USER MANUAL

Battery Isolator

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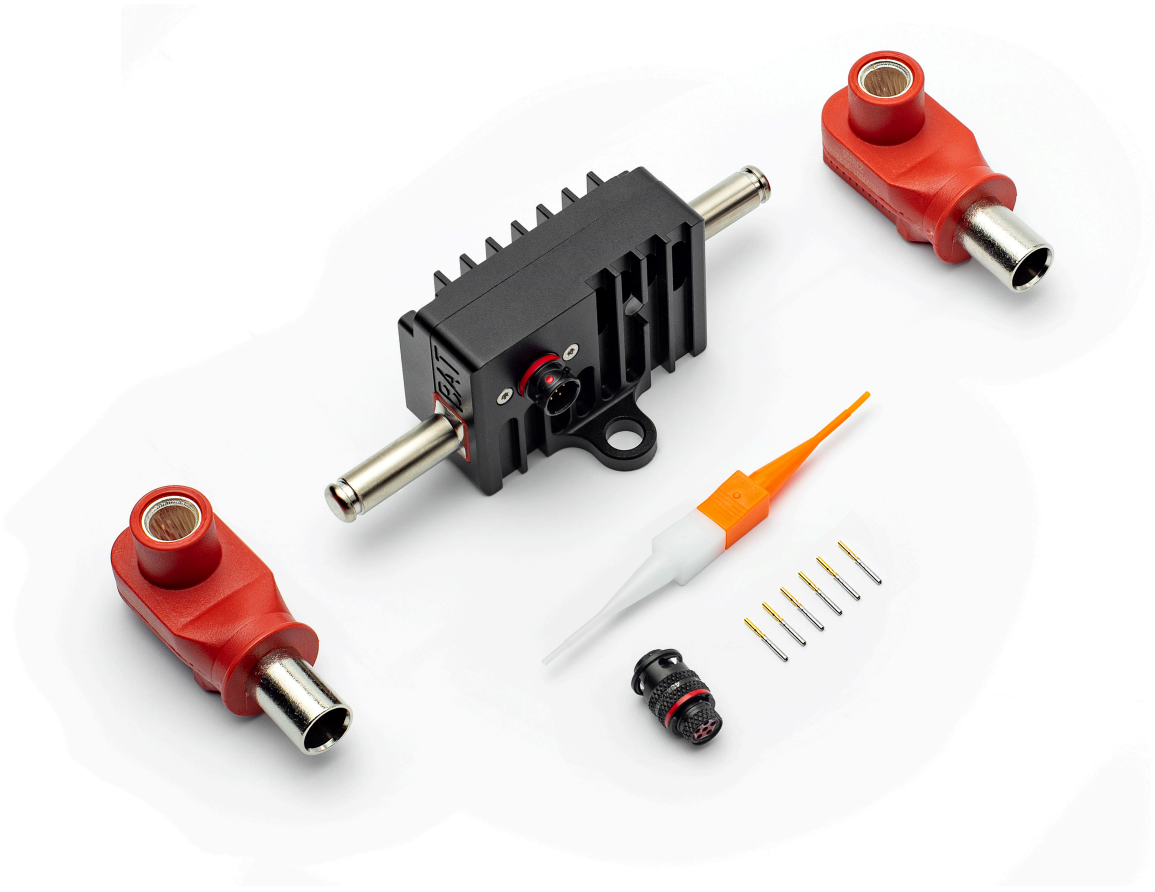


ECUMASTER

Contents

1. Device description

The Battery Isolator is a solid-state motorsport device which can be used for FIA compliant battery isolation and engine shutdown.

It is a lightweight solution, weighing less than 100 g. The device is designed for harsh motorsport environments. The absence of mechanical components ensures long service life and high reliability.

The device features built-in alternator load dump protection and does not require any external components. This eliminates the risk of damage to sensitive electronic equipment during an emergency shutdown.

The Battery Isolator is controlled by two external switches and can also be shut down via a CAN bus message. This message can be sent, for example, from an Ecumaster PMU unit in the event of a high-impact crash or another critical condition.

The device is configurable via CAN bus using the Light Client software. It also transmits diagnostic information that can be used by other systems and helps during device setup and troubleshooting.

The current state of the device is transmitted over the CAN bus and indicated by a multi-colour LED.
The device is fully protected against overheating and overcurrent.

The Battery Isolator is available in three variants, differing in connector type and power terminal configuration:

- **Club M8** – equipped with a Deutsch connector and M8 power terminals

- **AS-SR M8** – equipped with a Souriau Autosport connector and M8 power terminals

• **AS-SR Radlok** – equipped with a Souriau Autosport connector and Radlok power terminals

Each variant is functionally identical. The differences are limited to the connector type and power terminal design to suit various motorsport installation requirements. Rev.1 and Rev.2 share identical specifications and functionality.

Product	Power Terminals	Signal Connector	First Three Digits of Serial Number
Club M8	M8	Deutsch DTM-06	526
AS-SR M8	M8	Souriau Autosport	527
AS-SR Radlok	Radlok	Souriau Autosport	528
AS (*discontinued*)	M8	Deutsch Autosport ASX	524
AS Radlok (*discontinued*)	Radlok	Deutsch Autosport ASX	525

The discontinued Battery Isolator AS (M8 / Radlok) is electrically and functionally identical to the currently available Battery Isolator AS-SR (M8 / Radlok), except for the control connector.

The AS version used a Deutsch Autosport ASX connector, while the AS-SR version uses a Souriau Autosport connector.

Due to this difference, wiring looms prepared for the AS version are not compatible with the AS-SR version.

All other aspects — including dimensions, electrical properties, specifications, and configuration — are the same.

2. Specification

Specification	
Weight	90 g
Dimensions	50 x 100 x 38.5 mm
Operating voltage range	6 - 19 V
Transient voltage	28 V (12 V automotive systems only)
Current capability	300 A continuous, peak up to 1000A
Current measurement resolution	4 A
Current measurement range	-1000 A to 1000 A
Current measurement accuracy	±10%
Inductive load switching capability	600 mJ
Enclosure	Anodized billet aluminium, IP67 rated
Power terminals	M8 nickel-plated terminals or Radlok connectors
Signal connector	Club: Deutsch DTM04-6P (mating connector DTM06-6S included) AS-SR: Souriau Autosport 8STA2-0206PN499 (mating connector 8STA6-02-06SN included) AS: Deutsch ASX202-06PN (mating connector ASX602-06SN included)
Power save state current consumption	< 1 mA
ON state current consumption	~20 mA
PMU/ECU output	1.5 A, High (VBat), Low (GND) or Hi-Z[1]
PC communication	Using USB to CAN interface (Ecumaster USBtoCAN, Peak, Kvaser)
CAN bus bitrate	1 Mbps (default), 500 kbps, 250 kbps, 125 kbps
CAN termination	Software-selectable

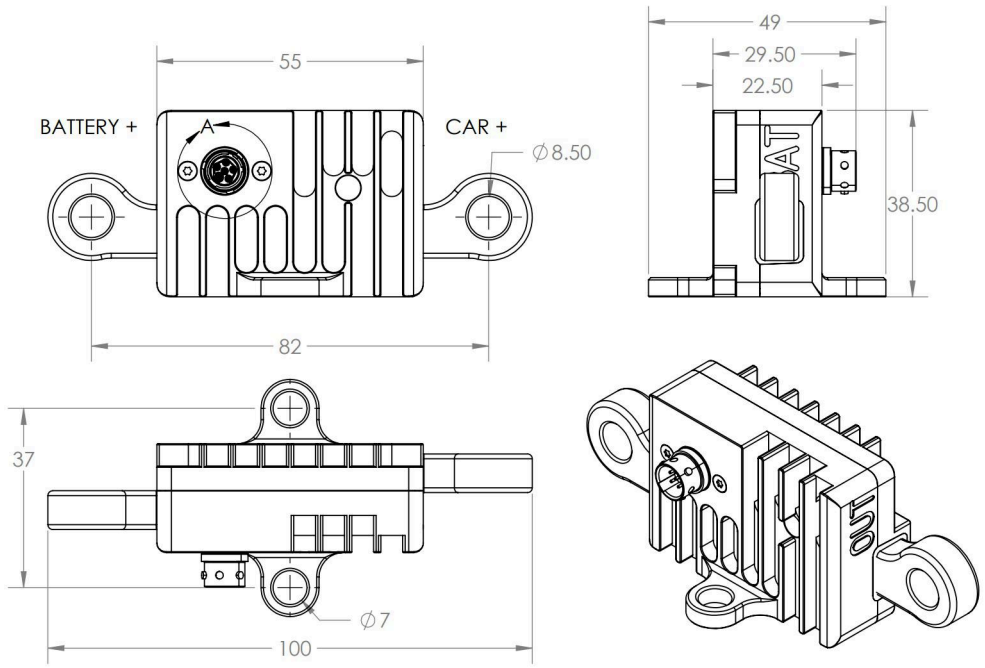
1* Hi-Z high impedance output not connected to 12 V or ground

Note:

The Battery Isolator is available in three variants. The **Club M8** and **AS-SR M8** variants use **M8 nickel-plated terminals**, while the **AS-SR Radlok** variant uses **Radlok power connectors**. All variants are electrically identical.

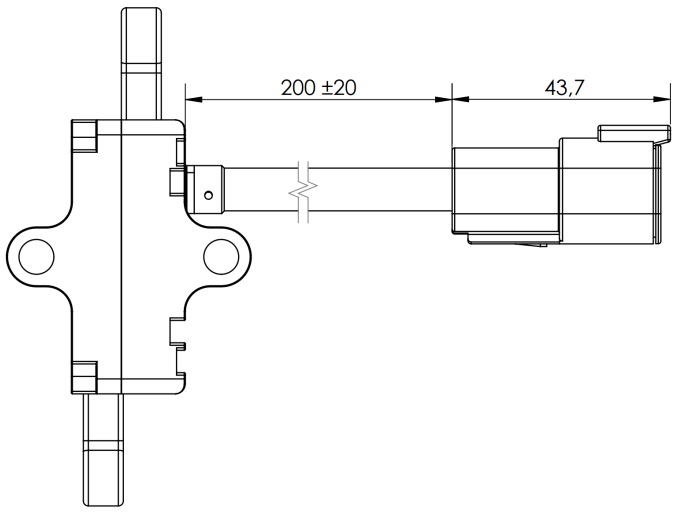
Battery Isolator AS-SR M8

All dimensions in mm

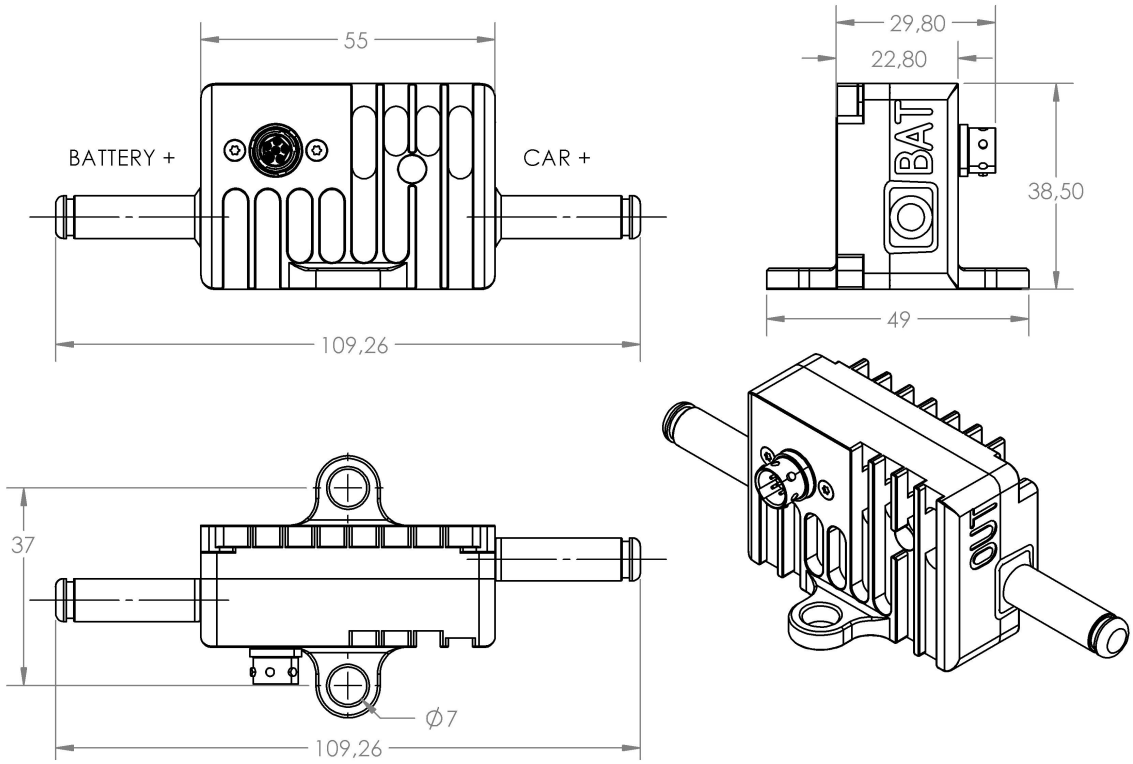


Battery Isolator CLUB M8

All dimensions in mm. Dimensions identical to AS-SR M8 except for the dimensions highlighted.



Battery Isolator AS-SR Radlok



3. Installation

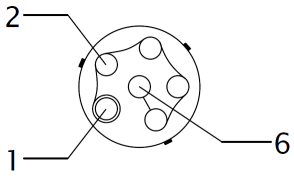
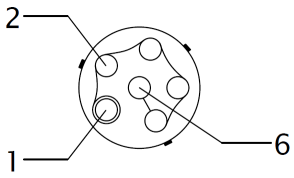
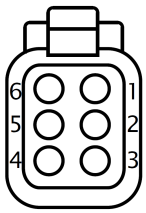
To prevent damage to the device, disconnect all electrical equipment before welding on the vehicle.

Warning:

Ensure that the power terminals are connected correctly. Attempting to crank the engine with reversed polarity will most likely damage the device. The correct polarity is clearly engraved on the device case.

Always disconnect the battery before removing the signal connector. Removing the signal connector while the device is operating may cause damage to the device.

3.1. Pinout

Type	Pinout
Battery Isolator 'AS-SR' Radlok 	1 – Power save switch input 2 – Emergency kill switch input 3 – PMU/ECU output 4 – CAN L 5 – CAN H 6 – Ground
Battery Isolator 'AS-SR' M8 	1 – Power save switch input 2 – Emergency kill switch input 3 – PMU/ECU output 4 – CAN L 5 – CAN H 6 – Ground
Battery Isolator Club M8 	1 – Power save switch input 2 – Emergency kill switch input 3 – PMU/ECU output 4 – CAN L 5 – CAN H 6 – Ground

3.2. Mounting

The device shuts down automatically when its internal temperature reaches 90 °C. A temperature warning is active at 80 °C.

Mount the device on a flat metal part of the chassis in a cool and well-ventilated location. This ensures proper cooling.

The rated continuous current applies at an ambient temperature of 30 °C. If cooling is not enough, the current capability may be reduced.

3.3. Electrical connection

The device is connected between the battery positive (+) terminal and the rest of the vehicle installation.

The device has two switch inputs:

- **Power save switch input**. When this input **is connected to ground**, the device shuts down the engine and enters a low power state with current consumption below 1 mA. This input is also used to reset the device after a fault. The input has an internal pull-up resistor and is **not active when disconnected**. The switch connected to this input must be latching and have two stable positions.
- **Emergency switch input**. When this input **is disconnected from ground** the device shuts down the engine and cuts off power to the vehicle's electrical system, although the device itself remains powered. Normally closed emergency switches should be connected in series to this input. The input has an internal pull-up resistor and is **active when disconnected**. The switch for this input must be momentary with normally closed configuration.

The device has one output used to shut down the engine in an emergency by switching off the ignition. This output is fully programmable and can independently switch between VBat, GND, or High-Z in both Run and Kill modes.

Note:

The engine must stop when the output is in Kill mode. If the engine continues running, the alternator will continue to supply power to the vehicle electrical system.

For better operation with a low or drained battery, use the GND–High-Z output configuration when current is drawn from the output.

Important:

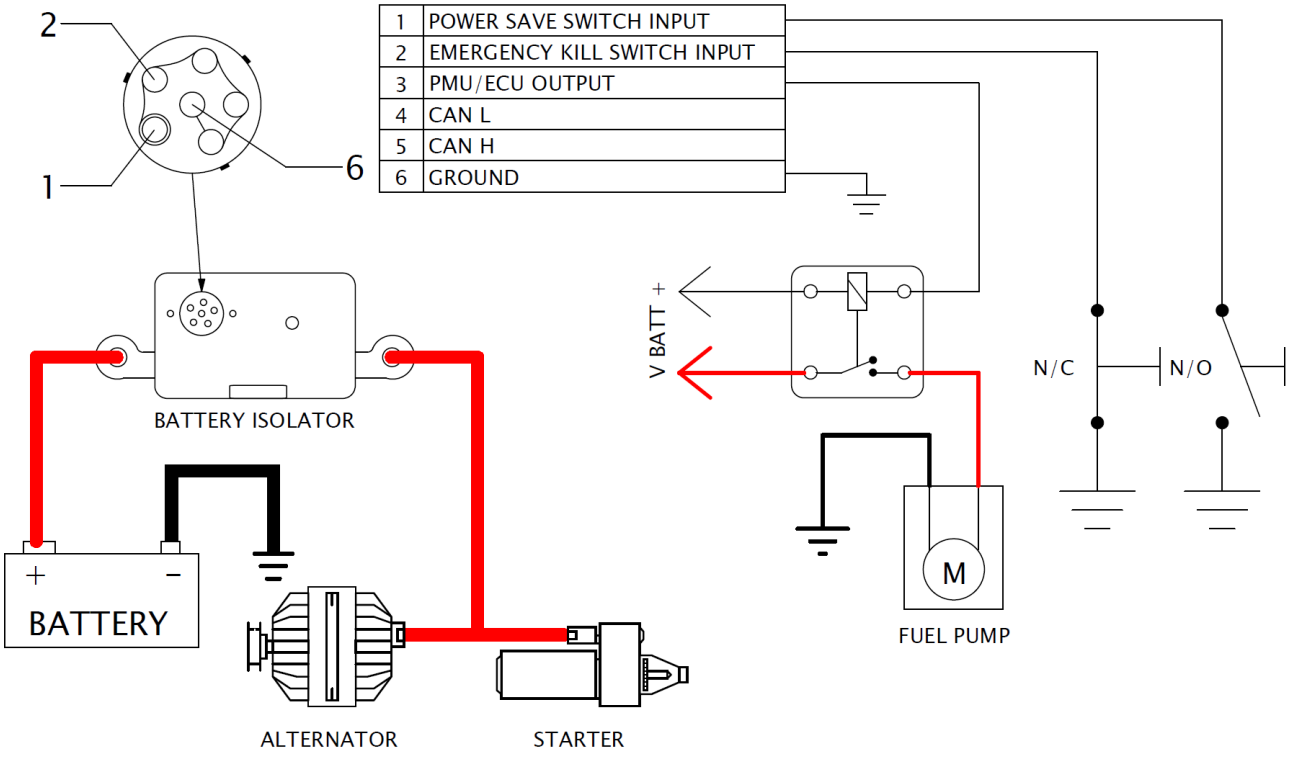
The output can deliver only 1.5A, so it can't be used as a direct feed for ignition. The relay is required if the isolator is not used with a power distribution device.

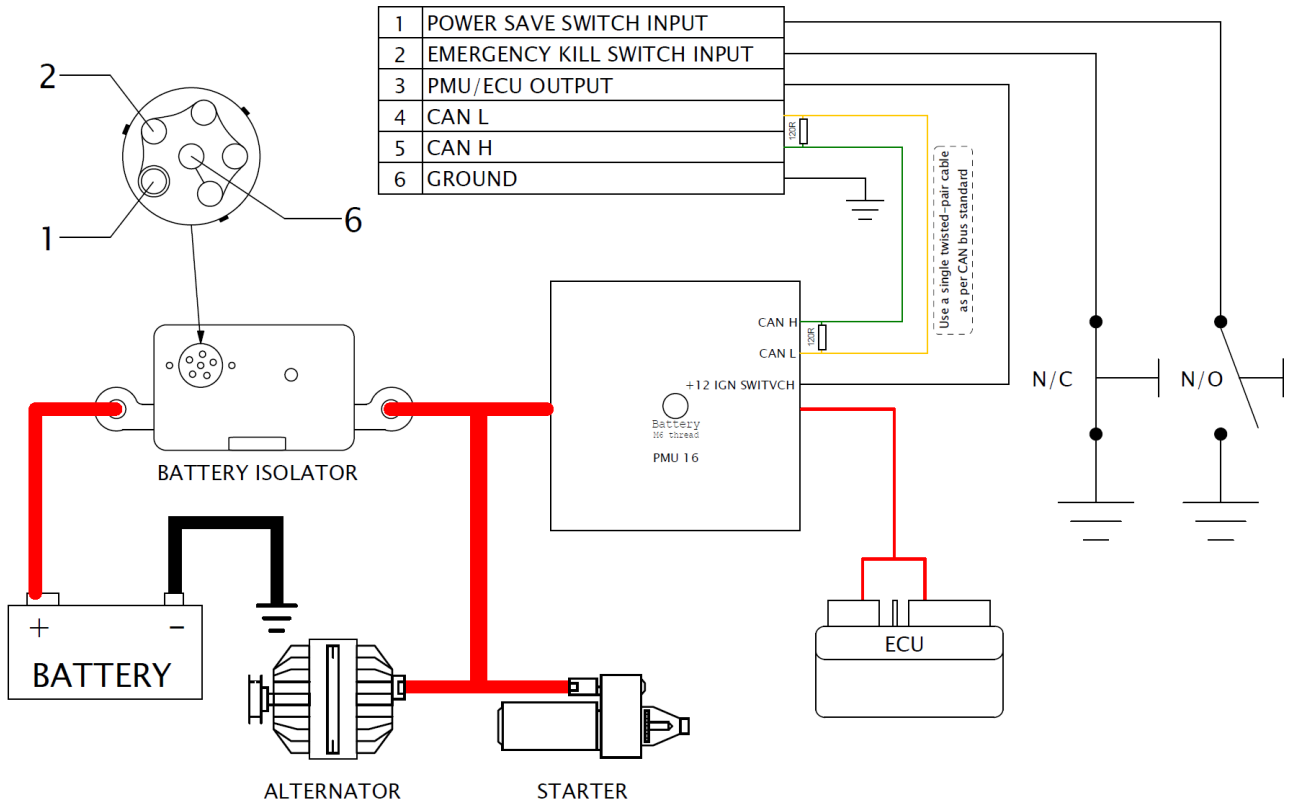
The signal connector in the **AS-SR variants** is a 6-way Souriau Autosport connector. The maximum wire size is AWG 24 (0.2 mm²).

Crimping the contacts requires a special tool (M22520/2-01 with K1586 positioner) for size 24 motorsport or military terminals.

If you do not have this tool or the correct wire size, contact your ECUMaster dealer for a pre-made wiring loom.

The wiring diagram presents the AS-SR version, but the CLUB version is wired analogously (pin numbers are the same).

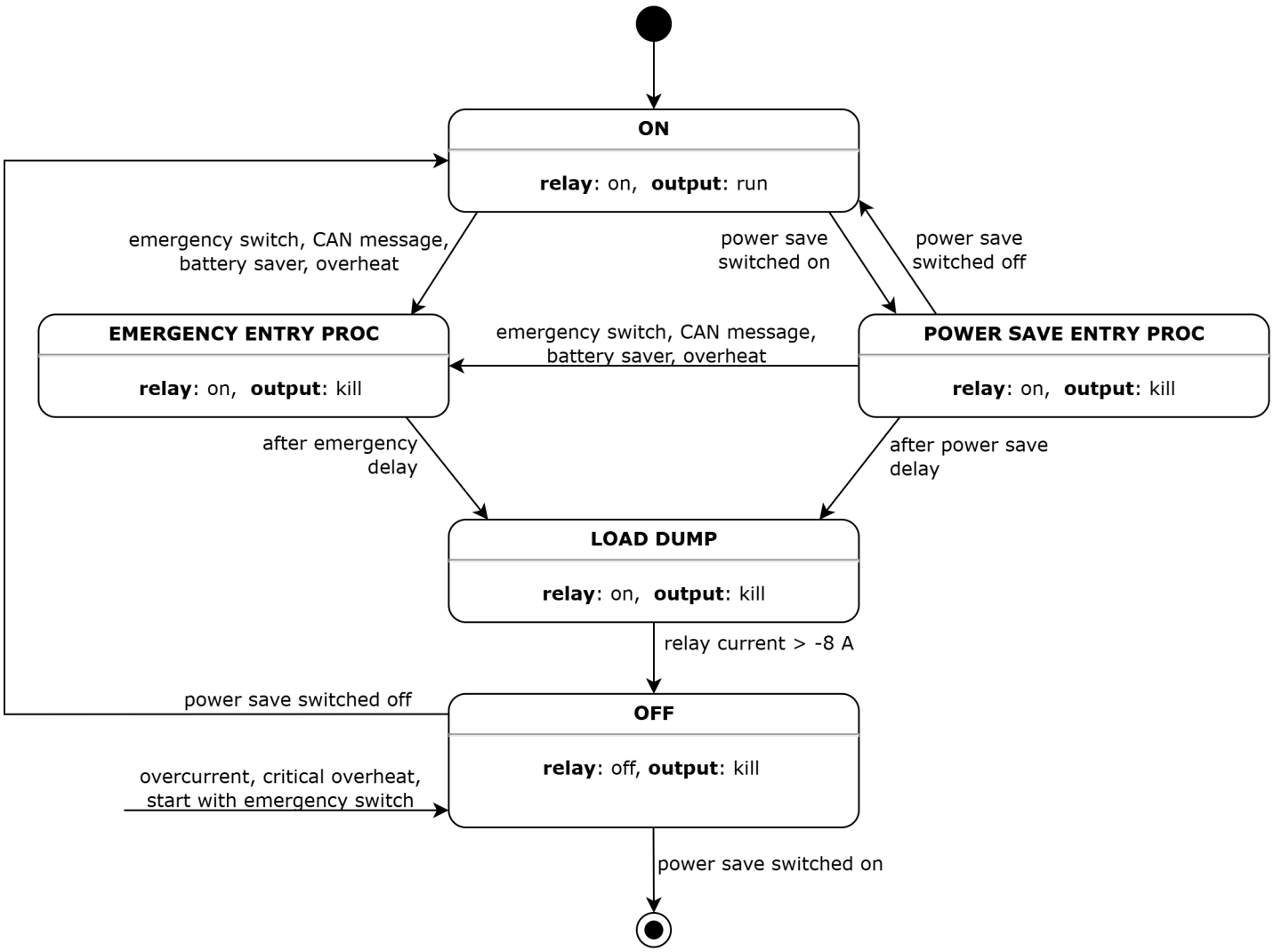




4. Operation principles

The device's operation is best understood with a state machine diagram, defined by the following states:

- Relay: state of main relay, on or off
- Output: state of ECU/PMU output: run or kill



When the device is turned on, it enters the **ON** state. It can then be turned off by activating the Power Save or Emergency switch, each of which initiates an entry procedure. The duration of this entry procedure can be configured using the Light Client software, allowing time for other CAN devices to shut down properly and for the engine to power down.

If the device detects current flowing **to the battery** (for example from the alternator), it will remain in the **LOAD DUMP** state until the current flow stops.

When the device is in the **OFF** state it can be reset only by toggling the Power Save switch.

The state of the device is indicated by an LED light in the following way:

Device states:

- green - relay **ON**
- red - relay **OFF**
- toggling green - **POWER SAVE ENTRY PROC** device countdown to Power Save mode
- toggling red - **EMERGENCY ENTRY PROC** device countdown to Relay **OFF** mode

Additional warnings (active in **ON** State Only):

- yellow – overheat (temperature > 80°C)
- short green flash – undervoltage (VBat < Battery Saver Threshold Voltage)
- short red flash – overvoltage (VBat > 19V)
- short blue flash – CAN bus error (also when nothing is connected to the CAN bus)

Additional warnings will add up in a sequence when multiple warnings are present.
For example, a short red flash followed by a short blue flash, then a yellow light indicates an overvoltage condition, with overheat and a CAN bus error.

4.1. Under Voltage Lock Out

The device includes a built-in Under Voltage Lock Out (UVLO) function to protect against malfunction due to low supply voltage.
If the battery voltage drops below 6V, the device will immediately cut off power to the vehicle.

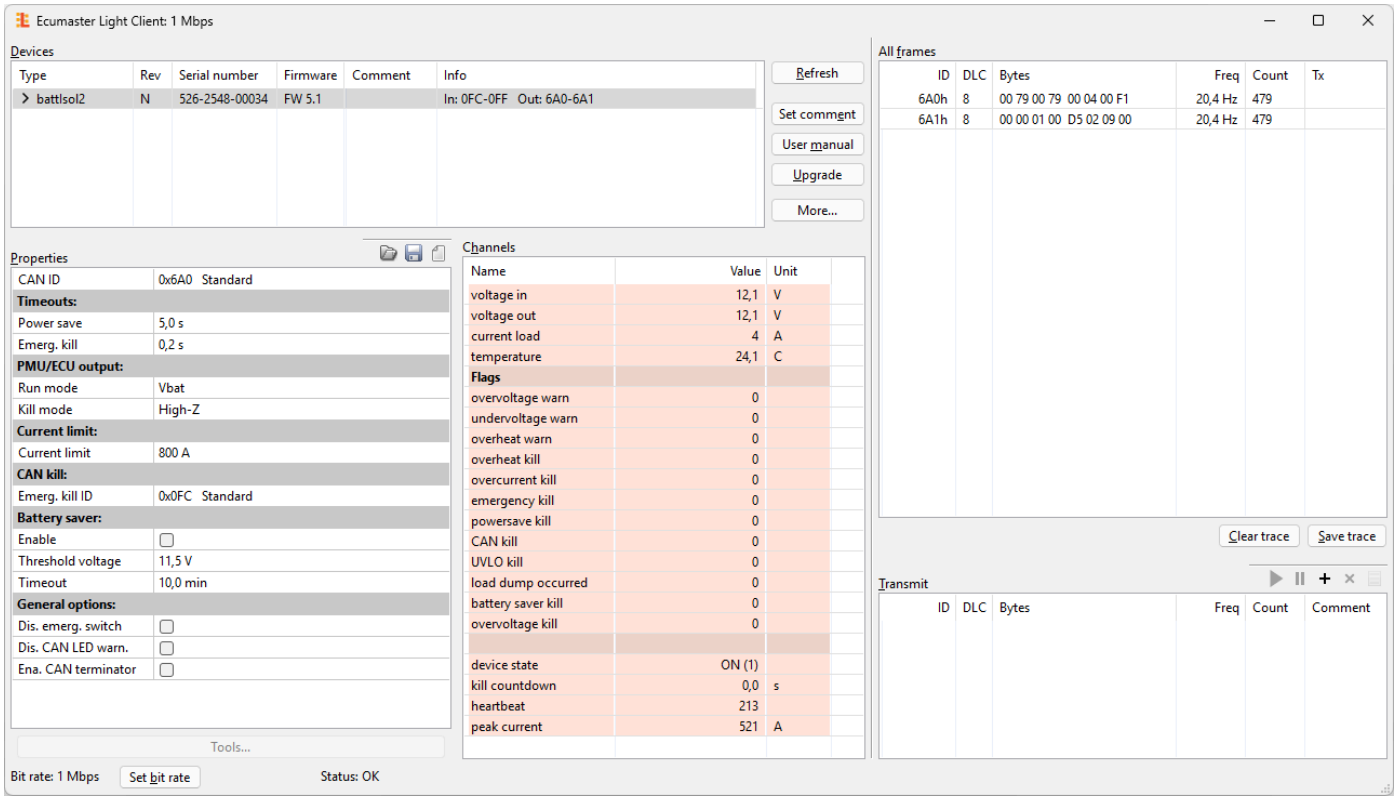
4.2. Battery saver

The Battery Saver function protects the car battery from deep discharge.
If the battery voltage remains below a set threshold for a defined period, the isolator will disconnect the battery by entering the **EMERGENCY ENTRY PROC** mode.

Note:
The total time from the voltage dropping below the threshold to power cutoff by the isolator is equal to the sum of the Battery Saver timeout and the Emergency Kill timeout.

5. Configuration

The Battery Isolator is configured using the Ecumaster Light Client software. Access to the device's CAN bus requires a USB-to-CAN interface or another compatible device. For general Light Client usage refer to the Light Client software manual https://www.ecumaster.com/files/LightClient/LightClientManual.pdf.



5.1. Properties

The following table provides descriptions for parameters of the Battery Isolator.

Parameter	Description
CAN ID	ID of the first CAN frame over which Battery Isolator diagnostics is transmitted. For more details, see CAN Stream *(on page 16)*
Timeouts	
Power save	Delay time from **POWER SAVE ENTRY PROC** to POWER SAVE (device fully off)
Emerg. kill	Delay time from **EMERGENCY ENTRY PROC** to **OFF**

Parameter	Description
PMU/ECU output	
Run mode	Output state during normal operation (VBat max 1.5 A, GND max 1.5 A, or High-Z)
Kill mode	Output state when engine shutdown is required (state "**output: kill**" in the state diagram, see Operation principles *(on page 11)*)
Current limit	
Current limit	Current threshold that switches the device to OFF when exceeded
CAN kill	
Emerg. kill ID	CAN ID for receiving emergency shutdown signals from the CAN bus
Battery saver	
Enable	Enables the battery saver functionality
Threshold voltage	Voltage level below which the timer starts. If voltage rises above this level, the timer resets
Timeout	Time the voltage must stay below the threshold to activate the function and enter **EMERGENCY ENTRY PROC mode**
General options	
Dis. emerg. switch	Disables the emergency switch input
Dis. CAN LED warn.	Disables the blue warning flash when the CAN bus is not connected
Ena. CAN terminator	Enables CAN bus internal 120 Ohm terminator (available from hardware Rev. D[1])

[1]The hardware revision can be verified in the *Light Client*.

CAN bus shutdown

CAN bus shutdown function is activated when the CAN message with the first data byte different from 0x00 is received. All other message bytes are irrelevant. If the first byte is equal to 0x00 the function is not activated.

For reliable operation, only one device on the CAN bus can transmit with a specific ID. To be able to be shut down by multiple devices, the Battery Isolator will listen to four message IDs starting from *Emerg. kill ID*.

For example, if *Emerg. kill ID* is 0x0FC, the device will shut down upon receiving messages with IDs 0x0FC, 0x0FD, 0x0FE, 0x0FF with the first data byte set to anything from 0x01 to 0xFF.

5.2. Channels

Channel	Description
Voltage in	Voltage on the battery side
Voltage out	Voltage on the vehicle side
Current load	Current flowing through the relay. Positive values: battery to car, negative: car to battery (charging). *Current Load* is intended for general information on device load and charging, not for precise current measurements. Please consider measurement accuracy when interpreting results.
Temperature	Device internal temperature
Device state	Refer to Operation principles *(on page 11)* for details on the device's current state
Kill countdown	Time remaining until transition from POWER SAVE ENTRY PROC to POWER SAVE or from EMERGENCY ENTRY PROC to OFF
Heartbeat	A counter that increments with each CAN message sent, indicating the device is active
Peak current	The highest current value measured since the device was powered on

Flags:

FLAG	SET condition	RESET condition
Overvoltage warn	Battery voltage > 19V	Battery voltage <= 19V
Undervoltage warn	Battery voltage < battery saver threshold voltage	Battery voltage >= battery saver threshold voltage
Overheat warn	Temperature > 80°C	Temperature <= 80°C
Overheat kill	Temperature > 90°C	Device reset
Overcurrent kill	Current > current limit	Device reset
Emergency kill	Emergency switch activated	Device reset
Powersave kill	Power save switch activated	Power save switch deactivated
CAN kill	CAN kill message received	Device reset
UVLO kill	Battery voltage < 6V	Device reset
Load dump occurred	Load dump state, see: Operation principles *(on page 11)*	Device reset

FLAG	SET condition	RESET condition
Battery saver kill	Battery saver function turned off main relay	Device reset
Overvoltage kill	Voltage exceeded device specification for too long	Device reset

6. CAN Stream

The default CAN bus bitrate of the device is **1 Mbps**. The format used is **big-endian**.

Byte	Bit	Channel	Data Type	Range	Multiplier/ Divider	Factor	Offset	Unit
Output base ID+0 (default: 0x6A0)								
0..1		Voltage in	16-bit U	0.0 – 6553.5	1/10	0.1	0	V
2..3		Voltage out	16-bit U	0.0 – 6553.5	1/10	0.1	0	V
4..5		Current load	16-bit S	-32768 – 32767	1/1	1	0	A
6..7		Temperature	16-bit U	0.0 – 6553.5	1/10	0.1	0	C
Output base ID+1 (default: 0x6A1)								
0..1	11 (0x800)	Overvoltage kill	1-bit	0 – 1	1/1	1	0	
	10 (0x400)	Battery saver kill	1-bit	0 – 1	1/1	1	0	
	9 (0x200)	Load dump occurred	1-bit	0 – 1	1/1	1	0	
	8 (0x100)	UVLO kill	1-bit	0 – 1	1/1	1	0	
	7 (0x80)	CAN kill	1-bit	0 – 1	1/1	1	0	
	6 (0x40)	Powersave kill	1-bit	0 – 1	1/1	1	0	
	5 (0x20)	Emergency kill	1-bit	0 – 1	1/1	1	0	
	4 (0x10)	Overcurrent kill	1-bit	0 – 1	1/1	1	0	
	3 (0x08)	Overheat kill	1-bit	0 – 1	1/1	1	0	
	2 (0x04)	Overheat warn	1-bit	0 – 1	1/1	1	0	
	1 (0x02)	Undervoltage warn	1-bit	0 – 1	1/1	1	0	
	0 (0x01)	Overvoltage warn	1-bit	0 – 1	1/1	1	0	
2		Device state[1]	8-bit U	enumeration	1/1	1	0	
3		Kill countdown	8-bit U	0.0 – 25.5	1/10	0.1	0	s
4		Heartbeat	8-bit U	0 – 255	1/1	1	0	
5..6		Peak current	16-bit U	0 – 65535	1/1	1	0	A

[1]Values for channel: **Driver state**

Value	Description
0	Init
1	ON
2	Power Save Entry
3	Emergency Entry
4	OFF
5	Load Dump

7. Troubleshooting

Finding the reason why the isolator disconnected the battery is mainly achieved by reading device flags. Flags can be read via the Light Client software. Possible causes and solutions are listed below:

- Device turned off with no active flags.
  - Power save switch was activated.
  - Supply voltage too low.
- **overvoltage warn** - warning only, does not turn off the device.
- **undervoltage warn** - warning only, does not turn off the device.
- **overheat warn** - warning only, does not turn off the device.
- **overheat kill** - internal device temperature exceeded 90°C
  - Reduce device current load.
  - Install the device in a cooler environment.
  - Install device on chassis with thermally conductive material to spread the heat.
- **overcurrent kill** - current limit was exceeded.
  - Check vehicle wiring and devices for shorts or malfunctions.
  - Increase **Current limit** if needed.
- **emergency kill** - emergency switch was activated.
  - If this wasn't intended, check the emergency switch circuit for continuity.
- **powersave kill** - flag is active when the power save switch is active, leading to the device turning off completely.
- **CAN kill** - device was turned off with CAN bus message.
  - if this wasn't intended, check that there aren't any devices sending messages on ID set up in ***Emerg. kill ID*** field, or on the following 3 IDs.

- **UVLO kill** - supply voltage dropped below specification.
    - Check if the battery is sufficiently charged. Voltage may drop during cranking.
    - Check if supply wires are properly fastened.
- **load dump occurred** - current was flowing to the battery, while the device was going to disconnect.
    - PMU/ECU output doesn't shut down the engine properly.
    - Timeouts are too short. The engine should stop before disconnecting the battery.
    - Charging battery through the Battery Isolator.
- **battery saver kill** - battery saver function was activated.
    - Check battery saver setup.
    - Check if the alternator is charging the battery when the engine is running.
- **overvoltage kill** - supply voltage exceeded the device specification.
    - Check the alternator for proper operation.
    - Check if the battery is properly connected to the chassis and the isolator.

8. Document history

Version	Date	Changes
0.2	2019.06.14	Initial revision
0.3	2019.07.17	Battery saver and UVLO added
0.4	2019.10.11	Switch type and kill output hints added
0.5	2019.11.28	Drawing for lug and Radlok versions
0.6	2019.12.12	Text revised
0.7	2020.06.16	Troubleshooting, firmware 3.0
1.0	2022.05.10	Table with the types of Battery Isolator Note about disconnecting the signal connector Drawing for CLUB version Drawing with dimensions of Battery Isolator AS Radlok connectors
1.1	2022.09.27	Engine kill output current rating changed
2.0	2022.09.27	Recent PMU/ECU output category changed to Auxiliary output and Kill mode to Stop mode. New properties added – Auxiliary disable: Delay to disable, Delay CAN control, Delay CAN ID.
3.0	2026.02.05	Document layout updated to follow the Ecumaster standard format The structure and text have been refined and improved for better readability and clarity. Device in version AS-SR and Rev.2 added.
3.1	2026.02.26	Updated screen in the *Configuration* chapter