	<b>Regulatory Recall Report</b>		<b>RRR0024</b>
	<b>Inverters Exceeding Current Limit May Cause Battery Shutdown</b>		Rev: 1
Author: MM, RS	PO: Dir of GRC	Appr: Dir of GRC	Date: 06/23/2021

## 1 SUMMARY

In accordance with Part 573 of Title 49 of the Code of Federal Regulations, Arcimoto Inc. hereby reports a safety issue and intends to recall quantity two-hundred fifty-two (252) Arcimoto Deliverator-1, Rapid Responder, FUVs and Roadsters produced between September 19, 2019 and March 10, 2021. Due to unintended firmware behavior, the inverters disrespect the Battery Management System's (BMS) Current Charge Limits (CCL) when using the throttle and the kinetic energy recovery system (KERS aka "regen") simultaneously. 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, which would make the vehicle more difficult to control and increase the likelihood of a crash.

*Note: Fields left blank will be marked "NR" meaning "Not Reported" in public view.*


## 2 NHTSA MANUFACTURER RECALL PORTAL FIELDS

### (c)1 IDENTIFICATION OF THE MANUFACTURER, IMPORTER, DISTRIBUTOR, OR BRAND NAME OWNER

<b>Manufacturer:</b>	Arcimoto, Inc.
<b>Address:</b>	2034 W. 2nd Ave., Eugene OR 97402
<b>Contact:</b>	John W. Dorbin, Jr. General Counsel and Corporate Secretary Arcimoto, Inc.

### (c)2 VEHICLE INFORMATION

<b>Model Year Start:</b>	<b>Type:</b>
2019	MOTORCYCLES
<b>Model Year End:</b>	<b>Body Style:</b>
2021	OTHER
<b>Make:</b>	<b>Powertrain:</b>
Arcimoto	HYBRID ELECTRIC
<b>Model:</b>	<b>Descriptive Information:</b>
Deliverator-1, Rapid Responder, FUV and	Affects all two-hundred fifty-two MY2019

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Roadster	- 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.
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<b>Production Dates:</b>	Begin: 09/19/2019	End: 03/10/2021
<b>VIN Range(s):</b> (T - FUV, tandem)	Begin: 7F7ATR312KER00000	End: 7F7ATR317KER00056
<b>VIN Range(s):</b> (D - Deliverator-1, single)	Begin: 7F7ADR316LER00001	End: 7F7ADR315LER00006
<b>VIN Range(s):</b> (T - FUV, tandem)	Begin: 7F7ATR312LER00001	End: 7F7ATR310LER00126
<b>VIN Range(s):</b> (Roadster, tandem)	Begin: 7F7ARR314LER00001	End: 7F7ARR31XLER00004
<b>VIN Range(s):</b> (D - Deliverator-1, single)	Begin: 7F7ADR314MER00001	End: 7F7ADR318MER00003
<b>VIN Range(s):</b> (Rapid Responder, tandem)	Begin: 7F7AER318MER00001	End: 7F7AER318MER00001
<b>VIN Range(s):</b> (Roadster, tandem)	Begin: 7F7ARR312MER00001	End: 7F7ARR314MER00002
<b>VIN Range(s):</b> (T - FUV, tandem)	Begin: 7F7ATR310MER00001	End: 7F7ATR318MER00053

**(c)3 TOTAL NUMBER POTENTIALLY INVOLVED, (c)4 ESTIMATED PREVALENCE OF DEFECT**

<b>Number potentially involved: 252</b>	<b>Estimated percentage of involved with defect: 100%</b>
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**(c)5 DEFECT / NONCOMPLIANCE DESCRIPTION**

For this Defect/Noncompliance:

<b>Describe the defect or noncompliance:</b>	<b>Describe the safety risk:</b>
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.	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.
<b>If a noncompliance, provide the applicable FMVSS:</b>	<b>Identify any warning which can precede or occur:</b>
	None.
<b>If applicable, provide any further FMVSS affected:</b>	
<b>Describe the cause:</b>	
A firmware update from Arcimoto's inverter supplier appears to cause unintended firmware behavior.	
<b>This Recall affects all vehicles.</b>	


If applicable, identify the manufacturer of the defective or noncompliant component. If the manufacturer of the component is unknown, provide the information for the company that supplied the subject component.

<b>Component Manufacturer:</b>	
<b>Company Information:</b>	<b>Company Contact Information:</b>
<i>Company Name:</i>	<i>First Name:</i>
Dana Inc. (formerly SME Group)	Peter


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<i>Country:</i>	<i>Last Name:</i>
Italy	McDonald
<i>Address 1:</i>	<i>Position:</i>
Via della Tecnica, Z.I. 40	Electrification Business Development Manager - Americas
<i>Address 2:</i>	<i>Email:</i>
	peter.mcdonald@dana.com
<i>City:</i>	<i>Phone:</i>
Arzignano (VI)	519-591-0965
<i>State:</i>	
N/A	
<i>Zip / Postal Code:</i>	
36071	

<b>Components Involved: (Please list in numerical order)</b>	
<i>Component Name (P/N + Description):</i>	
001052 BMS, Orion 2, Standard 36 Cell, Factory Default Firmware & Profile	
<i>Component Description:</i>	
BMS, Orion 2, Standard 36 Cell, Factory Default Firmware & Profile	
<i>Component Part Number:</i>	
001052	
<i>Component Name (P/N + Description):</i>	

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003222 VCU, ECOTRONS, ES1274A	
<i>Component Description:</i>	
VCU, ECOTRONS, ES1274A	
<i>Component Part Number:</i>	
003222	
<i>Component Name (P/N + Description):</i>	
003375 Firmware and Profile, Orion BMS2	
<i>Component Description:</i>	
Firmware and Profile, Orion BMS2	
<i>Component Part Number:</i>	
003375	
<i>Component Name (P/N + Description):</i>	
004085 Inverter, SME, AC-X1, CAN programming interface	
<i>Component Description:</i>	
Inverter, SME, AC-X1, CAN programming interface	
<i>Component Part Number:</i>	
004085	
<i>Component Name (P/N + Description):</i>	
004332 Kinetic Energy Recovery System, ASSY	
<i>Component Description:</i>	

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Kinetic Energy Recovery System, ASSY	
<i>Component Part Number:</i>	
004332	

**(c)6 CHRONOLOGY OF DEFECT / (c)7 NONCOMPLIANCE DETERMINATION**

<p><b>Provide the chronology of events leading up to the defect decision or test data for the noncompliance decision:</b></p>
<p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p>

**(c)8 IDENTIFY THE REMEDY**


<p><b>Describe the defect/noncompliance remedy program, including the manufacturer's plan for reimbursement.</b></p>
<p>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.</p>

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<p><b>Describe what distinguishes the remedy component from the recalled component.</b></p> <p>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.</p> <p>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.</p> <p>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.</p> <p>Arcimoto will work with its inverter supplier to implement corrected inverter firmware via a service bulletin in the future.</p>
<p><b>Identify and describe how and when the recall condition was corrected in production.</b></p> <p>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.</p>

**IDENTIFY THE RECALL SCHEDULE**

<b>Describe the recall schedule for notifications:</b>	<b>Planned Dealer Notification Begin Date:</b>
Arcimoto does not intend to send any dealer or distributor notifications, as it has neither dealers nor distributors at this time.	N/A
	<b>Planned Dealer Notification End Date:</b>
	N/A

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	<b>Planned Owner Notification Begin Date:</b>
	04/19/2021
	<b>Planned Owner Notification End Date:</b>
	05/03/2021
<b>Manufacturer's identification code for this recall (if applicable):</b>	

Please be reminded that owner notification letters must be mailed no more than 60 days from submission of this report.


#### **MANUFACTURER COMMENTS TO NHTSA STAFF**

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

#### **DOCUMENT UPLOAD**

- 1.1 (c)10 A representative copy of all notices, bulletins, and other communications that relate directly to the defect or noncompliance and are sent to more than one manufacturer, distributor, dealer or purchaser. These copies shall be submitted to NHTSA's Recall Management Division (NVS-215)



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### 3 REVISION HISTORY

Function	Role	Name	Signature	Date
Author	RA-RCP	Matt M	<insert name>	06/23/2021
Author	RA-RCA	Raymond S	<insert name>	06/23/2021
Author	Dir of GRC	Pete Z	<insert name>	06/23/2021
Author	Dir of Engineering	Gerrit H	Gerrit Hurenkamp	06/23/2021
PO	Dir of GRC	Pete Z	<insert name>	06/23/2021
Approver	Dir of GRC	Pete Z	<insert name>	06/23/2021

Revision		Reason for change;
#	Date Issued	Summary of change from prior Revision
0	03/31/2021	Initial Issue: Internal Outline of Defect and Noncompliance Report Format pursuant to §573.6.
1	06/23/2021	Updated to include component part, description and part number