



HAL-HPC300

Handheld Particle Counter

Operational Manual



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Important Messages

Quality Assurance

- This product has met the product specifications. All the test instruments and standard materials used for calibration are traceable.
 - This certification is for new production only and not valid for used one or ones for an exhibition purpose.
-

Commonly used symbols in this manual

Following symbols are used throughout this manual:



The action could lead to harmful damage to the instrument.



Bring your attention about the features of the instrument.

Unpacking and Inspection

- Inspect the receiving package and notify the shipper immediately if there appears to be susceptible damage during shipping.
 - Please verify that the enclosed items match with the shipping package list.
-



This Instrument is designed to be the class-1 laser equipment. Removing the cover without authorization may result in exposing to the laser radiation or high voltage. This Instrument also contains static sensitive components that may be damaged by improper handling. The warranty is void for any unauthorized opening of the instrument.

Environmental Requirements

To avoid any accident or damage to the instrument, please avoid using in the following situations:

- DO NOT expose to combustible, explosive environments.
- DO NOT expose to environments where rust or radioactivity are present.
- DO NOT expose to an environment exceeding the specified limits.

Technical Support and Warrantee

Within a year from the date purchased, the manufacturer will provide free technical support and software upgrade. For additional help, please contact info@haltechnologies.com



NOTICE

It is strongly recommended that the instrument should be calibrated annually. Please contact Hal Technology to schedule your calibration or any services needed. The HAL-HPC300 can only be serviced at Hal Technology or by Hal Technology's authorizing trained professionals.

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I. Introduction

The Model HAL-HPC300 handheld optical particle counter utilizes the laser technology for single particle detection. The scattering of light from the particles in the sampling air stream is converted into electrical pulses, which is then measured and calculated as a particle size. The HAL-HPC600 consists of a handheld set with a main base unit that allows users to conduct the sampling around with a handheld set while easily expanding to multiple functionalities with a base unit. These extended functions include data downloading, data real-time printing, software upgrading, and battery charging, etc. In addition to USB and RS232 interfaces, the RJ45 interface allows users to conduct the remote sampling away from the sampling location.

The HAL-HPC300 has up to three adjustable particle size channels starting at 0.3 microns at a flow of .1 CFM (2.83 LPM). Particle count data is displayed as Cumulative, Differential or Concentration mode (Counts/Liter or Counts/Cubic foot, Counts/Cubic Meter). The Model HAL-HPC300 can also include a digital temperature and relative humidity probe, back lit interface and is capable of storing 3,000 sample records. It is in compliance with the international standards (JIS B 9925:1997 and ISO14644-1) and support both metric and English systems.

1.1 Features

- User configurable for three size channels
- Set and display date and time.
- High speed USB interface for data downloading
- RS-232 communication port for data downloading, printing, and software upgrading
- Count Limit Warning: Setting according to the FED standard 209E or ISO 14644-1 standard
- Error status indicator: The instrument will automatically monitor the sensor status, out of flow calibration ($>\pm 5\%$), or insufficient battery
- Up to 1000 sets of data can be saved
- Timer, auto-start sampling
- Average of multiple times of measurements
- External digital temperature and humidity sensors to assure accurate measurement
- Up to 26 location labels of measurements
- No less than 6 hours of continuous operation.
- Auto print function.

1.2 Specifications

- Size Range: $0.3\mu\text{m}\sim 25\mu\text{m}$
- Channel Sizes: $0.3\mu\text{m}$, $0.5\mu\text{m}$ (default), $5.0\mu\text{m}$ (default channel can be configurable by users)
- Light Source: Laser diode (more than 100,000 hours MTBF)
- Coincidence Loss: $<5\%$ @70,000 particles/Liter
- Flow Rate: 2.83 Liter/min (0.1cfm)
- Counting Efficiency: $50\pm 20\%$ @ $0.3\mu\text{m}$; $100\pm 10\%$ @ $0.5\mu\text{m}$
- Test Standard: JIS-B-9921 (1997), ASTM-F649-01, ASTM-F328-98 (NIST traceable)
- Sampling Time: 1 sec ~ 59 min and 59sec (User defined)
- Sampling Count: 1 ~ 99 (User defined)

- Count Limit Warning: FED STD 209E (Class 1 ~ 100,000) or ISO 14644-1 (Class 2 ~ 9)
- Measurement: Single/repeat/Average
- Error Indication: Count limit, loss of laser power, out of flow calibration (>±5%), insufficient battery
- Communication Speed: USB —12Mbps, RJ45—100Mbps, RS-232—9600bps
- Power: Li-ion polymer Battery (7.4V/2800mAH)
or AC adapter (AC input: 100 ~ 240V, DC output: 9V/1.5A)
- Max. Operating time: continue operation > 6 hours with Li-ion polymer battery)
- Dimension: 93 (W) ×180 (H) × 48 (D) mm
- Weight: < 950 g
- Environmental Condition: Operating: 5~ 45 , <90%RH
- Storage: -20~ 50 , <90%RH

II. Basic Operation

2.1 Handheld Unit

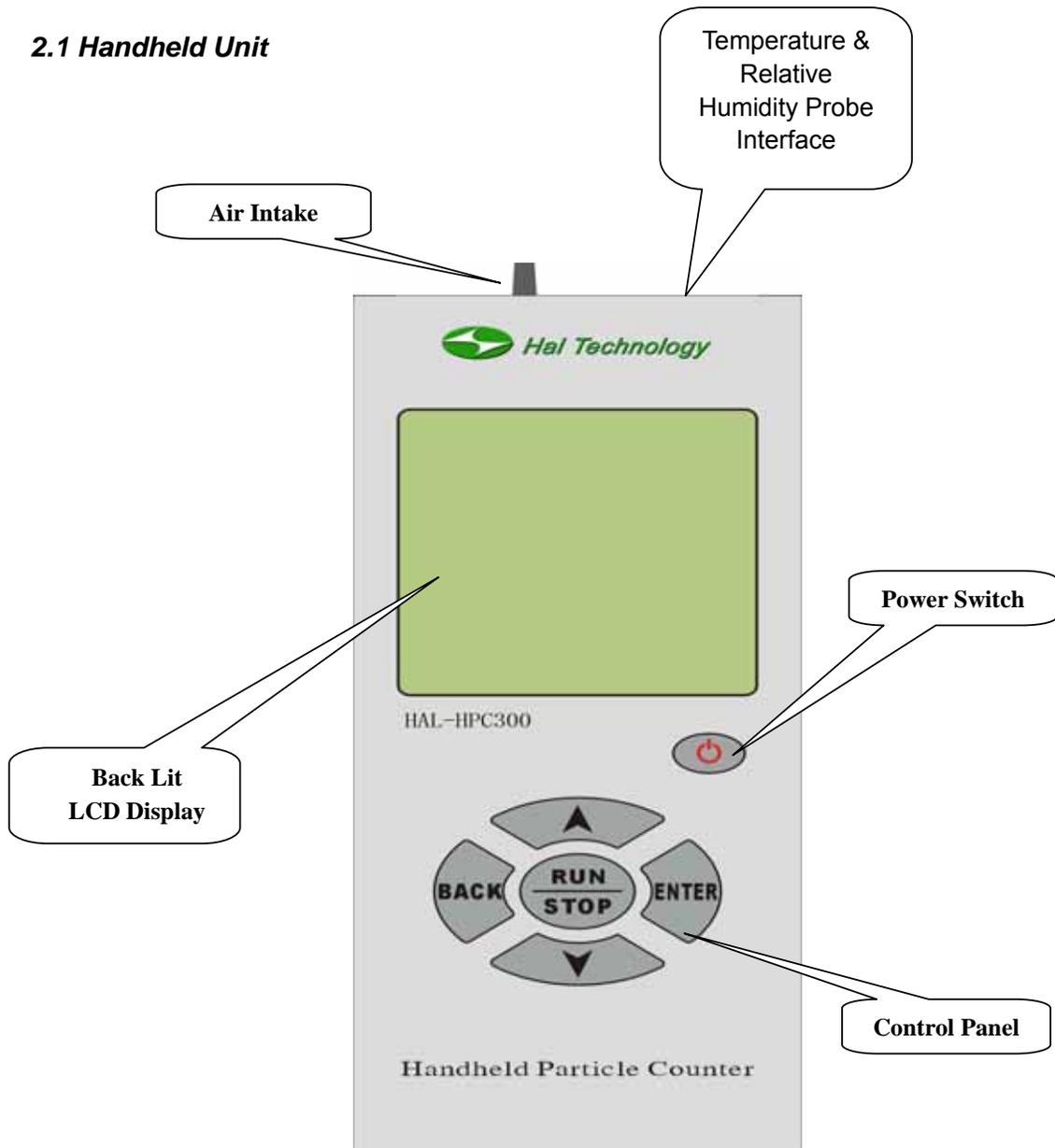


Figure 1 Front View of the Handheld Set



Push the Power button for approximately 2-3 seconds to turn on the instrument. To turn the instrument off, push the Power button for approximately 2-3 seconds and the instrument will turn off. After approximately 5 minutes of no operation, the instrument will automatically turn off to save the battery charge.



Starts or stops a measuring / sampling operation



Moves the cursor up or down to select a desired window or item



Confirms the current selection or parameter



Reverts to the previous window

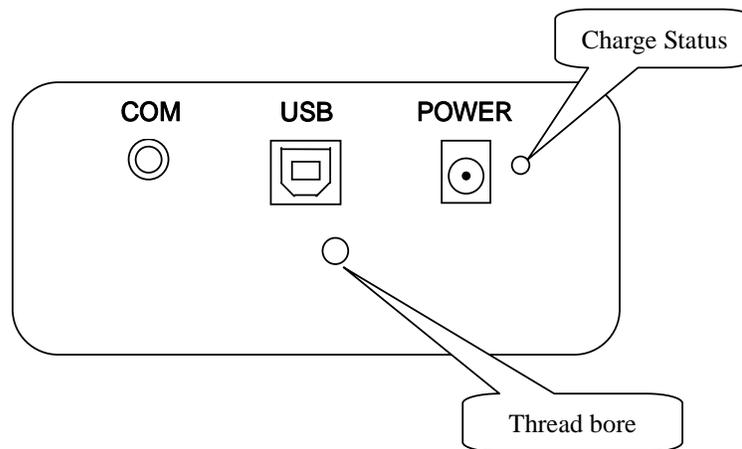


Figure 2 Bottom View of the Handheld Set

- USB Interface: Connect to the USB interface of a computer.
- COM port: Connect to the printer or serial port of a computer
- POWER: An AC adapter plug-in port.
- Thread bore is used for a tripod to minimize a human affect on the steady measurement condition.

- Charge Status: LED flash during charge; static light on after charge finished (about 5 to 6 hours); And LED off when charge stopped.

2.2 Control Panel

- Users interfaces with the instrument through six control keypads: , **RUN/STOP**, **ENTER**, **BACK**, , .

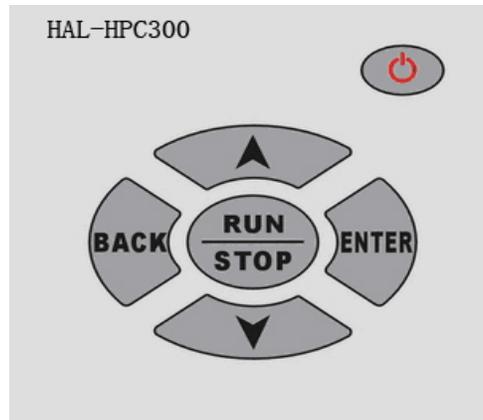


Figure 3 Control Key Pads

- Power button : Keep pushing on for about 2 seconds to turn on the instrument. After turned on, keep pushing on for about 2 seconds to turn off the instrument. After about 8 minutes standby or no operation, the instrument will shut off automatically to save the power.
- **RUN/STOP**: Start or stop a measurement operation.
-  : Move the cursor to select desired page or item.
- **ENTER**: Confirm the current selection or enter parameter.
- **BACK**: Back to the previous page.

2.3 Operational Windows

2.3.1 Startup Page

Hold the power button for about 2 seconds to turn on the instrument power and a start up menu page appears as illustrated below. The instrument will quickly enter into the Measuring Window page.



Figure 4 Startup Window page

2.3.2 Measuring Window

The Measuring Window page is the main page of the instrument for sampling testing. This page can be run at the default settings. It displays the test result and conditions according to the unit setting. One may wish to change the setting before the measurement run by pressing up or down arrow to enter into the Setup Window page. An example of the Measuring Window page is shown in the Figure 5.

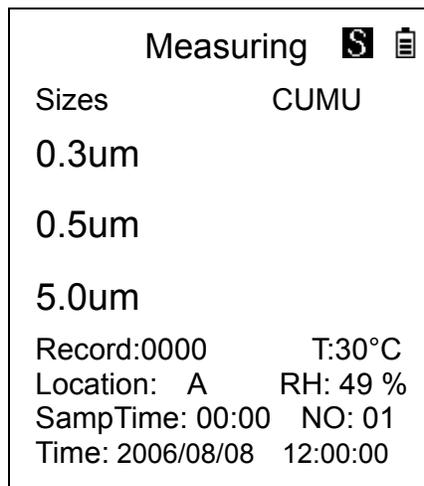


Figure 5 Measuring Window page

 **Battery Indicator**

The battery indicator displays the battery strength graphically. Four bars represent 100% of charge in the battery; three bars 75%; two bars 50%; one bar 25%. No bars signify a low battery status and simultaneously the alarm will buzz as a warning. Charging of the battery is necessary at this level and after a few seconds of the warning sound the instrument shuts itself off automatically.



NOTICE

It is suggested that not charge the battery using AC adaptor to while measuring particles.

S Sensor Error Indication

This sign will not appear if the sensor is working under the normal conditions. Whenever the sensor error indicator appears the instrument will give a warning sound. The sound can only be quieted by turning off the instrument.



NOTICE

- Flashing of the sensor error indicates that the sensor is dirty. A zero-count filter attached to the air-sampling intake may clean the sensor.
- If a steady sensor error indicator appears, it may imply the sensor is malfunctioning. In this case, please contact the manufacturer immediately.



WARNING

Non-authorized personal may not open the instrument. Otherwise, the warranty is void. If there is an abnormal operation with the instrument, contact the authorized service personnel directly.

Sizes

Factory default settings of the three particle sizes are 0.3 μ m, 0.5 μ m, and 5.0 μ m. The user may change the size of second channel selection from 0.5 μ m, 0.7 μ m, 1.0 μ m, 2.0 μ m, and 2.5 μ m in the Setup Window. The first channel and third channel may be pre-set at any other sizes by the factory with customer's special request and extra



charge may be applied.

Display Count Mode

There are three display modes for particle counts: Cumulative (CUMU), Differential (DIFF), and Concentration (e.g., Counts per Liter). The factory default setting is cumulative.

Count Mode	Meanings
Cumulative	The results represent the number of particles that are larger than the size (channel) that is displayed.
Differential	The results represent the number of particles between the size (channel) that is displayed and the adjacent channel (the larger size). The number displayed does not include the particles whose sizes are larger than the adjacent channel or larger.
Concentration	The results represent the number of particles in a unit volume under the accumulative situation. The unit volume may be set Counts per Liter, Counts per Cubic Meter (Counts/ Cu.M.), or Counts per Cubic Foot (Counts/Cu.Ft.).

Sample Time (SampTime)

Sample time is the time that is set for each air sample. Sample times can be set as low as one sample per second. In the case of multiple air samplings, each air sample will run at this sample time setting.

Number (No.)

Number indicates the number of samples that will be processed after pressing, "RUN". The factory default is set at one sample. The user may change the sample time in the Setting window. In the case that "No." is set at more than one sample, the displayed result is the average of the multiple samples.

Location

Location allows the user to label a location for each measurement by selecting a letter from A to Z. The location can only be changed in the Setup window.

Record

Record displays the total number of data samples that are saved.

Temperature & Relative Humidity (T and R/H)

Temperature and Relative Humidity automatically displays when the external sensor probe is attached.



NOTICE

- Use **BACK** keypad to toggle the temperature unit between Fahrenheit (F) and Celsius (C)

Time and Date

The current date and time is always displayed in the format of month-day-year and hour: minute: second, respectively. Date and time can be changed in the Setting window.

If the instrument is set as the manual saving mode, it will enter into the Saving Page after each run for data save confirmation. Use  The up arrow  to highlight the desired selection and then press “**ENTER**” key to confirm the selection.

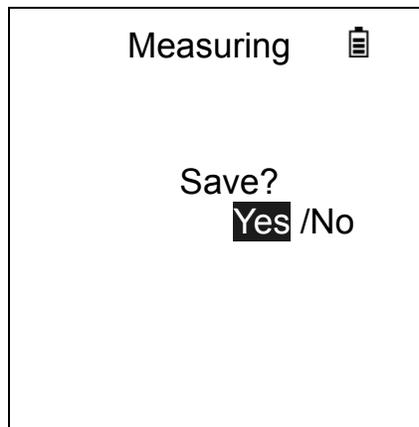


Figure 6 Data Saving Page

If the print function in the Setup Page is activated, it will enter the following Print Page:

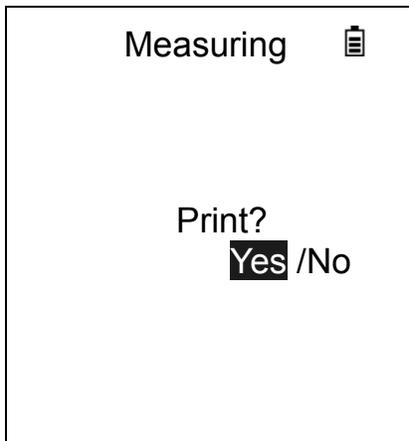


Figure 7 Print Page 1

Use  The up arrow  to highlight the desired selection and then press “**ENTER**” key to confirm the selection.

2.3.3 Browsing Window

Press the arrow keypad to select the Browsing window and enter into the window. This window will allow the user to browse, print or delete historic data. In the Browsing window, press **ENTER** keypad to enter into the last saved data record. Then use the arrow keypad to scroll through the stored data.

- Use  keypad to go to the next saved data record.
- Use  keypad to return to the previous saved data record.
- Use **BACK** keypad to return to the main Browsing window and the homepage.
BACK keypad is effective only after entering into the data record.

Browsing 	
Size	CUMU
0.3um	
0.5um	
5.0um	
Record: 0005/0020	
SampTime: 00:06 T: 27°C	
Location: A RH: 66 %	
Time: 2005/08/08 12:00:00	

Figure 8 An example of the Browsing Window

Location

Displays the sampling location of a historic data.

CUMU

Displays the mode that data was saved in CUMU

Record

Format as number of saved data/total number of stored Data. (e.g., 0015/0110)

SampTime

Displays the length of sampling time of a saved data.

Temperature and Humidity

Displays temperature and humidity at the time of a data saved.

Date and Time

Display the date and time of a data saved. The formats of date and time are Month-Day-Year and Hour:Minute:Second, respectively.

Print and Delete Selection Window

While in a data record window, press **ENTER** and you are taken to the Print and Delete Selection window:

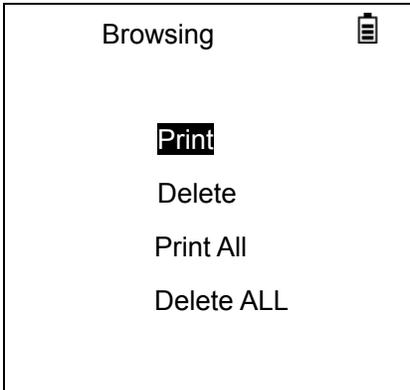


Figure 9 Browsing-Print and Delete Selection Window 1

- Press an arrow keypad to move up or down for highlighted selection
- Press **BACK** keypad to return to the previous Browsing window
- Press **ENTER** keypad to confirm the print or delete selection. Toggle between “Yes” and “No” selection with an arrow keypad and press **ENTER** to confirm the selection. Press **BACK** to cancel the selection and return to the previous Browsing window.

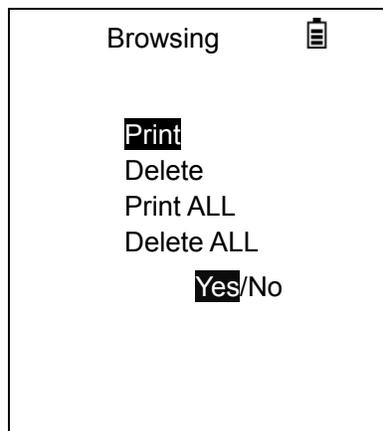


Figure 10 Browsing - Print and Delete Selection Window 2

2.3.4 Setting Window

The Setting window allows users to set or change the measurement parameters. Use an arrow and **ENTER** keypads to enter into the Setting window from the homepage window. Then press the **ENTER** keypad to highlight the parameter that needs to be changed / set. The chosen parameter will be at the bottom of the window. Press **ENTER** keypad again and using the keypads scroll through the parameter options or change the number and press **ENTER** to confirm the parameter's setting. Press **BACK** keypad to back to the previous window.

Setting	
Sizes	Alarm
DateTime	Location
SampTime	DispMode
AutoSave	KeySound
TimeDelay	BackLight
CountMode	PrintMode
Press"ENTER" To Set	

Figure 13 Setting Window page

Sizes

The user may change the size of the middle channel selected from 0.5 μ m, 0.7 μ m, 1.0 μ m, 2.0 μ m, and 2.5 μ m. Factory default setting is 0.5 μ m,

DateTime

Date and time can be changed in the format of: month-day-year and hour: minute: second.

SampTime

Sampling duration may be changed up to 59 minutes and 59 seconds in the format of minute: second. The factory default setting is 10 second.

AutoSave

This function will allow the user to have option to save each sample data. The setting options are: Off, Average Only, Every Sample. The user has the option of saving every sample, saving an average of a set of samples or not saving any sample data. If the setting is set to “Off”, no data will be saved for viewing in the Browsing window.



NOTICE

The maximum storage capacity is 1000 set or total of 3000 size data. When the instrument saved data reaches at the maximum capacity, the instrument will delete the first (the earliest) set of data set and save the new set of the data to the last record. Meanwhile, the record number will be automatically updated as an increment.

TimeDelay (start/interval)

The user has the option of setting a **start** time delay which is the period of time between pressing the **RUN** keypad and the beginning of the actual sample measurement. The user also has the option of setting a time **interval** between two consecutive sample runs when the Count Mode (see below) is set to be more than one. These auto-start and auto-repeat functions allow the user to move away from the instrument so not to interfere with the environment that the instrument is sampling. The maximum start time delay and the maximum delay time between each sample run are 59 minutes and 59 seconds.

CountMode

This function gives the user the ability to set a number of repeated measurements after pressing **RUN** each time. The maximum of repeated sample times that can be set are 99.

Alarm

The user may set the instrument to alarm the count limit based on either the Federal 209E or ISO standard. With the 209E standard option the user may set as class 1, 10, 100, 1000, 10000, 100000. With the ISO standard option the instrument may be set to alarm between classes 2 to 9.

Location



Location allows the user to label a location for each measurement by selecting a letter from A to Z.

DispMode

The instrument is configurable to collect and display data in the following modes: Cumulative (CUMU), Differential (DIFF), and Concentration (Counts/L, Counts/Cubic Foot, or Counts/Cubic Liter). The factory default setting is Cumulative.

KeySound

The keypad buttons may be configured to sound with a beep each time they are touched. The factory setting for this function is set to "Off".

BackLight

The back light of LCD display may be configured to stay on for the following lengths of time: On, Off, 5 seconds, 15 seconds, 30 seconds and 60 seconds. The factory default setting for this function is set to 15 seconds.

PrintMode

The print function may be turned "On" or "Off" from this setting parameter. When it is on, each sampled data will be automatically printed once the measurement is completed. When printing a real time data is desired, be sure that the serial cable is connected through RS232 port between the handheld set and the external mini-printer.

III. Miscellaneous

AC adaptor



NOTICE

- Be sure to use the factory supplied AC adapter .
- It is suggested to recharge the battery whenever the battery power is low
- It is not recommended to take the sample measurement while the unit is in charge.

Iso-Kinetic Probe



NOTICE

An iso-kinetic probe is necessary for accurate and reliable sampling.

Temperature and Humidity Probe



WARNING

Do not immerse the T/RH probe into water.

Zero-Count Filter and Purge Test

The instrument must be periodically cleaned using the purge filter. Following are instructions to purge the unit:

1. Unscrew the iso-kinetic probe and attach the 0.2µm Purge Filter to the air-sampling inlet using the provided tubing/adaptor. Be sure that the fit is very snug.
2. Configure the instrument to sample for a 30-minute period.
3. Then reconfigure the instrument to sample for ten (10) one (1) minute samples with a 10 second time delay between samplings.
4. There should be minimum no more than 1 count on an average per one-minute

sample after purge the unit for sometime.

5. If there is more than one count per one-minute sample then repeat steps 2 & 3 again.
6. If the instrument still fails the purge test, contact a Hal Technology representative for technical assistance.



NOTICE

The non-zero count may often to be improper seal on the inlet due to re-usable o-rings. Change it often if it is required for absolute zero count. The recommended O-ring size is 5.3 (OD) x 1.3 (H) (mm).

Data Downloading Software

The data download software, **CParticle**, can be used to download measurement data from the instrument using the provided USB cable. Simply click on the setup executable provided on the CD ROM and be sure that your com settings are set to either USB. Downloaded data could be managed, deleted, and saved as a Microsoft Excel file format.



NOTICE

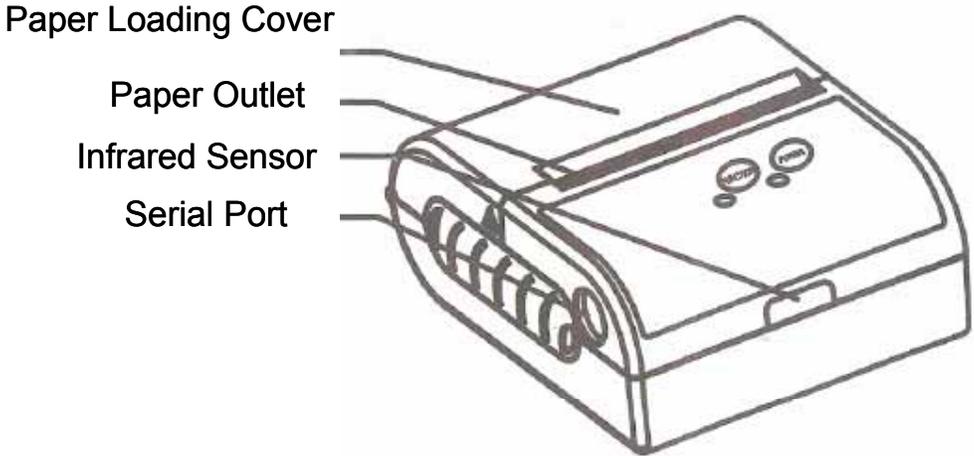
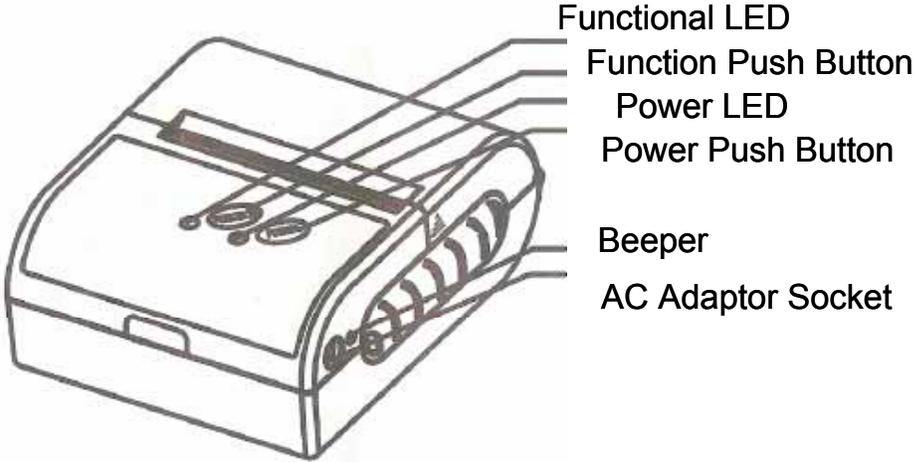
Use the data download software may help users better manage the stored data record on the instrument. It is strongly recommended that users to deleted the data through the download software.

External Printer

The optional accessory of a mini-printer allows the user to print out real-time measuring data. The HPC-300 can only support the manufacturer recommended external printer. The printer operates with a rechargeable battery. When the battery is low, the light on the printer would be on for warning. The user may use the AC adapter to charge the battery or power the printer. The example of print format as follows:

Sizes	ACCU
0.3um	
0.5um	
5.0um	
Record:	T: 23° C
Location:	RH: _ _ %
SampTime:	NO: _ _
Time:	

Mini Printer Overlook



Features

- Print technology: Direct thermal
- Paper width: 58mm
- Print zone Width: 48mm
- Resolution: 8 dots/mm(203dpi)
- Dots per row: 384 dots
- Print speed: 50mm/s(MAX)
- Paper thickness: 60~80μm
- Print contents: GB2312 characters, ASC characters, barcode CODE39、EAN13、ITF, graphics
- Dimension: 90 x 76 x 36 mm
- Paper roll diameter: ≤ 30 mm
- Weight: 220g (Excluding paper roll)
- Interface: Serial
- Power supply: 650mAh Ni-MH rechargeable battery (AC adapter for recharging the battery only)
- Battery charge time: Fast charging (1~5 hours to full level)
- Time to use: 20-40 m paper length assuming 25% print density or 10 days sleep mode.
- Operating temperature: 5 ~45
- Operating humidity: 20% ~85% RH
- Storage temperature: -20 ~70
- Storage humidity: 5% ~95% RH

Power Level Warning: Power LED turns red when the battery below the normal usage level.

Auto-sleep mode: The printer goes to sleep mode after 10 seconds if no printing command is received. The printer will go to working mode if the new command is received.

Turn on/off: hold the power button for 2 second to turn on or off the printer

Self-check: When the printer is off, push the power button and hold for longer time even though the printer turns on and the printer will print settings and status report

Manual paper feeding: Push the function button to manual feed the paper and push the function button again to stop paper feeding. The maximum paper feeding time is 5 seconds if no function button is pushed.

Printer Status Indication

Power LED	Steady green	Printer is turned on and ready to use
	Flash red (long red and short dark)	Battery in charge
	Flash green (long green and short dark)	Battery is fully charged or no battery installed



	Flash green (short green and long dark)	Printing in process
Functional LED	Steady green	Waiting for recediving data and ready to print
	Flash green	Paper feeding
	Flash red:	No paper
Beeper	Sound high and low	Printer turn on
	Sound low and high	Printer turn off
	Sound high three times	No paper
	Sound low two times	Insufficient battery power



IV. Warrantee

Hal Technology provides a one-year limited warranty of the Model HPC600 Handheld Air Particle Counter.

- Warranty begins from shipping date.
- The user is responsible for the cost of shipping in the case of any service or repair needed.
- The warrantee only limits to the HPC600 and HAL TECHNOLOGY does not extend this liability to accessories and any other equipment damage, body injury and loss of properties due to abnormal use.

The following are not included in the warranty:

- Improper connection to a power source, resulting in damage of the instrument.
- Any physical damage due to mechanical forces (e.g., collision or dropping) that may cause any damage of the front panel, LCD screen, switch and internal components, etc.
- Unauthorized opening of the instrument.
- Damage due to operation in an un-specified environmental condition.
- Abnormal operation due to instrument needing calibration.

Limitation of Warranty

A. Hal Technology warrants that all equipment shall be free from defects in material and workmanship under normal use for a period of one year from date of shipment to Buyer except that Hal Technology does not warrant that operation of the software will be completely uninterrupted or error free or that all program errors will be corrected. Buyer shall be responsible for determining that the equipment is suitable for Buyer's use and that such use complies with any applicable local, state, or federal law. Provided that Buyer notifies Hal Technology in writing of any claimed defect in the equipment immediately upon discovery and any such equipment is returned to the original shipping point, transportation charges prepaid, within one year from date of shipment to Buyer and upon examination Hal Technology determines to its satisfaction that such



equipment is defective in material or workmanship, i.e. contains a defect arising out of the manufacture of the equipment and not a defect caused by other circumstances, including, but not limited to accident, misuse, unforeseeable use, neglect, alteration, improper installation, improper adjustment, improper repair, or improper testing, Hal Technology shall, at its option, repair or replace the equipment, shipment to Buyer prepaid. Hal Technology shall have reasonable time to make such repairs or to replace such equipment. Any repair or replacement of equipment shall not extend the period of warranty. If the Instrument is modified or in any way altered without the explicit written consent of Hal Technology then the warranty is null and void. This warranty is limited to a period of one year, except as noted below, without regard to whether any claimed defects were discoverable or latent on the date of shipment.

B. If Buyer shall fail to pay when due any portion of the purchase price or any other payment required from Buyer to Hal Technology under this contract or otherwise, all warranties and remedies granted under this Section may, at Hal Technology's option, be terminated.

C. Warranty repairs shall be completed at a Hal Technology authorized service location, by an authorized service technician, or on site at buyer's facility by a Hal Technology authorized employee. Buyer pays shipping costs to factory; seller will pay standard return shipping costs during the warranty period. Buyer may select a faster method of shipment at their own expense.

Warranty of Repairs after Initial One (1) Year Warranty

A. Upon expiration of the initial one-year warranty, all parts and repairs completed by an authorized Hal Technology repair technician are subject to a six (6) month warranty.

B. Other than the above, Hal Technology makes no warranty of any kind, expressed or implied, except that the products manufactured and sold by Hal Technology shall be free from defects in materials and workmanship and shall conform to Hal Technology's specifications; Buyer assumes all risk and liability resulting from use of the products whether used singly or in combination with other products. If instrument is modified or in any way altered without the explicit written consent of Hal Technology, then the warranty is null and void.

C. Warranty repairs shall be completed at a Hal Technology authorized service location,



by an authorized service technician, or on site at buyer's facility by a Hal Technology authorized employee. Buyer pays shipping costs to factory; seller will pay standard return shipping costs during the warranty period. Buyers may select a faster method of shipment at their own expense.

Contact

HAL TECHNOLOGY, LLC
625 E Carroll Avenue
Glendora, CA 91741 USA
Phone: (510) 579-8540
Fax: (626) 963-7302
Info@haltechnologies.com
<http://haltechnologies.com>

Information Record

Model _____

Serial No. _____

Purchase Place _____

Address _____

Phone _____

Service Place _____

Address _____

Phone _____



Please fill out the Registration form below and send to:

HAL TECHNOLOGY, LLC

625 E Carroll Avenue

Glendora, CA 91741 USA

Phone: (510) 579-8540

info@haltechnologies.com

User Registration Form

Company _____

Contact Person _____

Address _____

City _____ State/Province _____ Country _____

Postal Code _____

Phone _____

Fax _____

E-mail _____

Product Model _____

Serial No. _____

Purchase Date _____

Purchase Place _____

Preferred Contact Method

- E-mail Mail Phone