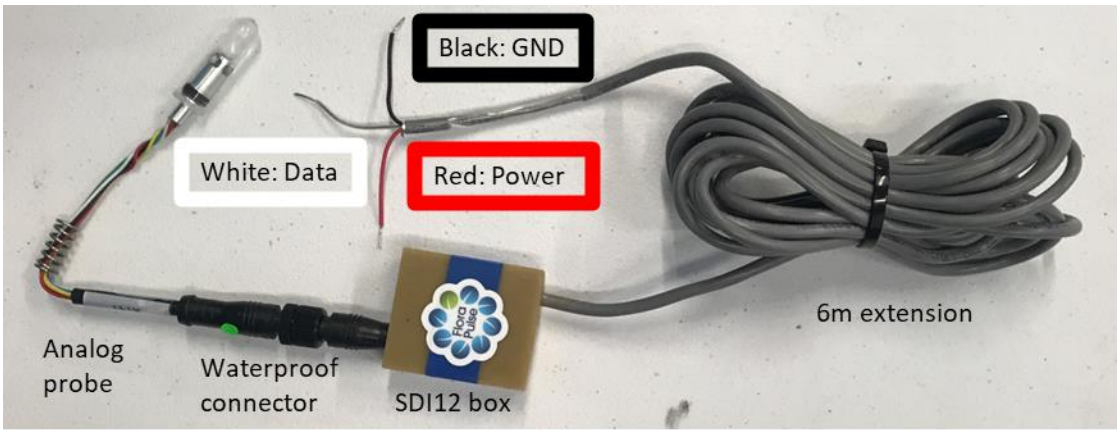
uTensiometer SDI-12 Probe Manual

About:



The uTensiometer SDI-12 probe directly measures the tree water potential. It consists of one analog probe and one "SDI-12 converter box". The analog probe is about 6" long and connects to the SDI-12 box through a twist-on waterproof connector. The SDI-12 box powers and reads the sensor, then transmits the information using the digital SDI-12 protocol. The SDI-12 box contains the calibration coefficients for the analog probe attached, but can be re-programmed using custom SDI-12 commands for a different probe (instructions below). The SDI-12 box is waterproof and comes with a 6m cord.

Connecting to a Logger:

The SDI-12 wiring is as follows: power wire (RED – connect to 3.6V to 16V), ground wire (BLACK – connect to GND), and data wire (WHITE – connect to DATA).

Communications:

The uTensiometer uses version 1.4 of the SDI-12 protocol. The sensor is addressable through the full range of the protocol and is set to the default address 0. Multiple SDI-12 boxes can be read through the same port if configured with different addresses.

The sensor provides stem water potential of a plant in units of bars as the first number output. The second number is a direct reading of the sensor in mV/V and the third number is the resistance of the probe thermometer in ohms. Communication commands are described below through an example probe with address '0', later changed to address '4'.

Examples:

Query the Address of a Sensor:

```
?!
0
```

Sending "?!" to a sensor that is alone on the SDI-12 bus will query the address. The sensor responds with the default address of 0 as the current address.

Changing the Address of the Sensor:

```
0A4!
4
```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Sending "0A4!" instructs the sensor at address 0 to change its address to 4. The sensor responds with its new address of 4.

Identifying the Sensor:

```
4I!
414FLORAPLS0000011.1alpha1
```

Sending "4I!" to the sensor's new address will request the sensor to identify itself. The sensor responds with its current address, SDI-12 version, company name, sensor model number, sensor version, and serial number. The serial number will match with the probe name, "alpha1", in this case.

Start Measurement & Send Data with a Checksum:

```
4MC!
40023
4D0!
4+20.78-3.73+1269.26GC`
```

Sending "4MC!" requests the sensor to begin taking a measurement. The sensor immediately responds with its address, 3 digits detailing in seconds when the measurement will be ready, and 1 digit for the number of values.

Sending "4D0!" after 2 seconds causes the sensor to respond with its address, the stem water potential in Bars, the direct reading of the sensor in mV/V, the resistance of the onboard thermometer in Ohms, and a 3-character checksum.

Note: use of the "4M!" command to read the data without a checksum is possible, but not recommended. The checksum ensures data integrity.

Switching Out uTensiometers:

A series of commands allows modification of calibration values that are initially sent with each SDI-12 probe. FloraPulse provides calibration values for each analog probe sold.

Calibration Values Provided by FloraPulse:

mp	-3.9
mpt	-0.00103
bpt	1.6709
mt	0.50061
bt	-568.2353
serial number	gamma3

The serial number represents the name of the uTensiometer given during manufacture. All other values are used to produce a measured pressure in units of bars.

List of Commands for each Value:

SDI-12 Command	Value to Set
XB	mp
XC	mpt
XD	bpt
XE	mt
XF	bt
XH	serial number

Each SDI-12 command sets a unique calibration value. The current address precedes the command. We recommend changing the calibrations with only a single SDI-12 box attached to the same port because the current address can be queried.

Changing mp, bpt, & serial number:

```
?!
4
4XB-3.9!
4-3.9
4XD+1.6709!
4+1.6709
4XHgamma3!
4gamma3
```

After querying the address, sending “4XB-3.9!”, instructs the probe to memorize the mp value as -3.9. The probe responds with the address and the memorized value. The bpt and serial number are shown for a positive number and a word. All values will need to be updated to provide an accurate pressure measurement.

Specifications:

Wiring diagram

- Power: RED
- Ground: BLACK
- Data: WHITE

Electrical specifications:

- Power input: 3.6 V to 16 V
- Current drain: 0.65mA (sleep), 12mA (measurement)
- Measurement duration: 200 mS (typical)

Measurement specifications:

- Water potential
    - Resolution: 0.1 bar
    - Accuracy: ±5% of reading

Physical specifications:

- Probe length: 6”
- Cable length: 5m
- Connector type: IP67 waterproof