VIC 6569/8565 Timing Chart

First half of cycle	Border				Main graphics				Each sprite		Each sprite			
	Wide		Narrow		Idle	Display		Display + badline	DMA enabled		DMA disabled Sprite enabled Y = RASTER	Y-flag on		Y-flag off	
	V-flag off	V-flag on	V-flag off	V-flag on		RC = 7	RC < 7	RC = 7	RC < 7	MC = 63	MC < 63	Y-expand on	Y-expand off	Y-expand on	Y-expand off
1 .. 2										Sprite 3: Fetch *					Set Y-flag
3 .. 4										Sprite 4: Fetch *					
5 .. 6										Sprite 5: Fetch *					
7 .. 8										Sprite 6: Fetch *					
9 .. 10					Clear VMLI					Sprite 7: Fetch *					
11 .. 13					VCBASE ---> VC										
14								Clear RC		MC + 3 ---> MC					
15								Fetch byte from vm[VC] to line[VMLI] during second half of cycle *							
16					Fetch and emit idle-mode pixels	Fetch and emit pixels according to line[VMLI], increment VC, increment VMLI						MC ---> MCBASE			Cr(MCBASE) ---> MCBASE
17	Latch V-flag									Disable DMA					Set Y-flag
	Border off														
18			Latch V-flag												
			Border off												
19 .. 54															
55											Enable DMA Clear Y-flag Clear MCBASE	Clear Y-flag		Set Y-flag	
56			Latch V-flag												
			Border on												
57	Latch V-flag									MCBASE ---> MC					
	Border on														
58					VC ---> VCBASE			VC ---> VCBASE		Sprite 0: Fetch *					
					To Idle	Increment RC									
59															
60 .. 61										Sprite 1: Fetch *					
62 .. 63										Sprite 2: Fetch *					

* The CPU is stalled on read accesses, starting three cycles before the fetch provided that the fetch could be anticipated.

Every cycle of rasterline	V-flag latch action				Main graphics		Main graphics	
	Tall		Short		DEN on	DEN off	YSCROLL matches	YSCROLL doesn't match
	D-flag on	D-flag off	D-flag on	D-flag off		At cycle 1	D-flag on	Display + badline
$00 .. $2F	Keep	Keep	Keep	Keep	Clear VCBASE			To Display
$30					Set D-flag	Clear D-flag	To Display + badline	
$31 .. $32								
$33	Clear							
$34 .. $36	Keep							
$37			Clear					
$38 .. $F6			Keep					
$F7			Set	Set				
$F8 .. $FA			Keep	Keep				
$FB	Set	Set						
$FC .. $137	Keep	Keep						

Sprite crunch function, Cr(MCBASE)

From	To	Deviation	From	To	Deviation	From	To	Deviation
00	01	-2	01	05	1	02		
03	07	1	04	05	-2	05	05	-3
06	05	-4	07	07	-3	08	09	-2
09	0d	1	0A			0b	0f	1
0C	0d	-2	0D	15	5	0e	15	4
0F	17	5	10	11	-2	11	15	1
12			13	17	1	14	15	-2
15	15	-3	16	15	-4	17	17	-3
18	19	-2	19	1d	1	1a		
1B	1f	1	1C	1d	-2	1d	15	-11
1E	15	-12	1F	17	-11	20	21	-2
21	25	1	22			23	27	1
24	25	-2	25	25	-3	26	25	-4
27	27	-3	28	29	-2	29	2d	1
2A			2B	2f	1	2c	2d	-2
2D	35	5	2E	35	4	2f	37	5
30	31	-2	31	35	1	32		
33	37	1	34	35	-2	35	35	-3
36	35	-4	37	37	-3	38	39	-2
39	3d	1	3A			3b	3f	1
3C	3d	-2	3D	15	-43	3e	15	-44

http://www.linusakesson.net/programming/vic-timing/