



Abbey Road Studio 3

User Guide



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Product Overview

Abbey Road Studio 3 is a headphone monitoring tool that enables you to mix within the acoustic space of one of the most famous mix rooms in the world: Abbey Road Studio 3.¹ It places you directly in the control room environment, so that you can make mix decisions as though you were sitting in the mix engineer's chair. You can with confidence judge mix depth, panning, stereo image, balance, and reverb. Paired with your favorite headphones, Abbey Road Studio 3 provides a meaningful reference point for stereo or multi-channel mixes monitored on headphones.

Abbey Road Studio 3 is a binaural processing plugin that's based on Waves Nx technology. It uses state-of-the-art psychoacoustic modeling of human hearing to achieve a natural, immersive, and transparent three-dimensional sound field over stereo headphones.

To provide greater immersion when mixing on headphones, Abbey Road Studio 3 incorporates the Nx HeadTracker, which changes your stereo headphones into a real-world surround space. It recreates a room in your headphones that behaves like the real room. Turning your head in the three-dimensional Nx headphone sound field provides the same experience as turning your head while sitting in the mixer's chair.

This offers numerous advantages, but two stand out:

- You can more easily focus on specific elements within the sound field. "Turning your head" toward a sound source helps your brain isolate it.
- You can accurately study what's happening in the surround speakers. There's nothing like turning around to understand what's happening in the back of the room.

The Abbey Road Studio 3 room IRs, combined with Nx technology, give you the tools you need to accurately create stereo and surround mixes while monitoring on your headphones. When you hear the mix played back in a speaker environment, you won't be surprised. If you get the chance to hear your mix in Abbey Road Studio 3, you'll be really happy (and lucky).

¹ Studio 3 is Abbey Road Studio's flagship mix room. Countless masterpieces have been mixed there, ranging from the Beatles classic, *Revolver* and Pink Floyd's *Dark Side of the Moon* to works by Amy Winehouse, Frank Ocean, Florence + the Machine, and countless others. It is widely regarded as one of the world's finest mix studios.



Getting Started

Abbey Road Studio 3 enables you to use stereo headphones to monitor a multichannel mix as heard in a specific studio control room. It does not change the processing of the mix itself, but rather the environment in which you monitor it. Plugin output is always a binaural stereo headphone signal containing all the mix channels in their virtual positions.

Here are the essential steps for setting up Abbey Road Studio 3. Each step is described in detail in later chapters.

1. INSERT THE PLUGIN

Insert one instance of the Abbey Road Studio 3 plugin on your master buss (don't use Abbey Road Studio 3 on individual tracks). There are three components that support different input channel formats: **stereo**, **5.1 surround**, and **7.1 surround**. Insert the component that matches the DAW channel format. The components are the same except in the number of **Input Channels** (the mix sent to each specific loudspeaker) and the **Studio Monitors** options.



Before you bounce the final mix, make sure that the Abbey Road Studio 3 plugin is bypassed.

2. ESTABLISH THE CHARACTERISTICS OF YOUR HEADPHONE MONITORING

Studio Monitors The stereo component offers three different front loudspeaker types. This selection affects your perception of the sound of the speaker itself, as well as its interaction with the room. The surround components use the same monitor type for front and surround speakers, so there is no Studio Monitors selector. (Refer to [Studio Monitor Select](#), in the next section.)

Headphone EQ Curve You have the option of applying a standardized EQ correction curve to your headphone signal. (Refer to [Selecting a Headphone EQ Curve](#), later in this user guide.)

3. SET UP HEAD TRACKING

Head Tracking is an important feature that coordinates your head movements with the sound imaging of the Studio. It provides the same aural feedback that you experience in the studio to make vital mix and sound field decisions. To get the most from Abbey Road Studio 3, we recommended that you always work with Head Tracking on. (Refer to [Head Tracking](#), later in this user guide.)



Abbey Road Studio 3 Controls

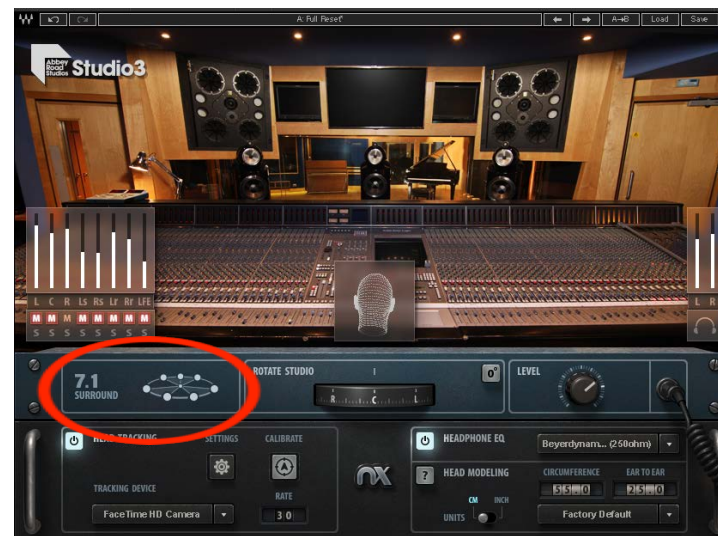
Studio Monitor Select

When using the stereo component, you can choose between three sets of front loudspeakers. In the surround components, the mid-type speaker is used for front and surround positions. There is no monitor selector.

Speaker Type	Speaker Options	Component
Far	A big speaker with a club-like feel	Stereo
Mid	A high-definition speaker with a hi-fi sound	Stereo and all surround components.
Near	An on-the-console speaker for critical listening	Stereo



STEREO COMPONENT
(note Studio Monitors selector)



SURROUND COMPONENT (7.1 SURROUND SHOWN)
speaker types are fixed



Meters



INPUT METERS



Each channel in the input signal has a full-scale meter with an infinite-hold clip indicator. Click on the clip indicator to reset it.

Each channel has mute and solo buttons at the bottom of the input meter.

Range: -infinity to 0 dBFS

MONITOR LEVEL AND METERS

The binaural stereo headphone output is represented by a full-scale stereo meter with infinite-hold clip indicators. Use the knob below the meter to control the headphone monitor level.

Range: -infinity to 0 dBFS

Output volume control: -24 dBFS to +6 dBFS

Default: 0 dBFS



! Please note: Nx can introduce clipping at the output, especially when fed with a signal whose levels are controlled by a limiter. In such cases, use the output gain fader to reduce the output.



Rotate Studio



The **Rotate Studio** wheel rotates the studio around your position at the mixing desk. What you see and what you hear are defined by your orientation. This is what you experience when using head tracking, except that Rotate Studio is controlled manually.

Click the 0° button, or Alt+Click on the Rotate Studio wheel, to reset rotation to its default position.

Head Tracking

Head Tracking is a valuable tool when mixing in a surround environment.

When Head Tracking is **on**, the virtual room does not move. Instead, it's you—your headphones—that change orientation. This is how you experience a sound in the three-dimensional world. This interaction with the studio space is vital in making critical imaging decisions. The wireframe head indicates the orientation of the engineer's head with respect to the studio. The head is grayed out when the user's head is outside the tracking range, or when there is insufficient ambient light for camera tracking, or when Head Tracking is turned off.

When Head Tracking is **off**, the soundscape moves with you as you turn your head. This is normal stereo headphone behavior.

Head Tracking Controls



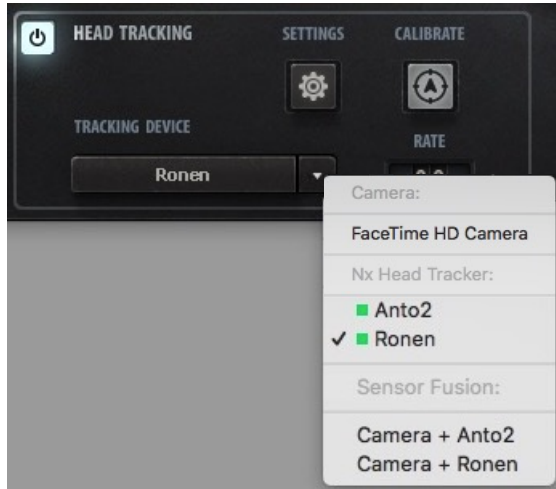
HEAD TRACKING ON/OFF

Toggles Head Tracking on or off. This does not affect Nx sound processing, which is always active.



TRACKING DEVICE MENU

Use this drop-down menu to select the device used for head tracking. Abbey Road Studio 3 can track head movement from two sources: **Camera** and **Nx Head Tracker**.



CAMERA activates computer's camera for head tracking. If more than one camera is available, choose from the list.

NX HEADTRACKER selects the Nx HeadTracker that will be used by Abbey Road Studio 3. Choose one HeadTracker from the list.

SENSOR FUSION mode uses the selected camera and one of the available Nx Head Trackers together. Using these two kinds of sensors simultaneously yields a tracking rate of up to 80 fps.

SETTINGS takes you to the HeadTracker application's control panel. Use it to reopen the application if it has been closed or if you want to tweak certain HeadTracker controls.

! Please note: The Sensor Fusion mode can be used by only one person at a time: that is, the camera must be aimed at the person who is wearing the Nx Head Tracker.

CALIBRATE defines your head position as the center position. Hold your head centered, look straight forward, and click the button to let the system know where your center listening position is. Each time you start the system or change either your position or the camera's placement, you can recalibrate.

RATE indicates the rate of head tracking, in frames per second (fps). The optimal rates are:

Camera: 25 fps–30 fps

Nx Head Tracker: 35 fps–50 fps

Sensor Fusion: 45 fps–80 fps



When you are *not* using the Sensor Fusion mode, you can have several instances of the Nx Virtual Mix Room plugin with a different tracking device for each instance. This will enable you to have more than one Nx listeners with individual head tracking for each in the same session. Note that each Nx Virtual Mix Room plugin needs to be routed to a separate headphone output per listener; a simple headphone split will not work for this use case.

Head Modeling



You can significantly improve the accuracy the Nx psychoacoustic effect by providing your head measurements: circumference around your head, over the ears, and a half circle from ear to ear, over the back of your head.

Nx is a binaural effect, so it incorporates these measurements to calculate the inter-aural delays, filters, and gains for each ear. If you do not provide these measurements, the default settings will be used.

! Please note: Entering values completely unrelated to your personal head measurements will heavily distort the effect. If you do not enter your individual measurements, it is advised that you use the default values.

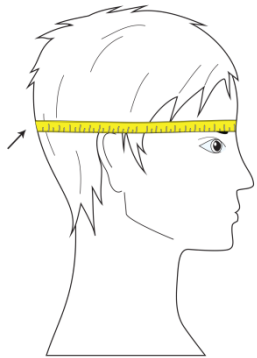


UNITS

Choose head measurement units: centimeters or inches.

CIRCUMFERENCE

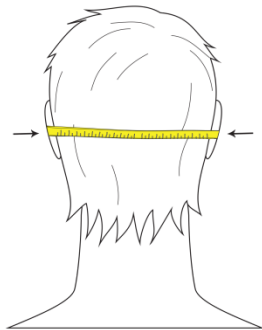
To find your head circumference, use a measuring tape to measure the longest distance around your head: over the back of the head, around your ears and around your eyebrows. Enter values directly by dragging up or down over the value box.



Default: 55 cm / 21.6 in (average adult circumference)

Range: 35 cm to 75 cm / 13.8 in to 29.5 in

EAR-TO-EAR is the distance from ear to ear around the back of your head, on a plane horizontal parallel to the floor.



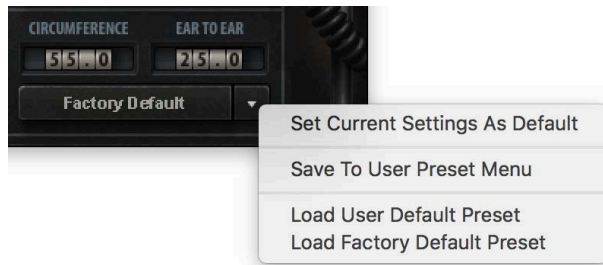
Default: 25 cm / 9.8 in (average adult ear-to-ear measurement)

Range: 15.0 to 40 cm / 5.9 to 15.8 in



Head Measurements Presets

Head modeling measurements can be saved as user presets. This makes it easy to change between mixers, for several people to participate in the mix, and to move your head tracking measurements from one system to another. Click on the arrow next to the Units panel to open the Head Modeling menu. Use this menu to save and load measurement presets.



When you open or enable the plugin, the factory preset is loaded. This sets the head measurements to their default values, even if the host session includes measurement settings. If you have saved your settings as the default preset, this will load when the plugin is opened or activated. You can also create user presets and add them to the Preset menu.

Save a preset to a new file to move it to another host.

Click the **HELP BUTTON (?)** to learn more about head modeling.



The Head Modeling menu is used to save and load measurement presets only. These presets do not contain settings for the plugin as a whole. Plugin presets are managed with the WaveSystem toolbar at the top of the interface. General presets do not affect the Head Modeling settings. Learn more about the [WaveSystem](#) at the Waves Download page.

Tips for better camera tracking

1. Make sure there is enough light in the room to enable a tracking rate of at least 20 frames per second. Webcams generally have a tracking rate of up to 30 fps. The optimal rate is anywhere between 25 fps and 30 fps. The framerate is shown on the Head Tracking panel.
2. Sit no more than 5–6 feet (150–180 cm) away from the camera (optimal distance varies by camera).
3. Move no further than 30 degrees left or right relative to the camera.



Selecting a Headphone EQ Curve



Abbey Road Studio 3 lets you monitor your multichannel mix through headphones, with the loudspeakers and the room acoustics of this famous studio. It does not, however, affect the color of the mix. In order to create a headphone mix that reliably translates to other spaces, you may choose to modify the EQ curve of your headphones. If you are familiar with the way your headphone mixes sound elsewhere, turn off Headphone EQ.

The Headphone EQ section provides EQ correction curves for specific popular headphone models. These curves are based on precision headphone measurement data provided by www.headphones.com.

Use this feature only if you are working with one of the specific headphone models provided in the menu. Otherwise, we recommend that you leave it set to None.



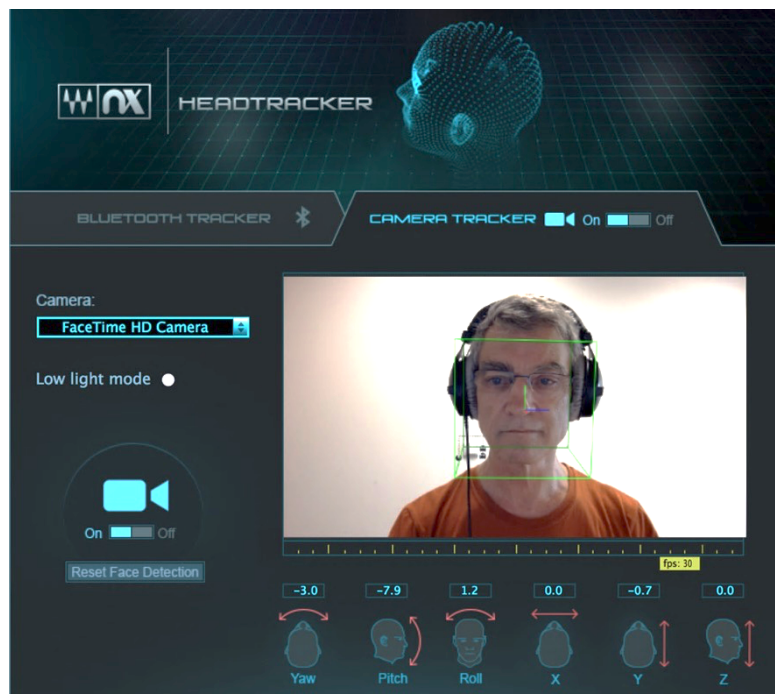
The Head Tracking Application

Waves Nx is the engine behind Abbey Road Studio 3. Nx creates the Studio 3 space and converts stereo or surround audio channels into a binaural headphone signal. NX HeadTracker is the Nx utility that uses camera and/or Bluetooth Head Tracker information to interpret the mix engineer's head movements. The Nx application opens or closes automatically when you open or close the Abbey Road Studio 3 plugin.

If the application closes, head tracking will stop. This will not affect the plugin or your DAW in any way: you can restart the application and re-establish head tracking. Click the Settings button in the Studio 3 Head Tracking section to bring the application forward or to reopen it if it's been closed.

The Camera Tracker and The Bluetooth Tracker are set up on separate tabs.

Camera Tracker Tab



ON/OFF SWITCH lets you turn camera tracking **on** for tracking or **off** to save CPU resources. *This switch corresponds to the Head Tracking On/Off switch on the plugin.*

CAMERA SELECT MENU selects the camera to track with if you have more than one camera connected to the computer. *You can also select a camera in the Head Tracking panel of the plugin.*

RESET FACE DETECTION resets the face detection algorithm. Reset face detection whenever you change users or if you suspect that the tracking sensor is not tracking correctly.

LOW LIGHT MODE increases the frame rate in poor lighting conditions. It is available only when you are working with a "FaceTime HD" camera built into certain MacBook Pro computers.



FRAME RATE INDICATOR displays the current frame rate. Higher frame rates indicate greater tracking resolution, and therefore greater tracking accuracy.

TRACKING DATA value boxes display the continuously refreshed head positions captured by the Camera tracking device.



The Camera Tracker can follow motion on these axes: yaw, pitch, roll, x-axis, y-axis, and z-axis. Each type of motion is illustrated in the head diagrams.



Bluetooth Tracker Tab

The Bluetooth tracker tab is used to connect Nx HeadTracker devices.



DEVICE LIST shows all available Nx Head Tracker devices, and indicates their status (Connected, Disconnected, Connecting, Unavailable). Up to seven Nx Head Tracker devices can be detected and connected simultaneously.

CONNECT (check box) – Check or uncheck this box in order to connect or disconnect an Nx Head Tracker device that appears in the device list.

REFRESH DEVICE LIST clears the list and rescans for Nx Head Tracker devices.

OPEN BLUETOOTH SETTINGS (Windows only) opens the system Bluetooth settings window. In Windows, you must first pair the Nx Head Tracker in your system's Bluetooth settings before the head tracking application can detect it.

RENAME lets you rename your Nx Head Tracker device. Renaming is permanent. The device will advertise itself with the new user-defined name.

1. Click the “Rename” button. A text box will open.
2. Enter a new name for the Nx Tracker device, up to 15 characters, and click OK.
3. The device will restart and reconnect automatically with the new user-defined name. This process can take up to 20 seconds to complete.



UPDATE initiates a firmware update on the selected Nx Head Tracker device. A message in red text will appear when a firmware update is available. If a firmware update is available, click Update. A dialogue box will open; follow its instructions to complete the update procedure.

If using Windows, you will first need to pair a secondary device called Nx Update (in the Bluetooth settings menu) before proceeding with the update.

IDENTIFY causes a light on the selected Nx Head Tracker device to blink. This helps to identify the specific head tracking device when you have more than one connected.

FW VERSION displays the current Head Tracker device firmware version.

AUTOMATIC CONNECT automatically creates a connection with any Nx Head Tracker device (when On). When Automatic Connect is unchecked, the application will automatically detect Nx Head Tracker devices and add them to the list, but the user will have to initiate the connection using the Connect button in the list.

We suggest that you select Off when there are several available Nx Trackers on different systems, in order to have better control of which system works with each Nx Head Tracker. This control is On by default.

TRACKING DATA value boxes display the continuously refreshed head positions captured by the Bluetooth tracking device.



The Bluetooth Tracker can follow motion in these directions: yaw, pitch, and roll. Each type of motion is illustrated in the head diagrams.



Setting Up the Nx Head Tracker

CONNECTING THE NX HEAD TRACKER

1. Mount the Nx Head Tracker on the top of the headphone band, with the logo facing forward. Nx Head Tracker L and R identification should have the same orientation as the L and R on your headphones. Inaccurate positioning of the Nx Head Tracker will result in inaccurate head tracking.
2. Power up the Nx Head Tracker device. Make sure your computer's Bluetooth is on and that it supports BLE (Bluetooth Low Energy).

Mac: The head tracking application will automatically connect to the Nx Head Tracker(s).

Windows: Pair the Nx Head Tracker(s) in your system's Bluetooth settings. The Head Tracking application will then automatically connect to the Nx Head Tracker.

3. Select a Head Tracker device from the drop-down Tracking Device menu.
4. To take a device online or offline, rename it, or check battery status, go to the Bluetooth tab of the Nx Head Tracker app. You can bring Nx Head Tracker to the front by clicking the Setting button on Abbey Road Studio 3 interface.
5. Calibrate Head Tracking in the Abbey Road Studio 3 plugin.

BASIC OPERATION

1. Move your head left and right, then up and down, to confirm that the virtual head in the Abbey Road Studio 3 interface moves in sync with you. Note that with some DAWs, you will need to play a bit of audio for the virtual head to wake up.
2. Position yourself where you want to be located while you mix. Press the **Calibrate** button in the Head Tracking section. This will now be your center position in the studio.
3. Listen to some program material, preferably a high-quality reference that you're familiar with. Take a few minutes to let your ears adjust to the effect.

The default values of the plugin's controls are a good place to start.

You should now be ready to monitor a mix through your headphones as though you're sitting in the mixer's chair at Studio 3 and to use head tracking to realistically experience the three-dimensional space.



Appendix A – Inputs/Outputs in the Surround Components

5.1 Surround Component – 6 inputs / 2 outputs

Input 1 – Left mix channel

Input 2 – Center mix channel

Input 3 – Right mix channel

Input 4 – Left surround channel

Input 5 – Right surround channel

Input 6 – Subwoofer speaker channel (post-bass management)

Output 1 - Left headphone channel

Output 3 – Right headphone channel

Outputs 2/4/5/6 – No audio

* Note: output channels may vary according to the host's surround channel configuration

7.1 Surround Component – 8 inputs / 2 outputs

Input 1 – Left mix channel

Input 2 – Center mix channel

Input 3 – Right mix channel

Input 4 – Left surround channel

Input 5 – Right surround channel

Input 6 – Left surround rear channel

Input 7 – Right surround rear channel

Input 8 – Subwoofer speaker channel (post-bass management)

Output 1 - Left headphone channel

Output 3 – Right headphone channel

Outputs 2/4/5/6/7/8 – No audio



Appendix B – Troubleshooting Guide

Problem	Possible Solutions
Head does not move in interface –no tracking	<ol style="list-style-type: none"> 1. Verify head tracking is on in the plugin interface. 2. Check if tracker app is running. 3. Play audio through the plugin (plugin on CPU). 4. Check tracking rate box in plugin GUI.
Head tracking application is not running	<ol style="list-style-type: none"> 1. Restart head tracking through the plugin. 2. Inactivate/reactivate plugin.
Low tracking rate in the head tracking app (<20 fps) (Camera)	<ol style="list-style-type: none"> 1. Improve lighting conditions. 2. In MacBook only, select “low light” mode in the tracker app. 3. Point the camera up slightly for a brighter frame. 4. Make sure that your face is well lit and not shadowed.
Low tracking rate in plugin interface (<20 fps) (Camera)	<ol style="list-style-type: none"> 1. Check the tracking rate in the head tracking app. 2. Verify audio buffer size is 1024 samples or lower.
Head tracking app often loses track of your head (Camera)	<ol style="list-style-type: none"> 1. Position the camera closer and straight in front of your face. 2. Remove sunglasses, hat or anything covering your face. 3. Improve lighting conditions. 4. Stay within +/-30 degrees off the center of the camera. 5. Make sure you’re no further than 5-6 feet away from camera.



<p>Nx Head Tracker will not connect</p>	<ol style="list-style-type: none"> 1. Make sure your computer's Bluetooth is turned on. 2. Make sure your computer's Bluetooth version is at least BT4.0 and supports BLE. 3. Make sure the head tracking application is running. 4. Make sure the Nx Head Tracker device is on and has a good battery. 5. Windows only: Make sure the Nx Head Tracker is paired to your computer in the system Bluetooth settings menu.
<p>Nx Head Tracker loses connection and doesn't move smoothly</p>	<ol style="list-style-type: none"> 1. Try using a new battery. 2. Try moving the Nx Head Tracker and the Bluetooth receiver closer together. 3. If you are using a BT-USB dongle on a desktop, connect the dongle on the front panel, or on an extension for better BT reception.
<p>Nx Head Tracker is tracking my movements but in wrong directions</p>	<ol style="list-style-type: none"> 1. Make sure the Nx Head Tracker is mounted on the top of the headphone arc with the logo side facing forward (L & R on the Nx Head Tracker should correspond to L & R on your headphones). Inaccurate positioning of the Nx Head Tracker will result in inaccurate head tracking.
<p>Audio is not externalized enough; the virtual positions are not clear</p>	<ol style="list-style-type: none"> 1. Verify L/R placement and routing of your headphones. 2. Verify that Nx is inserted at the last summing buss in the signal flow, with no other channels bypassing it. 3. Verify that head tracking is working. 4. Recalibrate head tracking. 5. Increase the room ambience. 6. Mute/unmute individual virtual speakers by double-clicking on them and listening to their position. 7. Measure and set your personal Head Modeling parameters. 8. Make sure the head modeling section is set to your individual measurements or to the factory default settings.



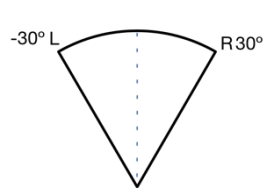
	Unreasonable head size settings can ruin the spatial effect.
No communication between the head tracking app and the plugin	1. Close the head tracking app, inactivate and reactivate the plugin.
Head tracking shows some latency	<ol style="list-style-type: none"> 1. Try to increase the tracking rate, optimally up to 30 fps. 2. Try to lower the buffer size. 3. In some DAWs, Nx must be on the master buss or on a live input AUX path in order to run with the user-set buffer size.



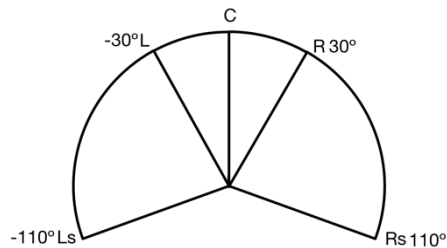
Appendix C – Studio 3 Speaker Configurations

SPEAKER PLACEMENT

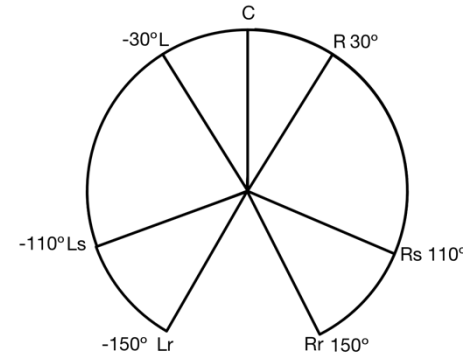
Each Abbey Road Studio 3 component credibly recreates Studio 3 loudspeakers placement. The loudspeakers are fixed in position for all formats; only the number of speakers used changes.



Stereo Component



5.1 Component



7.1 Component

SPEAKER CALIBRATION

Each front and surround loudspeaker is calibrated with pink noise at 85 dB SPL at the mixer's position.

The LFE is calibrated with pink noise to 91 dB SPL, measured from the mixer's position. LFE crossover is a 120 Hz low pass filter.

