

Digital Sensor Developers Kit (DSDK)

DSDK Tool

The DSDK Tool is a simple GUI that is useful for interacting with the D-ULPSM component of the DSDK. The tool allows you to:

(Setup)

- Establish serial communication.
- Reconfigure the module using the barcode on the back of the SPEC Sensor.

(Read)

- Query the module for a single measurement.
- Start & Stop measurement data logging to a file on the computer at 1 s intervals.
- Query the module for the contents of the EEPROM memory.

(Advanced)

- Re-zero the gas measurement calibration.
- Re-span the gas measurement calibration.
- Adjust the temperature sensor offset calibration.
- Reconfigure the SPEC Sensor potentiostat control circuit.

1. Required SPEC Sensor Hardware

- D-ULPSM Rev 0.3 (available individually or as part of DSDK).
- One or more SPEC Sensors (in pinned package).
- USB-to-UART Module with Pinout Adapter Board (included with purchase of D-ULPSM or DSDK).

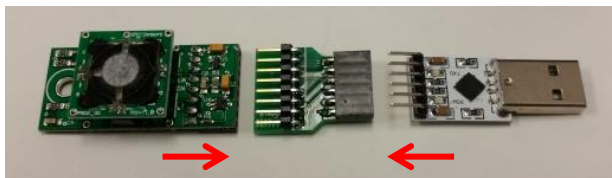
2. Required 3rd-Party Hardware

- Computer with USB port and Windows XP or later.

3. Instructions

3.1. Getting Started

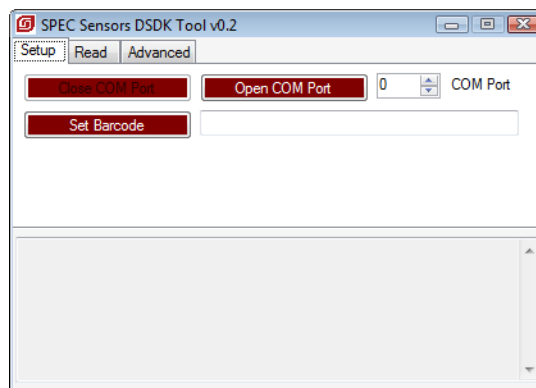
- Connect D-ULPSM Rev 0.3 module to the USB-to-UART Module via the Pinout Adapter Board.



- Connect the assembly to a USB port on a Windows PC.
- Locate and open the *Device Manager*.
- Expand the *Ports (COM & LPT)* heading.
 - If the USB-to-UART Module mounted properly, you will see *Silicon Labs CP210x USB to UART Bridge (COMXX)*, where XX is replaced by the number of the associated COM port.
 - If it did not mount properly: locate, download and install “CP210x USB to UART Bridge VCP Drivers” from the internet.
- Open the *SPEC DSDK Tool*.

3.2. Setup

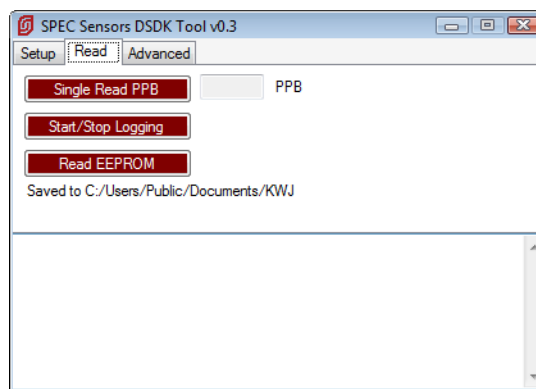
- Under the *Setup* tab, type the COM port number in the *COM Port* field
- Press *Open COM Port*



3.3. Configure the D-ULPSM for a Different Gas Sensor

The DSDK ships from SPEC Sensors pre-configured for the CO sensor. To configure the module for another sensor, follow the instructions below. Otherwise, skip to Section 3.4.

- Always remove the gas sensors from the module before reconfiguring the module.
- Use a barcode scanner or smartphone app to read and decipher the 2D barcode on the back of the sensor.
 - The sensor barcode includes the following information: Unique sensor serial number, sensor part number, target gas, date code, and sensitivity code. For more information, refer to SPEC Sensors document 590-002.
- If necessary, transcribe the deciphered code into the barcode field to the right of the button. Double-check for accuracy. Then press *Set Barcode*.
- The module will take up to 1 minute to reconfigure the settings and calculate parameters.
- Wait until the module returns: "Set OC....done", then plug the sensor into the module and allow the sensor to stabilize. The stabilization time may vary among sensors, depending on the target gas, bias settings, gain settings, and history of use.



3.4. Read Gas Sensor Measurements

- Under the *Read* tab, press the *Single Read PPB* button.
 - The ppb gas measurement will display in the field next to the button
 - The full serial string will appear in the field at the bottom of the window
 - The format of the full serial string is:

032116030233, 0, 24, 37, 32697, 26604, 22706, 00, 02, 06, 46

1	2	3	4	5	6	7	8	9	10	11
032116030233	0	24	37	32697	26604	22706	00	02	06	46

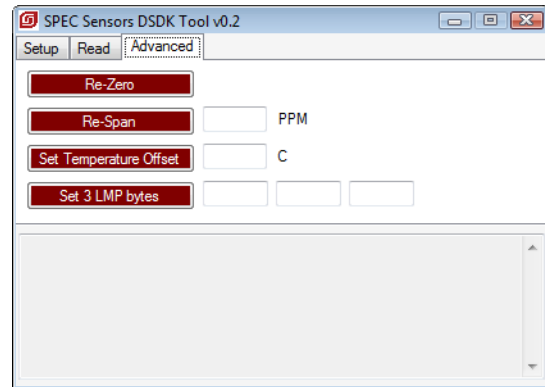
- Unique Sensor Serial Number
- Gas Concentration (ppb)
- Temperature (°C)
- Relative Humidity (%)
- Gas Sensor Measurement (ADC counts)
- Temperature Sensor Measurement (ADC counts)
- Relative Humidity Sensor Measurement (ADC counts)
- Timer, Days on power (up to 31 days)
- Timer, Hours on power (up to 23 hours)
- Timer, Minutes on power (up to 59 minutes)
- Timer, Seconds on power (up to 59 seconds)

- To start logging consecutive measurements to a file, press the *Start/Stop Logging* button.
 - Approximately once per second, consecutive measurements will be displayed in the field at the bottom of the window.
 - The measurements will also be saved under a default file name in the default file location, indicated below the buttons.
 - If the default file already exists, additional data will be appended to the end of the file.

- To stop logging, press the *Start/Stop Logging* button again.
- To read the contents of the EEPROM memory,
 - If necessary, stop logging.
 - Press the *Read EEPROM* button.
 - A single ppb gas measurement will display at the bottom of the window, followed by a read-out of the EEPROM memory variables.

3.5. Advanced Settings

- The sensor calibration may be modified by changing both the zero value and the span value. For best results, re-calibration should be done near room temperature (20 °C, 50% RH).
 - To change the zero, ensure there is no target gas present. Press the *Re-Zero* button. The module will take up to a minute to calculate a new zero.
 - To change the span, place the module in an enclosed environment and safely expose it to a known concentration of the target gas. Allow the environment and module to stabilize at the concentration. Type the known concentration (in PPM) into the field next to the *Re-Span* button, then press the button. The module will take up to two minutes to calculate a new span factor.
 - To reset the calibration, remove the sensor from the module and follow the instructions to **Configure the D-ULPSM for a Different Gas Sensor**.
- An offset may be added to the temperature sensor. Type the desired offset into the field to the right of the button and then press *Set Temperature Offset*.
- WARNING: Using the *Set 3 LMP bytes* button should be done with CAUTION. Changing these settings may severely alter the operation of the sensor. Furthermore, it may temporarily or permanently damage the sensor.



When the D-ULPSM module is reconfigured based on the sensor barcode, the potentiostat control circuit settings are set to defaults that were determined to be optimal by SPEC Sensors. To change the settings manually, first refer to the Texas Instruments LMP91000 data sheet for more information on the operation of the chip and the available settings options.

In the SPEC Sensors DSDK Tool, there are 3 fields to the right of the *Set 3 LMP bytes* button. From left to right, they correspond to: TIACN (TIA Control Register), REFCN (Reference Control Register), and MODECN (Mode Control Register). Determine the desired binary word settings for each register, convert to decimal, enter those decimal values into the 3 corresponding fields, and then press the button.