



# **Spectradyne nCS1<sup>TM</sup>**

## **Quick Start Guide**

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## Purpose of the Quick Start Guide

The purpose of this guide is to get the user quickly familiarized with the instrument operation and data acquisition. For more detailed information on software features and in-depth data analysis, refer to the **Operation Manual**.

## The nCS1 Instrument: Overview & Specifications

The nCS1 is a powerful tool for obtaining detailed size and concentration information about particle distributions in liquids. The core technology utilized in the nCS1 is called Resistive Pulse Sensing (RPS). A clean disposable cartridge targets a specific size range of particles for each analysis, eliminating concerns of contamination between samples.

### Specifications



**Figure 1.** The nCS1 instrument and analysis cartridges.

- Dimensions: 12" x 12" x 15" (30.5cm x 30.5cm x 38.1cm)
- Weight: 30 lbs (13.6 kg)
- Power: North America: 110V, 5A, 60 Hz;  
Europe: 230V, 16 A, 50 Hz
- Nitrogen or CDA: 15 to 30 psi regulated supply
- Min. analyte volume: 3  $\mu$ l
- Min. ionic strength of analyte: 1-10 mM
- Size Range: 50 nm – 10  $\mu$ m (Refer to cartridge coverage on page 12)
- Concentration range:  $1 \times 10^4$  –  $5 \times 10^{11}$  particles per ml, cartridge dependent
- Running buffer: PBS buffer + 1% polysorbate 20 filtered to 0.2  $\mu$ m

A computer is required to interface with the nCS1 through a standard USB link.



# Running the nCS1

## Workflow Process

A typical process flow for a measurement run is as follows:

1. **Startup instrument and software**
2. **Prime the instrument**
3. **Load the sample**
4. **Acquire data**
5. **End the measurement run**
6. **Shut down the instrument**

### 1. Startup Instrument and Software

- Make sure the instrument is connected to a source of clean inert gas (e.g., filtered nitrogen or air) with input pressures 15-30 PSI.
- Load the running buffer:
  - ❖ Add approximately 50 mL of running buffer to each of the two bottles labeled "Buffer" on the right side of the instrument.
  - ❖ **NOTE: Ensure all outer bottle caps and fittings are tight.**
- Turn ON the instrument with the switch located on the rear panel. The power indicator light (green) on the front of the instrument should be illuminated.
- Run the "nCS1" software on the computer.
  - ❖ Make sure the cartridge calibration file is up-to-date, please contact [support@spectradynllc.com](mailto:support@spectradynllc.com) for the latest version.
- **NOTE: The instrument should be turned on before running the nCS1 software. If the instrument is powered off, the software will need to be restarted before next use.**

### 2. Prime the Instrument

This sequence should be performed to prepare the instrument for running the first cartridge on startup.

- Load the **cleaning cartridge** into the instrument following the correct cartridge loading procedure on page 6.
- In the nCS1 control software, click on the "Instrument Prime" button (Utilities, Figure 2) and follow the prompts from the software.
  - ❖ Lower the stage
  - ❖ Remove the reusable cleaning cartridge and store it in a safe place.

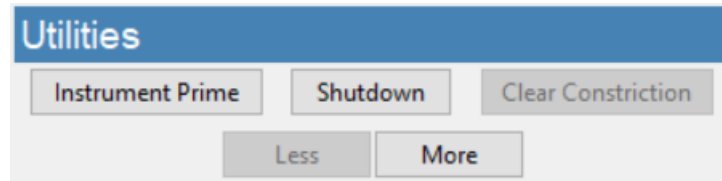


Figure 2. Utilities frame

### 3. Load the Sample

#### Prepare the sample

Prepare the sample according to specifications and cartridge coverage, refer to cartridge coverage map on page 12.

For further details on method development, refer to the Operation Manual or contact Spectradyne's support team at [support@spectradynellc.com](mailto:support@spectradynellc.com).

#### Load the analyte into the cartridge

A video demonstrating cartridge loading is available on Spectradyne's website: [www.nanoparticleanalyzer.com](http://www.nanoparticleanalyzer.com).

- Pipette 3-5 microliters of the sample to be measured into the analyte reservoir on the analysis cartridge (Figure 3).
- **IMPORTANT:**
  - ❖ Ensure that any air bubbles in the sample are acceptably positioned in the reservoir (see Figure 3).
  - ❖ Gently tap the cartridge on a flat surface to shift/remove any bubbles if necessary.

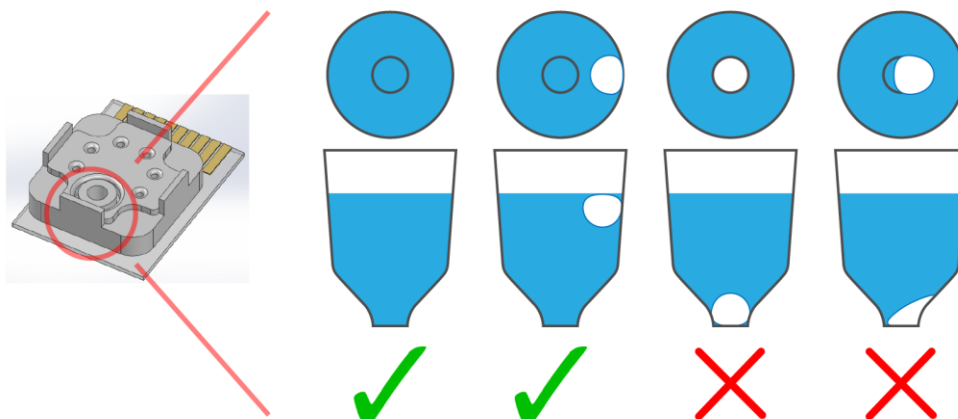
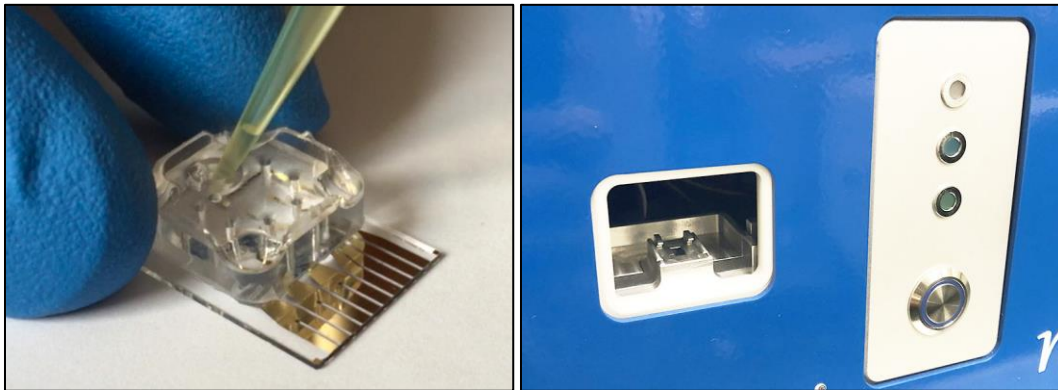


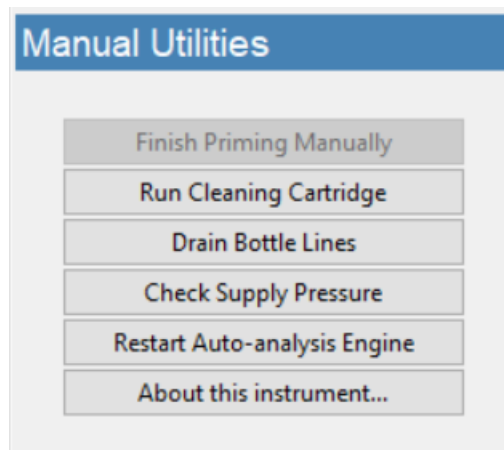
Figure 3. Any air bubbles in the analyte must not occlude the bottom of the reservoir.



**Figure 4.** Left: The sample pipetted into the analysis cartridge. Right: The front panel of the Spectradyn nCS1: On the left side is the cartridge insertion socket (Hardware Version 1), and on the right are the cartridge engage button and indicator lights.

### Load the cartridge into the nCS1

- Determine your hardware version, click on the “More” button in the nCS1 control software (Utilities frame, Figure 2).
  - ❖ Click on “About this instrument...” under Manual Utilities frame, see Figure 5.
- Load the cartridge into the socket in the front of the nCS1 following the specific hardware version instructions below.



**Figure 5.** Manual Utilities frame

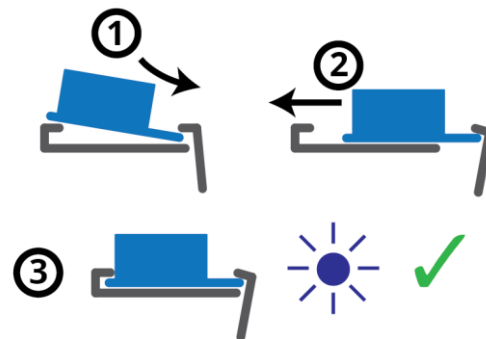


Hardware Version 1 or higher:

- **IMPORTANT:**
  - ❖ The cartridge must sit flat on the bottom of the holder. Refer to Figure 6.

Hardware Version 0:

- **IMPORTANT:**
  - ❖ The outer glass edge of the cartridge **MUST** be flush with the edge of the shelf on which it sits.



**Figure 6.** Guidelines for cartridge insertion.

All Hardware Versions:

- Refer to Figure 4 for button and indicator light locations.
- The middle indicator light (blue), and the button ring light (blue) on the front panel of the instrument must be illuminated before proceeding.
- Press the cartridge engage button on the front of the nCS1 to raise the cartridge into the instrument. The top indicator light (white) will illuminate to indicate that the stage has reached the top of its range of motion and that the cartridge is ready for priming.
- **IMPORTANT (Hardware Version 0):**
  - ❖ If the white light does not illuminate when the stage is raised to the top of its travel, immediately depress the cartridge engage button to lower the stage.
  - ❖ Call your customer service contact before continuing, or email [support@spectradynellc.com](mailto:support@spectradynellc.com) for assistance.
- After this point, the nCS1 and data acquisition process are controlled entirely through the Spectradyne “nCS1” acquisition software on the computer.



## 4. Acquire Data

### Enter run details

Fill out the appropriate fields under Run Details frame, see Figure 7.

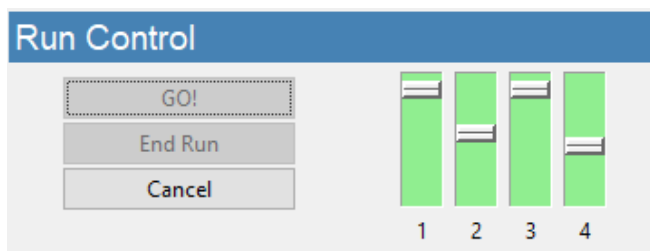
- “Cartridge Mold ID” should be printed on cartridge box: e.g., P15.2.3, or E16.1.2.
- “Box Number”: Six-digit date code printed on the cartridge box (e.g., 190915-NN).

The screenshot shows the 'Run Details' window with the following fields: 'Cartridge Mold ID' (P1.2.3), 'Box Number' (190915), 'Save Location' (C:\Spectradyn\Data), 'Data File Prefix' (empty), 'Sample Description' (empty), 'Calibration: Size (nm)' (empty), and 'Conc. (1/mL)' (empty).

**Figure 7.** Run Details frame.

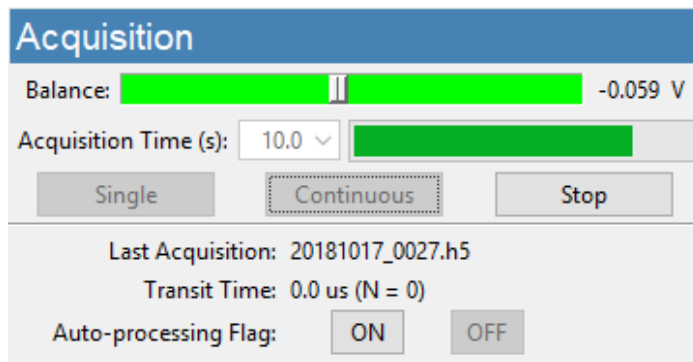
### Priming the cartridge

- Press “GO!” to prime the cartridge (Run Control frame, Figure 8).
- After normal priming, the fill monitors should have approximately the pattern shown in Figure 8.
- When the routine is complete, the Acquisition frame (Figure 9) will be activated and **data acquisition will begin automatically.**



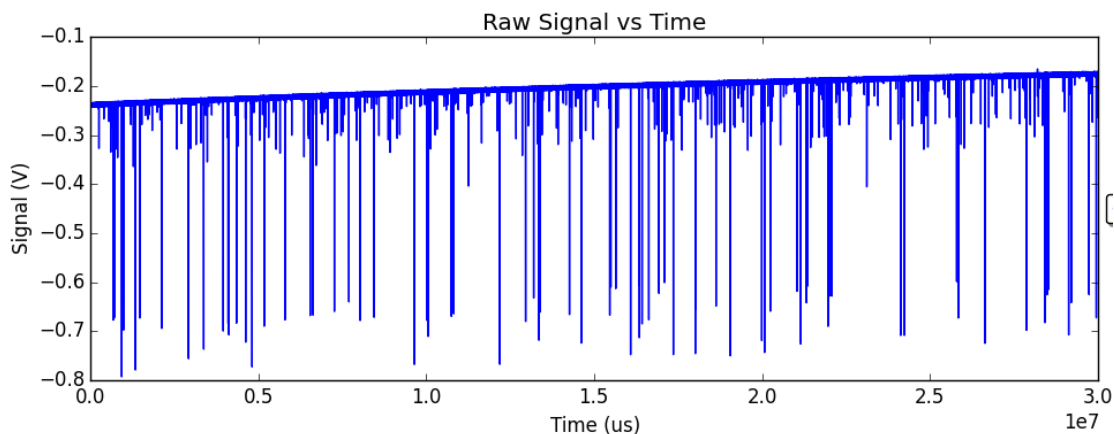
**Figure 8.** Run Control frame and fill monitors status.



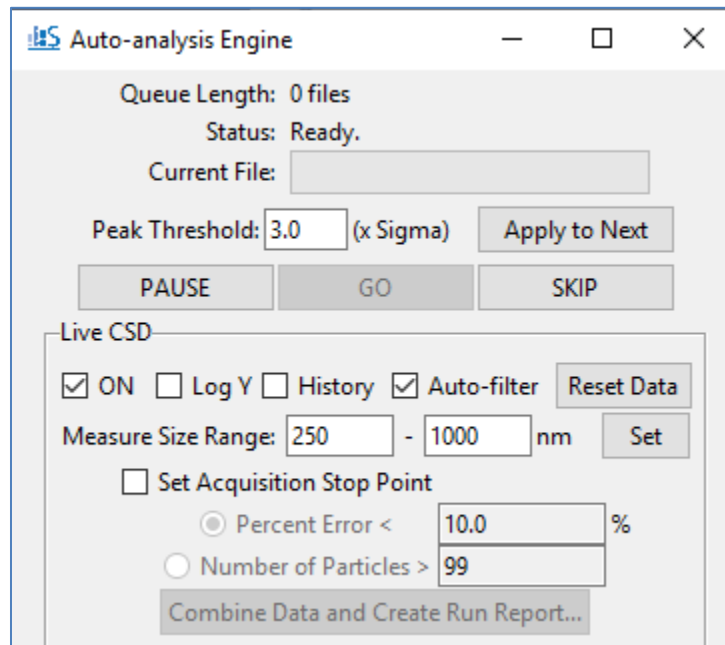


**Figure 9.** Acquisition frame.

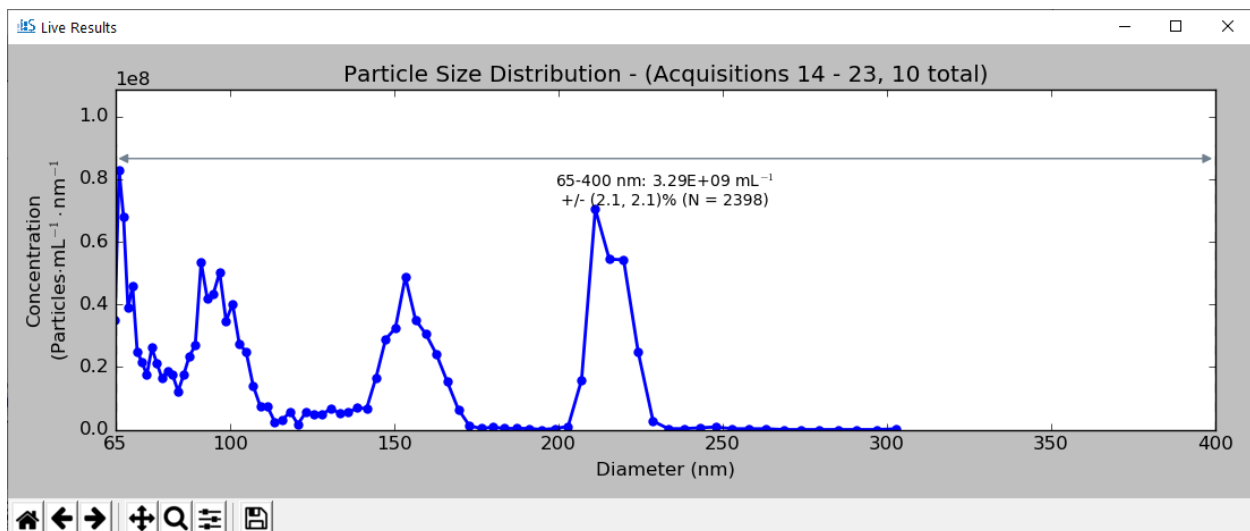
- Raw data should have the form shown in Figure 10—it has a smooth baseline with particle detection events appearing as downward spikes from the baseline.
- If the raw data shows too many steps, or poor display of calibration particles, click on the “Clear Constriction” button, wait for completion, then reattempt acquisition.
- The particle concentration (with error) measured over any user-defined size range can be obtained in real time (Figure 12) using the Live CSD feature of the Auto-analysis Engine (Figure 11).



**Figure 10.** Exemplary raw data: Smooth baseline with particle detection events appearing as downward spikes.



**Figure 11.** Auto-analysis Engine Interface.



**Figure 12.** An example of the Live CSD plot.



## 5. End the Measurement Run

- Determine a suitable data stop point by the statistical error on the integrated concentration or by the number of particles.
- After acquiring sufficient data, press “End Run” (Run Control frame, Figure 8).
- **IMPORTANT: DO NOT lower the stage until the End Run routine is completed and the next cartridge is ready for insertion.**
- Create a combined file and generate a Run Report for the acquisitions displayed in the Live CSD for the current measurement run.
- If necessary, prepare the next analysis cartridge and follow above steps 3-5.

## 6. Shutdown the Instrument

- Press the “Instrument Shutdown” button (Utilities frame, Figure 2) and follow the instructions.
- Wait for first stage of process to complete. Follow the prompt to replace running buffer with DI water (bottles 1 and 3):
  - Disconnect the running buffer bottles from the fluid lines using the quick-connect tube fittings.
  - Add 25-50 mL of **fresh deionized water** to running buffer bottles or separate DI water bottles and replace in the instrument.
- Follow the next prompt to remove the cleaning cartridge and store it in a safe place for re-use.
- Power off the instrument during long periods of inactivity (e.g., overnight).
- **IMPORTANT: Refrigerate buffer bottles and DI water bottles after use**

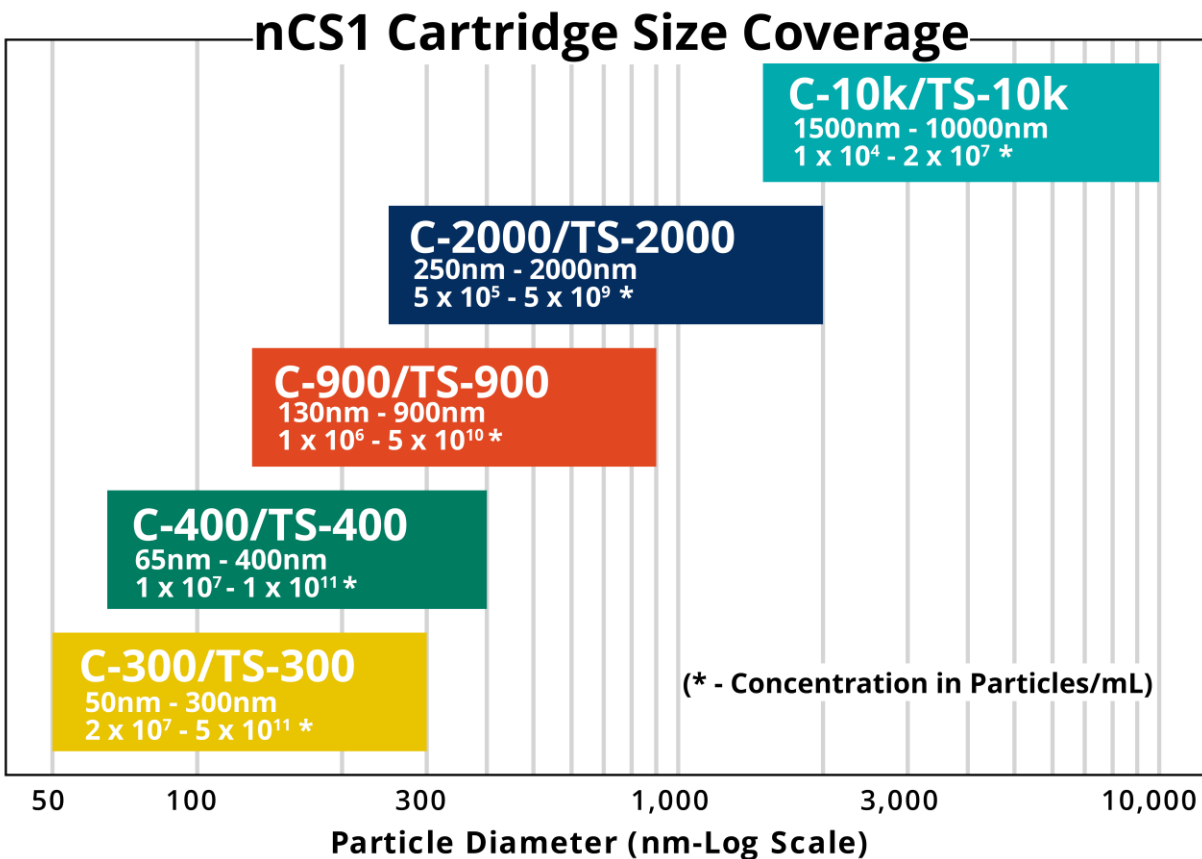


## Data Analysis

Refer to the Operation Manual for Viewer software features and data analysis.

## Cartridge Size and Concentration Coverage

A more up-to-date cartridge size coverage can be found on our website.





## More Information and Technical Support

More detailed information on the operation of the nCS1 and its software can be obtained by sending email to [support@spectradynelLC.com](mailto:support@spectradynelLC.com).

At Spectradyne we are eager to help with your particle analysis. Please contact us for help with specific measurement challenges and for help with the analysis of specific particle populations.



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