CHAPTER 5: MISCELLANEOUS GENERAL INFORMATION

1. MONITOR ROM

The DMG and CGB CPU includes internal monitor ROM.

When power on the hardware is turned on, the monitor ROM checks for errors in the ‘Nintendo’ logo character data within the game software.

If the data is correct, the Nintendo logo is displayed and the program is then started. If there is an error in the data, the screen flashes repeatedly.

For information on registering the Nintendo logo character data, refer to Appendix 3 of this manual, *Submission Requirements*.

The conditions required for starting the user program are as follows.

Starting Address	0x150 (default value)	The starting address can be freely set by writing a jump destination address at 0x102 and 0x103.

LCDC value 0x91
Stack value 0xFFFE

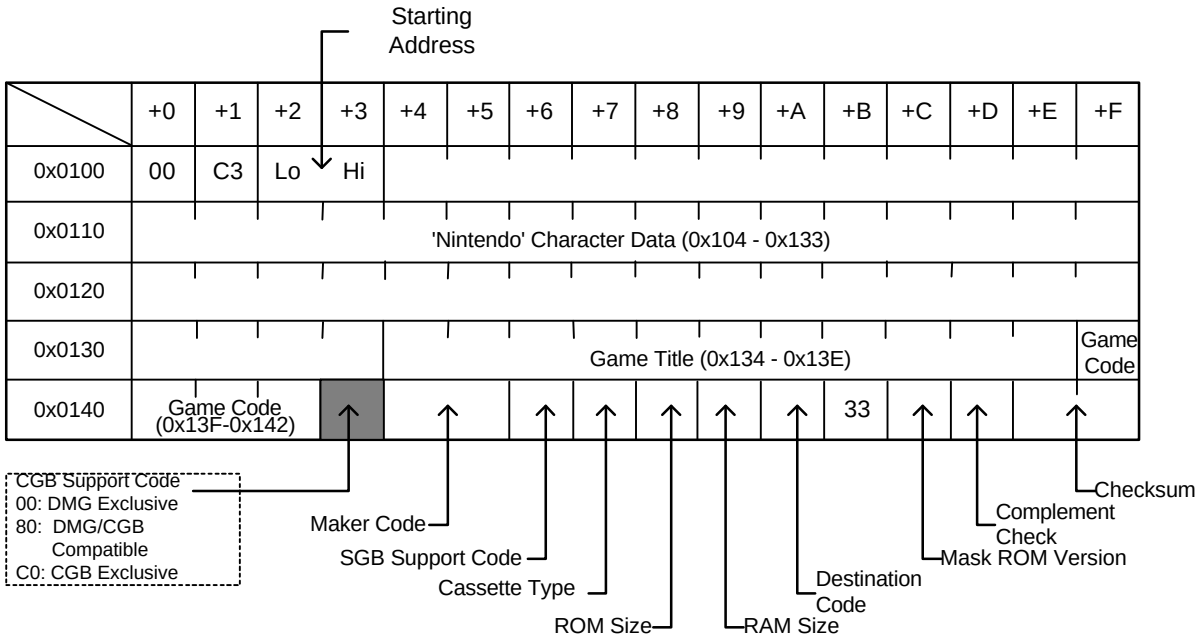
2. RECOGNITION DATA FOR CGB (CGB ONLY) IN ROM-REGISTERED DATA

As with software created for DMG, software for CGB (including software only for CGB) must place data concerning items such as the name of the game and Game Pak specifications in the 80 bytes of the program area between 0x100 and 0x14F. In the system, a code indicating whether the software is for CGB should be set at address 0x143.

> ***Note*** ***For an overall description of the ROM area shown below, please refer to Appendix 3,* Submission Requirements.**

Setting a value of 0x80 or 0xC0 at this address causes the system to recognize the software as being for CGB.

If 0x00 or any value less than 0x7F (existing DMG software) is set at this address, the software is recognized as non-CGB software and CGB functions (registers) are not available.



CGB/CGB Only: When operating on CGB, up to 56 colors can be displayed on a single screen.
Non-CGB: When operating on CGB, up to 10 colors can be displayed on a single screen.

> ***Note*** ***Regardless of the type of game, the following fixed values should be stored at the following addresses.***

- Address 0x100=0x00
- Address 0x101=0xC3
- Address 0x14B=0x33
- Addresses 0x104 – 0x133=‘Nintendo’ character data

3. POWER-SAVING ROUTINES FOR THE MAIN PROGRAM

To minimize battery power consumption and extend battery life, inclusion of programs such as those shown below is recommended.

During waiting for vertical blanking, halt the CPU system clock to reduce power consumption by the CPU and ROM.

```
;******                                          ******
;
;******              Main Routine                ******
;
;******                                          ******

MAIN
            CALL    CONT            :   Keypad input.
            CALL    GAME            :   Game or other processing.

VBLK_WT
            HALT                    :   Halt the system clock.
                                    :   Return from HALT mode if an interrupt is generated.
                                    :   Wait for a vertical blanking interrupt.
            NOP                     :   Used to avoid bugs in the rare case that the instruction.
                                        after the HALT instruction is not executed.
            LD      A, (VBLK_F)
            AND     A               :   Generate a V-blank interrupt?
            JR      Z, VBLK_WT      :   Jump if a non-V-blank interrupt.
            XOR     A
            LD      (VBLK_F), A
            JR      MAIN

;******                                          ******
;
;******      Vertical Blanking Routine           ******
;
;******                                          ******

VBLK
            PUSH    AF
            PUSH    BC
            PUSH    DE
            PUSH    HL

            CALL    DMA

            LD      A, 1            :   Set the V-blank completion flag.
            LD      (VBLK_F), A

            POP     HL
            POP     DE
            POP     BC
            POP     AF
            RETI
```

HALT instructions should not be executed while CGB horizontal blanking DMA is executed. (See Appendix 1, *Programming Cautions*.)

4. SOFTWARE CREATED EXCLUSIVELY FOR CGB

Because the shape of the Game Pak for CGB-only software is the same as that for DMG, CGB-only Game Paks also can be inserted in DMG. Therefore, a program that displays a message such as that shown below when a CGB-only Game Pak is mistakenly inserted in DMG should always be included in the software. The upper part of the message screen should display the official title of the game.

If the title is similar to that of other software (e.g., series software), a subtitle should also be displayed to distinguish the programs from one another.

For information on software methods of distinguishing game units, see Section 6 of this chapter, *Software Created for CGB: Example*.

Sample Message Display

5. SOFTWARE CREATED TO OPERATE ON CGB

As is shown below, CGB and DMG differ slightly in their specifications and operation. When creating software to operate on CGB, please give appropriate consideration to these differences.

CGB	DMG
When objects with different x-coordinates overlap, the object with the lowest OBJ NO. is given display priority.	When objects with different x-coordinates overlap, the object with the smallest x-coordinate is given display priority.
In CGB mode, BG display CANNOT be turned off using bit 0 of the LCDC register (address 0xFF40).	BG display CAN be turned on and off using bit 0 of the LCDC register (address 0xFF40).
_____	When the value of register WX (address 0xFF4B) is 166, the window is partially displayed.
_____	When an instruction that register pair increment is used, if the value of the register pair is an address that specifies OAM (0xFE00-0xFE9F), OAM may be destroyed.

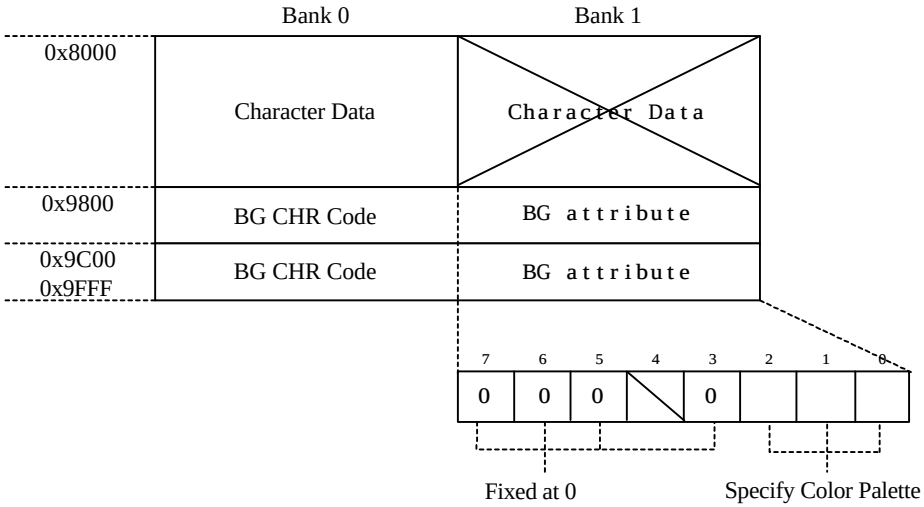
6. SOFTWARE CREATED TO OPERATE ON CGB: EXAMPLE

When creating software for CGB, a CGB support code is set in the ROM data area, and processing branches according to the hardware used internally by the program. For more information, see the flowchart in Part 1 of Section 6.3 of this chapter. Limiting the functions used, as shown below, allows the same processing to be used for different units without branching. For more information, see the flowchart in Part 2 of Section 6.3 of this chapter.

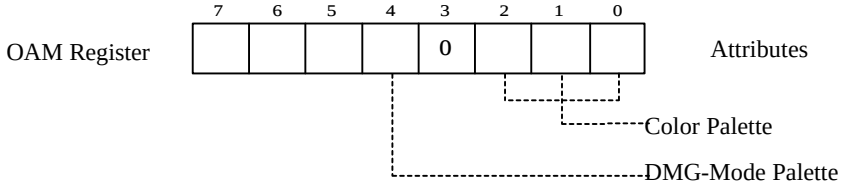
The following example describes how to create a program that operates on both CGB and DMG and allows display of 56 colors when running on CGB . Such means can be used to maintain compatibility with earlier hardware (DMG) while using CGB functions.

6.1 Program Specifications

- Only bank 0 is used as the character data area.
- Only the bits that specify the color palette (bits 0-2 of bank 1) are used for BG attributes.



- Both the color palette and DMG-mode palette are set as attribute flags in the OAM register.



- None of the other expanded CGB functions are used.

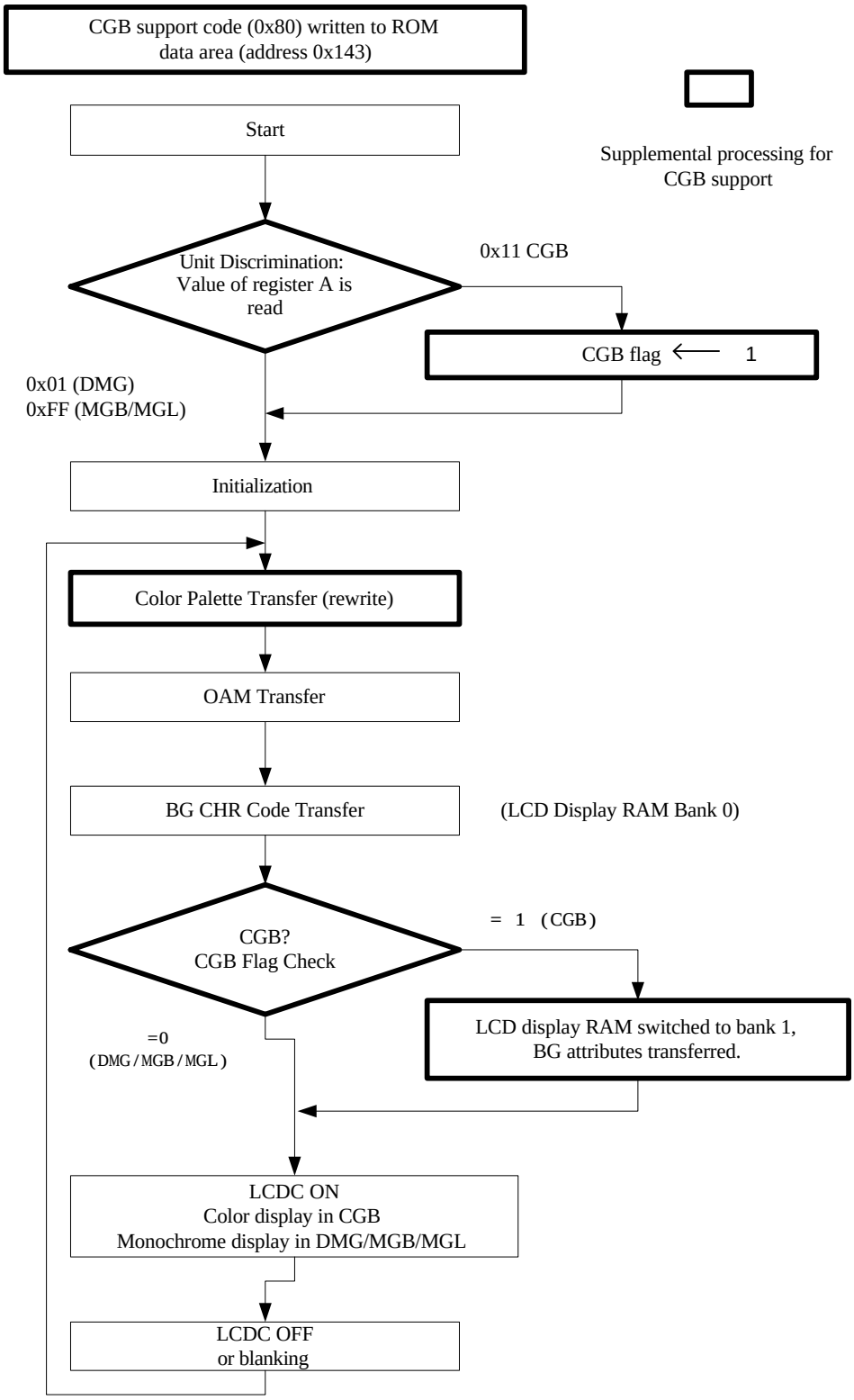
6.2 CGB Recognition Method

Immediately after program startup, the initial value of the accumulator (register A) is read to determine whether the hardware on which the program is operating is a DMG (SGB), MGB/MGL (SGB2) , or CGB.

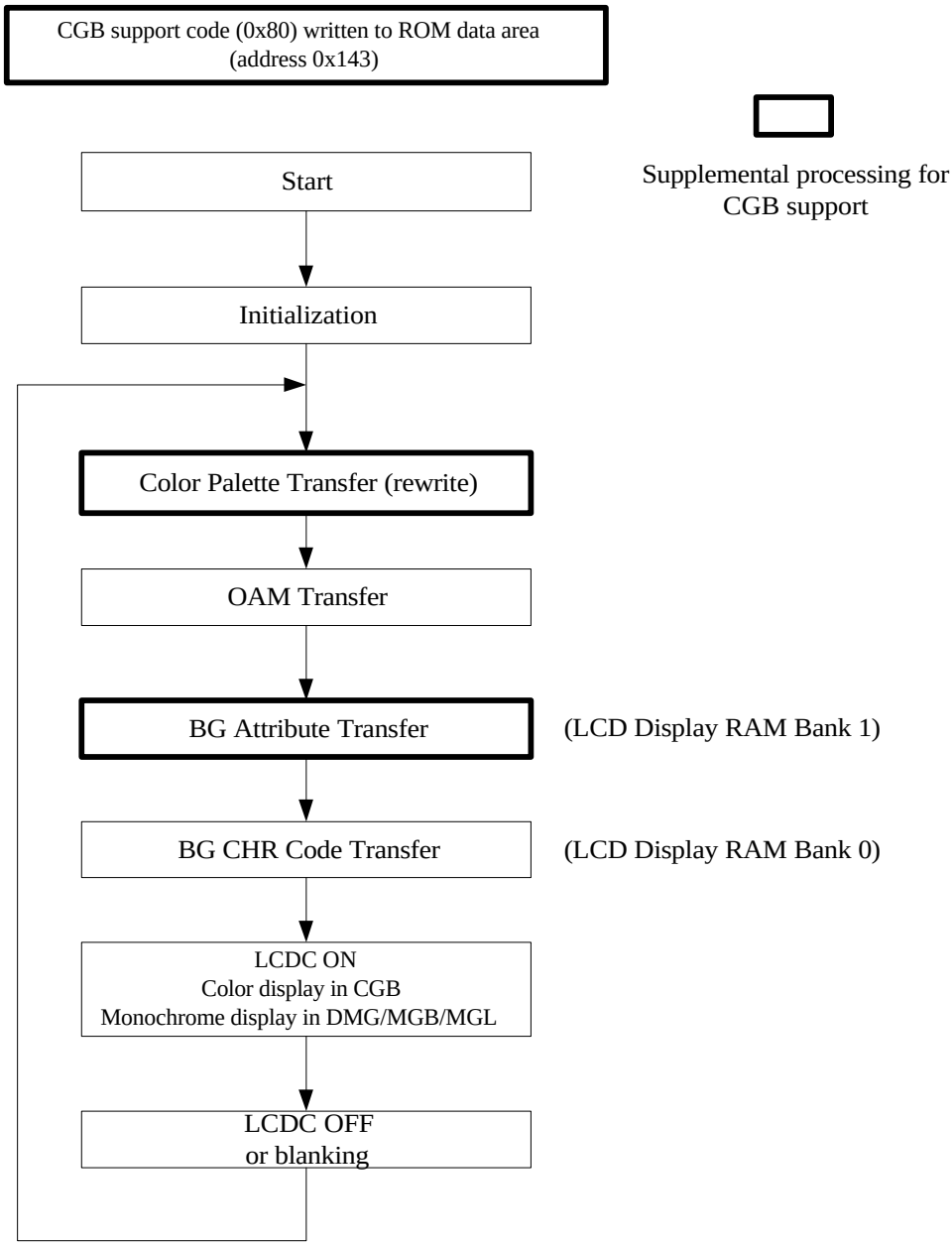
0x01 → DMG (SGB)
0xFF → MGB/MGL (SGB2)
0x11 → CGB

6.3 Flowcharts

1) Branched Processing for CGB and DMG/MGB/MGL



2) Uniform processing for CGB and DMG/MGB/MGL



Note	***The BG attributes should always be transferred before the BG character code.*** ***Even if only the BG attributes are changed, always transfer the character code from that same address.***