Collision Repair Diagnostics
Today’s Topics

• Vehicle Electronic System Advances
• Diagnostics For Blueprinting
• Diagnostic Challenges Facing Collision Industry
• Collision Repair Shop Diagnostic Needs
• Options For Electronic Diagnostics
• Group Discussion – Finding Solutions
Electronic System Damage

- Sensors
- Wiring and connectors
- Control modules
- Fault codes
- Calibration and aiming
Vehicle Or Computer On Wheels?

Courtesy of Chip Design
Collision Industry Challenges

- Increasing number of electronic systems
- Multiple sensors located in collision damage-prone areas
- Electronic component damage more likely on lower severity repairs
- Increased need for system data access and calibration

Courtesy of Analog Devices
Blueprinting - Ideal State Of Estimating

• Blueprinting allows a complete work order to be written and all parts ordered
• Includes a complete tear down to identify all of the damage
• Includes measuring to identify all of the structural damage
Diagnostics For Blueprinting

• Blueprinting includes checking for damage to electronic systems
• Finding electronic damage during damage analysis helps ensure:
  – Complete and safe repair/On-time delivery /Increased credibility with customer
  – Electronic issues won’t be found after repairs deeming vehicle a total loss
  – Better work-flow - shorter cycle time – fewer supplements in shop
• Minimizes the “Cycle Time Killer” at the end of the repair
Check Engine and Warning Light “Misconceptions”

Misconception that if there are no warning lights “everything is fine”:

- Lack of understanding that many electronic issues do not “turn on a light”
- Not all systems are looped into warning lights
- System issues are missed during estimating
- Customer complaint about history codes found later during service at dealer
- Questions arise about the qualifications of who repaired the vehicle
Electronic Diagnostic Needs

- Diagnostics in a collision facility can be required:
  - During the estimating process
  - During the repair when required by a repair procedure
  - After repairs are completed to check systems and clear codes
  - Before delivering the vehicle to the customer
Codes are set during the collision:

- Restraints deploying
- Electronic components becoming physically damaged or jolted
- Wiring and connectors being damaged creating shorts and opens
- Collision can cause conditions that can set any number of codes
- What else?

Will these new codes mask pre-accident codes from a pre-existing issue?
Codes can be set during collision repair:

- Turning key ON during repair when components are damaged or disconnected
- Battery disconnection or replacement requiring registration
- Restraint system part disconnection or replacement
- Electronic system part disconnection/ removal/ replacement
- Interior/seat removal/restraints component replacement and disconnection
- Wire repair/harness repair/ replacement /electrical connector replacement
- Installation of electrical parts with electronic interface (headlight module)
- Many others
Diagnostic Tool Operations

Following collision repair scan tool connection may be required for:

- Vehicles with multiple convenience, infotainment, and safety systems
- Zero point calibration /OCS calibration
- Steering angle sensor calibration
- Aiming or recalibrating cameras
- Clearing codes/ turning off warning lamps
- Initialization/registration of electronic components (headlight modules)
- Repairs involving mechanical systems that interface with a computer
- Repairs that involved welding (verify no damage was done to electronics)
- Restraint systems that have deployed
- Traction Control/ABS systems that were serviced
- Low battery voltage codes
- Grounding issues – mixed material structures
- Verifying electronic systems are functional
What About “Scan In - Scan Out”?

• “Scan In” before repair during damage analysis
• “Scan Out” before vehicle is delivered
• A straight-forward approach
• Helps ensure complete and safe repair
• Need SOP (Standard Operating Procedure) for when is a scan required?
SOP Considerations For “When To Scan”

SOP considerations for when a diagnostic scan is done could include:

– Vehicles that have extensive electronic systems
– Determine what issues exist before repairs are started so they can be discussed and documented
– When electronic systems may be damaged or have set codes
– When systems or control modules need to be recalibrated following specific repairs
– To verify safety systems are working correctly before delivery
– When codes need to be cleared
– Anything else?
Diagnostics – More Than Connecting A Scan Tool?

Diagnostic Tools:
- Identify the test or circuit triggering a MIL or trouble code
- May not determine the exact cause of the code
- May need to be used with OEM service information
- Require trained and experienced technicians to reliably diagnosis/repair/calibrate electronic systems
Understanding The Data

• Although it is an advantage having diagnostic data during damage analysis and repair;
  – The person reading the information must be capable of interpreting what it means
    • Pre-existing – loss related – repair related - irrelevant
  – It may require more research to determine what the codes indicate regarding the condition of the system being checked
  – It may be necessary to do additional checks or tests to verify the condition of an electronic system
  – It may be necessary to reference OEM service information in conjunction with using the tool to evaluate an electronic system
  – Can the codes just be cleared?
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<th>Shop RO#</th>
<th>VEHICLE</th>
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<td><em>Shop describes:</em> DEMO</td>
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Scan complete: 13 modules reporting with **42 DTCs** in 8 modules.

**Passenger Presence Module**
- U0151 (00) Lost Communication with Inflatable Restraint Module
- B1325 (03) Control Module Power Circuit Low Voltage

**Multimedia Player Interface Module**
- B1325 (03) Control Module Power Circuit Low Voltage
- B1325 (07) Control Module Power Circuit High Voltage
- U0073 (00) CAN Bus Communication Fault

**Instrument Panel Cluster**
- B0158 (05) Ambient Air Temperature Sensor Circuit Open
- B1325 (03) Control Module Power Circuit Low Voltage
- B1325 (07) Control Module Power Circuit High Voltage

**Electronic Brake Control Module**
- U0100 (71) Lost Communication with Engine Control Module
- U0140 (71) Lost Communication with Body Control Module
- C0800 (03) Control Module Power Circuit Low
- C0186 (71) Lateral Acceleration Sensor Circuit Malfunction
- C0196 (71) Yaw Rate Circuit Data Invalid
- C0800 (07) Control Module Power Circuit Voltage High

**Inflatable Restraint Sensing and Diagnostic Module**
- B1325 (03) Control Module Power Circuit Low Voltage
- B1325 (07) Control Module Power Circuit High Voltage
- B067F (04) Passenger Air Bag ON Indicator Circuit Open
- B0680 (04) Passenger Air Bag OFF Indicator Circuit Open
- U0140 (00) Lost Communication with Body Control Module
- U0155 (00) Lost Communication with Instrument Panel Cluster

**Radio**
- U0020 (00) Low Speed CAN Fault

**Body Control Module**
- B1517 (03) Battery Voltage Low
- B1529 (03) Control Module Voltage Reference Output Voltage Low
- B2575 (01) Headlamp Control Circuit Fault
- B2575 (04) Headlamp Control Circuit Open
- B257B (03) Light Control Switch Low Voltage
- B2645 (07) Ambient Light Sensor Voltage High
- B2699 (01) Right Headlamp Control Circuit Malfunction
- B2699 (04) Right Headlamp Control Circuit Open
- B2745 (01) Traction Switch Circuit Malfunction
- B3006 (02) Hood Ajar Circuit Malfunction
- B3948 (01) Left Front Turn Signal Circuit Fault
- B3948 (04) Left Front Turn Signal Circuit Open
- B3949 (01) Right Front Turn Signal Circuit Fault
- B3949 (04) Right Front Turn Signal Circuit Open
- C0277 (06) Brake Pedal Position Sensor Circuit Low Voltage
- C0890 (03) Control Module Voltage Reference Low
- B151D (03) control Module Power Circuit Low Voltage
- U0155 (00) Lost Communication with Instrument Panel Cluster
- U0164 (00) Lost Communication with Heating and Air Conditioning Module
- B101E (43) Electronic Control Unit Software Incorrect

**Power Steering Control Module**
- C0800 (03) Control Module Power Circuit Voltage Low

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CDS Client
Attn: John Doe
1452 Washington St.
Atlanta, GA 30305
Phone Number: (555)555-5555

jake.r@collisiondiagnosticservices.com

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<th>Shop RO</th>
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Service Description: Completion/Calibration Scan

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Shop reports: Front end and rear end damage. No lights on dashboard. Performed full vehicle scan “Health Check” 21 modules reporting with 18 faults in 7 modules.

AIRBAG

- 03551 Function restriction of seat occupied recognition (This code can cause the passenger airbags to not deploy with a present occupant at the event of a crash) Vehicle will need zero point calibration to clear

DASH PANEL INSERT

- (B103F1B) OUTSIDE AIR TEMPERATURE SENSOR RESISTANCE TOO HIGH (This code can cause an incorrect reading interpretation resulting in a skewed measurement value display) This code will effect dashboard temperature display, automatic climate control and cold start engine fuel enrichment. See A/C Fault below

IMMOLISER

- 1176 Key IMPLausible SIGNAL

ELECTRONIC CENTRAL ELECTRICS

- 1493 Left Front Turn Signal Light M5 (This code is in reference to a open circuit)
- 1497 Right Front Turn Signal Light M7 (This code is in reference to a open circuit)

- 987 LEFT BRAKE LIGHT M9 (This code is in reference to a open circuit)
- 2394 Left Parking Light M1 (This code is in reference to a open circuit)
- 2395 Right Parking Light M3 (This code is in reference to a open circuit)
- 984 Bulb for Left Tail lamp M4 (This code is in reference to a open circuit)
- 1495 Left High Beam Headlight M30 (This code is in reference to a open circuit)
- 1499 Right High Beam Headlight M32 (This code is in reference to a open circuit)
- 978 Bulb for dipped beam headlight left (This code is in reference to a open circuit)
- 979 Bulb for dipped beam headlight right (This code is in reference to a open circuit)

The above lighting codes are due to the vehicle’s key being cycled without the lighting components plugged in. If these faults are not cleared and appropriate adaptions performed, “smart” lighting features on the vehicle will be disabled such as auto brake lights for adaptive cruise control and hazard light flash when door locks are cycled via key fob.

A dashboard warning light for these faults does not exist

DRIVER SIDE DOOR ELECTRONICS

- 932 Motor for window regulator, driver side, NO OR INCORRECT BASIC SETTING/ADAPTATION (This code is in reference to lost memory from, being unplugged. Basic setting has to be readapted to initialise certain advanced functions)
- 131 Driver’s Door Handle Light/mirror light, driver side

Phone (888)404-4841 11554 Davis Creek Ct., Jacksonville, Florida 32256 Fax (904)680-5119

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Collision Facility Diagnostic Options

• Do diagnostics “in house”
  • purchase diagnostic tools
  • get tech(s) trained
  • hire a dedicated mechanical/electrical collision specialist

• Sublet to a dealer service department
• Sublet to a mobile diagnostic specialty service
• Use a remote diagnostics service provider
Remote Diagnostics

Remote tool interfaces:

- Damaged vehicle diagnostic connector
- Proper diagnostic tool
- Experienced diagnostic technician
Remote Diagnostics

Windows-Based PC + J2534 Device

Right to the Car in your Shop!

All BlueLink Software Tools

Or ANY J2534-Based Software!

Toyota TechStream

Newest Tech2Win (Not Pictured)

Mercedes PassThru SCN Coding
Resolving The Problem

Are there resolutions in the following areas for the problems that the collision shops are facing?

- Equipment
- Software - Built in tutorial and reference information
- Training - Is the key to effective diagnostics
- Diagnostic Services - Remote and live
- OEM Support
  - Position Statements On Safety System Verification

Anything Else?
I-CAR Electric/Electronic System Training

I-CAR Electrical/Mechanical Technician – PDP Role Optional for Gold Class

- Adaptive Cruise Control CRU01e
- Advanced Restraint Systems RES02
- Anti-Lock Brakes and Traction Control Systems ABR01
- Honda & Acura Electrical Collision Repair HON14e
- Honda & Acura Restraints Collision Repair HON12e
- Advanced Steering and Suspension Systems Damage Analysis DAM15
- Alternative Fuel Vehicle Damage Analysis ALT04e
- Basic Electronics Damage Analysis DAM13e
- Damage Analysis of Advanced Automotive Systems DAM07
- Collision Warning Systems CWS01e
- Electronic Stability Control Systems Overview ESC01
- Fault Code Retrieval, Diagnosis, and Testing Electronic Systems ELE03
- Lighting, Starting, and Charging Systems LSC01
- Keyless Entry KEY01e
Full Function Scan Tool
Full Function Scan Tool
Full Function Scan Tool
Questions?
**Please remember to reconnect for completion scan once vehicle is complete.**

### Service Description: Inspection Scan

- **Shop description:** Vehicle has front end and undercarriage damage, no airbag deployments are reported.
  - Perform full vehicle scan 13 modules reporting with 30 DTCs in 7 modules. Perform several body system output tests successfully.

**Passenger Presence Module**
- U1051 (06) Lost Communication with Inflatable Restraint Module
- B1325 (03) Control Module Power Circuit Low Voltage

**Multimedia Player Interface Module**
- B1325 (03) Control Module Power Circuit Low Voltage
- B1325 (07) Control Module Power Circuit High Voltage
- U0073 (00) CAN Bus Communication Fault

**Instrument Panel Cluster**
- B1319 (07) Ambient Air Temperature Sensor Circuit Open
- B1325 (03) Control Module Power Circuit Low Voltage
- B1325 (07) Control Module Power Circuit High Voltage

**Body Control Module**
- B1517 (03) Battery Voltage Low
- B1529 (03) Control Module Voltage Reference Low
- H2578 (03) Lighting Control Switch Voltage Low
- H2645 (07) Ambient Light Sensor Circuit Voltage High
- B745 (02) Traction Control Switch Circuit Short
- B3906 (02) Hood Ajar Circuit Short
- C1077 (06) Brake Pedal Position Sensor Circuit Fault
- C1006 (03) Control Module Voltage Reference Low
- H151 (03) Control Module Power Circuit Low
- H101E (43) Electronic Control Unit Software Fault

### Amount

**Demo**

**Electronic Brake Control Module**
- U0100 (7) Lost Communication with Engine Control Module
- U0140 (7) Lost Communication with Body Control Module
- C0930 (03) Control Module Power Circuit Low
- C0196 (7) Lateral Acceleration Sensor Circuit Malfunction
- C0196 (7) Yaw Rate Circuit Data Inaccurate
- C0080 (07) Control Module Power Circuit Voltage High

**Inflatable Restraint Sensing and Diagnostic Module**
- B1325 (03) Control Module Power Circuit Low Voltage
- B1325 (07) Control Module Power Circuit High Voltage
- B067F (04) Passenger Air Bag On Indicator Circuit Open
- B0680 (04) Passenger Air Bag OFF Indicator Circuit Open
- U0140 (00) Lost Communication with Body Control Module

**Radio**
- U0028 (00) Low Speed CAN Fault

**Recommendations:**
- Inspect battery condition, date code, charge and test, replace if test fails or damaged.
- Inspect ambient temp sensor and circuit for damage, repair or replace as needed.
- Inspect hood latch/switch and circuit for damage, repair or replace as needed.
- Inspect brake switch for damage and brake light operation.

**After completion:**
- All systems code clear
- Yaw rate sensor and lateral acceleration calibration.
- Steering angle zero point calibration
- Brake position sensor calibration
- System function check.