

## Proteus Communications Protocol

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**You can talk to the Proteus multiprobe without using the Proteus Control Software.**

You can connect a Proteus to a variety of third-party devices, such as data loggers, PLC's, and telemetry systems if you know the Proteus's connector assignments and basic commands.

Most of you will need only the most basic Proteus commands; those are shown in (1) below. A few of you will need the advanced commands shown in (3) below. We advise that you stick with the basic commands if possible.

### 1) Most Common Applications

If you are connecting a Proteus to common dataloggers, etc., here's all you need to know:

- a) We run at 19,200 baud, No parity, 8 data bits, 1 stop bit, no flow control.
- b) Send an ASCII command "read" and you get back one line of data separated by commas. You can put the parameters in any order you want. This is most easily done from the Proteus control software Sensors and Parameters list.
- c) You can send an "hdr" command and get the parameter and unit of measure.
- d) Power consumption is approx. 200 mA at 12 volts; could be more or less depending on the number of sensors installed in your Proteus.

### 2) Basic Protocol

- a) All commands will consist of strings of alphanumeric ASCII characters terminated by **Carriage Return** (0x0D). All commands will elicit a response. Unsupported commands and/or incorrect syntax result in an error response.
- b) The messages will contain a **command**, optional arguments, and the carriage return. The command and arguments (**tokens**) will be separated by at least 1 but possibly more whitespace characters or commas.
- c) Arguments shown as in [arg] are optional. All output is terminated by **CR** and **LF** (0x0A). Input is not case insensitive. **BS** (backspace) erases the last character from the input stream. The communication parameters are: 19200 baud, 8 bits, 1 stop bit, no parity, and no handshaking.
- d) Commands will be converted to upper case before being sent to the Proteus for execution.

### 3) Commands

- a. **GUI** [-on, -off] - Sets output format for either a computer or a dumb terminal. -on sets computer mode and -off sets terminal mode. No arguments returns current mode. The primary difference between modes is the inclusion of commas and message type prefixes in GUI mode. Prefixes are in the form #TYPE.
- b. **VER** (version) - returns Firmware version
- c. **SI** or **SENSORINFO** (sensor information) - returns a list of information about the installed sensors
- d. **SCR** or **SCROLL** (scroll) [-on,-off] [-I interval] - sets scrolling on or off and sets the interval (in seconds) between outputs; omitted -on-off argument defaults to -on and omitted -I argument defaults to 2 seconds.

- e. **HDR** (header) – returns a three-line header containing the date, time, and parameter types and units
- f. **READ** (read parameters) – returns one line containing all active parameter values
- g. **PT N** or **PASSTHRU N** (pass through) - enables a direct dialog to a sensor on port N; subsequent commands are send directly to the sensor and sensor responses are displayed; “exit” exits this mode

**PT N RAW** is a special case that directs input to port N; this means that there is no timeout for commands, commands are case sensitive, and this mode cannot be exited by **EXIT** – you must cycle power.

- h. **P** or **PARAM** (parameter)
  - a. Lists all currently active parameters if no arguments given.
  - b. **-ADD ParamName [N]** - adds parameter name to active list at position **N** or at end if no **N**
  - c. **-DEL N,-ALL** - deletes parameter at position **N** or all parameters if **-ALL** given.
  - d. **-DEF** - adds a default parameter for each installed sensor to Active Parameters
  - e. **-L** - lists all available parameters.
- i. **READPARAMETERS** (read parameters) - read all active parameters; CSV Format TBD; used by GUI
- j. **WRITEPARAMETERS** (write parameters) - writes all active parameters; CSV Format TBD; used by GUI
- k. **PARAMOPTIONS** (get parameter options) - dumps out TYPE,UNITS,SCALE for all parameters; CSV Format TBD; used by GUI
- l. **SETDEFAULTS** (set default values for most settings) - sets a default for most of the values; mostly used on a new CPU with random flash contents; follow this command with **WCONFIG** to save these values to flash RAM.
- m. **LOG [-ON,-OFF] [-I Interval] [-F Filename]** (log) - displays current state if no arguments given
  - a. **-ON,-OFF** - turns logging on or off.
  - b. **-I Interval** - lets logging interval in minutes. If no Interval given, defaults to 2 min.
  - c. **-F Filename** - sets log file name
  - d. We recommend setting all parameters except **-on,-off** first, then issue a **WCONFIG** to store them, and issue the command again with **-on** or **-off**. The on/off state is not stored in the flash and needs no **wconfig**.
- n. **CAL TYPE** – (calibrate sensor) - enters calibration dialog for sensor type if one exists; TYPE must be the parameter number or the parameter name and units (e.g. CAL PH\_UNITS).
- o. **WU** or **WARMUP [TYPE,N] [-DEF][-MAX]** (warmup times) - sets warmup time **N** in seconds for sensor **-DEF** sets all sensors to default times. **-MAX** returns the maximum warmup time; no arguments displays list of all warmup times
- p. **D** or **DIR** (directory) - displays all files in file system along with creation date & time
- q. **DELETE [filename,-ALL]** (delete file) - delete file specified by filename or all files if **-ALL** given
- r. **EMPTY [filename]** - empties contents of filename; zero length file remains
- s. **MKFILE Filename** (make file) - create new empty file Filename
- t. **GF [Filename]**(Get file) - output contents of Filename; current log file is output if no filename specified
- u. **FORMAT** (format file system) - prepares flash storage for use as a file system; destroys all current data
- v. **FORMAT63** will format sector 63 to clear Customer Parameter memory.
- w. **MEM N** or **MEMUSAGE** - displays program memory (the 32 bits of memory in address N) in reverse byte order (e.g. N = 0, 1, 2, or 3 each return the same values with byte 3 displayed first, byte 2 second, etc.)
- x. **PD SECTOR PAGE** - Dumps a File System Flash Page in hex and ascii.
- y. **DATE [YYYY MM DD]** (Set/Get date) - set date; no arguments returns current date
- z. **TIME [HH MM SS]** (Set/Get time) - set time; no arguments returns current time
- aa. **BP [“BP”,N]** (Set/Get Barometric Pressure) - set barometric pressure to N or obtain it from Depth sensor if BP entered; no arguments returns current BP

- bb. **WCONFIG** - writes system configuration variables to a flash block in the CPU; this command must be executed after any configuration changes if the changes are to be persistent across system power cycles or resets
- cc. **CIRC: [-ON,-OFF]** - turns circulator on or off; returns OK if successful or ERR if no circulator
- dd. **WIPE** - issues a WIPE command to all sensors that have a wiper - this currently includes the Proteus Wiper and the Turbidity Sensor
- ee. **IO PORT [BITN] [STATE]** - diagnostic command to set/get microprocessor port bits; PORT BITN STATE sets the indicated bit to STATE; without STATE argument, returns the current state of the bit; without BITN, returns state of all bits on port; ports are 0,1,2; bits are 0 to 31; state is 0,1, or X for tristate; this command will not affect port bits assigned to non-GPIO functions
- ff. **PROGRAM** - puts the microprocessor into Program Mode so new firmware can be loaded with the Phillips Flash Utility; **PGSENSOR N** prepares the sensor board attached to port N for programming with the Phillips Flash Utility
- gg. **RESTART** - restarts the firmware by jumping to location 0 (which is the same response as when power is applied)
- hh. **TO N** - turns off scrolling, turns off sensor power, and puts the microprocessor to sleep; activity on the RX input will wake it up; be sure to use an N large enough so you have enough time to type a change to that format; TO 0 means the processor will never go to sleep
- ii. **UV [-ON, -OFF]** – turns UV light parameter on or off
- jj. **SPWR [0,1]** – turns sensor power off for 0; on for 1
- kk. **CHKS** – displays remaining stack memory
- ll. **XREAD** – used internally for reading multiple depth sensors
- mm. **SETTEMP [1,2]** – returns the temperature sensors ADC type; **SETTEMP[1]** sets older type AD7788; **SETTEMP [2]** sets sensor type AD7790
- nn. **T** – displays temperature in degrees C and thermistor info
- oo. **A** – legacy function to debug onboard ADC (most notable reads line voltage)
- pp. **CUSTOMPARAM** – create a customer parameter
- qq. **DELCUSTOMPARAM** – delete a custom parameter
- rr. **WRITEFILE** – legacy function that simulates log data for testing file system
- ss. **SN-[N]** -retrieve serial number or set it to the eight-digit value N

#### 4) Sensor Identification Tags

<b>TEMP</b> temperature	<b>ORP</b> oxidation - reduction potential
<b>COND</b> conductivity	<b>TURB</b> turbidity
<b>DPTH</b> depth	<b>CIRC</b> circulator
<b>DO</b> dissolved oxygen	<b>WIPR</b> wiper
<b>ODO</b> optical dissolved oxygen	<b>CHL</b> chlorophyll
<b>ODOT</b> ODO temperature	<b>RHO</b> rhodamine
<b>PH</b> pH	<b>TDG</b> total dissolved gas

#### 5) Proteus Connector Pin Assignments

The Proteus Underwater Cable has a DB-9 nine-pin connector on one end. Here are that connector's pin assignments:

pin 1 - no connect	pin 6 - power (5 - 15 VDC)
pin 2 - TXD (Transmit Data)	pin 7 - no connect
pin 3 - RXD (Receive Data)	pin 8 - no connect
pin 4 - power (5 - 15 VDC)	pin 9 - power (5 - 15 VDC)
pin 5 - ground	