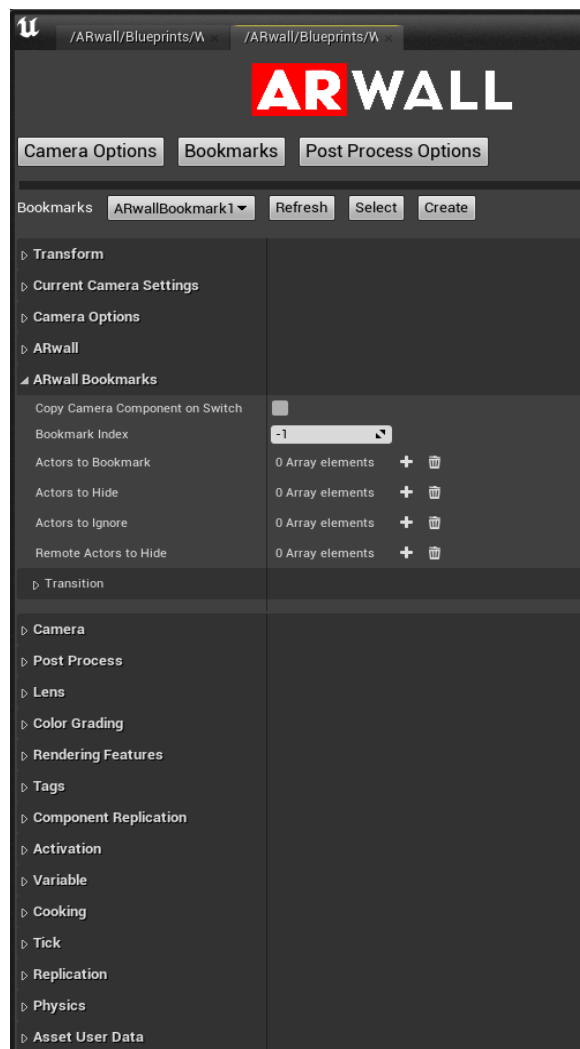
- a. **Camera Options:** This section provides the basic ARwall Camera Actor and Tracking Component options in one easy to access UI



- i. **ARwall Camera:** an ARwall Camera Actor will need to be added to the map for this section to show up in this menu.
 1. **Select Camera** button can help you find your ARwall Camera Actor if it has already been added, but not already shown in this panel

2. **Camera Options**
 - a. **Disable Tracking:** Disables tracking if checked on
 - b. **Screen Width:** Enter screen width in centimeters
 - c. **Screen Height:** Enter screen height in centimeters
 - d. **Near Clipping Distance:** “Clips away” the virtual surface/object to unblock the virtual camera view, increase value to remove more of the object/plane, decrease value to remove less of the object/plane
3. **Camera Bookmarks:** Make adjustments to bookmarks and transitions between bookmarks
 - a. **Disable Indexing**
 - b. **Do Not Create Origin Bookmark**
 - c. **F Transition Curve:** Provides control of the animation between bookmarks
 - d. **Transition Play Rate:** Adjusts speed of animation between bookmarks
- ii. **Tracking Component: Steam VR Tracking Component:**
 ARwall Tracking Component SteamVR will need to be added to the ARwall Camera Actor for that section to show up in this menu.
 1. **Hero Serial Number:** Enter serial number for HTC Vive tracker that will be placed on the physical camera
 2. **Calibration Serial Number:** Enter serial number for HTC Vive tracker that will be used for calibration
 3. **Samples:** Number of samples taken out of 256 frames per second to calculate the velocities used in thresholds
 4. **Tracking Frame Delay**
 5. **Velocity Threshold:** For UE4, start at 0.01 or 0.02 and adjust as needed
 - a. increase value by 0.01 at a time to decrease jitter on trackers
 - b. decrease value by 0.01 at a time to improve slow camera tracking movements
 6. **Angular Velocity Threshold:** For UE4, start at 0.01 or 0.02 and adjust as needed
 - a. increase value by 0.01 at a time to decrease jitter on trackers
 - b. decrease value by 0.01 at a time to improve slow camera tracking movements
 7. **Velocity Power Threshold:** For UE5, start at 13 or 14 and adjust as needed
 - a. increase value by 1 at a time to decrease jitter on trackers

- b. decrease value by 1 at a time to improve slow camera tracking movements
 - 8. **Angular Velocity Power Threshold:** For UE5, start at 13 or 14 and adjust as needed
 - a. increase value by 1 at a time to decrease jitter on trackers
 - b. decrease value by 1 at a time to improve slow camera tracking movements
- b. **Bookmarks:** This section provides the basic ARwall Bookmarks options in one easy to access UI
 - i. **Bookmarks:** Select the bookmark to adjust from the dropdown menu and adjust in options below.
 - 1. **Refresh**
 - 2. **Select**
 - 3. **Create:** Adjust viewport to preferred virtual camera position (not in play mode) and click *Create* button to create a new bookmark in that position



- c. **Post Process Options:** This section provides the basic Post Process Volume options in one easy to access UI.
 - i. **Post Process:** Post Process Volume will need to be added to the map for this section to show options. Make sure to set PPV to Enabled and Infinite Extent (Unbound).
 - ii. Select the Post Process Volume to adjust from the dropdown menu and adjust in options below.



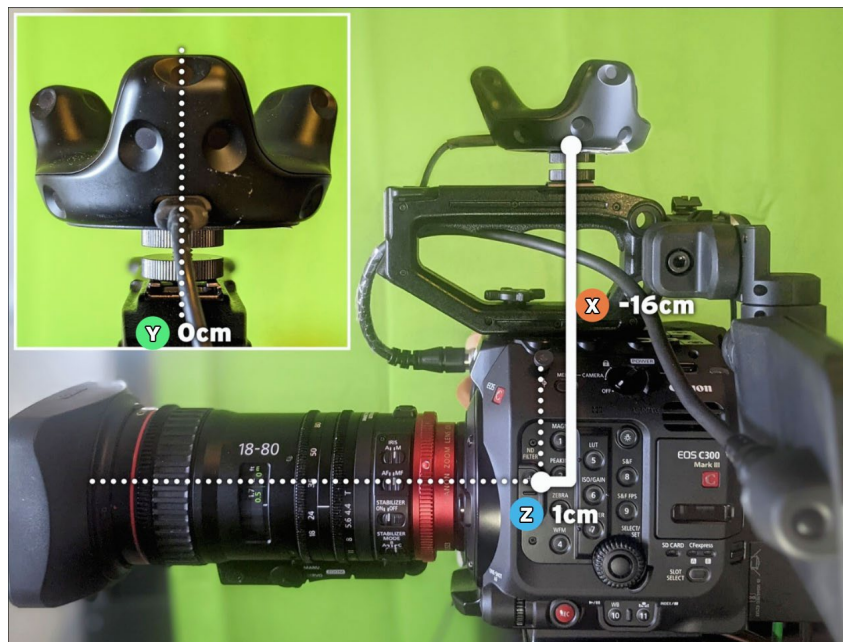
NOTE: When re-opening an Unreal Engine project that already had the ARFX Pro Plugin UI window open, it may show as a blank/black window. Simply close out that window and relaunch the ARFX Pro Plugin UI window from the Unreal Engine menu as described in steps 1-2 above to re-open the UI.

Section 5.3: Physical Camera and Hero Tracker Offset Setup

The *Camera Offset* function allows you to change the settings inside *Unreal Engine 4/5* in order to match the physical distance between the physical camera sensor and the hero camera tracker.

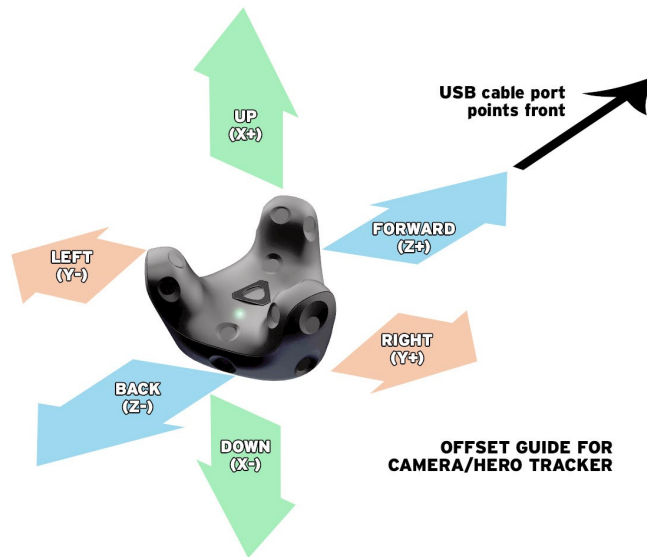
NOTE: *This is not always necessary, but if there are perceived issues in parallax or scale when in play mode, the camera offset should be adjusted. Accurate recordings help the virtual and real environments to match. If there are no perceived issues, then these settings can be left alone.*

1. Set up physical camera hero tracker offset to match in Unreal Engine.
 - a. Match the virtual *ARwall Camera Actor* offset to match the physical camera hero tracker offset.
 - i. Measure the vertical (up/down, X-axis), depth (forward/backward, Z-axis), and side to side (left/right, Y-axis) physical distance in centimeters from the physical camera sensor to the bottom/center of the physical Vive hero tracker.

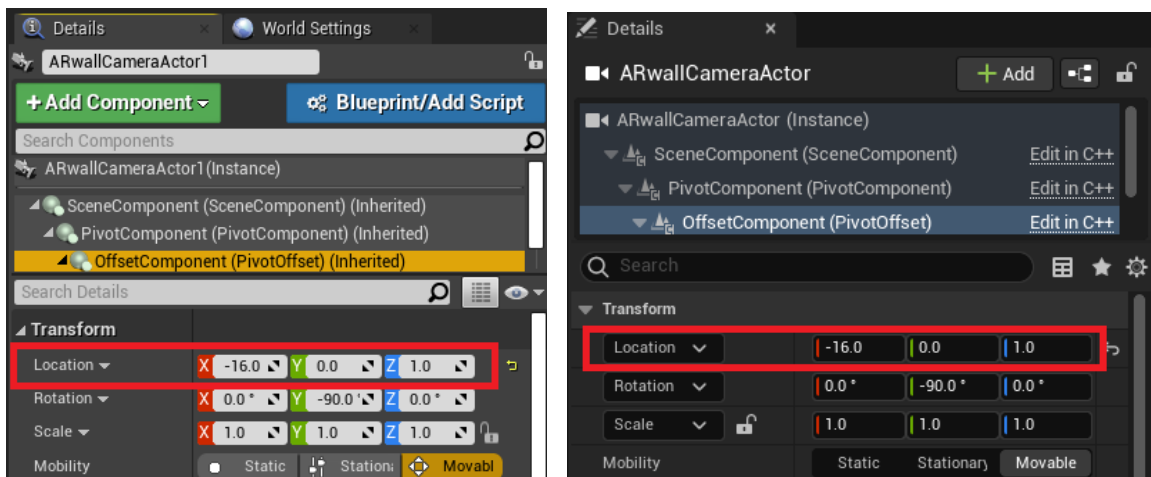


BEST PRACTICE: *A physical camera's sensor's depth is often represented by focus puller hook. Make sure to account for the sensors depth when measuring for the x-axis offset.*

- ii. Follow the examples displayed in the image below to offset correctly. Left offsets negatively, right offsets positively.



- iii. Input the X, Y, and Z-axis values determined from physical measurements into *ARwallCameraActor* > *OffsetComponent* > *Transform* > *Location*'s X, Y, and Z-axes.



Section 5.4: Change ARwall Camera Settings

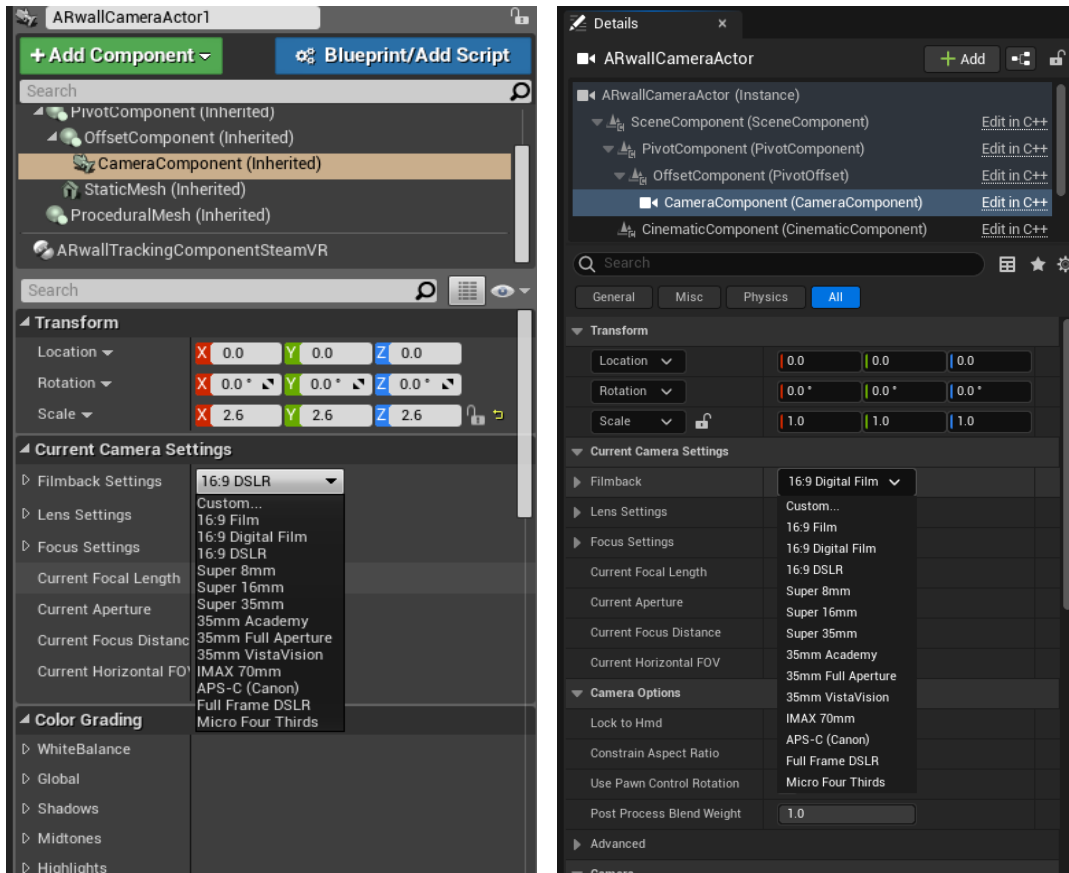
Changing the **ARwall** camera settings allows you to match the virtual camera to the physical camera as closely as possible by changing the camera, lenses, focus, and aperture.

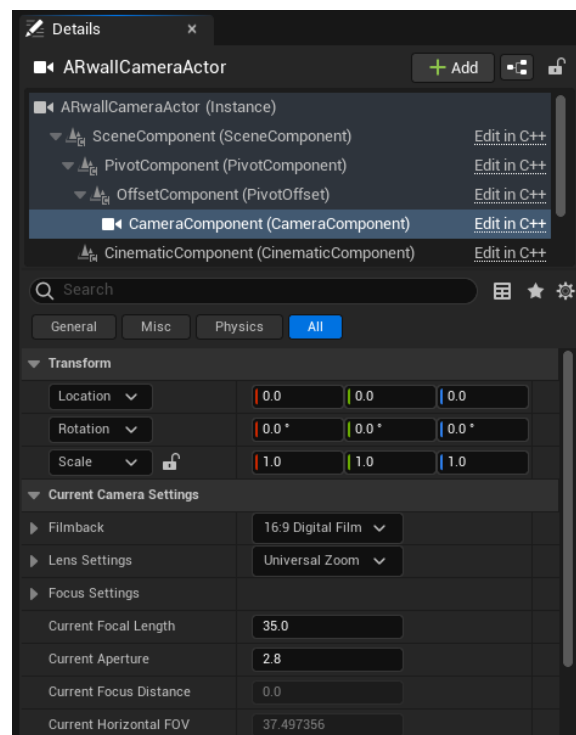
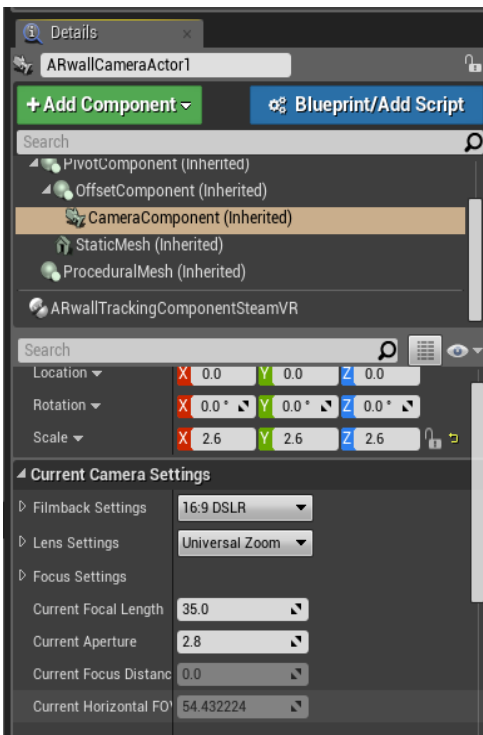
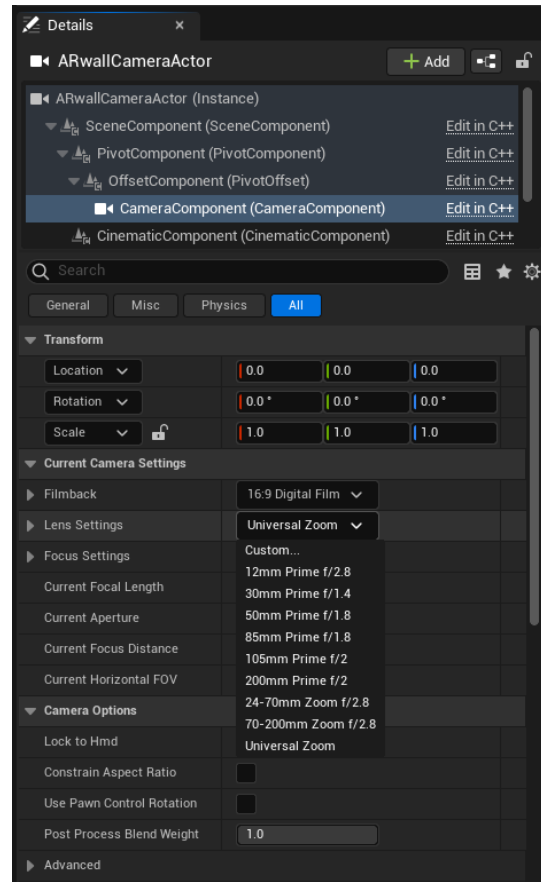
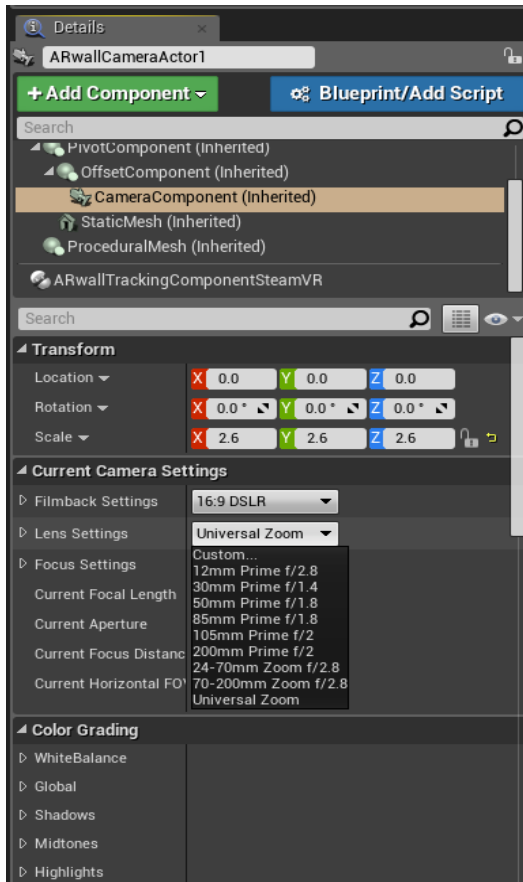
NOTE: While the following settings below can help match the virtual ARFX camera to the physical camera, the placement of the physical camera will also change how the virtual camera angle looks. It is a delicate dance between virtual camera and physical camera to get the right look for a shot, and it is recommended to have tech rehearsals

ahead of production shoot days to pre-set virtual camera settings and bookmarks and physical camera locations on the physical set.

To change the **ARwall** camera settings, do the following:

1. Select the **ARwallCameraActor** in your scene or in the World Outliner, navigate to the *Current Camera Settings* section in your Details panel.
2. Click on the box in this section to display a dropdown list of cameras or lenses that you can select from to match your equipment



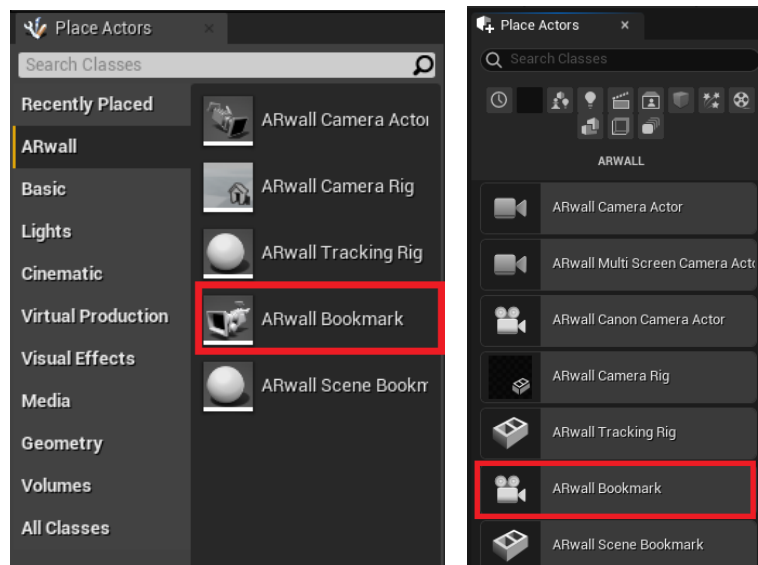


Section 5.5: Adding ARwall Bookmark Cameras

Adding an **ARwall** Bookmark Camera helps you bookmark a specific virtual camera angle of the scene you would like to shoot. This allows quick movement from one virtual camera angle to another, making shooting multiple angles in a scene easy and quick.

To add **ARwall** Bookmark Cameras to a scene, do the following:

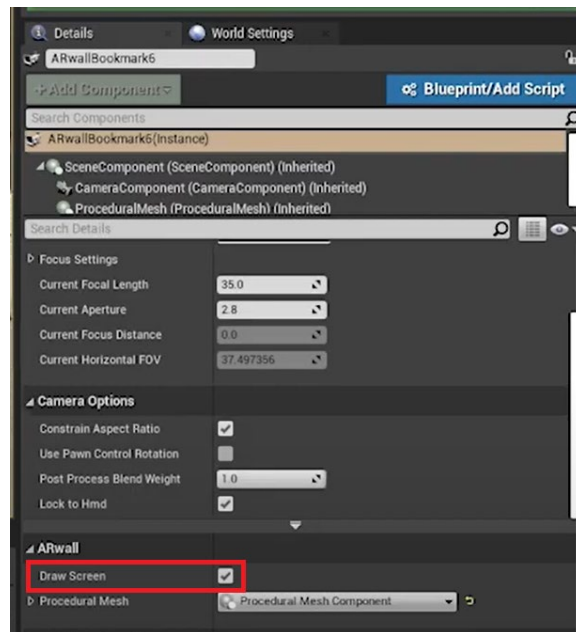
1. Open the *Unreal Engine* 4/5 project.
2. If using multiple maps within one project, under the *Content Browser* section, load the level *.umap* you want to add the bookmark cameras to.
3. Add the bookmark camera to the scene by dragging it from the *Place Actors* window under the ARwall tab shown in the next image, which is located on the left-hand side of the *Unreal Engine* GUI.
4. Drag the **ARwall** Bookmark Camera to the desired location in editor window.



NOTE: You can also create a bookmark with the “backspace” hotkey on the keyboard while in Play mode. This will create a bookmark wherever the virtual camera is currently placed.

BEST PRACTICE: If you're trying to match the virtual scene bookmark as an extension of the physical set, do the following:

While the **ARwallBookmark** camera is selected, navigate to *Details > ARwall* and check the “Draw Screen” checkbox to show the screen size for all future created **ARwall** Bookmarks.



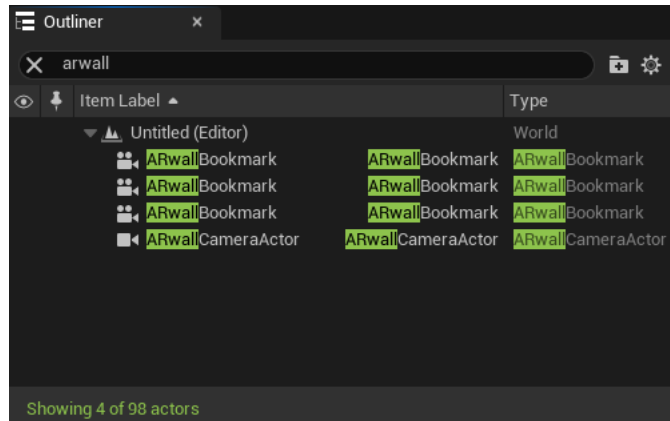
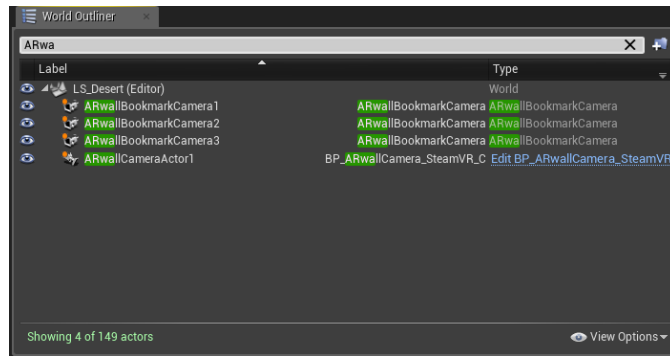
If left checked on as default, this can create a cluttered map to work in, so use with caution. Adjust the Bookmark Screen until you see the bottom of the screen match the bottom of the virtual map (the bottom yellow line helps show if you're on, below, or above the map floor).

BEST PRACTICE: *Snapping the virtual camera to a surface can perfect your virtual camera location before creating a bookmark. While in play mode, you can snap your camera to different surfaces by pressing "T" on the keyboard or pressing down "Left stick" on your Xbox controller to toggle on/off Snap Mode. Once enabled, use the arrow keys on the keyboard or the D-PAD arrows on the Xbox controller in the direction you want to snap to. Be sure to disable Snap Mode once finished by pressing "T" or "Left stick" again.*

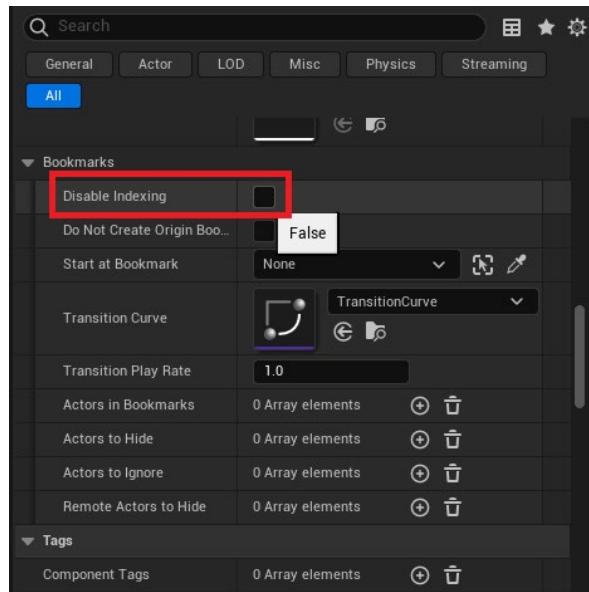
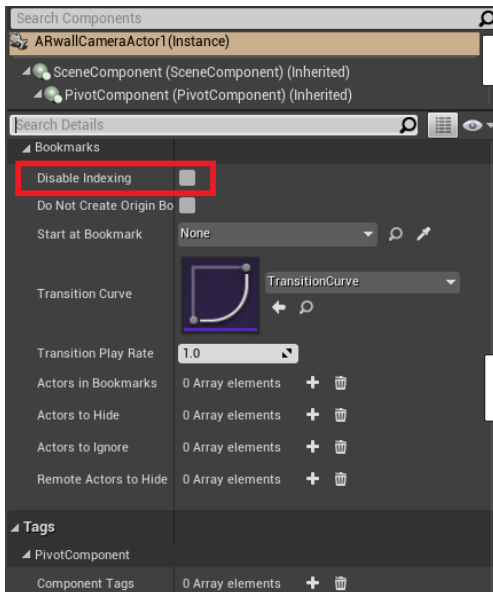
Section 5.6: Changing ARwall Bookmarks Order

To change bookmarked camera order, do the following:

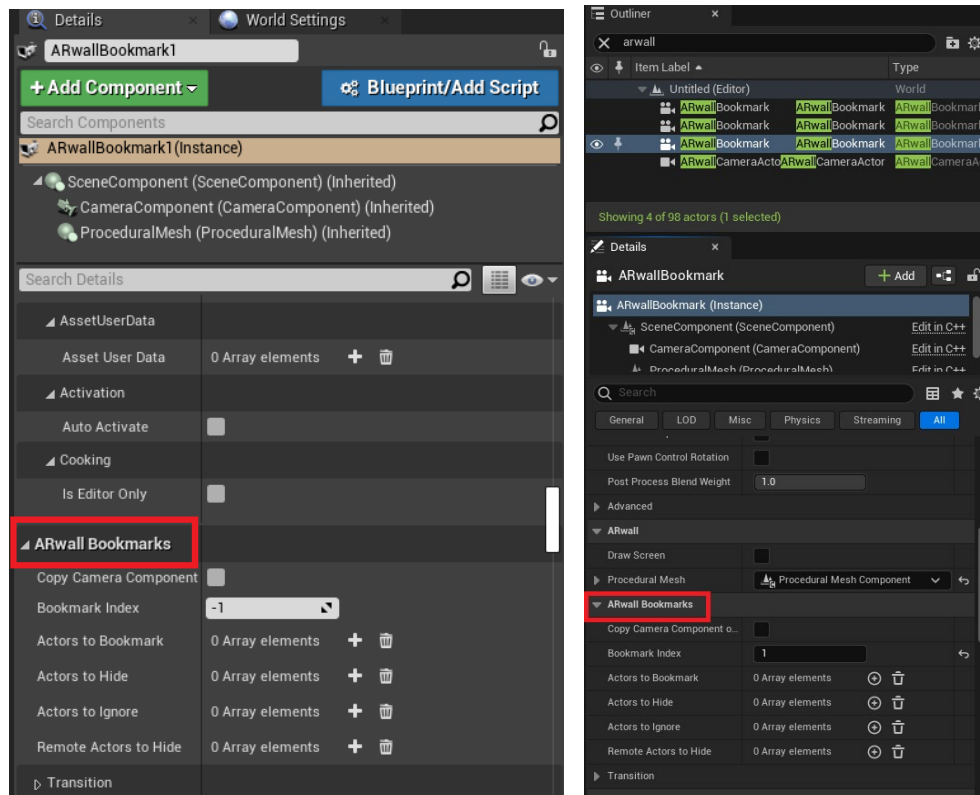
1. Open the *Unreal Engine 4/5* project
2. If using multiple maps, under the *Content Browser* section, load the level .umap you want to adjust the bookmarked camera order for.
3. Once the map is loaded, go to the (*World*) *Outliner* and type **ARwall** into the search bar as shown below.



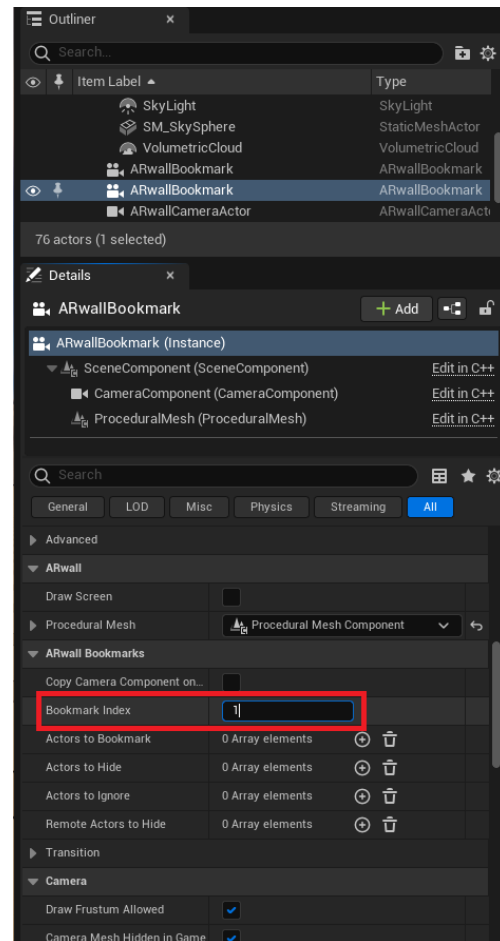
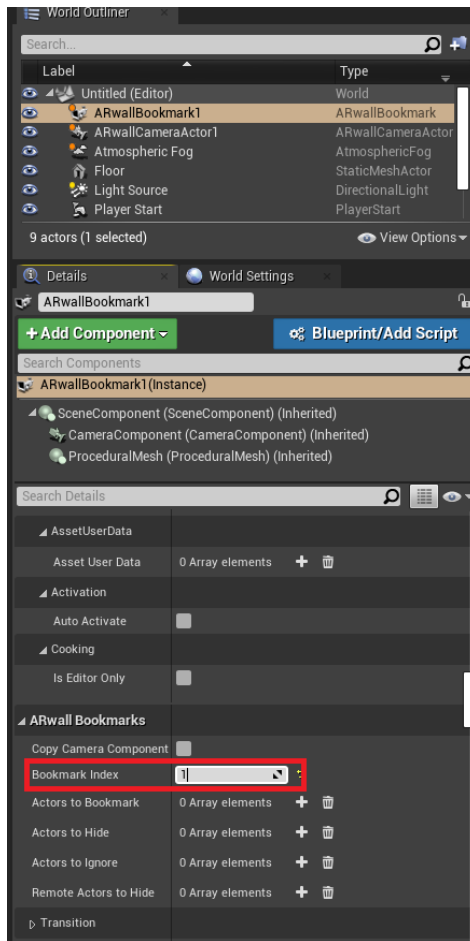
4. You will see a list of *ARwallBookmarkCameras* located in the scene.
5. Click on *ARwallCameraActor*.
6. Under the *Details* section, go to the second scroll bar and scroll down until you see *ARwall Bookmarks* as shown below.



7. Click to check the *Disable Indexing* box. This stops *ARwallCameraActor* from assigning bookmarked camera order based on which camera is loaded first.
8. Click on the *ARwallBookmarkCamera* that you want as the second bookmarked camera in the chain.
9. Under the *Details* section, scroll down until you see *ARwall/ARwall Toolset*. Click the triangle next to *Bookmark* to open the drop-down list as shown below.



10. Go to *Bookmark Index* and change the index number to 1. This is the second camera in the chain. *ARwallCameraActor* is the first in the chain and will have an index number 0.



11. Repeat Steps 8 – 10 to set up the next bookmarked camera in the chain by setting the third camera with Bookmark Index number 2 and so on.

NOTE: *These changes will only apply to the current map and will not be applied to other maps in the project.*

12. Once the *Bookmark Index* numbers have been set, click save and you can run the scene normally.

BEST PRACTICE: *It is best to check the bookmarked camera in editor viewport before changing the Bookmark Index number. This will make sure you have the bookmarked camera that you want in the correct order.*

NOTE: *To revert the bookmark settings back to default, just change the Bookmark Index number for each ARwallBookmarkCamera back to -1. Next, go to ARwallCameraActor and make sure the Disable Indexing box is unchecked.*

Section 6: Calibration and Virtual Camera Control

This section describes how to calibrate **ARwall ARFX** using the patented XR Sync system and describes how to use the **ARwall** camera controls once **ARFX** is up and running.

Section 6.1: XR Sync Calibration

This section describes how to calibrate **ARwall ARFX** using the patented XR Sync system. This process is the same whether running ARFX through the **ARFX Launcher** or through *Unreal Engine 4/5*.

Once the **ARwall ARFX** scene is up and running, calibrate the scene so that the proportions and parallax looks correct to the tracked physical camera. To perform calibration in **ARwall ARFX**, do following:

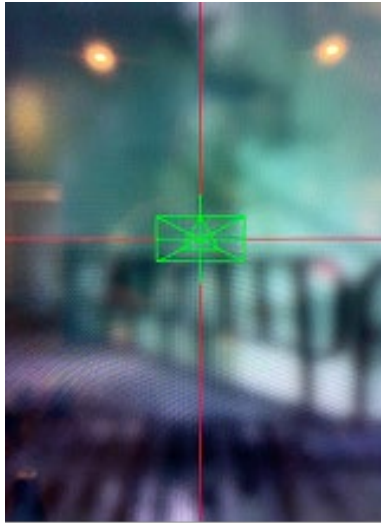
1. Press the **TAB** key on a keyboard or **X** button on an Xbox controller, the calibration screen will open. Locate the center of the screen marked by the red crosshairs.



2. The green triangle/square that appears represents the calibration tracker. The current position is always relative to the last calibration point but should always move in relationship to wherever you move the calibration puck.

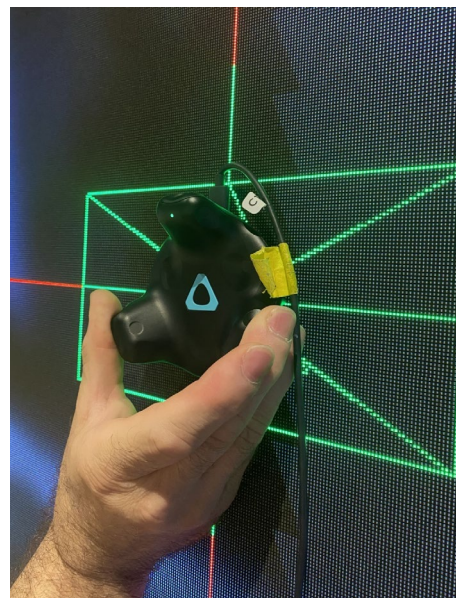
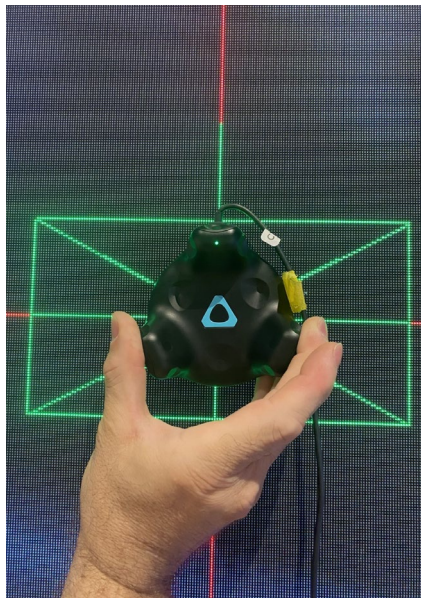
NOTE: The green triangle/square should move when moving one of the trackers connected to the system. This is the tracker previously set as the calibration tracker. If

this is not the intended tracker for calibration, either swap the trackers physical positions (on the camera vs next to the screen) or swap the serial numbers. Further information on how to obtain the serial numbers can be found here: [5](#)

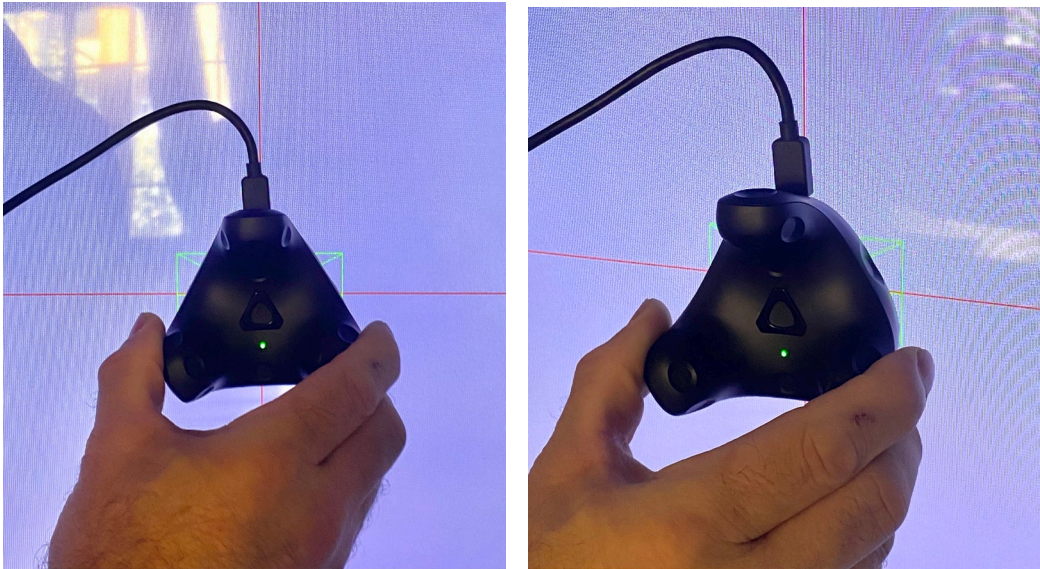


3. Place the calibration puck flat against the screen and centered on the crosshairs with the green light on the tracker facing up (for 2.0 Trackers) and with the green light on the tracker facing down (for 3.0 Trackers). Both 2.0 and 3.0 Trackers will have the cable pointed up for correct calibration. Press the Calibration button (that was set previously under Hotkeys, by default it should be the **C** key on keyboard and **B** button on Xbox controller) while the calibration puck is on the crosshairs, then press **TAB** (or whichever button was previously set under Hotkeys) to exit the calibration screen.

2.0 Trackers



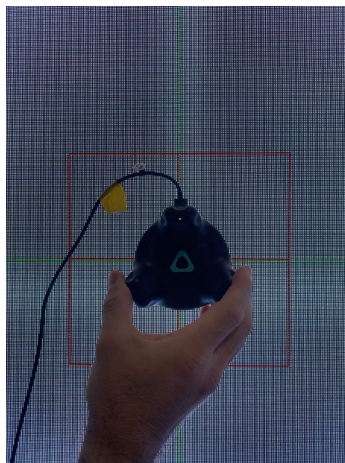
3.0 Trackers



BEST PRACTICE: *Feel free to press the Calibration button again if it does not look like it calibrated correctly the first time. Make sure the calibration tracker is positioned in place on the red crosshairs, until it looks like the ARFX Screen looks correctly positioned and does not jump around a lot between calibration button presses. This ensures that you have the most optimal calibration.*

NOTE: *It is good practice to recalibrate anytime a lighthouse is moved or bumped, even if very minute. This could cause jitter/jumping of the virtual camera if not recalibrated.*

4. If calibrating for a multiscreen version of **ARFX Pro Plugin**, the crosshairs will be green (instead of red) and the box representing the calibration puck will be a red box with a plus sign in the middle. Otherwise, calibration should be the same for multiscreen.



Section 6.2: Calibration Puck Tracker Offset Setup

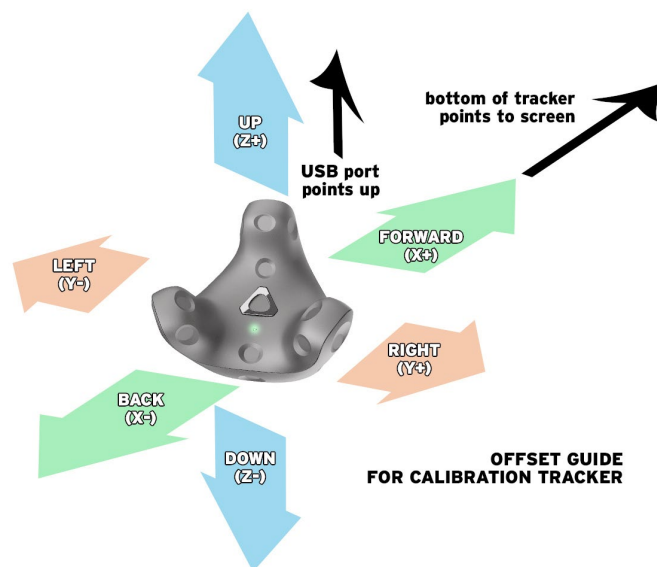
If for any reason the calibration puck cannot be physically placed on the center of the screen during the calibration process, it's possible to add an offset for calibration so that calibration puck can be placed somewhere more accessible. The *Screen Offset* function allows you to change the settings inside *Unreal Engine 4/5* to match the physical distance where the center of the physical screen is and where the calibration puck may need to be on set.

NOTE: During calibration mode, the bottom of the calibration tracker needs to be pointed at the screen, placed flat vertically on the center of the screen where the red crosshairs show. When using an offset location for the calibration puck, make sure to keep the bottom of the tracker still pointing towards the physical screen. This may require a $\frac{1}{4}$ inch screw set up that keeps the puck in that same 90 degree rotation.

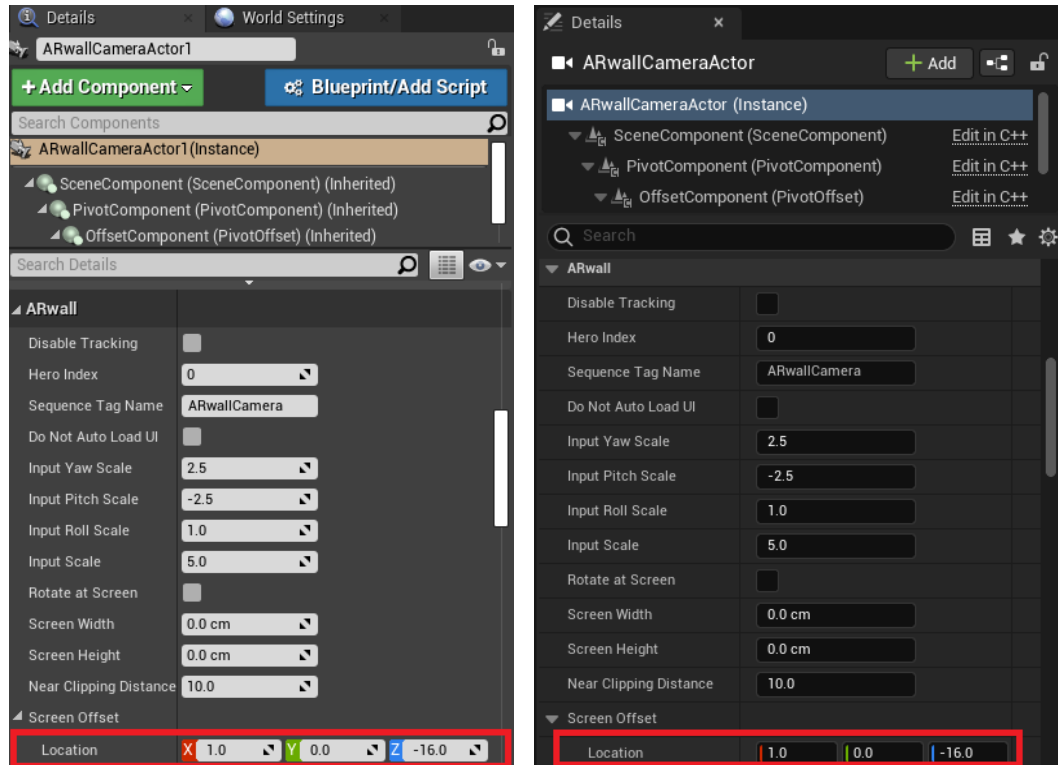
1. Set up calibration tracker offset to match in Unreal Engine.
 - a. Match the virtual *ARwall Camera Actor* offset to match the physical camera hero tracker offset.
 - i. Measure the vertical (up/down, Z-axis), depth (forward/backward, X-axis), and side to side (left/right, y-axis) physical distance in centimeters from the center of the red crosshairs from the screen while in calibration mode to the bottom/center of the physical Vive calibration tracker.

BEST PRACTICE: It is recommended to place your offset calibration tracker in a position that is precise, still, and unmoving.

- ii. Follow the examples displayed in the image below to offset correctly. Left offsets negatively, right offsets positively.



- iii. Input the X, Y, and Z-axis values determined from physical measurements into *Details* > *ARwallCameraActor* > *ARwall* > *Screen Offset* > *Location*'s X, Y, and Z-axes.



Section 6.3: Virtual Camera Control

This section describes how to use the **ARwall** camera controls for both keyboard and Xbox controller once the **ARFX Pro Plugin** is launched and calibrated.

1. Play ARFX Pro Plugin scene within Unreal Engine 4/5 and calibrate. Refer to [Section 5: ARwall Setup and Settings within Unreal Engine 4/5](#) and [Section 6.1: XR Sync Calibration](#) for further details.
2. Move the Hero Tracker (tracker on the physical camera) within the designated play area as dictated by the base stations. The scene should show the correct parallax.

BEST PRACTICE: Here is how to tell if you are seeing the correct parallax after calibration:


- Move the physical camera left, you should see more of the right side of the virtual scene environment.
- Move the physical camera right, you should see more of the left side of the virtual scene environment.
- Move the physical camera up, you should see more of the bottom of the virtual scene environment.
- Move the physical camera down, you should see more of the top of the virtual scene environment.
- Move the physical camera closer to the screen, you should see more of the virtual scene environment.
- Move further from the screen, you should see less of the environment.

If this is not what you're seeing, try to calibrate again and make sure that the base stations can clearly see each other and the trackers. Refer to [Section 3.4 Base Station Placement](#) for further details.


The default virtual camera controls are described in Table 4 below.

Table 4: Virtual Camera Controls

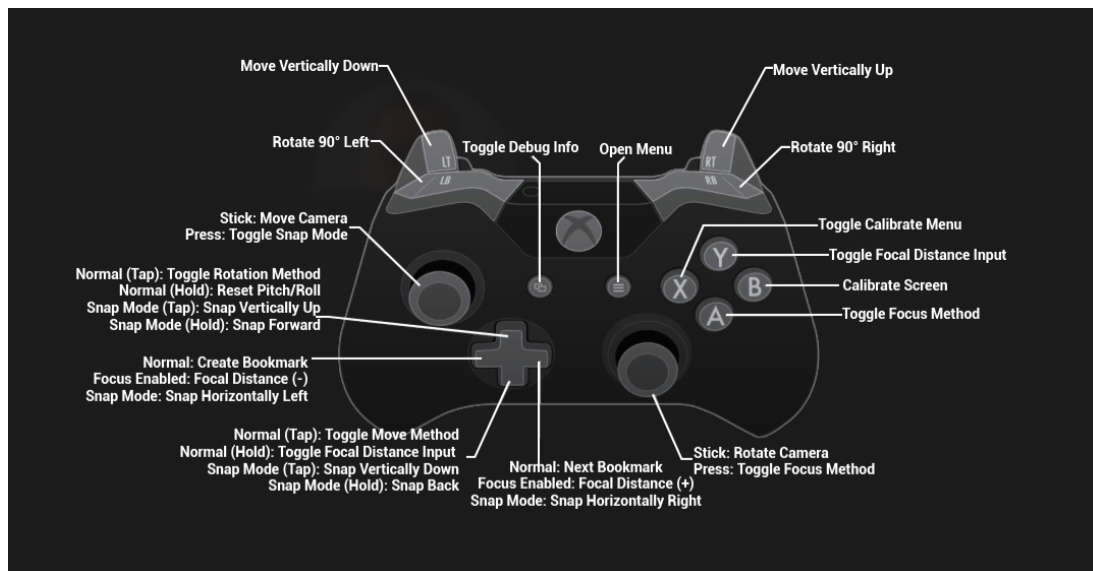
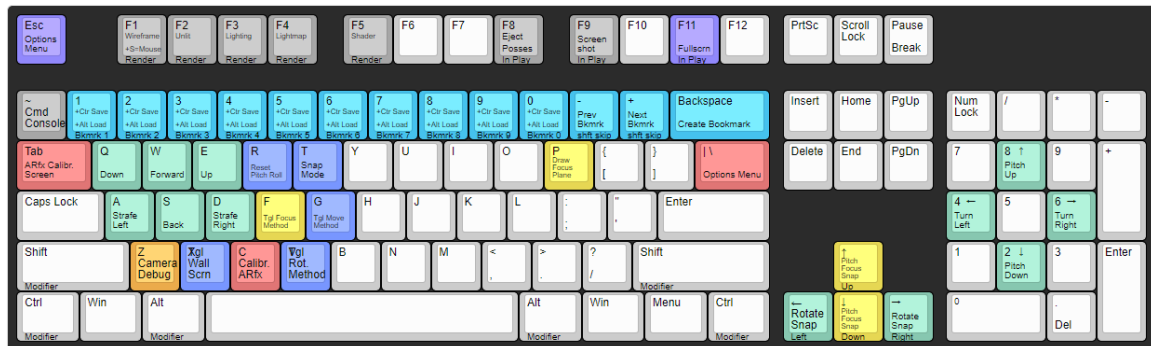
Action	Keyboard	Xbox Controller
To move the virtual camera	Use the WASD navigation controls: <ul style="list-style-type: none"> • W = Forward • S = Backwards • A = Left • D = Right 	Left Stick is the Forward, Backwards, Left, and Right control.
To move the virtual camera up or down	Use the following controls: <ul style="list-style-type: none"> • Q = Down • E = Up 	Left Trigger is to move vertically down Right Trigger is to move vertically up
To rotate/pan the virtual camera left or right (Refer to Section 6.3: Input Scale if using these hotkeys does not rotate/pan)	Use the following controls: <ul style="list-style-type: none"> • Use the left arrow (←) to pan the camera left. • Use the right arrow (→) to pan the camera right. 	Right Stick pans the camera LB (Left shoulder button) rotates 90 degrees left RB (Right shoulder button) rotates 90 degrees right
To toggle the calibration menu	Use the Tab key: <ul style="list-style-type: none"> • Press Tab to toggle on/off 	X button to toggle on/off

To calibrate the screen (while holding up the calibration puck to the center of the screen crosshairs, so the parallax and camera tracking look correct)	Use the C key: <ul style="list-style-type: none"> Press C while calibration puck is held in the center of the screen 	B button while calibration puck is held in the center of the screen
To toggle focus method	Use the F key: <ul style="list-style-type: none"> Press F to toggle on/off the focus method 	A button or press down the Right Stick button to toggle on/off the focus method
To toggle focal distance input (also adds focal plane)	Use the P key: <ul style="list-style-type: none"> Press P to toggle on/off the Draw Focus Plane, should look like a transparent purple wall on screen indicating your focus plane Use the up arrow (↑) and the down arrow (↓) to change the focal distance 	<p>Y button or while in normal mode: hold D-PAD Down arrow to toggle between focus enabled mode and normal mode.</p> <p>While in focus enabled mode:</p> <ul style="list-style-type: none"> Press D-PAD Right arrow to increase Focal Distance (+) Press D-PAD Left arrow to decrease Focal Distance (-)
To toggle camera debug info	Use the Z key: <ul style="list-style-type: none"> Press Z to toggle on the camera debugging, positional data, rotation data, and FPS Press the Z key again to remove positional and rotational data, but keeping FPS Press the Z key again to toggle off camera debugging 	<p>Press the View button (looks like 2 rectangles) to toggle on/off camera debug info</p> 

To add a bookmark	<p>Use the backspace key:</p> <ul style="list-style-type: none"> Press backspace to create a new bookmark where the virtual camera currently is placed 	<p>While in normal mode:</p> <ul style="list-style-type: none"> Press D-PAD Left arrow to create a new bookmark where the virtual camera currently is placed
To change bookmark or preset camera angle	<p>Use the minus (-) or equal (=) keys:</p> <ul style="list-style-type: none"> Press the + key to fly to the next bookmark Press the - key to fly to the previous bookmark 	<p>While in normal mode:</p> <ul style="list-style-type: none"> Press D-PAD Right arrow to fly to the next bookmark
<p>To toggle snap mode of the virtual camera</p> <p>(This forces the virtual camera to snap towards a direction on the virtual environment.)</p>	<p>Use the T key:</p> <ul style="list-style-type: none"> Press T to toggle between snap mode and normal mode. <p>While in snap mode:</p> <ul style="list-style-type: none"> Press the Up arrow (↑) once to snap vertically up Hold the Up arrow (↑) to snap forward Press the Right arrow (→) to snap horizontally right Press the Down arrow (↓) to snap vertically down Hold the Down arrow (↓) to snap backward Press the Left arrow (←) to snap horizontally left 	<p>Press down Left Stick button to toggle between snap mode and normal mode.</p> <p>While in snap mode:</p> <ul style="list-style-type: none"> Tap the D-PAD Up arrow (↑) once to snap vertically up Hold the D-PAD Up arrow (↑) to snap forward Press the D-PAD Right arrow (→) to snap horizontally right Tap the D-PAD Down arrow (↓) to snap vertically down Hold the D-PAD Down arrow (↓) to snap backward Press the D-PAD Left arrow (←) to snap horizontally left

To toggle rotation method	<p>Press the V key to toggle between:</p> <ul style="list-style-type: none"> Rotating at camera locked to the Y axis (left and right only) Rotating at screen (free pitch up and down) <p>To Rotate:</p> <ul style="list-style-type: none"> Use the left arrow (←) to rotate the camera left. Use the right arrow (→) to rotate the camera right. 	<p>While in normal mode: press the D-PAD Up arrow to toggle between:</p> <ul style="list-style-type: none"> Rotating at camera locked to the Y axis (left and right only) Rotating at screen (free pitch up and down) <p>To Rotate:</p> <ul style="list-style-type: none"> Use Right Stick to rotate the camera
To reset pitch & roll (move method) of the virtual camera	<p>Press the R key to:</p> <ul style="list-style-type: none"> Reset the <i>side-to-side or Y axis</i> and the <i>front-to-back of the X axis</i> 	<p>While in normal mode: hold the D-PAD Up arrow to:</p> <ul style="list-style-type: none"> Reset the <i>side-to-side or Y axis</i> and the <i>front-to-back of the X axis</i>
To toggle move method	N/A	<p>While in normal mode: Tap the D-PAD Down arrow to toggle on/off moving only in the XY plane (cannot go up/down)</p>
<p>To bring up the menu system</p> <p>(Refer to Section 6: Menu System for further details)</p>	<p>Press the ESC key or Backslash (\) to:</p> <ul style="list-style-type: none"> Open the menu system, where you can control ARFX settings, Post Process, Hotkeys/controls, audio, etc. 	<p>Press the Menu button (looks like a hamburger menu) to Open the menu system, where you can control ARFX settings, Post Process, Hotkeys/controls, audio, etc.</p> 

To enter Fullscreen in Play mode (if the ARFX screen pops up as a window, use this to set it to full screen)	Select the ARFX Screen and press the F11 key: <ul style="list-style-type: none"> This will toggle on/off fullscreen mode 	N/A
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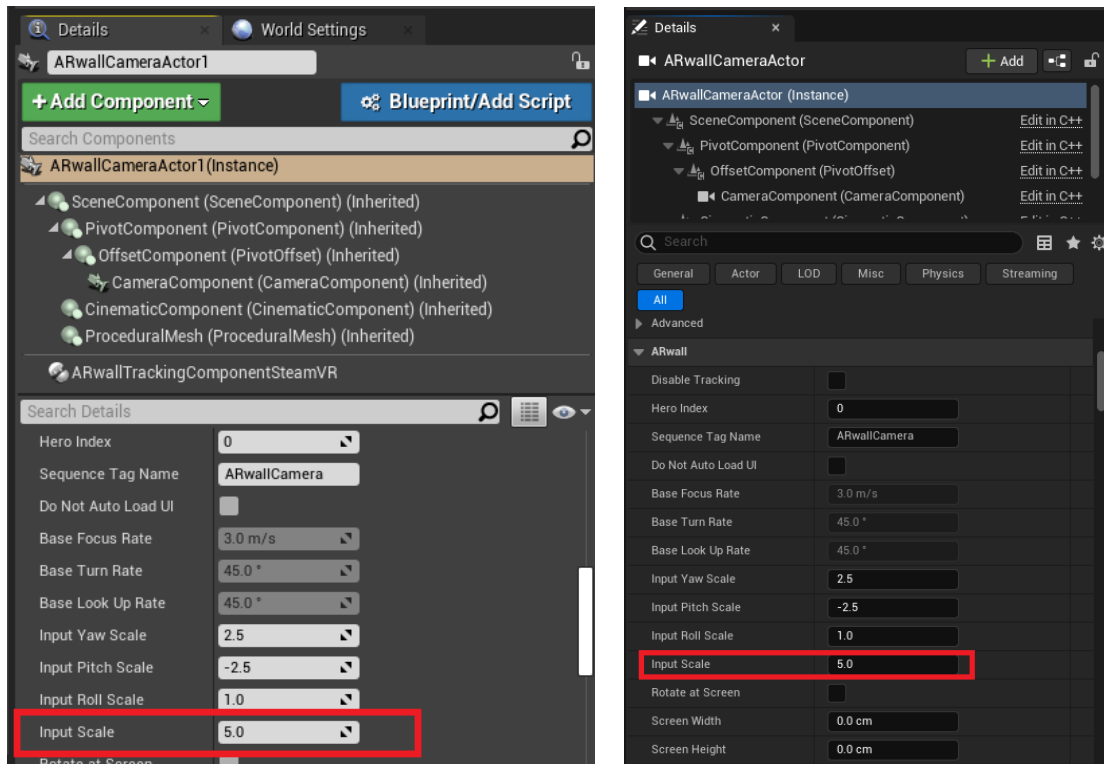
Refer to [end of manual](#) for larger version of keyboard and Xbox Controller hotkeys or refer to the keyboard hotkeys online here: <http://www.keyboard-layout-editor.com/#/gists/98cd82217ffe1eb61fc7a6ae19d97862>

Section 6.4: Input Scale

This section describes how to adjust the movement speed of the **ARwall** camera controls for both keyboard and Xbox controller once the **ARFX Pro Plugin** is launched and calibrated.

1. If the arrow keys described in [Table 4](#), which are used to rotate/pan the camera left or right, are not working, verify whether the four *Input Scale* options (Input Yaw Scale, Input Pitch Scale, Input Roll Scale, and Input Scale) inside the **ARwall** Camera match or have a value higher than 0 as displayed in [Figure 5](#) below.

Figure 2: ARwall Inputs

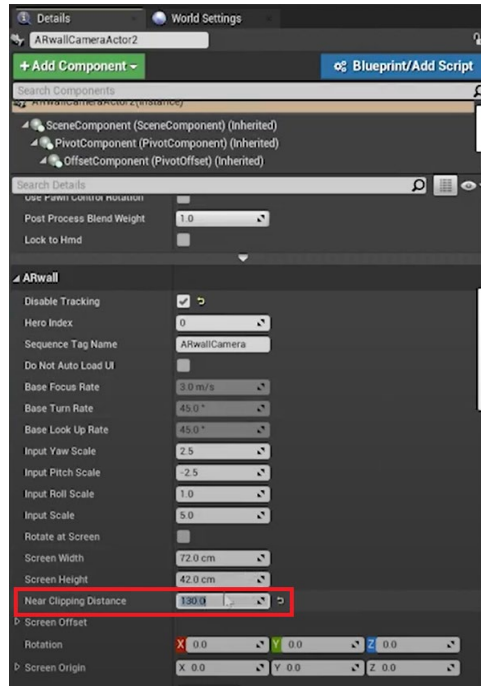


2. If moving the virtual camera is too slow or too fast while using WASD or the XBOX Controller left stick, adjusting *Input Scale* higher or lower will adjust this speed.
 - a. For instance, if a map is very large in scale, a higher *Input Scale* value (around 10-50) will help traverse the map more quickly. Conversely, if the *Input Scale* value is too high on a smaller map, lowering the value to 5-10 might be preferable.

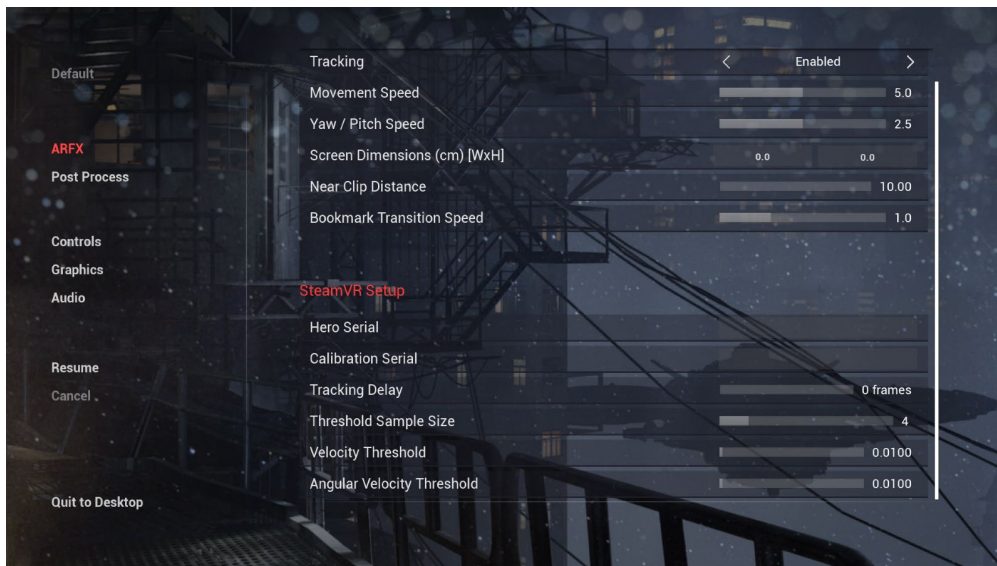
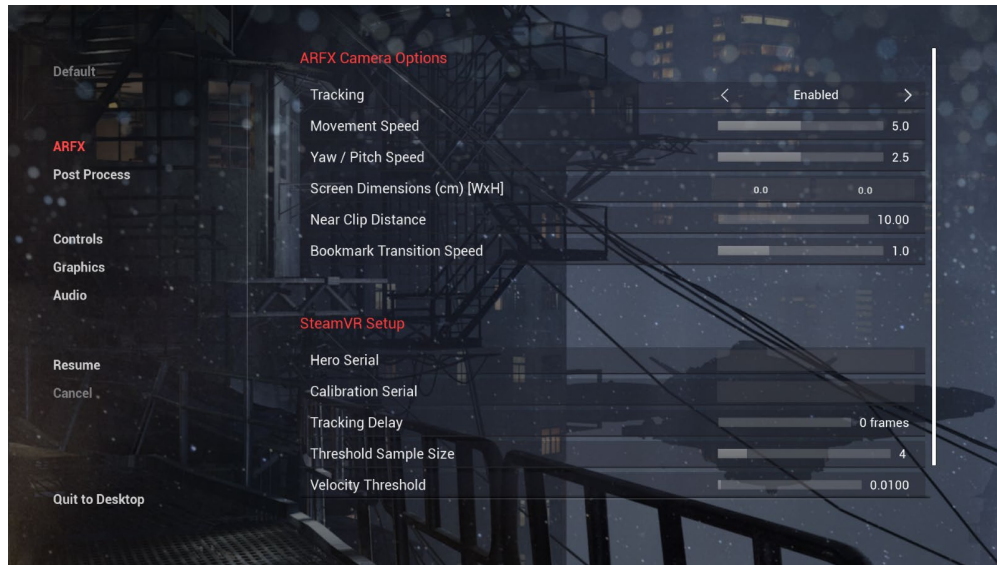
Section 6.5: Near Clipping Distance

This section describes how to adjust Near Clipping Distance of the **ARwall** camera once the **ARFX Pro Plugin** is launched and calibrated to remove unnecessary planes that block the virtual camera view. Near Clipping Distance is great for tight shots when a virtual plane or object is blocking the virtual camera view.

1. If composing a shot and the virtual camera is being blocked or is clipping through a surface or object, use Near Clipping Distance to “clip away” the virtual surface/object to unblock the virtual camera view. While in play mode, this can be adjusted in one of two ways:
 - a. In Unreal Engine:
 - i. Navigate to ARwall Camera Actor > Details > ARwall > Near Clipping Distance.
 - ii. Adjust the value to see the blocking virtual plane disappear/reappear.



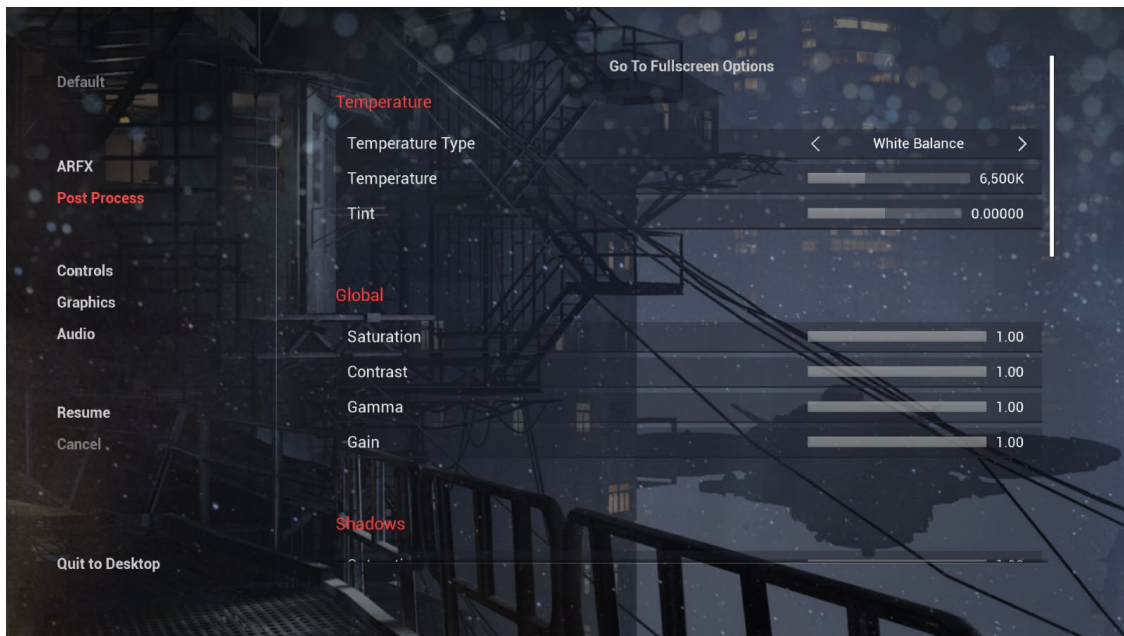
- b. In ARwall Options Menu:
 - i. Press Backslash on the keyboard to toggle on the ARFX Options Menu and navigate to ARFX > ARFX Camera Options > Near Clip Distance.
 - ii. Adjust the value to see the blocking virtual plane disappear/reappear.

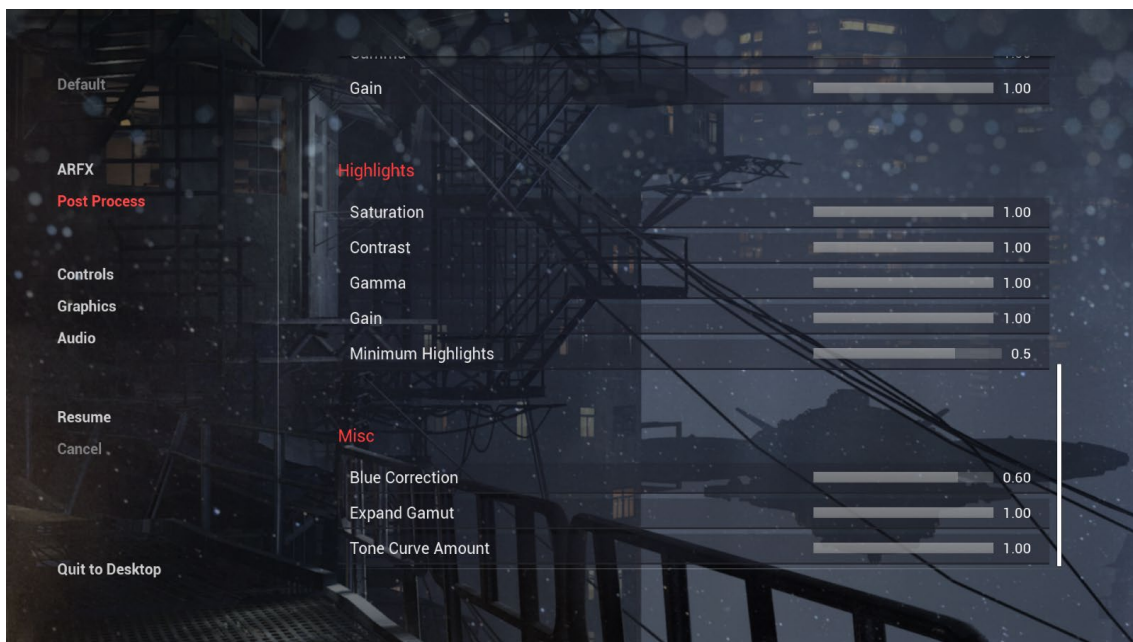


a. **ARFX:**

- i. **ARFX Camera Options:** Allow you to have further control over the ARwall Camera Actor within the scene
 1. **Tracking:** Toggles tracking on/off.
 2. **Movement Speed:** Input speed of the virtual camera as it moves around.
 3. **Yaw/Pitch Speed:** Movement speed of virtual camera pan and tilt.
 4. **Screen Dimensions (cm) [WxH]:** Physical Dimension of the screen in centimeters.
 5. **Near Clip Distance:** Distance at which the virtual camera will clip objects too close to the screen/wall.
 6. **Bookmark Transition Speed:** Speed at which the camera will transition between bookmarks.

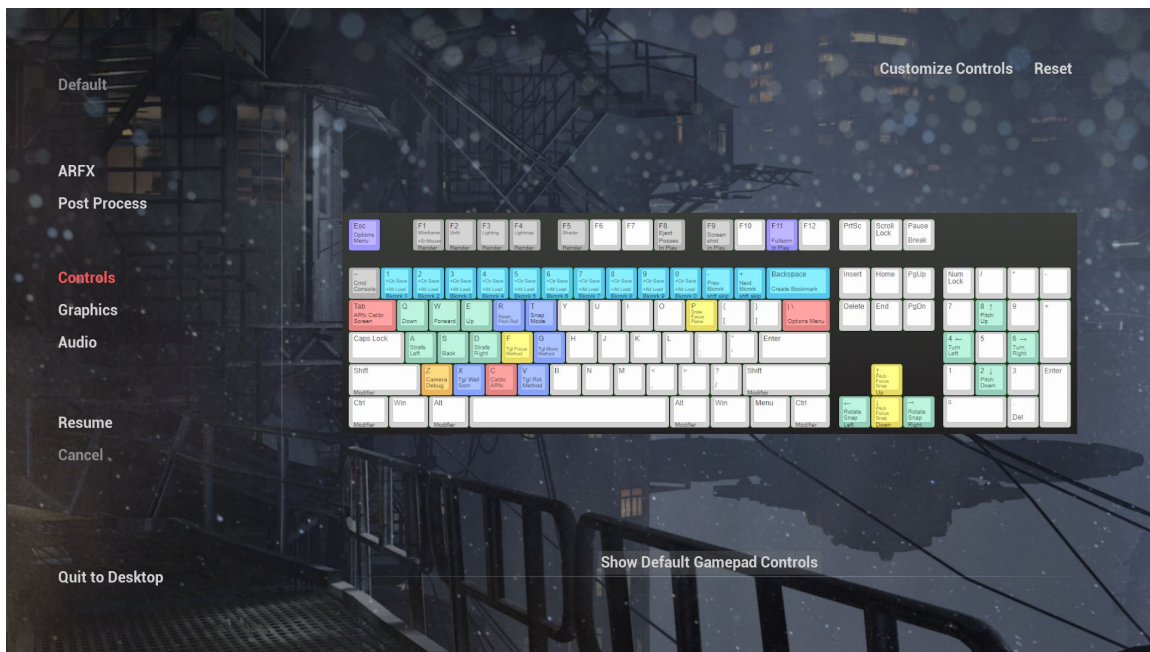
- ii. **SteamVR Setup**: Ability to fix Tracker Serial numbers and fine tune SteamVR settings
1. ***Hero Serial***: Serial number can be found via USBDeviceview.
 2. ***Calibration Serial***: Serial Number can be found via USBDeviceview.
 3. ***Tracking Delay***: Delays the tracking by this number of frames.
 4. ***Threshold Sample Size***: Number of samples we take to determine velocity and angular velocity.
 5. ***Velocity Threshold***: Threshold at which we start tracking.
 6. ***Angular Velocity Threshold***: Threshold at which we start tracking.





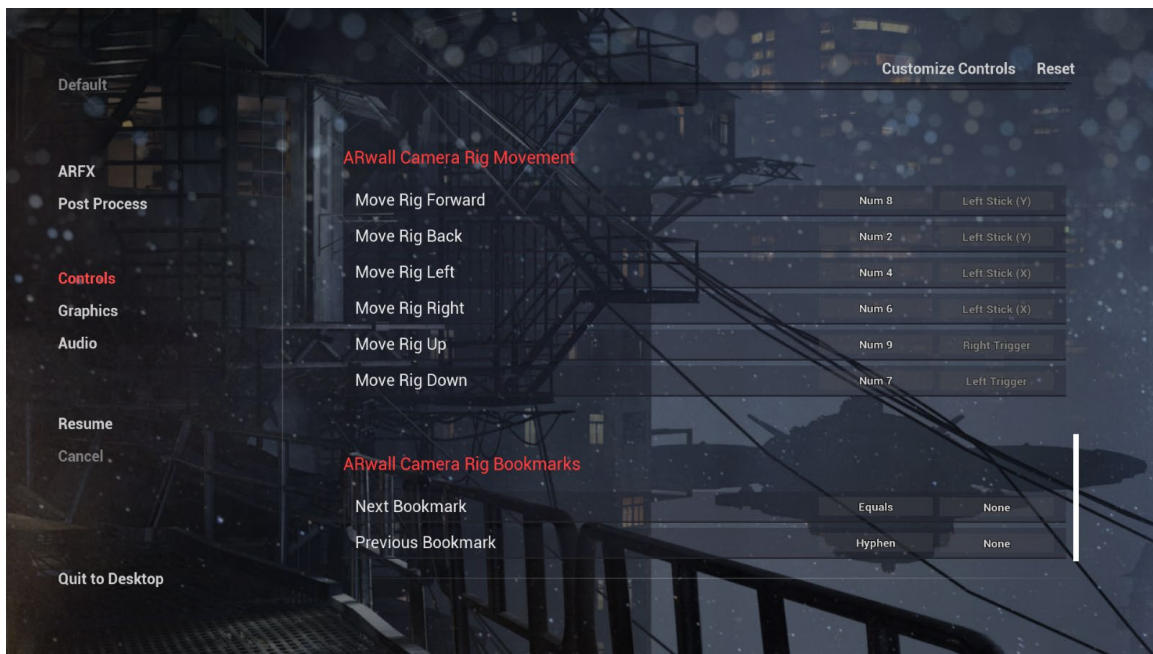
- b. **Post Process:** This section allows you to take further control over all your post process needs including:
- i. **Go To Fullscreen Options:** Clicking this allows you to hide the ARFX options Menu overlay to see the scene fully while making changes in real-time.
 - ii. **Temperature:**
 1. **Temperature Type:** Selects the type of temperature calculation.
 2. **Temperature:** Temperature in Kelvin
 3. **Tint**

- iii. **Global:**
 - 1. **Saturation**
 - 2. **Contrast**
 - 3. **Gamma**
 - 4. **Gain**
- iv. **Shadows:**
 - 1. **Saturation**
 - 2. **Contrast**
 - 3. **Gamma**
 - 4. **Gain**
 - 5. **Shadows Max**
- v. **Midtones:**
 - 1. **Saturation**
 - 2. **Contrast**
 - 3. **Gamma**
 - 4. **Gain**
- vi. **Highlights:**
 - 1. **Saturation**
 - 2. **Contrast**
 - 3. **Gamma**
 - 4. **Gain**
 - 5. **Minimum Highlights**
- vii. **Misc:**
 - 1. **Blue Correction**
 - 2. **Expand Gamut**
 - 3. **Tone Curve Amount**



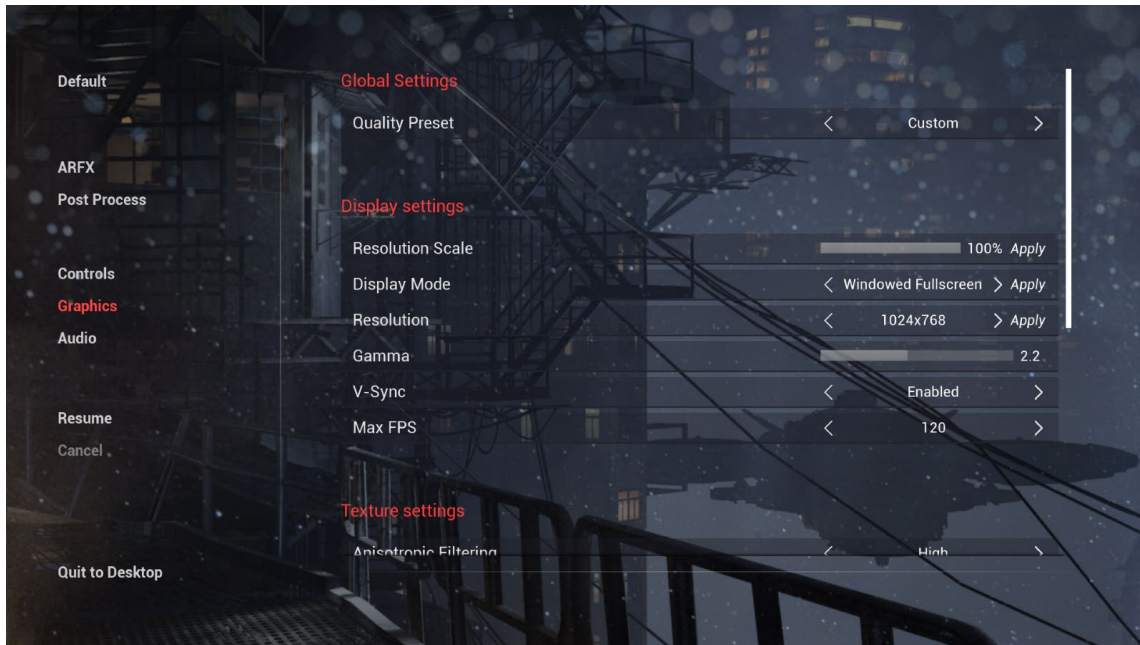






- c. **Controls:** (Hotkeys Customization for both Keyboard & Controller)
 - i. Default loads a keyboard with all the controls.
 - ii. **Show Default Gamepad Controls:** Change the UI to view the Xbox controller settings.
 - iii. **Customize Controls:** Every single hotkey on both keyboard and controller can be customized.
 - 1. If any hotkeys are changed, selecting Controls should load the list of Controls instead of the default image of the keyboard/Xbox Controller

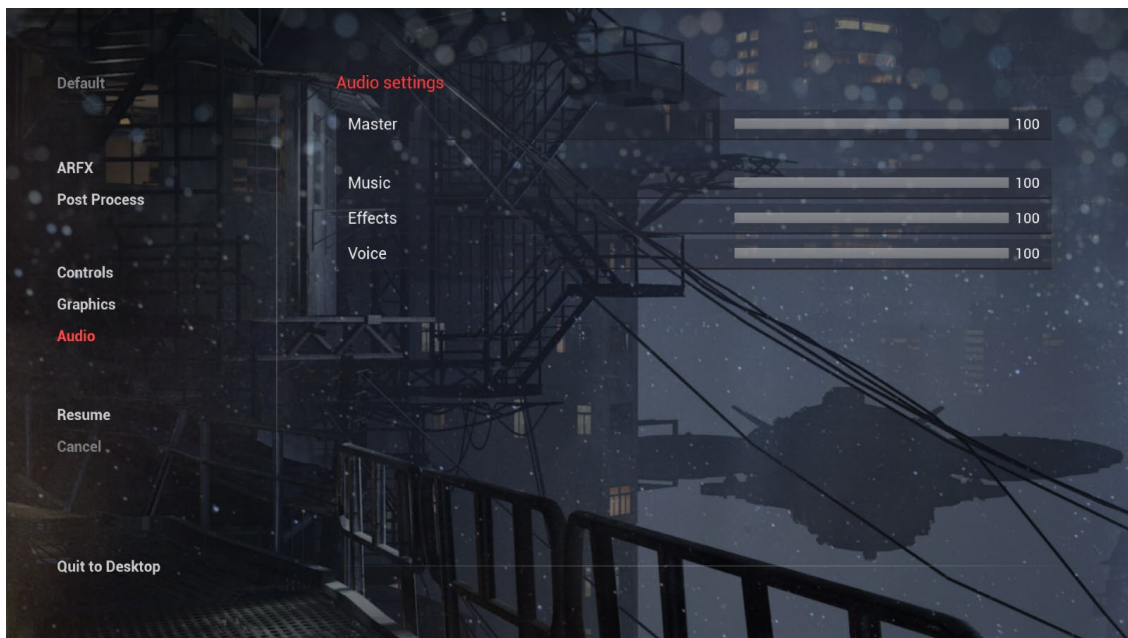
- iv. **Reset:** Resets all hotkeys to the default inputs.
- v. Toggle **Rotation Method** (V on keyboard, **D-PAD Up Arrow** on Xbox controller)
 - 1. Rotate at Screen:
 - a. Rotates at virtual camera location
 - b. Can rotate left and right
 - c. Can pitch up and down
 - 2. Rotate at Camera (Yaw Only)
 - a. Rotates where the Hero Puck is in physical space
 - b. Can rotate left and right
 - c. Cannot pitch up and down
- vi. Toggle **Snap Mode** (T on keyboard, **Left Stick button** on Xbox Controller)
 - 1. Forces virtual camera to snap towards the nearest surface in a direction on the virtual environment





- d. **Graphics:** This section gives you greater control of the overall quality settings of the scene including:
- i. **Global Settings:**
 - 1. **Quality Preset:** Adjust the quality of all graphics and textures settings.
 - ii. **Display Settings:**
 - 1. **Resolution Scale:** Adjust the sharpness of the game graphics. When it's too low, the items could show in a blurry image.
 - 2. **Display Mode:** Select the display mode.
 - 3. **Resolution:** Select the display resolution.
 - 4. **Gamma:** Adjust the gamma Calibration.
 - 5. **V-Sync:** Vertical synchronisation prevent screen tearing.
 - 6. **Max FPS:** Select the max FPS.
 - iii. **Texture Settings:**
 - 1. **Anisotropic Filtering:** Reducing blur and preserving detail at extreme viewing angles.
 - 2. **Textures:** Adjust the quality of the textures.
 - iv. **Graphic Settings:**
 - 1. **Post-Processing:** Adjust the quality of post processing effects.
 - 2. **Anti-Aliasing:** Adjust quality of AA, smooths the object's graphics. It is recommended to turn this on.
 - 3. **Shadows:** Adjust the quality of the shadows for character and objects.

4. **Effects:** Adjust the quality of various effects like reflections and the material fidelity. (Can take a moment)
5. **Detail Mode:** Adjust the minimum detail level for an actor to render.
6. **Foliage:** Adjust the quality of Foliage.
7. **View Distance:** Adjust the visible distance, objects will be hidden based on their distance to the player.
8. **Motion Blur:** Adjust the blur quality on fast moving objects.
9. **Planar Reflections:** Sets any and all planar reflections in the scene to render at a % of the screen's resolution. Recommended at 50% or lower.



- e. **Audio:** Provides you with greater control of your audio settings if applicable.
 - i. **Audio Settings:**
 1. **Master:** Adjust all Volume.
 2. **Music:** Adjust the Music Volume.
 3. **Effects:** Adjust the Effects Volume.
 4. **Voice:** Adjust the Voice Volume.
- f. **Resume**
 - i. If you have made changes to any of the above settings it will ask you if you want to save before resuming.
- g. **Cancel**
 - i. This will cancel any changes made to the above settings and resume play.

- h. **Quit to Desktop**
 - i. This will exit the application.

Section 8: Troubleshooting

This section describes how to correct common issues that may occur.

Section 8.1: Adjust Vive Trackers

This section describes how to correct the *Vive Trackers* if they are not working,

USBDeview

If the *Vive Trackers* are not tracking or if the **ARFX Launcher** (if available) is not able to automatically pull in the tracker serial numbers, double check the serial numbers. Use the following procedure:

4. Connect the *USB-A to Micro USB* (for Tracker 2.0) or *USB-A to USB-C* (for Tracker 3.0) cable from the computer to the *Vive Tracker*.
5. Open the *USBDeview* on your desktop.



6. In the *USBDeview*, under the Serial Number column, look for something that starts with *LHR*. It will be listed with a serial number. If it displays as green, this means it is active and connected to the machine.
 - a. To differentiate between the two trackers, connect only one tracker at a time and see what shows up in *USBDeview*.

USBDeview								
File Edit View Options Help								
Device Name	Description	Device Type	Connected	Safe To Unpl...	Disabled	USB Hub	Drive Letter	Serial Number
LHR	USB Composite Device	Unknown	Yes	Yes	No	No		LHR-DF83EEB3

BEST PRACTICE: It is recommended to label your trackers with their unique Serial Number for ease of identification on set. It is also recommended to label which wireless USB Dongle belongs to which tracker by identifying them as A, B, etc. for ease of future identification and troubleshooting.

A two-*Vive Tracker* system is generally recommended, with a *Calibration Vive Tracker* and a *Hero Vive Tracker*, but if only one tracker is available, please be sure

to use the same Serial Number of your one *Vive Tracker* for both *Calibration Tracker* and *Hero Tracker* fields.

SteamVR

If the *Vive Trackers* serial numbers are input correctly but are still not tracking, use *SteamVR* to help troubleshoot.

1. Quit out of Unreal Engine if project file is still open.
2. Navigate to the *SteamVR* window or launch it if it is not on.
3. If *SteamVR* asks for a head-mounted display (HMD), launch the **ARFX Launcher** (if available) and click on **Patch SteamVR** button and relaunch *SteamVR*. Or refer to [Section 2.5 SteamVR Software Set Up](#) to do this step manually. This should remove the requirement for the HMD and show you any connected *Vive Trackers* and *Base Stations*.
4. If there are any missing *Vive Trackers* and/or *Base Stations*:
 - a. Double check USB cables and USB extension cables for *Vive Trackers* are fully connected into the *Trackers* and the computer.
 - i. If there is a lot of wireless/mobile interference in a space, it's best to keep *Vive Trackers* wired instead of relying purely on the wireless dongle.
 - ii. Asking nearby cast/crew members to turn off their mobile devices may also help improve tracking in general.
 - b. Make sure to position the *trackers* and *base stations* so they can see each other. Give it a few moments as it usually takes a few seconds before *SteamVR* will recognize a previously unconnected device.
 - c. Double check that the trackers have a green (active) or amber (active and charging) light showing on their LED light.
 - i. If a tracker LED light is showing blue or white instead, be sure to press the *Vive Tracker* button. This should turn it green or amber.
 - d. If using more than two *Base Stations*, make sure that all *base stations* are on their own unique channels.
5. If none of the above work, restart the computer and start up *SteamVR* and the Unreal Engine Scene powered with **ARFX Pro Plugin** again.

SteamVR may stop tracking and go to sleep if the trackers have been unmoving or out of view of the *Base Stations* for too long. If this occurs, do the following:

1. Close the *UE4/5* project.
2. Close or restart *SteamVR*, and then reopen it to repeat the pairing process with the tracker.

If the tracker has been lost entirely, will not repair, or the computer crashes, then restart the computer and set up the *SteamVR* and *Unreal Engine* again.

Section 8.2: Tracking and Jittering Issues

If you are having jitters with the tracking,

1. Make sure there isn't any IR being reflected towards the puck
 - a. This can cause the puck to jitter and lose tracking, but the tracking will come back.
 - b. If you are losing tracking, make sure the puck isn't being blocked, and it is being seen by the Base Stations.
 - c. It is possible someone may have accidentally bumped one of the Base Stations while setting up. In this case you will just need to recalibrate.
2. If these solutions haven't worked out, you can hardwire the puck using a *USB-A to Micro-USB* or *USB-A to USB-C* cable. This will stop the jitteriness.

BEST PRACTICE: If tracking is jerky for a slow-moving hero camera shot:

- Unreal Engine 4:
 - Lower the Positional Threshold and Angular Threshold values down by 0.01 or 0.001 increments at a time until the tracking is smooth.
 - If the hero tracker is sitting still but there is perceived jitter on the ARFX background, increase the Positional Threshold and Angular Threshold values up by 0.01 or 0.001 increments until the jitter no longer shows.
- Unreal Engine 5:
 - Lower the Positional Power Threshold and Angular Power Threshold values down by 1 increment at a time until the tracking is smooth.
 - If the hero tracker is sitting still but there is perceived jitter on the ARFX background, increase the Positional Power Threshold and Angular Power Threshold values up 1 increment until the jitter no longer shows.

Section 8.3: Recommended Wires

All wires used with **ARwall** should be the most up-to-date versions for best performance:

- *HDMI* should be minimum of 2.0.
- *DisplayPort* should be minimum 1.4.
- If converters are used, be sure to match the minimum versions listed above.
- USB-A Extension Cables should be a minimum of 2.0 or 3.0. If this cable needs to extend longer than 50 feet, fiber optic USB extension cables are recommended.
 - It is recommended to plug trackers directly into the USB slots on the motherboard. Avoid plugging into USB hubs if tracking issues occur

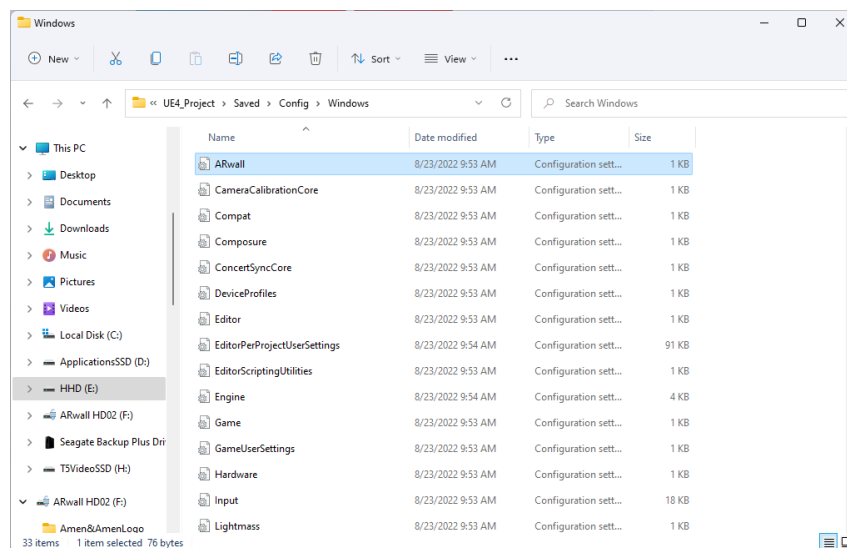
Section 8.4: Unreal Engine System Issues

If the *Unreal Engine* crashes, do the following:

1. Click *Close* **without** resending.
2. Re-open the *UE4/5* project, play scene, and recalibrate the scene.
The *SteamVR* engine is still running and tracking in the event of an *Unreal Engine* crash. Once you re-open the *UE4/5* project, the *SteamVR* will continue tracking.
3. Test the tracker for confirmation that it is working or verify by looking at the *SteamVR* window.

Section 8.5: Project File Launch / Login Issues

1. If the Unreal project keeps closing or not opening the login window, a few different things may have happened:
 - a. If the login window does not appear make sure to download .NET6 Runtime.
 - i. This is required for the login window to communicate with our software. You can download your appropriate .NET6 Runtime [here](#).
 - b. If you entered an incorrect Activation Code with your login and password, follow these steps for the Plugin.
 - i. Open your project folder
 - ii. Locate the 'Saved' folder -> 'Config' folder -> 'Windows' folder -> delete the 'ARwall.ini' file



- iii. Then launch the project and a prompt to ask you to enter your Activation Code.

Glossary

A

ARwallCameraActor: An *Unreal Camera* in the form of an *Actor* in the *Unreal Engine*, which you activate in the *Unreal Scene* to view the **ARwall**. This is a proprietary plugin developed by ARwall.

C

Camera Offset: Allows you to change the settings inside the *Unreal Engine* to match the physical set.

L

Base Station: Rectangular boxes with motion-sensing capabilities.

S

SteamVR: The *SteamVR Desktop Theater Mode* allows you to play your entire *Steam* game library in virtual reality on a virtual big screen TV. First put your headset on and access *SteamVR*, and then use the menu to launch a non-VR game in your library.

U

Unreal Engine: a complete suite of development tools designed for real-time technology that includes everything from enterprise applications and cinematic experiences to high-quality games across PCs, consoles, mobiles, VR and AR.

V

Vive Dongle: Reads the *Vive Tracker*.

Vive Tracker: Puck-shaped device used to track motion within the range of the motion-sensing Base Station.

Default Hotkey Layouts for Keyboard and Xbox Controller



