SPOT Demonstrator Manual

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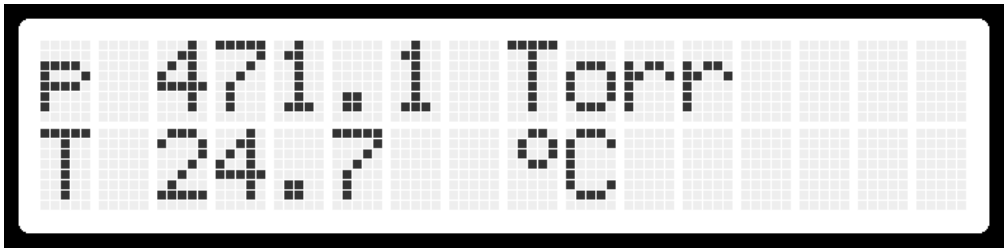
User manual

Pressure and temperature screen

At the start the SPOT demonstrator displays the INFICON logo on the display for a few seconds. After initializiation it shows both the combined pressure and the temperature on the LCD:

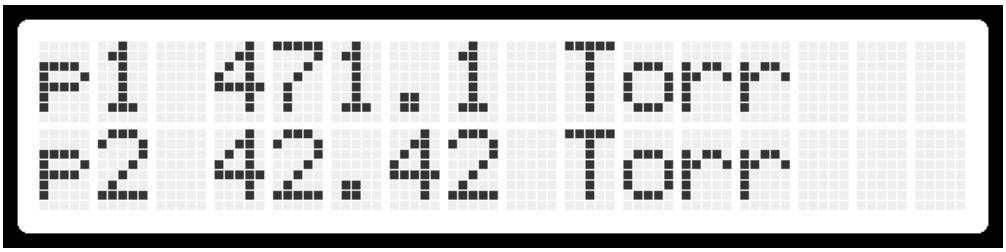


The demo is controlled using the buttons on the LCD shield:

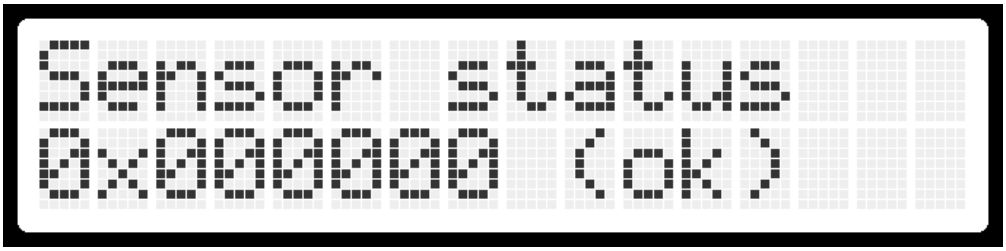
Use the **left** and **right** buttons to change the screen that is displayed. If the screen that is currently displayed includes a configuration option, its value can be changed using the **up** and **down** buttons (Note that in current versions of the Spot Demonstrator Kit firmware/sketch there are no such settings available). The new value is selected and stored to EEPROM by pressing the **select** button.

Dual SPOT pressures

By pressing the **right** button on the initial screen the display is changed to the "dual SPOT pressures" screen. On this screen the two individual sensor results of a dual SPOT sensor are displayed:



Sensor status



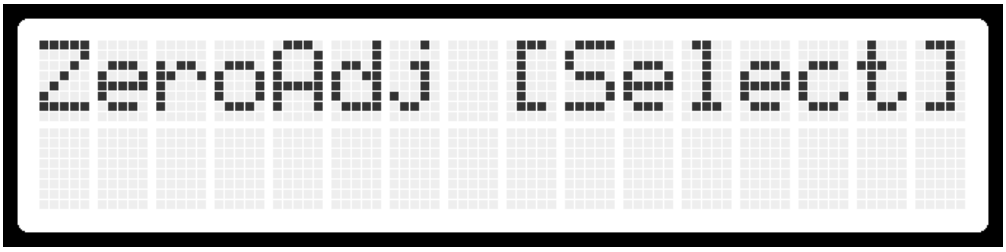
This screen shows the status bits of the Spot sensor. The 6 digit hexadecimal number shown is the bit-wise and of the sensor status and 0x8021e8 (= binary 1000 0000 0010 0001 1110 1000). Therefore only the value of bits 23, 13, 8, 7, 6, 5 and 3 is shown, all other bits are masked out. For the meaning of these bits refer to the table below (from the Spot communication manual).

Bit	Description
23	SPI communication took place during measurement
13	Pressure error
8	port 3 error
7	port 2 error
6	port 1 error
5	port 0 error
3	Temperature error

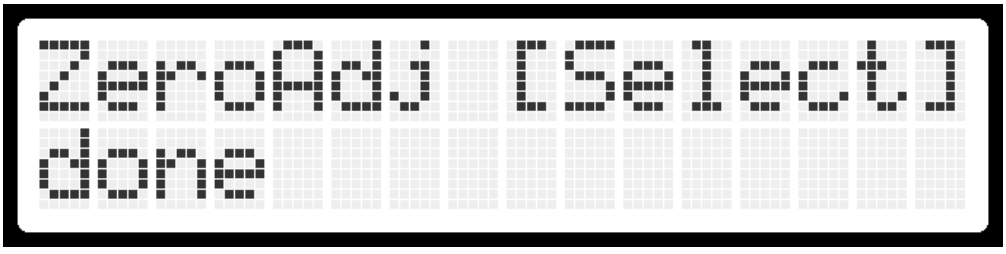
A status of 0x000000 therefore indicates "no errors, no warnings".

Zero adjust

A zero adjust function has been implemented for the combined pressure reading. Navigate to the screen shown below using the **left** and **right** buttons.



When pressing the select button, the SPOT Demonstrator stores the next valid (=no error bits set in status) combined pressure reading and subtracts it from all subsequent combined pressure readings. After a successful zero adjust, the word "done" is displayed in the second line of the LCD.



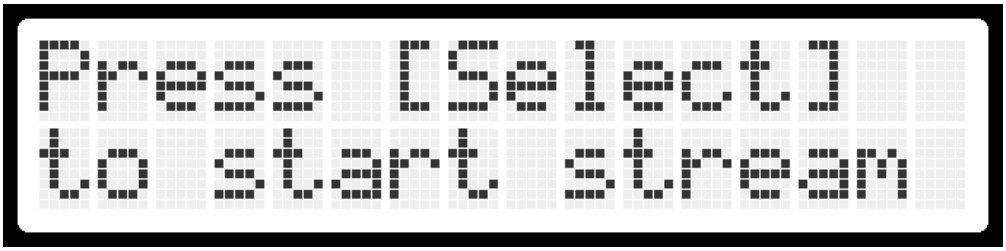
If no valid reading was obtained within 5 seconds, "timeout" is displayed in the second line instead.

> ⚠ Note that the zero adjust only applies to the combined pressure reading, not to the p1 and p2 readings of a dual spot sensor. Furthermore the zero adjust value is volatile. Power-cycling the demonstrator or pressing the Reset button resets the zero adjust value to zero.

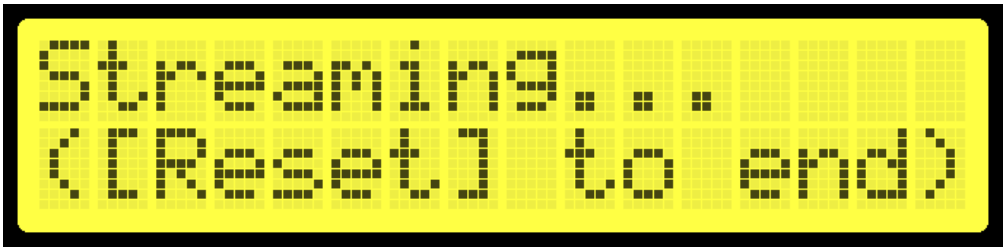
Streaming data to serial port

The Spot demonstrator kit can be switched into a streaming mode. In this mode, every pressure reading is output to the serial port. The sample rate depends on the Spot sensor beeing used. If a 1ms sensor is used, 1000 readings per second are transferred to the serial port. Operating the LCD screen and the pushbuttons is not possible since the Arduino CPU is busy converting and sending the data. So once the streaming mode is started it is only possible to stop it by pressing the Reset button.

The streaming mode is started by selecting the screen below and pushing the Select button:



When streaming is active, the screen below is displayed:



The data format on the serial port is

`sequence number, combined pressure, temperature, status & 0x8021e8`

Data	Comment
sequence number	This number is incremented at every measurement received from the Spot.
combined pressure	Combined pressure reading.
temperature	Temperature reading in °C
status & 0x8021e8	See the "Sensor status" section above. Same value as displayed in the corresponding screen.

Example:

```
8549,734.46,22.82,0
8550,734.45,22.82,0
8551,734.70,22.82,0
8552,734.26,22.82,0
8553,734.55,22.82,0
8554,734.39,22.82,0
8555,734.51,22.82,0
8556,734.46,22.82,0
8557,734.67,22.82,0
```

The data stream can be stored to a CSV file using the *getspotdata* command line utility.

Follow the instructions below to record data to a CSV file:

1. Download getspotdata.exe: getspotdata.exe

2. Open the Windows command line and navigate to the directory with the getspotdata.exe.
3. Run the tool and specify the serial port of the Arduino with the -p option and the output filename with the -f option, e.g.,

```
getspotdata -p COM14 -f file.csv
```

4. The getspotdata tool will wait for the data stream to start:

```
C:\work\spot_arduino\getspotdata\dist>getspotdata.exe -p COM14 -f test.csv
Waiting for data stream...
```

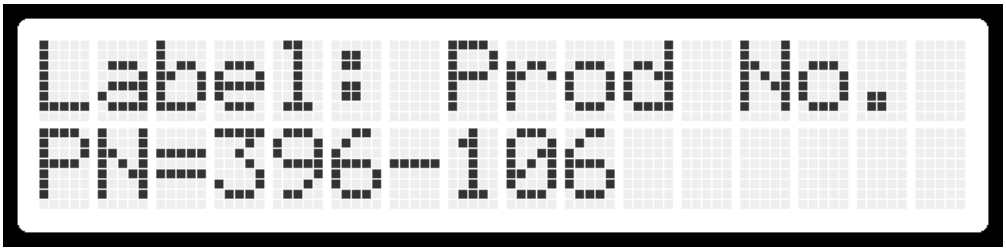
5. Note that the Spot Demostrator Kit is reset every time the serial port is opened again, i.e., every time the getspotdata tool is started. This is a known feature of the Arduino. There are some ways to prevent it, see http://playground.arduino.cc/Main/DisablingAutoResetOnSerialConnection, but for now we accept it as it is. Actually it is not a big problem, only zero-adjusts are lost, so if you like to do a zero-adjust, now is the time to do it.
6. Start the streaming mode of the Spot Demonstrator as described above by navigating to the streaming screen and pressing Select.
7. Data recording now starts until it is stopped by either pressing the Reset button on the Arduino or pressing Ctrl+C on the computer.

For the source code and building instructions of the getspotdata utility see getspotdata Utility (Only required if you want to modify the tool).

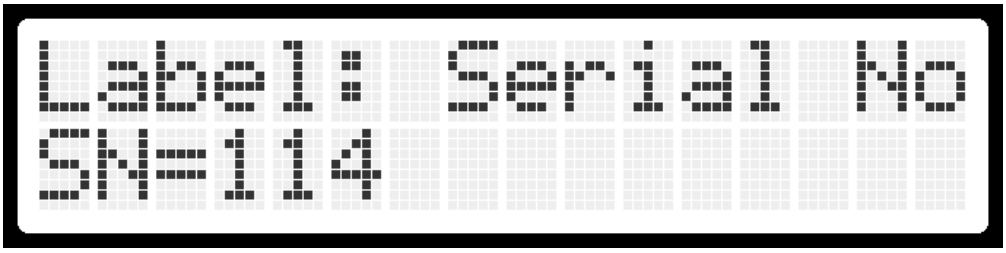
Label data

There are six screens that display label data programmed to the Spot sensor. The first line of these screens indicates which label data is shown, the second line displays its content.

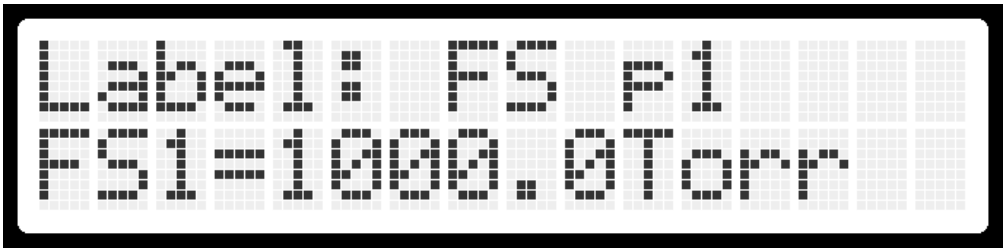
Production number:



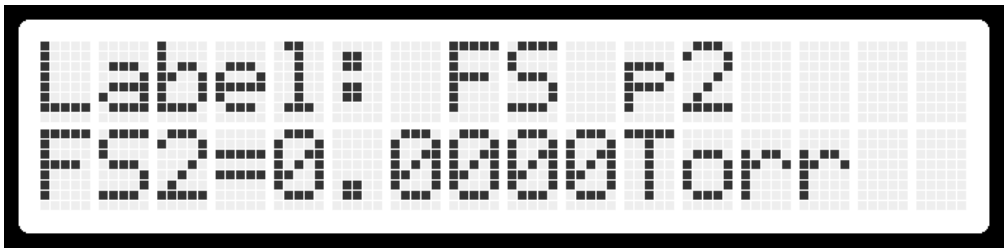
Serial number:



Pressure 2 fullscale range:

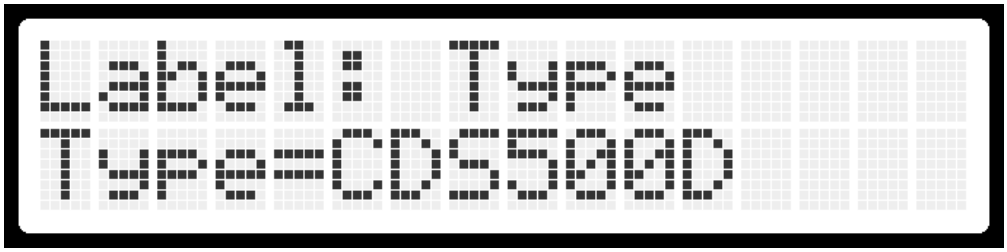


Pressure 2 fullscale range:

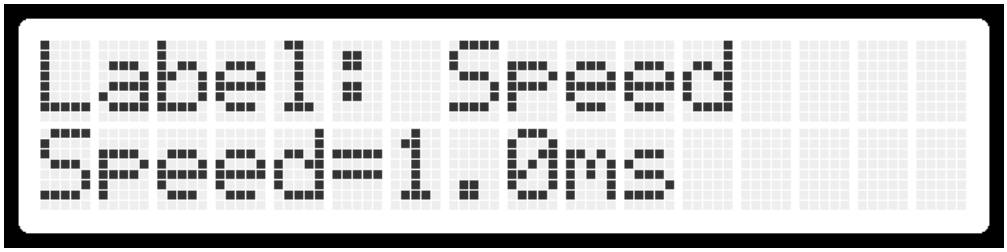


A zero Torr reading indicates that there is only a single sensor (single Spot). No p2 is measured.

Sensor type:

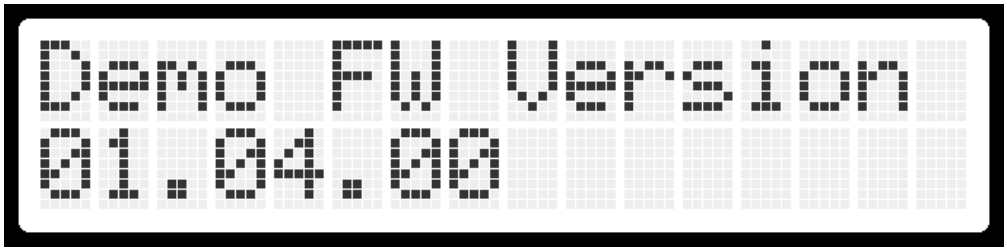


Sensor speed:



Spot Demonstrator Version

The screen below displays the version number of the Spot Demonstrator Kit (i.e. the code running on the Arduino, not the firmware version of the Spot sensor itself):

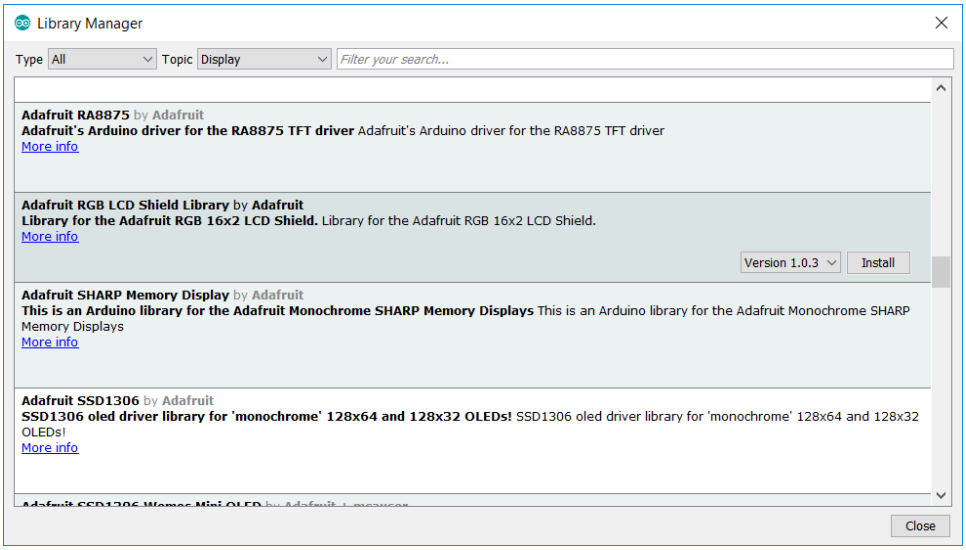


Display update rate

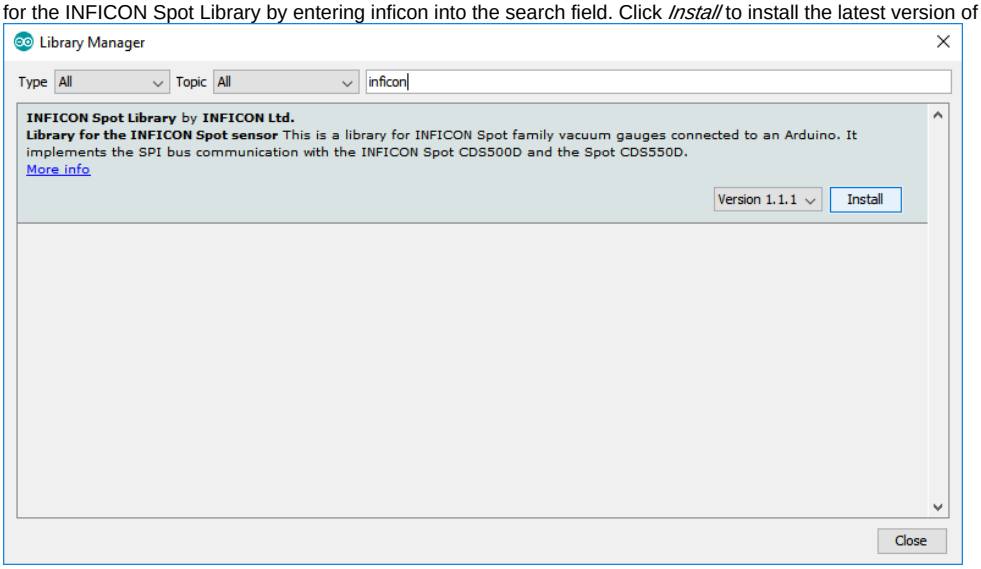
At startup the Spot Demonstrator reads the fullscale 1, fullscale 2, and speed label data from the Spot sensor. The fullscale values and units are used to scale the pressure readings. The speed label value is used to determine the moving average filter window size. The goal is a display update rate of 4 Hz, i. e., a the display is updated every 250 ms. For example with a sensor speed of 1ms the Spot demonstrator calculates a window size of 250. Every 250 pressure measurements an average value is calculated and the LCD is updated.

Firmware update

1. To update the SPOT Demonstrator to the latest firmware version, the Arduino IDE (https://www.arduino.cc/en/Main/Software) is required. Download the Arduino IDE, install it on your computer, and run it.
2. Furthermore, the Adafruit RGB LCD library and the INFICON Spot library must be installed in the Arduino IDE. The libraries can be installed easily using the Library Manager of the Arduino IDE. In the Arduino IDE open ToolsManage Libraries... and select Topic "Display" in the library manager. Install the latest version of the Adafruit RGB LCD shield library.



The INFICON Spot Library is also available in the Library Manager. Start the library manager as described above for the LCD library and search for the INFICON Spot Library by entering inficon into the search field. Click *Install* to install the latest version of this library.



3. Finally download the source code of the Spot Demonstrator from https://github.com/criesch/inficon-spot-demo
   On this website, click "Clone or download" "Download ZIP".
4. Extract the ZIP file on your computer and open the SPOT Demonstrator.ino sketch in the Arduino IDE.
5. Connect the SPOT demonstrator to the computer using the USB cable.
6. In the Arduino IDE select the virtual serial port of the SPOT Demonstrator under Tools Port.
7. Compile the sketch and download it to the Spot Demonstrator by selecting Sketch Upload.

References

LCD screenshots created using http://avtanski.net/projects/lcd/

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You may also find a copy of the SPOT Demonstrator source at https://github.com/criesch/inficon-spot-demo.

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```
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```

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structure layouts and accessors, and small macros and small inline
functions (ten lines or less in length), then the use of the object
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