Nintendo DS Programming Guidelines

Version 3.1

The content of this document is highly confidential and should be handled accordingly.

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Confidential

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Revision History

Version	Revision Date	Description
3.1	2010/01/14	• Changed the text in section 1.1 Contents. • Changed the text and changed the level of importance to [Required] for section 2.2.2 Card Removal Detection for DS Download Play Child [Required]. • Changed the text in section 3.3.1 Banner Display Verification on the Launcher Screen [Required] • Changed the text in section 4.3.4 Preventing Erroneous Microphone Input Due to Speaker Output [Required] • Added sections 8.3 Nintendo Titles for China and 8.3.1 Publisher Notation for Nintendo Titles for China [Required]
3.0	2009/11/13	• Revised content for developers of NTR-ROM regardless of the SDK that is used, based on the Nintendo DS/TWL Programming Guidelines. • Added section 1.7 System Names. • Changed title of section 2.6.3 Prohibition of Use of Backup Memory Default Values [Required]. • Changed section 7.3 Display of Licensed by Nintendo Logo.

1 Introduction

1.1 Contents

These guidelines provide programming cautions exclusively for the Nintendo DS system (DS) and its peripherals.

The terminology used in these guidelines is based on the Nintendo DS and Nintendo DSi terminology. Be sure to refer to these documents as well.

Collectively, the Nintendo DS and Nintendo DSi menus are referred to as launchers.

1.2 Levels of Importance

The following notations indicate the relative importance of the topics contained in this document.

- [Required] Items that must be completed.
- [Recommended] Items suggested for improving the quality or performance of your game.
- [Information] Additional items that provide information for game developers.

1.3 Note

These guidelines were established to reduce problems in the market. However, adherence to these guidelines does not guarantee that all problems can be avoided.

1.4 Prohibition of Using Files Provided for the Nintendo DS/TWL on Other Platforms

Files included in each of the development tools or SDKs provided for the DS/TWL are not to be used on other platforms.

1.5 Terminology

To ensure you're using the correct terminology, please refer to the Nintendo DS Terminology and Nintendo DSi Terminology files for the names of the system and system parts, names related to operations, names of accessories, and other names.

This content is also included in section 7.10.1 Naming Standardization [Required].

1.6 Supplemental Information

This document contains supplemental information, either at the end of a particular guideline or within the guideline itself. This information is not part of the actual guideline, but rather is included to help clarify the meaning of the given guideline.

1.7 System Names

Unless specified otherwise, system information and cautions are organized as shown below.

- Information and cautions for the Nintendo DS Lite are the same as those for the Nintendo DS.
- Information and cautions for the Nintendo DSi XL are the same as those for the Nintendo DSi.

Other system-specific information will be noted as Nintendo DS Lite and Nintendo DSi XL.

2 Game Card and Game Pak Slots

2.1 Slots

2.1.1 Types of Slots [Information]

In these Programming Guidelines, devices that connect to the DS Game Card slot are called “Game Cards.” Devices that connect to the Game Pak slot are called “Game Paks.”

There are two types of Game Paks: Game Paks that can be played on GBA systems, and Game Paks that are exclusively for Nintendo DS and cannot be played on GBA systems.

2.2 DS Game Card Slot

2.2.1 Processing When Booted from a DS Game Card and Card Removal Is Detected [Required]

If the device is booted from a DS Game Card, process according to whether the system is open or closed. For applications that do not require card removal detections, see section 2.2.2 Card Removal Detection for DS Download Play Child [Required].

1. When a DS Game Card is removed while the system is open:

   Stop the DS/TWL CPU core and enter the HALT state when the DS Game Card is removed. Turning off the power is prohibited. If the NITRO/TWL-SDK library is being used to access the DS Game Card, when a DS Game Card is removed, the system automatically enters the HALT state without the program doing anything.

   If DS Wireless Communications is on when the removal of a DS Game Card is detected, NITRO/TWL-SDK automatically shuts down DS Wireless Communications and halts the CPU cores on the DS or TWL.

2. When a DS Game Card is removed while the system is closed:

   When the removal of a DS Game Card is detected while the system is closed, turn off the power. If you are using the NITRO/TWL-SDK library, this process is performed automatically, so no additional programming is needed.

   Special types of DS Game Cards may generate card interrupts at times other than the removal of a DS Game Card while the system is sleeping. For these types of DS Game Cards, a card interrupt must not be included in the conditions for waking the system from Sleep Mode. Instead, the first indication that the DS Game Card has been removed occurs when the system awakens for some other reason. At that time, the system should make the transition to the HALT state.

2.2.2 Card Removal Detection for DS Download Play Child [Required]

Before you access a DS Game Card (the header region or the backup region) from a DS Download Play child, be sure to call the `CARD_CheckPulledOut` function to check whether the card has been removed. If it is determined that the card has been removed, all subsequent access to the card is prohibited.

No such process is necessary if the DS Game Card will not be accessed.

If the Card is removed while the Nintendo logo is displayed during or at the time a download has completed, the system enters a HALT state. This is by design.

2.2.3 Card Application ROM Type Setting [Required]

When building an application, define `RomSpeedType` in the RSF file properties and explicitly specify the ROM type setting (mask ROM/one-time PROM). Only DS software between 64 and 512 megabits can use the "mask ROM" setting.

Table 2-1 Card Application ROM Type Setting

	DS Software
64 megabit, 128 megabit, 256 megabit, 512 megabit	Both of the following can be used: Mask ROM setting One-Time PROM setting
1 gigabit, 2 gigabit	Only the following can be used: One-Time PROM setting

Note: See the Card's manual for a detailed explanation of the Mask ROM setting and One-Time PROM setting.

2.2.4 DS Wireless Communications Between Software with Different ROM Type Settings [Information]

Communications may not function properly when DS Wireless Communications is used within the software that has different ROM type settings. When updating the remaster version due to a change in the ROM type setting, follow the directions in section 6.6.10 Connection Between Different Remastered Versions [Required] and make sure that communication functions normally.

2.2.5 Strict Adherence to Use of Libraries [Required]

To access a DS Game Card (including the backup memory region), always use the library provided by Nintendo of America Inc.

2.3 Game Pak Slot

2.3.1 Detection of Removal with Games That Do Not Use Game Paks [Required]

With games that do not use Game Paks, do not perform screen display or stop the game if Game Pak removal is detected.

2.3.2 Detection of Removal with Games That Use Game Paks [Required]

For games using Game Paks, prohibit further Pak access when the Game Pak is removed.

When accessing Game Paks using the NITRO/TWL-SDK library, these processes occur automatically and without programmer awareness.

When a Game Pak is removed during Sleep Mode, detection of the removal normally takes place upon return to Active Mode. However, when a Game Pak is swapped with another with the same title, removal detection does not occur.[1]

Note: Due to the hardware specifications, the removal of active products is prohibited in Sleep Mode. To avoid giving the game player a mistaken impression, avoid using this functionality (for example, do not exchange data among Game Paks).

2.3.3 Swapping of GBA Game Paks with the Same Title During Sleep Mode [Recommended]

During Sleep Mode, Game Pak removal is not detected even when swapping a Game Pak with the same title from another device.[2]

To avoid any problems that might arise in such a circumstance, and to detect any swapping that occurs during Sleep Mode, we recommend using the hash values for the Game Pak's backup data before and after Sleep Mode.

2.3.4 Access to Game Paks [Required]

As a general rule, accessing any region on GBA Game Paks produced by other companies is prohibited. Use either the `CTRDG_GetAgbMakerCode` or `CTRDG_GetAgbGameCode` function in NITRO/TWL-SDK to determine whether a GBA Game Pak is supported or produced by your company.

2.3.5 Access to DS Option Paks [Required]

DS Option Pak access is limited to compatible Game Paks. Access across all regions for other DS Option Paks is prohibited.

In addition, guidelines specific to DS Option Paks are included in sections 2.4 Nintendo DS Rumble Pak and 2.5 Nintendo DS Memory Expansion Paks.

2.3.6 How to Handle DS Programs on Game Paks [Required]

DS programs (native code for consumption in the ARM core) cannot be placed on Game Paks for immediate or later transfer to memory.

2.3.7 How to Handle DS Scripts on Game Paks [Required]

You must confirm that DS scripts or code based on scripts that are placed on Game Paks for immediate or later transfer to memory are valid (that is, that they are indeed scripts produced by the game developer).

If you are considering using scripts, contact support@noa.com in advance.

2.3.8 How to Handle DS Data on Game Paks [Recommended]

Simple data, exclusive of applications or scripts, can be used directly on Game Paks or transferred to memory in the DS. Nevertheless, we recommend confirming the validity of such data.

[1] Waking from sleep upon removal of a Game Pak is prohibited. See section 5.2.2 Sleep Mode to Active Mode Transitions [Required] and section 2.3.3 Swapping of GBA Game Paks with the Same Title During Sleep Mode [Recommended].

[2] Waking from sleep upon removal of a Game Pak is prohibited. See section 5.2.2 Sleep Mode to Active Mode Transitions [Required].

2.4 Nintendo DS Rumble Pak

2.4.1 Games That Require the Rumble Feature [Required]

The Nintendo DS Rumble Pak is optional hardware. Because not all users have a Rumble Pak, do not implement specifications that require the use of the Rumble Pak to progress through a game.

2.4.2 Detecting Rumble Pak Removal [Required]

Games should not stop or be otherwise affected when Rumble Pak removal is detected.

2.4.3 Switching Nintendo DS Rumble Feature On/Off [Recommended]

We recommend that developers implement a Rumble Feature on/off switch for games that support the Nintendo DS Rumble Pak.

2.4.4 Avoid Continuous Operation of the Nintendo DS Rumble Pak [Recommended]

Games that use the Rumble Feature should be designed to avoid continuous operation of the Rumble Feature. For the health of the game player and the life of the equipment, do not design the game such that a pressed key results in continuous rumbling.

2.4.5 Stopping the Nintendo DS Rumble Pak [Required]

Do not use the Rumble Feature while the game is paused. Also, be sure to turn off the Rumble Feature when placing the DS into Sleep Mode or when performing a software reset.

2.4.6 Using the Nintendo DS Rumble Pak with the Microphone [Required]

Do not use the Rumble Pak with the microphone because the microphone may pick up the sound caused by the Rumble Feature while the microphone is in use.

2.5 Nintendo DS Memory Expansion Paks

2.5.1 Prohibition of Using Memory Expansion Paks [Required]

The Nintendo DS Memory Expansion Pak and the Nintendo DS Lite Memory Expansion Pak are for use exclusively with the Nintendo DS Browser. These Memory Expansion Paks cannot be used with any game.

However, if the use of a Memory Expansion Pak is an unavoidable element in your game, contact support@noa.com.

2.6 Backup Memory

Unless otherwise noted, backup memory procedures are the same for both DS Game Cards and Game Paks.

2.6.1 Restriction on Library Use [Required]

Always use the library provided by Nintendo of America Inc. to access backup memory on the DS Game Card and Game Pak.

The library provided by Nintendo has been tested and adjusted in accordance with the backup memory specifications to achieve proper access. Direct access without the use of these Nintendo-provided libraries is prohibited. Such direct access is not in accordance with specifications and may lead to malfunctions.

Accessing the EEPROM in a GBA Game Pak is prohibited while operating in DS Mode.

2.6.2 Specifying Backup Memory [Required]

Inappropriately accessing backup memory (for example, by using a function specific to FLASH in the SRAM) causes malfunctions. Therefore, do not use functions related to backup memory (including identify functions) until the type and capacity of the backup memory is specified.

The method for specifying the type and capacity of the backup memory is as follows.

- Handling the backup memory on the DS Game Card side

  The type and capacity of the DS Game Card-side backup memory is determined when booting from a DS Game Card. However, when using a DS Download Play application to access the backup memory of an inserted DS Game Card, you should identify the type and capacity of the backup memory after confirming that the Game Card is your own product by getting the manufacturer code and the Game Code with the `CARD_GetRomHeader` function.

- Handling the backup memory on the GBA Game Pak side

  After using the `CTRDG_GetAgbMakerCode` function to get the manufacturer code to confirm that it is a valid product, look up the Game Code with the `CTRDG_GetAgbGameCode` function and specify the type and capacity of backup memory.

2.6.3 Prohibition of Use of Backup Memory Default Values [Required]

Specific values are written to backup memory when it is ready for shipping from the factory. However, there is no guarantee that those values will remain unchanged.

Therefore, do not implement processes that assume the default value of backup memory is a specific value (for example, determining that when a certain address value is 0xff, it is in a factory default state).

2.6.4 Disabling the Display of Error Messages for Default Backup Data [Required]

Make sure that error messages for default backup data are not displayed. For example, you could display an error message only when a fixed value is stored in a specific location in backup memory, this content is maintained, and backup data is corrupted.

2.6.5 Endurance of Backup Memory [Required]

EEPROM, FLASH, and DACS all have a limited number of erase-write cycles. Avoid excessive writing and erasing (for example, performing a save every second or each time a character takes a step) with these devices.

Note: SRAM does not have this limitation.

DS Game Cards

The manufacturers of EEPROM and FLASH packaged in Game Cards guarantee the number of writes and erases, as listed in Table 2-2.

Table 2-2 Erase-Write Endurance of Backup Memory in Game Cards

Backup Memory	Guaranteed Endurance of Erase-Write Cycles	Average Daily Guaranteed Number of Erase-Write Cycles (Assuming End of Life in One Year)
4-kilobit, 64-kilobit, 512-kilobit EEPROM	1,000,000 times (per byte)	Approximately 3,000 times
2-megabit, 4-megabit, 8-megabit, 64 megabit FLASH	100,000 times (per page)	Approximately 300 times
256-kilobit FRAM	10,000,000,000 [1]	Approximately 30,000,000 times [1]

GBA Game Paks

The manufacturers of FLASH and DACS packaged in GBA Game Paks guarantee the number of writes and erases, as listed in Table 2-3.

Table 2-3 Erase-Write Endurance of Backup Memory in GBA Game Paks

Backup Memory	Guaranteed Endurance of Erase-Write Cycles Per Sector	Average Daily Guaranteed Number of Erase-Write Cycles (Assuming End of Life in One Year)
512-kilobit and 1-megabit FLASH	10,000 times	30 times
1-megabit and 8-megabit DACS	100,000 times	300 times

[1] Accessing the EEPROM in a GBA Game Pak is prohibited while operating in DS Mode.

2.6.6 Distribution of Backup Data [Recommended]

Backup data should be written to all sections in backup memory, rather than to a specific address or page. For example, if the size of the data to be backed up is 10 pages, the first backup should be to pages 0 to 9, the second to pages 10 to 19, and so on, to reduce the number of erase-write cycles to each page.

2.6.7 Backup Data Reliability [Required]

Code should be written so that the program does not malfunction, even if backup data is corrupted. (Data corruption can be detected by using a method such as a checksum or CRC.)

2.6.8 Preventing the Corruption of Backup Data [Recommended]

We recommend that you take precautions, such as making a copy, to be able to recover corrupted data.

2.6.9 Display a Message When Backup Data Is Corrupted [Recommended]

We recommend that you display an error message to the game player when unrecoverable backup data is discovered. Do not display an error message when the backup memory has its initial factory setting.

Contents of backup devices that are present at shipping are not guaranteed to be in any specific state.

2.6.10 Removing Corrupted Backup Data [Required]

Ensure that corrupted backup data is deleted or overwritten with correct backup data. The following are possible approaches.

- Automatically delete the corrupted backup data when it is detected. Alternatively, allow the game player to delete the data.
- Overwrite the corrupted backup data with normal backup data with the next save.

Ensure that corrupted backup data does not result in unexpected behavior.

2.6.11 Display While Writing to the Backup Memory [Required]

When a write to backup memory exceeds 0.5 seconds, provide some visual indication such as “Saving. Do not touch the Game Card or turn the power off.” to prevent the player from turning off the power during the write.

Be particularly careful that the "Writing to backup memory" display does not disappear while the data is still being written.

The display time may be extended to ensure that the game player has adequate time to read the indication.

2.6.12 Animation Display While Writing to Backup Memory [Required]

If the backup write operation takes longer than 5 seconds, display onscreen animation so the game player does not mistakenly think the system is hung.

2.6.13 Caution Before Writing to Backup Memory [Recommended]

When writing data to backup memory, we recommend reading at least 1 byte in advance each time (you can read and discard the data). If the `Read` function returns an error, the DS Game Card terminals may not be making good contact. When this occurs, do not write data. Instead, follow the instructions in section 2.6.15 Caution About Reading from Backup Memory [Required].

2.6.14 Caution After Writing to Backup Memory [Recommended]

Because the TWL-SDK backup functions retry 10 times internally when data write fails, you do not need to implement a retry process when errors occur. However, even if the `Write` function finishes normally without returning an error, there is no guarantee that data was written in the targeted backup memory. Therefore, we recommend either using the `Verify` function in addition to the `Write` function or using the `WriteAndVerify` function instead of the `Write` function.

2.6.15 Caution About Reading from Backup Memory [Required]

When using the read function to read backup data, be sure to verify the return value. When the read function returns an error, the DS Game Card terminals may not be making proper contact. This problem can probably be resolved by reinserting the DS Game Card, so do not assume that the data has been corrupted. In addition, stop the game and display a message such as “The save data could not be accessed. Please turn off the power and reinsert the DS Game Card.”

In addition, display this message *before* stopping the game in cases where the read function returns an error as indicated in section 2.6.13 Caution Before Writing to Backup Memory [Recommended].

2.6.16 Verification of the DS Game Card Backup Memory [Required]

When the application supports DS Game Card backup memory, read at least 1 byte from any backup memory address (the data can be discarded) soon after the application is launched and before the title screen is displayed. If the read function returns an error at this time, the DS Game Card terminals may not be making proper contact, so immediately perform the error handling described in section 2.6.15 Caution About Reading from Backup Memory [Required].

2.6.17 Overwriting Backup Memory on DS Game Cards [Recommended]

When a game player manually deletes backup data, display a confirmation message and wait for confirmation before deleting the data.

2.6.18 Overwriting Backup Memory on GBA Game Paks [Required]

Before rewriting backup memory data on GBA Game Paks, display a confirmation screen to inform the game player and to get consent.

Use the same procedure when initializing backup memory on GBA Game Paks.

3 Launcher

3.1 Profiles

3.1.1 Profiles [Information]

Whether to reference information registered on an individual system and use it in a game is determined by the game itself; there are no restrictions on the use of the profile data.

3.1.2 Use of User Nicknames and Comments [Required]

If characters not included in the application are used in user nicknames or comments, ensure that the display is not corrupted and that gameplay continues without problems.

3.1.3 Display of User Nicknames and Comments [Recommended]

When characters not included in the application are used in user nicknames or comments, alternate characters may be used for those characters. Make every effort to maintain a similar meaning as the original user nickname or comment.

When displaying alternate characters, do not use blanks (`0x0020` or `0x3000`) as alternate characters because it may appear as if nothing is being displayed. We recommend using symbols other than spaces for alternate characters: for example, the asterisk (`*`, `0x002a`), question mark (`?`, `0x003f`), or hyphen (`-`, `0x002d`).

There are no limits on which characters you can include in the application. For example, instead of including European characters, you can replace them with English characters that are similar for display purposes. Alternatively, you can replace the English uppercase letters with lowercase letters (or vice versa).

3.2 Options

3.2.1 Language Settings [Information]

The software can freely access the language setting for individual DS devices and use that language in the game. Games can also have an option to set a language other than that set in System Settings. For example, an option in the game can be used to select English in the game even if the language set in System Settings is Japanese. This data can also be saved to backup memory and loaded the next time the game is started. However, it is not possible to change the Language setting in System Settings from within the game.

3.2.2 Language Settings [Required]

The number of languages supported by the DS/TWL systems may increase in the future. Accordingly, be sure that a malfunction does not occur when the `language` member of the `OSOwnerInfo` structure obtained with `OS_GetOwnerInfo` is an undefined value. Process the value as a language that is not supported by the game.

3.2.3 Time and Date Settings [Required]

The time and date can be freely changed in System Settings. Therefore, the time when gameplay starts may be earlier than the time stamp of the previous backup. Steps should be taken to ensure that

the program is not affected if time is turned back. This problem may also occur when game players swap DS Game Cards.

3.2.4 Time and Date Offset Value Handling [Information]

To test whether the game player has changed time settings on a DS, get the time/date offset value and compare it to the previous value on the same device. This comparison works only for values from the same DS. This time determination can be used during a game, but ensure that gameplay is not impeded when continued on a different DS. The MAC address of the DS can be used to determine whether a different DS is being used.

3.2.5 Prohibited Use of Time and Date Settings [Information]

The functions provided by NITRO/TWL-SDK to set the time and date in the real-time clock (RTC) can be used only for debugging. When built with the Master ROM as the build target (see the note below), the request to write to the RTC always fails.

Note: When using the command line, “NITRO (TWL)_FINALROM” is the target. When using the IDE, “Nitro (TWL) ROM” is the target.

3.3 Game Banners

3.3.1 Banner Display Verification on the Launcher Screen [Required]

Verify that the banner (that has both the game icon and the game description text) displays normally on both the DS system IPL screen and the TWL system launcher screen, regardless of which language is selected on the system.

The game description text must include information about both the title and the publisher. When the title (and the subtitle) consists of one line, include the name of the publisher on the second line. When the game title (and the subtitle) consists of two lines, include the name of the publisher on the third line. (**Note:** For Nintendo titles, adhere to guideline item 8.3.1 Publisher Notation for Nintendo Titles for China [Required].)

For the Nintendo DS game description, you can specify a maximum of three lines with a width of 139 dots. For TWL you can specify a maximum of three lines with a width of 240 dots. However, if several wide characters (see Table 3-1) are used and the text is longer than the display area, text outside the display area is not shown. (About 28 alphanumeric characters can be displayed per line.)

Confirm that the banner is displayed normally on DS and TWL.

Supplemental Information

As shown in Table 3-1 below, certain characters are wider or narrower than others, so the number of these characters that can be displayed will differ from normal characters.

Table 3-1 Banner Font Character Limitations

	Launcher (DS)	Launcher (TWL)
Width of region	139 px	240 px
Maximum number of `W`'s	23	17
Maximum number of `M`'s	23	20
Maximum number of `w`'s	23	20
Maximum number of `i`'s	69	80

You can confirm the banner display on the TWL launcher screen in the same way as the DS by using the `addbanner` tool included in NITRO-SDK 4.2 plus 6 or later, instead of this method.

3.3.2 Description Text in Each Language [Recommended]

If the game description text is displayed in a language that is not supported by the game, the player may mistakenly believe that the game supports that language.

For the language that the game supports, enter text in the software description input column in that language. For languages that it does not support, enter text in one of the languages that it does support. In this case, if the game supports English, give English priority.

For those tables below that have more than one “Input Language” row, choose any of the rows and use the corresponding languages in your application. Also, note that TWL systems have regions, so languages shown with gray backgrounds cannot be selected.

Table 3-2 Games for Japan

Input Column Type	JP	EN	FR	GE	IT	SP
Input language	Japanese	Japanese	Japanese	Japanese	Japanese	Japanese

Table 3-3 Games for the USA

Input Column Type	JP	EN	FR	GE	IT	SP
Input language	English	English	English	English	English	English

Table 3-4 Games for Europe Using the Same ROM Throughout the European Market

Input Column Type	JP	EN	FR	GE	IT	SP
Input language	English	English	French	German	Italian	Spanish
	English	English	English	English	English	English

Table 3-5 Games for a Specific European Country (France, for Example)

Input Column Type	JP	EN	FR	GE	IT	SP
Input language	French	French	French	French	French	French
	English	English	French	English	English	English

Table 3-6 Games for China

Input Column Type	JP	EN	FR	GE	IT	SP	CN
Input language	English	English	English	English	English	English	Chinese

Chinese market games work only with the Chinese DS system iQueDS.

Table 3-7 Games for Korea

Input Column Type	JP	EN	FR	GE	IT	SP	CN	HN
Input language	English	English	English	English	English	English	English	Korean

Because the non-Korean language supported DS will also be circulated as an official product, use of Korean outside HN is prohibited.

For more information about Chinese and Korean market games, see the *NITRO (TWL) SDK Function Reference Manual*.

Note: Even if Japanese is specified in the input language row, there is no need to convert alphanumeric characters included in the formal Japanese title into hiragana or katakana.

3.3.3 Download Play Banner Display Verification [Required]

As with section 3.3.1 Banner Display Verification on the Launcher Screen [Required], confirm that banners (game icons, game description text) are properly displayed on the DS Download Play game list screen.

The following points differ from banner display in the launcher.

- Because DS Download Play specifications do not allow text to be changed according to the child device's language settings, you may display text in any of the languages supported by the game.
- The game title name display region is one line of 185 dots (approximately 36 alphanumeric characters). The software description text display region is two lines of 199 dots (approximately 40 alphanumeric characters on two lines).
- There is no need to display the publisher name.

4 Input Devices

4.1 Buttons

4.1.1 Chattering Prevention [Recommended]

Take measures to prevent chattering (one button press being registered multiple times). Such measures include setting the button read rate to once every sixtieth of a second.

4.1.2 Simultaneous Pressing of the Directional Buttons [Required]

Take measures to prevent the game from operating abnormally if Up and Down or Left and Right on the +Control Pad are pressed simultaneously. Some specific measures include invalidating simultaneous input or assigning priority to Up or Down and to Left or Right.

Supplemental Information

You do not have to consider this item when using the `PAD_Read` function with TWL-SDK, because measures to prevent this operation have been implemented in the SDK.

4.1.3 Unused Buttons [Required]

Take measures to ensure that the game does not freeze during gameplay when a user presses a button that the game does not use. In particular, be careful when one of the unused buttons has been allocated for programming use, such as debugging.

4.2 Touch Screen

4.2.1 Touch Screen Chattering [Information]

Touch Screen chattering may occur when the Touch Screen is pressed with a light force that is below the set input load (80 g when using the stylus). Chattering may occur in the following situations.

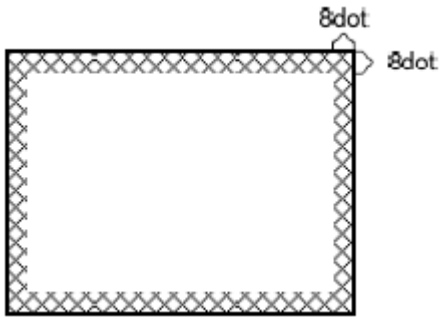
- The Touch Screen is touched with light force.
- The Touch Screen is tapped with the stylus.
- A line is drawn using light force.
- The Touch Screen is tapped repeatedly at high speed.

4.2.2 Touch Screen Durability [Information]

The 8-dot area around the outer edge of the Touch Screen is less durable than the area in the center. Avoid controls that would likely lead to players pressing hard on the 8-dot area around this outer edge.

Such controls could result in lifespan reduction or product damage.

Figure 4-1 Border Area of the Touch Screen



4.2.3 Calibration Value Use [Required]

Always use calibrated values when using the Touch Screen.

If it is not possible to get touch panel calibration (if the `TP_GetUserInfo` function fails), it is okay to not call the `TP_SetCalibrateParam` function. Although values obtained with the `TP_GetCalibratedPoint` function are incorrect when calibration setting is not performed, it is not necessary to do anything about this.

4.2.4 Prohibition of Stylus-Only Interfaces [Recommended]

Avoid interfaces that require the game player to use the stylus. Games should allow game players to use their finger if they have lost the stylus. For example, do not require a distinction of a few dots in the area to be pressed for simple operations such as yes/no selection. An exception to this recommendation is a game where a distance of a few dots in the area being pressed is critical to gameplay.

4.2.5 Active Area of the Stylus [Required]

Because the stylus has a rounded tip, it cannot reach the outermost edge of the Touch Screen. Therefore, ensure that the outer region of the Touch Screen is not used for gameplay. Specifically, to take into account variations in devices, the area within four dots of the edge should not be used.

4.2.6 Input Accuracy Verification [Recommended]

Because chattering and other problems may cause an incorrect coordinate value to be returned, check the `validity` flag to verify the accuracy of the obtained value.

On rare occasions chattering can result in the return of an abnormal value even if the `validity` flag is valid. If necessary, implement other measures, such as comparing the current value with the previous coordinate value and determining that the value is incorrect if there is too much difference between the two values.

4.2.7 Chattering Prevention for the Contact Determination Flag [Recommended]

Take measures to prevent complications caused by chattering during contact between the stylus and the Touch Screen. Such measures include setting the contact determination flag inquiry rate to once every sixtieth of a second.

4.2.8 Compliance with Library Use [Required]

When using the Touch Screen, be sure to use the library provided by Nintendo.

4.3 Microphone

4.3.1 Individual Differences in Microphone Sensitivity [Information]

Microphone sensitivity among individual Nintendo DS and Nintendo DSi systems may vary by as much as a factor of two.

4.3.2 Ranges in Which Microphone Input Determination Is Prohibited [Required]

Microphone input contains a noise component, so within certain ranges, microphone input will be erroneously detected even when there is no microphone input present. To prevent false-positive results when detecting microphone input, avoid making a determination that there was microphone input within the ranges shown in Table 4-1.

If the gain is large, button operations and casing friction noise show up pronouncedly as microphone input, so be careful when setting your threshold value.

Table 4-1 DS/CODEC-DS Mode Sound Circuitry for the TWL

Amplitude Resolution		Range in Which Microphone Input Determination Is Prohibited	Gain	
			Factor	dB
8-bit	Signed (MIC_SAMPLING_TYPE_SIGNED_8BIT)	±11	20	+26
		±13	40	+32
		±15	80	+38.1
		±20	160	+44.1
	Unsigned (MIC_SAMPLING_TYPE_8BIT)	117–139	20	+26
		115–141	40	+32
		113–143	80	+38.1
		108–148	160	+44.1
16-bit	Signed (MIC_SAMPLING_TYPE_SIGNED_12BIT*)	±2368	20	+26
		±2880	40	+32
		±3392	80	+38.1
		±4672	160	+44.1
	Unsigned (MIC_SAMPLING_TYPE_12BIT*)	30400–35136	20	+26
		29888–35648	40	+32
		29376–36160	80	+38.1
		28096–37440	160	+44.1

Note: When the microphone-sampling functions of the NITRO/TWL-SDK perform sampling with an effective width of 12 bits, what is actually obtained are 16 bits of data, with the lower 4 bits padded with zeros. In this case, refer to the 16-bit values in these tables.

4.3.3 Guaranteed Input Range [Required]

Not all of the range of values that express the number of bits of the amplitude resolution can be used for microphone input. Some systems are not able to detect any input outside of the guaranteed range. Avoid using values beyond the guaranteed range to prevent any erroneous determinations.

Table 4-2 Guaranteed Microphone Input Range

Amplitude Resolution		Range Below Guaranteed Input	Range Above Guaranteed Input	Guaranteed Microphone Input Range
8-bit	Signed (`MIC_SAMPLING_TYPE_SIGNED_8BIT`)	-128 to -101	100–127	-100 to +99
	Unsigned (`MIC_SAMPLING_TYPE_8BIT`)	0–27	228–255	28–227
16-bit	Signed (`MIC_SAMPLING_TYPE_SIGNED_12BIT*`)	-32768 to -25664	25648–32752	-25663 to +25647
	Unsigned (`MIC_SAMPLING_TYPE_12BIT*`)	0–7104	58416–65520	7105–58415

Note: When NITRO/TWL-SDK's microphone-sampling functions perform sampling with an effective width of 12 bits, what is actually obtained are 16 bits of data, with the lower 4 bits padded with zeros. In this case, refer to the 16-bit values in this table.

Note: The values above are common to the Nintendo DS system's sound circuit, and the TWL's CODEC-DS mode.

4.3.4 Preventing Erroneous Microphone Input Due to Speaker Output [Required]

The sounds output from the speaker, if treated as microphone input, can trigger undesirable symptoms in some applications. Even if no specific problems arise in a specific system unit, problems may still occur depending on individual variations in microphone sensitivity and speaker volume. To prevent problems from happening, be sure to implement at least one of the following three countermeasures.

- Set sound master volume to 50 or less while the microphone is in use. Use either `SND_SetMasterVolume` or `NNS_SndSetMasterVolume` to set the sound master volume.
- Provide an option that lets the player adjust the microphone's sensitivity. Use `PM_SetAmpGain` or `PM_SetAmpGainLevel` to set the sensitivity.
- Provide an option that lets the player adjust the microphone's input threshold value.

If implementing these measures proves difficult, contact support@noa.com.

Supplemental Information

The audio input to the microphone from the speaker output will have different frequency responses, depending on the model and the individual system. (In the case of the Nintendo DSi XL, the microphone tends to pick up more of the lower frequencies from the speaker output.) Please contact support@noa.com if your title uses frequency analysis or other complicated processes to evaluate input.

4.3.5 Preventing Acoustic Feedback [Required]

Avoid simultaneous recording of audio from a microphone input and playback of that recorded audio because there is the possibility that acoustic feedback will occur.

For example, caution is needed when implementing a feature such as voice chat.

However, if the specifications of a game require that audio recording and playback of that recorded audio take place at the same time, contact support@noa.com.

4.3.6 User Feedback for the Microphone Input State [Recommended]

When using audio data input from a microphone in a game, the operation might not work properly, depending on the game player's audio input method. This could cause the game player to mistakenly interpret the problem as a malfunction, either in the game or in the DS system.

To prevent such a mistaken impression, we recommend that you implement features such as an optional screen on which microphone input can be tested and a feature providing feedback that makes the user input appropriate audio.

If you are implementing features for testing purposes, refer to the example implementation in section 8.1 Microphone Tests, which targets Nintendo titles. Implementing this functionality is [Required] for titles published by Nintendo.

When using the Matsushita Voice Recognition Engine, see the accompanying manual for specific examples of these implementation methods.

4.4 Opening and Closing the System

4.4.1 Open/Close Detection Function [Required]

As a general rule, the open/close detection function of the system should be used only to switch to Sleep Mode or to turn the LCD off. Because frequent opening and closing of the system can damage or shorten the life of the product, using the opening or closing of the system as a key input is prohibited.

The following sections provide examples of when opening/closing the system is or is not considered key input.

4.4.1.1 Examples of When Opening/Closing the System Is Considered Key Input (Not Allowed)

- Opening/closing the system is counted as a button press, and continuous opening and closing is required
- Compressing or stretching out characters with the action of the system
- Calling an event after the system has been opened and closed a set number of times

4.4.1.2 Examples of When Opening/Closing the System Is Not Considered Key Input (Allowed)

- Implementing sound effects when the system is opened or closed
- Implementing fade-in, mosaics, and other visual effects when opening the system
- Auto-saving games when closing the system where a manual save method is provided

Exceptions may be made when opening and closing the system is essential to gameplay and the system does not have to be opened and closed frequently. If planning such a use, contact support@noa.com before proceeding.

Supplemental Information

Although the TWL hinge is slightly stronger than the DS hinge, it is not significantly stronger. If many applications use opening and closing as a switch, the concern is that this may damage the hinge.

Although, as an exception, the launcher will use the open/close detection function to advertise TWL features, currently the effect of this use in the market are unknown. For use other than in the launcher, use the same operating principles as for the Nintendo DS system.

4.5 Miscellaneous

4.5.1 Device Input When the System Is Closed [Required]

When the system is closed, there is no guarantee that input will not be generated from buttons other than the L and R Buttons, or from devices such as the Touch Screen, microphone, or camera. For this reason, ensure that no malfunctions will occur if device input is generated when the system is closed.

A specific example is to prohibit device input while the system is closed.

4.5.2 Continuous or Rapid Operations Over a Long Period [Recommended]

Do not program games to require continuous, rapid, or excessive pressure on the system (for example, the Touch Screen or other input device) over a long period of time. These types of operations can shorten the life of the product, damage the product, or cause injury to the game player.

4.5.3 Animation Display When Device Input Is Offline [Recommended]

When there is no response for more than 5 seconds after button input, from the Touch Screen, microphone, or other input sources, display animation on the screen so the game player knows the system has not frozen.

4.5.4 Ignore Launcher Button and Touch Screen Input When Starting Games from the Launcher [Recommended]

When the launcher is used to start or select a game, the game might register its input as game input if the button or Touch Screen is pressed for an extended interval.

To avoid this, discard the first value read from the buttons or Touch Screen after the game starts up.

5 Power Management

5.1 Power Management Modes

5.1.1 Active Mode [Information]

This mode is for gameplay. It is the opposite of Sleep Mode.

5.1.2 Sleep Mode [Information]

This mode is used to control the amount of power being consumed.

All processor circuits are stopped in this mode. The LCD does not display and sounds are not emitted. However, the CPU and main memory contents are preserved.

5.1.3 Power Controls [Information]

While in Active Mode, the power supplied to the CPU, LCD, LCD backlight, graphics, sound, and microphone modules can be individually controlled. Power to the Touch Screen, and wireless modules is automatically stopped when they are not in use, so their power supply cannot be controlled.

In addition, power to the system can also be turned off. (Note that the system cannot automatically be turned on from an OFF state.)

When turning the LCD on from an OFF state, hardware limitations require an interval of at least 100 ms. For more information, see the `PM_SetLCDPower` function in the *NITRO/TWL-SDK Function Reference Manual*.

5.2 Sleep Mode

5.2.1 Active Mode to Sleep Mode Transitions [Required]

Unless you have a particular reason to do otherwise, transition from Active Mode to Sleep Mode only when the system is closed. (The DS and TWL are in Sleep Mode only when closed.)

Use the `PM_GoSleepMode` function to transition to Sleep Mode.

Consult with Nintendo if your application's specifications make it highly desirable to transition to Sleep Mode other than when the system is closed.

5.2.2 Sleep Mode to Active Mode Transitions [Required]

Transition from Sleep Mode to Active Mode only when the DS is open.

However, the following exceptions are allowed.

- Temporarily transitioning to Active Mode using the RTC alarm function when the system is closed. In this case, move to Sleep Mode after running the process.
- Temporarily transitioning to Active Mode to turn power off when a DS Game Card is removed while in Sleep Mode. In this case, see section 2.2.1 Processing When Booted from a DS Game Card and Card Removal Is Detected [Required].
- Transitioning from Sleep Mode to Active Mode while the system is open if an exception was granted for your application to transition to Sleep Mode other than when the system is closed.

5.2.3 Mode Transitions During Backup [Required]

When deleting or writing to backup memory data, wait for processing to finish before transitioning to Sleep Mode.

5.2.4 Mode Transitions During Communication [Required]

If performing DS Wireless Communications, turn DS Wireless Communications off before transitioning to Sleep Mode. With NITRO-SDK, if DS Wireless Communications is not off when entering Sleep Mode, it is possible that wireless hardware will become corrupt and continually emit signals. This is very dangerous.

With TWL-SDK, if DS Wireless Communications is not off when entering Sleep Mode, TWL-SDK will force the system to halt. Therefore, there is no concern about this danger. However, you will not be able to continue the game.

Supplemental Information

It is possible that signals will be emitted if the system enters Sleep Mode while DS Wireless Communications is on. Also, the system state it returns to is not defined and hence is unpredictable, which may result in serious problems. This is why `OS_Panic` (from TWL-SDK) is called.

5.3 LCD OFF State

5.3.1 Transitions Caused by Closing the System [Information]

Use the `PM_SetLCDPower` function to enter the LCD OFF state when the system is closed. When the LCD OFF state is entered, power to the LCD backlight and microphone is turned off. Also no sound is emitted from the speakers.

For headphone output, however, a set of procedures allows sound to be played during the LCD OFF state. For more information, see section 5.3.3 Clarifying Procedures for Producing Sound from Headphones During an LCD OFF State [Required].

5.3.2 Transitions Caused by Opening the System [Required]

When the system transitions to the LCD OFF state after the system is closed, be sure to turn ON the LCD when the system is opened. Remember to restore any modules that were on prior to entering the LCD OFF state to the same state they were in before entering the LCD OFF state.

5.3.3 Clarifying Procedures for Producing Sound from Headphones During an LCD OFF State [Required]

With DS systems, if a game is designed to produce sound through the headphones[3] during the LCD OFF state, this should be clearly indicated in the game instruction booklet (for example, “Insert the headphone jack *before* closing the DS.”).

The reason for this is that with the DS, there is no guarantee that sound will be played (depending on when the headphones are inserted, sound might not be played). With TWL systems, sound is guaranteed to play, even in the LCD OFF state, so there is no need to consider this section.

[3] Sound can be produced from headphones during an LCD OFF state using the following procedures.

- After inserting the headphone jack into the DS system while the DS system is open (in the LCD ON state), close the DS system to place it in the LCD OFF state.
- Insert the headphone jack while the DS system is closed and in the LCD OFF state. However, there is no guarantee that the DS system will produce any sound through the headphones.

- To reliably produce sound from headphones

  To produce sound from headphones even in the LCD OFF state, insert the headphone jack into the DS while the DS is open (in the LCD ON state), and then close the DS to put it in the LCD OFF state.

- To non-reliably produce sound from headphones

  Due to the design of the DS, there is no guarantee that sound will be produced from headphones when the headphone jack is inserted while the DS is closed and in the LCD OFF state.

5.3.4 Automatic LCD OFF Transition [Required]

You can implement a feature to automatically turn the LCD OFF when there are no button inputs for a specified period of time. However, if you do, you must also include an option that will allow the game player to disable this feature, and this feature must initially be set to disabled.

5.3.5 Recovery After Automatic Transition to LCD OFF State [Required]

When automatic transition has automatically turned the LCD OFF, ensure that any button press will immediately turn the LCD ON.

Optionally, Touch Screen input may also turn the LCD ON.

5.4 Microphone

5.4.1 Cautions When Implementing Microphone Power Control [Required]

Because it takes up to 3 seconds for microphone circuitry operation to stabilize after the power to the microphone is turned on or when moving from Sleep Mode or LCD OFF state to Active Mode, discard the microphone sampling results from this period without using them. (There is no need to stop sampling.)

However, if leaving the microphone off for 3 seconds after recovering from Sleep Mode or LCD OFF causes problems due to game specifications, use the backlight-off state when the system is closed.

5.4.2 Avoiding Frequent ON/OFF [Information]

Turn on the power to the microphone before a scene where the microphone is actually used and leave it on during that scene. By avoiding frequent microphone ON/OFF transitions, it is possible to reduce situations where the user has to wait for the microphone to be enabled.

5.5 Backlight

5.5.1 Initial Backlight State [Information]

When the system's power is turned on, the backlight is on for both screens.

In the launcher, the backlight can be turned on or off when using a DS, and the brightness of the backlight can be specified when using a DS Lite system or a TWL system. However, that setting cannot be determined from the application. When the game starts, the backlight status remains the same as that set in the launcher.

5.5.2 Automatically Switching the Backlight On and Off [Required]

Do not automatically switch the backlight on and off except in one of the following cases.

- When one of the screens is not being used, the backlight for that screen can be turned off.
- When the screen saver is running and the game player is not performing any operations, you can save power by temporarily turning the backlight off and turning it on as soon as any button is pressed.
- When the system is closed, you can turn off the backlight.

5.5.3 Do Not Allow Game Player to Turn Backlight Off [Required]

Do not give the game player a way of turning off the backlight, except when the system is closed.

5.6 Encouraging Power Conservation

5.6.1 Power Conservation When the System Is Closed [Required]

When the system is closed, transition to one of the following states. In doing so, place the system into the state that maximizes power conservation as much as possible without causing problems.

For example, you can use Sleep Mode most of the time. However, when DS communication is active, you can use LCD OFF.

- Transition to Sleep Mode (extremely large power conservation)
- Transition to LCD OFF state and turn off unnecessary modules individually (moderate power conservation)
- Turn the backlight off (small power conservation)

Table 5-1 shows the comparative battery lives for each state when the battery is fully charged (DS only).

Table 5-1 Battery Life Depending on the Power Conservation State

State	Approximate Battery Life	Comment
Sleep Mode	2 weeks	
LCD OFF State	Approximately 18 hours	Changes according to the state of the other modules
Backlight OFF	Approximately 12 hours	

5.6.2 Power Conservation When the System Is Opened [Recommended]

Power management for each module can be modified. It is recommended that power to unused modules be turned off.

5.7 System Power-Down

5.7.1 Prohibition of Automatic System Power-Downs [Required]

Get permission from the game player before turning the power to the system off. Prepare a confirmation screen for the power-down, and allow the player to cancel and return to the game when the player has mistakenly selected either of them.

However, there is no need to allow for cancellation for the cases noted in section 6.6.13 Process for Terminating Child Devices After Ending Download Play [Recommended].

5.7.2 Powering Down of DS During LCD OFF State Prohibited [Required]

When an application powers down the system, it must be in the LCD ON state. There is no guarantee that the DS will actually power down in the LCD OFF state. In rare instances, the DS can even restart.

The TWL system will always be powered down if the program attempts to turn the system off regardless of the LCD ON/OFF state.

6 DS Wireless Communications

6.1 Wireless-Enabled Mode and Wireless-Disabled Mode

6.1.1 Wireless-Enabled Mode and Wireless-Disabled Mode [Information]

You can set the TWL system to wireless-enabled mode and wireless-disabled mode.

"Wireless-enabled mode" refers to the state in which the feature to receive or transmit wireless signals can be used from a hardware perspective. Even when a system is in wireless-enabled mode, wireless signals are not actually being received or transmitted if DS Wireless Communications (described below) is turned off.

"Wireless-disabled mode" refers to the state in which the feature to receive or transmit wireless signals cannot be used from a hardware perspective. If a system is in wireless-disabled mode, wireless signals will not be received or transmitted, even if DS Wireless Communications (described below) is turned on.

Wireless mode can only be switched between enabled and disabled from System Settings.

6.2 Three States of DS Wireless Communications

6.2.1 DS Wireless Communications ON State [Information]

When DS Wireless Communications is on, wireless signals can be or are currently being received and transmitted by the program. Specifically, the DS Wireless Communications ON State is the period from when `WM_Enable` is run while in the DS Wireless Communications READY state to when `WM_Disable` is run.

If the TWL system is in wireless-disabled mode, wireless signals will not be received or transmitted, even if DS Wireless Communications is on.

With the Nintendo DS or Nintendo DS Lite system, if DS Wireless Communications is on, the system's power indicator LED will blink at a variable speed.

With the TWL system, the system’s power indicator LED is not affected by whether DS Wireless Communications is on or off. However, the wireless indicator LED will blink at a variable speed for approximately 2 seconds when sending wireless signals.

Supplemental Information

In the following cases, the wireless indicator LED will blink at a variable speed even when the application developer does not intend to send wireless signals. This is due to TWL system’s design specifications. Application support is therefore not needed in such cases.

- When wireless communication is turned off immediately after sending wireless signals

  The wireless indicator LED blinks at a variable speed for approximately 2 seconds even after wireless communication is turned off.

- When wireless communication is turned off immediately after disconnecting using `WM_Reset`

  The behavior described above will occur because the `WM_Reset` function’s disconnection notification signal is sent.

- When recovering from Sleep Mode

  The wireless indicator LED will blink once after recovering from Sleep Mode even if wireless communication is correctly turned off when transitioning to Sleep Mode.

6.2.2 DS Wireless Communications Receive-Only State [Information]

The “receive-only” state refers to the state added in NITRO-SDK version 4.2 in which wireless signals can only be received.

Specifically, the DS Wireless Communications Receive-Only state is the period from when `WM_EnableForListening` is run while in the DS Wireless Communications READY state to when `WM_Disable` is run.

The only difference between this state and the DS Wireless Communications ON state is that wireless signals cannot be sent. There is no difference in the power consumption related to receiving data.

If the TWL system is in wireless-disabled mode, wireless signals will not be received, even if DS Wireless Communications is on.

6.2.3 DS Wireless Communications OFF State [Information]

When DS Wireless Communications is off, wireless signals cannot be received or transmitted. Specifically, this is the period before `WM_Enable` is run or after `WM_Disable` is run.

With the Nintendo DS or Nintendo DS Lite systems, if DS Wireless Communications is off, the system's power indicator LED either will be steadily lit (when in Active Mode or the LCD is off) or will blink slowly (when in Sleep Mode). The power indicator LED of the TWL system is not affected by whether DS Wireless Communications is on or off. Furthermore, there is no separate LED for distinguishing between the on and off states.

6.3 DS Wireless Communications ON/OFF

6.3.1 State Immediately After Game Startup [Required]

DS Wireless Communications must not be turned on automatically by calling the `WM_Enable` function from the initialization process when a DS game is started. However, DS Wireless Communications can be turned on automatically, but only for when the program for the DS Download Play child device requires DS Wireless Communications immediately after the download completes (for example, games that require additional downloads or games that can only be played when networked). DS Wireless Communications must not be turned on automatically when the program for the DS Download Play child device does not require DS Wireless Communications immediately after the download completes (for example, for games that have modes for single game players).

6.3.2 DS Wireless Communications ON State [Required]

Turn DS Wireless Communications on only when the game player explicitly selects “Use DS Wireless Communications.” For example, display a message such as “Do you want to use DS wireless communications?” in advance and turn on DS Wireless Communications after the player agrees.

DS Wireless Communications may be turned off automatically according to the situation, but you must reconfirm with the game player before turning DS Wireless Communications on again.

For example, when DS Wireless Communications returns to an OFF state from an ON state, if execution returns to the menu screen prior to the one where the DS Wireless Icon (or user confirmation message) is displayed, when wireless communications are turned on you can always go through the menu where the DS Wireless Icon (or user confirmation message) is displayed.

6.3.3 Icon Display When Enabling DS Wireless Communication [Required]

You can use the designated DS Wireless Icon in conjunction with menu options, instead of text, to allow a game player to select and enable DS Wireless Communications. The DS Wireless Icon is included in NITRO/TWL-SDK (`$NitroSDK($TwlSDK)/data/wl_icons/`). See Figure 6-1.

Figure 6-1 DS Wireless Icon

If you are using the DS Wireless Icon, be aware of the following.

Do Not Alter the DS Wireless Icon

Use of this icon always indicates enabling DS Wireless Communications. When using the icon, maintain the original size, dot pattern, and coloring of the icon. If the icon appears incorrectly as a menu option, the player might not understand its purpose and may assume that the application began sending a wireless signal on its own.

If the associated menu option is not selected and the game player can adequately see that the icon is present, its role will sufficiently avoid confusion for the game player.

Sample usage of the DS Wireless Icon is shown in Figure 6-2. In this case, if "2 Player Start" or "4 Player Start" is selected, DS Wireless Communications is turned on, and the appropriate game mode starts. The power light also starts blinking at a variable rate on the Nintendo DS system. On TWL, the wireless indicator LED starts blinking when wireless signals are sent.

Figure 6-2 Sample Use of the DS Wireless Icon

6.3.4 Transitioning from Active Mode to Sleep Mode [Information]

Because the power state in Sleep Mode differs from that of Active Mode, be sure to turn off DS Wireless Communications when switching to Sleep Mode, as discussed in section 5.2.4 Mode Transitions During Communication [Required].

6.3.5 Transitioning from Sleep Mode to Active Mode [Information]

When returning to Active Mode, turn on DS Wireless Communications after getting permission from the

game player, as indicated in section 6.3.2 DS Wireless Communications ON State [Required]. (Do not turn on DS Wireless Communications automatically after returning to Active Mode.)

When turning on the DS Wireless Communications Receive-Only state, this restriction does not apply because the applicable guideline is section 6.5.1 Receive-Only Mode ON [Required].

6.3.6 Error Processing During the Initialization of DS Wireless Networking [Recommended]

Be sure to determine the processing results of the WM initialization functions (`WM_Init`, `WM_Enable`, and `WM_PowerOn`) and perform error processing. When the processing result passed to the WM initialization function callback functions is anything other than `WM_ERRCODE_SUCCESS`, do not perform any wireless networking processing. Also make sure that the game process can continue after displaying “DS Wireless Communications is not available.”

6.4 Reception Strength Icon

6.4.1 Reception Strength Icon [Required]

When the DS Wireless Communications connection is made (referred to as "linked," below), show the signal strength of the reception data using the Reception Strength Icons below. (The display method and location of the icons are not regulated.)

The Reception Strength Icons are included in NITRO/TWL-SDK (`$NitroSDK($TwlSDK)/data/wl_icons/`).

Table 6-1 Reception Strength Icons

Reception Signal Strength	Icon on Black Background	Icon on White Background
LEVEL 3		
LEVEL 2		
LEVEL 1		

Reception Signal Strength	Icon on Black Background	Icon on White Background
LEVEL 0		

Select either the black background or the white background icons, based on appearance in the given scene. Do not mix their usage in the same scene.

However, if you know in advance that the DS Wireless Communications link status will be extremely brief (as for chance encounters), it is acceptable to not display the Reception Strength Icons.

Hiding the Reception Strength Icons or showing a false icon may be allowed for special reasons, including not wanting the game player to be notified of changes in the signal strength (even when not in Chance Encounter Communication), or in situations when the player would not be upset if the signal strength was not displayed (for example, when a movie is playing or during an ending scene). In these cases, contact support@noa.com before proceeding.

6.4.2 Prohibition of Changing the Reception Strength Icon [Required]

Changing the size, dot pattern, or color scheme of the icons is prohibited. However, you are permitted to modify the colors slightly as long as the green, yellow, and red colors are distinguishable.

6.5 DS Wireless Communications Receive-Only Mode ON/OFF

6.5.1 Receive-Only Mode ON [Required]

In receive-only mode, it is guaranteed that wireless signals will not be sent, so unlike the “DS Wireless Communications ON State,” the receive-only state can be enabled without the player’s confirmation.

However, if the receive-only state is enabled without the player’s confirmation, do not perform any of the actions shown below, as they indicate the “DS Wireless Communications ON State.”

- Blinking of the power indicator LED (the wireless indicator LED on the TWL)
- Displaying the reception strength icons
- Displaying other screens that indicate that wireless communications are underway

If the receive-only state is enabled after the player’s confirmation, be sure to follow the guidelines below.

- Sections 6.3.2 DS Wireless Communications ON State [Required] and 6.3.3 Icon Display When Enabling DS Wireless Communication [Required]
- Section 6.4.1 Reception Strength Icon [Required]

6.6 Other

6.6.1 Library Use Compliance [Required]

When using DS Wireless Communications, use only the libraries supplied by Nintendo.

6.6.2 Using MAC Addresses [Required]

There are no guarantees regarding MAC addresses other than the fact that they are unique to each system. Therefore, although MAC addresses can be used as a means of identifying a communication partner, do not use them for any other purpose. For example, avoid using a MAC address to determine whether a networking partner is a Nintendo DS or TWL system.

6.6.3 Message Display for Broken Links [Required]

When gameplay becomes difficult due to a broken link, display a warning message such as "Communication Error" when the broken link is detected with NITRO/TWL-SDK's wireless API.

For example, if several Nintendo DS or TWL systems are linked and some child devices become disconnected, a warning message must be displayed on those child devices that gameplay cannot continue. However, the warning message is not required for those child or parent devices that are still linked and not greatly affected by the disconnection.

Some exceptions are granted. The message does not need to be displayed for special reasons, such as not wanting to notify the game player of the lost link, implying that DS Wireless Communications had occurred. If you are planning such a use, contact support@noa.com before proceeding.

6.6.4 Data Batch Size for MP Communications [Recommended]

We recommend that the total communication time for MP communication between the parent and all the children be limited to 5600 μs or less. Shorter times result in better communication results. Larger data sizes can also cause interference and problems with wireless connectivity, data reception, simultaneous data transmission, and power consumption.

To calculate total communication time, see the Wireless Communications Time Calculation Sheet in Charts and Information located in the Wireless Manager (WM) section of the *NITRO/TWL-SDK Function Reference Manual*.

The following are sample calculations.

- MP communication every sixtieth of a second with one parent per 15 children
  Parent: 128 bytes or less
  Child: 16 bytes or less
- Data sharing with one parent device/15 child devices
  Data to be shared: 444 bytes
  Parent: 64 bytes
  Child: 8 bytes

6.6.5 Distributed Processing [Recommended]

We recommend that processing be distributed with data sharing to decrease the communication data size.

6.6.6 Power Consumption Control [Recommended]

To reduce power consumption, put the system in a state that consumes less power (as shown in Table 6-2).

Table 6-2 Power Consumption by State

Power Consumed	State (Definitions from Nintendo Libraries)	
More	SCAN CHILD DCF_CHILD	(WM_STATE_SCAN) (WM_STATE_CHILD) (WM_STATE_DCF_CHILD)
	PARENT MP_PARENT MP_CHILD	(WM_STATE_PARENT) (WM_STATE_MP_PARENT) (WM_STATE_MP_CHILD)
	IDLE	(WM_STATE_IDLE)
Less	STOP READY	(WM_STATE_STOP) (WM_STATE_READY)

6.6.7 GGID Application [Required]

Use only the GGID number provided for each game title by Nintendo of America Inc. To get your official GGID, contact submissions@noa.nintendo.com.

Note: Do not use numbers that are not provided by Nintendo.

Private GGIDs can be used when testing or in the early stages of development. However, private GGIDs are allocated for testing, not for individual game titles. Consequently, problems may occur when connecting from another test application that uses a private GGID.

Private GGID: `0x003FFF00 – 0x003FFFFF` (256 GGIDs)

6.6.8 TGID Uses [Required]

To avoid mistakenly establishing a connection with the old connection, ensure that a DS Wireless Communications parent device is assigned a different TGID value each time. Even after the unit's power is reset, the TGID value must be different than the previous value used before the reset took place.

Specifically, use the `WM_GetNextTgid` function in NITRO/TWL-SDK to get a different value at each invocation.

For DS Download Play, it is possible to configure a different TGID each time without handling the TGID in the application by specifying `MB_TGID_AUTO` for the `tgid` argument of the `MB_Init` function.

6.6.9 Prohibition of Connecting to Other Publishers' Software [Required]

Games are prohibited from connecting to games produced by other publishers without the approval of Nintendo.

If you are planning such use, contact support@noa.com before proceeding.

6.6.10 Connection Between Different Remastered Versions [Required]

Ensure that the software connects and communicates with different remastered versions of the same software without any trouble.

6.6.11 When Too Many Game Players Attempt to Connect [Required]

When more child devices attempt to connect than is allowed by the game, ensure there are no communication problems between a parent and the allowable number of children.

Also, notify the game players (on the child devices that are not allowed to connect) that the connection failed.

Note: There is no need to inform players in Chance Encounter Communication.

6.6.12 Access to Game Cards During Download Play [Required]

In principle, access to any area of a DS Game Card produced by another publisher is prohibited.

Allow access only to the backup memory region of a DS Game Card produced by your company. If you plan to access any region other than backup memory, contact support@noa.com before proceeding.

To determine whether a DS Game Card was produced by your company, refer to the ROM internal registration information stored in main memory. Use the NITRO/TWL-SDK's `CARD_GetRomHeader` function to get the address of the ROM internal registration information.

6.6.13 Process for Terminating Child Devices After Ending Download Play [Recommended]

When a Download Play child device does not perform independent processes after Download Play terminates normally, turn the power off after the player consents.

6.6.14 Usable Wireless Channels [Required]

In local game mode, use one of the channels returned by the `WM_GetAllowedChannel` function. For example, if the `WM_GetAllowedChannel` function returns Channels 1, 7, and 13, use Channel 1, 7, or 13. If the `WM_GetAllowedChannel` function returns 0, DS Wireless Communications is not possible because there are no available channels.

6.6.15 Prohibition of Using Wireless Channels That Are Always Fixed [Required]

6.6.15.1 Parent Devices for DS Wireless Communication

When selecting the actual channel to use from the allowed wireless channels, specifications that always use, or always do not use, specific channels are prohibited.

For more information on how to select the actual channel to use from the allowed wireless channels, see section 6.6.16 Check the Wireless State Before Beginning Parent Device Operation [Recommended].

6.6.15.2 Child Devices for DS Wireless Communication

When scanning for parent devices, scan all allowed wireless channels. Avoid specifications that scan or do not scan only specific channels.

6.6.16 Check the Wireless State Before Beginning Parent Device Operation [Recommended]

When selecting a channel from the allowed wireless channels, check the wireless states of the channels, using `WM_MeasureChannel`. The game should select the least occupied channel for the wireless link.

6.6.17 Update Display for Parent Information [Recommended]

When the parent device list is displayed on the child device, continuously check the parent information. Update the parent device list that is displayed whenever a change is made. Do not continue to display a parent device that is no longer accepting child devices.

6.6.18 Prohibition of Downloading Programs [Required]

Applications (ARM core native code) can be downloaded only with DS Download Play. No other wireless downloading of programs or running of downloaded programs is permitted. However, when the followings are met, the use of wireless overlays is allowed.

6.6.18.1 Use Prescribed Library Functions

Use the library functions listed in Table 6-3. These functions are available in NITRO/TWL-SDK.

Table 6-3 Overlay Functions

Function Name	Conditions for Use
`FS_AttachOverlayTable`	Always
`FS_LoadOverlay`	When performing synchronous load processes
`FS_LoadOverlayInfo`	When performing asynchronous load processes
`FS_LoadOverlayImage` or `FSLoadOverlayImageAsync`	
`FS_StartOverlay`	

Use the `NITRO_DIGEST` build option or specify the `-a` option when using the `compstatic.exe` tool because validity is determined in the SDK.

6.6.18.2 Download Overlay from Same Parent Device

The overlay module must be downloaded from the same parent device as that from which the static module was downloaded.

The parent device can easily be identified by its MAC address.

6.6.19 Parent Data Location During Clone Boot [Required]

When performing clone boot, the application data located in `0x5000` to `0x6FFF` of the DS Game Card is treated as parent-specific data. To maintain security, place application data in this region that is used only by the parent and not by the children.

6.6.20 Prohibition of Notification of Data Distribution Support by DS Download Stations, or Through Other Means [Recommended]

When data distribution is supported by a DS Download Station, or through other means, do not inform the user about this in any printed material packaged with the software. The user should also not be informed in pre-packaged printed material that there are elements, such as items and events, that can only be obtained through data distributed by a DS Download Station or through other means.

To explain, depending on the time of purchase, it is possible that the distribution may have already ended or that it will cease after the software is purchased.

Note: "DS Download Station" refers to equipment that Nintendo has installed in retail outlets and other locations that provide various Nintendo DS services. They are known as "DS Stations" in Japan and Korea, "DS Download Stations" in the USA and Europe, and "Nintendo Wi-Fi Connection Hotspots" in Australia. This includes Nintendo Zone locations as well.

6.7 PictoChat Search

6.7.1 Starting PictoChat Search [Required]

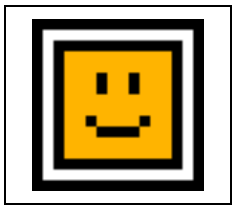
Perform PictoChat Search only when the game player has explicitly selected "Search for PictoChat."

When starting PictoChat search while DS Wireless Communications is off, display the message and icon described in section 6.3.2 DS Wireless Communications ON State [Required].

6.7.2 Chat Icon Display [Required]

When PictoChat Search finds a PictoChat room, display the chat icon in Figure 6-3 somewhere on the screen. The icon is provided in NITRO/TWL-SDK, located in the `$NitroSDK($TwlSDK)/data/cht_data/` directory.

Figure 6-3 Chat Icon



6.7.3 Chat Icon Modification [Required]

The chat icon design (that is, dot pattern, color palette, brightness, or size) may not be modified. However, creating minor visual effects that do not modify the design (for example, blinking or shaking the icon) is permissible.

In addition, when a PictoChat room is not found, the icon can be displayed to indicate that fact in ways that will not confuse the game player, such as including a grayed-out display, a display of smaller size, or a darkened display.

6.7.4 Chat Sound Playback [Required]

If playing a sound effect when the icon is displayed, use the customized sound included in NITRO/TWL-SDK. The file is located in the `$Nitro($TwlSDK)/data/cht_data/PictoChatSearcherSound/` directory.

The icon can also be displayed without any sound.

6.7.5 Prohibition of Consecutive Searches [Recommended]

Do not use PictoChat Search continuously (for example, in every frame) except in special circumstances.

Each time PictoChat Search is used, the parent device must be scanned in advance. Because the wireless circuitry in the SCAN state uses more power than in any other state, continuous scans of the parent device rapidly consumes the remaining power in the Nintendo DS Battery Pak. Therefore, we strongly recommend entering the STOP state for a fixed waiting period to reduce power consumption.

For reference, *Yoshi Touch & Go* has a wait period of 7.6 seconds (456 frames) after scanning for 2.4 seconds (144 frames).

6.7.6 Information Disclosure [Information]

You can decide whether each game references and uses the PictoChat information obtained from PictoChat Search in the game. There are no restrictions on using referenced data.

6.7.7 Signal Strength Icon Display [Information]

Signal strength icons do not need to be displayed because PictoChat search can be used only before DS Wireless Communications is linked. However, a signal strength icon can be displayed using the signal strength for the PictoChat room that is found.

6.7.8 Touching the Chat Icon [Information]

The chat icon must be displayed, but it does not need to function as a button.

For example, although touching the chat icon in *Yoshi Touch & Go* causes a special window to appear, this feature is not required for all games.

6.7.9 Power-Down Process When Transitioning to PictoChat [Information]

When implementing a power-down process before transitioning to a detected PictoChat, follow the guidelines in section 5.7.1 Prohibition of Automatic System Power-Downs [Required].

The following cautions also apply.

- Do not forcibly power-down without confirmation from the game player.
- If the game player chooses to power-down by mistake, let the game player resume the game by providing a cancel option on the Power-Down Confirmation Screen.

6.8 Chance Encounter Mode

6.8.1 Auto-Save for Chance Encounter Mode Communication [Recommended]

If your game auto-saves while in the Chance Encounter Mode (data is transmitted while the Nintendo DS system is closed), display a message immediately before entering the mode informing the game player that “Auto-save will be performed.” and “The data won’t be saved if the power is turned off during auto-save or if the Game Card is removed.”

6.8.2 Support for Chance Encounter Relay Stations [Required]

When using the Chance Encounter Communication library (WXC library) provided by TWL-SDK to implement the Chance Encounter Communication feature, be sure to provide appropriate support so that no problems occur even when data is exchanged via a “Chance Encounter relay station.”

Specifically, the application should continue to run normally even if any of the problems, specific to using a Chance Encounter relay station, listed below arise.

- Duplication of Chance Encounter data

  Enact measures against duplication either by exchanging data only where it does not matter if multiple instances exist in the game or by including a unique ID number in Chance Encounter data.

- Loss of Chance Encounter data

  Only exchange data if data loss is acceptable.

- Reception of invalid Chance Encounter data

  If invalid Chance Encounter data (data with a size of 0 bytes) is received, either treat it as if no Chance Encounter communication has occurred and cancel processing, or prepare substitute data on the application side in advance.

Chance Encounter relay stations automatically support all applications that use the WXC library. To run these checks, use the `RelayStation.srl` file included in the package for TWL-SDK versions 5.3 and later. For North American titles, also check using the `DSDownloadStation.srl` test program included in TWL-SDK versions 5.4 and later. This is because the DS Download Station in North America can also serve as a Chance Encounter relay station.

Supplemental Information

All applications that use the WXC library automatically support Chance Encounter relay stations.

7 Other

7.1 Main Memory

7.1.1 Main Memory Initialization [Required]

The content of main memory when a game starts is uncertain, so do not use uninitialized main memory assuming that it has specific initial values.

7.1.2 Main Memory Protection [Required]

Do not write to the following specified regions of main memory when starting a game because data cannot be reloaded to these regions during gameplay. See Table 7-1 for details.

Table 7-1 Regions That Cannot Be Reloaded During Gameplay

Region Name	Address	Size
Secure region	0x02000000 – 0x02003FFF	16 KB
DS setup data region	0x027FFC80 – 0x027FFDFF	384 B
ROM registration data region	0x027FFE00 – 0x027FFF7F	384 B

7.2 Display of Legal Rights

7.2.1 Compliance with Legal Rights Display [Required]

A separate indication of legal rights is required for some of the library tools provided by Nintendo. Use the specified method for display when using a library tool or other item requiring a legal rights display.

Note that the legal display can be shown in various formats, including display during game startup, in the instruction booklet, and on the packaging. For details, see the instructions for the library tools.

7.3 Display of *Licensed by Nintendo* Logo

This section describes the guidelines for displaying the Licensed by Nintendo logo as a measure against unauthorized applications.

It is the policy of Nintendo to support authorized businesses by eliminating unauthorized applications from the market. Displaying the *Licensed by Nintendo* logo is an effective means for implementing that policy. For further details on Nintendo's policy regarding unauthorized applications, see section 8.2.1 Nintendo Antipiracy Policy [Information].

For details on Nintendo titles and titles sold under license purchased by or consigned to Nintendo license, see section 8.2 Display of Logo as an Antipiracy Measure When Starting an Application in this documentation.

7.3.1 Displaying the Specified Logo at Application Startup [Required]

Always display the *Licensed by Nintendo* logo (shown below) when starting the application, and before starting the game. As long as the specified logo appears before the game starts, there is no particular order for the display of that logo.

Figure 7-1 Licensed by Nintendo Logo Image

The specified logo does not need to be displayed for DSiWare titles and download play titles. Nintendo has determined that there is a low probability that the illegal copying of DSiWare titles and download play applications will become a serious problem. Therefore, Nintendo wants to put a higher priority on shortening startup times to provide a more user-friendly approach to the game experience, rather than extending startup times to display the specified logo as a measure against unauthorized applications.

Observe the following points when using the specified logo.

- Use images provided by Nintendo.
- Do not alter the logo images.

  Use the images as they are provided, without scaling or rotating them, and without changing the transparency or the aspect ratio.
- Follow the directions provided in the image data specifications in the package when using the logo image.

7.3.2 Displaying the Licensed by Nintendo Logo Image [Required]

Adhere to the following points when displaying the specified logo image at application startup.

- Do not use any animation; only fade-in/fade-out effects can be applied.
- Do not play any sounds during the logo's display.
- Display the logo motionless for at least 1 second.

  However, if you are implementing a skip feature for the logo (see the recommendations below), it is acceptable to transition to the next screen even if the display time is less than 1 second, but only when the user has elected to skip the logo via user input.

The following points are recommended.

- Implement a skip feature for the logo.

  It is recommended that a skip feature allow users to skip the logo display at any time during its display. Allow the user to skip the logo display by using touch panel or button input. Apply the fade-out effect to transition to the next screen. (Generally, the fade-out time should be approximately 0.25 seconds.)

- Implement a fade in/fade out feature.

  Fade-in and fade-out of the display should take 0.25 seconds each, separate from the time for which the logo is displayed motionlessly..

Also consider the following information.

- The logo may be displayed on either the top screen or the bottom screen.
- There are no restrictions on the display content for the screen not displaying the logo.
- The system does not need to return to the logo display screen after a software reset has been applied.

7.4 Health and Safety

7.4.1 Prohibition of Health and Safety Warning Screen Display by Application [Required]

The DS and TWL systems display the health and safety warning screen when the user system starts. This onscreen warning directs the consumer to the *Nintendo DS Health & Safety Precautions Booklet*. Therefore, do not display any other warning message on the application side.

7.5 Image Methods for Photosensitivity

7.5.1 About Photosensitivity and These Guidelines [Information]

These guidelines are intended to be used in the development of video games for the Nintendo DS platform. Unlike films and television programs, which produce only one sequence of images each time they are played, one video game can produce an infinite sequence of images. This is because video games are interactive, so that each time a game is played, a different sequence of pictures and images is displayed, depending on the choices and inputs made by the game's player or (in the case of multiplayer games) players. In addition, the luminance of images displayed in three-dimensional games is not simply those of the video game artist's original image but the result of the game's programming processes, which render the image in a three-dimensional form in a three-dimensional space, with variations of light, shadow, distance, orientation, and player perspective. These variables are also affected by choices made by the individual player.

Because of these infinite variations that are possible within a single game, it may be possible with many games that certain player inputs cause screen imagery that exceed the suggested limits described below. Try to design games that comply with the limits when the games are played with normal gaming strategies and inputs, with the recognition that it may still be possible for player inputs to cause sequences of images that may exceed the suggested limits, particularly if the gameplay is idiosyncratic or counterintuitive. Compliance with these guidelines or with any other guidelines that have been or will be developed may reduce the incidence of photosensitive seizures, but it will not eliminate them or eliminate seizures that occur during video gameplay from causes other than the visual content of the games.

These guidelines attempt to take what medical science has learned about the images that can trigger photosensitive seizures in susceptible individuals and, in a few paragraphs, apply it to the infinite variety of imagery produced by modern video game technology. Medical research in this area is still developing, and the particular susceptibilities of photosensitive persons vary widely from individual to individual.

As the developers of other guidelines have recognized, it is impossible to craft guidelines that eliminate

all risk of seizures, and the measures taken should be proportionate to the risks involved and should not stifle developers' creativity, imagination, or freedom of expression. It may be possible that a game, even though complying with the guidelines, may produce a problematic sequence. Alternatively, a sequence out of compliance with the guidelines may not be problematic in its context. It is therefore recommended that all games, before final release, be reviewed by one or more persons knowledgeable about photosensitivity, who can check for potentially problematic sequences. It is also recommended that such persons review decisions to deviate from the guidelines when that may be desirable for the artistic or creative imperatives of a game.

These guidelines use the following lighting technology terms.

Luminance is a quantifiable measure of the observed brightness of an object—in this case, of a video screen.

Nits is a shorthand name for candelas per square meter, the metric system's measurement unit for luminance. (A candela is a measure of the candle power or angular density of light from a source).

A *photometer* is a device that measures the luminance of an object. A photometer with CIEEE characteristics is calibrated to match the response to various color spectra of the average human eye.

The *RGB* value of a color in a video display is a three-number representation of the intensities of, respectively, the red, green and blue elements of the display that combine to form the color. Each value is a number from 0 to 63. Consequently, an RGB value of (0,0,0) is black; and RGB value of (63,63,63) is white; and an RGB value of (63,0,0) is pure red.

A video with sample footage has been prepared to illustrate and supplement the guidelines. When a portion of the guidelines is illustrated by the video, the guidelines include a reference to the relevant section of the video. The video provides supplemental illustrations and is not an essential part of the guidelines, which can be used without the video.

7.5.2 Restrictions on Flashing Images and Lights [Recommended]

Do not use a sequence of images that does all of the following.

- Flashes so that the change in luminance of the flash exceeds 20 nits (candelas/square meter)
- Occupies more than 1/4 of either screen or more than 1/8 of the combined areas of both screens
- Has more than 3 flashes occurring in any 1-second period

The sample video contains examples of luminance changes of different magnitudes in sections 1 (1), 1 (2), and 1 (3).

A flash is a pair of opposing changes in luminance: that is, an increase in luminance followed by a decrease or a decrease followed by an increase. If the luminance measurements of successive flashes over time are plotted using *x*- and *y*-coordinates (*x* = time; *y* = luminance), the shape of the resulting plot appears in profile as alternating peaks (frames of localized maximum brightness) and valleys (frames of localized minimum brightness). Flashes should be evaluated for the change in luminance between adjacent peaks and valleys. No more than three of these peaks (or, alternatively, no more than three valleys) should occur in any 60 consecutive frames.

Screen luminance can be measured or calculated as described in section 7.5.6 Screen Brightness Calculations [Information].

7.5.3 Restrictions on Flashing Saturated Red Colors [Recommended]

Do not use a sequence of images with all of the following:

- The images produce flashes (regardless of the change in luminance of the flashes).

- One of the images contains saturated red.
- The saturated red occupies more than one-eighth of either screen or more than one-sixteenth of the combined areas of both screens.
- More than 3 flashes occur in any 1-second period.

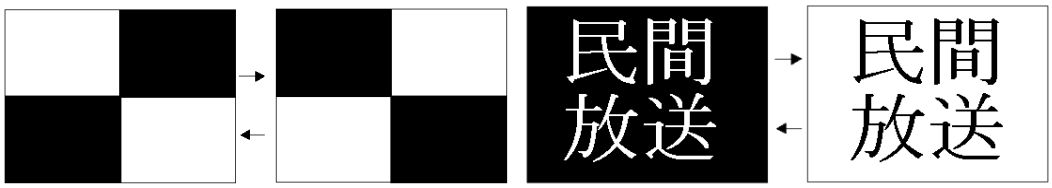
The sample video contains examples of red flashing in sections 2 (1), 2 (2), and 2 (3).

Saturated red is a color whose RGB value for red is greater than 85 percent of the sum of the color's RGB values.

7.5.4 Restrictions on Image Reversals [Recommended]

If the luminance of the elements of an image that occupies more than one-fourth of either screen, or more than one-eighth of the combined areas of both screens, are switched or interchanged (for example, switching between the negative and positive of an image or black and white images in which the black turns white and the white turns black, as in Figure 8-1), the changes in luminance should not exceed 20 nits or occur at a rate faster than that allowed for flashing in section 7.5.2 Restrictions on Flashing Images and Lights [Recommended].

Figure 7-2 Black and White Reversal



The sample video contains examples of images with switching luminance in sections 3 (1) and 3 (2).

7.5.5 Restrictions on Regular Patterns [Recommended]

Do not use an image that does all of the following.

- Consists of striped patterns composed of parallel lines or dots or other regular elements with distinct edges, such as the samples below
- Has high contrast between the bright and dark elements of the pattern, as defined below
- Occupies more than one-fourth of either screen or more than one-eighth of the combined areas of both screens
- Has more than five light-dark pairs of stripes in any orientation

An image has high contrast when it meets either of the following conditions.

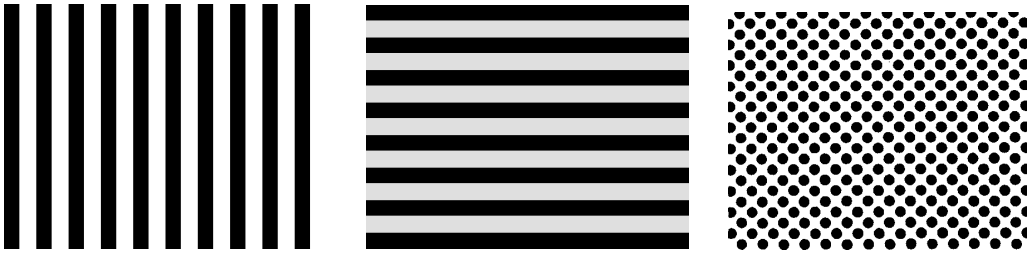
- The luminance of the brighter element of the pattern is 30 nits or more, and its contrast is greater than 40 percent. Contrast is $(L1-L2)/(L1+L2)$, where $L1$ is the luminance of the brighter element of the pattern and $L2$ is the luminance of the darker.
- The luminance of the brighter element of the pattern is less than 30 nits, and the difference in luminance between the brighter and darker elements ($L1-L2$) is 17 nits or more.

The sample video contains examples of patterns in sections 4 (1), 4 (2), 4 (3), and 4 (4).

The stripes may be parallel or radial, curved or straight, black and white or a combination of colors. Avoid especially stripes that oscillate or flash and moving stripes that change direction. Do not switch the luminance of the lighter and darker stripes (so that the dark become light and vice versa). Striped

patterns that flow smoothly across, into, or out of the screen in one direction may be used. Checkerboard patterns and plaids are acceptable.

Figure 7-3 Stripes and Dots



7.5.6 Screen Brightness Calculations [Information]

Screen luminance can be measured directly from a DS device or from a CRT monitor emulating a DS game with a hand-held spot photometer with a CIE characteristic designed for making measurements from a television screen. The screen brightness on a Nintendo DSi device can also be calculated from RGB values input to the LCD as indicated in the formula below.

DS Game Cards can also be used in the Nintendo DSi device, so calculations and measurements of screen brightness should assume the brightness values for the Nintendo DSi device because its display is brighter than that of the Nintendo DS or DS Lite devices.

The following equation shows how this is calculated.

$$T_{(RGB)} = 65.1 \times \left(\frac{R}{63}\right)^2 + 165.0 \times \left(\frac{G}{63}\right)^2 + 30.9 \times \left(\frac{B}{63}\right)^2 + 0.5$$

(T = screen brightness (in candelas/m^2) when the Nintendo DSi device is set to maximum brightness, R = level of red gradations, G = level of green gradations, B = level of blue gradations). Gradations are indicated as an integer ranging from 0 to 63.

7.6 Image Methods

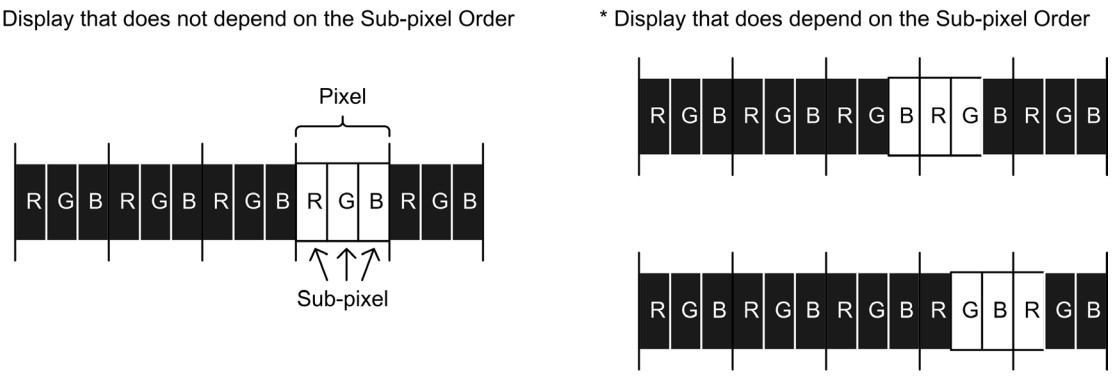
7.6.1 Screen Display Independent of the LCD Sub-Pixel Order [Recommended]

We recommend using a screen display that does not depend on the LCD sub-pixel order.

For the DS, LCD sub-pixels are in R-G-B order (from the left) for the upper screen and in B-G-R order (from the left) for the lower screen. For the DS Lite and the TWL system, both the upper and lower screens use B-G-R. However, these orders may be changed in the future.

For example, when displaying a one-pixel white point on a black background, if the group of sub-pixels that span the pixel is treated as a single pixel and is displayed as shown on the right of Figure 7-3, that display is dependent on the sub-pixel order.

Figure 7-4 Example Displays That Depend and Do Not Depend on Sub-Pixel Order



7.6.2 Displaying Captured Images [Required]

When a 3D image is captured using the display capture feature, the least significant bits of the original RGB=(6,6,6) image data are set to zero so that the resulting image uses RGB=(5,5,5).

Do not alternate between displaying the original image and the captured image because this might cause flickering to occur on certain LCDs.

Consequently, captured images must always be displayed when a 3D image is shown on both the upper and lower screens.

For a sample implementation, see the `Sub_Double3D` demo in TWL-SDK 5.1 and later or NITRO-SDK 4.2 patch plus 6 and later.

7.7 Software Reset

7.7.1 Software Reset Button Definition [Required]

When implementing a software reset function, use only the START + SELECT + L Button + R Button simultaneous combination. Do not use this button combination for any other purpose.

7.7.2 Reset During Backup and Communication [Required]

When writing to backup memory, be sure to reset the software only after the backup process has ended. During DS Wireless Communications, reset the software only after halting communications and after performing the procedure that restores the WM library to its pre-initialized state.

(For information on the procedure that restores the WM library to its pre-initialized state, see `WM_End` in the *NITRO/TWL-SDK Function Reference Manual*.)

7.7.3 Prohibit Resets on Child Devices During DS Download Play [Required]

The NITRO/TWL-SDK reset function, `OS_ResetSystem`, cannot be used for child devices during DS Download Play. Use of this function causes the game to halt.

7.8 Demo Screens

7.8.1 Demo Screen Looping [Required]

Demo screens can be looped day and night at stores, so ensure that errors in the demo screen (or title

screen if there is no demo screen) do not occur over a period of at least 24 hours. If a counter (or something similar) is used in the demo, make sure it does not overflow.

7.9 Master ROM

7.9.1 NITRO/TWL-SDK Version Used in the Master ROM [Required]

When submitting Master ROMs, you must use either the version of NITRO/TWL-SDK designated by Nintendo or a more recent version. The version designated by Nintendo will depend on when your Master ROM is being submitted and will be announced separately on WarioWorld.

7.9.2 Master ROM Compile Target [Required]

When providing a Master ROM, it must be built with the FINALROM option.

For details about the compile target, see “Description of the Compile Target” in the “Related Information” section of the *NITRO/TWL-SDK Function Reference Manual*.

7.10 Terminology

7.10.1 Naming Standardization [Required]

Names used for system hardware and hardware part names, names related to operations, names of peripheral devices, and other names should conform to the correct terms given in Nintendo DS Terminology and Nintendo DSi Terminology.

7.11 Applications for China

Use SDK version TWL-SDK 5.2 or a later version to submit Master ROMs for Chinese applications. Submitting a Master ROM that uses the NITRO-SDK is prohibited.

7.11.1 System Initialization Function [Information]

Do not use the `OS_Init` function to initialize the system in applications for China. Use the `OS_InitChina` function instead.

7.11.2 OS_InitChina Arguments [Required]

When using the `OS_InitChina` function, get the ISBN code and other pertinent codes issued by the Chinese government and specify the strings in the appropriate format. Make the appropriate settings that correspond to the method of use.

When creating the master ROM, do not specify the `OS_CHINA_ISBN_CHECK_ROM` function for the censorship ROM in the second argument.

8 Nintendo Titles

Guidelines that only target Nintendo titles are recorded in this chapter. Nintendo titles must adhere to the guidelines printed in this chapter.

8.1 Microphone Tests

8.1.1 Implementation of the Microphone Test Feature [Required]

In section 4.3.6 User Feedback for the Microphone Input State [Recommended], feedback to the user concerning the microphone input state is [Recommended]. Nevertheless, games published by Nintendo that use microphone input must implement a feature (hereafter, “microphone test”) to display the microphone input state in stages. Contact support@noa.com in advance if implementing the aforementioned feature is difficult, such as when microphone input is a hidden game element.

The requested specifications for this feature are shown below. See `MicTestSample`, provided separately, for a sample of program implementation.

8.1.2 Transitioning to the Microphone Test [Required]

Use a basic user interface (UI) by which the player can access the microphone test within a few levels of menus from the title screen (for example, from the game’s title screen, select **Options** and then **Microphone Test**). If for some reason this type of implementation is not possible, provide a shortcut feature to transition to the microphone test and note this method in the instruction manual. For example, the microphone test could be started by simultaneously pressing the A Button, B Button, X Button, and Y Button when the game is started (the button combination presented is an arbitrary example).

This is to prevent the microphone test from being usable unless specific in-game conditions have been met.

8.1.3 Microphone Test Screen Message Display [Required]

Display a message on the Microphone Test Screen stating “Speak in the direction of the system microphone.” You may change the message to one that better fits the game environment, as appropriate (for example, in a case where speech is not used in-game).

8.1.4 Confirming the Microphone Input Level [Required]

When testing the microphone, allow the microphone input level to be measured into five levels. So that users can easily confirm the measured microphone input level, display it continually for some time.

The five input levels are measured as follows.

- Set the gain to `PM_AMPGAIN_80` (a factor of 80) using `PM_SetAmpGain`.
- Given that the valid range for values in the 8-bit `unsigned char` sampling buffer is between 0 and 255, find the maximum value by subtracting data under 128 from 256 (waveform level inversion). Measure data obtained in this way with divisions similar to the following.

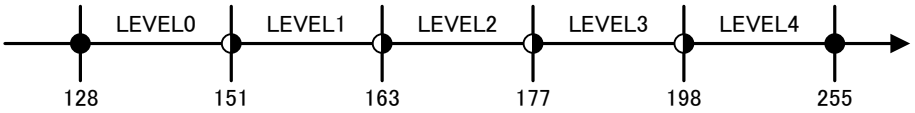


Table 8-1 Microphone Input Levels

Input Level	Sample Values
LEVEL 4	198–255
LEVEL 3	177–197
LEVEL 2	163–176
LEVEL 1	151–162
LEVEL 0	128–150

8.2 Display of Logo as an Antipiracy Measure When Starting an Application

This section describes the guidelines for displaying the logo as a measure against unauthorized applications when starting the application. This applies to Nintendo titles, titles for which sales licenses have been purchased by Nintendo from the software manufacturer, and titles sold under consignment of a sales license.

In this section, “specified logo” refers to the logo used as a measure against unauthorized applications that should be shown when starting the application.

8.2.1 Nintendo Antipiracy Policy [Information]

It is the policy of Nintendo to support authorized businesses by eliminating unauthorized applications from the market. Exercising Nintendo's trademark rights is one extremely effective tool for achieving that goal. Worldwide trademark laws tend to protect logos more strongly than ordinary text. Therefore, as one part of our efforts to counter the growing worldwide problem of copied or unauthorized software applications, Nintendo’s specified logo image must be displayed in a manner that corresponds to the application format.

Nintendo can claim infringement of its trademark rights by unauthorized software more effectively and more swiftly if the specified logo image, including the Nintendo logo, is displayed. For example, if an unauthorized software application, such as copied or pirated software, incorporates the Nintendo logo anywhere, Nintendo can take action in the form of a damages lawsuit against any purveyor of such software for infringement based on our trademark rights.

8.2.2 Displaying the Appropriate Logo at the Startup of the Application [Required]

Display the logo image that corresponds to the type of application before starting the game when the application is started. As long as the specified logo appears before the game starts, there is no particular order for the display of that logo.

The following table shows the logo for each type of application.

Table 8-2 Specified Logo Image by Application Type

For Nintendo Titles	For Titles that Use or Display the *Published by Nintendo* Logo
	

The specified logo image does not need to be displayed for DSiWare titles and download play titles. Nintendo believes that there is a low probability that illegal copying of DSiWare titles and download play applications will become a serious problem. Therefore, Nintendo wants to put a higher priority on shortening startup times to provide a more user-friendly approach to the game experience, rather than extending startup times to display a specified logo as a measure against unauthorized applications.

Observe the following points for the use of the specified logo.

- Use images provided by Nintendo.
- Do not alter the logo images.

  Use the images as they are provided, without scaling or rotating them, and without changing the transparency or the aspect ratio.
- Follow the directions provided in the image data specifications in the package when using the logo image.

8.2.3 Displaying the Logo Image [Required]

Adhere to the following points when displaying the specified logo image at application startup.

- Do not use any animation; only fade-in/fade-out effects can be applied.
- Do not play any sounds during the logo's display.
- Display the logo motionless for at least 1 second.

  However, if you are implementing a skip feature for the logo (see the recommendations below), it is acceptable to transition to the next screen even if the display time is less than 1 second, but only when the user has elected to skip the logo via user input.

The following points are recommended.

- Implement a skip feature for the logo.

  It is recommended that a skip feature allow users to skip the logo display at any time during its display. Allow the user to skip the logo display by using touch panel or button input. Apply the fade-out effect to transition to the next screen. (Generally, the fade-out time should be approximately 0.25 seconds.)
- Implement a fade-in/fade-out feature.

  Fade-in and fade-out of the display should take 0.25 seconds each, separate from the time for which the logo is displayed motionlessly.

Also consider the following information.

- The logo may be displayed on either the top screen or the bottom screen.
- There are no restrictions on the display content for the screen not displaying the logo.
- The system does not need to return to the logo display screen after a software reset has been applied.

8.3 Nintendo Titles for China

8.3.1 Publisher Notation for Nintendo Titles for China [Required]

When selling Nintendo titles in China, use "Nintendo/iQue" as the publisher.

Past Revision History

Version	Revision Date	Description
2.0.8a	2009/09/08	• Changed “DS Single-Card Play” to “DS Download Play.”
2.0.8	2008/12/22	• Deleted description of FRAM device that is not part of the line-up from sections 2.5.1.1 DS Cards and 2.5.4.1 Game Cards. • Added an explanation that banner display verification of the TWL Launcher screen is necessary (and that there is a substitute method for performing this verification using the Nintendo DS instead of the TWL) in section 3.3.1 Banner Display Verification on the Launcher Screen [Required]. • Corrected SDK version notation in section 4.3 Microphone. • Changed screen brightness calculations to apply to the TWL system in section 7.5.6 Screen Brightness Calculations [Information]. • Revised section 7.6.2 Displaying Captured Images [Recommended] and changed its importance to [Required].
2.0.7	2008/09/29	• Divided 4.3.2 Preventing Erroneous Determination of Microphone Input [Required] into subsections 4.3.2.1 Ranges in Which Microphone Input and 4.3.2.2 Guaranteed Input Range, and redefined the rated values for the different SDK versions. • Added section 4.3.2.3 Preventing Erroneous Microphone Input Due to Speaker Output. • In section 6.2.2 DS Wireless Communications ON State [Required], changed the text to reflect the existence of the receive-only mode of DS Wireless Communications. • In section 6.5.1 Transitioning from Active Mode to Sleep Mode [Information], corrected the part about the power supply to the wireless module being stopped during Sleep Mode. • In section 8.1.1.3 Confirming the Microphone Input Level, changed the definitions for microphone input levels 0 through 4.
2.0.6	2008/06/17	• In section 2.5.14 Verification of the DS Card Backup Memory [Required], clarified the previously vague reference to the timing of the process. • Changed "Touch Panel" to "Touch Screen" in sections 4.2.1 Touch Screen Chattering [Information], 4.2.4 Prohibition of Calibration Values Estimation [Required], 4.5.1 Device Input when the DS is Closed [Required], and 5.5.2 Automatically Switching the Backlight On and Off [Required]. • Added section 4.2.2 Durability of the Touch Screen [Information]. • Added section 6.1 The Three States of DS Wireless Communications. • Added section 6.4 DS Wireless Communications Receive-Only Mode ON/OFF. • Added consideration of Receive-Only mode to section 6.5 Processes Related to Sleep Mode [Information]. • In section 6.6.8 TGID [Required], noted that TGID must change not only when the power is turned on, but also when the console takes on the role of the parent. • Changed section 7.9.1 NITRO-SDK Version Used in the Master ROM [Required] to

Version	Revision Date	Description
		reference the SDK version separately.
2.0.5	2007/12/13	• Added section 1.3 Prohibition of Using Files Provided for the DS on Other Platforms. • Clarified exceptional cases in section 4.3.3 Microphone Sensitivity Setting [Recommended]. • In section 6.2.2 DS Wireless Communications ON State [Required], emphasized the importance of re-confirmation with the user when wireless communication is turned back ON after being turned OFF. • Deleted section 6.1.6 ON/OFF Switching Feature for DS Wireless Communications during Gameplay [Recommended]. • Changed section 6.1.8 Channels Scanned when Operating as a Child Device [Required] to section 6.6.15 Prohibition of Using Wireless Channels that are Always Fixed [Required] . • In section 6.3.1.1 Reception Strength Icon Display, added specific (special) cases during which it would be permissible to hide the reception strength icon. • Changed an expression in section 6.3.8 TGID Used in Single-Card Play [Required] to prevent the misunderstanding that TGID values do not have to differ every time communications begin if the TGID value changes every time power is applied to the DS Download parent device. • In section 6.3.8 TGID Used in Single-Card Play [Required], changed the method used to obtain a different TGID value every time to the WM_GetNextTgid function in the NITRO-SDK. • Added section 7.5.2 Displaying Captured Images [Recommended]. • Added Chapter 8 Nintendo Titles. • Added section 8.1 Microphone Tests.
2.0.4	2007/06/05	• Added section 6.3.19 Prohibition Against Notification of Data Distribution Support by DS Download Stations, or Through Other Means [Recommended]. • Added details to section 7.6.2. Reset During Backup and Communication [Required]. • Changed the NITRO-SDK version given in section 7.9.1 NITRO-SDK Version Used in the Master ROM [Required].
2.0.3	2007/04/02	• Added 2.2.5 About Data in Final Unused Memory of the Master ROM [Recommended] • Added 2.2.7 Restriction on Use of 2Gbit Nintendo DS Cards [Required]. • Changed the time required for mic input to stabilize from 500msec to 3 seconds in 5.4.2 Microphone [Required]. • Added 5.4.2.1 Avoiding Frequent ON/OFF [Information]. • Added 5.4.2.2 Supporting the DS Unit's Sleep Mode [Information]. • Changed the statement that games should use either the black background icon or white background icon used to indicate signal intensity to state that games should use the icon that looks best for the scene in 6.2.1.1 Reception Strength Icon

Version	Revision Date	Description
		Display. • Added 7.3 Prohibition of Warning Screen Display by Application [Required].
2.0.2	2007/02/02	• Clarified the fact that the DS Wireless icon is included in the NITRO-SDK along with its location in 6.1.4.2 Icon Confirmation. • Made the entry about the Prohibition of Altering the DS Wireless Icon as a subsection in 6.1.4.2 Icon Confirmation. • Clarified the fact that the Reception Strength icons are included in the NITRO-SDK along with its location in 6.2.1.1 Reception Strength Icon Display.
2.0.1	2006/12/19	• Added entries about Chinese and Korean game titles in 3.3.2 IPL Banner in Regional Languages [Recommended].
2.0.0	2006/08/07	• Deleted the entry about the old version of the NITRO-SDK in 2.2.1 Processing when Card Removal is Detected [Required]. • Made clarifications in 2.2.1.2 If Device is a DS Single-Card Play Child that a card interrupt is invalidated in the SDK by the factors for recovery from Sleep Mode. • Deleted the entry about the old version of the NITRO-SDK in 2.2.2 DS Card ROM Type Setting [Required]. • Deleted the NITRO-SDK version in 2.2.4 Access to the ROM Region [Required]. • Added section 2.2.5 Limitations when Using a 1 Gbit DS Game Card [Required]. • Deleted the entry about the old version of the NITRO-SDK in 2.3.2 Detection of Removal with Games that use Game Paks [Required]. • Added section 2.4.2 DS Memory Expansion Paks. • Added 8-megabit FLASH to the table in 2.5.1.1 Cards. • Added entries about the NITRO-SDK versions that correspond to FLASH and SRAM in 2.5.1.2 GBA Game Paks. • Revised the erroneous number of characters in 3.3.1 Banner Display Verification on the IPL Screen [Required]. • Revised the erroneous number of dots in 3.3.3.1 Screen Display Verification, and changed the phrase “simple game instructions” to “software introductory text” in accordance with the banner guidelines terminology. • Added an explanation to 3.2.3.3 Prohibited Settings that attempts to write to the RTC in the Master ROM will fail. • Deleted the NITRO-SDK version in 4.2.8 Compliance with Library Use [Required]. • Made slight corrections to the individual difference values in 4.3.2 Preventing Erroneous Microphone Input Determinations [Required], and put in clarifications regarding both signed and unsigned. Also added a new table that shows the guaranteed parameters for microphone input values. • Added an entry about voice chat as a concrete example in 4.3.4 Preventing Acoustic Feedback [Required]. • Added section 4.3.5 User Feedback for the Microphone Input State [Recommended]. • Deleted section 5.2.4 Compliance with Library Use [Required].

Version	Revision Date	Description
		• Added an entry to 5.5.1 Initial Backlight State [Information] about when the device is a DS Lite to the part about the backlight controls that can be performed with IPL. • Changed 6.1.7 Error Processing During the Initialization of DS Wireless networking [Required] to Recommended. • Added section 6.1.8 Channels Scanned when Operating as a Child Device [Required]. • Deleted the NITRO-SDK version in 6.3.1 Library Use Compliance [Required]. • Added an explanation to 6.3.11 When Too Many Game Players Attempt to Connect [Required] that there is no need to inform the player when Chance Encounter Communication occurs. • Made the description in 7.3 Image Methods for Light Hypersensitivity more detailed, and added a regulation about the display area when using both upper and lower screens. • Deleted section 7.8 Library Use Compliance [Required], and added a new section 7.8 Master ROM.
1.9.0	2006/03/31	• Deleted section 2.2.2 Message Display when Card Removal is Detected [Recommended]. • Added a section on removal detection during Sleep Mode to 2.3.2 Removal Detection with Cartridge Games [Required]. • Added section 2.3.3 Swapping GBA Cartridges for the Same Title during Sleep Mode [Recommended]. • Modified the content of 2.3.4 Accessing GBA Cartridges [Required]. • Added section 2.3.5 Accessing DS Option Cartridges [Required]. • Modified the content of 2.3.6 Handling DS Programs on Cartridges [Required]. • Added section 2.3.7 Handling DS Scripts on Cartridges [Required]. • Added section 2.3.8 Handling DS Data on Cartridges [Recommended]. • Added section 2.4 Handling DS Option Cartridges. • Added 4-megabit FLASH to 2.5.1.1 Cards. • Added 4-megabit FLASH to 2.5.4.1 Cards. • Added section 4.2.8 Compliance with Library Use [Required] to section 4.2 Touch Screen. • Modified the content of 5.1.2 Sleep Mode [Information]. • Added a reference specific to the need for an interval of at least 100 ms when turning the LCD on from an off state, in 5.1.3 Power Controls [Information]. • Added section 5.2.4 Compliance with Library Use [Required]. • Clarified the production of sound from headphones during an LCD OFF state in 5.3.1.1 Switching the LCD Off. • Added section 5.3.2 Clarifying Procedures for Producing Sound from Headphones during an LCD OFF State [Required]. • Changed 5.3.3 Notes for Automatic LCD Off Function Packaging [Required] to [Recommended].

Version	Revision Date	Description
		• Revised the wording (in Japanese, change not needed in English) in 5.3.3.1 Automatically Switching the LCD Off. • Added section 5.8.2 Powering-down of DS during LCD OFF State is Prohibited [Required]. • Clarified conditions for unconfirmed DS wireless communication in 6.1.4 DS Wireless Communication On [Required]. • Clarified the role of icon display in menu selections in 6.1.4.2 Icon Confirmation. • Clarified the display of icons specific to chance encounters in 6.2.1 Reception Strength Icon [Required]. • Changed the version of NITRO-SDK in 6.3.1 Library Use Compliance [Required]. • Indicated the allowed procedure for downloading programs in 6.3.17 Prohibition of Downloading Programs [Required]. • Modified the content of 6.4.3.2 Modifying the Chat Icon. • Changed section 7.3 Image Methods to 7.3 Image Methods for Light Hypersensitivity. • Added section 7.3.1 Light Hypersensitivity [Information]. • Added section 7.3.2 Screen Brightness Calculations [Information]. • Modified the content of 7.3.3 Images and Blinking Lights [Recommended]. • Added section 7.3.4 Flashing Bright Red Colors [Recommended]. • Completely modified the content of 7.3.5 Screen Contrast and Brightness Change [Recommended]. • Completely modified the content of 7.3.6 Regular Pattern Use [Recommended]. • Added section 7.4 Image Methods. • Added information on sub-pixel ordering on the DS Lite in 7.4.1 Screen Display that does not depend on the LCD Sub-pixel Order [Recommended]. • Added section 7.5.3 Prohibiting Resets on Child Devices during DS Single-Card Play [Required]. • Deleted the latter half of 7.6.1 Name Consistency [Required]. • Added section 7.6.2 Using Images in Place of Names [Recommended]. • Added section 7.8 Library Use Compliance [Required].
1.8.0	2005/12/20	• Clarified that the power must be off in the heading 1) When a Card Is Removed While the Nintendo DS System is Open in section 2.2.1.1 If Device Booted from a DS Card in 2.2.1 Processing During Card Removal Detection [Required]. • In 2.2.1.2 If Device is a DS Single-Card Play Child, added that the HALT state that occurs when a card is removed while downloading is part of the IPL specification, and corrected a spelling error in CARD_CheckPulledOut. • Made clarifications to the reason why no direct access should be made without using Nintendo-provided libraries in 2.5.1 Strict Library Requirement [Required]. • Added section 2.5.2 Specifying Backup Memory [Required]. • Removed a portion of the contents from 2.5.8 Message Display when Backup Data is Corrupted [Recommended], and added it to 2.5.3 Supporting Default Settings for

Version	Revision Date	Description
		Backup Memory [Required]. • Added section 4.3.2 Preventing Erroneous Determinations Specific to Microphone Input [Required]. • Added section 4.3.4 Preventing Acoustic Feedback [Required]. • Added section 6.1.7 Error Processing During the Initialization of DS Wireless networking [Required]. • Added section 6.3.2 Using MAC Addresses [Required]. • Corrected a spelling error in WM_MeasureChannel in 6.3.15 Check of Wireless State before Beginning Parent Device Operation [Recommended].
1.7.1	2005/10/06	• Added section 2.3.5 DS Option Pak.
1.7.0	2005/09/26	• Added section 2.2.1.2 If Device is a DS Single-Card Play Child to 2.2.1 Processing during Card Removal Detection [Required]. • Added 512 Kbit EEPROM and 256 Kbit FRAM information in 2.5.1.1 Cards. • Modified the description in 2.5.9 Removing Corrupted Backup Data [Required]. • Added to the description in 3.2.1 Language Settings [Information]. • Added section 4.2.1 Touch Panel Chattering [Information]. • Made additions to the explanation in 4.2.6 Verifying Input Accuracy [Recommended]. • Completely modified the content of 5.5.2 Automatically Switching the Backlight On and Off [Required]. • Deleted section 5.5.3 Backlight Switching Function During Game Play [Recommended]. • Added section 5.5.3 Prohibiting Game Player from Turning Backlight OFF [Required]. • Modified the reception strength icon with a black background being slightly different from the icons implemented in SDK in 6.2.1 Reception Strength Icon [Required]. • Changed the terminology “Infrastructure Mode” to “Wi-Fi Connection Mode.” • Added section 6.5 Chance Encounter Mode.
1.6.1	2005/07/01	• Clarified description in 2.5.13 Backup Memory Reads [Required].
1.6.0	2005/06/27	• Added section 2.2.2 The DS Card’s ROM Type Setting [Required]. • Added section 2.2.3 DS Wireless Communication between Software with Different ROM Type Settings [Information]. • In 2.5.4 Backup Memory Life [Required], corrected guaranteed number of overwrites in the DS Card 2M flash device. • Slightly modified 3.1.3 Displaying User Names and Comments [Recommended]. • Changed 2.4.10 Note about backup memory write [Recommended] to 2.5.12 After Writing to Backup Memory [Recommended]. • Added section 2.5.11 Before Writing to Backup Memory [Recommended].
1.5.0	2005/04/12	• Revised improper description resulting from differences in SDK versions in 2.2.1

Version	Revision Date	Description
		Processing During Card Removal Detection. • Changed 2.4.3 Notes when using the library [Recommended] to 2.5.12 After Writing to Backup Memory [Recommended]. • Changed 2.4.10 After Writing to Backup Memory [Recommended] to Display When Writing to Backup Memory [Required]. • Added section 2.4.13 Backup Memory Reads [Required]. • Added section 2.4.14 Confirming DS Card Backup Memory [Required]. • Added section 2.4.17 Sleep Mode-related Processing [Information]. • Added example to 3.1.3 Displaying User Names and Comments [Recommended]. • Added section 3.2.2 Language Settings [Required]. • Modified content of 3.3.3.2 Language-specific Game Title Names and Simple Game Instructions. • Changed 4.2.4 Active Range of the Touch Pen [Recommended] to 4.2.4 Active Area of the Touch Pen [Required]. • Added other items for reference to 5.2.3 Transitioning during Backup and Communication [Required]. • Slightly changed and added an exception to 5.5.2 Automatically Switching the Backlight On and Off [Required]. • Added section 5.8 DS Main Unit Power OFF. • Added exceptions to 6.1.3 State Immediately After Game Startup [Required]. • Added exceptions to 6.3.3 Message when the Link is Cut [Required]. • Added example to 6.3.8 TGID used in DS Single-Card Play [Required] and clarified expressions. • Added section 6.4 PictoChat Search. • Changed contact information from “the engineering department” to “Nintendo.”
1.4.2	2005/01/20	• Stated the prohibition on changing DS wireless icons in 6.1.4.2 Icon Confirmation. • Added section 6.3.18, Arranging Parent Data when Performing Clone Boot [Required].
1.4.0	2004/12/27	• Changed the content of 2.2.1 Processing During Card Removal Detection [Required]. • Revised 2.2.2 Message Display when Card Removal is Detected [Recommended]. • Added section 2.4.15 Backup Memory Overwrite for Nintendo DS Game Cards [Recommended]. • Added a condition that the programmer can specify in 5.1.2 Sleep Mode [Information]. • Described the function to transition to Sleep Mode in 5.2.1 Switching from Active to Sleep Mode [Required]. • Changed the contents of 5.3.1.1 Switching the LCD Off. Added explanation for the LCD OFF state and the function that moves to the LCD OFF state. • Revised 5.3.1.2 Switching the LCD On.

Version	Revision Date	Description
		• Changed the notation method, and added an example to 5.5.3 Backlight Switching Function During Game Play [Recommended]. • Added section 5.6.1 Power Conservation when the DS is Closed [Required]. • Changed the previous 5.6.1 Recommendation for Power Savings to 5.6.2 Power Conservation when the DS is Opened [Recommended]. • Changed 6.1.6 On and Off Settings during Game Play [Recommended] to 6.1.6 ON/OFF Toggle for Wireless Communications during a Game [Recommended]. • Added an explanation regarding the linked state to 6.2.1.1 Reception Strength Icon Display. • Changed the NITRO-SDK version in 6.3.1 Restriction on Library Use [Required]. • Removed 6.3.11 Card and Cartridge Access for DS Single-Card Play [Required]. Made a new 6.3.12 Card Access for DS Single-Card Play [Required]. • Modified content of 6.3.14 Useable Wireless Channels [Required]. • Added 7.3.4 Screen Display that does not depend on the LCD Sub-pixel Order [Recommended]. • Fixed notation mistakes in the revision history.
1.3.0	2004/11/05	• Changed 2.2.1 Processing During Card Removal Detection [Recommended] to 2.2.1 Processing During Card Removal Detection [Required], and changed the description to match the newest NITRO-SDK. • Changed “hold” to “halt.” • Added section 2.2.2 Message Display when Card Removal is Detected. • Changed NITRO-SDK version in 2.2.3 Accessing ROM Region [Required]. • Changed 2.3.2 Removal Detection with Cartridge Games [Recommended] to 2.3.2 Removal Detection with Cartridge Games [Required], and changed the description to match the newest NITRO-SDK. • Changed the description in 2.3.3 Accessing GBA Cartridges [Required]. • Divided 2.4.7 Restoring Backup Data [Recommended] into 2.4.7 Preventing Corruption of Backup Data [Recommended], 2.4.8 Message Display when Backup Data is Corrupted [Recommended], and 2.4.9 Removing Corrupted Backup Data [Required]. • Added section 3.1.2 Using User Names and Comments [Required]. • Added section 3.1.3 Displaying User Names and Comments [Recommended]. • Changed 3.3.1.1 Verification of Screen Display to 3.3.1 Verification of Banner Display on the IPL Screen [Required], and described the location for the game introduction text (title and publisher). • Changed 3.3.1.2 Regional Game Titles to 3.3.2 Software Introductory Text for Each Language [Recommended], • Changed the content of 4.2.6 Verifying Input Accuracy [Recommended]. • In 4.3.3 Microphone Sensitivity Setting [Recommended], changed "user" to "game player." • Added section 4.5.1 Device Input When the DS is Closed [Required].

Version	Revision Date	Description
		• Added section 4.5.2 Continuous or Rapid Operations over a Long Period [Recommended]. • Added one exception to 5.2.2 Switching from Sleep Mode to Active Mode [Required]. • Changed 5.4.2 Mic [Recommended] to 5.4.2 Mic [Required]. • In 6.1.1 DS Wireless Communication On State [Information], changed "WM_READY_STATE" to "Wireless Communication READY state." • Added section 6.3.1 Restriction on Library Use [Required]. • Added the same Wireless Communication state transitions to the State Column in the table in 6.3.6 Requested Power Consumption Control [Recommended]. • Added section 6.3.8 TGID used in DS Single-Card Play [Required]. • Added section 6.3.13 Process for Terminating Child Devices after Ending DS Single-Card Play [Recommended]. • Changed the explanation for return values of 0 in 6.3.14 Useable Wireless Channels [Required]. • Added section 6.3.16 Update Display for Parent Information [Recommended]. • Added section 6.3.17 Prohibition of Downloading Programs [Required]. • Fixed the PDF bookmarks. • Revised the Revision History to included paragraph numbers. • Revised the Revision History to have sequential paragraph numbers. • Deleted the "Authorized by" and "Revised by" columns in the Revision History. • Corrected typographical errors.
1.2.0	2004/10/07	• For games that are not using a Game Pak: Changed "Do not run process for detecting Game Pak removal" to "Even if Game Pak removal is detected, do not run processes to stop or display on screen." • In Banner Display on the IPL Screen [Required], "distributor" was added to the list of items that must be confirmed on the display. • In DS Single-Card Play Banner Display [Required], it was noted that the distributor does not need to be displayed. • Touch panel: Added Apply Calibration Value [Required] and Do Not Use Estimated Calibration Values [Required]. • Added microphone to input devices. Added 4.3.1 Fixed Differences in Microphone Sensitivity [Information], 4.3.3 Microphone Sensitivity Settings [Recommended]. • Transition to LCDOFF when closing the DS: Added supplement "If LCDOFF is not possible, turn the backlight off". • In Signal Strength Icon [Required] the display assumption was changed to "when DS wireless communications are linked." • Changed so that in wireless communications Data Size for One MP communication [Recommended] prompts to use the Wireless Communications Time Calculation Sheet (JavaScript) in the Function Reference Manual when calculating time. • GGID to use [Required]: Added that can used "Private GGID" that have been

Version	Revision Date	Description
		allocated for testing. • As a result of adding Allowed Wireless Channels [Required], changed Check of Wireless State before Beginning Parent Device Operation [Recommended]. • Corrected typos.
1.1.1	2004/09/21	• Changed the "Card/Cartridge Slot" references to "Card/Cartridge Slot." • Changed the wording for processing during detection of card removal from "If card removal is detected during Sleep Mode, turn the power off." to "Turn power off when using card removal to recover from Sleep Mode." • Changed the phrasing that describes the power lamp when DS wireless communication is on from "rapid blinking" to "variable blinking."
1.1.0	2004/09/14	• Modified the rank and description of 2.5.1 Strict Library Requirement [Required] to reflect changes in the specifications of the initial backup API. • Revised 3.3 Game Banners. • Revised content of 5.4 Power Controllable Modules to conform to NITRO-SDK specifications. • Deleted section "When the DS Wireless Function is Disabled" in conjunction with the removal of the IPL enable/disable option for DS wireless communication. • Replaced the functions that turn DS wireless communications on or off, mentioned in 6.1 DS Wireless Communication On and Off States with WM_Enable and WM_Disable. • Changed the design of the DS wireless icon in section 6.1.4.2 Icon Confirmation. • Changed the rank and description of 6.1.5 Processing related to Sleep Mode [Information] because the programmer can control DS wireless communication during Sleep Mode. • Added to and modified the reception strength icons in 6.2 Reception Strength Icons. The separate descriptions for parent and child devices were deleted, and restrictions for changing the icons were substituted. • Modified the data size for each communication mode in 6.3.3 Data Batch Size for MP Communication [Recommended]. • Added section 6.3.5 Requested Power Consumption Control [Recommended]. • Added section 6.3.14 Useable Wireless Channels [Required]. • Miscellaneous corrections and additions.
1.0.0	2004/08/28	• Initial version.