



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

PRODUCT  
SPECIFICATION

FITNESS

|               |                  |
|---------------|------------------|
| Product Code: | HCS-T015-1       |
| Version:      | 1.3              |
| Date:         | February 5, 2004 |

**Hong Kong 香港**

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*Fitness (HCS-T015-1)*

## DOCUMENT HISTORY

| Date           | Product Code | Version | Approved by   | Revision Details  |
|----------------|--------------|---------|---|---|
| Feb. 5, 2004   | HCS-T015-1   | 1.3     |  | <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></ul> |
| Mar. 5, 2002   | HCS-T015-1   | 1.2     | <b>OBSOLETE</b>   |   |
| Jan. 25, 2002  | HCS-T015-1   | 1.1     | <b>OBSOLETE</b>   |   |
| Sept. 29, 2001 | HCS-T015-0   | 1.0     | <b>OBSOLETE</b>   |   |



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*Fitness (HCS-T015-1)*

## GENERAL DESCRIPTION

The FITNESS is a single-chip micro-controller that is preprogrammed for digital watch and portable applications. Featured with Countdown Timer with automatic time setting, it could be a good companion for daily exercise in achieving a healthier life. By using LSI originated from Japan, quality, reliability and excellent performance could be ensured.

## FEATURES

- LSI Used
  - SANYO Semiconductor LC573224A
- Real Time Clock
  - Hour, Minute, Second, Month, Date, Day of Week
  - 12 or 24 hour display format by key option
  - Hourly Chime
- Daily Alarms
  - Two daily alarms operated separately
- Countdown Timer
  - User adjustable time duration range from 1 minute up to 240 minutes
  - Short sound alerts for last 5 minutes, 1 minute, 50 seconds, 40 seconds, 30 seconds, 20 seconds, and each second in last 10 seconds
  - Long sound alert when countdown to zero
- Chronograph
  - Count up to 99 hours 59 minutes 59.99 seconds with 1/100 second resolution
  - Split time display
- Pacer
  - User adjustable beat rate from 60 BPM to 180 BPM



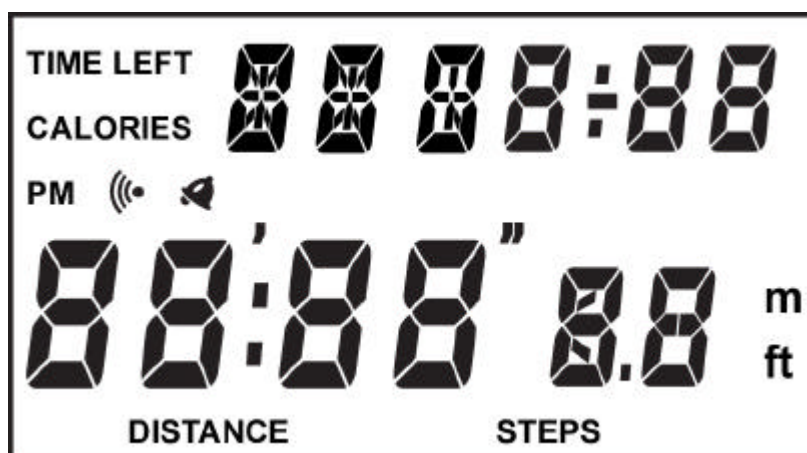
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## *Fitness (HCS-T015-1)*

- Calories Burner
  - Ten built-in activities
    - Kickboxing, Jogging, Aerobics, Badminton, Tennis, Walking, Dancing, Swimming, Rope Jumping, Stair Climbing
  - One user preset activity
  - Automatically timer setting based on user's weight, activity selected and target calories to be consumed
  - Motion detector start/stop timer automatically (optionally)
  - Step counter with maximum count up to 999999 steps
  - Distance counter with user adjustable stride distance
  - Imperial or Metric system by bonding option
- Operates with 3 buttons
- Operates with 3V Lithium battery

## LCD PATTERN



Duty: 1/5  
Bias: 1/3  
Vop: 4.5V

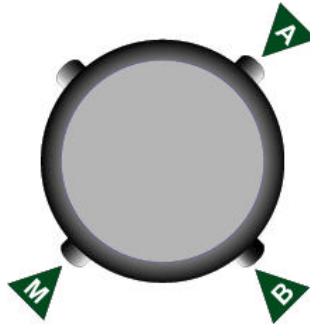


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**KEYBOARD LAYOUT**

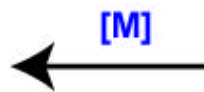


**FUNCTIONAL FLOWCHART**

**Real Time Clock**



**Chronograph**



**Daily Alarms**



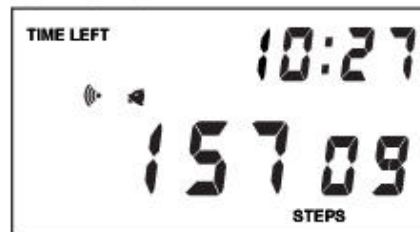
**Pacer**



**Timer**



**Cal Burner**





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**FUNCTIONAL DESCRIPTIONS**

1. System Defaults

- System Defaults will be initialized upon system startup:

| MODE            | ELEMENT         | SETTING          |
|-----------------|-----------------|------------------|
| Real Time Clock | Time            | 12:00:00 AM      |
|                 | Date            | Sunday 01-01     |
|                 | Display System  | 12-hour          |
| Daily Alarms    | Time            | 12:00 AM         |
|                 | Alert           | Off              |
| Countdown Timer | Time Duration   | 1 minute         |
|                 | Status          | Stopped          |
| Calories Burner | Weight          | 20 Kg (44 lb)    |
|                 | Activity        | 01               |
|                 | Target Calories | 20               |
|                 | Steps           | 0                |
|                 | Stride Distance | 0                |
|                 | Distance        | 0                |
| Pacer           | Beat rate       | 60 BPM           |
|                 | Status          | Stopped          |
| Chronograph     | Total Time      | 0 hr 0 min 0 sec |
|                 | Status          | Stopped          |

2. Auto Return

- Normal display will be resumed in any setting state if no key operation for 1 minute

3. Auto Advance

- In any setting state, press and hold [B] for more than 2 seconds will activate Auto Advance function. Digits being blinking will be adjusted at a rate of 10 steps per second until [B] is released.



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*Fitness (HCS-T015-1)*

**OPERATIONAL INSTRUCTIONS**

**1. Real Time Clock**

- Normal Display



e.g. 2:29:45 PM  
 Monday Jan 28  
 Daily Alarm enabled

- Operating the Real Time Clock
  - Press [A] to enable or disable Hourly Chime

Hourly Chime disabled

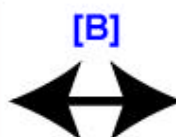


Hourly Chime enabled



- Press [B] to toggle between 12-hour and 24-hour display

12-hour display



24-hour display



- Adjusting the Real Time Clock
  - Press and hold [M] for 2 seconds to enter into setting state. SECOND digits will be blinked.
  - Press [A] to select the digits to be altered according to the below sequences:  
 Sec -> Min -> Hr -> Day of Week -> Month -> Date -> Sec



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- Press [B] to adjust the selected digits.
- Press [M] once to exit setting state.
- Validity of the adjusted date will be checked upon exiting the setting state. If invalid date is entered, the date will be adjusted automatically to the 1<sup>st</sup> day of the current month.
- There are 28 days in February during normal clock update. The 29<sup>th</sup> could be selected while in Setting State.

## 2. Daily Alarms

- Normal Display



Daily Alarm 1  
- Alarm time 7:30AM  
- Enabled



Daily Alarm 2  
- Alarm time 10:45PM  
- Disabled

- Operating the Daily Alarm
  - All Daily Alarms are operated identically.
  - Upon mode entry, the previous selected alarm will be displayed (Default is AL-1).
  - Use [B] to select the desired Daily Alarm to be shown.
  - Use [A] to enable or disable the selected Daily Alarm.





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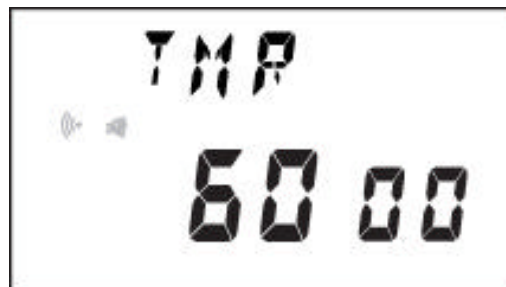
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- Adjusting the Daily Alarms
  - Select the desired alarm to be adjusted by [B].
  - Press and hold [M] for 2 seconds to activate the setting state with MINUTE digits blinking.
  - Use [A] to select digits to be altered according to the following sequences:  
Minutes -> Hour -> Minutes
  - Use [B] to adjust the selected digits.
  - Press [M] once to confirm the setting and exit to normal display.
  
- Daily Alarm Alert
  - Alert sound will be played for 20 seconds when the preset alarm time is reached.

### 3. Countdown Timer

- Normal Display



- Operating the Countdown Timer
  - Use [A] to start/stop the timer.
  - When timer stopped, press [B] once to reload the previous timer value. Press [B] subsequently to adjust the timer value from 1 minute to 240 minutes in 1-minute step.
  - Short alert tone will be heard when timer reaches last 5 minutes, 1 minute, 50 seconds, 40 seconds, 30 seconds, 20 seconds, and each second in last 10 seconds.
  - When timer reaches zero, counting will be stopped automatically and a long alert tone will be played.



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*Fitness (HCS-T015-1)*

## 4. Pacer

- Normal Display



- Operating the Pacer
  - Use [A] to start/stop the Pacer.
  - When Pacer stopped, press [B] to adjust the beat rate from 60BPM to 180BPM in 5BPM per step.
  - Beat sound will be played according to the selected beat rate under the following conditions:
    - No other alert sound being played
    - In Pacer Mode
    - In Chronograph running state
    - In Calories Burner running state

## 5. Chronograph

- Normal Display





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- Operating the Chronograph
  - Use [A] to start/stop the Chronograph.
  - While Chronograph running, the ['] and [“] symbols will be blinked,
  - Press [B] to display the split time while Chronograph started.



- Normal display will be resumed, when:
  - No key operation for 10 seconds in Split Time Display
  - Upon mode entry
- While Chronograph stopped and in Split Time display, press and release [B] within 2 seconds to resume to Normal Display with total time being displayed.
- Press and hold [B] for 2 seconds while Chronograph stopped to reset the total time to zero.
- Maximum count is 99 hours 59 minutes 59.99 seconds. If maximum is reached, count will be continued with time reset to zero.



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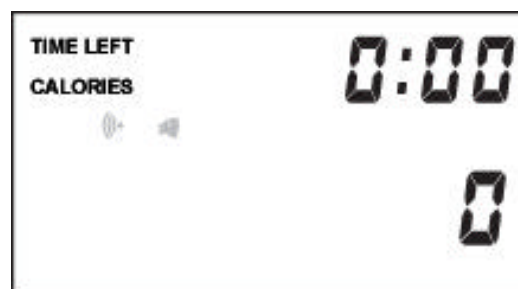
*Fitness (HCS-T015-1)*

## 6. Calories Burner

- The Calories Burner could be operated with the following factory options:
  - Imperial system with motion detector (Option 1)
  - Imperial system without motion detector (Option 2)
  - Metric system with motion detector (Option 3)
  - Metric system without motion detector (Option 4)
- Mode Entry Screen (Default Screen)
  - Option 1 and Option 3



- Option 2 and Option 4



- Setting User's Options
  - In Calories Burner, press and hold [M] for 2 seconds to set the User's Options. Once activated, the following screen will be shown:



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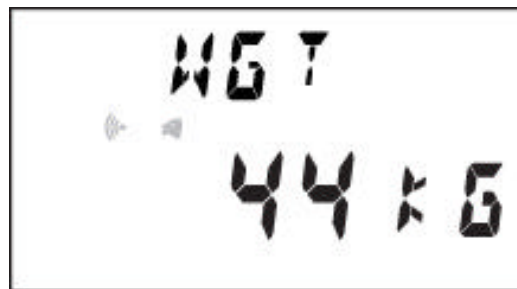
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## *Fitness (HCS-T015-1)*

- Option 1 and 2



- Option 3 and 4



- Press [M] at any time to abort setting and return to Default Screen.
- Press [B] to set the Weight from 44lb to 440 lb (20kg to 200kg).
- Press [A] in Option 1 and Option 3 to proceed for Stride Distance adjustment or to User Preset Activity if in Option 2 and Option 4.



'm' or 'ft' will be shown  
based on the option selected

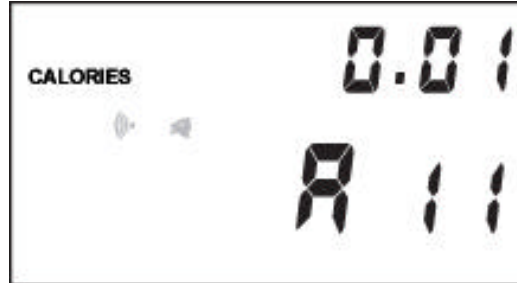
- Press [B] to set the Stride Distance from 0.1m to 1.5m (or 0.1ft to 4ft).
- Press [A] to adjust User Preset Activity.
- In adjusting the User Preset Activity, the following screen will be displayed:



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- Press [B] to set the Calories consumed per pound for each minute ranged from 0.01 to 0.99.
- Press [A] to confirm and return to Default Screen.
- Preparing for Exercise
  - Press and release [B] within 2 seconds in Default Screen while counting stopped to adjust per exercise setting. The following screen will be shown.



- Press [M] at any time to abort setting.
- Press [B] to set the target calories consumed from 20 to 400 in step of 10 kcal.
- Press [A] once to confirm the setting and proceed to select activity.
- In selecting activity, the below screen will be displayed:





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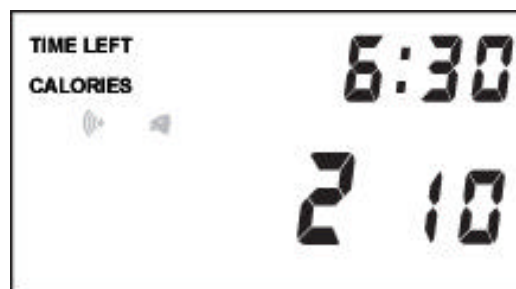
- Lists of Activities

| No  | Activity   | No  | Activity       |
|-----|------------|-----|----------------|
| A01 | Kickboxing | A06 | Swimming       |
| A02 | Walk Dog   | A07 | Aerobics       |
| A03 | Jogging    | A08 | Badminton      |
| A04 | Tennis     | A09 | Rope Jumping   |
| A05 | Dancing    | A10 | Stair Climbing |

- Press [B] to select the desired activity. Activity '11' could not be selected if the User Preset Activity had not been set.
- Press [A] to confirm the setting and exit. Time duration (from 30 seconds to 999 minutes 30 seconds in step of 30 seconds) for exercise will be calculated automatically.
  - Option 1 and Option 3



- Option 2 and Option 4



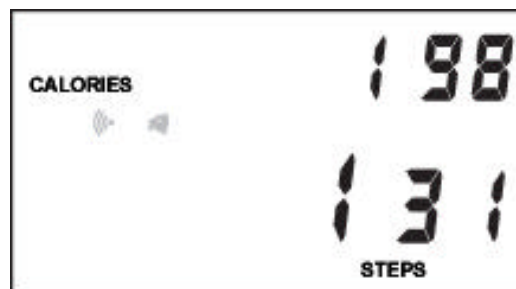


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## *Fitness (HCS-T015-1)*

- Start Doing Exercise
  - For Option 1 and Option 3
    - With calculated time duration for exercise, press [A] to start doing exercise. Timer will start counting immediately after a motion detected by the motion detector.
    - Timer will stop counting down if no motion was detected for 10 seconds. Warning signal will be sounded for 10 seconds. The warning signal will be repeat every minute thereafter until the Timer is stopped by pressing [A] or when motion is being detected again.
    - While counting started, Time Left and Calories Remained will be shown on the display alternatively for each second.



- During timer counting down, press [B] to toggle between STEPS and DISTANCE display.



- When timer counts down to zero, alert signal will be played and timer will be stopped automatically.
- Maximum count for the Step Counter is 999999 steps. When maximum is reached, counting will restart from zero.





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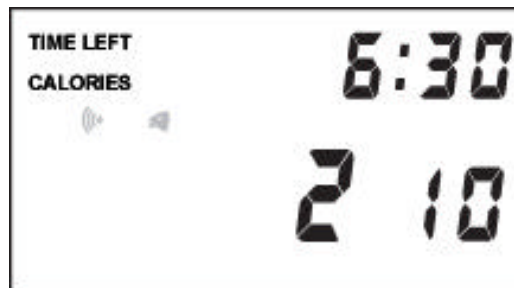
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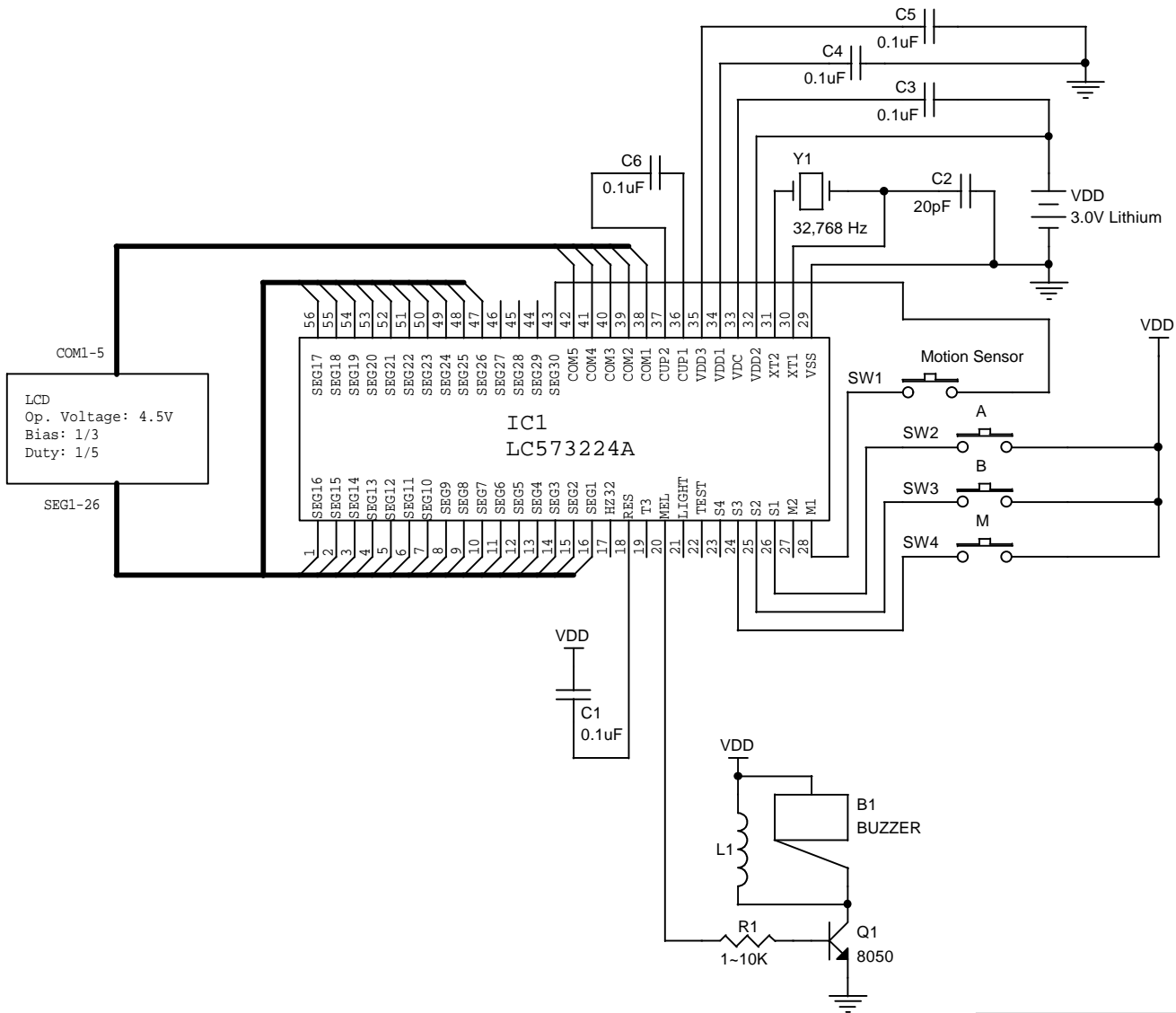
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- Maximum count for Distance Counter is 99999.9m (or feet). When maximum is reached, counting will restart from zero.
- For Option 2 and 4
  - With calculated time duration for exercise, press [A] to start the timer. Timer will start counting down with both time left and calories remained being shown as follows:



- Press [B] to stop the timer.
- When timer counts down to zero, alert signal will be played with timer automatically stopped.
- With timer in stopped state (either timeout or manually stopped), press and hold [B] for 2 seconds will reset timer value and all counters to zero, i.e. Default Screen.

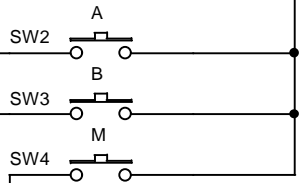
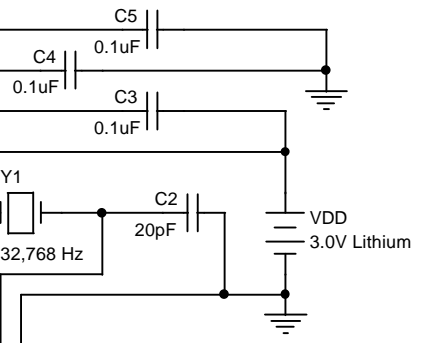
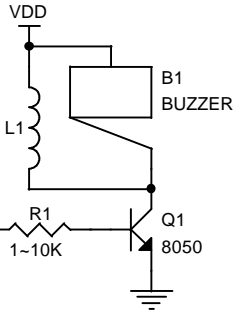
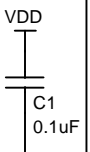
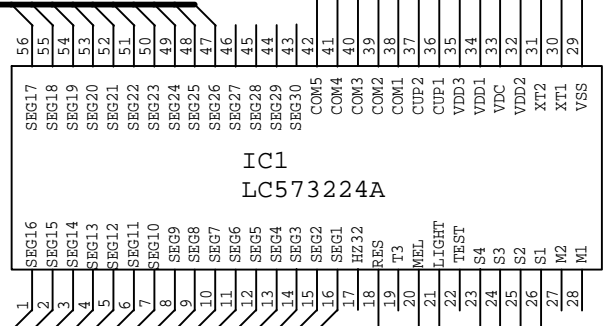


Substrate of IC1 should be connected to VSS

|                                    |                               |            |
|------------------------------------|-------------------------------|------------|
| HICO Industrial (H.K.) Ltd.        |                               |            |
| Title<br>Fitness (Option 1)        |                               |            |
| Size<br>A                          | Document Number<br>HCS-T015-1 | Rev<br>1.1 |
| Date:<br>Friday, February 06, 2004 | Sheet<br>1                    | of<br>1    |

COM1-5  
 LCD  
 Op. Voltage: 4.5V  
 Bias: 1/3  
 Duty: 1/5

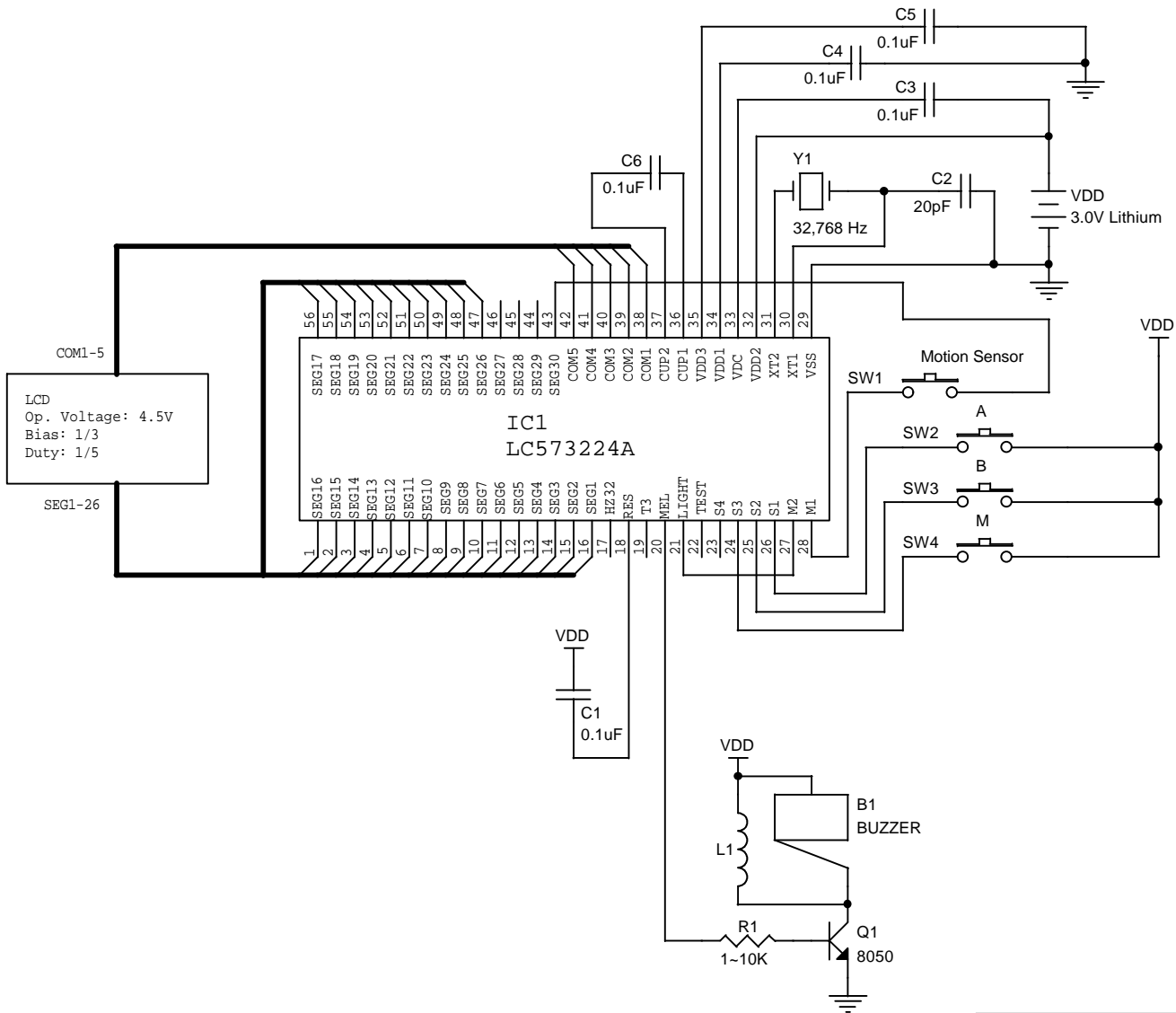
SEG1-26



Option 2: Imperial System without Motion Detection

Substrate of IC1 should be connected to VSS

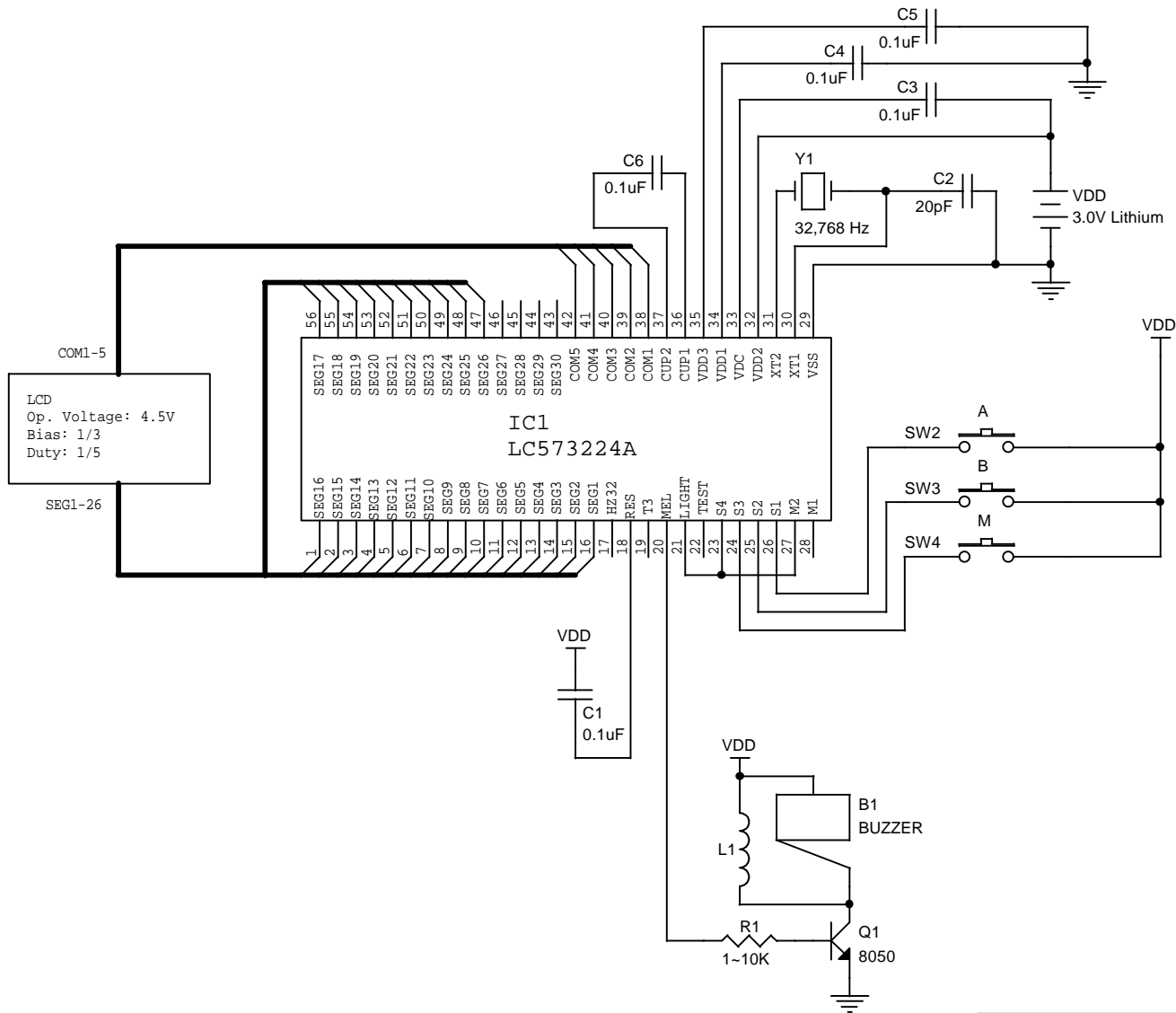
|                                    |                               |            |
|------------------------------------|-------------------------------|------------|
| HICO Industrial (H.K.) Ltd.        |                               |            |
| Title<br>Fitness (Option 2)        |                               |            |
| Size<br>A                          | Document Number<br>HCS-T015-1 | Rev<br>1.1 |
| Date:<br>Friday, February 06, 2004 | Sheet<br>1                    | of<br>1    |



Option 3: Metric System with Motion Detection

Substrate of IC1 should be connected to VSS

|                             |                               |              |
|-----------------------------|-------------------------------|--------------|
| HICO Industrial (H.K.) Ltd. |                               |              |
| Title<br>Fitness (Option 3) |                               |              |
| Size<br>A                   | Document Number<br>HCS-T015-1 | Rev<br>1.1   |
| Date:                       | Friday, February 06, 2004     | Sheet 1 of 1 |

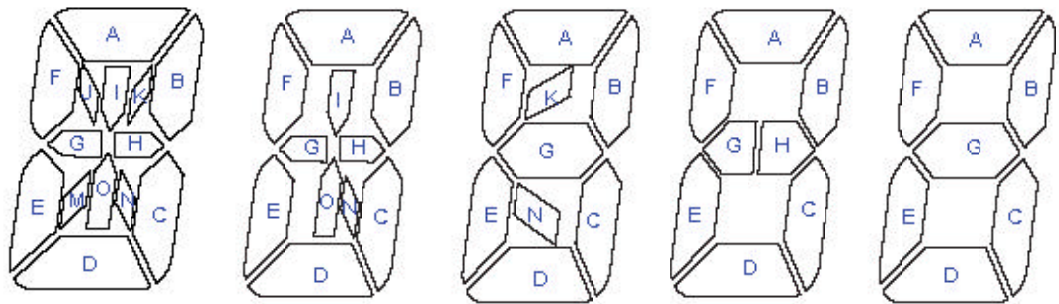
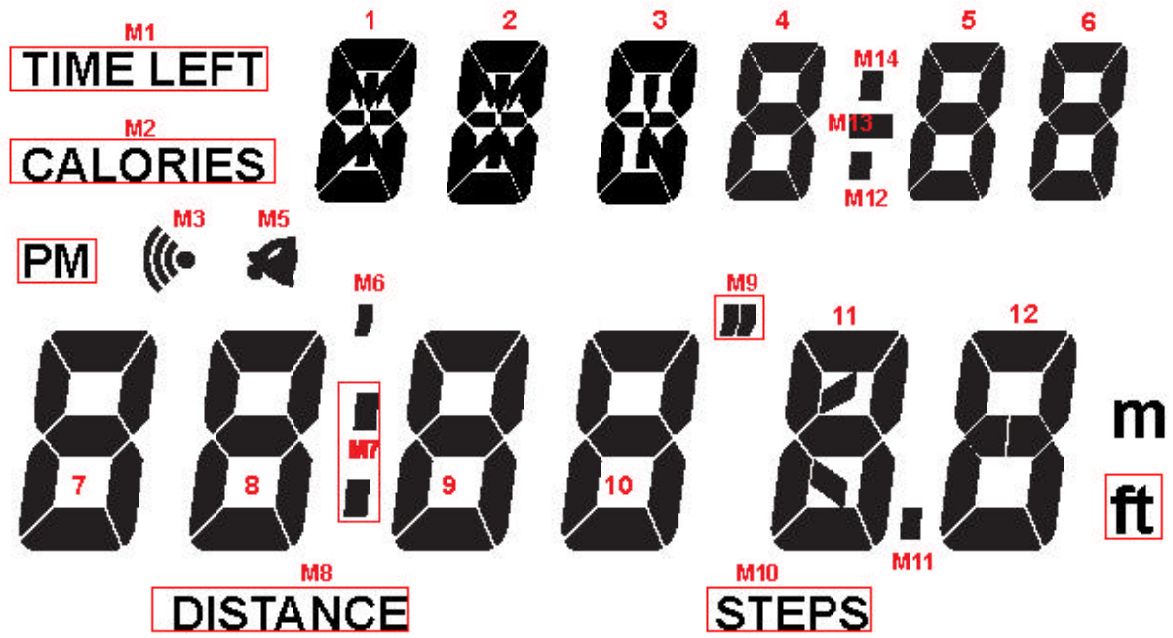


Option 4: Metric System without Motion Detection

Substrate of IC1 should be connected to VSS

|                                    |                               |            |
|------------------------------------|-------------------------------|------------|
| HICO Industrial (H.K.) Ltd.        |                               |            |
| Title<br>Fitness (Option 4)        |                               |            |
| Size<br>A                          | Document Number<br>HCS-T015-1 | Rev<br>1.1 |
| Date:<br>Friday, February 06, 2004 | Sheet<br>1                    | of<br>1    |

# HCS-T015 FITNESS



**HCS-5015 LCD ASSIGNMENT TABLE**

| <b>PIN NO</b> | <b>COM1</b> | <b>COM2</b> | <b>COM3</b> | <b>COM4</b> | <b>COM5</b> |
|---------------|-------------|-------------|-------------|-------------|-------------|
| 1             | ft          | M           | 6C          | 6B          | 6A          |
| 2             | 12C         | 12B         | 6D          | 6G          | 6F          |
| 3             | 12D         | 12H         | 12A         | 6E          | 5A          |
| 4             | 12E         | 12G         | 12F         | 5C          | 5B          |
| 5             | M11         | 11B         | 11A         | 5D          | 5G          |
| 6             | 11C         | 11G         | 11K         | 5E          | 5F          |
| 7             | 11D         | 11N         | 11F         | M12         | M14         |
| 8             | M10         | 11E         | M9          | M13         | -----       |
| 9             | 10C         | 10B         | 4D          | 4C          | 4B          |
| 10            | 10D         | 10G         | 10A         | 4E          | 4G          |
| 11            | 10E         | 10F         | 3C          | 4F          | 4A          |
| 12            | 9C          | 9B          | 3N          | 3H          | 3B          |
| 13            | 9D          | 9G          | 3D          | 3O,3I       | 3A          |
| 14            | 7D          | 7C          | 1N          | 1H          | 1K          |
| 15            | PM          | M2          | M1          | -----       | -----       |
| 16            | 7F          | M3          | 1E          | 1F          | -----       |
| 17            | 7E          | 7A          | 1M          | 1G          | 1J          |
| 18            | 7G          | 7B          | 1D          | 1O,1I       | 1A          |
| 19            | 8F          | M5          | 1C          | 1B          | -----       |
| 20            | 8E          | 8A          | 2E          | 2F          | -----       |
| 21            | 8G          | 8B          | 2M          | 2G          | 2J          |
| 22            | 8D          | 8C          | 2D          | 2O,2I       | 2A          |
| 23            | M8          | M6          | 2N          | 2H          | 2K          |
| 24            | 9E          | M7          | 2C          | 2B          | -----       |
| 25            | 9F          | 9A          | 3E          | 3G          | 3F          |
| 26            | -----       | -----       | -----       | -----       | COM5        |
| 27            | -----       | -----       | -----       | COM4        | -----       |
| 28            | -----       | -----       | COM3        | -----       | -----       |
| 29            | -----       | COM2        | -----       | -----       | -----       |
| 30            | COM1        | -----       | -----       | -----       | -----       |

**HCS-T015 LCD TO LSI CONNECTION TABLE**

| <b>LCD PIN NO</b> | <b>LC573224A PAD NO</b> | <b>PAD NAME</b> |
|-------------------|-------------------------|-----------------|
| 1                 | 15                      | SEG2            |
| 2                 | 14                      | SEG3            |
| 3                 | 13                      | SEG4            |
| 4                 | 12                      | SEG5            |
| 5                 | 11                      | SEG6            |
| 6                 | 10                      | SEG7            |
| 7                 | 9                       | SEG8            |
| 8                 | 8                       | SEG9            |
| 9                 | 7                       | SEG10           |
| 10                | 6                       | SEG11           |
| 11                | 5                       | SEG12           |
| 12                | 4                       | SEG13           |
| 13                | 3                       | SEG14           |
| 14                | 2                       | SEG15           |
| 15                | 1                       | SEG16           |
| 16                | 56                      | SEG17           |
| 17                | 55                      | SEG18           |
| 18                | 54                      | SEG19           |
| 19                | 53                      | SEG20           |
| 20                | 52                      | SEG21           |
| 21                | 51                      | SEG22           |
| 22                | 50                      | SEG23           |
| 23                | 49                      | SEG24           |
| 24                | 48                      | SEG25           |
| 25                | 47                      | SEG26           |
| 26                | 42                      | COM5            |
| 27                | 41                      | COM4            |
| 28                | 40                      | COM3            |
| 29                | 39                      | COM2            |
| 30                | 38                      | COM1            |



■パッド配置案

- ・パッドピッチ : 110  $\mu\text{m}$  (Min.)
- ・パッドサイズ : 100  $\mu\text{m}$  × 100  $\mu\text{m}$
- ・パッド開口部 : 80  $\mu\text{m}$  × 80  $\mu\text{m}$  (ジャケット開口)
- ・チップサイズ : 2.4mm × 3.37mm (?)

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

# LC573224A PAD Coordinates

November , 21 , 2001

| PIN No. | P I N NAME | Coordinates   |               |
|---------|------------|---------------|---------------|
|         |            | " X " $\mu$ m | " Y " $\mu$ 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 " $\mu$ m | " Y " $\mu$ 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**