

Nintendo GameCube™ Sound Guidelines

Version 1.3

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Revision History

Version	Revision Date	Description of Revisions
1.3	1/30/02	- Added statements to paragraph 4.1 regarding monaural playback capabilities
1.2	8/3/01	- Revised paragraph 2.1.1 - Revised flow diagram 2.3 - Revised Chapter 4
1.0	7/13/01	- Released by NOA

1. Introduction

This document outlines the sound settings guidelines for the Nintendo GameCube™.

Please also refer to the Nintendo GameCube™ Function Reference Manual, which documents each of the APIs in detail.

2. Setting the Sound Output Mode

2.1 About the two sound modes

The sound output mode for the Nintendo GameCube™ is determined by two sound modes.

2.1.1 Main Sound Mode

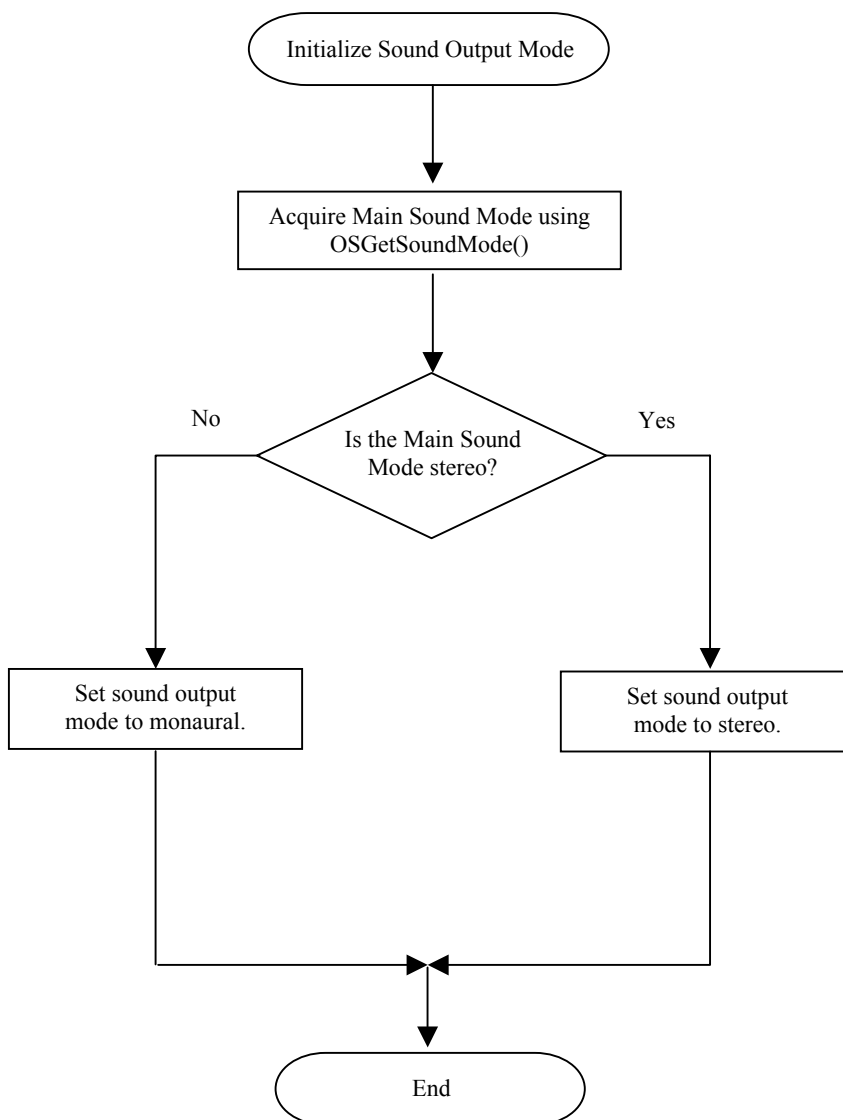
Sound settings can be specified in the Initial Program Loader (IPL) Option Screen of the Nintendo GameCube™. These sound settings are preserved within the Nintendo GameCube™, itself. This is called Main Sound Mode. The only settings that can be saved as Main Sound Mode are stereo and monaural.

2.1.2 Sub-Sound Mode

The only settings that can be saved as Main Sound Mode are stereo and monaural. If the game supports other extended sound modes (such as headphone mode or surround mode), and the game developer wishes to reproduce the most recent game-play environment when restarting the game, Main Sound Mode is not sufficient for representing these additional sound modes. These additional sound modes must be saved as data on the Nintendo GameCube™ Memory Card. This type of sound mode is called a Sub-Sound Mode.

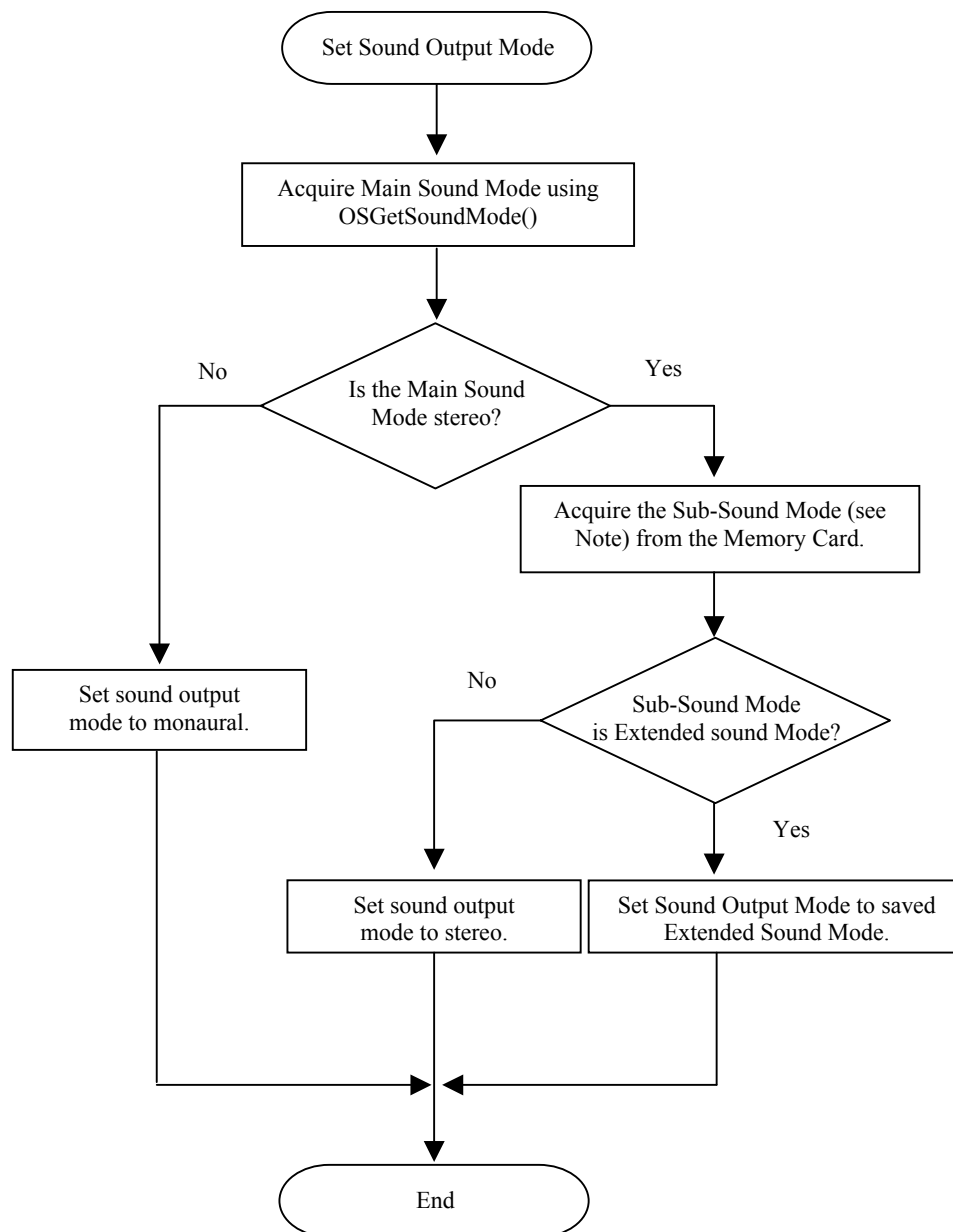
2.2 Determining the sound output mode at game startup

When starting the game, the only thing you need to consider for setting the sound output mode is the Main Sound Mode. The following flowchart illustrates how to set the sound output mode.



2.3 Determining the sound output mode when loading saved game data

Games can sometimes place Sub-Sound Modes in saved game data. The following flowchart illustrates how the sound output mode is set when saved game data is loaded.



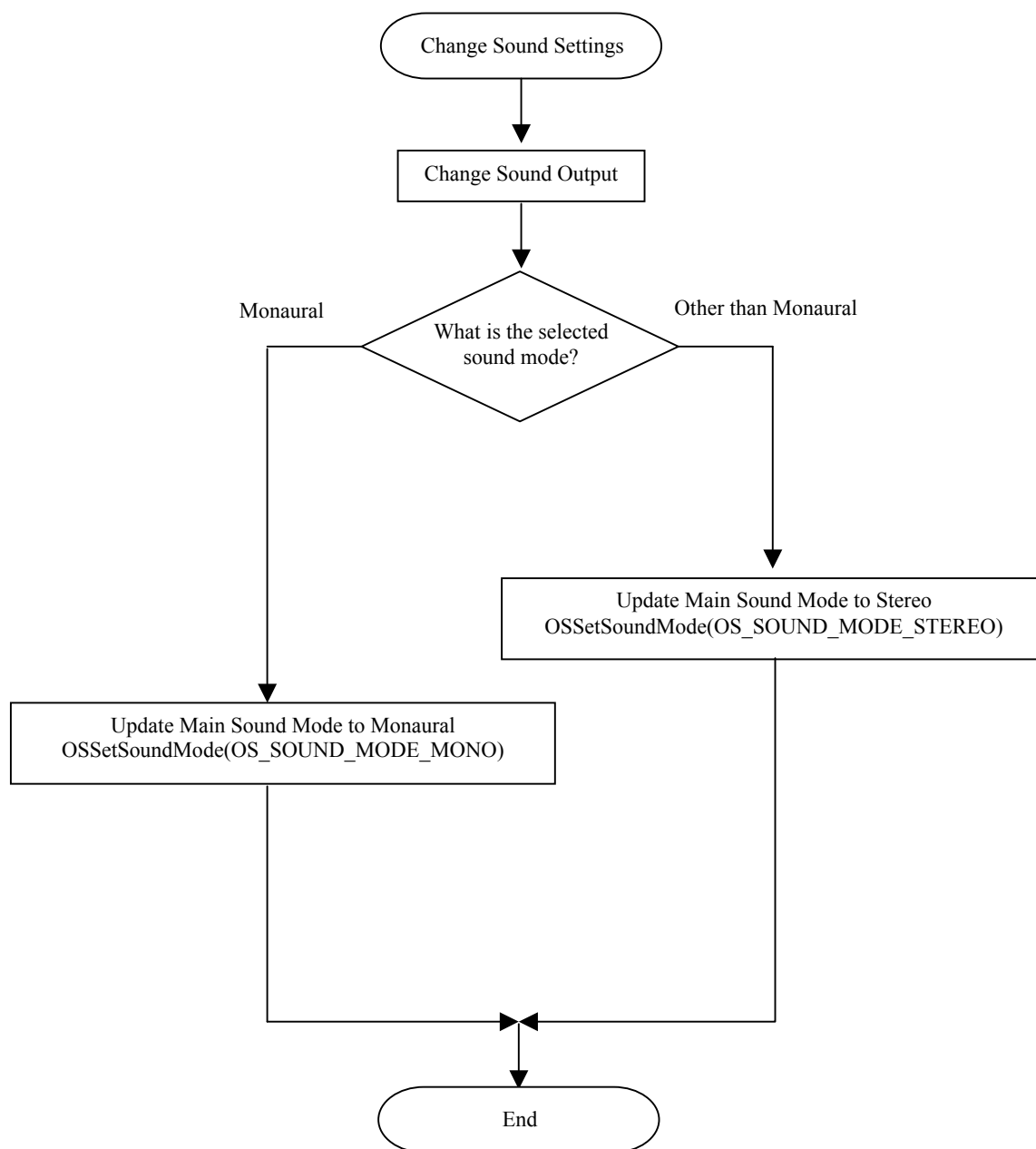
Note: Sub-Sound Modes are only considered when the Main Sound Mode indicates stereo. The sub-sound mode is saved as either an extended sound mode or as a non-extended sound mode (monaural or stereo).

3. Updating the Sound Mode after Changing the Sound Settings

Many games have a sound settings screen. When the sound settings are changed during a game, the Main Sound Mode is updated, along with any Sub-Sound Modes (if necessary).

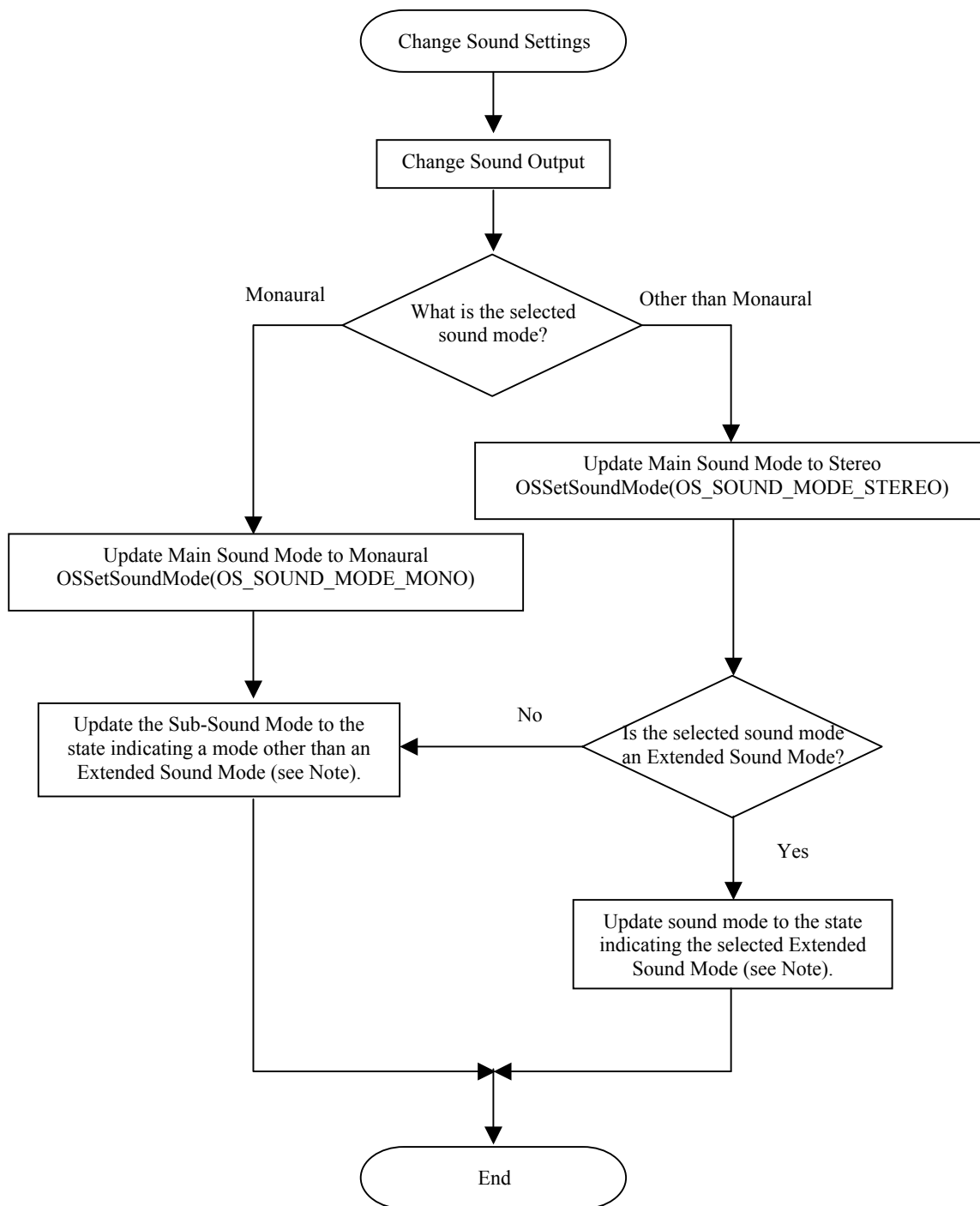
3.1 If a Sub-Sound Mode is not saved on Memory Card

The following flowchart illustrates how the Main Sound Mode is updated if the game does not save the Sub-Sound Mode to the Memory Card.



3.2 If a Sub-Sound Mode is saved on Memory Card

The following flowchart illustrates how the Main Sound Mode and Sub-Sound Mode are updated if the game does save the Sub-Sound Mode to the Memory Card.



Note: The game does not need to save the Sub-Sound Mode to the Memory Card immediately. Save the Sub-Sound Mode to the Memory Card when appropriate (such as when saving game data).

4. Cautions Regarding the Sound Output Modes

4.1 Hardware streaming

The Hardware Streaming feature of Nintendo GameCube™ does not have monaural playback capabilities, and can only play stereo sound data in stereo. However, the monaural AV cable used to connect the Nintendo GameCube™ and a monaural television converts stereo sound to monaural sound by mixing the L channel and R channel in the monaural AV cable. Therefore, there is no need to provide hardware streaming data that supports monaural playback when the sound output mode is monaural.

However, you need to be careful in the following situations:

- The L channel and R channel of the hardware streaming sounds have opposing phase waveforms thus cancelling each other out. This results in the sound produced by hardware streaming with mixing using the monaural AV cable to be cancelled out. It could also result in problems like the sound being played at an extremely low level.
- In a game where the sounds played with hardware streaming are a main feature, and the quality of the game is affected by the mixing associated with a monaural AV cable.
- Due to mixing by the monaural AV cable the user is lead to mistakenly believe there is a problem with their Nintendo GameCube™ or with their software.

To deal with these situations you need to create monaural playback hardware streaming data separate from that for stereo playback.

However, with hardware streaming you can only playback stereo data in stereo. So even with data for monaural playback, you need to have 2 channels, L and R (L and R channels have same data), as with stereo data. This causes the entire data size to be doubled in comparison to data that only includes stereo playback. This will of course have an effect on your open Game Disc space.

In addition, if you are concerned about users connecting the Nintendo GameCube™ and the monaural television with a stereo AV cable, you need to be careful in the following situations:

- The pan for the playback sound with hardware streaming has moved in an extreme fashion to either L or R. This results in the sound produced by hardware streaming not being heard or being played at an extremely low level when a stereo AV cable is used to connect the monaural television and the Nintendo GameCube™ (only the L or the R plug of the stereo AV cable is actually connected to the television).
- In a game where the sounds played with hardware streaming are a main feature in an environment as described above, and the quality of the game is affected.
- In an environment like that described above and the user is lead to mistakenly believe there is a problem with their Nintendo GameCube™ or with their software.

To deal with these situations you need to create monaural playback hardware streaming data separate from that for stereo playback. Or you can include a statement like the one below in the game's Instruction Booklet urging the user to exercise caution.

If you are using a monaural television and connect the Nintendo GameCube™ to this with a stereo AV cable, the game's sound may not be played back correctly. Please use a monaural AV cable to connect your Nintendo GameCube™ to a monaural television.

4.2 If you use Dolby Surround

MusyX and AX support Dolby Surround encoding. If you use Dolby Surround, you must obtain approval from Dolby Laboratories, Inc.