

Part 573 Safety Recall Report

21V-242

Manufacturer Name : Arcimoto Inc**Submission Date :** JUN 23, 2021**NHTSA Recall No. :** 21V-242**Manufacturer Recall No. :** NR**Manufacturer Information :**

Manufacturer Name : Arcimoto Inc

Address : 2034 W. 2nd Ave
Eugene OR 97402

Company phone : 5416836293

Population :

Number of potentially involved : 252

Estimated percentage with defect : 100 %

Vehicle Information :

Vehicle 1 : 2019-2021 Arcimoto FUV, Deliverator, Rapid Responder, Roadster

Vehicle Type : MOTORCYCLES

Body Style : OTHER

Power Train : HYBRID ELECTRIC

Descriptive Information : Affects all two-hundred fifty-two MY2019 - MY2021 vehicles (fifty-seven MY2019 T-FUV, one-hundred twenty-six MY2020 T-FUV, six MY2020 D-Deliverator-1, four MY2020 R-Roadster, three MY2021 D-Deliverator-1, one MY2021 E-Rapid Responder, two MY2021 R-Roadster, fifty-three MY2021 T-FUV) produced from 09/19/2019 through to 03/10/2021.

Production Dates : SEP 19, 2019 - MAR 10, 2021

VIN Range 1 : Begin :	7F7ATR312KER00000	End :	7F7ATR317KER00056	<input type="checkbox"/> Not sequential
VIN Range 2 : Begin :	7F7ADR316LER00001	End :	7F7ADR315LER00006	<input type="checkbox"/> Not sequential
VIN Range 3 : Begin :	7F7ATR312LER00001	End :	7F7ATR310LER00126	<input type="checkbox"/> Not sequential
VIN Range 4 : Begin :	7F7ARR314LER00001	End :	7F7ARR31XLER00004	<input type="checkbox"/> Not sequential
VIN Range 5 : Begin :	7F7ADR314MER00001	End :	7F7ADR318MER00003	<input type="checkbox"/> Not sequential
VIN Range 6 : Begin :	7F7AER318MER00001	End :	7F7AER318MER00001	<input type="checkbox"/> Not sequential
VIN Range 7 : Begin :	7F7ARR312MER00001	End :	7F7ARR314MER00002	<input type="checkbox"/> Not sequential
VIN Range 8 : Begin :	7F7ATR310MER00001	End :	7F7ATR318MER00053	<input type="checkbox"/> Not sequential

Description of Defect :

Description of the Defect : Due to unintended firmware behavior, the inverters do not respect the Battery Management System's (BMS) Current Charge Limits (CCL) when using the kinetic energy recovery system (KERS aka "regen"). Repeated and/or sustained exceeding of the CCL can cause the BMS to open the main contactor.

FMVSS 1 : NR

FMVSS 2 : NR

Description of the Safety Risk : Repeated and/or sustained exceeding of the CCL can cause the BMS to open the main contactor, leading to unexpected battery shutdown and immediate loss of motive power, which would make the vehicle more difficult to control and increase the likelihood of a crash.

Description of the Cause : A firmware update from Arcimoto's inverter supplier appears to cause unintended firmware behavior.

Identification of Any Warning that can Occur : None.

Involved Components :

Component Name 1 : 001052 BMS, Orion 2, Standard 36 Cell, Factory Def

Component Description : BMS, Orion 2, Standard 36 Cell, Factory Default Firmware & Profile

Component Part Number : 001052

Component Name 2 : 003222 VCU, ECOTRONS, ES1274A

Component Description : VCU, ECOTRONS, ES1274A

Component Part Number : 003222

Component Name 3 : 003375 Firmware and Profile, Orion BMS2

Component Description : Inverter, SME, AC-X1, CAN programming interface

Component Part Number : 003375

Component Name 4 : 004085 Inverter, SME, AC-X1, CAN programming inter

Component Description : Firmware and Profile, Orion BMS2

Component Part Number : 004085

Component Name 5 : 004332 Kinetic Energy Recovery System, ASSY

Component Description : Kinetic Energy Recovery System, ASSY

Component Part Number : 004332

Supplier Identification :

Component Manufacturer

Name : Dana Inc. (formerly SME Group)

Address : Via della Tecnica, Z.I. 40
Arzignano (VI) Foreign States 36071

Country : Italy

Chronology :

On February 9, 2021, a vehicle was reported to Arcimoto's Service Department as shutting down unexpectedly. An immediate analysis of service records showed a total of four vehicles with potentially similar symptoms. BMS logs indicated that these four vehicles lost motive power because the BMS opened the main contactor. Logs also indicated overcurrent faults.

Testing immediately began on several vehicles in an effort to reproduce the fault but was initially unsuccessful. However, during testing it was observed that the inverters were not respecting the maximum CCL level set by the BMS. Although short CCL excursions can be tolerated, longer excursions have the potential to overload the battery, thus the BMS as an independent safety system will detect such potentially dangerous overcurrent conditions and will open the main contactor before any damage can occur.

Further testing was able to reliably provoke the failure mode and demonstrate that these repeated excursions did indeed cause the BMS to open the contactor.

Since this situation can result in a loss of motive power, an Engineering and Regulatory meeting was held on March 10, 2021 and recommended this issue to be escalated as a recall-candidate to Leadership. Leadership accepted the recommendation with a majority vote on March 29, 2021 and declared a voluntary safety recall.

Description of Remedy :

Description of Remedy Program : Owners will be notified by mail and instructed to contact Arcimoto to schedule a service appointment to have their inverter firmware updated. There will be no charge to vehicle owners for this service. To the best of our knowledge, no owners have incurred any costs resulting from this defect.

How Remedy Component Differs from Recalled Component : Arcimoto is unable at this time to unilaterally fix the inverters; in certain situations, the inverters will continue to disrespect the Battery Management System's (BMS) Current Charge Limits (CCL), such as when using the Kinetic Energy Recovery System (KERS aka "regen") at the same time as the throttle.

However, Arcimoto has developed a modification to the Vehicle Control

Unit (VCU) firmware that can successfully and consistently prevent motive battery-pack contactors from opening and causing battery shutdown in the event of the inverters disrespecting BMS CCL. The modified VCU firmware catches the failure mode in a fail-safe and prevents the shutdown cascade by reducing KERS, then turning KERS off, thus ensuring motive power is not lost.

Specifically, the modified VCU firmware is intended to stop overcurrent excursions before the BMS reaches the decision to open the contactors (and thereby cascade a battery shutdown), by disabling the KERS in the event of an imminent BMS fault if the inverters violate the CCL.

Arcimoto will work with its inverter supplier to implement corrected inverter firmware via a service bulletin in the future.

Identify How/When Recall Condition was Corrected in Production :

Starting March 23, 2021, all vehicles in production are built with the same modified VCU firmware used as remedy, which will successfully and consistently prevent motive battery-pack contactors from opening and causing battery shutdown in the event of the inverters disrespecting BMS CCL. The modified VCU firmware catches the failure mode in a fail-safe and prevents the shutdown cascade by reducing KERS, then turning KERS off, thus ensuring motive power is not lost.

Recall Schedule :

Description of Recall Schedule : Arcimoto does not intend to send any dealer or distributor notifications, as it has neither dealers nor distributors at this time.

Planned Dealer Notification Date : NR - NR

Planned Owner Notification Date : APR 19, 2021 - MAY 03, 2021

* NR - Not Reported