APPENDIX SUMMARY

Reference	Item
APPENDIX IX	SSD7317 Graphic Command Table and Command Descriptions

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Appendix IX: SSD7317 Graphic Command Table and Command Descriptions

Scrolling Command Table

D/C#	Hex	D7	D6	D5	D4	D3	D2	D1	D0	Command	Description
0	26/27	0	0	1	0	0	1	1	X_0	Continuous	26h, X[0]=0, Right Horizontal Scroll
0	A[7:0]	0	0	0	0	0	0	0	0	Horizontal Scroll	27h, X[0]=1, Left Horizontal Scroll
0	B[3:0]	*	*	*	*	B_3	B_2	B_1	B_0	Setup	
0	C[2:0]	*	*	*	*	*	C_2	C_1	C_0		Horizontal scroll by 1 column
0	D[3:0]	*	*	*	*	D_3	D_2	D_1	D_0		
0	E[7:0]	0	0	0	0	0	0	0	0		A[7:0] : Dummy byte (Set as 00h)
0	F[6:0]	*	F_6	F_5	F_4	F_3	F_2	F_1	F_0		
0	G[6:0]	*	G_6	G_5	G_4	G_3	G_2	G_1	G_0		

B[3:0] : Define start page address

0000b – PAGE0	0100b – PAGE4	1000b – PAGE8
0001b – PAGE1	0101b – PAGE5	1001b – PAGE9
0010b – PAGE2	0110b – PAGE6	1010b – PAGE10
0011b – PAGE3	0111b – PAGE7	1011b – PAGE11

C[2:0] : Set time interval between each scroll step in terms of frame frequency

000b – 6 frames	100b – 3 frames
001b – 32 frames	101b – 4 frames
010b – 64 frames	110b – 5 frames
011b – 128 frames	111b – 2 frames

D[3:0] : Define end page address

0000b – PAGE0	0100b – PAGE4	1000b – PAGE8
0001b – PAGE1	0101b – PAGE5	1001b – PAGE9
0010b – PAGE2	0110b – PAGE6	1010b – PAGE10
0011b – PAGE3	0111b – PAGE7	1011b – PAGE11

E[7:0] : Dummy byte (Set as 00h)

F[7:0] : Define the start column address (RESET = 00h)

G[7:0] : Define the end column address (RESET = 7Fh)

Notes:

(1) The value of D[3:0] must be larger than or equal to B[3:0]

(2) The value of G[6:0] must be larger than or equal to F[6:0]

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Scrolling Command Table

D/C#	Hex	D7	D6	D5	D4	D3	D2	D1	D0	Command	Description
0	29/2A	0	0	1	0	1	0	X_1	X_0	Continuous Vertical and Horizontal Scroll Setup	29h, X_1X_0=01b : Vertical and Right Horizontal Scroll 2Ah, X_1X_0=10b : Vertical and Left Horizontal Scroll A[0] : Set number of column scroll offset 0b No horizontal scroll 1b Horizontal scroll by 1 column B[3:0] : Define start page address 0000b – PAGE0 | 0100b – PAGE4 | 1000b – PAGE8 0001b – PAGE1 | 0101b – PAGE5 | 1001b – PAGE9 0010b – PAGE2 | 0110b – PAGE6 | 1010b – PAGE10 0011b – PAGE3 | 0111b – PAGE7 | 1011b – PAGE11 C[2:0] : Set time interval between each scroll step in terms of frame frequency 000b – 6 frames | 100b – 3 frames 001b – 32 frames | 101b – 4 frames 010b – 64 frames | 110b – 5 frames 011b – 128 frames | 111b – 2 frames D[3:0] : Define end page address 0000b – PAGE0 | 0100b – PAGE4 | 1000b – PAGE8 0001b – PAGE1 | 0101b – PAGE5 | 1001b – PAGE9 0010b – PAGE2 | 0110b – PAGE6 | 1010b – PAGE10 0011b – PAGE3 | 0111b – PAGE7 | 1011b – PAGE11 E[7:0] : Vertical scrolling offset e.g. E[7:0]= 00000001b refer to offset = 1 row E[7:0]= 01011111b refer to offset = 95 rows F[6:0] : Define the start column address (RESET = 00h) G[6:0] : Define the end column address (RESET = 7Fh) **Note** (1) The value of D[3:0] must be larger than or equal to B[3:0] (2) The value of G[6:0] must be larger than or equal to F[6:0]
0	A[0]	*	*	*	*	*	*	*	A_0		
0	B[3:0]	*	*	*	*	B_3	B_2	B_1	B_0		
0	C[2:0]	*	*	*	*	*	C_2	C_1	C_0		
0	D[3:0]	*	*	*	*	D_3	D_2	D_1	D_0		
0	E[7:0]	0	E_6	E_5	E_4	E_3	E_2	E_1	E_0		
0	F[6:0]	*	F_6	F_5	F_4	F_3	F_2	F_1	F_0		
0	G[6:0]	*	G_6	G_5	G_4	G_3	G_2	G_1	G_0		

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Scrolling Command Table

D/C#	Hex	D7	D6	D5	D4	D3	D2	D1	D0	Command	Description
0	2E	0	0	1	0	1	1	1	0	Deactivate scroll	Stop scrolling that is configured by command 26h/27h/29h/2Ah. **Note** (1) After sending 2Eh command to deactivate the scrolling action, the ram data needs to be rewritten.
0	2F	0	0	1	0	1	1	1	1	Activate scroll	Start scrolling that is configured by the scrolling setup commands : 26h/27h/29h/2Ah with the following valid sequences: Valid command sequence 1: 26h; 2Fh. Valid command sequence 2: 27h; 2Fh. Valid command sequence 3: 29h; 2Fh. Valid command sequence 4: 2Ah; 2Fh. For example, if "26h; 2Ah; 2Fh." commands are issued, the setting in the last scrolling setup command, i.e. 2Ah in this case, will be executed. In other words, setting in the last scrolling setup command overwrites the setting in the previous scrolling setup commands.
0 0 0	A3 A[6:0] B[6:0]	1 * *	0 A_6 B_6	1 A_5 B_5	0 A_4 B_4	0 A_3 B_3	0 A_2 B_2	1 A_1 B_1	1 A_0 B_0	Set Vertical Scroll Area	A[6:0] : Set No. of rows in top fixed area. The No. of rows in top fixed area is referenced to the top of the GDDRAM (i.e. row 0). [RESET = 0] B[6:0] : Set No. of rows in scroll area. This is the number of rows to be used for vertical scrolling. The scroll area starts in the first row below the top fixed area. [RESET = 96] **Note** (1) A[6:0]+B[6:0] <= MUX ratio (2) B[6:0] <= MUX ratio (3a) Vertical scrolling offset (E[6:0] in 29h/2Ah) < B[6:0] (3b) Set Display Start Line ($X_6X_5X_4X_3X_2X_1X_0$ of 40h~7Fh or A[6:0] of A2h) < B[6:0] (4) The last row of the scroll area shifts to the first row of the scroll area. (5) For 96d MUX display A[6:0] = 0, B[6:0]=96 : whole area scrolls A[6:0]= 0, B[6:0] < 96 : top area scrolls A[6:0] + B[6:0] < 96 : central area scrolls A[6:0] + B[6:0] = 96 : bottom area scrolls (6) When vertical scrolling is enabled by command 29h / 2Ah, the vertical scroll area is defined by this command.

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Advance Graphic Command Table

D/C#	Hex	D7	D6	D5	D4	D3	D2	D1	D0	Command	Description
0	2C/2D	0	0	1	0	1	1	0	X_0	Content Scroll Setup	2Ch, X[0]=0, Right Horizontal Scroll by one column 2Dh, X[0]=1, Left Horizontal Scroll by one column Horizontal scroll by 1 column A[7:0] : Dummy byte (Set as 00h) B[3:0] : Define start page address 0000b – PAGE0 | 0100b – PAGE4 | 1000b – PAGE8 0001b – PAGE1 | 0101b – PAGE5 | 1001b – PAGE9 0010b – PAGE2 | 0110b – PAGE6 | 1010b – PAGE10 0011b – PAGE3 | 0111b – PAGE7 | 1011b – PAGE11 C[7:0] : Set wrap around of RAM content for static scrolling 00h wrap around 01h No wrap around D[3:0] : Define end page address 0000b – PAGE0 | 0100b – PAGE4 | 1000b – PAGE8 0001b – PAGE1 | 0101b – PAGE5 | 1001b – PAGE9 0010b – PAGE2 | 0110b – PAGE6 | 1010b – PAGE10 0011b – PAGE3 | 0111b – PAGE7 | 1011b – PAGE11 E[7:0] : Dummy byte (Set as 00h) F[6:0] : Define the start column address (RESET = 00h) G[6:0] : Define the end column address (RESET = 7Fh) **Note** (1) The value of D[3:0] must be larger than or equal to B[3:0] (2) The value of G[6:0] must be larger than F[6:0] (3) A delay time of $2/FrameFreq$ must be set if sending the command of 2Ch / 2Dh consecutively.
0	A[7:0]	0	0	0	0	0	0	0	0		
0	B[3:0]	*	*	*	*	B_3	B_2	B_1	B_0		
0	C[7:0]	0	0	0	0	0	0	0	C_0		
0	D[3:0]	*	*	*	*	D_3	D_2	D_1	D_0		
0	E[7:0]	0	0	0	0	0	0	0	0		
0	F[6:0]	*	F_6	F_5	F_4	F_3	F_2	F_1	F_0		
0	G[6:0]	*	G_6	G_5	G_4	G_3	G_2	G_1	G_0		

Note
(1) "*" stands for "Don't care".

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1.1 Graphic Acceleration Command

1.1.1 Horizontal Scroll Setup (26h/27h)

This command consists of seven consecutive bytes to set up the horizontal scroll parameters and determines the scrolling start page, end page, scrolling speed, start column and end column.

Before issuing this command the horizontal scroll must be deactivated (2Eh). Otherwise, RAM content may be corrupted.

The SSD7317 horizontal scroll is designed for 128 columns scrolling. The following figures (Figure 0-1, Figure 0-2, and Figure 0-3) show the examples of using the horizontal scroll:

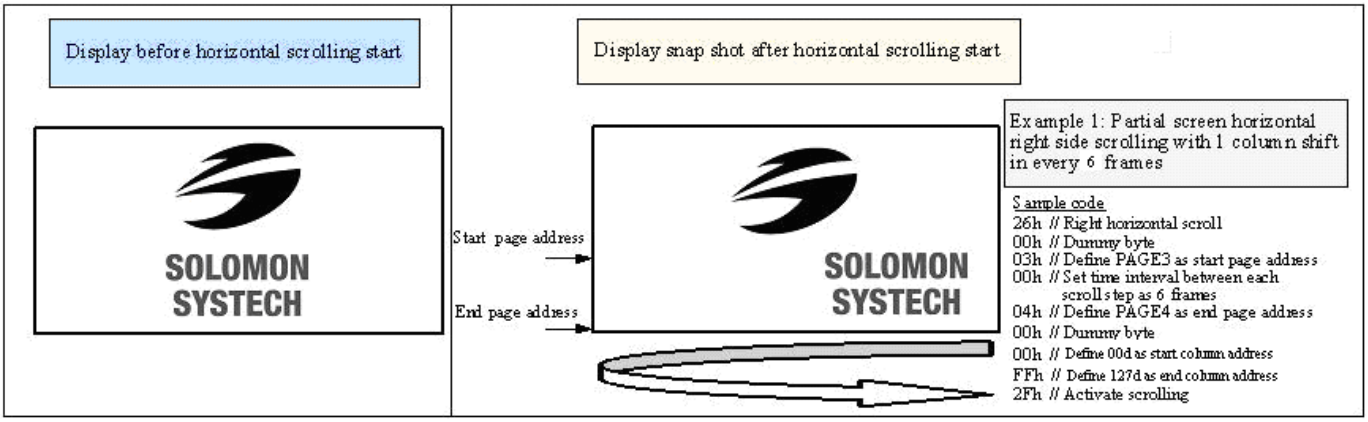
Figure 0-1 : Horizontal scroll example: Scroll RIGHT by 1 column

Original Setting	SEG0	SEG1	SEG2	SEG3	SEG4	SEG5	…	…	…	SEG122	SEG123	SEG124	SEG125	SEG126	SEG127
After one scroll step	SEG127	SEG0	SEG1	SEG2	SEG3	SEG4	…	…	…	SEG121	SEG122	SEG123	SEG124	SEG125	SEG126

Figure 0-2 : Horizontal scroll example: Scroll LEFT by 1 column

Original Setting	SEG0	SEG1	SEG2	SEG3	SEG4	SEG5	…	…	…	SEG122	SEG123	SEG124	SEG125	SEG126	SEG127
After one scroll step	SEG1	SEG2	SEG3	SEG4	SEG5	SEG6	…	…	…	SEG123	SEG124	SEG125	SEG126	SEG127	SEG0

Figure 0-3 : Horizontal scrolling setup example



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1.1.2 Continuous Vertical and Horizontal Scroll Setup (29h/2Ah)

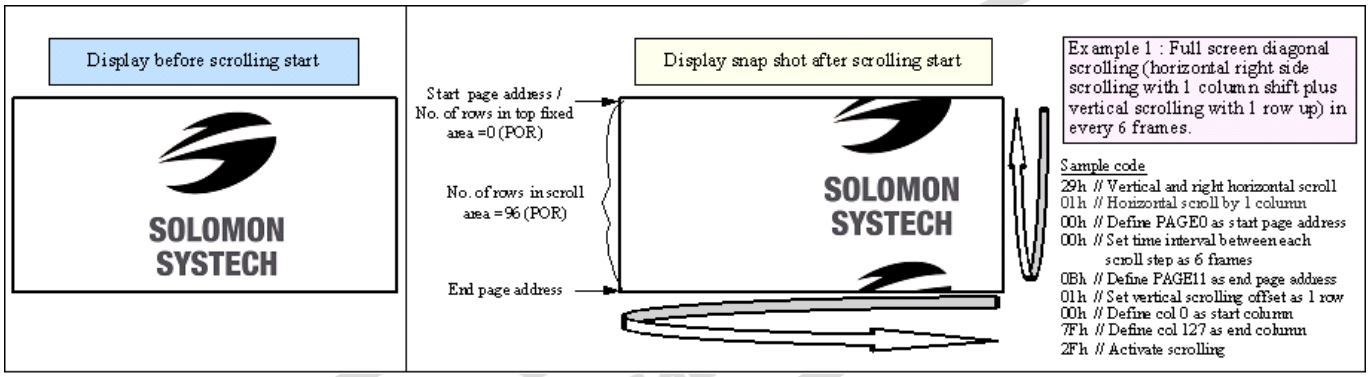
This command consists of seven consecutive bytes to set up the continuous vertical scroll parameters and determine the scrolling start page, end page, start column, end column, scrolling speed, horizontal and vertical scrolling offset.

If the vertical scrolling offset byte E[6:0] of command 29h / 2Ah is set to zero, then only horizontal scrolling is performed (like command 26/27h). On the other hand, if the number of column scroll offset byte A[0] is set to zero, then only vertical scrolling is performed.

Continuous diagonal (horizontal + vertical) scrolling would be enabled if both A[0] and E[6:0] are set to be non-zero, whereas full column diagonal scrolling mode is suggested by setting F[6:0]=00h and G[6:0]=7Fh.

Before issuing this command the scroll must be deactivated (2Eh), or otherwise, RAM content may be corrupted. The following figure (Figure 0-4) show the examples of using the continuous vertical and horizontal scroll.

Figure 0-4 : Continuous Vertical and Horizontal scrolling setup example



1.1.3 Deactivate Scroll (2Eh)

This command stops the motion of scrolling. After sending 2Eh command to deactivate the scrolling action, the ram data needs to be rewritten.

1.1.4 Activate Scroll (2Fh)

This command starts the motion of scrolling and should only be issued after the scroll setup parameters have been defined by the scrolling setup commands: 26h / 27h / 29h / 2Ah. The setting in the latest scrolling setup command overwrites the setting in the previous scrolling setup command.

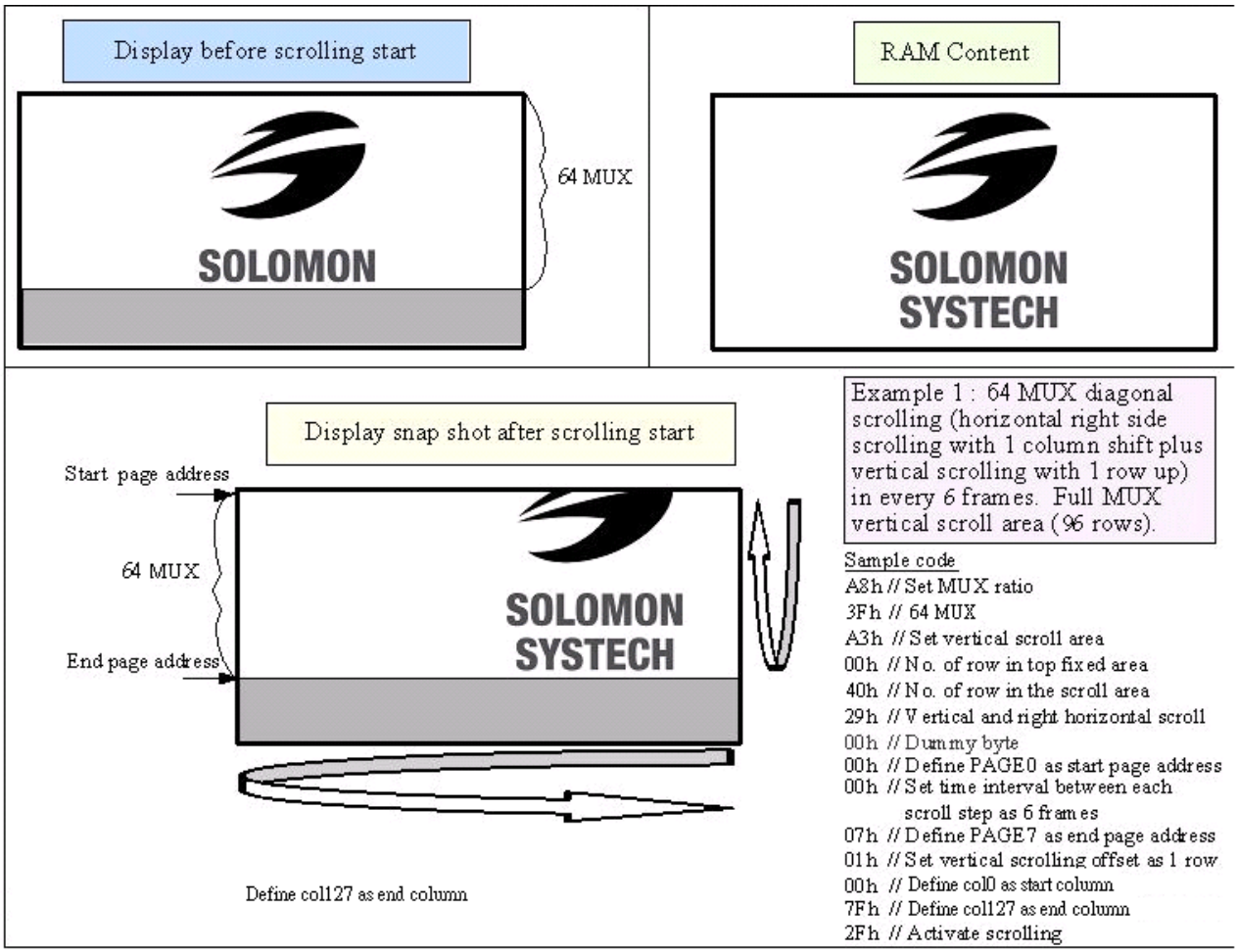
The following actions are prohibited after the scrolling is activated

1. RAM access (Data write or read)
2. Changing the horizontal scroll setup parameters

1.1.5 Set Vertical Scroll Area (A3h)

This command consists of 3 consecutive bytes to set up the vertical scroll area. For the continuous vertical scroll function (command 29h / 2Ah), the number of rows in the vertical scroll area can be set smaller than or equating to the MUX ratio. Figure 0-5 shows a vertical scrolling example with different settings in vertical scroll area.

Figure 0-5 : Vertical scroll area setup examples



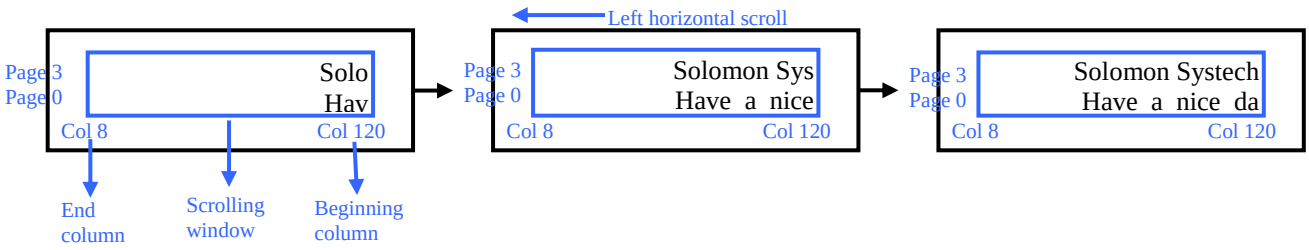
1.2 Advance Graphic Acceleration Command

1.2.1 Content Scroll Setup (2Ch/2Dh)

This command consists of seven consecutive bytes to set up the horizontal scroll parameters and determine the scrolling start page, end page, start column and end column. One column will be scrolled horizontally by sending the setting of command 2Ch / 2Dh once.

When command 2Ch / 2Dh are sent consecutively, a delay time of $^{2}/_{FrameFreq}$ must be set. Figure 0-6 shown an example of using 2Dh "Content Scroll Setup" command for horizontal scrolling to left with infinite content update. In there, "Col" means the graphic display data RAM column.

Figure 0-6: Content Scrolling example (2Dh, Left Horizontal Scroll by one column)



By using command 2Ch/2Dh, RAM contents are scrolled and updated by one column. Table 0-1 is an example of content scrolling setting of SSD7317 (eg. scrolling window of 4 pages). The values of registers depend on different conditions and applications.

Table 0-1 : Content Scrolling software flow example (Page addressing mode – command 20h, 02h)

Step	Action	D/C#	Code	Remarks
1	**For i= 1 to n**	-	-	Create "For loop" for infinite content scrolling
2	Set Content scrolling command (scrolling window : Page 0 to 3, Col 8 to Col 120)	0	2Dh	Left Horizontal Scroll by one column
		0	00h	A[7:0] : Dummy byte (Set as 00h)
		0	00h	B[3:0] : Define start page address
		0	01h	C[7:0] : Set no wrap around of RAM content
		0	03h	D[3:0] : Define end page address
		0	00h	E[7:0] : Dummy byte (Set as 00h)
		0	08h	F[6:0] : Define start column address
		0	78h	G[6:0] : Define end column address
3	Add Delay time of $2/FrameFreq$	-	-	E.g. Delay 20ms if frame freq ≈ 100Hz
4	Write RAM on the beginning column of the scrolling window			
	Write RAM on (Page0, Col 120) *(Content update in beginning column)*	0	B0h	Set Page Start Address for Page Addressing Mode
		0	17h	Set Higher Column Start Address for Page Addressing Mode
		0	08h	Set Lower Column Start Address for Page Addressing Mode
		1	-	Write data to fill the RAM
	Write RAM on (Page1, Col 120) *(Content update in beginning column)*	0	B1h	Set Page Start Address for Page Addressing Mode
		0	17h	Set Higher Column Start Address for Page Addressing Mode
		0	08h	Set Lower Column Start Address for Page Addressing Mode
		1	-	Write data to fill the RAM
	Write RAM on (Page2, Col 120) *(Content update in beginning column)*	0	B2h	Set Page Start Address for Page Addressing Mode
		0	17h	Set Higher Column Start Address for Page Addressing Mode
		0	08h	Set Lower Column Start Address for Page Addressing Mode
		1	-	Write data to fill the RAM
	Write RAM on (Page3, Col 120) *(Content update in beginning column)*	0	B3h	Set Page Start Address for Page Addressing Mode
		0	17h	Set Higher Column Start Address for Page Addressing Mode
		0	08h	Set Lower Column Start Address for Page Addressing Mode
		1	-	Write data to fill the RAM
5	i=i+1	-	-	Go to next "For loop"
	Delay timing	-	-	Set time interval between each scroll step if necessary
	End			

There are 3 different memory addressing mode in SSD7317: COM-page H mode, Page addressing mode and SEG-page H mode and it is selected by command 20h. Table 0-1 is an example of content scrolling software flow under page addressing mode, while COM-page H mode example is shown in below Table 0-2.

Table 0-2 : Content Scrolling setting example (COM-page H mode – command 20h, 01h)

Step	Action	D/C#	Code	Remarks
1	**For i= 1 to n**	-	-	Create "For loop" for infinite content scrolling
F	Set Content scrolling command (scrolling window : Page 0 to 3, Col 8 to Col 120)	0	2Dh	Left Horizontal Scroll by one column
		0	00h	A[6:0] : Dummy byte (Set as 00h)
		0	00h	B[3:0] : Define start page address
		0	01h	C[7:0] : Set no wrap around of RAM content
		0	03h	D[3:0] : Define end page address
		0	00h	E[6:0] : Dummy byte (Set as 00h)
		0	08h	F[6:0] : Define start column address
		0	78h	G[6:0] : Define end column address
3	Add Delay time of $2/FrameFreq$	-	-	E.g. Delay 20ms if frame freq ≈ 100Hz
4	Write RAM on the beginning column of the scrolling window (Page 0 to 3, Col 120) *(Content update in beginning column)*	0	21h	Set Column address
		0	78h	Set column start address for Vertical Addressing Mode
		0	78h	Set column end address for Vertical Addressing Mode
		0	22h	Set Page address
		0	00h	Set start page address for Vertical Addressing Mode
		0	03h	Set end page address for Vertical Addressing Mode
		1	-	Write data to fill the RAM
5	i=i+1	-	-	Go to next "For loop"
	Delay timing	-	-	Set time interval between each scroll step if necessary
	End			

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