# LCD Position and Scrolling

These registers can be accessed even during Mode 3, but modifications may not take effect immediately (see further below).

## FF42 - SCY (Scroll Y) (R/W), FF43 - SCX (Scroll X) (R/W)

Those specify the top-left coordinates of the visible 160×144 pixel area within the 256×25 pixels BG map. Values in the range 0–255 may be used.

## FF44 - LY (LCD Y Coordinate) (R)

LY indicates the current horizontal line, which might be about to be drawn, being drawn, just been drawn. LY can hold any value from 0 to 153, with values from 144 to 153 indicating the VBlank period.

## FF45 - LYC (LY Compare) (R/W)

The Game Boy permanently compares the value of the LYC and LY registers. When both values are identical, the "LYC=LY" flag in the STAT register is set, and (if enabled) a STAT interrupt is requested.

## FF4A - WY (Window Y Position) (R/W), FF4B - WX (Window X Position + 7) (R/W)

Specify the top-left coordinates of the Window. (The Window is an alternate background area which can be displayed above of the normal background. OBJs (sprites) may be still displayed above or behind the Window, just as for normal BG.)

The Window is visible (if enabled) when both coordinates are in the ranges WX=0..166, WY=0..143 respectively. Values WX=7, WY=0 place the Window at the top left of the screen, completely covering the background.

> **WARNING**
>
> WX values 0 and 166 are unreliable due to hardware bugs.
>
> If WX is set to 0, the window will "stutter" horizontally when SCX changes (depending on SCX % 8).
>
> If WX is set to 166, the window will span the entirety of the following scanline.

## Mid-frame behavior

### Scrolling

The scroll registers are re-read on each tile fetch, except for the low 3 bits of SCX, which only read at the beginning of the scanline (for the initial shifting of pixels).

All models before the CGB-D read the Y coordinate once for each bitplane (so a very precisely timed SCY write allows "desyncing" them), but CGB-D and later use the same Y coordinate for both no matter what.

### Window

While the Window should work as just mentioned, writing to WX, WY etc. mid-frame shows more articulated behavior.

For the window to be displayed on a scanline, the following conditions must be met:

- **WY condition was triggered**: i.e. at some point in this frame the value of WY was equal to LY (checked at the start of Mode 2 only)
- **WX condition was triggered**: i.e. the current X coordinate being rendered + 7 was equal to WX
- Window enable bit in LCDC is set

If the WY condition has already been triggered and at the start of a row the window enabl
bit was set, then resetting that bit before the WX condition gets triggered on that row yiel
a nice window glitch pixel where the window would have been activated.