Campbell Data Loggers with an SDI-12 Hydra Probe

The Stevens Hydra Probe II is a fully compliant SDI-12 sensor compatible with SDI-12 compliant data loggers such as the Stevens DOT logger, Stevens Data Logic 3000, the Campbell CR10X, and the Campbell CR1000 data loggers. Most Campbell Loggers can be programmed with PC200W software. PC200W Software can be downloaded free of charge from Campbell Scientifics' website at http://www.campbellsci.com/index.cfm. For more information about serial data interface at 1200 baud (SDI-12), please visit http://www.sdi-12.org/ .

-1 Download the latest version of the Campbell PC200W software.

-2 The SDI-12 Hydra Probe has 3 wires, red (+12V), black (ground), and blue (data). Connect the ground, the +12V wire, and connect the blue data wire to the C8 port on the Campbell CR10X Logger.

-3 Connect the Campbell Logger to the RS232 serial port on a computer that has PC200W software. The Campbell CR10X Logger requires an SC32A Optically Isolated RS232 Interface to go between the computer and the logger. Refer to Campbell's technical literature for more information about Optically Isolated Interfaces.

-4 Setting the Sensor Address and Parameters.
Each SDI-12 sensor must have its own unique address or there will be communication conflicts between the logger and the sensor. There are also a number of parameters the user can choose from. The default address for the Hydra Probe is "0". Note: For the following exercises, the terminal commands are in **BLUE** and the terminal responses are in *RED*.

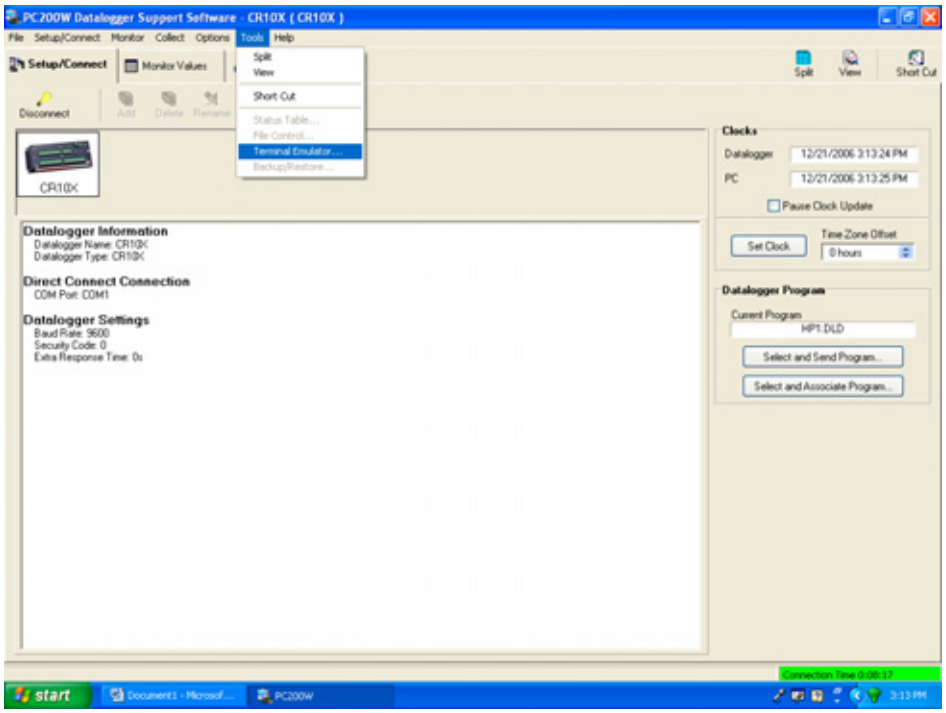
A) First, make sure the logger is connected by clicking the connect button on the top left corner of the dialog screen in the PC200W software. A green tab with the connection time will appear in the lower right of the screen.

B) Under tools, open the terminal emulator window and click Open Terminal.

C) Once the terminal window is active, type "**8X**" to go into transparent mode (for port 8 on the logger). Transparent mode is a mode that allows direct communication with the SDI-12 sensor bypassing the logger. Transparent mode makes the logger "transparent". The Campbell transparent mode times out within a few seconds, therefore it may be necessary to type the **8X** command after every SDI-12 command .

D) Type the command '**?!**". This shows the current address.

E) If the address is 0, you may want to change it to something else, such as 1. Type "**0A1!** To change the address from 0 to 1.



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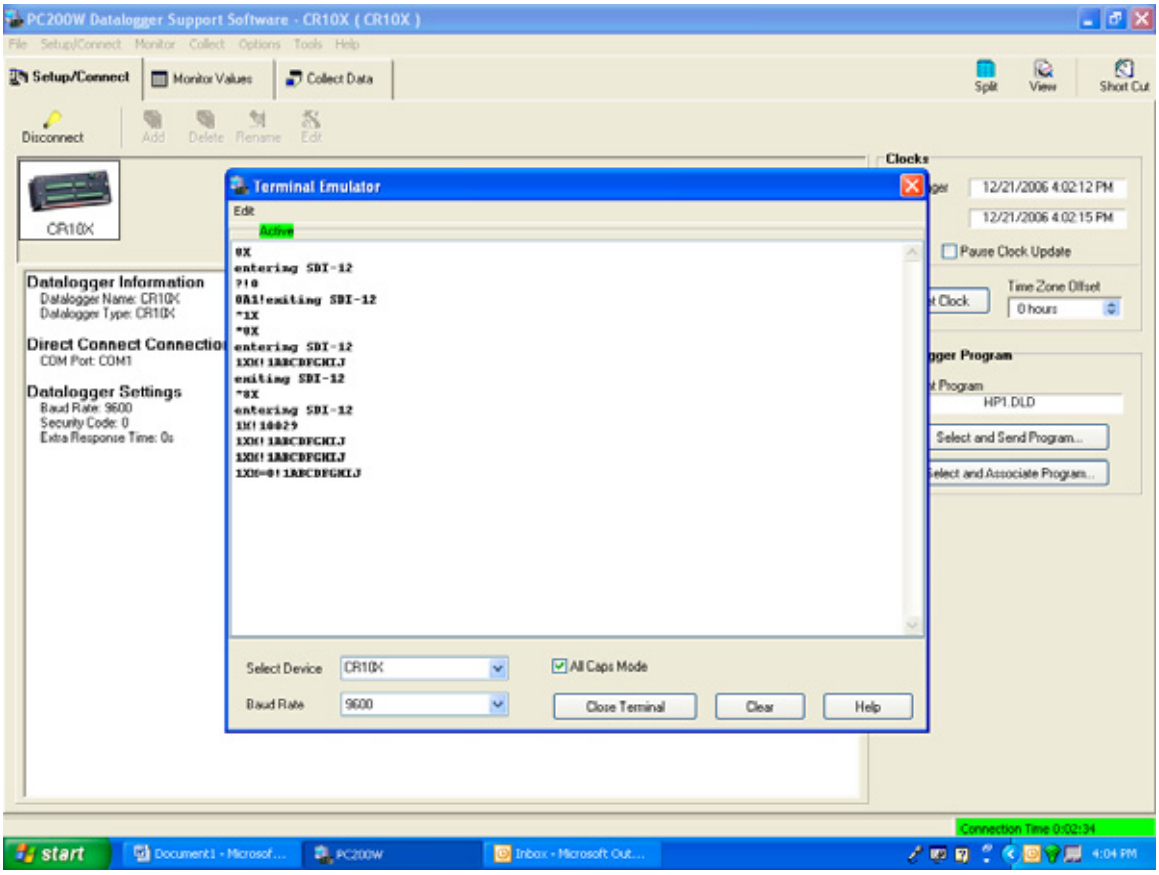


F) Type "**1M!**" . the response should be *10029*. This means that a sensor with an address of 1 will take 2 seconds to return 9 parameters with one or more D commands.

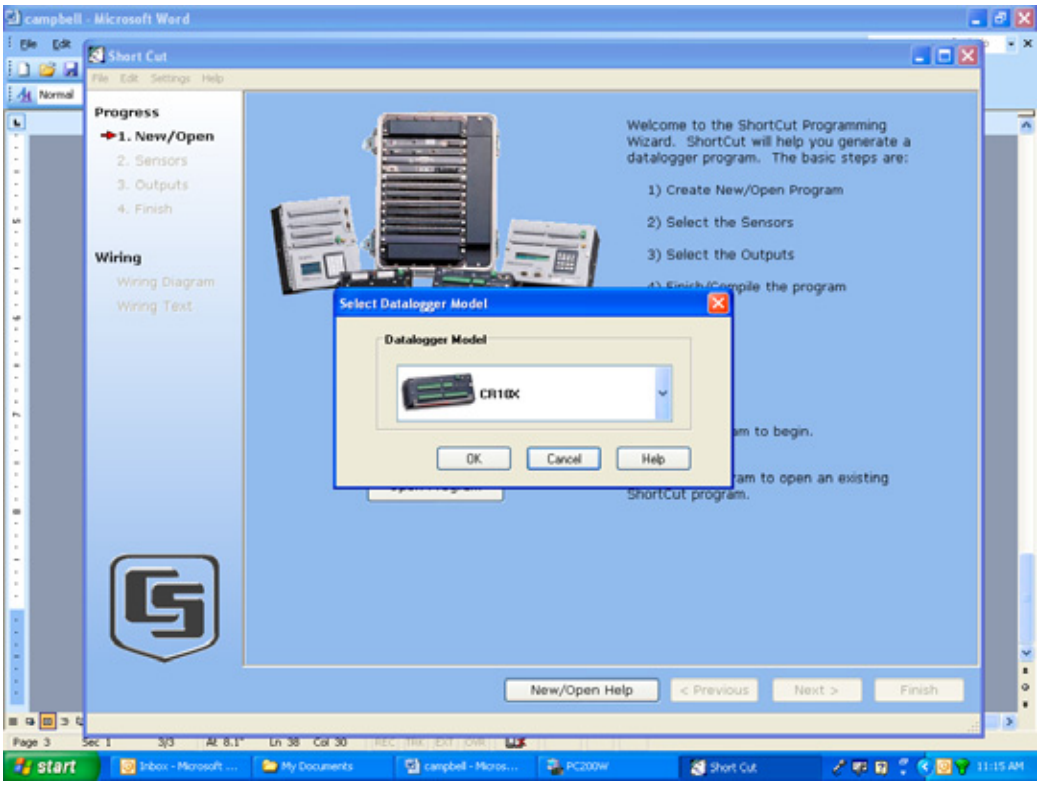
G) Type "**1XM!**". The response should be *1HJFGOKMLN* (for firmware 2.7 and later). This means that the sensor with address 1 has been set to the first default parameter set. The letters correspond to parameters that the Hydra Probe is capable of measuring in this set. Most users are only interested in F, G, H, and J (see table 1 bellow) which corresponds to Temperature in Celsius, Temperature in Fahrenheit, Soil Moisture (wfv) and Soil Electrical Conductivity (S/m) respectively. If the probe has another parameter set, you may wish reset the probe to the first default parameter set by typing "**1M!"** or alternatively, the user may type **1XM=GH!** to only measure soil moisture and temperature.

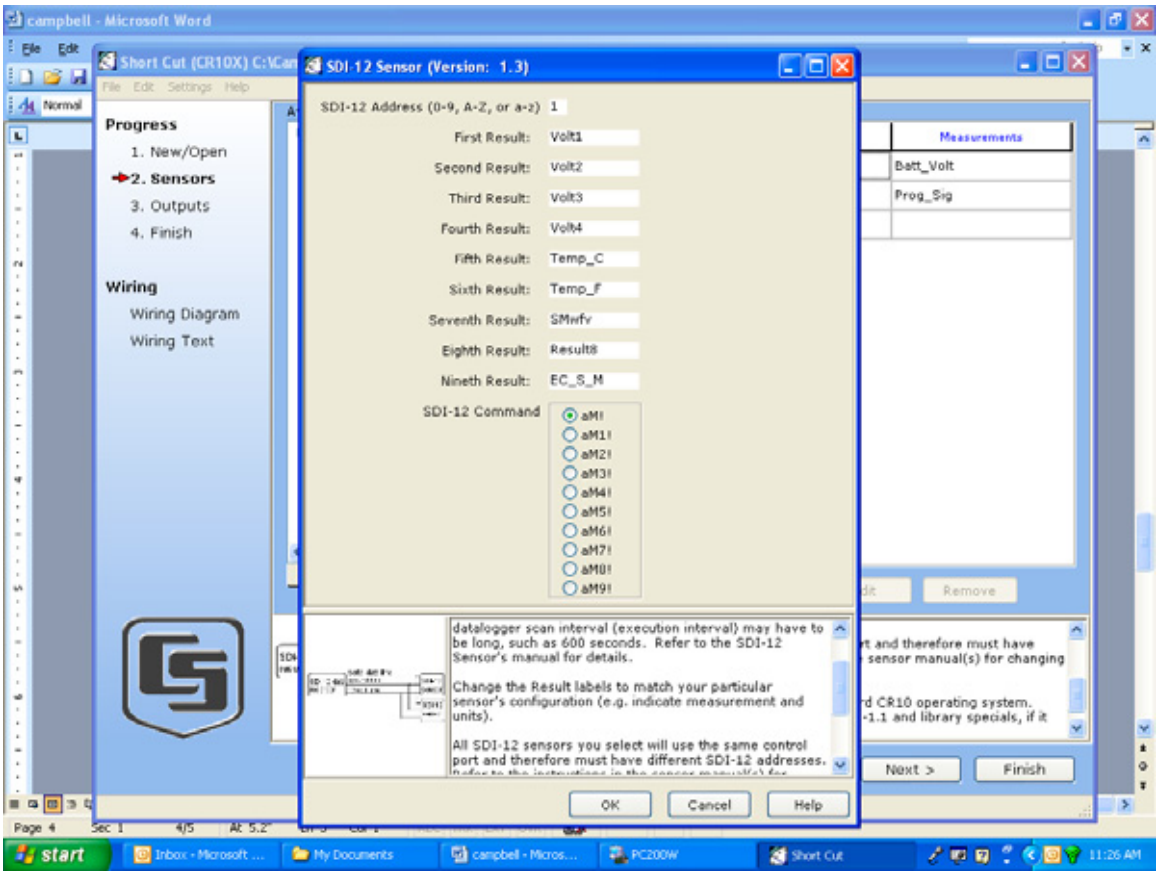
Parameter	Unit	Parameter index	Parameter Number
Temperature	C	F	5
Temperature	F	G	6
Soil Moisture	Wfv (m^3 m^{-3})	H	7
Electrical conductivity	S/m	J	9

Table 1. Most common parameters for the first default parameter set.

H) (Optional). To verify that the Hydra Probe is functioning properly perform the following commands: Place the Hydra Probe in distilled water in a plastic container. Make sure the entire probe is submerged. (Note: The probe is fully potted and designed to be submerge or buried for many years.) In transparent mode and with the third parameter set (aM3!), type "**1M3!**" followed by "**1D0!**". The typical response of a Hydra Probe that is functioning properly should be *1+77.895+78.826+2.462*. From this example, the real dielectric constant is 77.895, the temperature corrected dielectric constant is 78.826, and the imaginary dielectric constant is 2.462. According to factory specifications, the temperature corrected dielectric constant should be from 75 to 85 and the imaginary dielectric constant should be less than 5. After the probe verification, the user may wish to reset the probe back to the default parameter set or any other parameter set.

-5 After the probe has been given a proper address, and the desired parameter set has been chosen, close the terminal emulator and open Short Cut. The Short Cut icon is located in the upper right hand window of PC200W. Click new program, select the appropriate data logger and select a scan interval of 20 seconds. It may be necessary to increase the scan interval if you add multiple SDI-12 Sensors.


campbell - Microsoft Word
Short Cut
Progress
1. New/Open
2. Sensors
3. Outputs
4. Finish
Wiring
Wiring Diagram
Wiring Text
Welcome to the ShortCut Programming Wizard. ShortCut will help you generate a datalogger program. The basic steps are:
1) Create New/Open Program
2) Select the Sensors
3) Select the Outputs
Select Datalogger Model
Datalogger Model
CR10X
OK
Cancel
Help
New/Open Help
< Previous
Next >
Finish

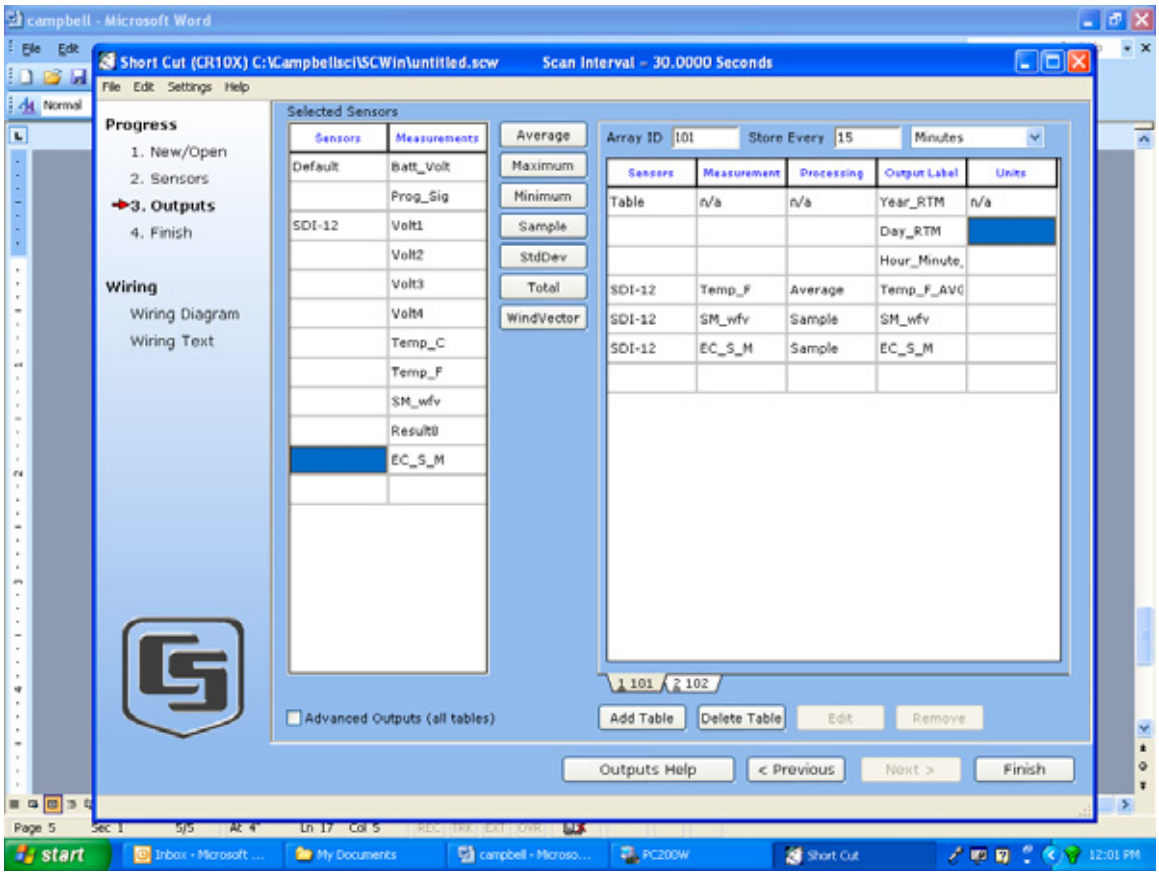

campbell - Microsoft Word
Short Cut (CR10X) C:\Can
SDI-12 Sensor (Version: 1.3)
SDI-12 Address (0-9, A-Z, or a-z) 1
First Result: Volt1
Second Result: Volt2
Third Result: Volt3
Fourth Result: Volt4
Fifth Result: Temp_C
Sixth Result: Temp_F
Seventh Result: SMwfv
Eighth Result: Result8
Nineth Result: EC_S_M
SDI-12 Command
aM!
aM1!
aM2!
aM3!
aM4!
aM5!
aM6!
aM7!
aM8!
aM9!
datalogger scan interval (execution interval) may have to be long, such as 600 seconds. Refer to the SDI-12 Sensor's manual for details.
Change the Result labels to match your particular sensor's configuration (e.g. indicate measurement and units).
All SDI-12 sensors you select will use the same control port and therefore must have different SDI-12 addresses.
OK
Cancel
Help
Progress
1. New/Open
2. Sensors
3. Outputs
4. Finish
Wiring
Wiring Diagram
Wiring Text
Measurements
Batt_Volt
Prog_Sig
Remove
Next >
Finish

-6 In Short Cut under available sensors, expand sensors generic measurement and click on SDI-12 sensor. After clicking SDI-12 Sensor, a control window pops up

-7 In the SDI-12 pop up window, select aM!. This corresponded to the first parameter set and the 1M! transparent mode terminal command in step 4G.

-8 Select the SDI-12 address located at the top of the pop up window (make it address1 for this example). Label the 6th result, 7th result and 9th result Temp_F, SW_wfv and EC_S_m respectively. See table 1. Then click OK. Then click next.

-9 You should have 2 Arrays. Array 101 corresponds to the sensor parameters and Array 102 corresponds to logger performance and battery voltages. Move result Temp_F, SW_wfv and EC_S_m to Array 101 by highlighting them in the parameters available box to the left of the Array box. Clicking on the parameter highlights it and clicking the Sample button moves it over to the array screen. The user may wish to use the Average button to move the temperature parameter over instead of the Sample. The Sample button just takes a single reading during the logging interval where as the Average button averages the measurements over the scan rate during the logging interval.



-10 In the upper part of the array windows, the user can select a logging interval. Select a logging interval of 15 minutes for array 101 and select a logging interval of 24 hours for 102. Click finish, name it HP1 and save it to the default location.

-11 To add additional SDI-12 sensors, repeat steps 1 through 10. The second sensor parameters will show up in the parameters available box under the first sensor and the user can add these parameters to the array by clicking the Sample or Average button. Make sure you give the second SDI-12 sensor a different address in transparent mode before opening Short Cut.

-12 The user can monitor the current values from the PC200W software under the monitor values tab by opening the file named HP1.

-13 The user can collect the data under the collect data tab.

If you have any questions about Campbell Scientific Data Loggers, contact Campbell Scientific at 435.753.2342 or consult the appropriate technical literature. For information regarding the Stevens Hydra Probe or the Stevens DOT Logger, please contact Steven Water Monitoring Systems at 1-800-452-5272.

Stevens®
Water Monitoring Systems, Inc.
www.stevenswater.com
12067 NE Glenn Widing Drive
Suite 106
Portland, OR 97220
(800) 452-5272