Step-By-Step Instructions

Warning: Not adhering to the following assembly sequence could prevent you from gaining the required access to another component.

✓	Task
	1. Solder the 8-pin DIP IC socket to the PCB, making sure to orient the notch as shown on the white silkscreen on the PCB.
	2. Solder J1 to the PCB, with the open end of the connector oriented off the edge of the PCB.
	3. Solder (the short leads of) JP1 to the PCB. Orientation doesn't matter.
	4. Solder Q1 to the PCB, orienting it to match the shape outline on the PCB.
	5. Solder Q2 to the PCB, orienting pin 1 toward the white circle on the PCB.
	6. Solder D1, D2, ZD1, and D3 to the PCB, orienting them as shown on the PCB: with the end of the component marked with the white band (cathode) toward the band side of the white "triangle/band" diode symbol shown on the PCB.
	7. Solder U2 to the PCB, orienting pin 1 toward the white circle on the PCB.
	8. Solder R1 through R10 to the PCB. Orientation doesn't matter functionally (but prefer gold-colored tolerance band down).
	9. Solder C4 and C3 to the PCB. Orientation doesn't matter functionally (but prefer labeled side away from the IC socket).
	10. Solder C2 and C1 to the PCB. These are polarized capacitors; make sure to orient them so the long lead (and the "+" marking on the component body) is closest to the "+" marked in white on the PCB. (**Note:** the "+" marking on C2 is very small).
	11. Solder L2 to the PCB. Orientation doesn't matter.
	12. Solder LED1 (blue) and LED2 (red) to the PCB. For each LED, the long lead is the anode and the short lead is the cathode. The cathode/short lead must go into the hole on the "flat side" of the LED outline on the PCB; the anode/long lead must go into the other hole (also marked with a "+" on the PCB). **Important:** The LEDs must be installed such that the centerlines of where the leads are parallel to the PCB are 3.5 mm ± 1 mm above the surface of the PCB. Note that there is a line on the edge of J1 (the green terminal block header) that is 3.5 mm from the PCB; you can use that line as a reference point (see photo on previous page). **Hint:** if you squeeze the leads for the LEDs at the elbow (where they're bent at 90°) to slightly bend them together, the LED will hold its position better after being inserted into the PCB, making it easier to solder.
	13. Insert L1 through the bottom side of the PCB with the leads emerging on the top side of the PCB, and adjust them to make L1 as tight against the PCB as possible and then solder them. Recommended: further secure L1 to the PCB by applying some kind of adhesive (a hot glue gun is ideal for this) between the PCB and L1 at the two points on L1's perimeter farthest from the leads.
	14. Install U1 in the IC socket, orienting it so the notch or dot indicated on U1 is aligned with the notch in the IC socket.

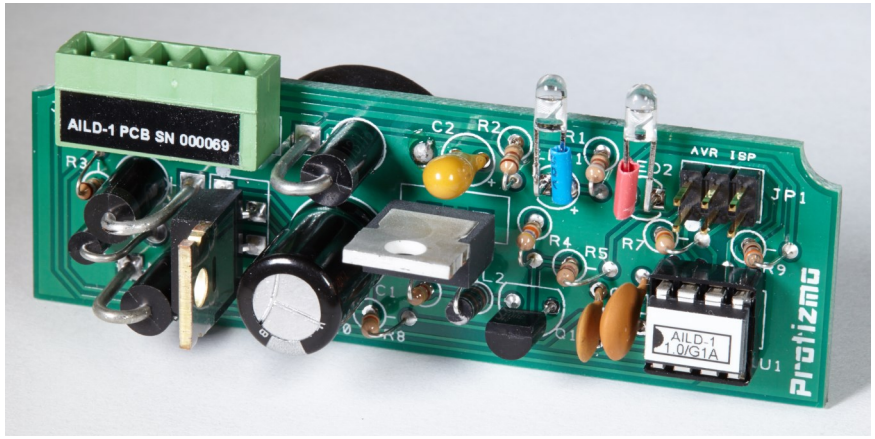
This completes the PCB assembly. To install it into the enclosure, slide the PCB into the appropriate slots in the enclosure and place the cover on it, adjusting the positions of the LEDs if necessary. Secure the lid with the screws provided. See *AILD-1 Installation and User's Guide* for more information.

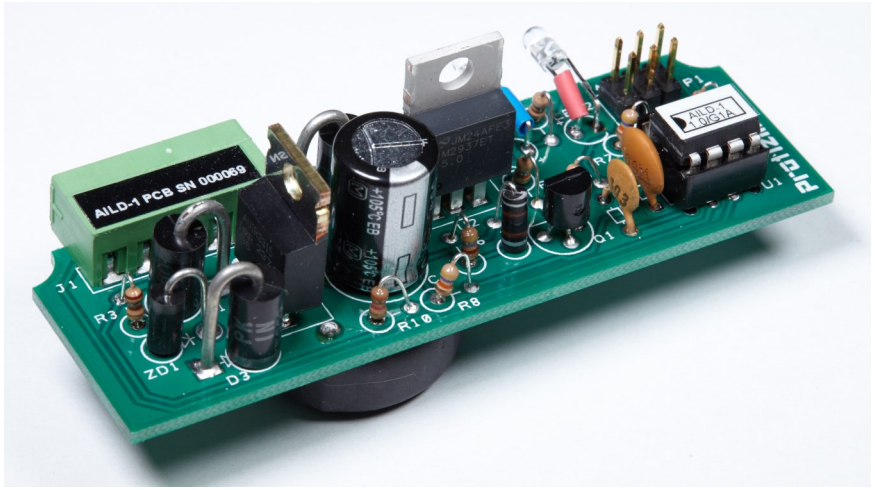
AILD-1

Automotive Instrumentation Lighting Dimmer

DIY Kit Assembly Guide

product information





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Parts List

The AILD-1 DIY kit includes:

- a PCB (printed circuit board) to which the electronic components must be soldered;
- various electronic "through hole" components, listed in the following table; and
- a pre-labeled, pre-slotted/drilled, two-part plastic enclosure with screws for the lid.

ID	Description
	8-pin, dual-wipe, low-profile, DIP IC socket
J1	OSTOQ053251: 5 position terminal block header, labeled with PCB serial number
JP1	2-by-3, 6-pin header, 2.54 mm pitch, male, straight
Q1	2N3904: 200 mA, 40 V general-purpose NPN transistor
Q2	AUIR3315: 40 V, 3 to 30 A, current sensing, low EMI high side switch
D1, D2	80SQ045NG: 8 A, 45 PIV Schottky rectifier
ZD1	P6KE24A-T: 24 V, 600 W, uni-directional TVS
D3	1N5822: 3 A, 40 PIV Schottky rectifier
U2	LM2937ET-5:.0 5 V, 0.5 A low dropout voltage regulator
R1	820 Ω, ¼ W, 5% carbon film resistor
R2, R3	100 Ω, ¼ W, 5% carbon film resistor
R4, R7, R8	47 kΩ, ¼ W, 5% carbon film resistor
R5	1 kΩ, ¼ W, 5% carbon film resistor
R6	4.7 kΩ, ¼ W, 5% carbon film resistor
R9	330 Ω, ¼ W, 5% carbon film resistor
R10	3.3 kΩ, ¼ W, 5% carbon film resistor
C4	10 nF, 50 V, 20% ceramic disc capacitor
C3	100 nF, 50 V, 20% ceramic disc capacitor
C2	10 µF, 20 V, 2.9 Ω ESR tantalum capacitor (Note: long lead is "+")
C1	220 µF, 50 V, 10000 h @ 105 °C radial-lead electrolytic capacitor
L2	100 µH, 125 mA I_{dc} choke
LED1	OVLBB4C7: 3 mm blue discrete LED (45°, 470 nm, 1750 mcd) (Note: long lead with blue heat-shrinkable tubing is anode, short lead is cathode)
LED2	OVLBR4C7: 3 mm red discrete LED (45°, 623 nm, 3700 mcd) (Note: long lead is with red heat-shrinkable tubing is anode, short lead is cathode)
L1	390 µH or 470 µH toroidal power inductor
U1	ATTINY85-20PU: 8-pin P-DIP, 20 MHz ATtiny85 AVR microcontroller, pre-programmed with the version of the AILD-1 firmware shown on the label

Additional Items Needed

You will need the following tools and supplies (not included with the kit):

- a soldering iron (temperature-controlled with a small $^{1}/_{16}$" screwdriver tip such as Weller "ETA" is recommended);
- solder (⌀ 1 mm lead-free solder such as Sn96.5/Ag3/Cu0.5 is recommended); and
- small wire cutters for cutting component leads.

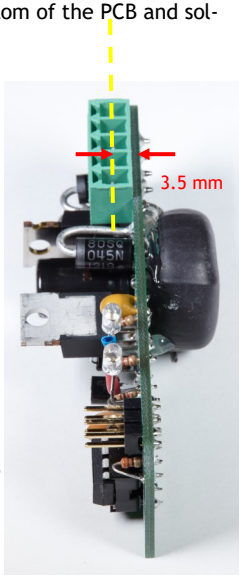
Useful, but not necessary:

- a clip-on heat sink (to limit component heating during soldering);
- a PCB holder/vice (e.g., a PanaVise of some sort);
- tweezers;
- reverse tweezers (useful for holding certain components to the PCB while soldering);
- solder wick and/or a solder sucker tool (to undo any soldering mistakes); and
- good task lighting.

General Instructions

With one exception, all components are mounted on the top side (where the component outlines are silkscreened in white) of the PCB and soldered on the bottom side. The sole exception is the toroid inductor L1, which is mounted on the bottom of the PCB and soldered on the top.

The through-hole components come in two styles, each of which need to be handled a little differently when inserting and soldering the component to the PCB:



- The components with short, stiff leads (J1, JP1, and the 8-pin DIP IC socket) should be inserted and held in place with reverse tweezers, tape, or some other clamping mechanism while you solder them. The leads do not need to be trimmed before or after soldering.

- The components with longer, flexible leads should be inserted and the leads bent (to hold the component in place so it doesn't pull out again when the PCB is flipped over for soldering). The leads should be trimmed (to approximately 1 mm to 2 mm of exposed lead) prior to soldering.

Due to space constraints on the PCB, axial lead components are mounted vertically, with one lead bent around 180°. The component outline markings on the PCB show a circle for the end of the component that should be placed against the board, with a line pointing toward the hole for the other lead.

It is critical to get the polarity correct on all components *except* for the ten resistors R1-R10, ceramic disc capacitors C3 and C4, and inductors L1 and L2. (On pre-assembled AILD-1 units, by convention and for consistency, resistors are mounted with the gold tolerance band down and with C3 and C4's printed markings oriented away from the IC socket, but this is not required for functional reasons).

If you are using lead-free solder (e.g., Sn96.5/Ag3/Cu0.5), a tip temperature of 750 °F (400 °C) should yield good results. Do not apply heat any longer than necessary to flow the solder joints.