

MODULES WITH BUILT-IN 1330 CONTROLLER

SEIKO INSTRUMENTS OFFERS FIVE MID-SIZE GRAPHIC MODULES WITH A BUILT-IN CONTROLLER

- ▶ G121C = 128 x 128 = SED1335
- ▶ G242C = 240 x 128 = SED1330
- ▶ G321D = 320 x 200 = SED1330
- ▶ G324E = 320 x 240 = SED1330

The SED1330 LCD controller IC generates all the signals required by the display memory and by the common and segment drivers, and has a built-in character generator ROM. The MPU interface can be configured for both the 6800 family and 8080 family processors. Text, graphics, and overlaid text and graphics can be displayed.

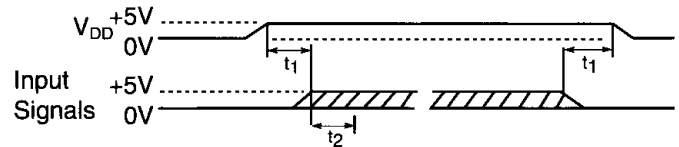
The new SED1335 controller, used in model G121C, has all of the same features as the SED1330. In addition, this new controller accommodates a +3.3 volt input.

SLEEP IN	53	Enter standby mode
DISP ON/OFF	58,59	Display blinking and blanking
SCROLL	44	Set display starting address and display area
CSRFORM	5D	Set cursor type
CSRDIR	4C-4F	Set cursor movement direction
OVLAY	5B	Set overlay format
CG RAM ADR	5C	Set CG RAM start address
HDOT SCR	5A	Set horizontal scroll position
CSRW	46	Set cursor address
CSRR	47	Read cursor address
MWRITE	42	Write data to display memory
MREAD	43	Read data from memory

TIMING CHARACTERISTICS

Power ON/OFF and signal input timing should be performed according to the following timing charts.

G242C (WITH DC/DC CONVERTER)



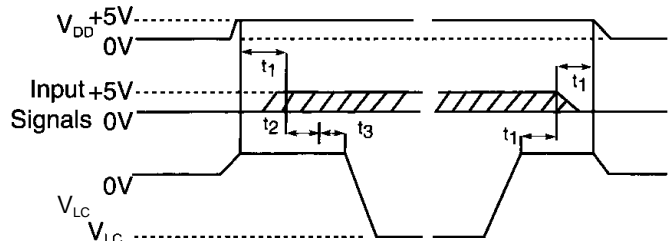
$t_1 \geq 0$ ms

t_2 : controller initialization time 20 ms

NOTE: The controller must be initialized immediately after the power supply goes to 5V.

ALL OTHER GRAPHIC MODULES

The power conditions for power-on initial setup are as follows:



$t_1 \geq 0$ ms

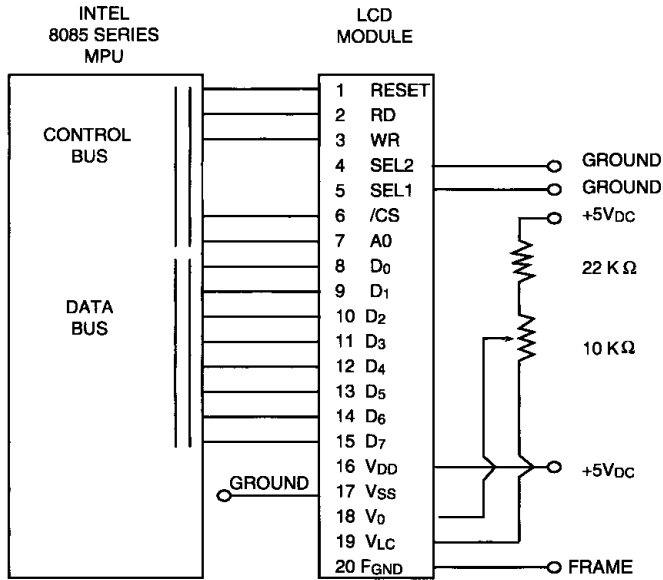
$t_3 \geq 20$ ms

t_2 : controller initialization time

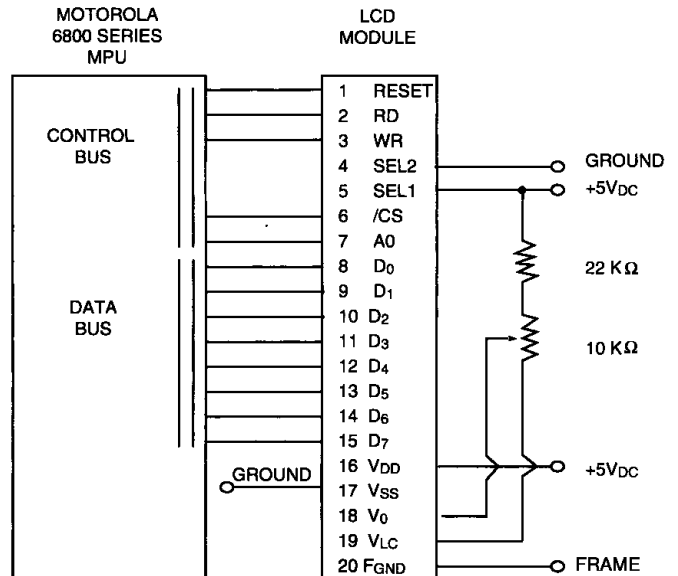
Item	Symbol	Min.	Typ.	Max.	Unit
Reset time	t_{RST}	1.0	-	-	μ S
Rise time	t_r	-	-	200	ns

MODULES WITH BUILT-IN 1330 CONTROLLER

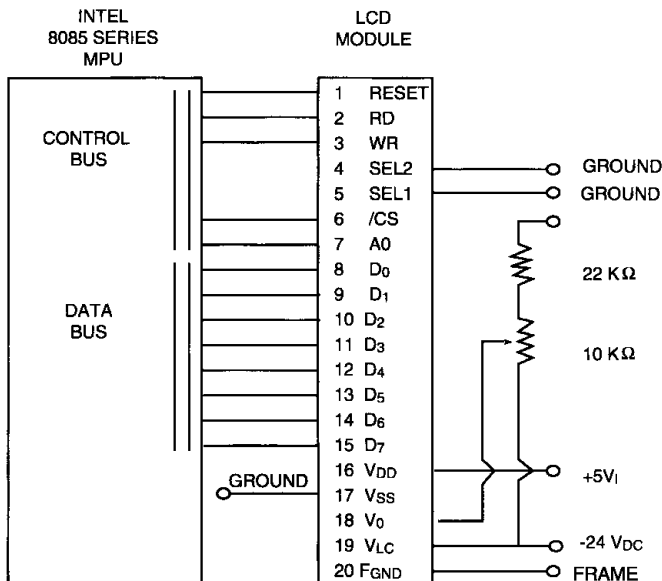
CONNECTIONS FOR G242C WITH BUILT-IN CONTROLLER



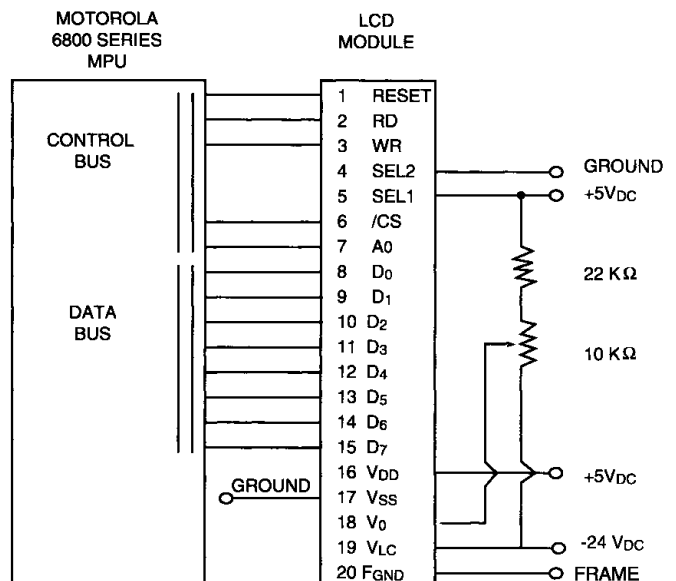
CONNECTIONS FOR G242C WITH BUILT-IN CONTROLLER



CONNECTIONS FOR G121C, G321D, G324E WITH BUILT-IN CONTROLLER*



CONNECTIONS FOR G121C, G321D, G324E WITH BUILT-IN CONTROLLER*



* Note: Modify these two diagrams as follows:

G121C Pin 20 = INH. Pins 21 & 22 = LED backlight.
 G324E: Pin 4 = no connection. SEL2 is internally grounded for G324E with built-in controller.

On the following pages you can find the initialization examples for the five display modules. Transferring the parameters to the display modules will set up a display system having:

- ▶ Single screen drive mode
- ▶ Layer 1, character display
- ▶ Layer 2, graphic display
- ▶ Character font, 8 x 8 pixels
- ▶ CG RAM, 32 characters max.

MODULES WITH BUILT-IN 1330 CONTROLLER

INITIALIZATION EXAMPLE FOR G121C (128 x 128)

Command	Code (HEX)	Function								Description	
		D7	D6	D5	D4	D3	D2	D1	D0		
SYSTEM SET	40	0	1	0	0	0	0	0	0	System and display initialization command	
Parameter 1	30	PKT	0	IV	1	W/S	M2	M1	M0	M0: 0 Internal CG ROM M1: 0 CG RAM 32 characters max M2: 0 Character height = 8 pixels W/S: 0 Single screen display IV: 1 Character offset disabled PKT: 0	
Parameter 2	87	WF	0	0	0	0	←	FX	→	FX: 7 Character field width = 8 WF: 1 Two frame AC drive	
Parameter 3	07	0	0	0	0	←	FY	→	FY: 7 Character field height = 8		
Parameter 4	10	←	C/R				→				C/R: 29d Characters per row = 16
Parameter 5	4A	←	T C/R				→				T C/R: 148d Timing characters per row = 149d fosc = 6 MHz; Frame freq. = 70 Hz
Parameter 6	7F	←	L/F				→				L/F: 63 Number of lines per screen = 128
Parameter 7	1E	←	APL				→				APL: 30d Address pitch = C/R + 1
Parameter 8	00	←	APH				→				APH: 00H
SCROLL	44	0	1	0	0	0	1	0	0	Set display starting address and display area	
Parameter 1	00	←	SAD1L				→				Screen1 start address (low) = 00H
Parameter 2	00	←	SAD1H				→				Screen1 start address(high) = 00H
Parameter 3	7F	←	SL1				→				SL1: 127d Number of lines in Screen 1 = 128d
Parameter 4	00	←	SAD2L				→				Screen2 start address (low) = 00H
Parameter 5	05	←	SAD2H				→				Screen2 start address (high) = 05H
Parameter 6	7F	←	SL2				→				SL2: 127d Number of lines in Screen 2 = 128d
CSRDIR	4C	0	1	0	0	1	1	CD1	CD2	Set cursor movement direction CD1, CD2: 00 Shift direction = Right	
HDOT SCR	5A	0	1	0	1	1	0	1	0	Set horizontal scroll position	
Parameter 1	00	0	0	0	0	0	←	CD1	→	CD1: 0d Don't scroll display horizontally	
CSRW	46	0	1	0	0	0	1	1	0	Set cursor address	
Parameter 1	00	←	CSRL				→				Cursor address (low) = 00
Parameter 2	00	←	CSRH				→				Cursor address (high) = 00
MWRITE	42	0	1	0	0	0	0	1	0	Write data to display memory	
Parameter 1 - n	—	←	Character codes				→				Write n characters to the display memory
OVLAY	5B	0	1	0	1	1	0	1	1	Set overlay format	
Parameter 1	01	0	0	0	OV	DM2	DM1	MX1	MX0	MX1, MX0: 01 L1 exOR L2 DM2, DM1: 001st and 3rd screens in character mode OV: 0 Two layer synthesis	
DISP ON/OFF	59	0	1	0	1	1	0	0	D	Display blinking and blanking D: 1 Entire display active	
Parameter 1	04	FP5	FP4	FP3	FP2	FP1	FP0	FC1	FC0	FC1, FC0: 00 Cursor display OFF FP1, FP0: 01 1st screen ON FP3, FP2: 00 2nd screen OFF FP5, FP4: 00 3rd screen OFF	

Note: d: decimal notation; H: hex notation

MODULES WITH BUILT-IN 1330 CONTROLLER

INITIALIZATION EXAMPLE FOR G242C (240 x 128)

Command	Code (HEX)	Function								Description	
		D7	D6	D5	D4	D3	D2	D1	D0		
SYSTEM SET	40	0	1	0	0	0	0	0	0	System and display initialization command	
Parameter 1	30	PKT	0	IV	1	W/S	M2	M1	M0	M0: 0 Internal CG ROM M1: 0 CG RAM 32 characters max M2: 0 Character height = 8 pixels W/S: 0 Single screen display I/V: 1 Character offset disabled PKT: 0	
Parameter 2	87	WF	0	0	0	0	←	FX	→	FX: 7 Character field width = 8 WF: 1 Two frame AC drive	
Parameter 3	07	0	0	0	0	←	FY	→	FY: 7 Character field height = 8		
Parameter 4	1D	←	C/R				→				C/R: 29d Characters per row = 30
Parameter 5	4A	←	T C/R				→				T C/R: 74d Timing characters per row = 75d fosc = 6 MHz; Frame freq. = 70 Hz
Parameter 6	7F	←	L/F				→				L/F: 127 Number of lines per screen = 128
Parameter 7	1E	←	APL				→				APL: 30d Address pitch = C/R + 1
Parameter 8	00	←	APH				→				APH: 00H
SCROLL	44	0	1	0	0	0	1	0	0	Set display starting address and display area	
Parameter 1	00	←	SAD1L				→				Screen1 start address (low) = 00H
Parameter 2	00	←	SAD1H				→				Screen1 start address (high) = 00H
Parameter 3	7F	←	SL1				→				SL1: 127d Number lines in Screen 1 = 128d
Parameter 4	00	←	SAD2L				→				Screen2 start address (low) = 00H
Parameter 5	05	←	SAD2H				→				Screen2 start address (high) = 05H
Parameter 6	7F	←	SL2				→				SL2: 127d Number of lines in Screen 2 = 128d
CSRDIR	4C	0	1	0	0	1	1	CD1	CD2	Set cursor movement direction CD1, CD2: 00 Shift direction = Right	
HDOT SCR	5A	0	1	0	1	1	0	1	0	Set horizontal scroll position	
Parameter 1	00	0	0	0	0	0	←	CD1	→	CD1: 0d Don't scroll display horizontally	
CSRW	46	0	1	0	0	0	1	1	0	Set cursor address	
Parameter 1	00	←	CSRL				→				Cursor address (low) = 00
Parameter 2	00	←	CSRH				→				Cursor address (high) = 00
MWRITE	42	0	1	0	0	0	0	1	0	Write data to display memory	
Parameter 1 - n	—	←	Character codes				→				Write n characters to the display memory
OVLAY	5B	0	1	0	1	1	0	1	1	Set overlay format	
Parameter 1	01	0	0	0	OV	DM2	DM1	MX1	MX0	MX1, MX0: 01 L1 exOR L2 DM2, DM1: 00 1st and 3rd screens in character mode OV: 0 Two layer synthesis	
DISP ON/OFF	59	0	1	0	1	1	0	0	D	Display blinking and blanking D: 1 Entire display active	
Parameter 1	04	FP5	FP4	FP3	FP2	FP1	FP0	FC1	FC0	FC1, FC0: 00 Cursor display OFF FP1, FP0: 01 1st screen ON FP3, FP2: 00 2nd screen OFF FP5, FP4: 00 3rd screen OFF	

Note: d: decimal notation; H: hex notation

MODULES WITH BUILT-IN 1330 CONTROLLER

INITIALIZATION EXAMPLE FOR G321D (320 x 200)

Command	Code (HEX)	Function								Description	
		D7	D6	D5	D4	D3	D2	D1	D0		
SYSTEM SET	40	0	1	0	0	0	0	0	0	System and display initialization command	
Parameter 1	30	PKT	0	IV	1	W/S	M2	M1	M0	M0: 0 Internal CG ROM M1: 0 CG RAM 32 characters max M2: 0 Character height = 8 pixels W/S: 0 Single screen display IV: 1 Character offset disabled PKT: 0	
Parameter 2	87	WF	0	0	0	0	←	FX	→	FX: 7 Character field width = 8 WF: 1 Two frame AC Drive	
Parameter 3	07	0	0	0	0	←	FY	→	FY: 7 Character field height = 8		
Parameter 4	27	←	C/R				→				C/R: 39d Characters per row = 40
Parameter 5	2F	←	T C/R				→				T C/R: 47d Timing characters per row = 48d fosc = 6 MHz; Frame freq. = 70 Hz
Parameter 6	C7	←	L/F				→				L/F: 199 Number of lines per screen = 200
Parameter 7	28	←	APL				→				APL: 40d Address pitch = C/R + 1
Parameter 8	00	←	APH				→				APH: 00H
SCROLL	44	0	1	0	0	0	1	0	0	Set display starting address and display area	
Parameter 1	00	←	SAD1L				→				Screen1 start address (low) = 00H
Parameter 2	00	←	SAD1H				→				Screen1 start address (high) = 00H
Parameter 3	C7	←	SL1				→				SL1: 199d Number of lines in Screen 1 = 200d
Parameter 4	00	←	SAD2L				→				Screen2 start address (low) = 00H
Parameter 5	05	←	SAD2H				→				Screen2 start address (high) = 05H
Parameter 6	C7	←	SL2				→				SL2: 199d Number of lines in Screen 2 = 200d
CSRDIR	4C	0	1	0	0	1	1	CD1	CD2	Set cursor movement direction CD1, CD2: 00 Shift direction = Right	
HDOT SCR	5A	0	1	0	1	1	0	1	0	Set horizontal scroll position	
Parameter 1	00	0	0	0	0	0	←	CD1	→	CD1: 0d Don't scroll display horizontally	
CSRW	46	0	1	0	0	0	1	1	0	Set cursor address	
Parameter 1	00	←	CSRL				→				Cursor address (low) = 00
Parameter 2	00	←	CSRH				→				Cursor address (high) = 00
MWRITE	42	0	1	0	0	0	0	1	0	Write data to display memory	
Parameter 1 - n	—	←	Character codes				→				Write n characters to the display memory
OVLAY	5B	0	1	0	1	1	0	1	1	Set overlay format	
Parameter 1	01	0	0	0	OV	DM2	DM1	MX1	MX0	MX1, MX0: 01 L1 exOR L2 DM2, DM1: 00 1st and 3rd screens in character mode OV: 0 Two layer synthesis	
DISP ON/OFF	59	0	1	0	1	1	0	0	D	Display blinking and blanking D: 1 Entire display active	
Parameter 1	04	FP5	FP4	FP3	FP2	FP1	FP0	FC1	FC0	FC1, FC0: 00 Cursor display OFF FP1, FP0: 01 1st screen ON FP3, FP2: 00 2nd screen OFF FP5, FP4: 00 3rd screen OFF	

Note: d: decimal notation, H: hex notation

MODULES WITH BUILT-IN 1330 CONTROLLER

INITIALIZATION EXAMPLE FOR G324E (320 x 240)

Command	Code (HEX)	Function								Description	
		D7	D6	D5	D4	D3	D2	D1	D0		
SYSTEM SET	40	0	1	0	0	0	0	0	0	System and display initialization command	
Parameter 1	30	PKT	0	IV	1	W/S	M2	M1	M0	M0: 0 Internal CG ROM M1: 0 CG RAM 32 characters max M2: 0 Character height = 8 pixels W/S: 0 Single screen display IV: 1 Character offset disabled PKT: 0	
Parameter 2	87	WF	0	0	0	0	←	FX	→	FX: 7 Character field width = 8 WF: 1 Two frame AC drive	
Parameter 3	07	0	0	0	0	←	FY	→	FY: 7 Character field height = 8		
Parameter 4	27	←	C/R				→				C/R: 39d Characters per row = 40
Parameter 5	2F	←	T C/R				→				T C/R: 47d Timing characters per row = 48d fosc = 6 MHz: Frame freq. = 70 Hz
Parameter 6	EF	←	L/F				→				L/F: 199 Number of lines per screen = 240
Parameter 7	28	←	APL				→				APL: 40d Address pitch = C/R + 1
Parameter 8	00	←	APH				→				APH: 00H
SCROLL	44	0	1	0	0	0	1	0	0	Set display starting address and display area	
Parameter 1	00	←	SAD1L				→				Screen1 start address (low) = 00H
Parameter 2	00	←	SAD1H				→				Screen1 start address (high) = 00H
Parameter 3	EF	←	SL1				→				SL1: 239d Number of lines in Screen 1 = 240d
Parameter 4	00	←	SAD2L				→				Screen2 start address (low) = 00H
Parameter 5	05	←	SAD2H				→				Screen2 start address (high) = 05H
Parameter 6	EF	←	SL2				→				SL2: 239d Number of lines in Screen 2 = 240d
CSRDIR	4C	0	1	0	0	1	1	CD1	CD2	Set cursor movement direction CD1, CD2: 00 Shift direction = Right	
HDOT SCR	5A	0	1	0	1	1	0	1	0	Set horizontal scroll position	
Parameter 1	00	0	0	0	0	0	←	CD1	→	CD1: 0d Don't scroll display horizontally	
CSRW	46	0	1	0	0	0	1	1	0	Set cursor address	
Parameter 1	00	←	CSRL				→				Cursor address (low) = 00
Parameter 2	00	←	CSRH				→				Cursor address (high) = 00
MWRITE	42	0	1	0	0	0	0	1	0	Write data to display memory	
Parameter 1 - n	—	←	Character codes				→				Write n characters to the display memory
OVLAY	5B	0	1	0	1	1	0	1	1	Set overlay format	
Parameter 1	01	0	0	0	OV	DM2	DM1	MX1	MX0	MX1, MX0: 01 L1 exOR L2 DM2, DM1: 00 1st and 3rd screens in character mode OV: 0 Two layer synthesis	
DISP ON/OFF	59	0	1	0	1	1	0	0	D	Display blinking and blanking D: 1 Entire display active	
Parameter 1	04	FP5	FP4	FP3	FP2	FP1	FP0	FC1	FC0	FC1, FC0: 00 Cursor display OFF FP1, FP0: 01 1st screen ON FP3, FP2: 00 2nd screen OFF FP5, FP4: 00 3rd screen OFF	

Note: d: decimal notation, H: hex notation