Handheld Particle Analyzer
Models TCH Pro 202
& TCH Pro 203

Safety Information

This section gives instructions for promoting safe and proper handling of the Particle Analyzer.

Laser Safety

The Model TCH Pro 20x handheld Particle Analyzer is a Class I laser-based instrument.
- During normal operation, you will not be exposed to laser radiation.
- **WARNING:** Class IV visible or invisible laser inside. Exposure to this light causes blindness.
- **DO NOT** remove any cover or disassemble the device.

Important - Take these precautions

- **DO NOT** remove any parts from the particle analyzer unless you are specifically told to do so in this manual.
- **DO NOT** remove the housing or covers. There are no user serviceable components inside the housing. All repair and maintenance needs should be done by a qualified technician.
- **Take precautions not to** get any particles over 50 μm inside the unit. Failure due to foreign objects found in the unit are not covered by the Warranty.
- Precautions for power use:
- **AC Adaptor.** The AC adapter accommodates voltage of AC 100~240V and frequency of 50/60 Hz.
- **Batteries**: 2 units of Li-ion, 3.7V, size 18650.

Table of Contents
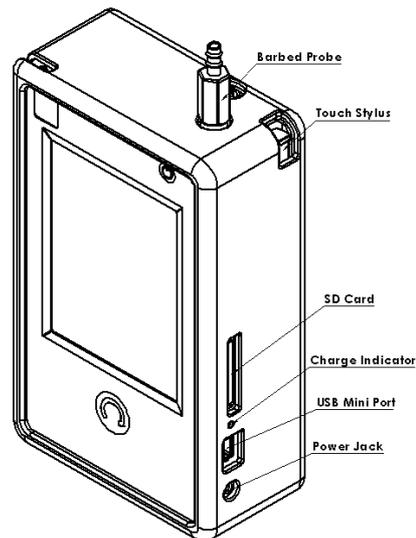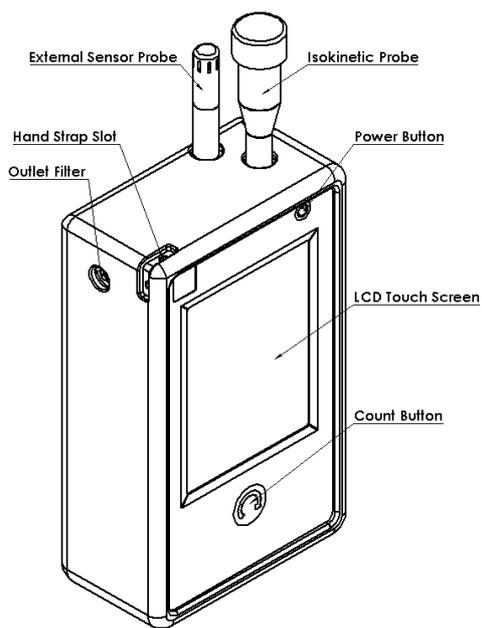
Chapter 1: Product Overview

INTRODUCING TCH PRO MODELS

The Handheld Particle Analyzer TCH Pro is a lightweight, handheld particle counter with a 3.5" Color LCD display, a touchscreen and a single button. It is simple to use and maintain. It operates on battery or AC power. This model series has a 0.1 CFM with internal flow meter (1% FS) and active flow control counts particle sizes of 0.2µm (50%) to 10µm full and continuous particle size spectrum by turning the concept of channels obsolete. Over 1,000 data sets can be stored in removable SD card and downloaded for analysis and reporting using the utility included with the device.

Key features:

- TCH PRO is the smallest 0.2µm particle counter in the market. A truly portable device
- Not bound by channels. Full continuous particle spectrum
- High power variable light source allows unprecedented range of 0.2µm to 10µm
- State of the art analog and digital signal processing
- Advanced particle analysis directly at device
- PM2.5 and PM10 display
- Differential pressure (1 Pa resolution) display
- Embedded flow meter (1% FS)
- Humidity and temperature sensors

External Sensor Probe

Isokinetic Probe

Hand Strap Slot

Power Button

Outlet Filter

LCD Touch Screen

Count Button

Barbed Probe

Touch Stylus

SD Card

Charge Indicator

USB Mini Port

Power Jack

Side Views

Note that the **External Sensor Probe** only applies to Teilch Pro 203

Inlet Filter

TEILCH

TCH PRO 202 - AIRBORNE PARTICLE ANALYZER
Model: TCH2021205
DC Input: 5VDC, 3A
CLASS 1 LASER PRODUCT
Designed and Assembled in USA ~PATENT PENDING~

Rechargeable Battery

Speaker

Reset Button

Tripod Mount
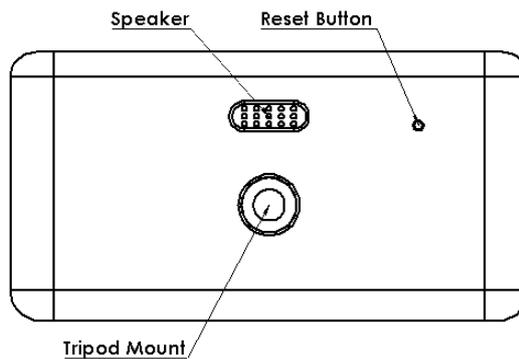
Back View

Bottom-up View

SPECIFICATIONS

Main Uses	Cleanroom certification. Air quality and filter monitoring in household, office, industrial and healthcare environments
Particle Size Range	0.2μm (50%) to 10μm, continuous
Channels	Unlimited number of channels. Capture size information for each particle with 10nm resolution
Supported Standards	ISO 21501-4 (Instrument), US FED STD 209E and ISO 14644-1 (Cleanroom Classification)
Sensor	High sensitivity, ultra-low noise and fully compensated
Flow	0.1cfm with internal flow meter (1% FS) and active flow control
Light Source	High power, >10,000hr laser diode with active control. Full temperature compensation and stabilization
Pressure	115kPa max, 1Pa noise-free resolution
Humidity	5% to 95%, +-2%
Temperature	0-50C, +-0.1C Internal and external (203) sensors
Display	3.5" Color LCD
Operating Method	Touchscreen and single button
Battery	User replaceable Li-Ion, 5 hr continuous counting, 10hr intermittent counting. Size 18650
Storage	External SD Card
Connection	USB, SD Card
Dimensions	82mm(W)x137mm(H)x42mm(D)
Weight	830gr (w/o accessories)

Chapter 2: Unpacking

Carefully unpack Teilch Handheld Particle Analyzer from its case and verify that all the items shown in the photos below and listed in the following tables are present. It is recommended to unpack the particle counter within a cleanroom-type environment. Doing so will minimize the counter's exposure to dirt and moisture.

BOX CONTENT

Find below an inventory of the different components of the case . Contact us immediately if any items are missing or broken.

- TCH Pro 202 Handheld Particle Analyzer
- Power Supply
- Isokinetic Probe
- Barbed Probe
- Inlet Filter
- Hand Strap (for 203 model only)
- External Sensor (for 203 model only)
- SD Memory Card (2GB) - Installed
- USB Cable
- USB Flash Drive (Software, documentation, and Operation Manual)
- Inlet Caps (x2)
- Case Protector
- Carrying Case
- Inlet O-ring Seal Replacements (x4)
- Calibration Certificate and Quick Start Guide

Customer support in the US:

265 Cambridge Ave, #60250
Palo Alto, CA 94306, USA
Ph. (+1) 650 319 3018
Website: www.teilch.com

Customer support in Asia:

7B Mountain Drive, Light Industry & Science Park II
Calamba City, Laguna 4027, Philippines
Ph. (+63) 49 545 6957
Email: info@teilch.com

Chapter 3: Theory of Operation

A clean, contamination-free work environment is critical to maximize yields as certain particles are likely to cause defects, irregularities, inaccuracies and even failures. Analyzing particle contaminants is an important step in having control over operating environments and reducing particle deposition in critical components.

Isolating, characterizing and understanding the types of particles found in products or processes can usually yield a likely source for the particles. Once the source is known then elimination of the particulate contamination becomes substantially easier.

II. PARTICLE DETECTION

PARTICLE COUNTING PRINCIPLE

A particle counter is an instrument that detects and counts particles. A particle counter works on the principle of either light scattering, light blocking, or condensation for detecting and measuring particle size or size distribution.
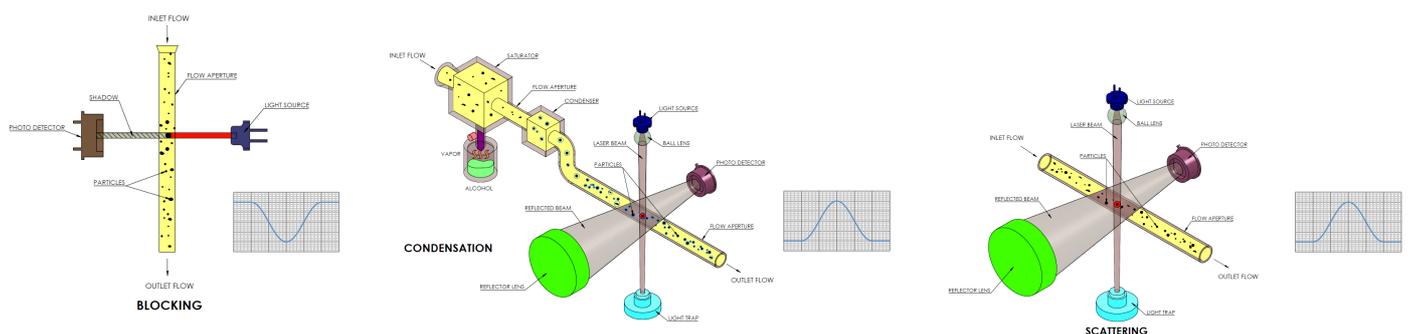

When a particle is illuminated by a light beam, light is reemitted (if light scattering is used) or absorbed (obstruction). The scattered or absorbed light (depending on method used) is detected by a photo detector, measured, and the particle is counted and tabulated into standardized counting bins. If direct imaging is used, light illuminates particles from the back

within a cell while a high definition, high magnification camera records passing particles. Recorded video is then analyzed by computer software to measure particle attributes.

Notes:

- The **light blocking optical particle counter method** is typically useful for detecting and sizing particles greater than 1 micrometer in size. This type of technique allows high resolution and reliable measurement.

- The **light scattering method** is capable of detecting smaller sizing particles. Typical detection sensitivity of the light scattering method ranges between 0.1μm to 25μm. Scattered light is significantly smaller for small particle sizes. A 0.2μm particle emits $1*10^{-10}$ of the intensity emitted by a 10μm particle.
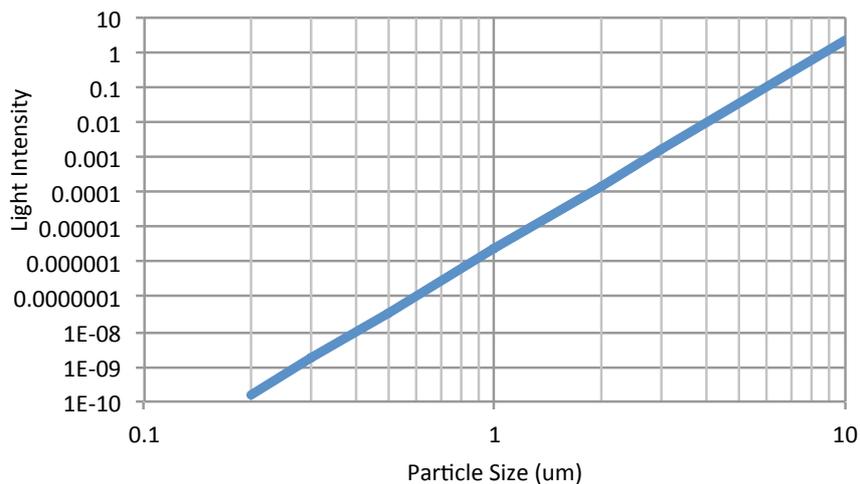
- The **condensation method** is used to detect particles over 5nm, but it cannot differentiate among different particle sizes.

ANATOMY OF A PARTICLE COUNTER'S SENSOR

A particle counter is made up of the following components:

- Light Source (bright laser light)

- Reflector

- Light Sensor

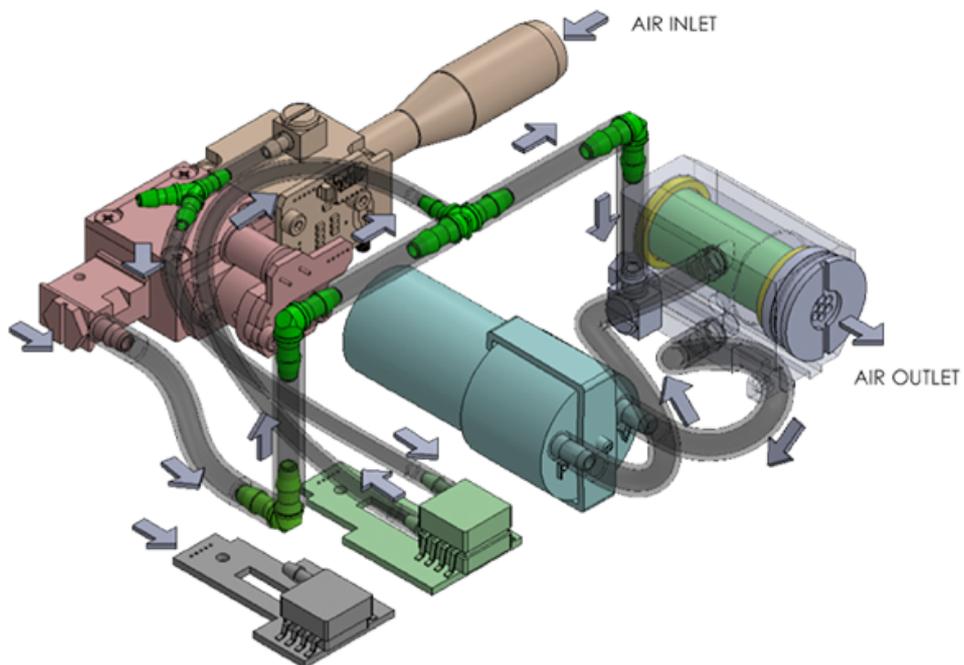- Electronic Signal Processing Circuit

- Pump

- Flow Sensor

- Filter

Diagram: Anatomy of a particle counter

III. CALIBRATION

PROCESS

Flow calibration is performed with a low back pressure - displaced volume - calibration-grade flow meter. Particle size calibration is performed in four stages with NIST-traceable mono-size polystyrene spheres.

- Stage 1, wet aerosol. Particles smaller than 2μm are diluted in UDI water and atomized. The mist containing particles is dried, static charges are neutralized and the dry aerosol is sampled by the Particle Analyzer.
- Stage 2, dry particles. Particles between 2μm and 10μm are stored dry and fed directly into the Particle Analyzer.
- Stage 3, peak location determination and loading of calibration values.
- Stage 4, reference comparison. Calibrated device results are compared against a reference unit to determine counting efficiency.

The APA Pro 202 and 203 are calibrated with 7 different traceable particle sizes:
- Liquid solution (atomized and dried): 0.2μm, 0.3μm, 0.5μm, 1.0μm and 2.0μm
- Dry: 3.0μm and 10.0μm

CALIBRATION OUTPUTS

- Traditional Pulse Height Analyzer (PHA). Noise level increases significantly for smaller particle sizes.
- Picture is for 1µm mono-disperse aerosol with device's embedded PHA.
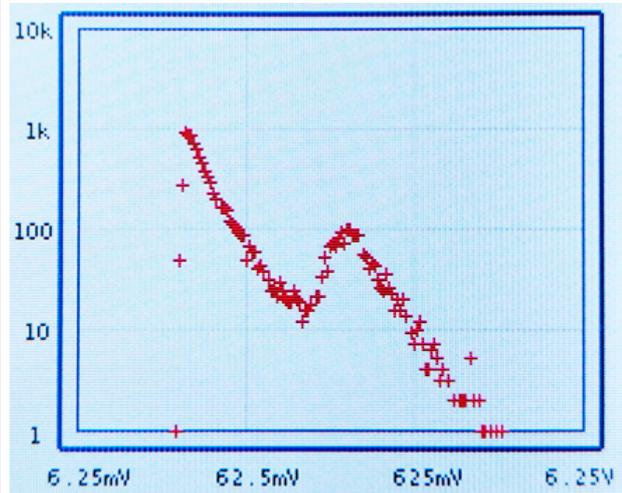
- 0.3µm mono-disperse aerosol with analog hardware particle detection noise filtering.
- **Graph caption**: Median peak distribution of mono-sized NIST-traceable PSL spheres is utilized as threshold for each calibrated particle size. Right of the mean (red area) is included in the total count for that specific particle size.
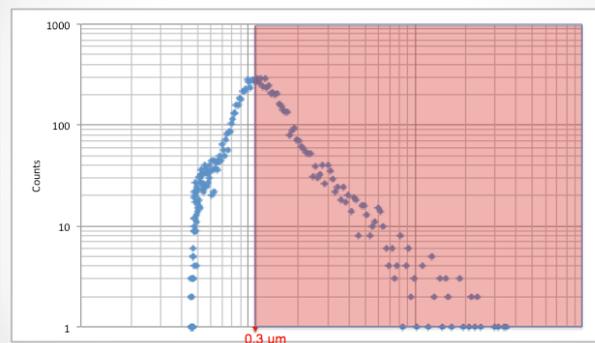
- 0.5µm mono-disperse aerosol with analog hardware noise filtering.
- **Graph caption**: Median peak distribution of mono-sized NIST-traceable PSL spheres is utilized as threshold for each calibrated particle size. Right of the mean (red area) is included in the total count for that specific particle size.
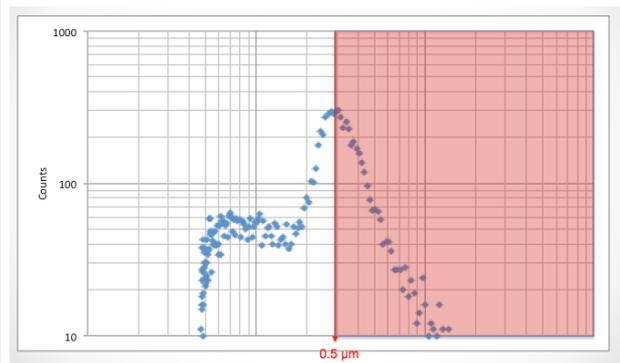
- As noise does not saturate the sensor due to the particle detection filter, mono-disperse aerosols may be combined to execute a single-sample calibration.
- **Graph caption**: Median peak distribution of 5 mono-sized NIST-traceable PSL spheres is utilized as threshold for each calibrated particle size. The image shows peaks for 0.2µm, 0.3µm, 0.5µm, 1µm and 2.0µm. Right of the mean (shaded areas) are included in the total count for each specific particle size.
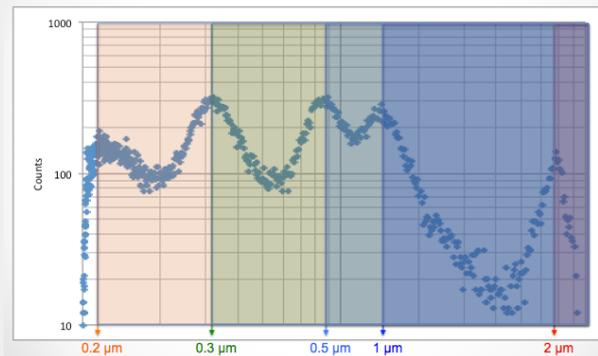
SAMPLE CALIBRATION CERTIFICATE

Calibration Cert. No. 8888888

Certificate of Calibration and Compliance

Product Name:	*Airborne Particle Analyzer*
Model:	*TCH PRO 2021205*
Serial No.	*8888888888*
Seal No.	*888888*
Calibration Date	March *2nd, 2017*
Temperature & Humidity	*22.5 C / 45.3%*
Atmospheric Pressure	*101.0kPa*

Teilch LLC certifies that the instrument listed above meets or exceeds manufacturing specifications. It has been calibrated using equipment and standards whose accuracies are traceable to the National Institute of Standards and Technology (NIST).

Item	Standard	Comments	Result
Sampling Flow Rate	Vol. flow rate ±5%	0.10056CFM	Pass
Counting Efficiency	50% ±20% 100% ±10% for 1.5x	50.5% - 0.2µm [1] 103% - 0.3µm	Pass
Size Resolution	≤15%	2.5%	Pass
Zero Count	≤1 count / 5 minutes	0 counts [2]	Pass
Sampling Time	100% ±1%	100% ±0.005% [3]	Pass
Response Rate	≤0.5%	0.12% [4]	Pass

1. Measured for smallest detectable size
2. Tested in U15-Class HEPA filtered environment for ≥ 0.3µm
3. Not tested; guaranteed by design
4. 100k counts to 0 counts

References
Flow: Mesa Labs Defender 520, Cal. 06/26/2015
NIST Traceable Polymer Microspheres:
- 0.203µm ±0.005µm. Lot #88888. Duke Standards ™
- 0.296µm ±0.006µm. Lot #88888. Duke Standards ™
- 0.498µm ±0.009µm. Lot #88888. Duke Standards ™
- 0.994µm ±0.015µm. Lot #88888. Duke Standards ™
- 2.020µm ±0.015µm. Lot #88888. Duke Standards ™
- 3.000µm ±0.020µm. Lot #88888. Dry Duke Standards ™
- 10.20µm ±0.100µm. Lot #88888. Dry Duke Standards ™

Unit has been tested and calibrated as per Teilch's standard procedure and complies with ISO 21501-4.

Prepared: Approved:
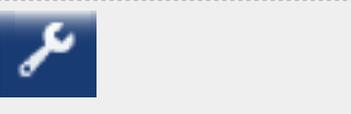
Chapter 4: Operation

This chapter describes how to use TCH PRO.
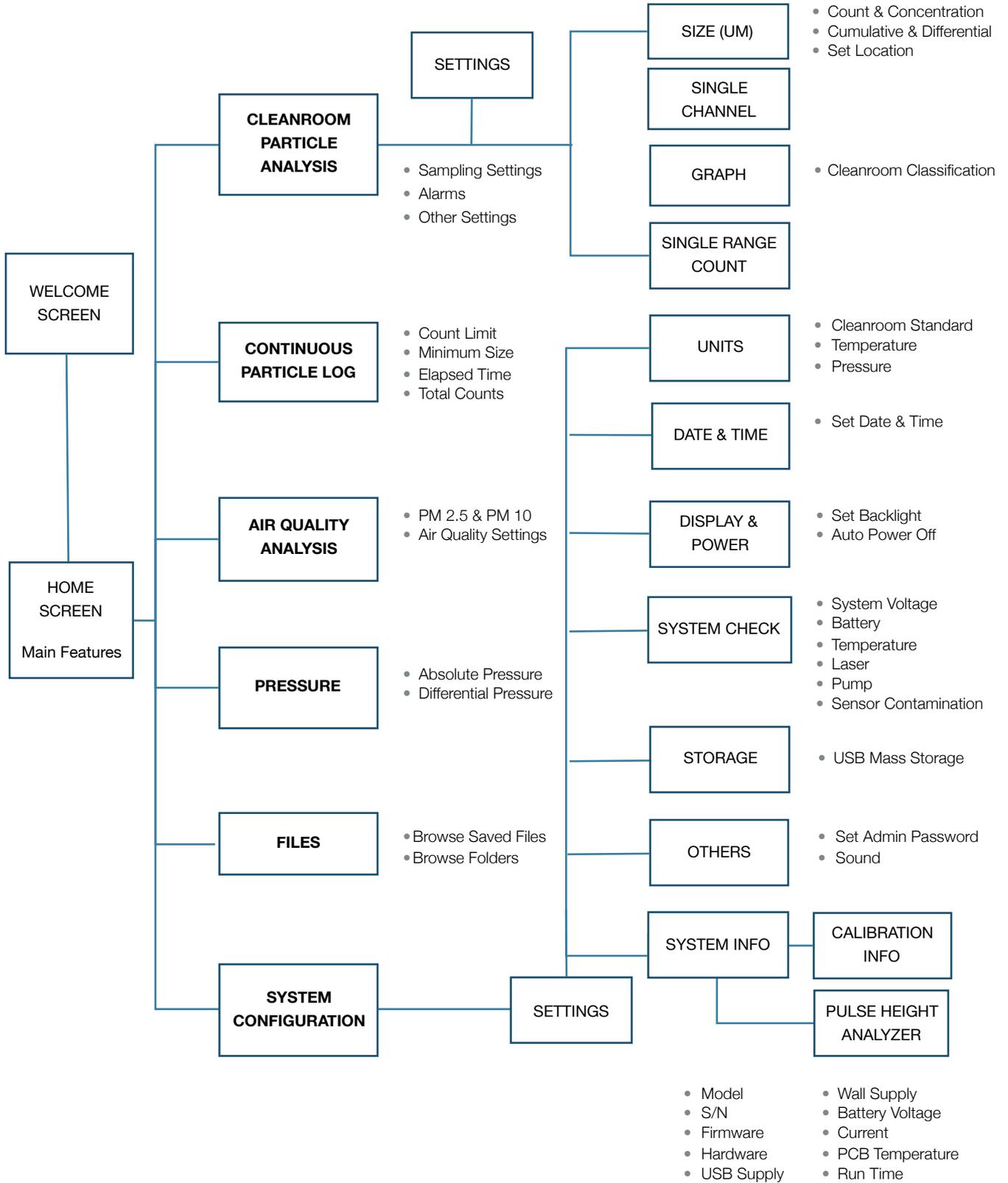
I. GETTING STARTED

The device is ready to use out of the box. Battery may be charged to half capacity. To start using the instrument, proceed as follows:

1. Make sure you are using the isokinetic inlet (installed by default) when sampling.
2. Position the instrument in the environment to be measured.
3. Remove the red protective cap from the inlet.
4. Turn the device **ON** by pressing the Power button and holding it for 3 seconds.
5. After pressing the power key, a **SPLASH** screen will appear for three seconds, displaying model number, serial number, and firmware version number. The Start screen then displays on the LCD.
6. When the **MENU** screen appears, the instrument is ready for use. Select mode and follow on-screen instructions.
7. Press Count button to start sampling at any particle analysis screen

II. SCREEN SYMBOLS

SYMBOLS	MEANING
	SD inserted
	SD busy. Do not remove
	Data saved to SD
	Data not saved (SD not present or full)
	Save
	Secure the device by locking the screen. To unlock, use the default password 1234. To reset the password, press the reset button
	Settings
	Navigation
	Red Dot: Coincidence Loss Error

III. MENU MAP

- **CLEANROOM PARTICLE ANALYSIS**
  - SETTINGS
    - Sampling Settings
    - Alarms
    - Other Settings
  - SIZE (UM)
    - Count & Concentration
    - Cumulative & Differential
    - Set Location
  - SINGLE CHANNEL
  - GRAPH
    - Cleanroom Classification
  - SINGLE RANGE COUNT

- **CONTINUOUS PARTICLE LOG**
  - Count Limit
  - Minimum Size
  - Elapsed Time
  - Total Counts

- **AIR QUALITY ANALYSIS**
  - PM 2.5 & PM 10
  - Air Quality Settings

- **PRESSURE**
  - Absolute Pressure
  - Differential Pressure

- **FILES**
  - Browse Saved Files
  - Browse Folders

- **SYSTEM CONFIGURATION**
  - SETTINGS
    - UNITS
      - Cleanroom Standard
      - Temperature
      - Pressure
    - DATE & TIME
      - Set Date & Time
    - DISPLAY & POWER
      - Set Backlight
      - Auto Power Off
    - SYSTEM CHECK
      - System Voltage
      - Battery
      - Temperature
      - Laser
      - Pump
      - Sensor Contamination
    - STORAGE
      - USB Mass Storage
    - OTHERS
      - Set Admin Password
      - Sound
    - SYSTEM INFO
      - CALIBRATION INFO
      - PULSE HEIGHT ANALYZER
      - Model, S/N, Firmware, Hardware, USB Supply
      - Wall Supply, Battery Voltage, Current, PCB Temperature, Run Time

WELCOME SCREEN — HOME SCREEN — Main Features

IV. FUNCTIONALITIES

Different MENU options and functionalities of the instrument:

1. **Cleanroom Particle Analysis: Cleanroom certification and monitoring**

2. **Continuous Particle Log: Save full particle log data into SD Card**

3. **Air Quality Analysis: Particulate Matter**

4. **Pressure: Differential Pressure Sampling**

1. Cleanroom Particle Analysis

Purpose: To monitor particles in a cleanroom via handheld single measurement or fixed multiple samples. Cleanroom particle monitoring can be performed in the following ways, offering a wide range of insights:

MENU	SCREEN
COUNT To count particles with 8 sized channels. Upon completing a measurement sample with a particle counter, the unit can display the count values as different readings: • Counts or Concentration • Absolute (Σ) or Differential (Δ) • Loc: Set 99 different locations **Time**: Time elapsed since the start of sampling **Samp#**: Sample x out of y total samples (x/y) **S/H**: Sample time / Hold time between samples **T**: Ambient Temperature **RH**: Relative Humidity in % **P**: Ambient Pressure	

SINGLE CHANNEL COUNT

To count a pre-defined particle size. In order to use it, enter which particle size you would like to count and press the count button below the screen.

"Sound On/Off" to activate or deactivate a beep sound for each particle counted.

Note: single channel count is always cumulative total counts.
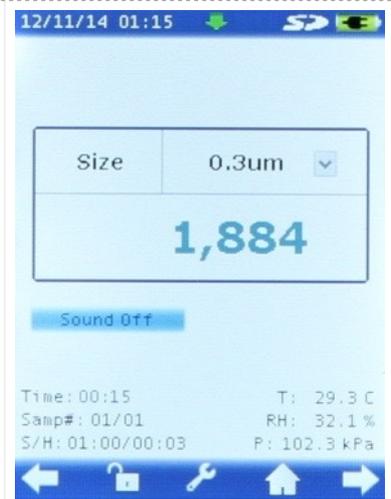
CLEANROOM ANALYSIS

Plot your count in real time and compare it to the ISO 14644-1 or FED STD 209E cleanroom standards. To begin your sampling, choose your cleanroom classification and start counting by pressing the count button below the screen.

- **Straight red line**: Cleanroom standard chosen;
- **Pink line**: Your actual count. If you are over the red line, the environment is not compliant with the selected cleanroom standard.
- **Class**: Cleanroom standards.
- **Size**: Six particle sizes displayed by default.
- **Count/volume (ft3 or m3)**
- **Allowed/volume (ft3 or m3)**: Maximum particle concentration as per cleanroom standard.
- **%**: Concentration of sample versus cleanroom standard.
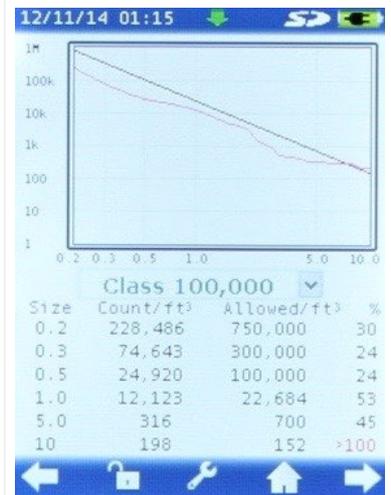
SIZE RANGE COUNT

Count particles that are only within the range of a particle size with a 10 nanometer resolution.

Frame the particle size window you are interested in counting by entering a minimum and maximum size. Press the count button to begin the count.
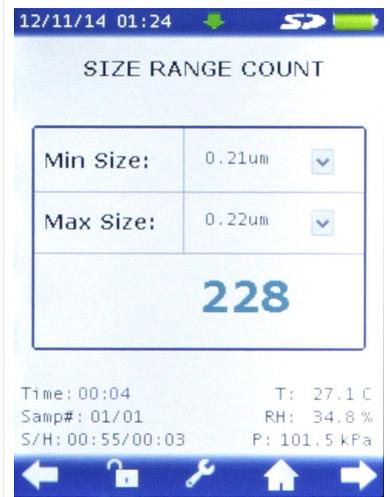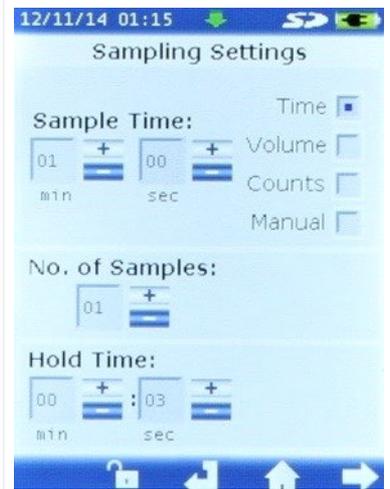
CLEANROOM PARTICLE ANALYSIS > SETTINGS

Personalize the sampling process by choosing the individual settings of Time, Volume, and Counts or Manual. Set number of Samples and Hold Time.

- **Hold Time**: Time delay between samples
- **Number of Samples**: Desired number of samples or test
- **Time**: Sampling based on elapsed time
- **Volume**: Sampling based on accumulated sample volume
- **Counts**: Sampling based on number of counts of the smallest channel
- **Manual**: Continuous sampling

Note: When setting hold time >30 secs, it is normal that pump and laser turn itself off

CLEANROOM PARTICLE ANALYSIS > ALARMS

Set up independent alarms for absolute counts and maximum concentration.
- **Size**: Select your particle size or leave it on disabled.
- **Counts Alarm**: Set particle size and maximum allowed total particle number.
- **Concentration Alarm**: Set particle size and maximum allowed particle concentration.

CLEANROOM PARTICLE ANALYSIS > OTHER SETTINGS

Set up storage settings.
- **Auto**: Automatically saves data.
- **Manual**: Device will ask after sample set/count routine if user wants to save data.
- **Save Displayed Data**: Save a summary of 8 common channels displayed in first screen of particle analysis.
- **Save Full Data**: Save data for sixty particle size bins. Bins are organized in logarithmic type array.
  - Between 0.2μm and 1μm, particle sizes are grouped in 20nm size bins.
  - Between 1μm and 3μm, particle sizes are grouped in 250nm size bins.
  - Between 3μm and 7μm, particle sizes are grouped in 0.5μm size bins.
  - Between 7μm and 10μm, particle sizes are grouped in 1μm size bins.
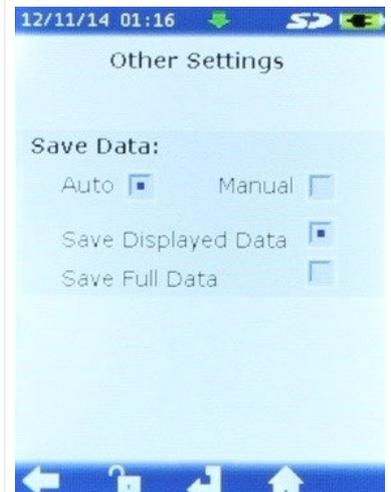
2. Continuous Particle Log

**Purpose**: To log particle counts with 10nm resolution for up to 20,000 particles.

MENU	SCREEN

CONTINUOUS PARTICLE LOG

Perform a detailed analysis of a particle size.

- **Count Limit**: Count up to x number of particles.
- **Minimum Size**: Minimum particle size to be saved in report. To maximize targeted particle size collection, select the largest possible Minimum Size.
- **Elapsed Time**: Period of time during which the sampling occurs. Note that the Elapsed Time is not adjustable by user. Unit will count up to the Count Limit, regardless of Elapsed Time.
- **Total Counts**: Total cumulative counts during sampling.
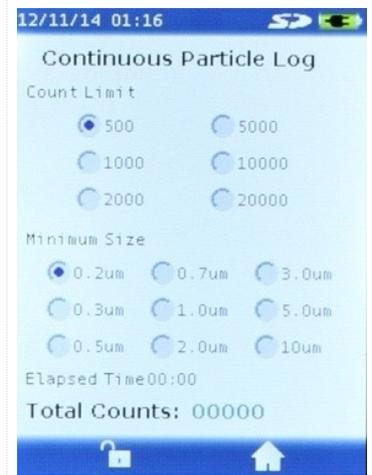
3. Air Quality Analysis

Purpose: To monitor particulate matter as per EPA standards.
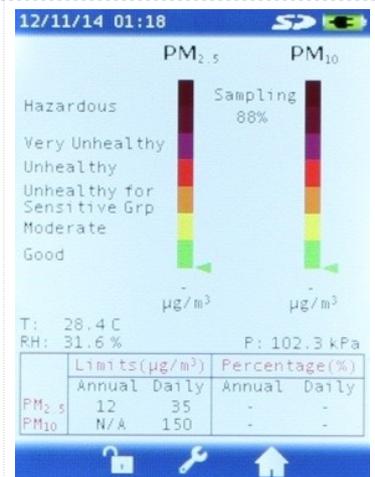
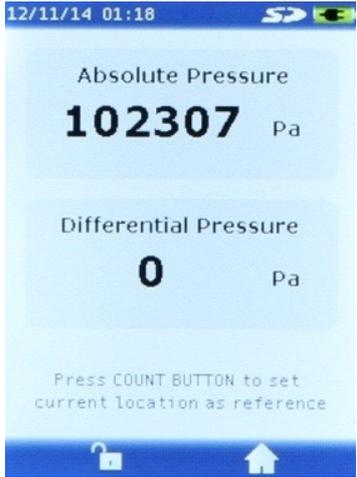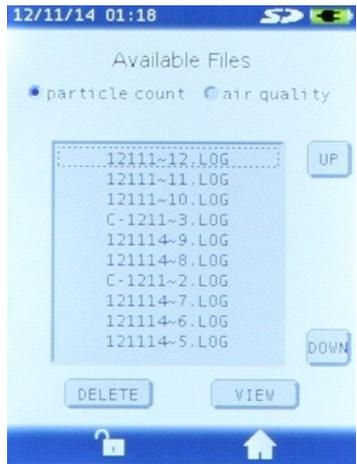| MENU	SCREEN
AIR QUALITY ANALYSIS Start sampling by pressing the count button. A countdown will appear when the sampling begins and ends when it reaches 100%. - An Air Quality Index for PM2.5 and PM10 - **Limits (µg/m3)**: The annual and daily limits of PM2.5 and PM10 per cubic meter set by the Environmental Protection Agency (EPA). - **Percentage %**: Concentration of sample versus EPA standard. **Important**: In <u>Settings</u>, user may set particle density for the environment under sampling. By default, the particle density is set at **1.225gr/cm3**.	

4. Pressure

Purpose: Monitor air pressure in different controlled environments to determine airflow direction.

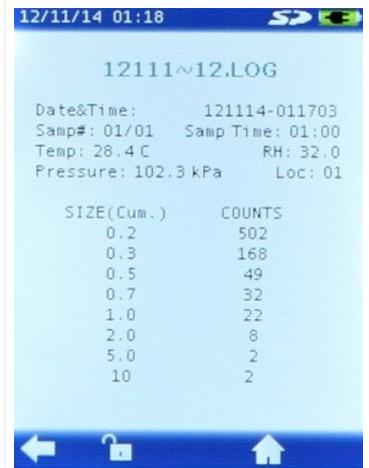| MENU	SCREEN
PRESSURE Press the COUNT button to set the differential pressure to zero and move the device around to obtain the differential pressure relative to initial location. **Accuracy tips:** 1. Take all samples at the same altitude (no height differential with respect to initial location). 2. Take all samples in the shortest possible time to avoid weather-related pressure variations.	12/11/14 01:18 Absolute Pressure **102307** Pa Differential Pressure **0** Pa Press COUNT BUTTON to set current location as reference

5. Files

Purpose: Navigate through saved reports.

MENU	SCREEN
BROWSE FILES AND FOLDER Use UP and DOWN buttons to navigate through the reports. Reports are grouped in "particle count" and "air quality".	12/11/14 01:18 Available Files ● particle count ○ air quality 12111~12.LOG UP 12111~11.LOG 12111~10.LOG C-1211~3.LOG 121114~9.LOG 121114~8.LOG C-1211~2.LOG 121114~7.LOG 121114~6.LOG 121114~5.LOG DOWN DELETE VIEW

VIEW A FILE
This screen displays saved reports.

6. System Configuration

Purpose: Adjust system settings.

MENU	SCREEN
SETTINGS The System Configuration Menu Screen	
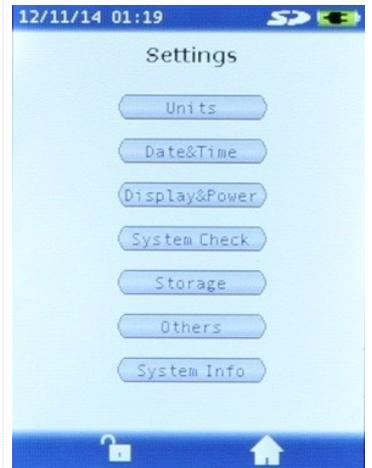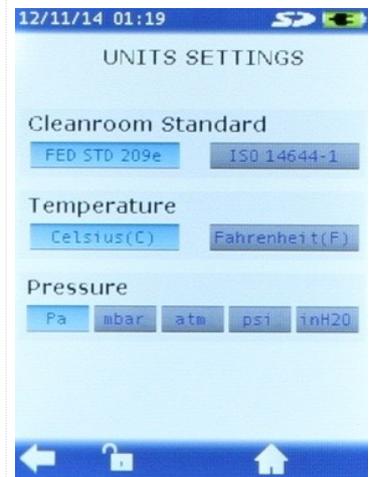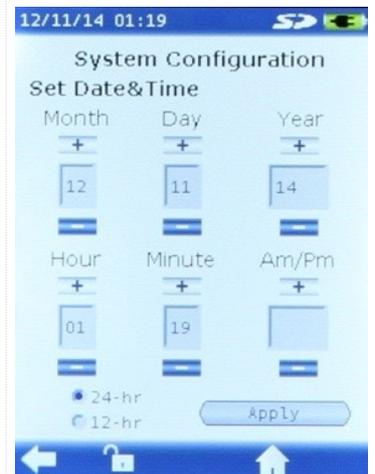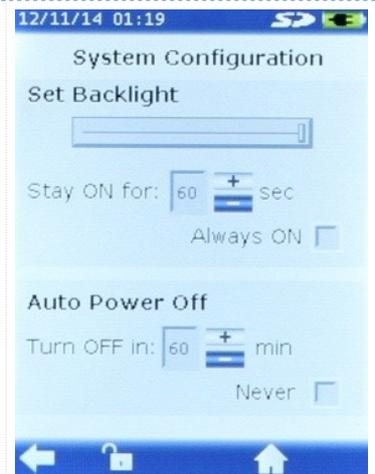
SYSTEM CHECK

If inconsistent results are observed or malfunction is suspected, plug to the power supply and run system test. If any item status displays "FAIL", contact Teilch Customer Support at info@teilch.com.
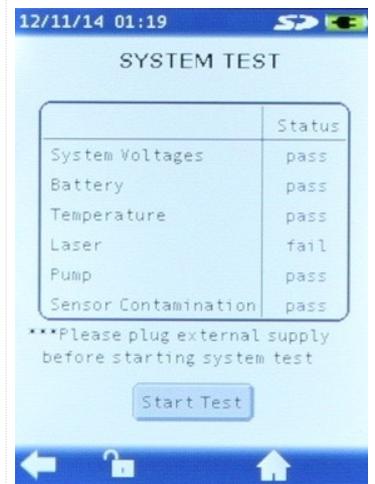
STORAGE

By default, USB Mass Storage is disabled. This enables use of the unit while charging via USB Computer Port. For accessing SD card via USB, USB Mass Storage must be enabled.

OTHER SETTINGS
- **Admin Password**: Password used to lock settings to prevent accidental changes by user. Default password is 1234.
- **Sound**: Activate or mute beeps during Power On and sampling. This setting does not apply to alarms.

SYSTEM INFO

Find detailed information about TCH PRO 202 and its operating system.

Diagnostics: Password-protected area used for calibration purposes by Teilch service center only. Users may request password to perform custom or in-house calibration. However, this will void warranty and calibration certificate.

```
12/11/14 01:20              SD
                SETTINGS
System Info
Model:               TCH Pro 202
S/N:                   313219009
Firmware:                   v1.1
Hardware:                    1.3
USB Supply                    ✕
Wall Supply                   ✓
Battery Voltage:            4.1
Current:                0308 mA
PCB Temp:                 32.5C

Calibration:            1510281
Date Calibrated     10/28/2015
Date Due            10/28/2016
DIAGNOSTICS           [      ]
```
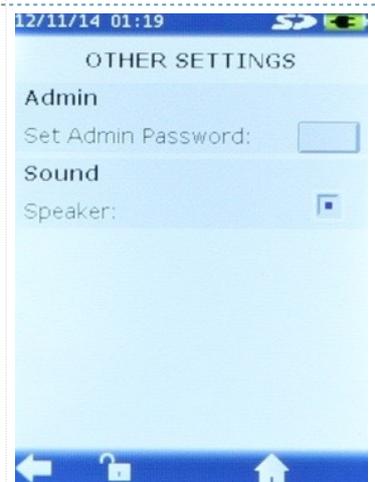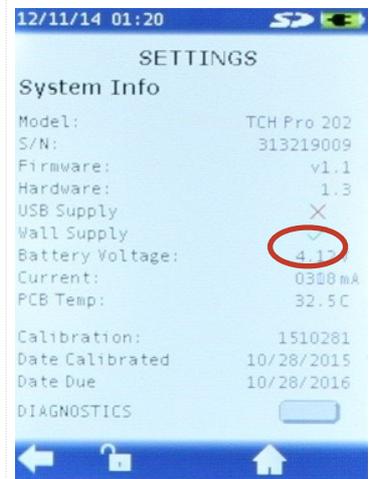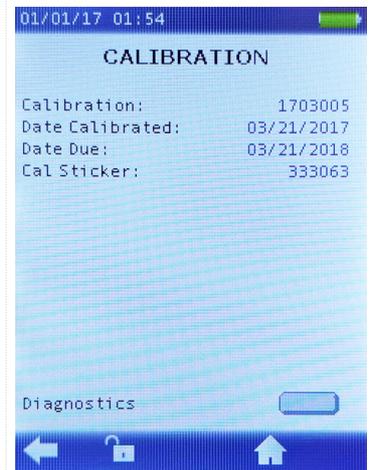
CALIBRATION INFO

- Calibration: Certificate number
- Calibration date
- Calibration due date
- Cal Sticker: Unique number of seal sticker (inside battery compartment)

```
01/01/17 01:54
              CALIBRATION

Calibration:             1703005
Date Calibrated:      03/21/2017
Date Due:             03/21/2018
Cal Sticker:              333063




Diagnostics              [      ]
```

PULSE HEIGHT ANALYZER

Used for verifying sensor output in mono-dispersed particle aerosols. The screen displays the actual output of the particle sensor in millivolts versus Pulse Height Count.

```
12/11/14 21:49
    PULSE HEIGHT ANALYZER
10k
1k
100
10
1
   6.25mV  62.5mV  625mV  6.25V
        [Start/Stop Count]
Total Counts:        10000
Count Limit:         10000
```
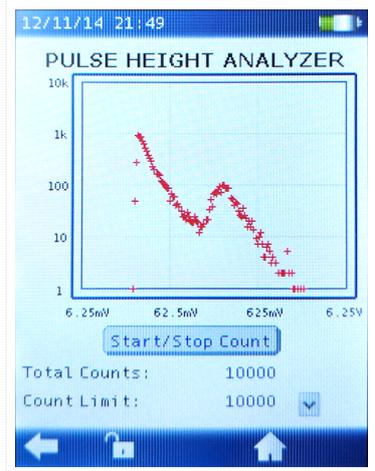
V. DATA MANAGEMENT

- All data is saved by default on the provided SD card.

- To download the data:

    1. Enable mass storage in settings and connect the device to a computer with the USB cord or;

    2. Remove the SD card from the device and directly insert it into your computer.

VI. REMOTE OPERATION

*** Software and firmware updates required for remote operation to be released in spring, 2017 ***

Device may be controlled directly via computer for operation and data analysis.

Please download **Teilch Lab Software** from www.teilch.com/support.

Requirements

- Bootloader 2.0

- Firmware 2.0 or superior

Refer to **Chapter 5, Section II** for software updates.

Chapter 4: Troubleshooting

If you have a problem with your unit, please check the following list for solutions.

Symptom	Possible Causes	Solutions
Unit does not turn on and nothing happens when plugged into wall.	Battery fully discharged.	1) Leave it plugged until charging light turns red (start of normal charging cycle). **Note**: to protect a deeply discharged battery, charging current is limited and normal charging cycle will not start immediately. 2) Replace charger.
Pump not running or making irregular noises.	Large object (>100um) or water droplets may have entered the device.	Make sure that operating and storage ambients are non-condensing and no large particles are in the proximity of isokinetic probe.
Screen not responding.	1) Unit is Sampling or on-hold; 2) Need calibration.	1) Cancel sampling by pressing Count button. **Note**: Touchscreen is disabled during sampling, even during hold time. 2) Follow touchscreen calibration procedure.
Large Temperature and RH offset.		1) Use external sensor (TCH PRO 203 only). **Note**: for APC PRO 202, the displayed temperature is the flow temperature. Offset is reduced when the pump is running (active flow).
Forgotten Admin password.		Press the reset button. Password will be reset to 1234.
Battery drains too fast.		Replace batteries (2-18650 Lithium-ion).
Particle concentration/count is high or low.		Run System check to look for possible system failure.
Reading displays >9,999,999.	Counts/ concentration exceeds the display range.	
Cannot transfer data to computer.	1) Loose/damaged usb cable; 2) Mass storage setting not enabled.	1) Replace cables. 2) Follow steps in enabling mass storage.
Red patch/circle blinking.	Coincidence loss above limit.	Contact Teilch Customer Support.
Temperature/ humidity or pressure displays "N/A".		Contact Teilch Customer Support.

Symptom	Possible Causes	Solutions
System test parameter fails.		Contact Teilch Customer Support.
Counts/Concentration doesn't increase or change when counting.	1) Incorrect firmware loaded. 2) Component Failure.	Contact Teilch Customer Support.

If the problem cannot be solved by confirming the above, please contact your local distributor or our customer support center.

Chapter 5: Maintenance

There are no user-serviceable parts inside the TCH Pro Models. Teilch recommends contacting customer service if maintenance or servicing is required.

I. RECOMMENDED MAINTENANCE SCHEDULE

Annual factory cleaning and calibration is recommended for TCH Pro Models to ensure accuracy and longevity of the instrument. Below is a recommended maintenance schedule for the instrument.

1.   Zero count check – Monthly. Included inlet filter has a HEPA filtration media. For proper test, utilize a 0.1µm or ULPA filters.

2.   Factory calibration – Annually

3.   External cleaning – As needed

II. TCH PRO FIRMWARE UPGRADE

1. Download and uncompress the latest firmware for your unit from http://www.teilch.com/support/.

2. Press and hold Power button.

3. Press Reset button with a paper clip. For button location, see Page 6 of this manual.

4. Release Power Button. You should now see the Firmware Upgrade Screen. If you do not see this screen, press Power and Reset buttons simultaneously again.

5. Connect Particle Analyzer to PC with USB cable.

6. Open Windows Firmware Update Tool and follow on-screen instructions.

7. Power button is disabled in upgrade mode. To restart the unit without upgrading, press Reset button.

III. TOUCHSCREEN CALIBRATION

1. Turn off the unit.

2. Press the Power Button, Count Button and screen simultaneously.

3. Teilch touch calibration welcome screen will appear.

4. Follow on-screen instructions.

Chapter 6: Warranty

WARRANTY

TEILCH LLC warrants to the original user that this instrument shall be free from defects in material and workmanship for one year from the date of shipment. Teilch's obligations under this warranty, and the sole remedy for its breach, are limited to repair or, at Teilch's sole discretion, replacement of the instrument or any of its parts.

Should it become necessary to return the instrument for repair during or beyond the warranty period, user shall contact Teilch LLC (USA). E-mail: info@teilch.com. User is responsible for shipping charges, freight, insurance and proper packaging to prevent damage in transit.

This warranty shall be void in the event of user actions including misuse, improper wiring, operation outside of specifications, improper maintenance or repair, unauthorized modification, or any other defect caused by the user's neglect or accident.

This warranty is the sole and exclusive warranty for this instrument, and no other warranty, whether written or oral, is expressed or implied. Teilch specifically disclaims any implied warranties of merchantability or fitness for a specific purpose and will not be liable for any direct, indirect, incidental, consequential, or punitive damages. Teilch's total liability is limited to repair or replacement of the product.

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