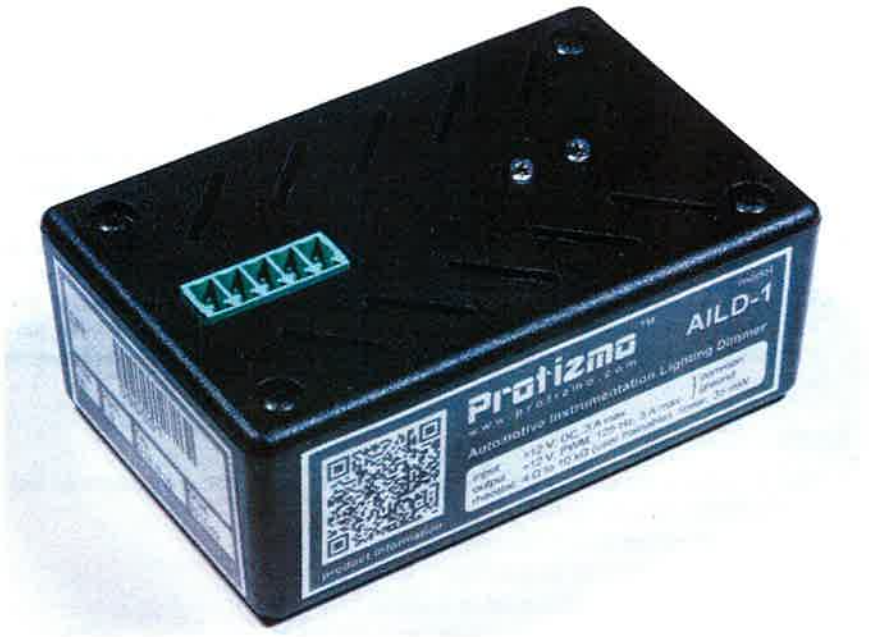
AILD-1

Automotive Instrumentation Lighting Dimmer

Installation and User's Guide

product information



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Features

- simple installation: wired between existing dimmer rheostat and the wires originally connected to that rheostat, along with one new ground wire
- small enough to tuck somewhere under dashboard
- high-side driver, supporting common-ground operation
- microcontroller-based control
- anti-noise rheostat input filter (implemented in software; eliminates or reduces the effect of the "high resistance" spots while moving the rheostat control)
- illumination level fader (up/down adjustments are smoothed)
- after a brief delay allowing further adjustment, illumination level is locked to avoid jitter (hysteresis implemented in software)
- output short-circuit protection with visual fault indicator and automatic reset
- reversed input power polarity protection
- two indicator lamps (LEDs) to provide information about the state of the unit
- defaults to 50% illumination level if rheostat is disconnected
- pre-configured for 6 Ω rheostat; can be trained to work with rheostats in the range 4 Ω to 10 kΩ, and can also be trained to invert the operation of the rheostat (turn opposite way to increase illumination)
- for those who want the ultimate in control or are interested in future potential developments: in the event new software or different configuration parameters are desired, a single, socketed 8-pin DIP IC containing the software can be replaced or the software and/or configuration can be programmed via the 6-pin AVR ISP header (an AVR programmer such as the Atmel AVRISP mkII would be required if you ever wanted to experiment with this)

Specifications

- 12 V DC nominal voltage (typical automotive voltages of 14 V DC are acceptable and voltage spikes are suppressed)
- 3 A maximum output current for output/load
- 125 Hz PWM frequency for output/load
- 35 mW maximum power dissipation at rheostat
- AILD-1 main unit dimensions: 84 mm × 54 mm × 31 mm (3.3 in. × 2.1 in. × 1.2 in.)
- AILD-1 main unit weight: 76 g (2.7 oz.)

Connections

The AILD-1 has a single five-position jack which mates to a removable plug for the electrical connections:

- Ground: provides a ground reference point for both the microcontroller and the output; must be connected to the vehicle ground (typically, a chassis ground point near where the AILD-1 is installed)

- Power: provides power for both the microcontroller and for the output driving circuitry.
- Rheostat B and Rheostat A: connect to the variable resistance (i.e., a rheostat/potentiometer) to measure to control the output illumination level.
- Output: up to 3 A of PWM current to drive instrumentation light-

ing. Connected to the wire in the vehicle that is connected to the instrument lights; that wire must first be disconnected from its existing power source (generally, one of the wires initially connected to the dimmer rheostat).

Indicators

The AILD-1 has a:

1. ● red indicator lamp for faults and other status (solidly lit indicates output short circuit or current limiter hit; 1 Hz blinking indicates that rheostat is disconnected; 4 Hz blinking indicates that rheostat profiling—system training—is enabled; 10 Hz blinking continuously for 5 s indicates resetting to factory configuration; 10 Hz blinking and also on/off at 1 Hz rate indicates incomplete or invalid configuration; rapid flickering during firmware programming)
2. ● blue indicator lamp for monitoring output; illuminates at same level as lights connected to output; also blinks (along with any lights connected to the output) for 2 s at 4 Hz to indicate that rheostat profiling/training has completed

Usage

Once installed (and optionally configured; see the next section), the operation of the AILD-1 is as simple as adjusting the rheostat connected to terminals Rheostat A and Rheostat B. The illumination level of lamps connected to the output will track the rheostat position.

Advanced Configuration: Training the Dimmer with a Rheostat Profile

1. Provide power to the dimmer module (turn on the instrumentation lights if it is connected to a lighting circuit).
2. Disconnect either one of the wires between the rheostat and the dimmer module for at least 1 s. As long as the rheostat is disconnected, the status indicator (red LED) will flash at 1 Hz and the monitor indicator (blue LED) and any connected lights will illuminate at a 50% illumination level.
3. Reconnect the rheostat. The status indicator (red LED) should start flashing at 4 Hz and the monitor indicator (blue LED) and any connected lights will illuminate to a level controlled by the rheostat (although it might not control the illumination level correctly until training is complete).
4. Constantly adjust the rheostat for at least 3 s, ending on which ever limit that you want to correspond to the lowest illumination level (completely off). You can adjust it slowly, but do not allow it to be in any one position for more than 0.5 s.
5. Wait at least 3 s without disturbing the rheostat.
6. Adjust the rheostat from one end to the other three times: starting with where it was in step 5 to the other end, back, other end, back, other end, back, ending where you started. Each time you hit an end, wait for at least 0.5 s, but no more than 3 s.
7. If the rheostat limits registered correctly (the resistances at each limit measured by the dimmer module must be close within a certain margin of error across the three cycles), the monitor indicator (blue LED) and any connected lights will flash at 4 Hz for two 2 s and then the status indicator (red LED) will turn off. You can proceed to step 9.
8. If you didn't get the results described in step 7 (i.e., instead, the status indicator is still flashing at 4 Hz), wait at least 3 s and then try again, starting at step 4.
9. As the rheostat is now positioned at the "low illumination level" end of its control range, the monitor indicator (blue LED) and any connected lights will be off (or will fade to off). The dimmer module has stored the rheostat profile in non-volatile memory; the rheostat should now control the illumination level correctly.
10. If, for some reason, you are not satisfied with the rheostat's controlling behavior, you can repeat the process starting at step 2. Note that once a training operation has succeeded as described in step 7, the dimmer module will not allow further training until the rheostat has been disconnected again.

Inactivity Time Limit

If, in steps 4 through 7, you do not adjust the rheostat at all for a minute or more, training mode will be deactivated: the status indicator (red LED) will turn off and you will need to repeat the process starting at step 2.

Stubborn Rheostats

It is not unusual with some rheostats to have to perform steps 4 through 8 repeatedly because the rheostats don't provide a reliable, repeatable resistance at the limits. Higher quality potentiometers will usually fare better than crude rheostats with the training process.

Resetting the Dimmer to the Factory Configuration

1. Provide power to the dimmer module (turn on the instrumentation lights if it is connected to a lighting circuit).
2. Disconnect either one of the wires between the rheostat and the dimmer module. As long as the rheostat is disconnected, the status indicator (red LED) will flash at 1 Hz and the monitor indicator (blue LED) and any connected lights will illuminate to half brightness.
3. Ground the Rheostat A terminal on the dimmer module five times (by connecting it with a wire to the Ground terminal on the dimmer module or any ground point to which the Ground terminal is connected): each time, ground for between 0.1 s and 1 s and then remove from ground for between 0.5 s and 2 s.
4. If the reset operation described in step 3 was detected correctly, the monitor indicator (red LED) will flash at 10 Hz for 5 s and the dimmer module has been reset to the factory configuration.