愛高實業(香港)有限公司

HICO INDUSTRIAL (HK) LIMITED

PRODUCT SPECIFICATION

MESSAGE WATCH

Product Code:	HCS-T017-0
Version:	1.4
Date:	June 14, 2004

Hong Kong 香港

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DOCUMENT HISTORY

Date	Product Code	Version	Approved by	Revision Details
June 14, 2004	HCS-T017-0	1.4		• "List of Characters" updated • Circuit diagram updated • Special Event Reminders updated
May 7, 2004	HCS-T017-0	1.3	**OBSOLETE**	• LCD table updated • Changed Shenzhen office address
Nov. 25, 2003	HCS-T017-0	1.2	**OBSOLETE**	Animation Enable/Disable function by User option
Apr. 15, 2003	HCS-T017-0	1.1	**OBSOLETE**	Animation feature page 1
Mar. 26, 2003	HCS-T017-0	1.0	**OBSOLETE**	Initial

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GENERAL DESCRIPTION

This MESSAGE WATCH is a single-chip micro-controller that is preprogrammed for digital watch applications. Features include Real-time Clock, 2 Daily Alarms, 3 Schedule Alarms, Dual Time, Countdown Timer, Chronograph and Special Events Reminders.

FEATURES

- Animation and scrolling in Dot-matrix display (25 x 7) ---- User option to enable /disable by key
  - 3 kinds of message animation: 1) Shift-up Animation
    2) Spinning Animation
    3) Masking Animation
  - Scrolling Real Time Year-Month-Day
  - Scrolling Logo and Event messages

- Real Time Clock
  - Hour, Minute, Second, Month, Day, Day of Week
  - 12 or 24 hour display format by user option
  - Hourly chime
- Dual Time Clock
  - Time display of another city
  - Half-Hour Adjustable
- Auto Calendar
  - Year, Month, Day, Day of Week
  - Auto leap year adjustment from 2003 to 2049
  - Auto setting on Day of Week
- Alarms
  - Two independent Daily Alarms with adjustable Hour and Minute
  - Three independent Schedule Alarms with adjustable Month, Day, Hour, Minute and Event Reminder's Message
  - 5 Melodies selection
- Countdown Timer
  - One Countdown Timer with 16 preset time duration ranging from 0 to 120 minutes
  - Alert signal when countdown to zero
- Chronograph
  - Count up to 23 hours 59 minutes 59.99 seconds with 1/100 second resolution
  - One Split Time Record
- Special Events Reminders
  - 3 user-defined Reminder's Messages with Schedule Alarm,15 characters for each message
  - 1 user-defined Screen Logo message with 23 characters
  - 6 preset Event Messages with specific date
- Operates with 3 volt Lithium battery

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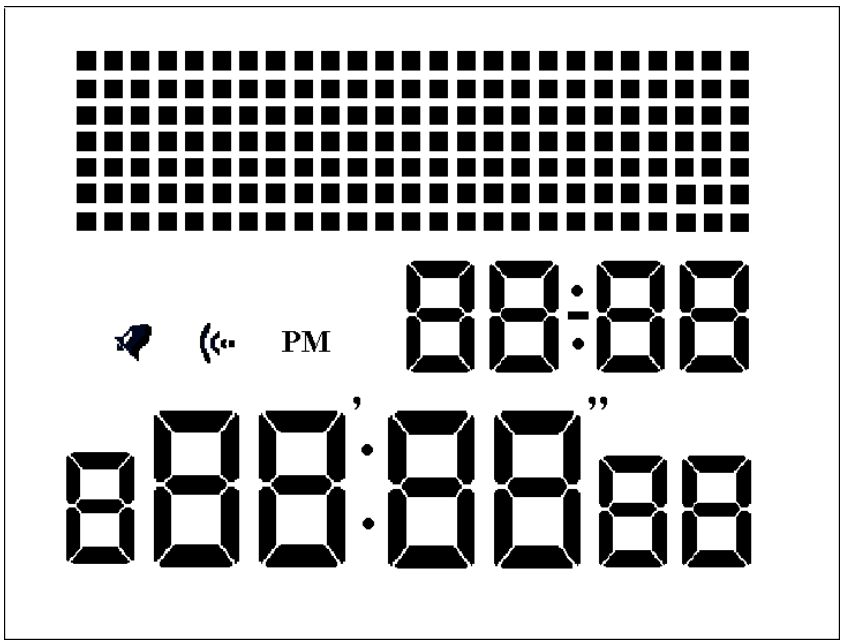
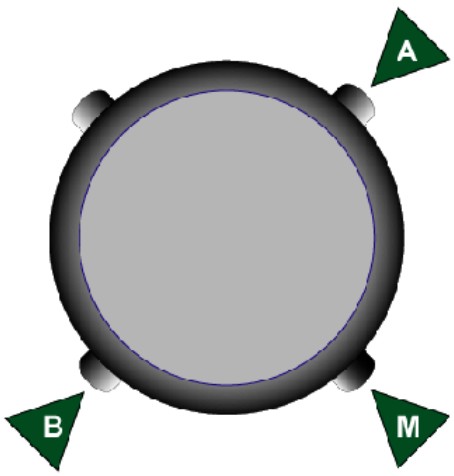
- Operates with 3 buttons
- Beep tone alert for key operation

LCD PATTERN



Operating Voltage	:	6V
Duty Cycle; Bias	:	1/9; 1/4
Viewing Direction	:	6 O'clock
Connection	:	Top and Bottom
Dot Matrix	:	25 x 7 = 175 dots

KEYBOARD



A: Start/Stop Button

B: Select Button

M: Mode Button

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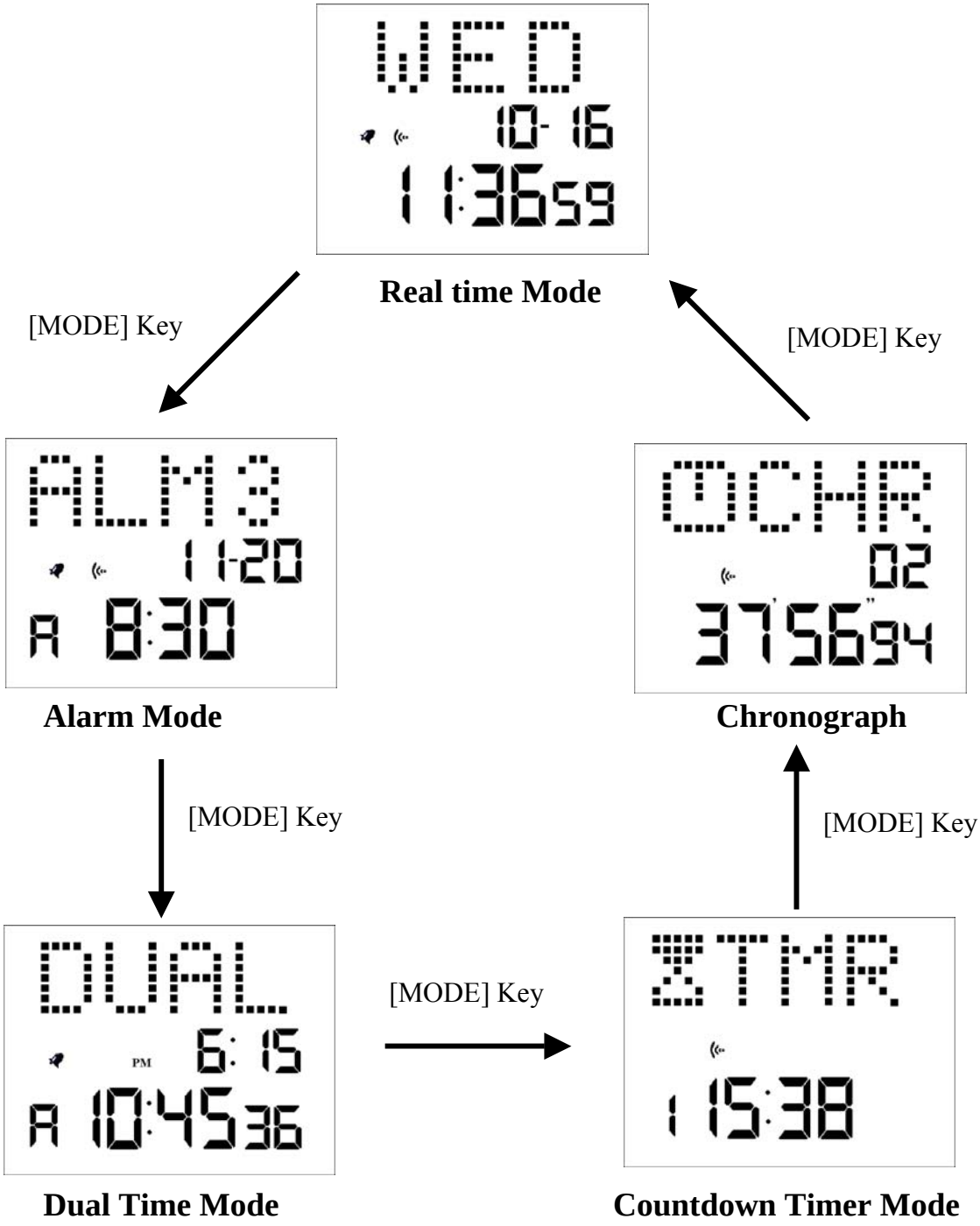
FUNCTIONAL FLOWCHART



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FUNCTIONAL DESCRIPTIONS

1. System Defaults

- System Defaults will be initialized upon system startup

MODE	ELEMENT	SETTING
Real Time	Time	12:00:00 AM
	Date	Wednesday 2003-01-01
	Hourly chime	Disabled
	12 / 24 Hour	12-Hour
Dual Time	Time	12:00:00 AM
Alarms	Time	12:00 AM
	Date	None
	Alert	Disabled
Melody	Alarm 1	Melody 1
	Alarm 2	Melody 2
	Alarm 3	Melody 3
	Alarm 4	Melody 4
	Alarm 5	Melody 5
Chronograph	Total Time	0 minutes 00.00 second
	Status	Stopped
Countdown Timers	Time	1 Minute
	Status	Stopped
Special Events Reminder	Screen Logo	“SCREEN LOGO”
	Alarm 3	“ALARM 3 MESSAGE”
	Alarm 4	“ALARM 4 MESSAGE”
	Alarm 5	“ALARM 5 MESSAGE”

2. Auto Return

- Real Time Clock will be resumed if no key operation for 1 minute in any operating mode except the following:
  - Countdown Timer at running state
  - Chronograph at running state

3. Auto Advance

- In any setting mode, press and hold [A] for more than 2 seconds will activate Fast Scroll function. Current selected digits will be adjusted at a rate of 8 steps per second until [A] is released.

4. Alert Signals

- Alert signals will be played based on the following priority:
  - Timer, Alarm 1, Alarm 2, Alarm 3, Alarm 4, Alarm 5, Hourly Chime
  - If more than one signal arrive simultaneously, only the one with higher priority will sound.

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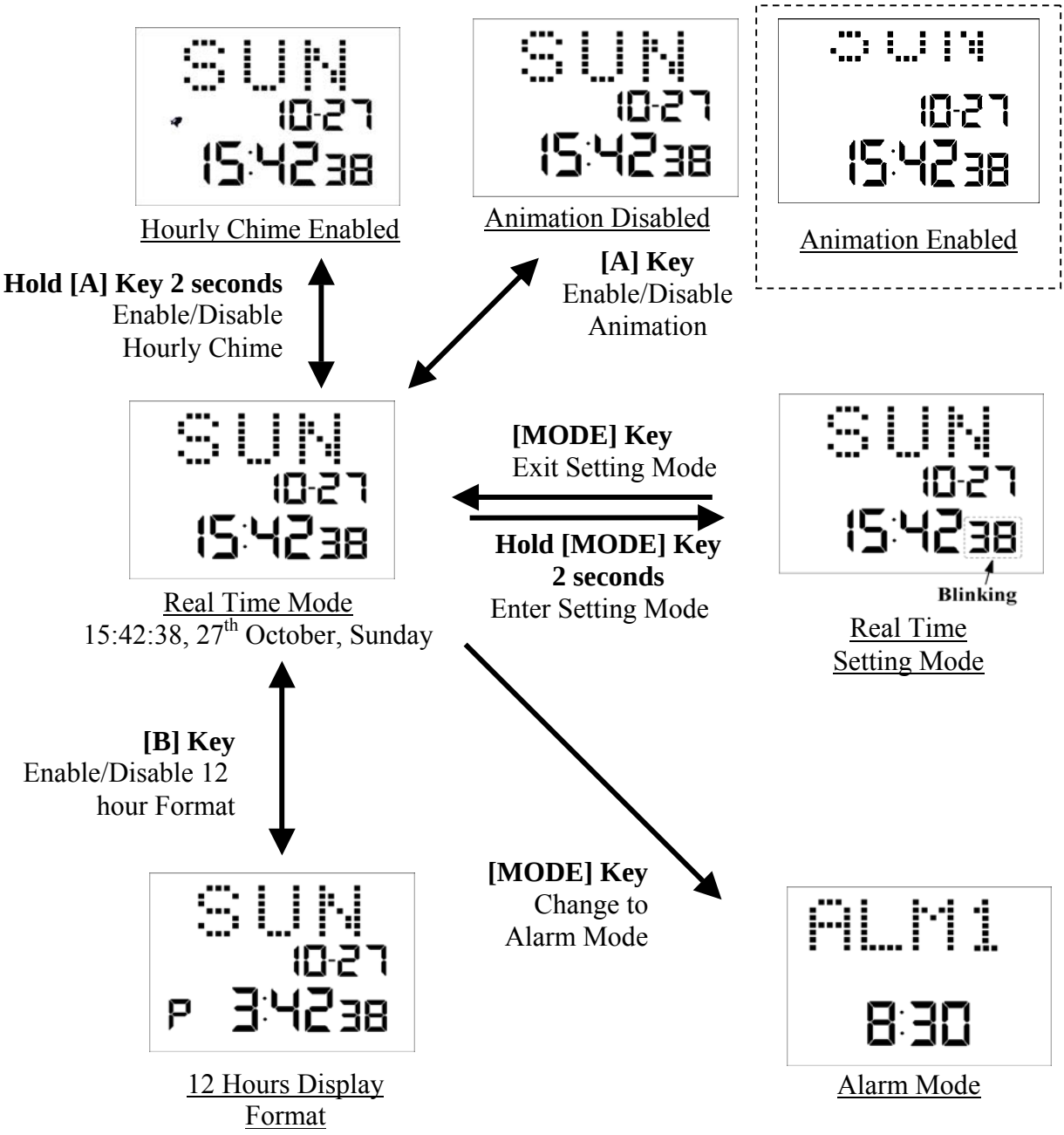
OPERATIONAL INSTRUCTIONS

1. Real Time Mode

- Second, Minute, Hour, Month, Day and Day of week display
- Animation and Message Scrolling
- Press and Hold [A] key 2 seconds to Enable/Disable Hourly Chime
- Press [A] key to Enable/Disable Animation
- Press [B] key to change 12 or 24 hours display format
- Press [MODE] key to change to Alarm Mode
- Press and hold [MODE] key 2 seconds for entering setting mode



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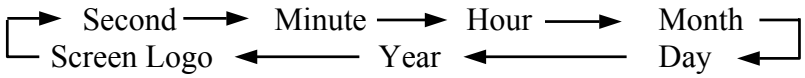
1.1 Real Time Setting Mode

- Press and hold [MODE] key 2 seconds in Real Time Mode for enter setting mode.
- Press [B] key to select the blinking digit according to the following sequence:



Real Time Mode

[MODE] Key Exit Setting Mode

- Press [A] key to adjust the blinking digit
- Hold [A] key for 2 seconds to adjust the current digit at a rate of 8 steps per second until [A] key is released.
- Press [MODE] key again for exit setting mode
- On exit, the Day of Week will be adjusted automatically

Hold [MODE] Key 2 seconds Enter Setting Mode

[B] key

Year

[B] key Select Character

Blinking

Second

[B] key

Screen Logo Character

[B] key

Day

[B] key

Minute

[B] key

Hour

[B] key

Month

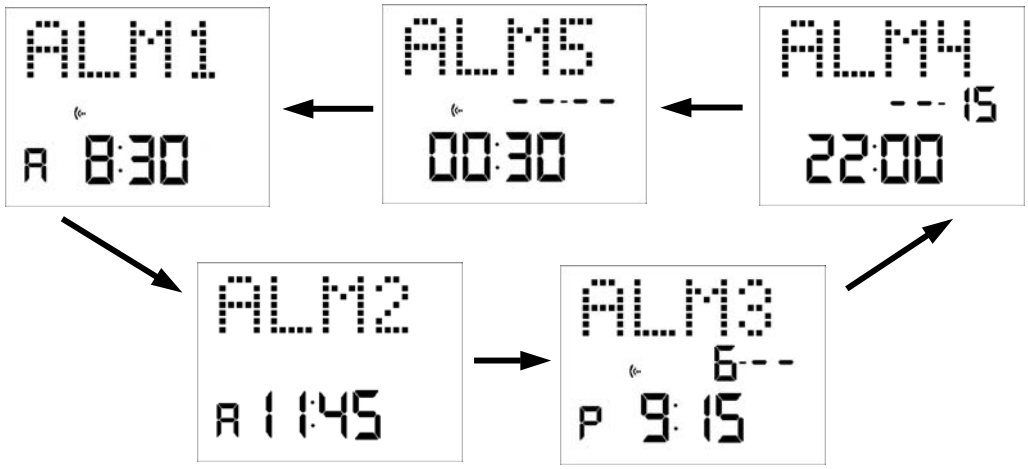
1.2 Edit Screen Logo

- Refer to Item 7 Message Editing

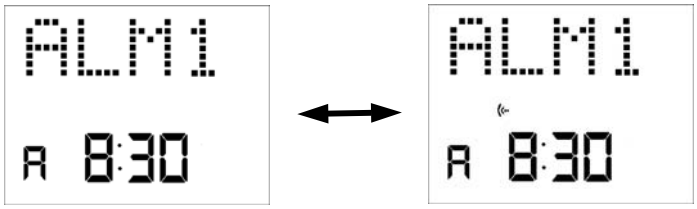
2. Alarm

- 2 Daily Alarms (Alarm 1 and Alarm 2) and 3 Schedule Alarms (Alarm 3, Alarm 4 and Alarm 5)
- Press [A] key to change Alarm 1 to Alarm 5
- Press and hold [MODE] key 2 seconds for enter Alarm setting mode

Daily Alarm	Alarm 1
	Alarm 2
Schedule Alarm	Alarm 3
	Alarm 4
	Alarm 5



- Press [B] key to Enable / Disable current Alarm Alert
- Melody will be played once if Alarm Enabled by [B] key
- User can change the Melody by press [B] key twice



Alarm Disabled Alarm Enabled

- Each Alarm can only assign one melody. Total 5 Melodies can be chosen for the Alarm:

Melody 1 : Wolfgang Amadeus Mozart, Eine Kleine Nacht Final Movement (partial)
Melody 2 : Wolfgang Amadeus Mozart, Turkish Rondo (partial)
Melody 3 : Franz Schubert, Marche Militaire (partial)
Melody 4 : Franz Schubert, Marche Militaire (partial)
Melody 5 : Robert Schumann, The Happy Farmer (partial)

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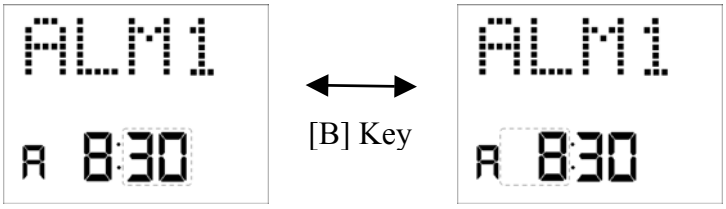
2.1 Daily Alarm Setting Mode

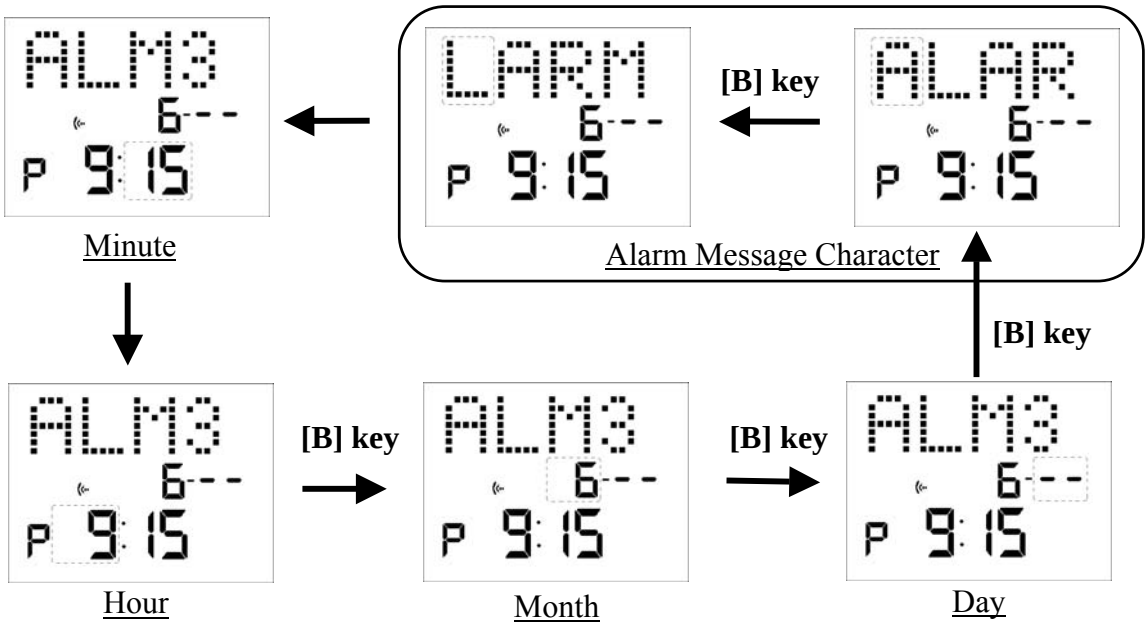
- Press and hold [MODE] key 2 seconds for entering setting mode
- Press [MODE] key again for exit setting mode
- Alarm 1 and Alarm 2 is Daily Alarm
- Press [A] key to adjust the blinking digits
- Press [B] key to select the blinking digits according to the following sequence:



Minute Hour

2.2 Schedule Setting Mode

- Press and hold [MODE] key 2 seconds for entering setting mode
- Press [MODE] key again for exit setting mode
- Alarm 3, Alarm 4 and Alarm 5 is Schedule Alarm
- Press [A] key to adjust the blinking digits
- Press [B] key to select the blinking digits according to the following sequence:



- Alarm melody will be sounded for about 20 seconds upon the alarm time is reached. Alarm Message will display and scroll from right side to left side one time after the alarm alert arrives.

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- Schedule Alarm can be adjusted to alert at the desired time with the following options:

Daily
Both Month & Day set to "- -"

Monthly at specific Day
Month set to "- -" with Day set to desired day

Daily at specific Month
Month set to desired Month with Day set to "- -"

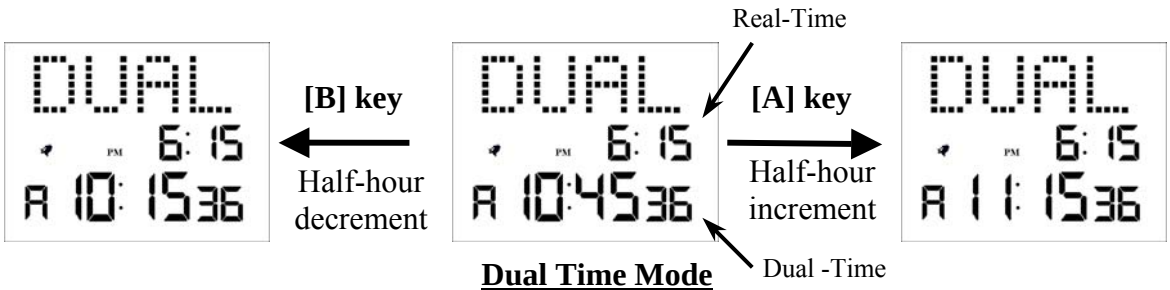
Specific Day
Both Month & Day set to desired Date

2.3 Edit Alarm Message (Schedule Alarm Only)

- Refer to Item 7 Message Editing

3. Dual Time Clock

- Half-hour adjustable
- Press [A] key for Half-hour increment
- Press [B] key for Half-hour decrement



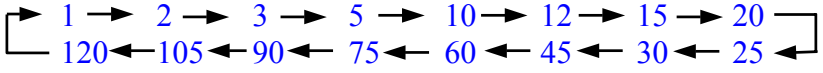
Dual Time Mode

Dual Time: 10:15:36 a.m. Dual Time: 10:45:36 a.m. Dual Time: 11:15:36 a.m.
Real Time: 6:15:36 p.m.

4. Countdown Timer

4.1 Timer stopped:

- Press [B] key while timer is stopped to select the time duration in minutes from 16 preset value with the following sequence:



- Press [A] key to start the counting

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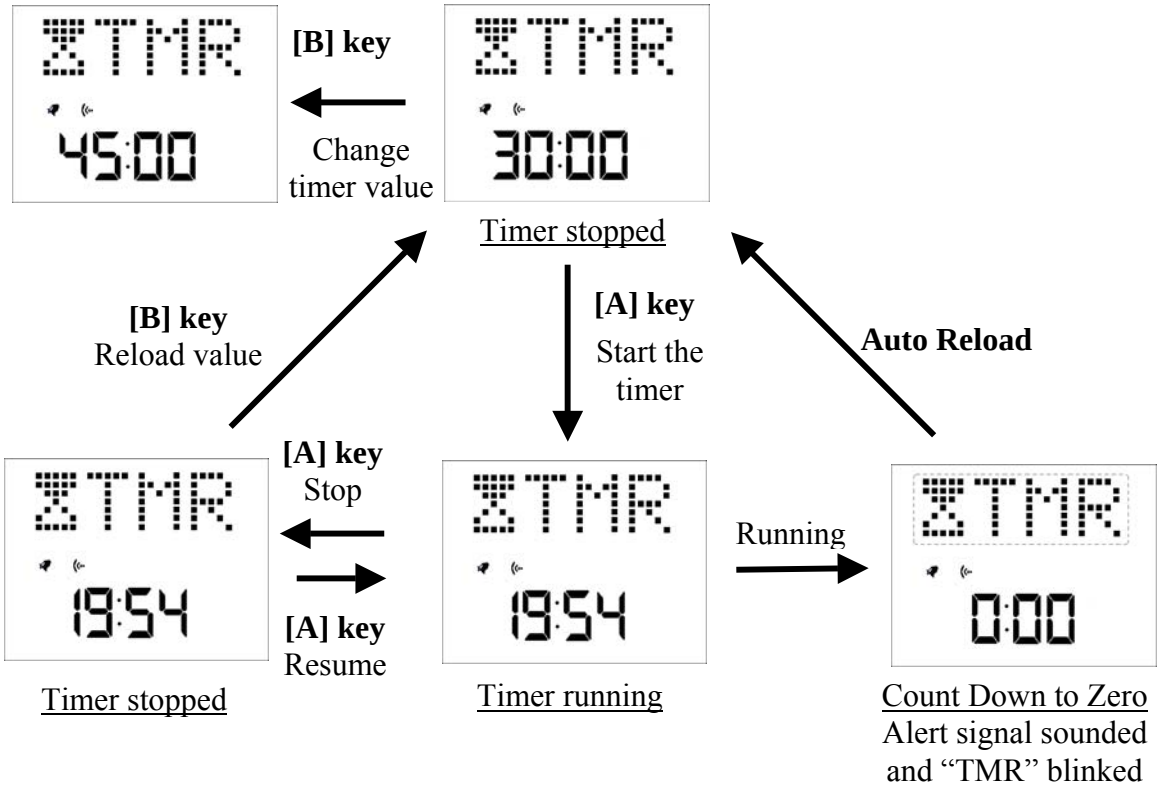
4.2 Timer running:

- Press [A] key to pause/stop the timer
- No function for [B] key upon timer running

4.3 Timer Count down to Zero:

- Upon counting down to zero, the Timer will stop automatically
- The alert tone will be sounded for about 10 seconds. Press any key to stop the alert tone.
- Timer value will be reloaded after the alert tone.

Operating the Count Down Timer :



5. Chronograph

- Chronograph counts up to 23 hours 59 minutes 59.99 seconds with 1/100-second resolution
- Upon reaching the maximum value, counting will continue and time reset to zero
- When split time record is occupied, new value will overwrite the existing one.

5.1 Chronograph stopped:

- Press [A] key to start the chronograph
- Press [B] key to switch between split time value and chronograph value
- Press and Hold [B] key 2 seconds to reset chronograph and split time value

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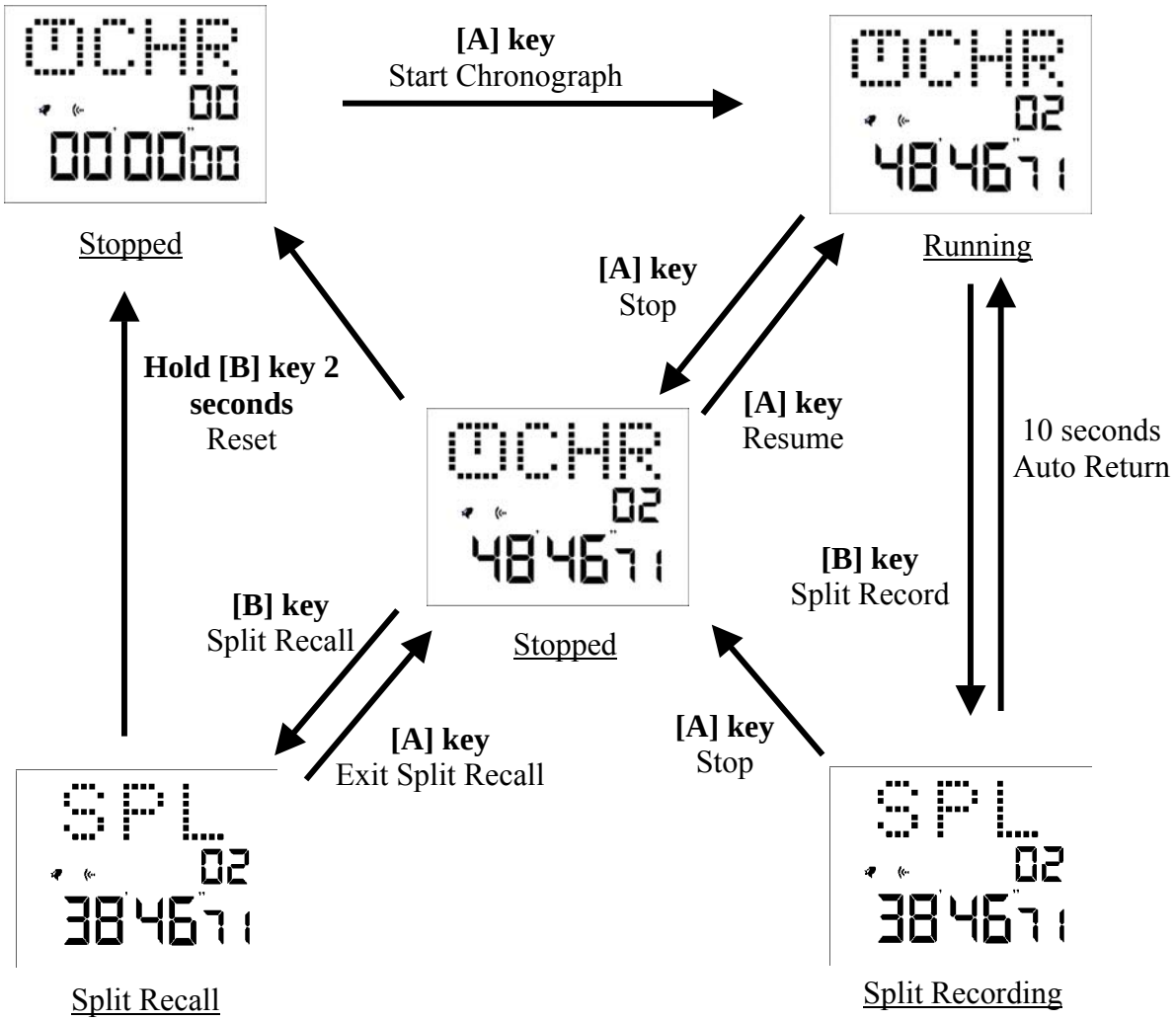
5.2 Chronograph running:

- Press [A] key to pause the chronograph
- Press [B] key to split time recording
- Upon Split Time Recording, split time will display for 10 seconds
- After 10 seconds the unit will resume the chronograph value

5.3 Split Recall

- Press [B] key in stopped state to enter split recall mode
- Press [A] key to return to chronograph stopped state
- Press and Hold [B] key 2 seconds to reset chronograph and split time value

Operating the Chronograph :



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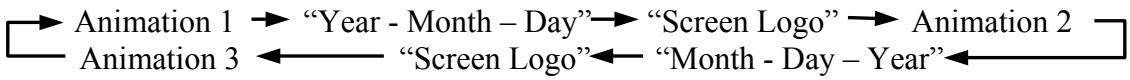
6. Animation, Screen Logo & Alarm Message Display

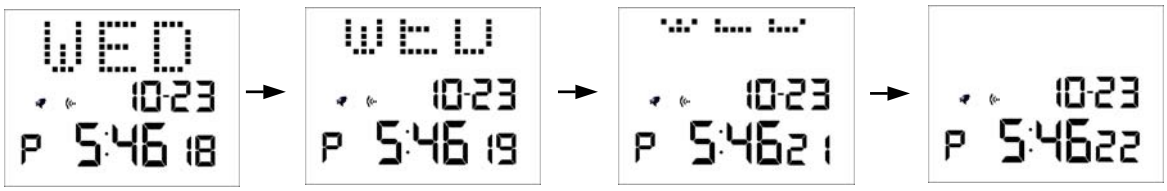
6.1 Animation

- 3 kinds of animation
- Animation in Real Time Mode only
- After the animation, "Year - Month - Day" message will scroll from right side to left side.
- Screen Logo Message also scrolls following the "Year - Month - Day" message
- The animation will repeat non-stop in Real Time Mode



6.1.1 Animation 1 : Shift-up animation:

- The day of week will be shifted up.



6.1.2 Animation 2 : Spinning animation

- Day of week and Month will spin as if turning 360 degree horizontally respectively in sequence.

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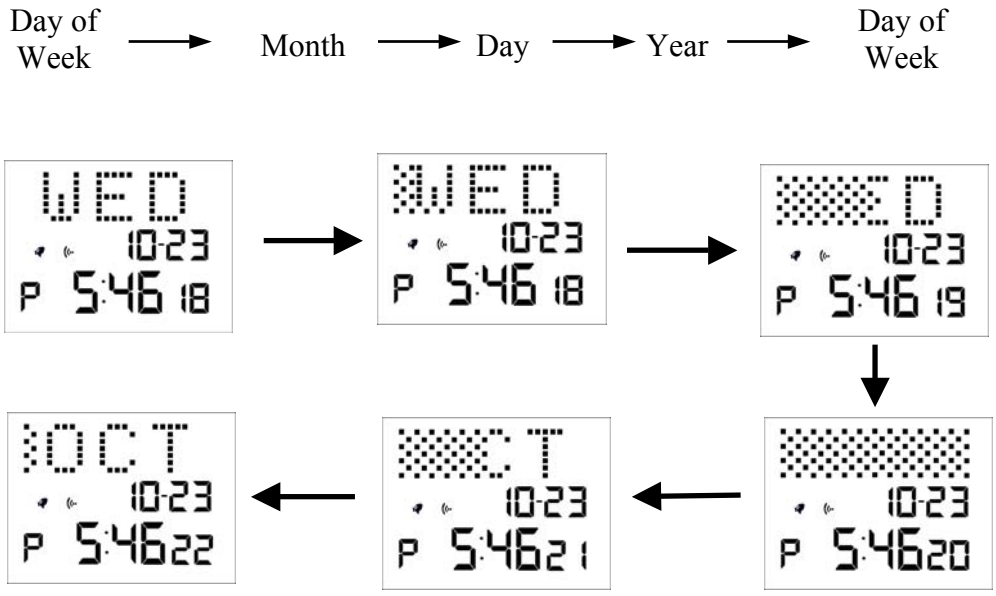
6.1.3 Animation 3 : Masking animation

- Day of week will be masked and changed to Month display
- The sequence of the display is showed as follows:



6.1.4 "Year - Month - Day" Message

- "Year - Month - Day" Message will scroll from right to left after the animation

"2 0 0 2 - O C T - 2 3" scrolls from right side to left side

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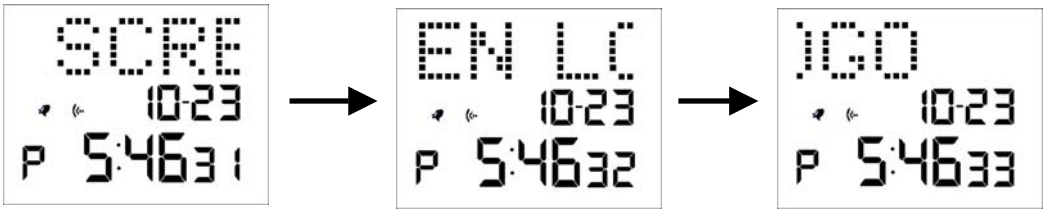
6.1.5 "Screen Logo" Message

- Screen Logo message can only be edited in Real Time Setting mode.
- "S C R E E N L O G O" Message will scroll from right side after the "Year - Month - Day" message



"S C R E E N L O G O" scrolls from right side to left side

6.1.7 Special Event Reminders

- 6 special event messages are set on specific dates
- When the date is reached, Event Message will be shown following the Screen Logo Message
- The list of the event and date are as follows:

Event Message	Date
HAPPY NEW YEAR	January 1
♥♥♥♥♥	February 14
TRICK OR TREAT?	October 31
SANTA CLAUS IS COMING TO TOWN	December 24
MERRY CHRISTMAS	December 25
COUNT DOWN TO.. (Next Year)	December 31

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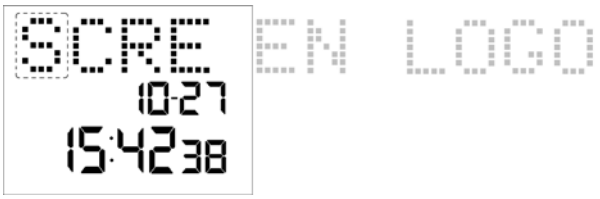
TEL: (852) 2648 6862 FAX: (852) 2637 3691 URL: http://www.hico.com.hk EMAIL: hico@hico.com.hk
香港新界沙田小瀝源安耀街三號匯達大廈二十二樓

7. Message Editing

- Each Alarm Message can store 15 characters
- Screen Logo Message can store 23 characters
- Upon editing the message, the first character of the message is blinking

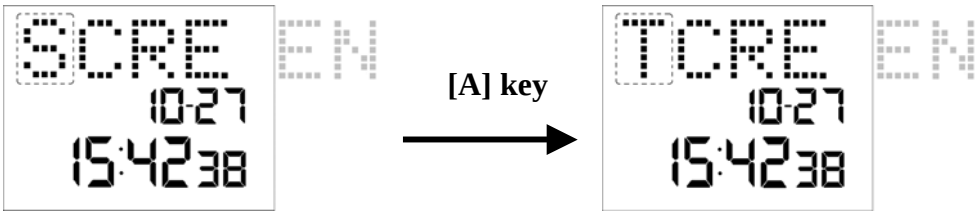


"SCREEN LOGO" Message in Real Time Setting Mode

"ALARM 3 MESSAGE" in Schedule Alarm 3 Setting Mode

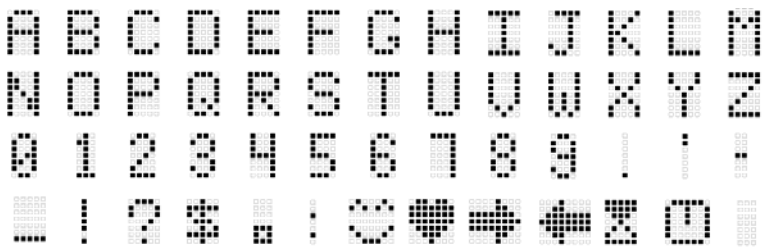
7.1 Character adjust

- Press [A] key to adjust the character



Character "S" Changed to character "T"

- The list of characters is as follows:

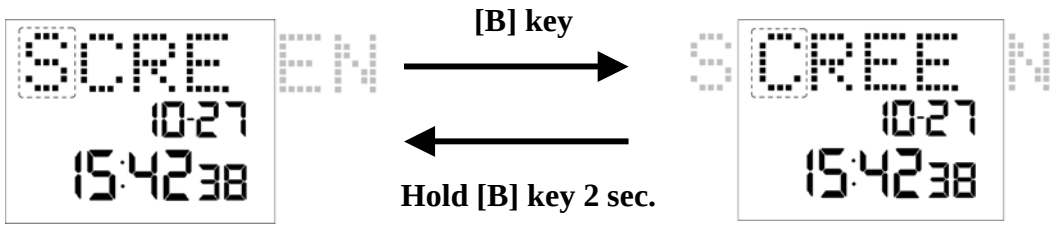


The List of Characters

- Last character is a “space” character, press [A] key again will repeat the character list and start from “A” character
- Hold [A] key 2 seconds to activate Fast Scroll

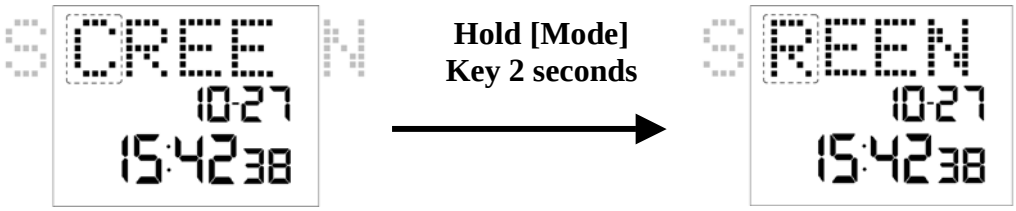
7.2 Select character

- Press [B] key to shift the message from right to left
- Press and hold [B] key 2 seconds to shift the message from left to right



7.3 Erase Character

- Press and Hold [MODE] key 2 seconds to erase selected character



The rest of the string of characters will shift left by one position

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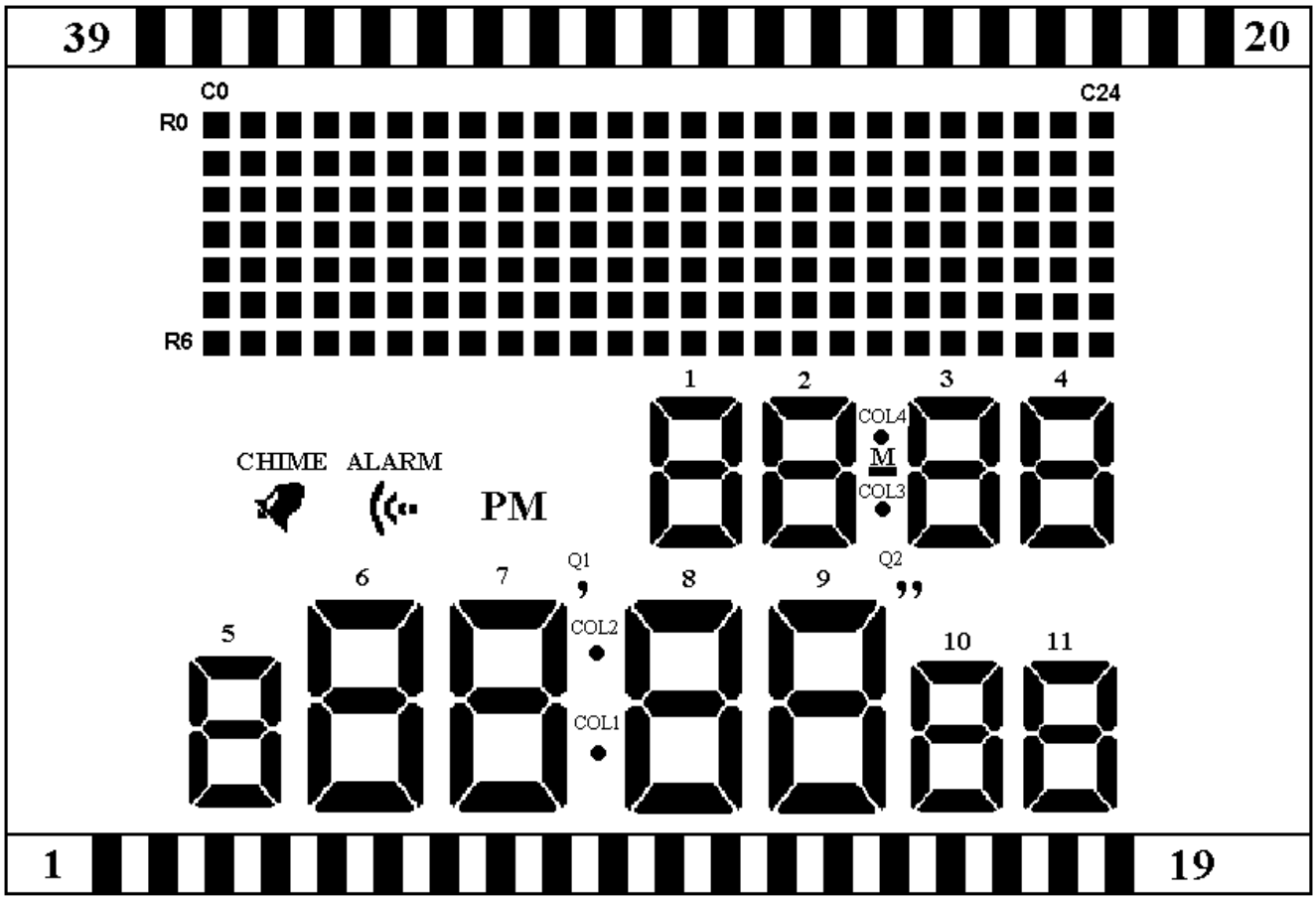
8. LCD Pattern Assignment



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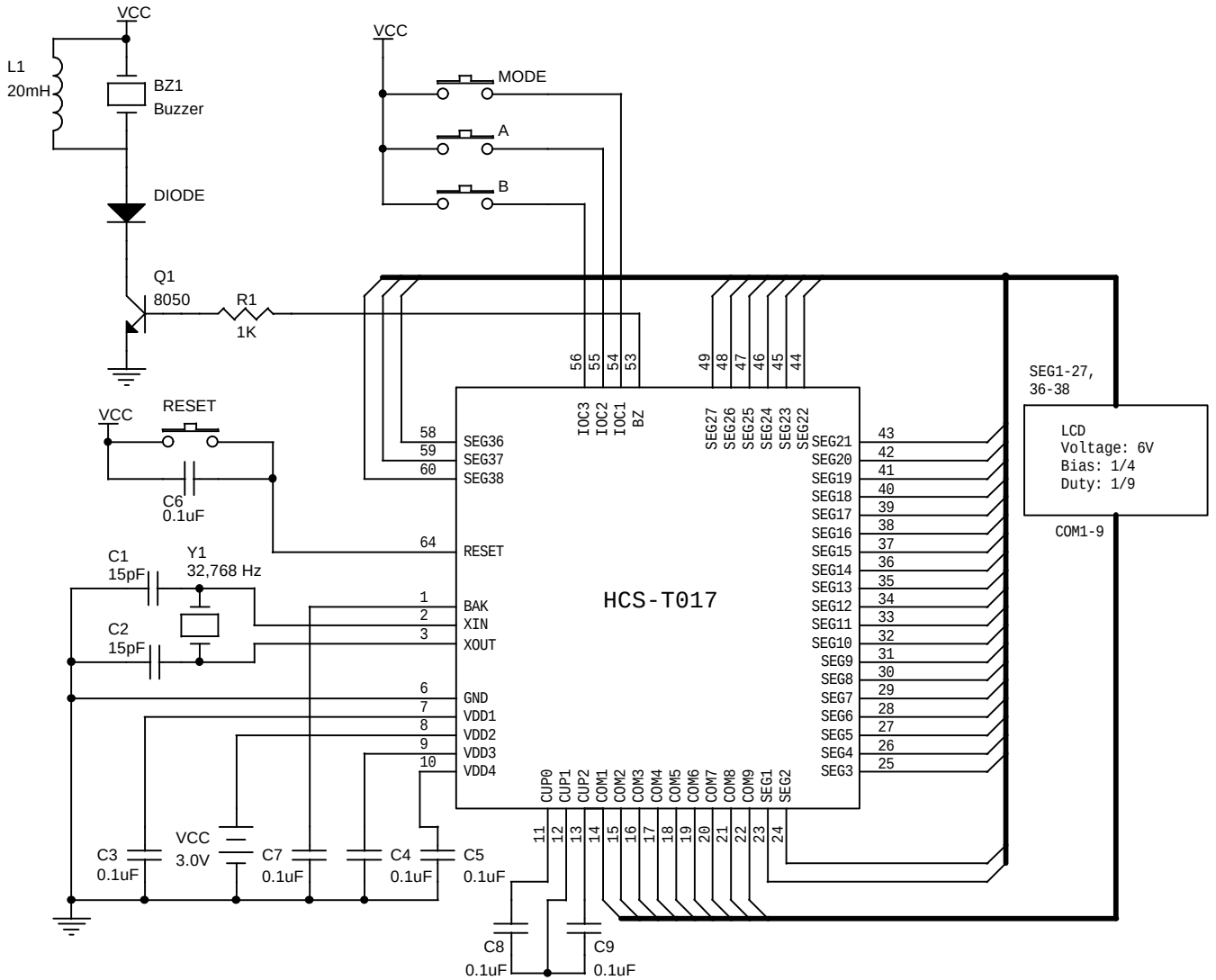
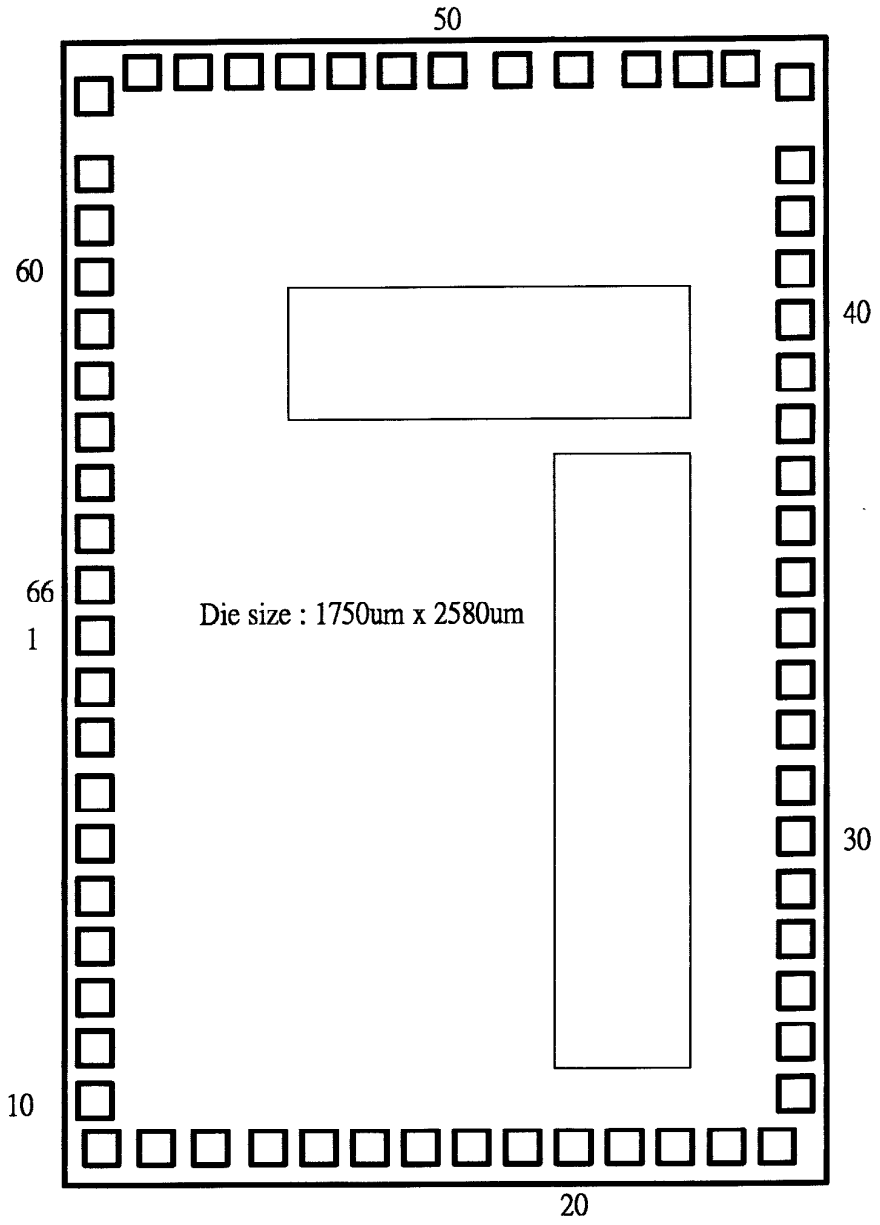
LCD Table

PAD No.	LSI PAD No.	LSI NAME	COM1	COM2	COM3	COM4	COM5	COM6	COM7	COM8	COM9
1	14	COM1	COM1	--	--	--	--	--	--	--	--
2	15	COM2	--	COM2	--	--	--	--	--	--	--
3	16	COM3	--	--	COM3	--	--	--	--	--	--
4	17	COM4	--	--	--	COM4	--	--	--	--	--
5	18	COM5	--	--	--	--	COM5	--	--	--	--
6	19	COM6	--	--	--	--	--	COM6	--	--	--
7	20	COM7	--	--	--	--	--	--	COM7	--	--
8	21	COM8	--	--	--	--	--	--	--	COM8	--
9	22	COM9	--	--	--	--	--	--	--	--	COM9
10	23	SEG1	R1C0	R2C0	R3C0	R5C0	R6C0	5E	5D	R4C0	R0C0
11	24	SEG2	R1C4	R2C4	R3C4	R5C4	R6C4	6E	6D	R4C4	R0C4
12	25	SEG3	R1C8	R2C8	R3C8	R5C8	R6C8	7E	7D	R4C8	R0C8
13	26	SEG4	R1C12	R2C12	R3C12	R5C12	R6C12	Q1	COL1	R4C12	R0C12
14	27	SEG5	R1C13	R2C13	R3C13	R5C13	R6C13	COL2	8D	R4C13	R0C13
15	28	SEG6	9E	--	--	--	1A	1G	1D	9F	9G
16	29	SEG7	9D	10F	9B	--	2A	2G	2D	9A	9C
17	30	SEG8	10E	10B	10A	--	COL4	M	COL3	Q2	10G
18	31	SEG9	10D	11E	11F	--	3A	3G	3D	11A	10C
19	32	SEG10	11C	11G	11B	--	4A	4G	4D	--	11D
20	33	SEG11	R1C24	R2C24	R3C24	R5C24	R6C24	4B	4C	R4C24	R0C24
21	34	SEG12	R1C23	R2C23	R3C23	R5C23	R6C23	4F	4E	R4C23	R0C23
22	35	SEG13	R1C22	R2C22	R3C22	R5C22	R6C22	3B	3C	R4C22	R0C22
23	36	SEG14	R1C21	R2C21	R3C21	R5C21	R6C21	3F	3E	R4C21	R0C21
24	37	SEG15	R1C20	R2C20	R3C20	R5C20	R6C20	2B	2C	R4C20	R0C20
25	38	SEG16	R1C19	R2C19	R3C19	R5C19	R6C19	2F	2E	R4C19	R0C19
26	39	SEG17	R1C18	R2C18	R3C18	R5C18	R6C18	1B	1C	R4C18	R0C18
27	40	SEG18	R1C17	R2C17	R3C17	R5C17	R6C17	1F	1E	R4C17	R0C17
28	41	SEG19	R1C16	R2C16	R3C16	R5C16	R6C16	8B	8C	R4C16	R0C16
29	42	SEG20	R1C15	R2C15	R3C15	R5C15	R6C15	8A	8G	R4C15	R0C15
30	43	SEG21	R1C14	R2C14	R3C14	R5C14	R6C14	8F	8E	R4C14	R0C14
31	44	SEG22	R1C11	R2C11	R3C11	R5C11	R6C11	7B	7C	R4C11	R0C11
32	45	SEG23	R1C10	R2C10	R3C10	R5C10	R6C10	PM	7A	R4C10	R0C10
33	46	SEG24	R1C9	R2C9	R3C9	R5C9	R6C9	7F	7G	R4C9	R0C9
34	47	SEG25	R1C7	R2C7	R3C7	R5C7	R6C7	6B	6C	R4C7	R0C7
35	48	SEG26	R1C6	R2C6	R3C6	R5C6	R6C6	ALM	6A	R4C6	R0C6
36	49	SEG27	R1C5	R2C5	R3C5	R5C5	R6C5	6F	6G	R4C5	R0C5
37	58	SEG36	R1C3	R2C3	R3C3	R5C3	R6C3	5B	5C	R4C3	R0C3
38	59	SEG37	R1C2	R2C2	R3C2	R5C2	R6C2	CHIM	5A	R4C2	R0C2
39	60	SEG38	R1C1	R2C1	R3C1	R5C1	R6C1	5F	5G	R4C1	R0C1



Title	HCS-T017	
Size A	Document Number HCS-T017	Rev 3
Date: Tuesday, June 15, 2004	Sheet 1 of 1	

PAD DIAGRAM



The substrate of chip should be connected to GND.

PAD COORDINATE

No	Name	X	Y	No	Name	X	Y
1	BAK	72.50	1229.50	34	SEG12(K12)	1677.50	1244.50
2	XIN	72.50	1114.50	35	SEG13(K13)	1677.50	1359.50
3	XOUT	72.50	999.50	36	SEG14(K14)	1677.50	1474.50
4	CFIN	72.50	884.50	37	SEG15(K15)	1677.50	1589.50
5	CFOUT	72.50	769.50	38	SEG16(K16)	1677.50	1704.50
6	GND	72.50	654.50	39	SEG17	1677.50	1819.50
7	VDD1	72.50	539.50	40	SEG18	1677.50	1934.50
8	VDD2	72.50	424.50	41	SEG19	1677.50	2049.50
9	VDD3	72.50	309.50	42	SEG20	1677.50	2175.00
10	VDD4	72.50	194.50	43	SEG21	1677.50	2300.00
11	CUP0	89.50	72.50	44	SEG22	1677.50	2477.00
12	CUP1	204.50	72.50	45	SEG23	1558.50	2507.50
13	CUP2	319.50	72.50	46	SEG24/IOA1/CX	1430.45	2507.50
14	COM1	434.50	72.50	47	SEG25/IOA2/RR	1305.00	2507.50
15	COM2	549.50	72.50	48	SEG26/IOA3/RT	1164.50	2507.50
16	COM3	669.50	72.50	49	SEG27/IOA4/RH	1024.00	2507.50
17	COM4	789.50	72.50	50	SEG28/IOB1/ELC	881.50	2507.50
18	COM5	909.50	72.50	51	SEG29/IOB2/ELP	766.50	2507.50
19	COM6	1029.50	72.50	52	SEG30/IOB3/BZB	651.50	2507.50
20	COM7	1149.50	72.50	53	SEG31/IOB4/BZ	536.50	2507.50
21	COM8	1269.50	72.50	54	SEG32/IOC1/KI1	421.50	2507.50
22	COM9	1389.50	72.50	55	SEG33/IOC2/KI2	306.50	2507.50
23	SEG1(K1)	1509.50	72.50	56	SEG34/IOC3/KI3	191.50	2507.50
24	SEG2(K2)	1629.50	72.50	57	SEG35/IOC4/KI4	72.50	2477.00
25	SEG3(K3)	1677.50	197.50	58	SEG36/IOD1	72.50	2300.00
26	SEG4(K4)	1677.50	322.50	59	SEG37/IOD2	72.50	2175.00
27	SEG5(K5)	1677.50	439.50	60	SEG38/IOD3	72.50	2049.50
28	SEG6(K6)	1677.50	554.50	61	SEG39/IOD4	72.50	1934.50
29	SEG7(K7)	1677.50	669.50	62	SEG40	72.50	1819.50
30	SEG8(K8)	1677.50	784.50	63	SEG41	72.50	1704.50
31	SEG9(K9)	1677.50	899.50	64	RESET	72.50	1589.50
32	SEG10(K10)	1677.50	1014.50	65	INT	72.50	1474.50
33	SEG11(K11)	1677.50	1129.50	66	TEST	72.50	1359.50

PIN DESCRIPTION

Name	I/O	Description
BAK	P	Positive Back-up voltage. At Li power mode, connect a 0.1u capacitor to GND.
VDD1,2,3,4	P	LCD supply voltage, and positive supply voltage. .In Ag Mode, connect positive power to VDD1. .In Li or ExtV power mode, connect positive power to VDD2.
RESET	I	Input pin for external reset request signal, built-in internal pull-down resistor.
INT	I	Input pin for external INT request signal. . Falling edge or rising edge triggered is defined by mask option. . Internal pull-down or pull-up resistor is defined by mask option.
TEST		Test signal input pin.
CUP0,1,2	O	Switching pins for supply the LCD driving voltage to the VDD1, 2,3,4 pins. . Connect the CUP0, CUP1 and CUP2 pins with non-polarized electrolytic capacitors when chip operated in 1/2, 1/3 or 1/4 bias mode. . In no BIAS mode application, leave these pins opened.
XIN XOUT	I O	Time base counter frequency (clock specified. LCD alternating frequency. Alarm signal frequency) or system clock oscillation. . The usage of 32KHz Crystal oscillator or external RC oscillator is defined by mask option.
CFIN CFOUT	I O	System clock oscillation for FAST clock only or DUAL clock operation. . The usage of 3.58MHz ceramic/resonator oscillator or external R type oscillator is defined by mask option
COM1~9	O	Output pins for driving the common pins of the LCD panel. COM5~9 could be defined as COMS or Open Drain type output.
SEG1-41	O	Output pins for driving the LCD panel segment.
IOA1-4	I/O	Input / Output port A, (muxed with SEG24~27)
IOB1-4	I/O	Input / Output port B, (muxed with SEG28~31)
IOC1-4	I/O	Input / Output port C, (muxed with SEG32~35)
IOD1~4	I/O	Input / Output port D, (muxed with SEG36~39)
CX RR/RT/RH	I O	1 input pin and 3 output pins for RFC application. (muxed with SEG24~27)
ELC/ELP	O	Output port for El panel driver. (muxed with SEG28~29)
BZB/BZ	O	Output port for alarm, clock or single tone melody generator. (muxed with SEG30~31)
K1~K16	O	Output port for key matrix scanning.(Shared with SEG1~SEG16)
KI1~4	I	Input port for key matrix scanning.(Muxed with SEG32~SEG35)
GND	P	Negative supply voltage.

ABSOLOUTE MAXIMUM RATINGS

GND= 0V

Name	Symbol	Range	Unit
Maximum Supply Voltage	VDD1	-0.3 to 5.5	V
	VDD2	-0.3 to 5.5	V
	VDD3	-0.3 to 8.5	V
	VDD4	-0.3 to 8.5	V
Maximum Input Voltage	Vin	-0.3 to VDD1/2+0.3	V
Maximum output Voltage	Vout1	-0.3 to VDD1/2+0.3	V
	Vout2	-0.3 to VDD3+0.3	V
	Vout3	-0.3 to VDD4+0.3	V
Maximum Operating Temperature	Topg	-20 to +70	℃
Maximum Storage Temperature	Tstg	-25 to +125	℃

POWER CONSUMPTION

at Ta=-20℃ to 70℃,GND= 0V

Name	Sym.	Condition	Min.	Typ.	Max.	Unit
HALT mode	IHALT1	Only 32.768KHz Crystal oscillator operating, without loading. Ag mode, VDD1=1.5V, BCF = 0		2		uA
	IHALT2	Only 32.768KHz Crystal oscillator operating, without loading. Li mode, VDD2=3.0V, BCF = 0		2		uA
STOP mode	ISTOP				1	uA

Note : When RC oscillator function is operating, the current consumption will depend on the frequency of oscillation.

ALLOWABLE OPERATING CONDITIONS

at Ta=-20℃ to 70℃,GND= 0V

Name	Symb.	Condition	Min.	Max.	Unit
Supply Voltage	VDD1		1.2	5.25	V
	VDD2		2.4	5.25	V
	VDD3		2.4	8.0	V
	VDD4		2.4	8.0	V
Oscillator Start-Up Voltage	VDDB	Crystal Mode	1.3		V
Oscillator Sustain Voltage	VDDB	Crystal Mode	1.2		V
Supply Voltage	VDD1	Ag Mode	1.2	1.65	V
Supply Voltage	VDD2	EXT-V, Li Mode	2.4	5.25	V
Input "H" Voltage	Vih1	Ag Battery Mode	VDD1-0.7	VDD1+0.7	V
Input "L" Voltage	Vil1		-0.7	0.7	V
Input "H" Voltage	Vih2	Li Battery Mode	VDD2-0.7	VDD2+0.7	V
Input "L" Voltage	Vil2		-0.7	0.7	V
Input "H" Voltage	Vih3	OSCIN at Ag Battery Mode	0.8xVDD1	VDD1	V
Input "L" Voltage	Vil3		0	0.2xVDD1	V
Input "H" Voltage	Vih4	OSCIN at Li Battery Mode	0.8xVDD2	VDD2	V
Input "L" Voltage	Vil4		0	0.2xVDD2	V
Input "H" Voltage	Vih5	CFIN at Li Battery or EXT-V Mode	0.8xVDD2	VDD2	V
Input "L" Voltage	Vil5		0	0.2xVDD2	V
Input "H" Voltage	Vih6	RC Mode	0.8xVDDO	VDDO	V
Input "L" Voltage	Vil6		0	0.2xVDDO	V
Operating Freq	Fopg1	Crystal Mode	32		KHZ
	Fopg2	RC Mode	10	1000	KHZ
	Fopg3	CF Mode	1000	3580	KHz

ALLOWABLE OPERATING FREQUENCY

at Ta=-20℃ to 70℃,GND= 0V

Condition	Max, Operating Frequency
BAK=1.5V (VDD1)	800KHz
BAK=3V (VDD2)	4MHz

INTERNAL RC FREQUENCY RANGE

Option Mode	BAK	Min.	Typ.	Max.
250KHz	1.5V	200KHz	300KHz	400KHz
	3.0V	200KHz	250KHz	300KHz
500KHz	1.5V	450KHz	600KHz	750KHz
	3.0V	400KHz	500KHz	600KHz

ELECTRICAL CHARACTERISTICS

at#1:VDD1=1.2V(Ag);
at#2:VDD2=2.4V(Li):
at#3:VDD2=4V(Ext-V):

Input Resistance

Name	Symb.	Condition	Min.	Typ.	Max.	Unit
"L" Level Hold Tr(IOC)	Rllh1	Vi=0.2VDD1,#1	10	40	100	Kohm
	Rllh2	Vi=0.2VDD2,#2	10	40	100	Kohm
	Rllh3	Vi=0.2VDD2,#3	5	20	50	Kohm
IOC Pull-Down Tr	Rmad1	Vi=VDD1,#1	200	500	1000	Kohm
	Rmad2	Vi=VDD2,#2	200	500	1000	Kohm
	Rmad3	Vi=VDD2,#3	100	250	500	Kohm
INT Pull-up Tr	Rintu1	Vi=VDD1,#1	200	500	1000	Kohm
	Rintu2	Vi=VDD2,#2	200	500	1000	Kohm
	Rintu3	Vi=VDD2,#3	100	250	500	Kohm
INT Pull-Down Tr	Rintd1	Vi=GND,#1	200	500	1000	Kohm
	Rintd2	Vi=GND,#2	200	500	1000	Kohm
	Rintd3	Vi=GND,#3	100	250	500	Kohm
RES Pull-Down R	Rres1	Vi=GND or VDD1,#1	10	40	100	Kohm
	Rres2	Vi=GND or VDD2,#2	10	40	100	Kohm
	Rres3	Vi=GND or VDD2,#3	10	40	100	Kohm

DC Output Characteristics

Name	Symb.	Condition	Port	Min.	Typ.	Max.	Unit
Output "H" Voltage	Voh1c	Ioh=-200uA,#1	COM5~9 SEG1~41	0.8	0.9	1.0	V
	Voh2c	Ioh=-1mA,#2		1.5	1.8	2.1	V
	Voh3c	Ioh=-3mA,#3		2.5	3.0	3.5	V
Output "L" Voltage	Vol1c	Iol=400uA,#1		0.2	0.3	0.4	V
	Vol2c	Iol=2mA,#2		0.3	0.6	0.9	V
	Vol3c	Iol=6mA,#3		0.5	1.0	1.5	V

Segment Driver Output Characteristics

Name	Symb.	Condition	For	Min.	Typ.	Max.	Unit.
Static Display Mode							
Output "H" Voltage	Voh1d	Ioh=-1uA,#1	SEG-n	1.0			V
	Voh2d	Ioh=-1uA,#2		2.2			V
	Voh3d	Ioh=-1uA,#3		3.8			V
Output "L" Voltage	Vol1d	Iol=1uA,#1				0.2	V
	Vol2d	Iol=1uA,#2				0.2	V
	Vol3d	Iol=1uA,#3				0.2	V
Output "H" Voltage	Voh1e	Ioh=-10uA,#1	COM-n	1.0			V
	Voh2e	Ioh=-10uA,#2		2.2			V
	Voh3e	Ioh=-10uA,#3		3.8			V
Output "L" Voltage	Vol1e	Iol=10uA,#1				0.2	V
	Vol2e	Iol=10uA,#2				0.2	V
	Vol3e	Iol=10uA,#3				0.2	V
1/2 Bias Display Mode							
Output "H" Voltage	Voh12f	Ioh=-1uA,#1,#2	SEG-n	2.2			V
	Voh3f	Ioh=-1uA,#3		3.8			V
Output "L" Voltage	Vol12f	Iol=1uA,#1,#2				0.2	V
	Vol3f	Iol=1uA,#3				0.2	V
Output "H" Voltage	Voh12g	Ioh=-10uA,#1,#2	COM-n	2.2			V
	Voh3g	Ioh=-10uA,#3		3.8			V
Output "M" Voltage	Vom12g	Iol/h=+/-10uA,#1,#2	COM-n	1.0		1.4	V
	Vom3g	Iol/h=+/-10uA,#3		1.8		2.2	V
1/3 Bias display Mode							
Output "H" Voltage	Voh12h	Ioh=-1uA,#1,#2	SEG-n	3.4			V
	Voh3h	Ioh=-1uA,#3		5.8			V
Output "M1" Voltage	Vom1h	Iol/h=+/-10uA,#1,#2		1.0		1.4	V
	Vom13h	Iol/h=+/-10uA,#3		1.8		2.2	V
Output "M2" Voltage	Vom22h	Iol/h=+/-10uA,#1,#2		2.2		2.6	V
	Vom23h	Iol/h=+/-10uA,#3		3.8		4.2	V
Output "L" Voltage	Vol12h	Iol=1uA,#1,#2				0.2	V
	Vol3h	Iol=1uA,#3				0.2	V
Output "H" Voltage	Voh12i	Ioh=-10uA,#1,#2	COM-n	3.4			V
	Voh3i	Ioh=-10uA,#3		5.8			V
Output "M1" Voltage	Vom12i	Iol/h=+/-10uA,#1,#2		1.0		1.4	V
	Vom13i	Iol/h=+/-10uA,#3		1.8		2.2	V
Output "M2" Voltage	Vom22i	Iol/h=+/-10uA,#1,#2		2.2		2.6	V
	Vom23i	Iol/h=+/-10uA,#3		3.8		4.2	V
Output "L" Voltage	Vol12i	Iol=10uA,#1,#2				0.2	V
	Vol3i	Iol=10uA,#3				0.2	V
1/4 Bias display Mode							
Output "H" Voltage	Voh12j	Ioh=-1uA,#1,#2	SEG-n	4.6			V
Output "M2" Voltage	Vom22j	Iol/h=+/-10uA,#1,#2		2.2		2.6	V
Output "L" Voltage	Vol12j	Iol=1uA,#1,#2				0.2	V
Output "H" Voltage	Voh12k	Ioh=-10uA,#1,#2	COM-n	4.6			V
Output "M1" Voltage	Vom12k	Iol/h=+/-10uA,#1,#2		1.0		1.4	V
Output "M3" Voltage	Vom22k	Iol/h=+/-10uA,#1,#2		3.4		3.8	V
Output "L" Voltage	Vol12k	Iol=10uA,#1,#2				0.2	V