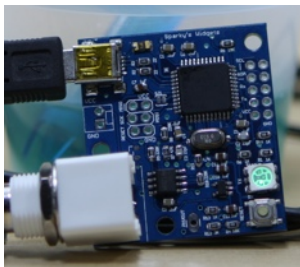




SPARKYS WIDGETS: LEOPHI PH INTERFACE v2.0B

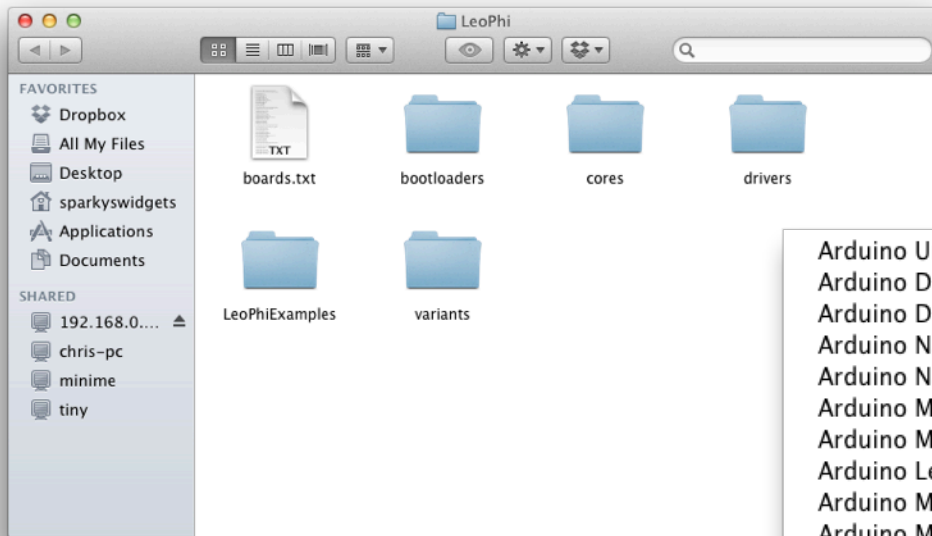


LeoPhi is the perfect solution for interfacing pH probes, supporting a large number of modern communication protocols. Featuring an Arduino compatible Atmega32u4 onboard LeoPhi allows users to configure it however it needs to be! Many key pins have been brought out to the 2 headers which allow for quite a few options from control to sensing!

Since this is an Open Source Hardware Project all design files, firmware and software are made available. This is the only OSHW, fully Arduino compatible pH interface out there.

INSTALLATION

LeoPhi is fully Arduino compatible, but does require some files to be copied over into the Arduino folder. These help tell the IDE what type of board it is (boards.txt), how to use the bootloader properly (again boards.txt and an update to core files), and what pins are there plus peripherals available (variants). In windows these files are located under the main Arduino folder\hardware\arduino, and on mac these are found by right clicking Arduino icon, then click “show package contents” with the path to the folders /contents/resources/java/hardware/arduino/. Windows users will also need to add the driver to the arduino’s driver folder then point to this folder for the driver source.



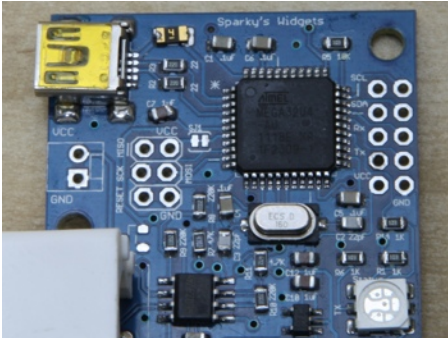
Simply copy the contents of bootloaders, cores, variants over into the appropriate Arduino folders. Then append Boards.txt with the contents of LeoPhi's boards.txt. Windows users can also copy drivers over Arduino Root/drivers.



- Arduino Uno
- Arduino Duemilanove w/ ATmega328
- Arduino Diecimila or Duemilanove w/ ATmega168
- Arduino Nano w/ ATmega328
- Arduino Nano w/ ATmega168
- Arduino Mega 2560 or Mega ADK
- Arduino Mega (ATmega1280)
- Arduino Leonardo
- Arduino Mini w/ ATmega328
- Arduino Mini w/ ATmega168
- Arduino Ethernet
- Arduino Fio
- Arduino BT w/ ATmega328
- Arduino BT w/ ATmega168
- LilyPad Arduino w/ ATmega328
- LilyPad Arduino w/ ATmega168
- Arduino Pro or Pro Mini (5V, 16 MHz) w/ ATmega328
- Arduino Pro or Pro Mini (5V, 16 MHz) w/ ATmega168
- Arduino Pro or Pro Mini (3.3V, 8 MHz) w/ ATmega328
- Arduino Pro or Pro Mini (3.3V, 8 MHz) w/ ATmega168
- Arduino NG or older w/ ATmega168
- Arduino NG or older w/ ATmega8
- ✓ Leophi

With any luck when the IDE is restarted you should see LeoPhi in the boards list. You can now use it just like an Arduino Leonardo! Including the USB serial port and the Hardware Serial port (USB to Serial and many other cool things).

This is similar to adding any other Arduino variant or custom board to the IDE. There are lots of tutorials on the net on how to add custom boards to Arduino IDE, should help be needed please ask us or look on the net!



PIN OUTS

LeoPhi features 2 headers which break out extra pins out for extensibility and ISP programming. These pins may be used as GPIO digital pins, or they can be used for their alternate functions which are listed below.

Whether LeoPhi needs to control a mosfet via PWM or read an analog input the various pins on the either SPI or expansion header will take care of it!

HEADER PIN FUNCTIONS			
FUNCTION	PIN#	PORT	ARDUINO#
VCC - can accepted 2.65-5v(5v recommended) regulated input via USB or 10 pin VCC pin	VCC	VCC	VCC
GND - Reference and return path	GND	GND	GND
Tx - RS-232TTL(5v) level Transmit Pin(USART1Tx) this is a separate serial port then the USB serial port. Serial1 in ArduinoIDE.	21	PD3	D1
Rx - RS-232TTL(5v) level Receive Pin(USART1Rx) this is a separate serial port then the USB serial port. Serial1 in ArduinoIDE.	20	PD2	D0
SDA - TWI Serial Data Pin (I2C SDA). Can be used as an External Interrupt INT(0)	19	PD1	D2
SCL - TWI Serial Clock Pin (I2C SCL). Output Compare(OC0B), Timer Counter(0) and INT(0)	18	PD0	D3
PWM output, Analog to Digital input(ADC12), Complimentary Output Compare(OC1A)	29	PB5	D9, A9
PWM output, Analog to Digital input(ADC13), Complimentary Output Compare(OC1B)	30	PB6	D10, A10
PWM output, also complimentary High Speed PWM signal to PC7	26	PC6	D5
Input capture, High Speed PWM, optional MCU clock signal output	27	PC7	D13
SPI Header pins			
SPI Bus Serial Clock, Pin Change Interrupt1	9	PB1	D15
SPI Bus Master Out Slave In(MOSI), Programming Data Input(PDI), Pin Change Interrupt2	10	PB2	D16
SPI Bus Master In Slave Out(MISO), Programming Data Output(PDO), Pin Change Interrupt3	11	PB3	D14
RESET is also brought out to this header for programming reasons, but is a handy place if needed for external resets from a master for example	13	Reset	Reset



BASIC OPERATION

LeoPhi ships with the Basic firmware loaded, this is a simple implementation of the pH interface and some more advanced ADC usage. It allows a user to get up and running right away by allowing common commands to be issued over Serial (or I2C is that sketch is loaded). On linux or mac for instance one could plug it in, place probe in calibration solutions wait a few moments in each, then send the proper calibration commands, and can be reading pH in a matter of seconds!

With proper care pH probes can last anywhere from 18-36 months (or longer). Care should be taken to keep them clean, and when in storage, stored in a proper solution (such as how many are shipped). When used In Situ its a good idea to regularly clean and calibrate to ensure probe age, and other factors are taken in consideration for pH calculations. Plus making sure the contact surfaces are clear of debris.

With some creativity this unit can be used to create some neat standalone pH meters. We've also included a demo on the project page, to show how one can wire up a 20x4 LCD, plus temp and humidity sensors to create a basic standalone meter!



STANDALONE, EASILY ADAPTABLE

This unit is the only one out there can has the power and ease of configuration to create a standalone meter, even allowing for adaptability here as well!



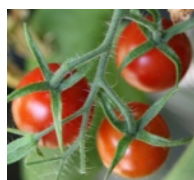
FIXED LOGGING, HARDWIRED (USB)

Whether you want to remotely read pH a few times a week or you want to constantly monitor pH over USB LeoPhi has you covered. Even allowing connection to Devices such as the Raspberry pie for Ultimate functionality (Hello Homebrewers!!!)



I2C SLAVE, OR OTHER PROTOCOLS

Easily adaptable whether over USB, Serial SPI, or I2C LeoPhi can communicate over them all. Thanks to all the hard work of the Arduino community what an Arduino can do so can LeoPhi!



COMMAND QUICK REFERENCE LIST

SERIAL COMMANDS	CMD	DEFAULT
Initiate a single pH read, response in "pH: XX.XX" notation	R	NA
Set pH 7 calibration (please allow a few moments for reading to settle before sending cmd)	S	NA
Set pH 4 calibration (please allow a few moments for reading to settle before sending cmd)	F	NA
Set pH 10 calibration (please allow a few moments for reading to settle before sending cmd)	T	NA
Get Information (version, pH calibrations, probe slope, etc...)	I	NA
Set reading mode to Continuous (data dump every second)	C	ENABLED
Set reading mode to Single (issue R CMD to get reading)	E	DISABLED
L0	ORG	4572
L1	PUR	6985
I2C COMMANDS		
0x00 : Request full I2C register Dump	0x00	
0x00, 0x46 : Send Set pH4 calibration (F hex ASCII)	0x00 0x46	
0x00, 0x53 : Send Set pH7 calibration (S hex ASCII)	0x00 0x53	
0x00, 0x54 : Send Set pH10 calibration (T hex ASCII)	0x00 0x54	
0x00, 0x58 : Send Reset to Defaults command (X hex ASCII)	0x00 0x58	

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