4044 – Low Voltage Disconnect

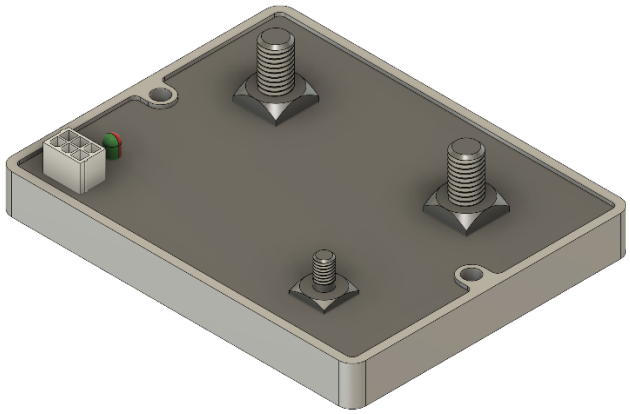
Items in RED are Preliminary and subject to change.

Features:

- 12V Automotive Operating Voltage
- Bi-Directional Current Flow
- 200A Continuous
- 250A Surge
- Disconnect after 60sec of being <11.6v
- Diagnostic Red/Green LED
- M10 Stud Connections
- Reverse battery Protection
- Short Circuit Protection
- Overload Protection
- Thermal Protection
- Reverse Current Protection (Optional)
- Loss of Ground Protection
- Loose Connection Protection

Operating Voltage:	11.6 … 16.0	V
On Resistance:	450	uΩ
Nominal Current:	200	A
Current Limitation:	250	A
Short Circuit Limit	350	A
Voltage Drop @ 200A:	90	mV
Switching Time:	60	uS
Over Temp Trip:	85	°C
Quiescent- Active	8	mA
Quiescent- Disconnected	4	mA

Package:



Overview

The 4044 is a smart battery protection module designed to keep your truck's power system reliable. It automatically disconnects auxiliary power if the vehicle system gets too low, preventing unexpected dead, deep-discharged batteries. Once the battery recovers, the user can perform a manual reset. Built for tough conditions, it handles high-power loads and includes multiple safety features to prevent damage. With a connection to dash-mount indicators and controls, it ensures your equipment stays protected and ready to go.

4044 – Low Voltage Disconnect

Functionality:

The B-4044 is a module that detects low voltage on the battery and will disconnect auxiliary power to the utilities in the truck. When the battery is less than 11.5V_{DC}, a 60 second timer will begin and will disconnect the load after the time is up. The board is designed to take an input voltage of +9.5-18.5V_{DC}, with a typical voltage of ~13.8V_{DC}. Additionally, it is to be designed to deliver up to a continuous 200A to the load with a maximum of 250A at 185°F (85°C). There are fault detections that will turn the switch off, disconnecting the load to protect it in cases such as reverse polarity protection, current sensing, overcurrent protection, under-voltage protection, short circuit, and high temperature. The device will function between the temperature range of -40 to +85°C.

A control input is used to clear any faults present and to resume normal operation after the load is disconnected due to low battery voltage. A voltage greater than +9.5V_{DC} must be applied to the control input for X number of seconds and then removed to clear/reset any present faults. Faults must be removed before normal operation happens. If the battery voltage is still below 11.5V_{DC} when the faults are cleared, another 60 second countdown timer will immediately initiate before disconnecting the load again. If the battery voltage increases at or above 11.6V_{DC}, the module will automatically resume normal operations, and power will be delivered to the load again.

An LED indicator determines the status of the device. During normal operation (above 11.5V_{DC}), a green LED will be on continuously. When there is a fault, the LED will flash red to indicate a fault. When the 60 second countdown timer starts due to low battery voltage, the LED will flash green indicating that the timer has been initiated. If the disconnect switch is off and not delivering to the load, the LED will be off entirely.

Faults will occur for the following conditions: Overcurrent, over temperature threshold, or above operating voltage range, and short circuit. An overcurrent fault will be present if the current exceeds the 250A rating for 500 milliseconds. The over-temperature fault will initiate if the case temperature exceeds greater than 185°F (85°C). Overvoltage fault will be present if the input voltage exceeds 18.5V_{DC} for more than 250 milliseconds.

4044 – Low Voltage Disconnect

Electrical Characteristics:

- 12-18V input (13.8-14.4VDC nominal)
- Low Voltage Trip at 11.5V
  - Disconnect after 60s at this voltage, prevents load surge from false disconnection
  - If voltage is at or above 11.6V, normal operation will resume
- 200A continuous; 250A Max
  - Assumes meets effective heat dissipation requirements (listed below)
- Operating range: -40 to +85°C
- Solid State Relay Typology, Bi-directional, True Battery Separation
- Ground Loss Protected
- Short Circuit Protected
  - 400A and over, shutdown within 220us
  - Verified at 80C operating temperature
- Idle Currents
  - ON – 8mA (with LED lit, no external LED)
  - OFF – 4mA (no LED lit, no external LED)
  - Proposed/pending Sleep with Latched Fault OFF– < 2mA
- Switching Cycles: >100,000 Cycles
- Switching Time: 10uS
- Contact Resistance: 450uΩ +/- 100uΩ (lowest in the industry)
- Voltage Drop at 200A: 90mV +/- 5mV (20.0W Dissipation, lowest in the industry)

Mechanical Characteristics:

- L x W x H: 5.2” x 4.14” x 1.4”/ 132mm x 105mm x 35mm
- Power Studs: M10 Thread, with Stainless Steel Nut, No Washer
- Ground and Control: M6 Stud, with Stainless Steel Nut, No Washer
- Molex MiniFit Jr. for Controls and Dashboard Indicator
- Dual Mounting Holes, 0.230”/ 6mm Diameter, 4.550”/ 116mm Apart
- T6061 Aluminum Back, isolated to 200V, requiring thermal paste or silicone thermal pad for dissipation
  - Effective heat dissipation will allow full operating current by the required items,
    - 1/8” Thick Aluminum, Size 18”x18”, Bolted to Aluminum Back with a minimum 5 ft-lbs of torque, must be flat surface, and minimum total surface area to be 2 sq ft
    - Thermal Paste or Silicone Thermal Pad, Size: 5.2” x 4.14” x 1.4”/132mm x 105mm x 35mm, maximum thickness of 1mm, placed between aluminum sheet and aluminum back
    - Power Studs Required Torque:14 ft-lbs (+/- 2 ft-lbs) of torque
    - Using Copper lugs properly crimped with correct current rated wire for continuous operation (Do not stack Lugs)

Diagnostic Fault Codes:

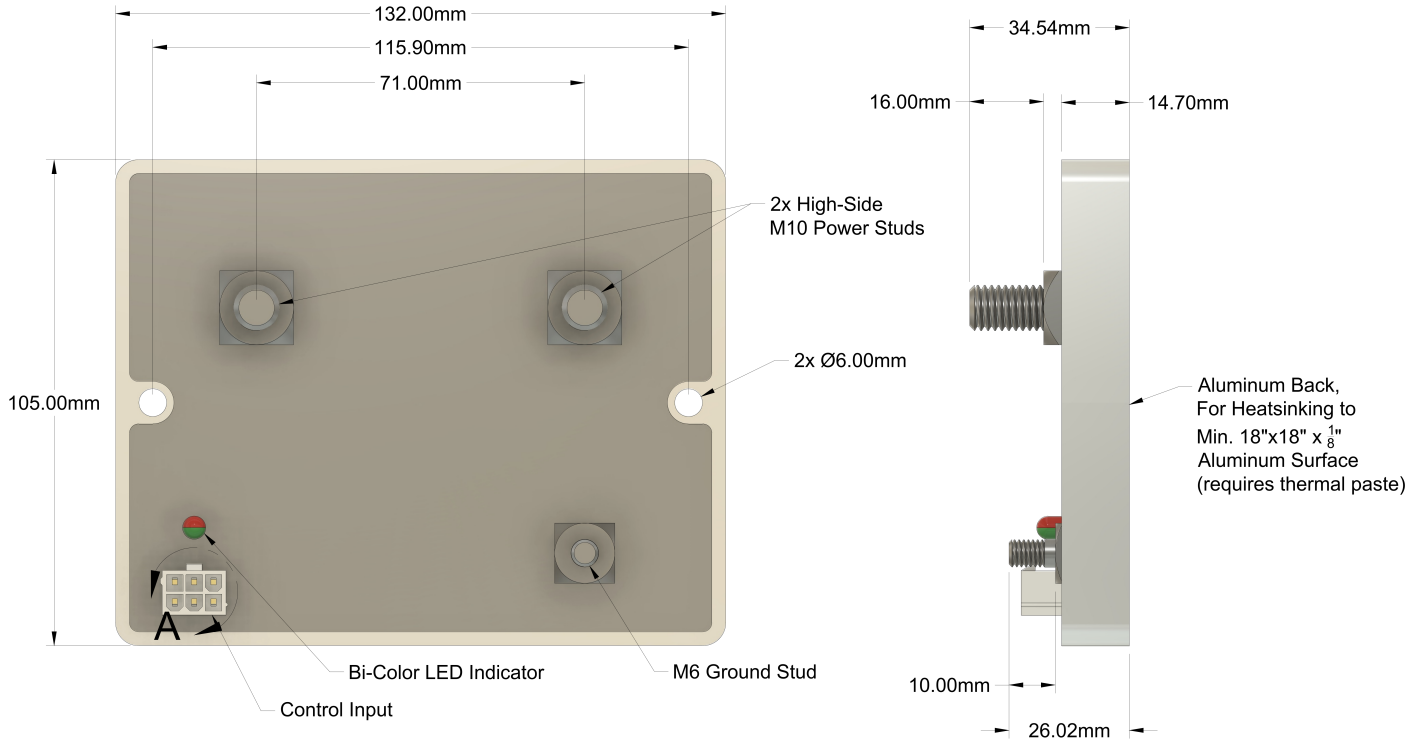
No Blink: No Error
1 Blink: Internal Wiring Problem detected on POST (Power On Self Test)
2 Blinks: Low Voltage Tripped
3 Blinks: High Voltage Tripped
4 Blinks: High Stud Post Temperature
5 Blinks: High Heatsink Temperature
6 Blinks: High Current
7 Blinks: Short Circuit
8 Blinks: Reverse Polarity (Optional if customer wants unidirectionality)

4044 – Low Voltage Disconnect

FAILURE TO ADHERE TO REQUIREMENTS MAY RESULT IN LOSS OF LIFE AND/OR PROPERTY. FOLLOW ALL GUIDELINES BELOW.

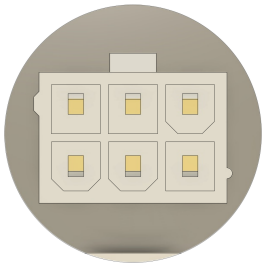
- Carefully follow all manufacturer recommended installation instructions for all loads connected to the 4044 Low Voltage Disconnect.
- It is required to have a circuit breaker/interrupter/fuse placed nearest to the power source, it is then followed by the 4044 Low voltage disconnect to be placed right after the circuit breaker/interrupter/fuse and system loads. This is to ensure safety downstream to the wires and into the loads. Failure to include a circuit breaker/interrupter in the system voids all expressed warranty and liabilities due to installation negligence.
- The fuse rating is to be matched with the wire gauge used considering length to safely carry any amount of current. Failure to properly match wire gauge with loads may result in loss of life and/or property at the fault of application and design negligence. The 4044 Low voltage disconnect is NOT to be considered as a safety device.
- All heavy gauge wire connections must adhere to strict quality control and traceability requirements
  - Power studs must have copper/brass lugs installed and fastened with required torque of 14 ft-lbs on the M10 nut
  - Lugs shall not be stacked, there shall be no washers or lock washers added to the connections, no exceptions.
  - Any visible damage to stud threads or nut threads shall constitute replacement of the device, no exceptions.
  - Any loose connections may result in fire. Damaged/stripped threads may result in fire.
  - Running current through the vehicle chassis may result in fire and is prohibited, no exceptions.
- It is required to heatsink the 4044 Low Voltage Disconnect by fastening the device to a large surface of aluminum material to meet the full capability of the product and avoid unnecessary fault conditions. Please see specification for effective heat dissipation requirements.

Dimensions:



4044 – Low Voltage Disconnect

Connection Pinout:



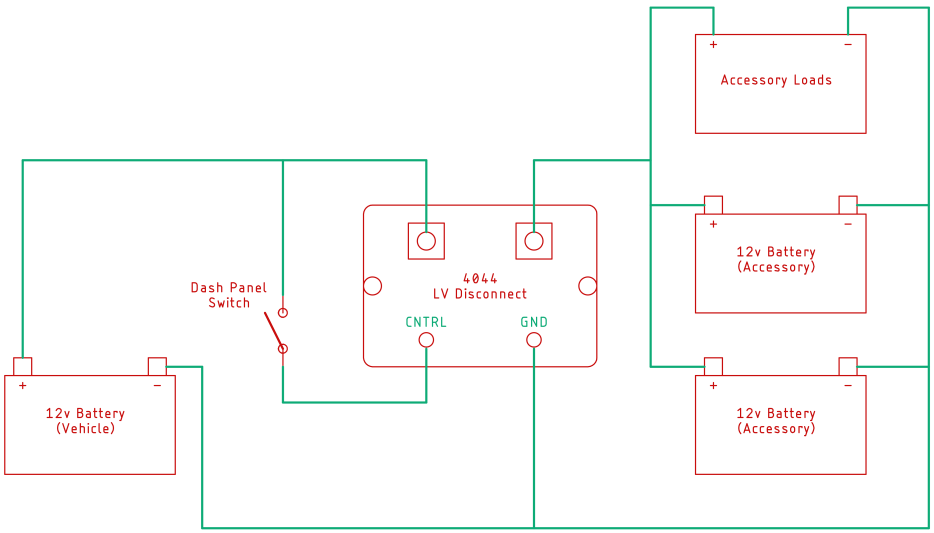
Pinout on Molex Mini-Fit
1.) Control Input (Bottom Right)
2.) External Red LED (Bottom Middle)
3.) NC (Bottom Left)
4.) Ground (Top Right)
5.) External Green LED (Top Middle)
6.) NC (Top Left)

Uses Molex Part: 0039296068
Mates with Molex Shell Part: 39012060 or 39012065
Recommended Molex Terminal Part: 39000073 or 39000074
Recommended Wire Gauge – 18AWG

4044 – Low Voltage Disconnect

Wiring Diagrams:

Battery Separator Configuration



Load Separator Configuration