Updated: 07/7/2022	STATUS: Open	ESCALATION:

BACKGROUND

- JEP (Jamestown Engine Plant) has received 35 BIS (Before In Service) reports of ECM's (Electronic Control Modules) with No Communication;
  - 1 reported by DTNA Cleveland
- RMEP (Rocky Mount Engine Plant) has received 15 BIS reports of ECM's with No Communication;
  - 9 reported by DTNA (4 at DTNA Santiago, 2 at DTNA Mount Holly, 2 at DTNA Cleveland, and 1 at FCCC Gaffney)
- There have been no failure reports from units at the supplier or at Cummins plants
- Cummins is investigating 1 reported failure from the field

FAULT CODE/FAIL MODE

- Engine will not start and ECM will not communicate
- ECM has no communication and may cause the engine to stop running

CURRENT STATE

- Total suspect ECM's for all Cummins locations = 15,122
  - No suspect ECM's were shipped to Cummins MDC locations
  - The supplier (Vitesco) does not have new ECM's from the suspect population at their facility
- Suspect quantity of ECM's for DTNA:
- RMEP = 1590 total (787 - Kontane, 729 - Santiago, 63 - TBB High Point, and 11 - Portland)
  - JEP = 254 total (137 - Kontane, 79 - Saltillo, 27 - Santiago, and 11 - Portland

ROOT CAUSE AND GOAL STATEMENT

- Selective Solder Fixture had a screw loose. Screw was contacting the Lytic cap and applying excess force into the PCB (Printed Circuit Board). Vitesco can detect a direct short of capacitor ground post to V-Batt layer. However, when the capacitor post ground is pressed into the dielectric layer, there is no short to detect. Some scrubbing or movement of PCB & capacitor wears through the dielectric layer into the V-Batt layer resulting in high current draw and heat leading to L2002 reflow and ECM No communication.

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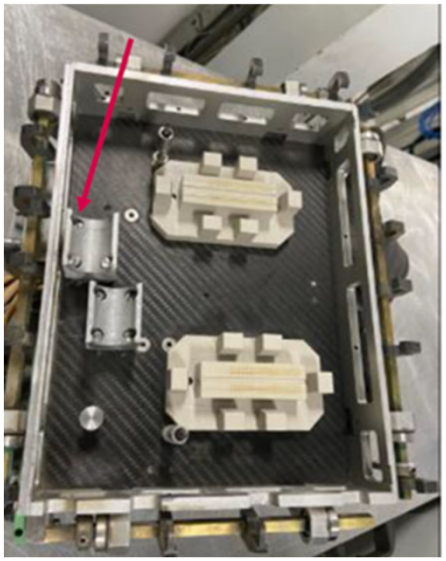
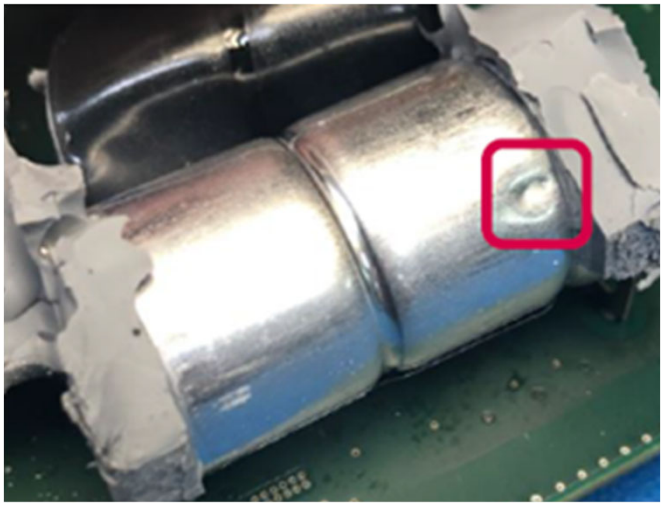
Completed

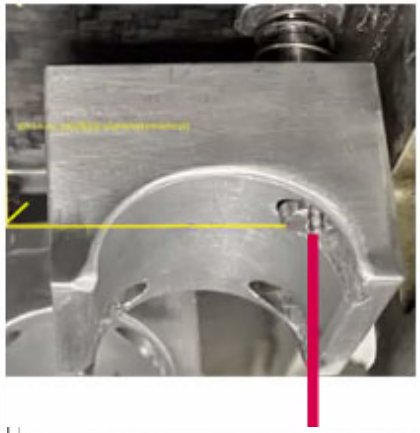
- Selective Solder Screw maintenance log shows repair on 06/03/2022 at the Supplier
  - This date was determined through the failure investigation of an ECM that was returned to the supplier on June 27th; the supplier notified Cummins on June 28th with this information
- To date Vitesco has analyzed 5 ECM's returned from OEM's
- SCAR issued to the Supplier
- RMEP is building with clean date ECM's
- JEP is building with clean date ECM's

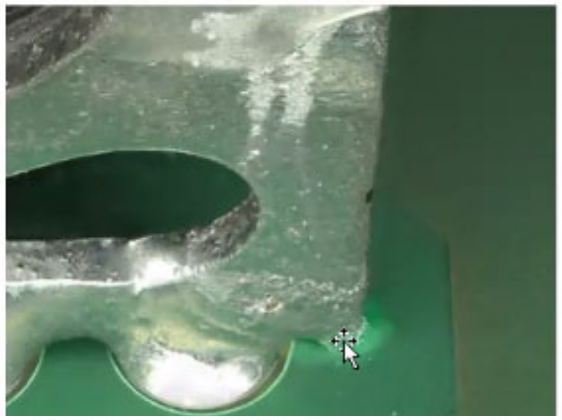


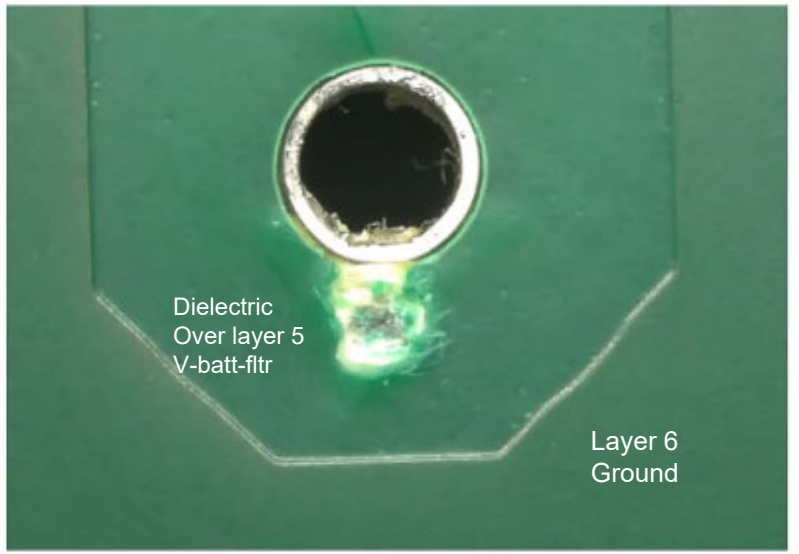
Location of loose/raised screw in Selective Solder fixture

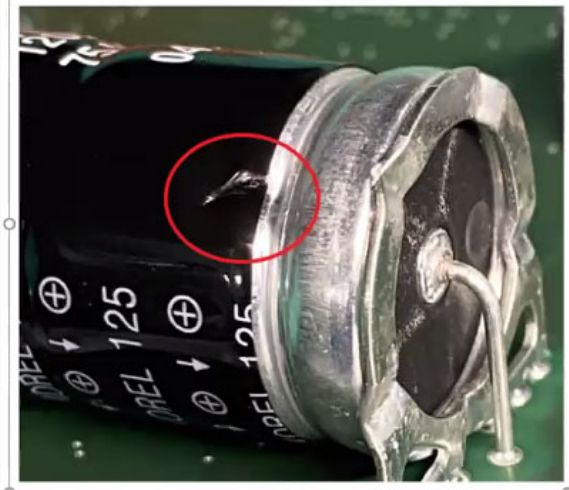


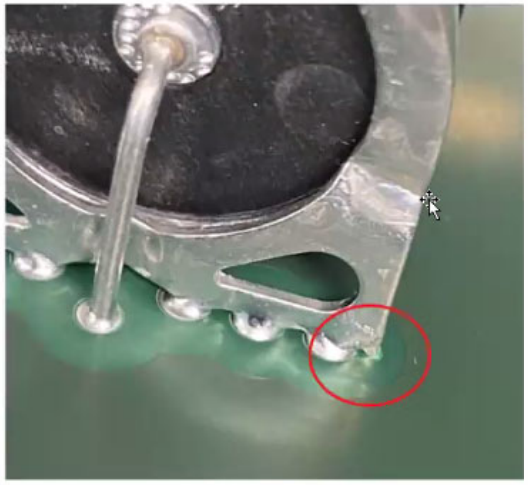
Damaged Lytic Cap

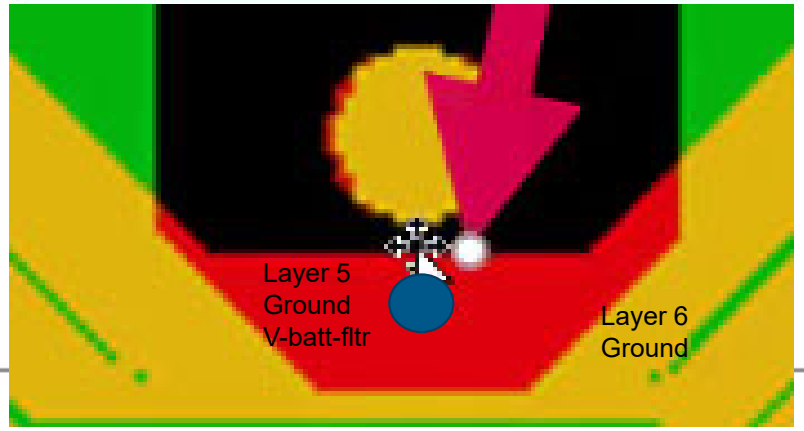




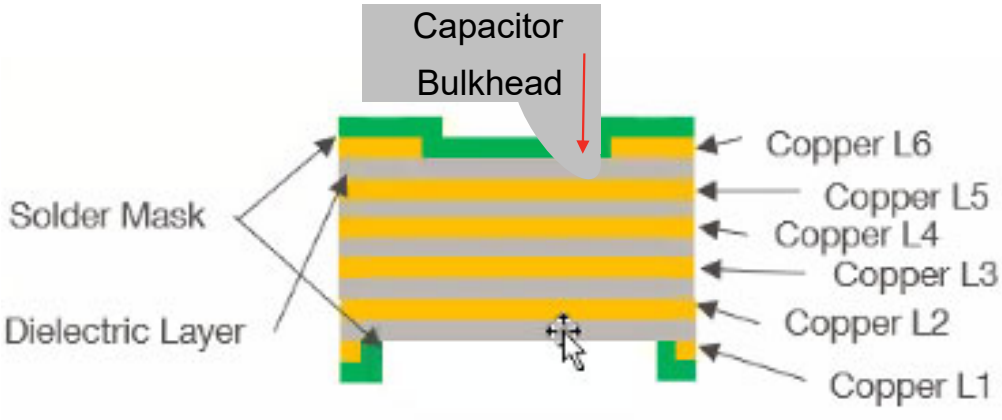

Dielectric
Over layer 5
V-batt-fltr
Layer 6
Ground

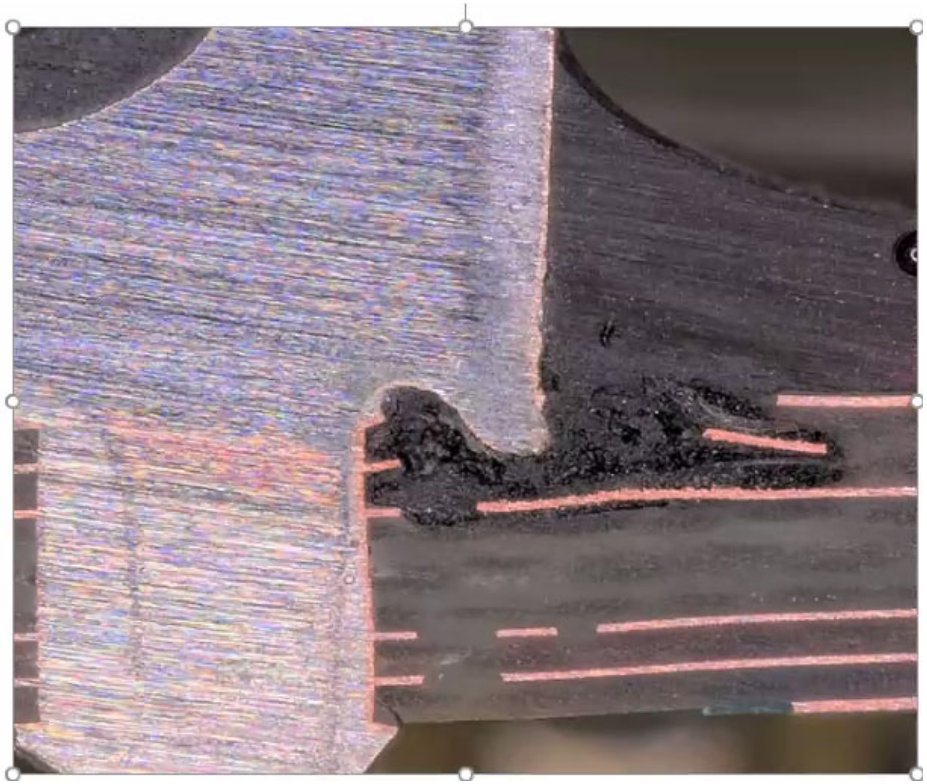





Layer 5
Ground
V-batt-fltr
Layer 6
Ground

PC Board layers





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NEXT STEPS

Agree on next steps for engines still at customer locations and past customer locations

Vitesco

- Complete analysis of a module manufactured May 10th
  - No visible dents, will cross-section to confirm no issues
- Complete cross sections (3)
  - (1) Current module (manufactured June 28th) to confirm no issues
  - (2) Module manufactured May 10th to confirm no issues
  - (3) Suspect module to understand proximity to trace
  - Information and pictures available July 7th for all 3 cross sections
- Complete combined environment testing (shaker and temperature, 1 shaker table with 3 nests)
- Publish results of testing using different levels of a loose screw
- Understand different failure rates between Heavy Duty and Midrange, is it related to vibration, heat, etc..
- Revisit the use of x-ray or scans to see if the defect can be identified
- Re-creating defect
  - Does part pass Vitesco testing but starts to look physically different
- Define screening method for ECM's already in trucks
- Perform Risk Assessment for ECM's already in trucks

Cummins Electronics

- Working on CT imaging in the Fuel Systems lab
  - Understand if dent is visible
  - Understand if compressive residual stress can be measured