U.S. Department of Transportation

**National Highway Traffic Safety Administration**

# ODI RESUME

OFFICE OF DEFECTS INVESTIGATION

NHTSA

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**Investigation:** PE 19-005
**Date Opened:** 04/19/2019
**Date Closed:** 12/09/2021
**Investigator:** Peter Kivett
**Reviewer:** Joshua Neff
**Approver:** Stephen Ridella
**Subject:** Unintended Movement

## MANUFACTURER & PRODUCT INFORMATION

**Manufacturer:** Isuzu Technical Center of America, Inc.
**Products:** 2012-2015 Isuzu NPR with Automatic Transmissions
**Population:** 23,635

**Problem Description:** While attempting to bring the vehicle to a stop, it may move inadvertently.

## FAILURE REPORT SUMMARY

| | ODI | Manufacturer | Total |
|---|---|---|---|
| **Complaints:** | 7 | 5 | 7** |
| **Crashes/Fires:** | 1 | 0 | 1 |
| **Injury Incidents:** | 0 | 0 | 0 |
| **Fatality Incidents:** | 0 | 0 | 0 |
| **Other*:** | 17 | Confidential | Confidential |

***Description of Other:** EWR reports and warranty combined

** Total eliminates duplicates received by ODI and manufacturer.

## ACTION / SUMMARY INFORMATION

**Action:** This Preliminary Evaluation is closed.

**Summary:**

The Office of Defects Investigation (ODI) opened this investigation on April 19, 2020. ODI was made aware of seven consumer complaints related to model year (MY) 2012-2015 Isuzu N-series gasoline-powered trucks for unintended movement. ODI worked with Isuzu and peer manufacturers to understand the severity, failure mechanism and frequency of the issue. Attached is a report outlining these details, in addition to the investigation's chronology. This investigation is being closed with Isuzu releasing a technical service bulletin (TSB), with owner notification, to resolve the unintended movement issue in MY 2012-2017 vehicles. The closing of this investigation does not constitute a finding by NHTSA that a safety-related defect does not exist. The Agency will continue to monitor the issue and reserves the right to take further action if warranted by new circumstances.

Please review the attached closing report for full details.

# PE19-005 Closing Report

The Office of Defects Investigation (ODI) opened this Preliminary Evaluation (PE) on April 19, 2019, to investigate 17 instances of Early Warning Reporting (EWR) data and 7 Vehicle Owner Questionnaire (VOQ) complaints on (MY) 2012 - 2015 Isuzu N-series gasoline-powered trucks, alleging that the vehicle may surge forward after the vehicle comes to a stop. During the complainant interview process, an ODI investigator interviewed complainants and learned the subject vehicle could lunge forward as little as a few inches or up to two feet depending on if the driver has their foot on the brake pedal or not. In all cases, the drivers alleged they would instantly push harder on the brake pedal once this lunge occurred. Complainants also alleged there was no specific condition under which this phenomenon would occur. This report details the chronology and investigation process throughout the PE, and ODI's conclusion, based on interviews and work completed by ODI in concert with the Vehicle Research Testing Center (VRTC), Isuzu, General Motors (GM).

It is to be noted that for the subject vehicles, Isuzu orders/purchases the powertrain and chassis from GM in either a gas or diesel configuration. Isuzu is the final stage manufacturer of the vehicles for sale to the public.

On October 8, 2019, ODI learned, through Isuzu's Information Request (IR) letter response, that they were aware of 106 unique warranty claims to the subject population. Isuzu identified the subcomponents behind any claim for which the text mentioned or suggested unintended acceleration or vehicle movement when the accelerator was not being pressed or when the brakes were being applied. Isuzu submitted these reviewed unattended acceleration claims to ODI. Isuzu provided ODI with numerous possible causes of unattended acceleration; however, the majority were found to be isolated cases. After evaluation, the warranty claims that revealed the greatest frequency and warranted a further review were claims related to: E-97/E-98 ECM Loose Grounds, Throttle Body Sticking/ Throttle Body Relearn, EVAP Valve Leaking, $O_2$ Sensor/Post Oxygen Sensor Diagnostic (POSD) failures and Internal Transmission/Sticking Torque Converter Clutch (TCC) to be an area of concentration.

ODI investigated these potential causes of unwanted vehicle movement starting with the possibility of the transmission's torque converter clutch engaging while the vehicle was stationary but still in gear (#5 listed below). During normal operation, the Torque Converter Clutch (TCC) is only engaged in higher gears. Its purpose is to increase fuel efficiency and eliminate power losses while driving at high speeds. However, while evaluating Isuzu's Technical Assistance Line (TAL) field reports, ODI learned of a possible condition where the torque converter may be engaging the internal clutches through a faulty signal from the transmission control module (TCM), which could cause the vehicle to move forward.

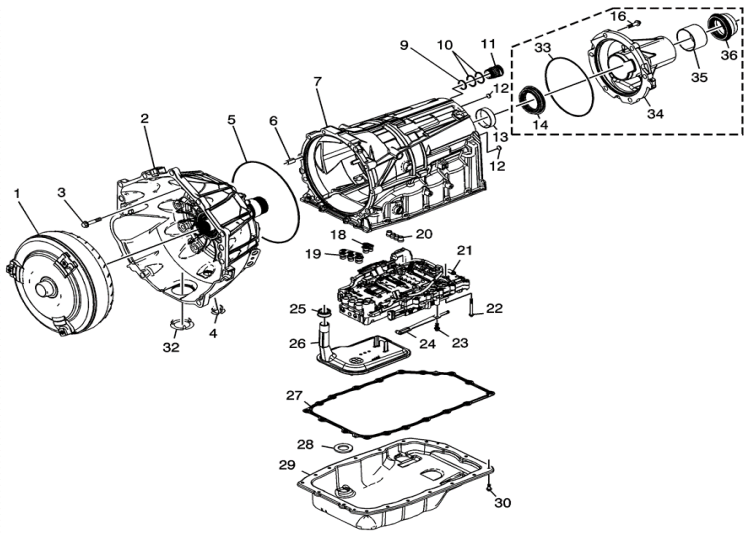


**Figure #1** Shows the transmission layout and torque multiplying method. The torque converter (1) is used to transmit power to the transmission. It contains the Torque Converter Clutch (TCC), Stator, Impeller, and Turbine. When requested by the (4) TCM, the TCC Solenoid (2) in the Control Body sends pressurized transmission fluid from the TCC Control Valve (3) in the front pump to the Torque Converter (1) to engage the TCC.

ODI asked Isuzu for assistance to better understand the TAL field reports. As a result, Isuzu contacted GM and organized a field test/inspection.

On January 20, 2020, ODI and VRTC engineers traveled to the GM Proving Grounds, exploring all possible root causes related to powertrain/transmission failures which could cause the alleged defect to occur. A GM engineer, while riding in the passenger seat of the peer test vehicle, would manually override the TCM electronically, inducing a converter lockup just as the test vehicle came to rest. The goal of the test was to simulate and observe a worst-case scenario "Stuck-on" TCC field complaint (forward lunge). We then wanted to assess the severity of the lunge and determine if the service brakes were effective at mitigating any unexpected movement. The toggle switches were controlled as required to either allow the TCM to control the solenoids, or for the solenoids to be controlled manually. The TCC was hydraulically engaged by supplying power to the TCC solenoid by an assistant approximately 2-3 seconds before a full stop while the driver decelerated. After several test runs at different vehicle speeds, ODI concluded that a minimal safety hazard existed from the transmission converter locking up. A forward lunge was easily mitigated with minimal application of the service brake and less than a few inches of forward lunge occurred and was considered was de-minimus in the testing, since it would result in little to no severe consequence.

Shortly after this testing was completed at GM, Isuzu made ODI aware of another, and more probable, failure mechanism. While conducting their own internal investigation, Isuzu discovered that faulty continuity associated with the E-97 and E-98 ground wire fastener location could affect the ECM's signal output. This failure mechanism was also detected within the 17 warranty reports submitted with Isuzu's PE IR response. The E-97 and E-98 grounds are connected to the left rear of the engine (Figure #2) with eyelet connectors sharing a bolt (Figure #3).

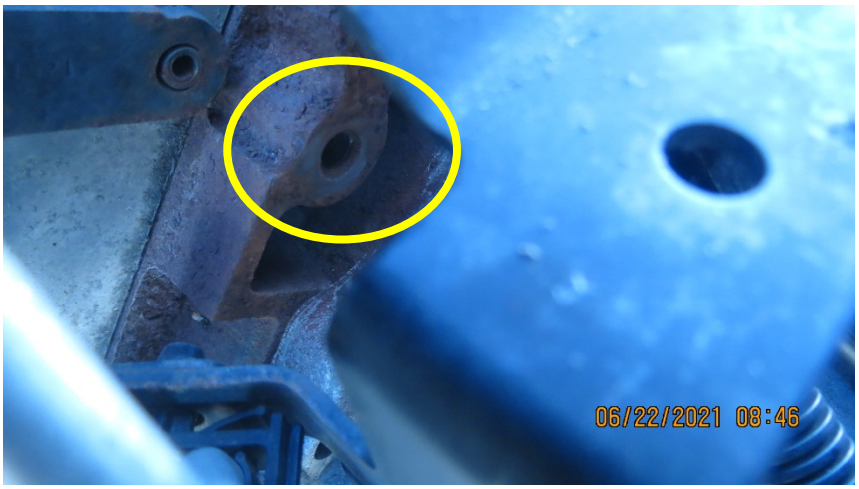


**Figure #2**

*The location on the engine block for E-97 and E-98 ground ring terminals.*

The E-97 grounds the 8 ignition coils and the A/C compressor while the E-98 grounds the ECM and Mass Air Flow (MAF) sensor. On June 22, 2021, both VRTC and Isuzu met at a complainant's location and tested the ground continuity for the E-97 and E-98 connection points.

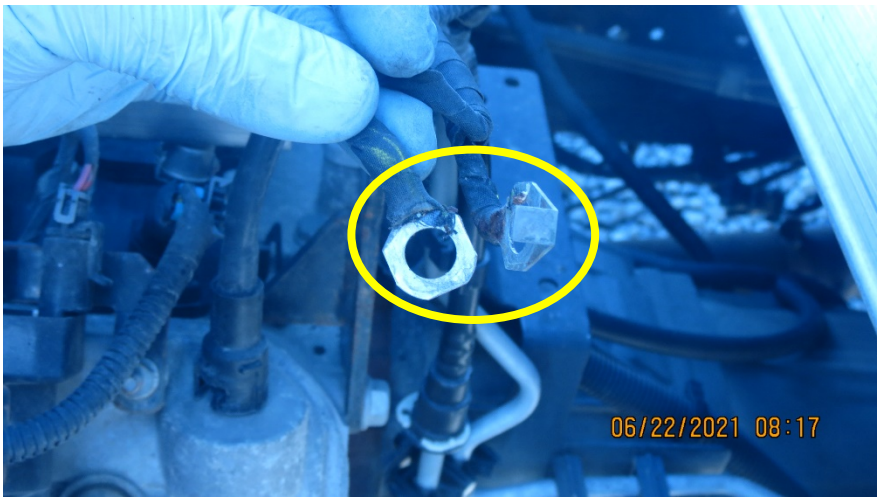


**Figure #3**

*The E-97 and E-98 ring terminals*

The bolt was loosened so that an intermittent ground could be easily induced. The tests were performed on a 2015 NPR-HD crew cab truck. The engine and transmission data were monitored with an IDSS (Isuzu diagnostic scan tool) and this subject vehicle was chosen because it allegedly had symptoms related to the defect.

Upon inspection, both VRTC and Isuzu discovered loose ground connections, and the fasteners' (bolts) clamping load(s) were compromised. (Figure #4)


**Figure #4**

*Both ground ring eyelets and terminals show pitting and corrosion.*

In a report that Isuzu shared with ODI on February 3, 2021, Isuzu determined that during production of the engine harness, the E-97 and E-98 ground eyelets, pre-assembled onto the wiring harness, were faulty. Furthermore, Isuzu identified the crimped eyelet on the end of the harness ground wire was compromised due to a faulty heat shrinking process and a defective crimp interface to the ground wire. According to Isuzu, "when the non-conductive material is compressed within the joint, a clamping force reduction occurs due to material creep from heat and vibration. Once the clamping force lessens, the electrical resistance increases; that resistance may cease to increase at a point that does not cause an issue, or the bolt may continue to loosen and the resistance may continue to increase until high resistance, or an open circuit (loss of continuity) occurs".

Isuzu described possible errors in the assembly of the wiring harnesses which may cause anomalies in ground integrity. This wiring defect can affect the operation of the vehicle. For these reasons Isuzu acknowledged instances where vehicle movement can occur when there is a loose ground connection between the E-97 and/or E-98 circuits. The E-97 connects the Ignition Coil Packs, and E-98 connects the Electronic Control Module (ECM) and Mass Air Flow Sensor (MAF). Isuzu concluded in its report: "In the event the ground is momentarily lost while a driver is coming to a stop and the accelerator pedal (APP sensor) is at 0%, the ECM will detect the actual engine speed (RPM) drop below the target engine idle speed (RPM). This condition can cause the control logic in the ECM to believe an engine stall is imminent and to react by momentarily opening the throttle body plate to 35% to prevent the stall."

The engine speed would fall to 300 rpm and within approximately a half second the throttle body plate would open, increasing the engine speed to 1200 rpm. The ECM would detect that the actual engine rpm is above target engine speed and close the throttle blade, the engine rpm would return to target idle speed and the vehicle surge would be noticed by driver (elapsed time = approximately 2 seconds). ODI learned from Isuzu's testing that minimal service brake pressure

was needed from the driver to maintain control of the vehicle. The weight of a driver's foot on the brake pedal can stop the vehicle from lunging forward.

Although ODI believes, after the testing, that very lightly applied brake pressure is needed to keep the vehicle from lunging, discussions with Isuzu resulted in their initiation of a Customer Satisfaction Campaign to address the possible poor ground connection issue, including expanding the scope to incorporate MY 2012 through 2017 vehicles. Based on Isuzu's actions, including notifying owners of this potential problem, this investigation is closed. Further use of agency resources does not appear warranted; however, the closing of this investigation does not constitute a finding by NHTSA that a safety-related defect does not exist. The agency reserves the right to take further action if warranted by the circumstances.