Game Boy® Advance Programming Cautions

Please review the following cautions prior to submitting AGB software for submission. Failure to observe these programming cautions may result in your submission being delayed and/or disapproved.

1. Master ROM Submission

1.1 Master ROM Size must Equal Ordered Mask ROM Size (Required)

Ensure Master ROM size equals the Mask ROM size ordered and do a CRC calculation using the CRC Check Utility before submitting to Nintendo. If the size is different from the Mask ROM size ordered, it will be disapproved in Lot Check. The CRC Check Utility software is in the AGB Download area of our web site (www.noa-engineering.com). Instructions for use are included with the utility. (Be sure you calculate using little endian.)

Reference

AGB Software Submission Requirements, "4. Saving Data to a Disk"

1.2 Use 00H for Reserved Areas of ROM Registration (Required)

Fill in reserved areas (80000B5H~80000BBH, 80000BEH, and 80000BFH) of the ROM registration with "00H".

Reference

AGB Software Submission Requirements, "6. ROM Registration Data Specifications"

1.3 Blank Screen on Power Up or During Game Play (Recommended)

If a blank screen appears for more than two seconds when powered up, Nintendo suggests placing a message or graphic (e.g., --“Connecting”--) on the screen so that consumers do not think their game is inoperable. If a blank screen appears for more than five seconds during game play, a message or graphic should also be placed on the screen.

2. Game Pak Memory

2.1 Wait State Control (Required)

After executing the System ROM (when the User Program is started) the Wait Control Value is 000. In the Game Pak Mask ROM used with the actual manufactured product the specifications are 1st Access/3 Wait, 2nd Access/1 Wait. In this case, set the Wait Control Value to 101.

Reference

AGB Programming Manual, "3.3 Game Pak Memory Wait Control"

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3. Rendering Functions

3.1 Display Priority of OBJ and BG (Required)

When **the order** of OBJ number and OBJ priority are reversed, they are not displayed correctly if BG is between such OBJs. Please be sure to avoid this situation.

(Examples)

OBJ-No.0 (OBJ priority 2)
BG (BG priority 1)
OBJ-No.1 (OBJ priority 0)

Reference

AGB Programming Manual, "6.4 Display Priority of OBJ and BG"

4. DMA Transfer

4.1 DMA (Required)

Delay of 2 waits will occur before DMA is actually started. Accessing DMA related registers during this time may cause a DMA malfunction. Do another process or insert a dummy load command instead.

Reference

AGB Programming Manual, "12. DMA"

5. Communication

5.1 AGB Game Link Communication, General (Recommended)

When communicating, try to avoid lock-ups or malfunctions by various communication failures.

(Examples of ways to avoid malfunctions)

Permit canceling a communication by pressing a key.
Ignore unexpected data and try again or display error message.

(Examples of communication failure)

Peripheral equipment that is not compatible is connected.
Incompatible Game Pak may be installed in the other machine.
Communication mode is different from the other machine.
Communication cable is connected incorrectly.
Unexpected data is received.

Reference

AGB Programming Manual, "13. Communication Functions"

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5.2 Multi-Player Communication (Required)

Due to individual differences in AGB hardware, there is a variation in timing of interrupts. Always use a timer when sending, and be sure to have enough intervals of communication (minimum send interval + 600 clocks (maximum value of interrupt timing variation)).

Reference

AGB Programming Manual, "13.2 16-Bit Multi-player Communication"

5.3 IR Communication Library, General (Required)

The prefetch buffer must be disabled before using.

Before communicating, make sure the following conditions of the sender and receiver agree with each other.

*Communication Speed
*Game Pak ROM wait cycles
*Version of communication program core (ROM or RAM)
*Location of data Buffer (CPU internal WRAM or CPU external WRAM)

In order to reduce power consumption, please set the IR module to shutdown mode when not performing IR communication.

6. Backup Library

6.1 Dealing with Damaged Backup Data (Required)

Ensure that the program continues to function as intended even if the power switch is turned off while data is being saved. (The data must be restored or memory must be re-initialized.)

Discussion

It is impossible to prevent the destruction of data when power is turned off while data is being saved.

Remarks

Examples of measures to take for back-up data which has been destroyed are:

Error detection -------- Check-sum / CRC.

Detection of other than normal data by the game program.

Use a flag which indicates completion of the data saving process.

For example:

When initializing the saved data, an initialization finish flag (or dirty bit) should not be written until after the initialization is completed. Push the Reset Switch during the initialization process to make sure that no abnormalities occur during subsequent initialization attempts.

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6.2 Backup Memory Initialization (Required)

Ensure that the initialization process works properly even when the content of the back-up memory is undefined.

Discussion

A specific value is stored in back-up memory when it is shipped from the factory. However, this value may be lost over time.

6.3 Master ROM Versions for Backup Library (Required)

When submitting master ROM for the backup library, use the versions listed below or later versions.

256kbit SRAM Library Header Version 1.1.0 (In AgbSram.h)
256kbit SRAM Library Header Version 1.0.0 (In AgbSramFast.h)
512kbit FLASH Library Header Version 1.2.1 (In AgbFlash.h)
4kbit EEPROM Library Header Version 1.1.1 (In AgbEeprom.h)

The version number is written in each header.

Reference

AGB Game Pak Backup Library Manual, "Updated Version of Library"

6.4 Cautions when Using SRAM (Required)

Avoid loss of SRAM data due to a CPU lockup that is caused by inserting or removing a Game Pak, while power is applied.

If you insert or remove a Game Pak during game play with the power ON, backup data may be destroyed.

Although the Instruction Booklet states that a Game Pak should not be inserted/removed during game play, we expect quite a few claims in the event that backup data is erased.

To be safe, it will be necessary to partially modify the software. Regardless of the result of lot check, we ask you to follow the [Support level 1] shown below, and re-submit it.

Please include a statement in the Remarks (for example, "Program to avoid loss of SRAM-Support level 1" when (re-)submitting a Software Specification Sheet so that we can verify it.

Process

Use a Game Pak interrupt. Program it so that it enters an infinite loop when an interrupt occurs. Program it so that a Game Pak interrupt is always permitted with a program that runs with a Game Pak.

As a sample to support this, "simple.zip" has been uploaded to the AGB Download area of our web site (http://www.noa-engineering.com.

The following example describes only the changes according to the existing sample source.

Permit a Game Pak interrupt as much as possible during a main loop (including sub routines).

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However, with a program which downloads using Multi Game Pak Mode, do not permit a Game Pak interrupt, because there is a possibility that if ROM registration of a Game Pak is checked and no cartridge is inserted, a noise may be generated due to the open connector and a Game Pak interrupt will occurs.

If a Game Pak is inserted, permit a Game Pak interrupt so that it will not be removed during the access to the Game Pak, allowing abnormal data to be read.

When starting a Game Pak program from a download program, the IE flag is cleared once. So, permit a Game Pak interrupt again using a Game Pak program.

We recommend that it is included in the Game Pak initialization routine.

Example: simple / main.c / AgbMain() / 96th line

Reference

AGB Game Pak Backup Library Manual, "256 Kbit SRAM"

6.5 Cautions when Using Flash Memory (Required)

(1) Ignore the return value for ProgramFlashSector(), and use the return value for VerifyFlashSector() to check if write was successful.

(2) In order to assure completely safe operation, avoid direct sound and all interrupts.

Discussion

Use the return value for VerifyFlashSector() to check if the write was successful. A program may be added to retry when the write fails.

When writing to a 512K Flash ROM, avoid direct sound and all interrupts on the application side before carrying out the write.

Reference

AGB Game Pak Backup Library Manual, "512 Kbit Flash ROM"

6.6 Life of AGB Flash Memory Rewrite (Recommended)

Do not unnecessarily write to or erase flash memory during game play.

Discussion

Usually, flash memory is limited by number of rewrites per sector, so you need to be careful how things are saved.

You cannot use this with games that do auto-saves which frequently do rewrites.

If you do not follow these guidelines, you may extremely shorten the life of the product.

Reference Techniques

Lengthen the data rewrite interval. Do not write to the same sector, instead use multiple sectors and decrease the number of rewrites for 1 sector.

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Remarks

The manufacturer of the flash memory used with AGB guarantees a minimum of 10,000 rewrites per 1 sector. This is equal to a life of around 30 saves per day, and a life of 1 year.

Reference

AGB Game Pak Backup Library Manual, "512 Kbit Flash ROM"

6.7 Cautions when Using EEPROM Access Functions (Required)

In order to assure completely safe operation, avoid direct sound and all interrupts during EEPROM access.

Discussion

The access functions (ProgramEepromDword(), ReadEepromDword(), and VerifyEepromDword()) for this device use DMA3 for access. However, when this DMA is executing, it could be interrupted by a higher priority DMA interrupt, causing it to fail. Therefore, when DMA is executing, interrupts are prohibited in the Library functions.

This will not prevent DMA1 and DMA2 from occurring with direct sound. Therefore, do not use direct sound when calling this function.

Reference

AGB Game Pak Backup Library Manual, "4 Kbit EEPROM"

6.8 Life of AGB EEPROM Rewrite (Recommended)

Do not unnecessarily write to or erase EEPROM during game play.

Discussion

Usually, EEPROM is limited by number of rewrites, so you need to be careful how things are saved.

You cannot use this with games that do auto-saves which frequently do rewrites.

If you do not follow these guidelines, you may extremely shorten the life of the product.

Remarks

The manufacturer of the EEPROM used with AGB guarantees a minimum of 100,000 rewrites. This is equal to a life of around 300 saves per day, and a life of 1 year.

Reference

AGB Game Pak Backup Library Manual, "4 Kbit EEPROM"

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