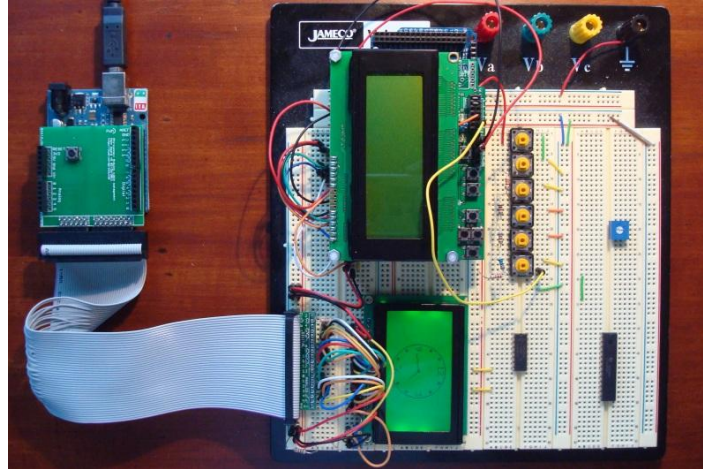


Phi-connect for Arduino (connector board V1.9)



*Last reviewed on 3/29/2012
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1. Introduction

Welcome to the phi-connect wire management system for your Arduino UNO and compatible boards! This is an innovative system to manage all wires for your projects on your breadboards or in your project boxes. Finally have the freedom to switch between projects without having to reconnect dozens of wires, and defeat the spaghetti jumper wire monsters residing on your bread boards or in your project boxes! Take a look at the following pictures you will understand its importance.

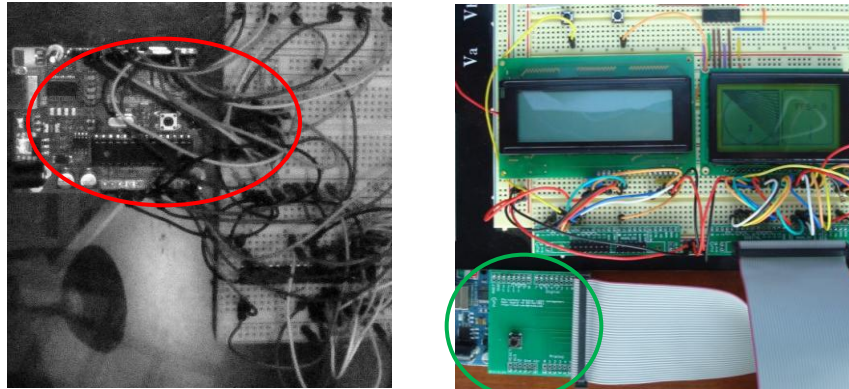


Fig. 1 **Messy wires** between Arduino and breadboard, switching to another project takes an hour and lots of headache. Use phi-connect, **Arduino is clean** and switching between left project and right project is a quick 5 second work!

2. Main features

Here are the main features of the management system:

- ☆ The main board brings all Arduino connections to a 28 pin connector.
- ☆ A ribbon cable passes all pins from Arduino to a breadboard using a breakout board. One cable, one step to connect or disconnect; no need to reconnect dozens of wires when switching between projects or messy jumper wires hanging over your arduino or breadboard.
- ☆ Breakout board clearly marks all pins so you can easily read and connect them.
- ☆ Main board can be stacked above or below other shields. Stacking female headers and right angle male headers are needed to stack phi-connect below a shield.
- ☆ 2-pin connector on the breakout board plugs into two buses, supplying 5V and GND, and also improve mechanical stability.
- ☆ Additional 12 connections for 5V and 12 connections for GND, perfect for use as switch board inside a project box
- ☆ The kit contains all parts for one set of boards and an extra breakout board to get you started working on two projects. You can easily switch between projects on two breadboards or regions of one breadboard. One cable, one step, no mixed up wires, no hair-pulling or cursing.

- ☆ The breakout board comes with mounting holes for permanent installation in a project box. Imagine how heart-breaking it must be to take your complete project apart just to reuse the Arduino. With the breakout board, you can remove your Arduino in a blink of the eye. In the future you want this project again; just reconnect Arduino with one step, your project springs back to life and well!
- ☆ Showing off your project won't be embarrassing with wires all over the place.

The following is just a short list of things that you will be missing if you use the phi-wire:

- ⊗ Having to reconnect dozens of wires when switching between projects
- ⊗ Memorizing which jumper wire goes where when switching between two projects
- ⊗ Having to break your heart pulling Arduino from a complete project, reducing the project into tangled wires
- ⊗ Nasty spaghetti monster residing on your Arduino, breadboard, or project box
- ⊗ Having to redesign connections between breadboard and perforation board
- ⊗ Ashamed to share your project pictures fearing to be accused as disorganized

3. Parts list

| Part | Quantity |
|--------------------------------|----------|
| Main board | 1 |
| Breakout board | 2 |
| Male headers | 3 |
| Tactile switch | 1 |
| Ribbon cable | 1 |
| Stacking female headers | 4 |
| Right angle 2-row male headers | 2 |



Fig. 2 Phi-connect kit parts. Picture has connector boards V1.8 (top right).

4. How to assemble

Version 1.8 assembly steps are included below. For other versions, just follow similar steps and read the white silk screen on the board. Version 1.5 and 1.9 have two sets 5v/GND pins. Version 1.9 also has a lot of additional 5V and GND that you only need if you use it inside of a project box with on breadboard.

This shield is very easy to assemble. When assembling the main board, make sure you use the outside holes for the stacking female headers, see fig.5-1. The trick to assemble the connector boards is to following these steps in sequence:

- 1) Solder the 5V/GND pins first, facing down, see fig. 4.1
- 2) Solder the 28 pins for the ribbon cable, all facing up, see fig. 4-2
- 3) Solder the 19 pins for the breadboard, all facing down, see fig. 4-3

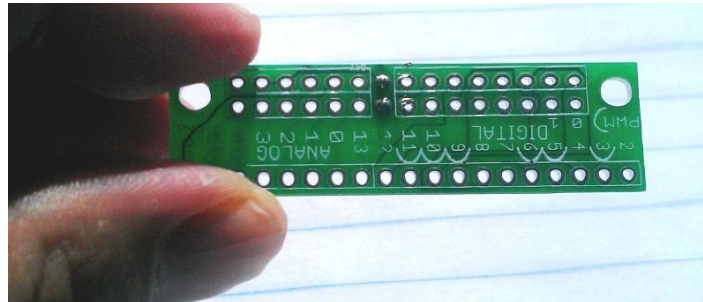


Fig. 4-1. Solder the 5V/GND pins first, facing down, with the side with text as up.

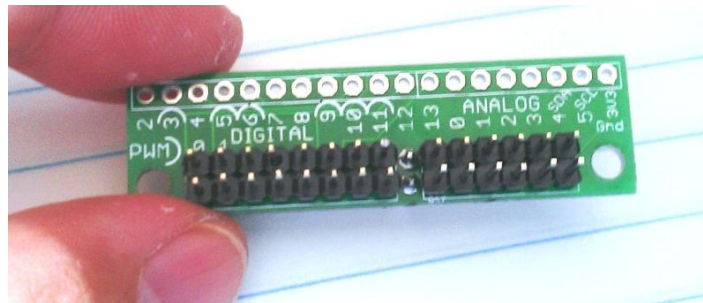


Fig. 4-2. Solder the 28 pins for the ribbon cable, all facing up. See the 2 pins are facing down.

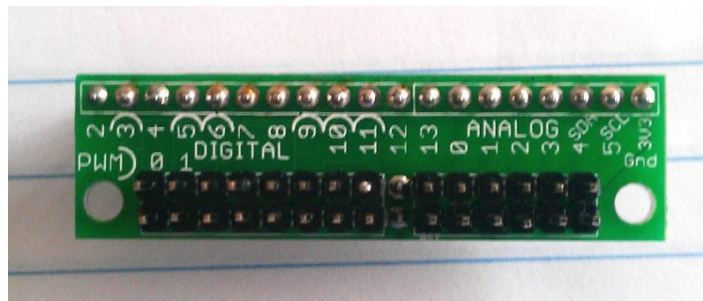


Fig. 4-3. Solder the 19 pins for the breadboard, all facing down.

5. How to use

DISCONNECT FROM THE BREAKOUT BOARD BEFORE YOU UPLOAD A DIFFERENT PROJECT. HOLD THE RESET WHILE CONNECTING TO A DIFFERENT PROJECT!

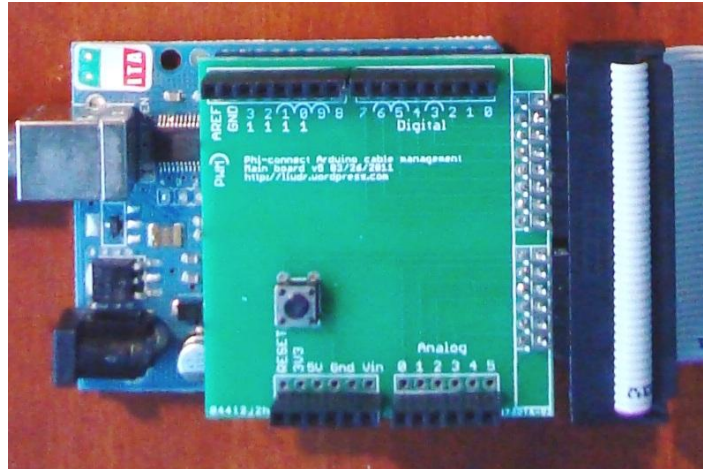


Fig. 5-1 Connect the main board to Arduino or compatible board.



Fig. 5-2 Insert breakout board on a breadboard per picture. Make sure that you have inserted the downward 2-pin firmly into the busses on the side of your board. This powers these busses and stabilizes the breakout board.

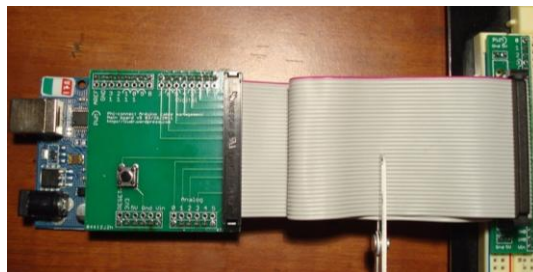


Fig. 5-3 Connect the main board to the breakout board. Watch the mechanical key when you insert the connectors. THE CABLE STAYS FLAT. DO NOT TWIST IT 180°.

6. Improving your Arduino experience with phi-connect

The following are examples (Connector board V1.5 was used in pictures) from me and contributors (contact me if you want to be featured):

1. Switching between several projects is a snap

I have a project using a 128X64 dot matrix LCD, which needs 20 connections to arduino. I also have a project using a 20X4 character display, which needs 12 connections with arduino. If I want to switch between these two projects, I'm looking at a major headache of rewiring my arduino with these 32 wires every time I switch project. That's why one of these projects has never started! Will phi-connect will eliminate my headache? Yes!

- **Project 1 – alarm clock**

This is an alarm clock project I wrote for my phi-2 shield. I've modified it to use only two buttons. I need 20X4 character display for it.

- **Project 2 – obstacle sensor with display**

This is a project to display obstacles behind my car on dot matrix display and I am in the very beginning of it. I'm just using the 128X64 display to run its test code. After this, I will want to draw pictures on it to represent sonic ranger results of obstacles. I'm working with someone half way across the world.

- **Solution**

Using one phi-connect kit, I am able to switch between these two projects effortlessly, taking a total of 10 seconds to disconnect my arduino from one project and and reconnect it to the other project. My arduino doesn't have to be tethered to my breadboard with haywire-like jumper wires but will sit nicely besides the table.

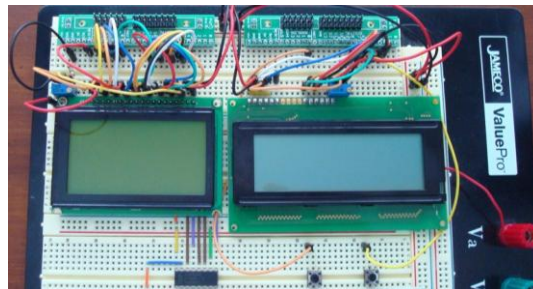


Fig. 7 Two breakout boards are attached to my large breadboard (top left and top middle). The left side is my car sensor project with a 128X64 display; the right side is my alarm clock project with a character display and two buttons.

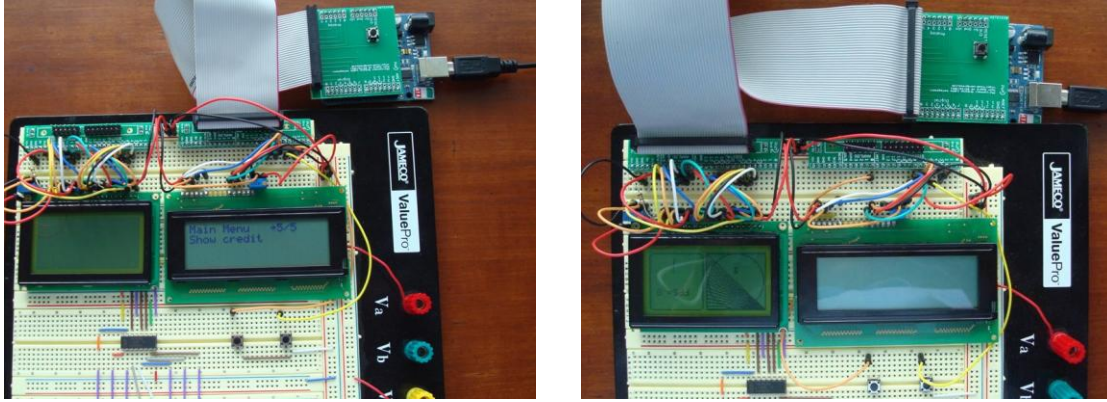


Fig. 8 With the Phi-connect, I can separately power the first project or the second project. Switching between has never been so easy!

II. Organizing your crazy jumper wires is a snap

I am sending phi-connect to a few brave volunteers to expose their messy project pictures and hope to get their much-improved wire organization after using the phi-connect. I will update this section as information becomes available. Contact me if you want to contribute pictures and a short project description, you'll be sharing your experience anonymously.

III. Installing your project in a box is a snap

I am sending phi-connect to a few brave volunteers to expose their messy project installation pictures and hope to get their much-improved wire organization after using the phi-connect. I will update this section as information becomes available. Contact me if you want to contribute pictures and a short project description, you'll be sharing your experience anonymously.

7. Updates and future improvement

The original version released in 2011 was V1.5 of breakout board. Two later versions were released in 2012. V1.8 breakout board is small and has less pins. V1.9 is identical to V1.5 only with added 5V and GND strips.

I would ponder on the following in the future:

- Feedback from customers like you can help me a lot. Visit <http://liudr.wordpress.com> and leave your feedback under Phi-duino
- I will consider a screw terminal breakout board
- I will consider a MEGA-connect if enough people are interested
- I will also consider a connector board to easily connect various LCDs and keypads to your arduino via phi-connect. You will miss all the fun messing with the wires but gain a lot of time and enjoy your project quicker and better.

8. Read this if you want to use your own old cables!!!

If you plan to use your old cables lying in a box of old computer parts, the following list tells you what works and what doesn't, in order of preference (first is most suggested):

- ☑ 34-wire floppy drive cables. Use a sharp knife and cut the useless half cleanly. Make sure the cut edge is clean without loose wire ends touching one another. **Make sure you line up your connections as there's no mechanical key.**
- ☑ 40-wire hard drive cables. As long as you line up the mechanical key with the connectors, and don't twist the cable, you are fine. Please use a short cable.
- ☒ **But if you insist on using 80-wire hard drive cables, let me convince you not to. Here's why:**
 - Pin 19, 22, 24, 26, 30, and 40 are not separate, but connected to the ground!
 - Pin 28 of the gray (slave/middle) connector of an 80 conductor cable is not attached to any conductor of the cable. It is attached normally on the black (master drive end) and blue (motherboard end) connectors.
 - Pin 34 is connected to ground inside the blue connector of an 80 conductor cable but not attached to any conductor of the cable. It is attached normally on the gray and black connectors.
 - For more information, visit http://en.wikipedia.org/wiki/Parallel_ATA

9. The legal stuff

Let's keep this short: be safe with electronics! The phi-connect wire management system is sold as an un-assembled kit. Buyers assume all responsibilities the moment they start assembling the kit. You should practice caution when soldering and when using it. The designer assumes no responsibility for personal injuries or property damages.