



愛高實業(香港)有限公司  
HICO INDUSTRIAL (HK) LIMITED

## PRODUCT SPECIFICATION

# WORLDTIME CHRONOGRAPH

Product Code:	HCS-T009-1
Version:	1.4
Date:	February 5, 2004

### Hong Kong 香港

22<sup>nd</sup> Floor, Delta House, 3 On Yiu Street, Siu Lek Yuen, Shatin, N. T., Hong Kong  
香港新界沙田小瀝源安耀街三號匯達大廈二十二樓  
Tel: 26486862 Fax: 26373691 Email: [hico@hico.com.hk](mailto:hico@hico.com.hk)

### Shenzhen 深圳

16/F., Times Plaza, 1 Prince Road, Shekou, Shenzhen, China  
深圳蛇口太子路一號新時代廣場十六樓  
Tel: (0755)26812638 Fax: (0755)26817308 Email: [sales@sz.hico.com.hk](mailto:sales@sz.hico.com.hk)

### Shanghai 上海

Level 21, HSBC Tower, 101 Yin Cheng East Road, Pudong, Shanghai, China 200120  
上海市浦東新區銀城東路 101 號匯豐大廈二十一樓，郵編：200120  
Tel: (021)28903020 Fax: (021)28903022 Email: [sales@sh.hico.com.hk](mailto:sales@sh.hico.com.hk)

Room 833, No. 8 Huajing Road, Waigaoqiao Free Trade Zone, Pudong, Shanghai, China 200131  
上海市浦東外高橋保稅區華京路八號八三三室，郵編：200131  
Tel: (021)50462088 Fax: (021)50460960




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 香港新界沙田小瀝源安耀街三號匯達大廈二十二樓

*Worldtime Chronograph (HCS-T009-1)*

**DOCUMENT HISTORY**

Date	Product Code	Version	Approved by	Revision Details
Feb. 5, 2004	HCS-T009-1	1.4		<ul style="list-style-type: none"> <li>Revised VDC pin on circuit diagram</li> <li>Added Document History</li> <li>Changed Shenzhen office address</li> <li>Clarification on EL Backlight Control pin output when EL Backlight is disabled (p. 3,4,7)</li> <li>Clarification on pressing [B]+[C] when EL Backlight Control is disabled (p. 14)</li> </ul>
May 16, 2003	HCS-T009-1	1.3	<b>OBSOLETE</b>	
July 11, 2002	HCS-T009-1	1.2	<b>OBSOLETE</b>	
Dec. 21, 2001	HCS-T009-0	1.1	<b>OBSOLETE</b>	



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## *Worldtime Chronograph (HCS-T009-1)*

### GENERAL DESCRIPTION

The WORLDTIME CHRONOGRAPH is a single-chip micro-controller that is preprogrammed for digital watch applications. Features with 10-lap memories Chronograph, World Time Clock, and 3 Daily Alarms, it could be a useful tool for frequent travelers. By using LSI originated from Japan, quality, reliability and excellent performance could be ensured.

### FEATURES

- Real Time Clock
  - Hour, Minute, Second
  - 12 or 24 hour display format by user option
  - Hourly chime
  - Per city DST option
- World Time Clock
  - 24 cities with abbreviated city name display
- Auto Calendar
  - Year, Month, Day, Day of Week
  - Auto leap year adjustment from 2000 to 2099
  - Auto setting of Day of Week
  - Options for mode of display:
    - Option 1: Sub-mode of RTC (activate by key action)
    - Option 2: Separate mode
- Daily Alarms
  - Three daily alarms operated separately
  - User adjustable Hour, Minute and City
  - Alarm tone will be deactivated when EL backlight (J2) is disabled
- Countdown Timer
  - User adjustable time duration from 1 minute up to 180 minutes
  - Auto repeat function by user option
  - Alert signal when countdown to zero
- Chronograph
  - Count up to 9 hours 59 minutes 59.99 seconds with 1/100 second resolution
  - Memories for 10 lap time
- Night mode
  - Available when EL backlight is enabled by bonding option J2
  - When enabled, EL backlight control will be activated for any key operation
- Operates with 3 volts Lithium battery
- Operates with 4 buttons
- Beep tone alerts for key operations



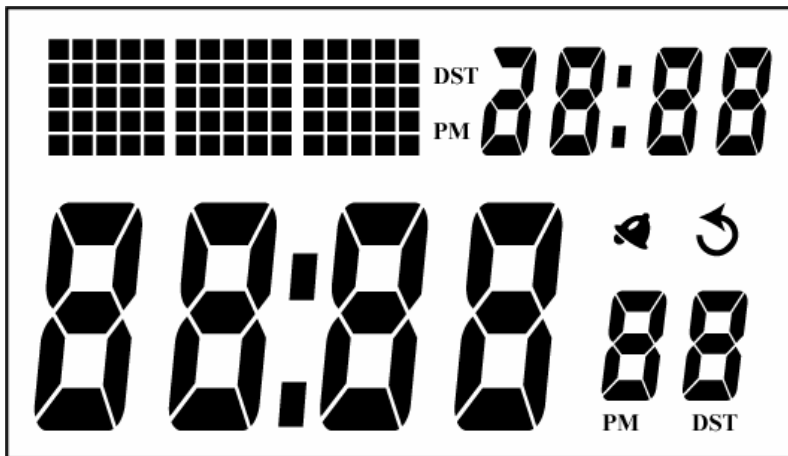
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## Worldtime Chronograph (HCS-T009-1)

- EL backlight control (selectable by bonding option J2)
  - Option 1 – enabled:
    - Output signal for EL backlight control (active HIGH)
  - Option 2 – disabled:
    - Night Mode will be deactivated
    - EL backlight control pin will output HIGH when alarm time arrives. In this case press one of the keys to change output to LOW.

## LCD PATTERN



- Operating Voltage: 4.5V
- Duty Cycle: 1/5
- Bias: 1/3
- Viewing Direction: 6H
- Connection: Top and Bottom

## KEYBOARD



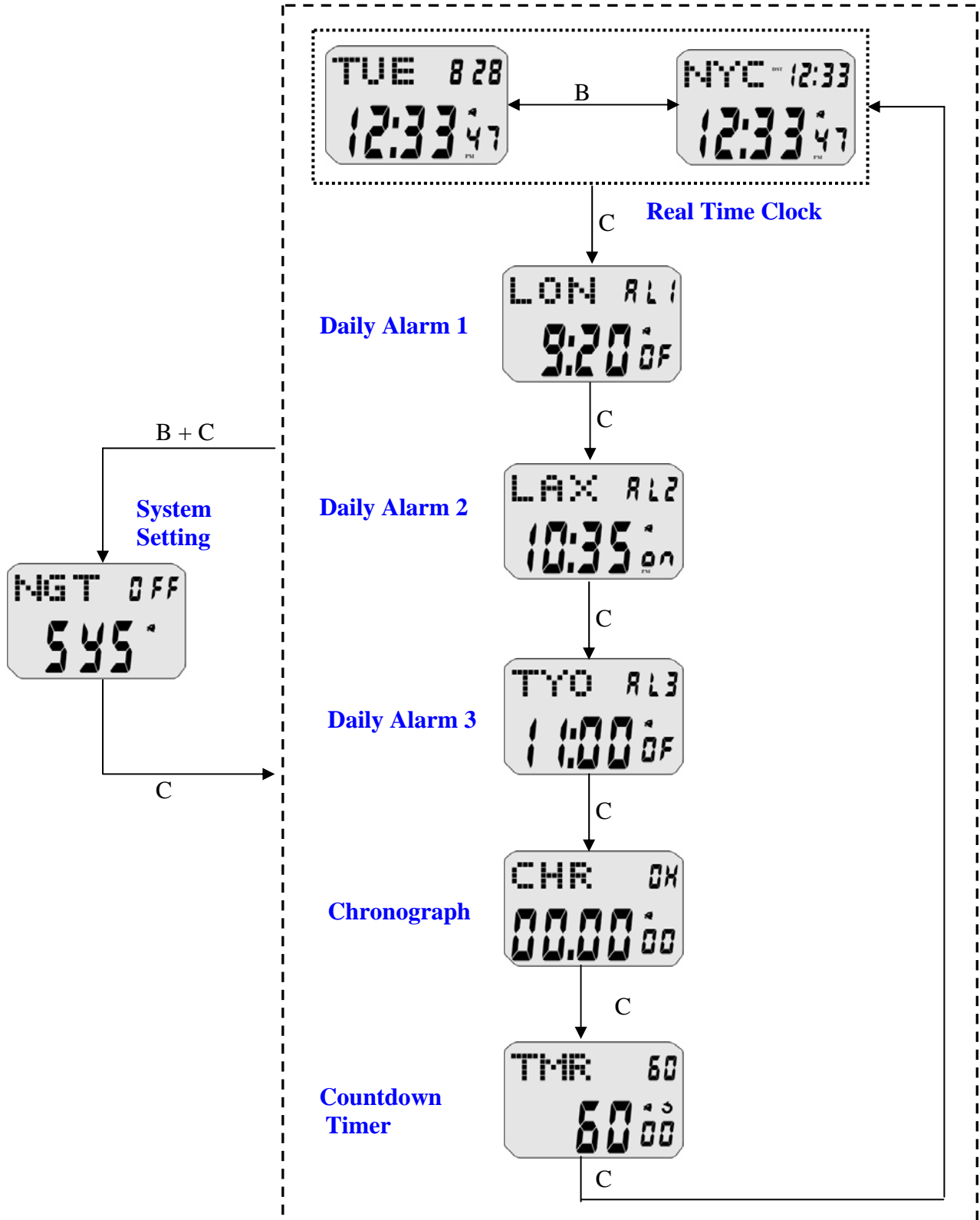


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*Worldtime Chronograph (HCS-T009-1)*

**FUNCTIONAL FLOWCHART – OPTION 1**



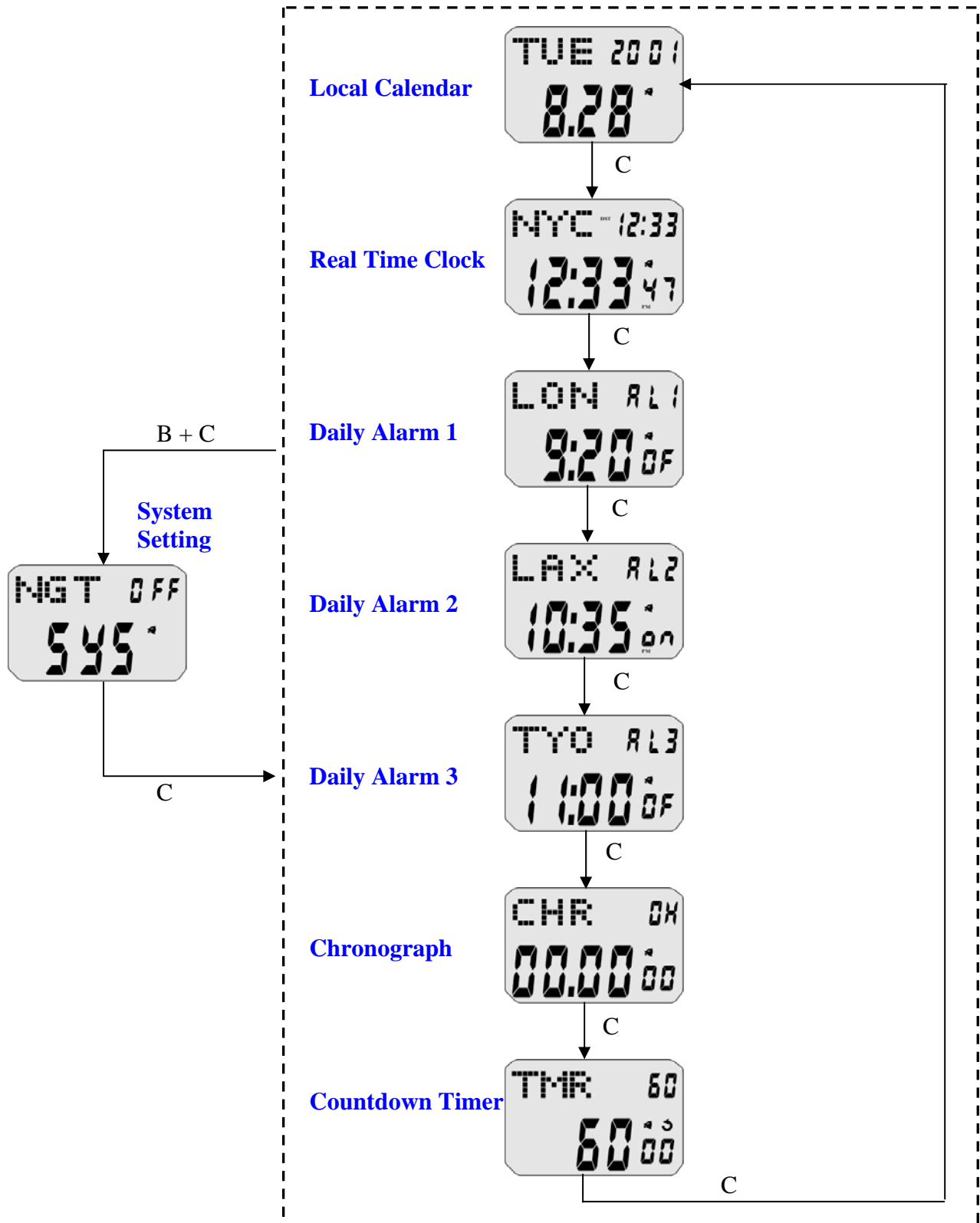


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*Worldtime Chronograph (HCS-T009-1)*

**FUNCTIONAL FLOWCHART – OPTION 2**





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*Worldtime Chronograph (HCS-T009-1)*

## FUNCTIONAL DESCRIPTIONS

### 1. System Defaults

- System Defaults will be initialized upon system startup

MODE	ELEMENT	SETTING
Local Time	Time	12:00:00 AM
	Date	Monday 2001-01-01
	Display format	12-hour
	Hourly chime	Disabled
	City	UTC
World Time	City	UTC
	DST	All cleared
Daily Alarms	Time	12:00 AM
	City	UTC
	Alert	Off
Chronograph	Total Time	0H 00 minutes 00.00 second
	LAP	All cleared
	Status	Stopped
	Time	60 minutes
Countdown Timer	Status	Stopped
	Auto Reload	Disabled
Night Mode	Status	Disabled

### 2. Auto Return

- Normal mode will be resumed in any setting mode if no key operation for 1 minute.

### 3. Auto Advance

- In any setting mode, press and hold [A] for more than 2 seconds will activate Auto Advance function. Current selected digits will be adjusted at a rate of 5 steps per second until [A] is released.

### 4. EL Backlight Control

- EL Backlight is available by bonding option J2.
- When EL Backlight is enabled (J2 = VSS), press [LIGHT] will activate the EL Backlight Control for 3 seconds. The Control will be deactivated after 3 seconds regardless the status of [LIGHT].
- When NIGHT MODE is enabled, any key operation will activate EL Backlight Control for 3 seconds.
- When EL Backlight is disabled (J2 = VDD), EL Backlight Control pin (see circuit diagram) will output HIGH when alarm time arrives. In this case press one of the keys to change output to LOW. This feature can be used in radio alarm control application.



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5. Alert Signals

- Alert signals will be played based on the following order:

TIMER → AL1 → AL2 → AL3 → CHIME

- Duration of alert

TIMER timeout: 10 seconds  
 AL1 to AL3: 20 seconds  
 CHIME: 1 second

6. Cities Included

City Code	City	Country	Time Difference
UTC	Coordinated Universal Time	-----	-----
LON	London	UK	±00:00 UTC
PAR	Paris	France	+01:00 UTC
ROM	Rome	Italy	+01:00 UTC
CAI	Cairo	Egypt	+02:00 UTC
MOW	Moscow	Russia	+03:00 UTC
DXB	Dubai	UAE	+04:00 UTC
KHI	Karachi	Pakistan	+05:00 UTC
DEL	New Delhi	India	+05:30 UTC
DAC	Dhaka	Bangladesh	+06:00 UTC
BKK	Bangkok	Thailand	+07:00 UTC
SIN	Singapore	Singapore	+08:00 UTC
HKG	Hong Kong	China	+08:00 UTC
TYO	Tokyo	Japan	+09:00 UTC
SYD	Sydney	Australia	+10:00 UTC
NOU	Nouméa	New Caledonia	+11:00 UTC
AKL	Auckland	New Zealand	+12:00 UTC
HNL	Honolulu	USA	-10:00 UTC
ANC	Anchorage	USA	-09:00 UTC
LAX	Los Angeles	USA	-08:00 UTC
DEN	Denver	USA	-07:00 UTC
CHI	Chicago	USA	-06:00 UTC
NYC	New York	USA	-05:00 UTC
CCS	Caracas	Venezuela	-04:00 UTC
RIO	Rio De Janeiro	Brazil	-03:00 UTC





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*Worldtime Chronograph (HCS-T009-1)*

## OPERATIONAL INSTRUCTIONS

### 1. Real Time Clock

#### Time Display



← World Time (e.g. New York 12:33 AM DST)

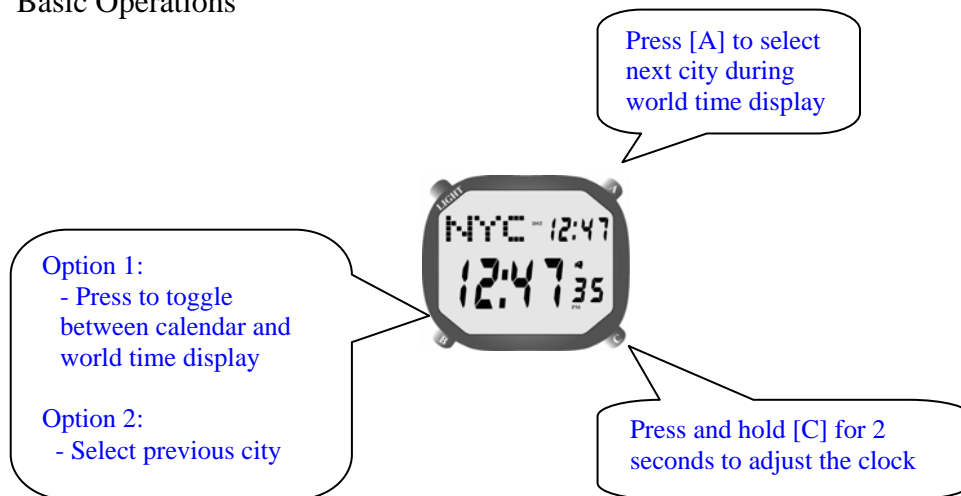
← Local Time (e.g. 12:33:47 PM STD)

#### Calendar Display



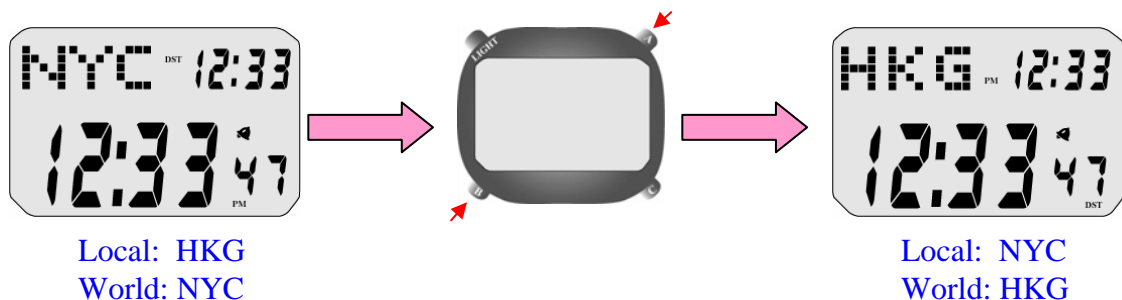
Current Date of Local Time  
(e.g. 2001-8-28 Tuesday)

- Basic Operations



- Swap Local Time and World Time

- Press [A] and [B] simultaneously to swap Local Time and World Time





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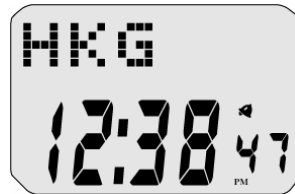
## Worldtime Chronograph (HCS-T009-1)

- Adjusting the Local Time
  - Adjusting the Local Time will automatically adjust the time for all other cities according to the time differences.

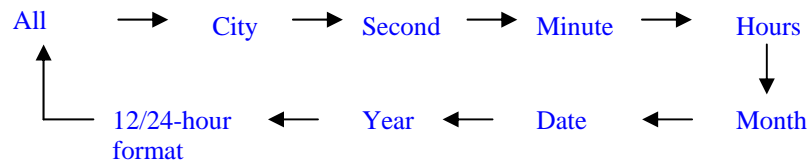


Press and hold [C] for 2 seconds to enter Time setting

- City name and time will be shown



- Whole display will blink for Hourly Chime Setting.
- Press [A] to enable/disable Hourly Chime
- Press [B] to select the digits to be blinked in the following sequence:



- Use [A] to adjust the blinking digits.
- Press [C] to confirm setting and return to normal operation.
- Day of Week will be adjusted automatically.
- Display Formats:



Selecting 12/24-hour format



Adjusting calendar



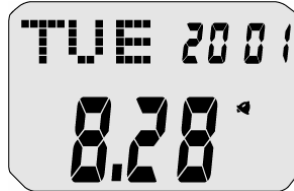
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### 2. Calendar Mode (Option 2 only)

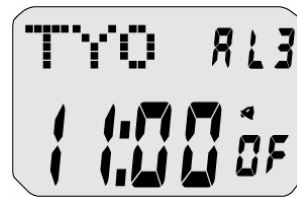
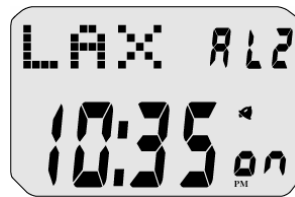
#### Calendar Display



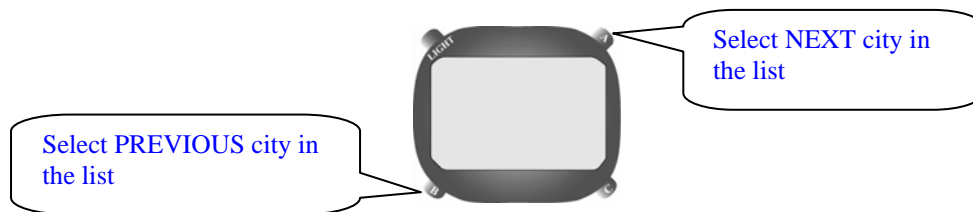
Current Date of Local Time  
(e.g. 2001-8-28 Tuesday)

- Press [C] to change to next mode in the sequence.
- Buttons [A] and [B] will have no function.

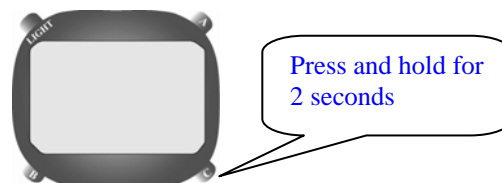
### 3. Daily Alarm



- The operations of all Daily Alarms are the same. The only differences are the associated alert signals.
- Once alarm is set and enabled, it sounds at the same time every day until it is disabled.
- Press [A] and [B] to select the desired city. Alarm time will change according to the time difference.



- Setting the Alarm
  - Press and hold [C] for 2 seconds to set the Alarm



- Whole display will blink for setting the Alarm ON/OFF.

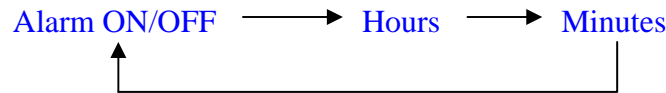


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## Worldtime Chronograph (HCS-T009-1)

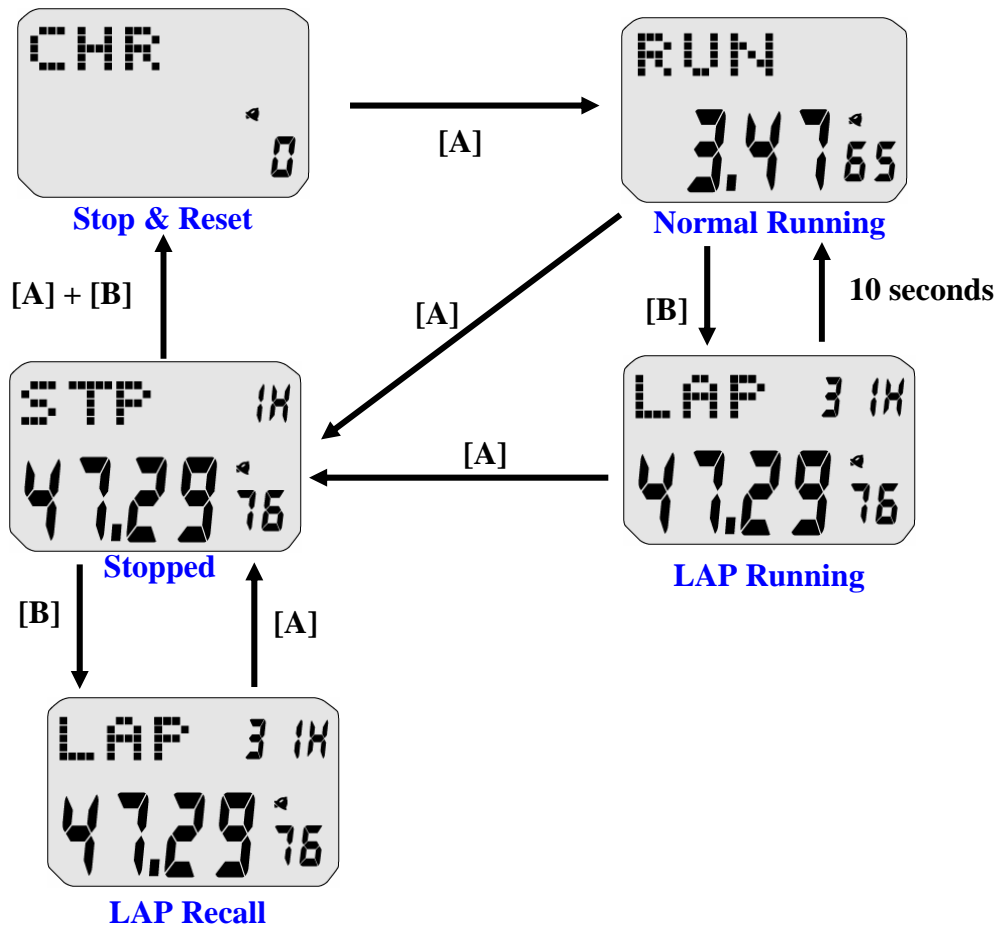
- Press [B] to select digits to blink in the following sequence:



- Press [A] to adjust the blinking digits.
- Press [C] to confirm the setting and return to normal operation.
- When Alarm alert is activated, press [A], [B], or [C] to turn it off.

### 3. Chronograph

- Operating the Chronograph



- Maximum count is 9 hours 59 minutes 59.99 seconds. When maximum count is reached, counting will continue with time reset to zero.



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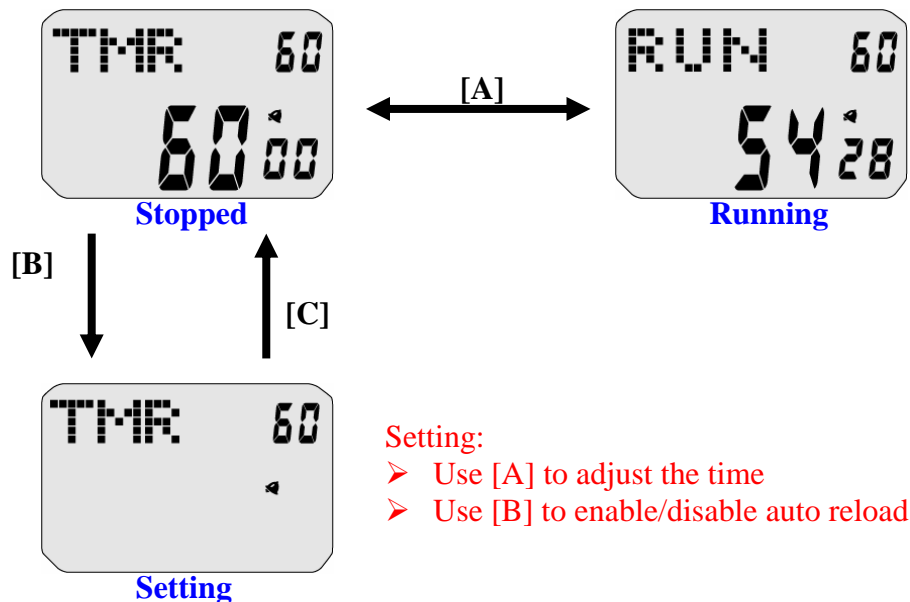
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## *Worldtime Chronograph (HCS-T009-1)*

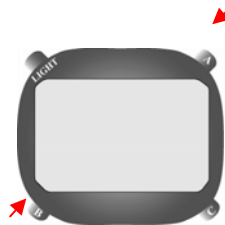
- Ten LAP records can be stored in the internal memory. When all the records are occupied, new LAP entry will overwrite the 10<sup>th</sup> record.
- In LAP Recall, press [B] will retrieve all LAP records sequentially.

### 4. Countdown Timer

- Operating the Countdown Timer



- The timer can be set from 1 minute to 180 minutes in 1-minute step.
- To reload the original value in Stopped, press [A] and [B] simultaneously.



- The timer is equipped with Auto Reload function; once enabled, the timer will reload its preset value and start counting automatically when timeout occurs.
- Beep reminder will be played when time remains equal to 50, 40, 30, 20, 10, 9, 8, 7, 6, 5, 4, 3, 2, and 1 seconds.



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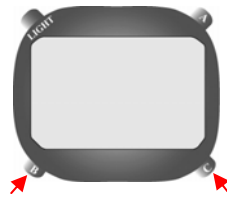
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## Worldtime Chronograph (HCS-T009-1)

- Timeout alert will be sounded when timer reaches zero.

### 5. System Setup

- Press [B] and [C] simultaneously in any operating mode (except any setting mode) will enter into this mode.

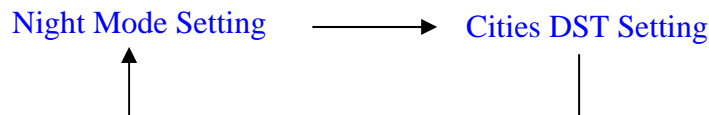


- Upon entering this mode, the display will show:
- Press [A] to select the state of the current parameter.



Night Mode Setting

- Press [B] to select the parameter to set according to the below sequence:

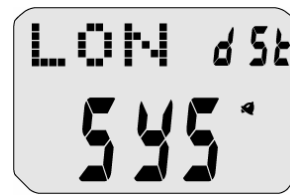


- When EL Backlight Control is disabled by bonding option (J2 = VDD), Pressing [B] and [C] simultaneously will enter Cities DST Setting mode directly.

- For Cities DST Setting, the display will show:

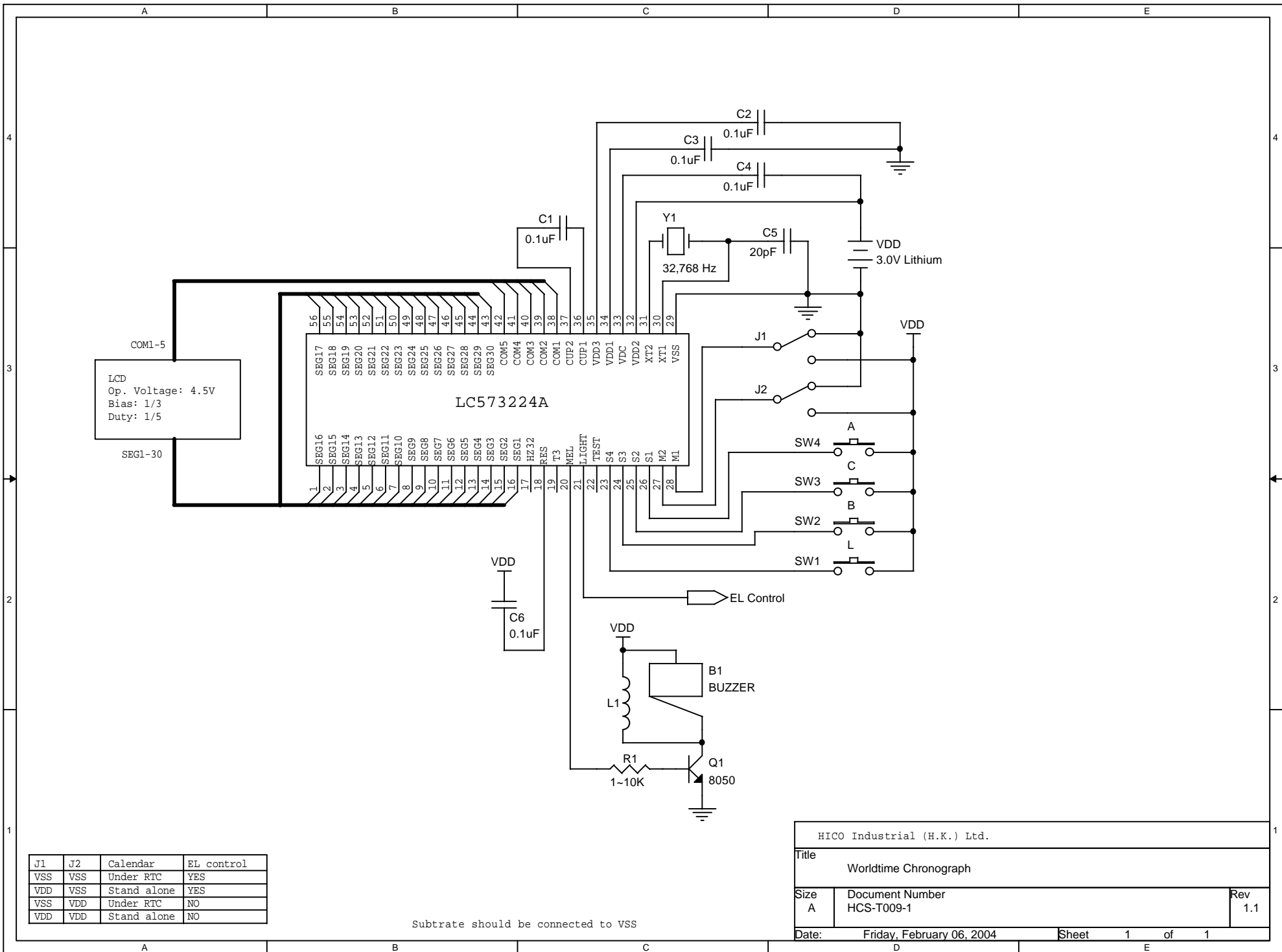


City with Standard Time



City with DST

- When finished, press [C] to confirm the setting and return to the PREVIOUS mode.



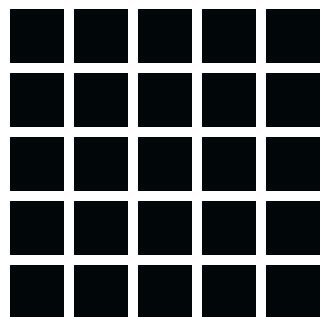
J1	J2	Calendar	EL control
VSS	VSS	Under RTC	YES
VDD	VSS	Stand alone	YES
VSS	VDD	Under RTC	NO
VDD	VDD	Stand alone	NO

Substrate should be connected to VSS

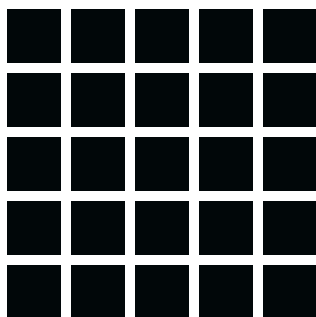
HICO Industrial (H.K.) Ltd.		
Title Worldtime Chronograph		
Size A	Document Number HCS-T009-1	Rev 1.1
Date:	Friday, February 06, 2004	Sheet 1 of 1

a	b	c	d	e
f	g	h	i	j
k	m	n	o	p
q	r	s	t	u
v	w	x	y	z

13



12



11

M1  
DST



10



9



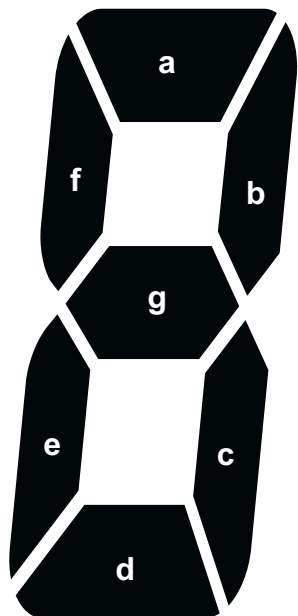
C3



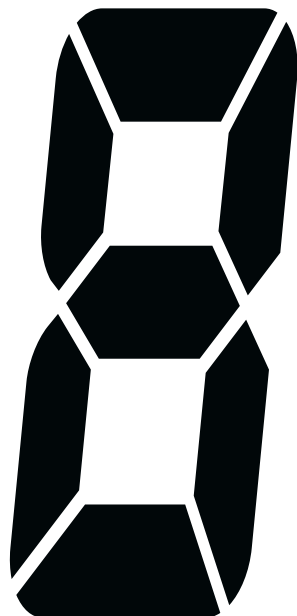
8



7



1



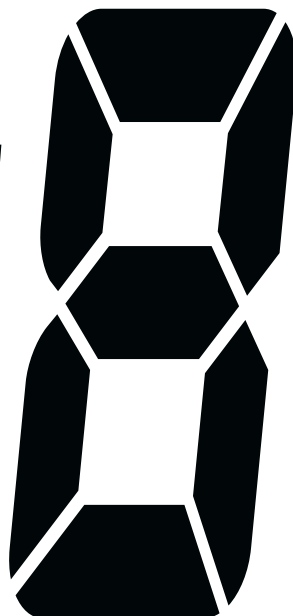
2



C1



C2



3



4



5



PM  
M5



6



DST  
M6



## LCD WIRING TABLE - T009

LCD PIN	LSI PIN	NAME	COM1	COM2	COM3	COM4	COM5
1	16	SEG1	6c	6g	6b	6a	7b
2	15	SEG2	6d	6e	6f	7c	7g
3	14	SEG3	M6	5c	5b	M4	7d
4	13	SEG4	5d	5g	5a	7e	7f
5	12	SEG5	M5	5e	5f	M3	7a
6	11	SEG6	4c	4b	4a	8c	8b
7	10	SEG7	4d	4g	4f	8d	8g
8	9	SEG8	4e	3b	3a	8e	8f
9	8	SEG9	3c	3g	3f	C3	8a
10	7	SEG10	3d	3e	C1	9c	9b
11	6	SEG11	C2	2b	2a	9d	9g
12	5	SEG12	2c	2g	2f	9e	9f
13	4	SEG13	2d	2e	1b	10b	9a
14	3	SEG14	1c	1g	1a	10c	10a, d, e, g
15	2	SEG15	1d	1e	1f	M2	M1
16	1	SEG16	13k	13q	13v	13f	13a
17	56	SEG17	13m	13r	13w	13g	13b
18	55	SEG18	13n	13s	13x	13h	13c
19	54	SEG19	13o	13t	13y	13i	13d
20	53	SEG20	13p	13u	13z	13j	13e
21	52	SEG21	12k	12q	12v	12f	12a
22	51	SEG22	12m	12r	12w	12g	12b
23	50	SEG23	12n	12s	12x	12h	12c
24	49	SEG24	12o	12t	12y	12i	12d
25	48	SEG25	12p	12u	12z	12j	12e
26	47	SEG26	11k	11q	11v	11f	11a
27	46	SEG27	11m	11r	11w	11g	11b
28	45	SEG28	11n	11s	11x	11h	11c
29	44	SEG29	11o	11t	11y	11i	11d
30	43	SEG30	11p	11u	11z	11j	11e
31	42	COM5	-----	-----	-----	-----	COM5
32	41	COM4	-----	-----	-----	COM4	-----
33	40	COM3	-----	-----	COM3	-----	-----
34	39	COM2	-----	COM2	-----	-----	-----
35	38	COM1	COM1	-----	-----	-----	-----

■ Pad Configuration

- Pad Pitch : 1 1 0  $\mu\text{m}$  (Min.)
- Pad Size : 1 0 0  $\mu\text{m}$   $\times$  1 0 0  $\mu\text{m}$
- Chip Size : 2 . 4 m m x 3 . 3 7 m m

1	56	SEG17
2	55	SEG18
3	54	SEG19
4	53	SEG20
5	52	SEG21
6	51	SEG22
7	50	SEG23
8	49	SEG24
9	48	SEG25
10	47	SEG26
11	46	SEG27
12	45	SEG28
13	44	SEG29
14	43	SEG30
15	42	COM5
16	41	COM4
17	40	COM3
18	39	COM2
19	38	COM1
20	37	CUP2
21	36	CUP1
22	35	VDD3
23	34	VDD1
24	33	VDC
25	32	VDD2
26	31	XT2
27	30	XT1
28	29	VSS
16		SEG16
15		SEG15
14		SEG14
13		SEG13
12		SEG12
11		SEG11
10		SEG10
9		SEG9
8		SEG8
7		SEG7
6		SEG6
5		SEG5
4		SEG4
3		SEG3
2		SEG2
1		SEG1
		HZ32
		RES
		T3
		MEL
		LIGHT
		TEST
		S4
		S3
		S2
		S1
		M2
		M1

## LC573224A PAD Coordinates

November , 21 , 2001

PIN No.	P I N NAME	Coordinates	
		" X " $\mu\text{m}$	" Y " $\mu\text{m}$
1	SEG16	-995	1502
2	SEG15	-995	1392
3	SEG14	-995	1282
4	SEG13	-995	1172
5	SEG12	-995	1062
6	SEG11	-995	952
7	SEG10	-995	842
8	SEG09	-995	732
9	SEG08	-995	622
10	SEG07	-995	512
11	SEG06	-995	402
12	SEG05	-995	292
13	SEG04	-995	182
14	SEG03	-995	72
15	SEG02	-995	-38
16	SEG01	-995	-148
17	HZ32	-995	-278
18	RES	-995	-388
19	T3	-995	-498
20	MEL	-995	-608
21	LIGHT	-995	-718
22	TEST	-995	-828
23	S4	-995	-938
24	S3	-995	-1048
25	S2	-995	-1158
26	S1	-995	-1268
27	M2	-995	-1378
28	M1	-995	-1488

P I N No.	P I N NAME	Coordinates	
		" X " $\mu\text{m}$	" Y " $\mu\text{m}$
29	VSS	995	-1515
30	XT1	995	-1405
31	XT2	995	-1295
32	VDD2	995	-1185
33	VDC	995	-1055
34	VDD1	995	-925
35	VDD3	995	-795
36	CUP1	995	-685
37	CUP2	995	-575
38	COM1	995	-465
39	COM2	995	-355
40	COM3	995	-245
41	COM4	995	-135
42	COM5	995	-25
43	SEG30	995	85
44	SEG29	995	195
45	SEG28	995	305
46	SEG27	995	415
47	SEG26	995	525
48	SEG25	995	635
49	SEG24	995	745
50	SEG23	995	855
51	SEG22	995	965
52	SEG21	995	1075
53	SEG20	995	1185
54	SEG19	995	1295
55	SEG18	995	1405
56	SEG17	995	1515

**CHIP SIZE = 2.40 x 3.37**