PSI User's Guide

Version 1.31
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1. Introduction

Thank you for purchasing my "Astromech PSI Kit." These boards are my first electronic contribution to the R2 Builders Club. They were designed with several goals in mind:

1) To create PSIs with a "random-looking" flash pattern
2) To create PSIs which can flash or fade
3) To use high-brightness LEDs
4) To use wide-angle LEDs to minimize "hot spots"
5) To create round PSI boards that can be mounted in a tube
6) To create a fully assembled kit for less than $50, including domestic shipping

2. Getting started

Kit Contents:

Your PSI kit contains two PSIs, mode selection shunts (jumpers), and connection wires.

In a standard PSI kit, the front (red/blue) PSI contains the "brains" of the system, and will be referred to as the "master" PSI. The rear (yellow/green) PSI does not contain any control electronics, and is referred to as the "slave" PSI.

The wires have been twisted to form two cables. A standard PSI kit contains a two-wire (red & black) POWER CABLE and a three-wire (red, yellow, and green) MASTER/SLAVE CABLE.

The shunts are used to control the operating mode of the PSIs, and will be explained in more detail later.

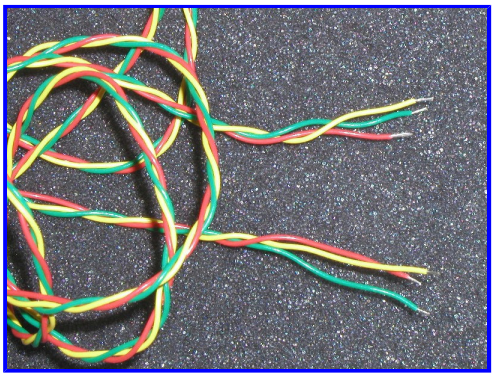
Required Tools and materials:

- Small common screwdriver
- Wire strippers
- Wire cutters
- 12V DC source (battery or DC power supply)

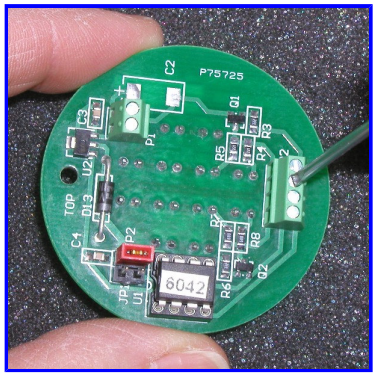
2a. Connecting the front and rear PSIs

The front (red/blue) PSI contains the "brains" of the system, and will be referred to as the "master" PSI. The rear (yellow/green) PSI does not contain any control electronics, and is referred to as the "slave" PSI.

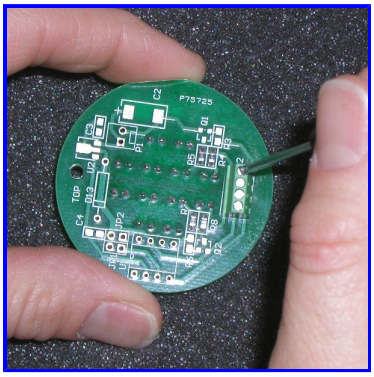
1) Strip off about 1/8" of insulation from all three wires on both ends of the MASTER/SLAVE CABLE:



2) Loosen the terminals of the four pin connector (J2) on both the MASTER board and the SLAVE board by turning the screws counter-clockwise.



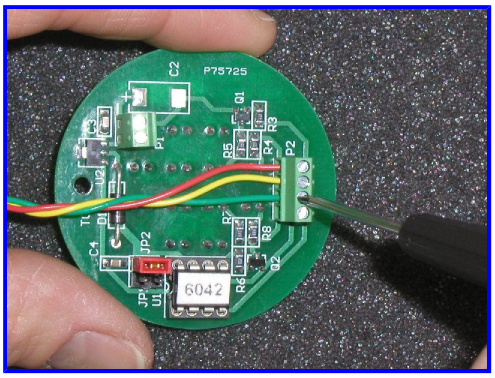
Master Board



Slave Board

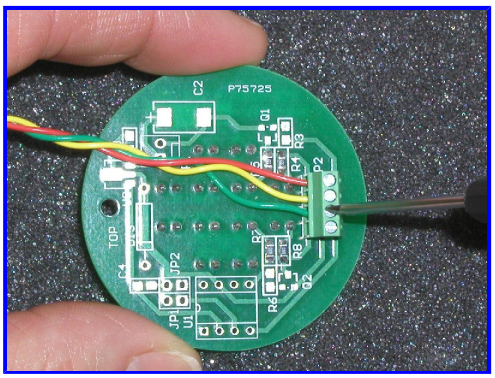
3) Insert the stripped wires into the four pin connector (J2) on the MASTER board and tighten the screw terminals by turning the screws clockwise.

Be sure to match the color and location of each wire (RED, YELLOW, GREEN, NONE) in the picture. Note that the fourth position ("GND") is not used.



Master Board

4) Repeat for the matching connector (J2) on the SLAVE board, making certain that the wire locations match in both connectors. Again, note that the fourth position ("GND") is not used.



Slave Board

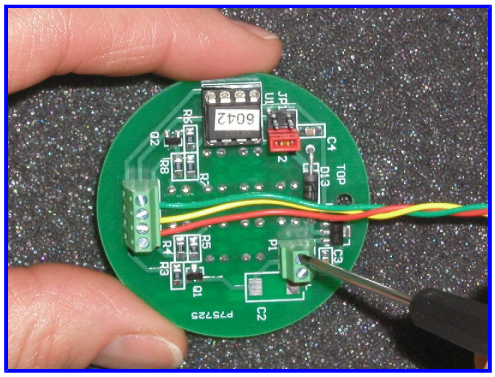
WARNING!

Never connect a "master" board to another "master" board. If your kit contains two master boards, you should connect each board to a power source, and not to the other board. I don't believe that anything will fry, but you'll be attempting to drive the LEDs from two different sources.

2b. Connecting the Power Cable

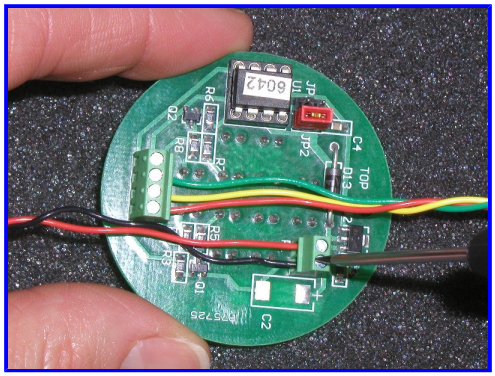
1) Strip off about 1/8" of insulation from both wires on one end of the POWER CABLE:

2) Loosen the terminals of the two-pin connector (J1) on the MASTER board by turning the screws counter-clockwise.



3) Insert the stripped wires (RED = +12V, BLACK = GND) into the two-pin connector (J1) on the MASTER board and tighten the screw terminals by turning the screws clockwise.

   Be sure to match the color and location of each wire (RED, BLACK) in the picture.



4) Strip off the insulation from the other end of the power cable to suit your wiring configuration.

5) Connect the stripped wires to the battery or DC power source, making sure that the RED wire is connected to +12V (or BATTERY+), and the BLACK wire is connected to GROUND (or BATTERY-).

6) The properly connected PSIs will blink three times, then begin sequencing the LEDs in the selected operating mode.

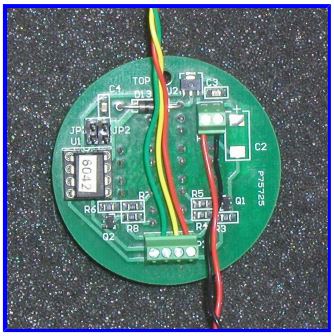
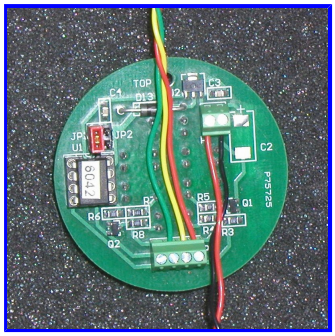
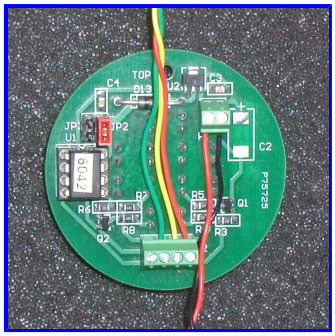
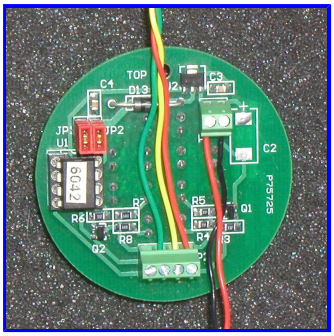
WARNING!

These boards are designed for 12V power. Using less that 12V will reduce the brightness of the LEDs. Using greater than 12V will overdrive the LEDs, and may cause permanent damage.

3. Operating Modes

These PSIs use a microcontroller to control the flash rate and pattern, to create a psudo-random behavior. The boards can operate in one of four modes, controlled by installing different combinations of shunts on jumpers JP1 and JP2. The four modes of operation are:

1) FLASH mode (no shunts) - colors change by blinking back and forth.
2) FADE mode (shunt on JP1) - colors change by fading back and forth.
3) FLASH+FADE (mixed) mode (shunt on JP2) - colors change by a combination of blinking and fading.
4) TEST mode (shunts on JP1 and JP2) - colors FLASH slowly, to allow you to verify each LED is operating properly, or to help with placement of diffuser material.

			
 FLASH mode (no shunts installed)	 FADE mode	 FLASH+FADE mode	 TEST mode (both shunts installed)

Note: Shunts are shown in RED. Your shunts may be a different color.

In all cases, you'll need to remove power from the board and power it back on again for the new jumper setting to take effect. The PSIs typically ship with shunts installed for "mixed" mode (FLASH+FADE), with a spare shunt on one of the pins (or in the bag) for storage.

4. Mounting Considerations

Each PSI board is 1.875" (1 7/8") in diameter, and there should be sufficient clearance to the board edge to allow for a tube with a 1.75" (1/ 3/4") inner diameter to butt up against the board.
I've found several pieces of PVC tube that work pretty well. I also went to onlinemetals.com and ordered aluminum tube that was (if memory serves)

2.00" OD, 0.058" wall thickness and
1.875 OD, 0.058" wall thickness

This should allow the smaller tube to fit inside the larger tube, and be used as a "spacer" between the PCB and any diiffuser material that one might choose to use. However, I haven't built one up like this yet, so I'm still talking "in theory".

5. Board Versions and Revisions

Each PSI board has a label indicating the version and revision of the board. Most kits ship with a red/blue master board and a yellow/green slave board. However, the exact version and revision of each board depends on when the board was made, what connectors are being used, whether it's a master or a slave board, and the LED configuration for the board. The table below summarizes all currently available versions and revisions.

VERSION	REVISION	MASTER/SLAVE	LED COLORS	LED ARRANGEMENT	PCB	CONECTOR TYPE
SUB-R2001-A	00	Master	Red/Blue	Left/Right	A	Molex latching (white or brown)
SUB-R2001-A	01	Master	Red/Blue	Left/Right	A	Phoenix (green w/screw terminals)
SUB-R2001-A	02	Master	Yellow/Green	Left/Right	B	Phoenix (green w/screw terminals)
SUB-R2001-B	00	Slave	Yellow/Green	Left/Right	A	Molex latching (white or brown)
SUB-R2001-B	01	Slave	Yellow/Green	Left/Right	A	Phoenix (green w/screw terminals)
SUB-R2001-B	02	Slave	Yellow/Green	Left/Right	B	Phoenix (green w/screw terminals)
SUB-R2001-C	00	Master	Yellow/Green	Left/Right	A	Molex latching (white or brown)
SUB-R2001-C	01	Master	Yellow/Green	Left/Right	A	Phoenix (green w/screw terminals)
SUB-R2001-D	00	Slave	Yellow/Green	checkerboard	B	Phoenix (green w/screw terminals)
SUB-R2001-E	00	Master	White/Green	Left/Right	A	Phoenix (green w/screw terminals)
SUB-R2001-F	00	Slave	White/Green	Left/Right	A	Phoenix (green w/screw terminals)
SUB-R2001-G	00	Master	Red/Blue	checkerboard	B	Phoenix (green w/screw terminals)

6. Additional Information & Feedback

For the latest versions of this document, go to http://www.radiostarband.net/r2-d2/index.html and follow the links to the PSI page. The online html version contains links to larger images as well.

I'm interested in hearing your comments, complaints, and suggestions. If you have any "out of the ordinary" requests (different flash rates or patterns, different colors, etc.), get in touch to discuss what you'd like to do.

7. Document History

VERSION	DESCRIPTION
1.0	Initial Release
1.1	Added wiring instructions for screw terminal connectors
1.2	Corrected photo and text in section 2a., step 3.
1.3	Added board versions and revisions to section 5.
1.31	Added version "G" board to section 5.