

Collision Repair Diagnostics



Today's Topics

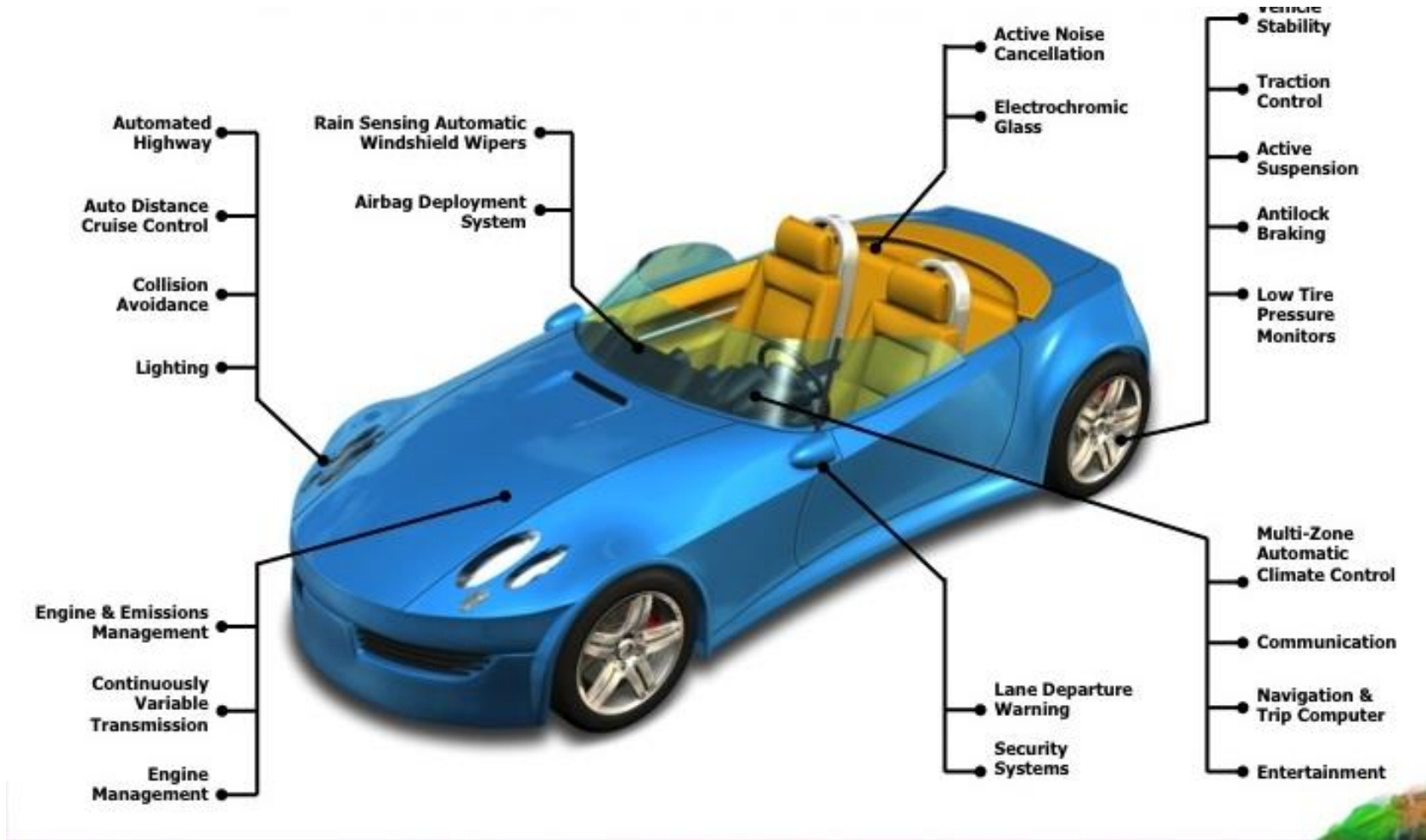
- Vehicle Electronic System Advances
- Diagnostics For Blueprinting
- Diagnostic Challenges Facing Collision Industry
- Collision Repair Shop Diagnostic Needs
- Options For Electronic Diagnostics
- Group Discussion – Finding Solutions

Electronic System Damage



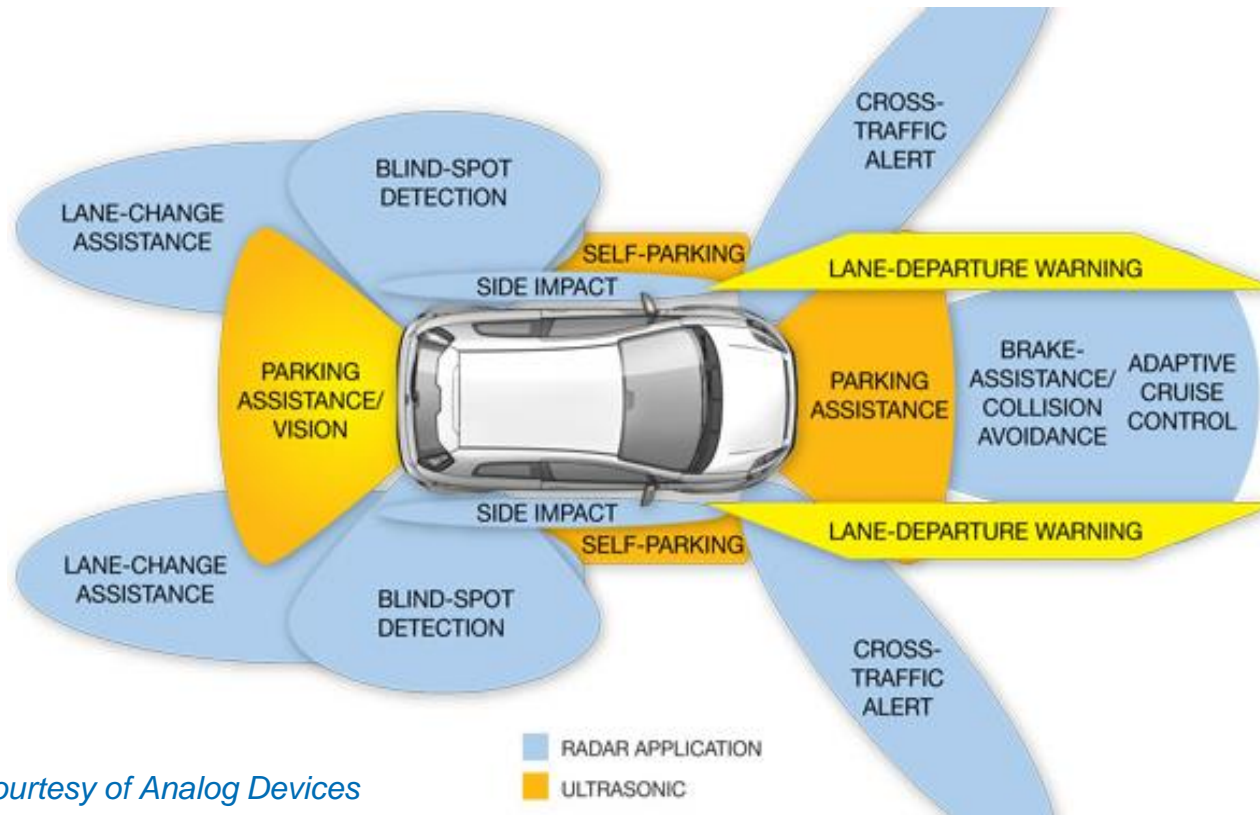
- Sensors
- Wiring and connectors
- Control modules
- Fault codes
- Calibration and aiming

Vehicle Or Computer On Wheels?



Courtesy of Chip Design

Collision Industry Challenges



Courtesy of Analog Devices

- 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

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 Set During Collision



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 Set During Collision Repair

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



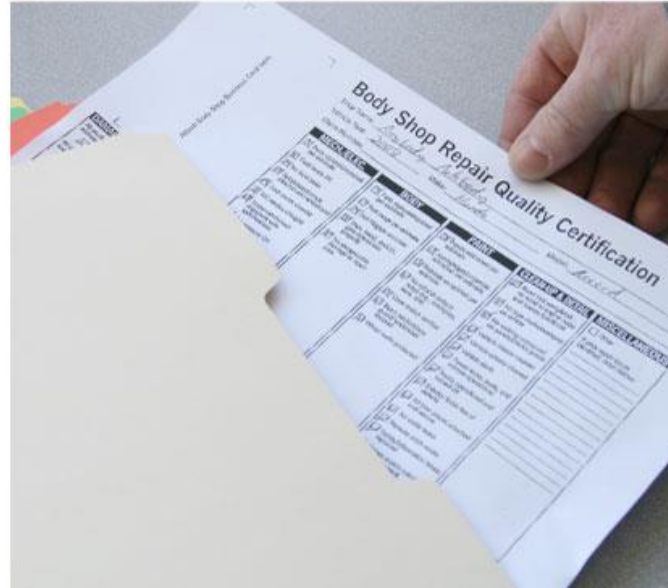
2013 BMW 74

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?

Bill To:
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Date: 11/2/2013
Time: 3:30 PM EST
Invoice: 101720138827-I

Shop RO#	VEHICLE	Current Odometer
1	2012 CHEVROLET CRUZE VIN:1G1PF5SC7C7368827	33,329

Service Description: Inspection Scan	Amount
Shop describes :DEMO Perform full vehicle scan "Health Check" Scan complete: 13 modules reporting with 42 DTCs in 8 modules. Passenger Presence Module <ul style="list-style-type: none"> U0151 (00) Lost Communication with Inflatable Restraint Module B1325 (03) Control Module Power Circuit Low Voltage Multimedia Player Interface Module <ul style="list-style-type: none"> 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 <ul style="list-style-type: none"> 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 <ul style="list-style-type: none"> 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 <ul style="list-style-type: none"> 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 	\$00.00

Radio <ul style="list-style-type: none"> U0020 (00) Low Speed CAN Fault Body Control Module <ul style="list-style-type: none"> B1517 (03) Battery Voltage Low B1529 (03) Control Module Voltage Reference Output Voltage Low B2575 (01) Headlamp Control Circuit Fault B2775 (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 <ul style="list-style-type: none"> C0800 (03) Control Module Power Circuit Voltage Low 			
			\$00.00

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

Date: 10/04/2013
 Time: 9:52AM EST
 Invoice: 100420138799-C

jake.r@collisiondiagnosticservices.com

Shop RO	VEHICLE	Current Odometer
26166	2010 VOLKSWAGEN CC VIN: WVWMN7AN1AExxxxxx	60,690

Service Description: Completion/Calibration Scan	Amount
<p>Shop reports: Front end and rear end damage. No lights on dashboard.</p> <p><i>Performed full vehicle scan "Health Check" 21 modules reporting with 18 faults in 7 modules.</i></p> <p>AIRBAG</p> <ul style="list-style-type: none"> 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 <p>DASH PANEL INSERT</p> <ul style="list-style-type: none"> (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 <p>IMMOBILISER</p> <ul style="list-style-type: none"> 1176 Key IMPLAUSIBLE SIGNAL <p>ELECTRONIC CENTRAL ELECTRICS</p> <ul style="list-style-type: none"> 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) 	\$85.00

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- 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 theses 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 intialise certain advanced functions)
- 131 Driver's Door Handle Light/mirror light, driver side

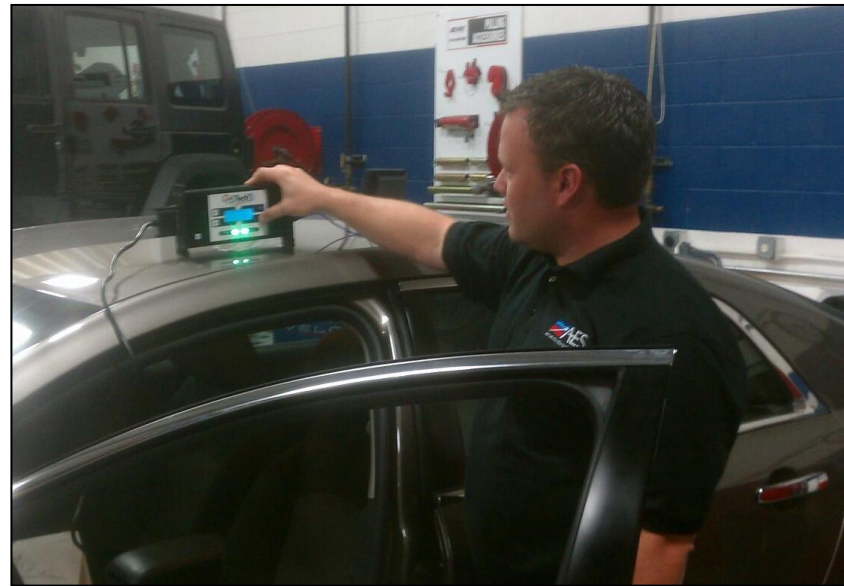
Collision Facility Diagnostic Options

- 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

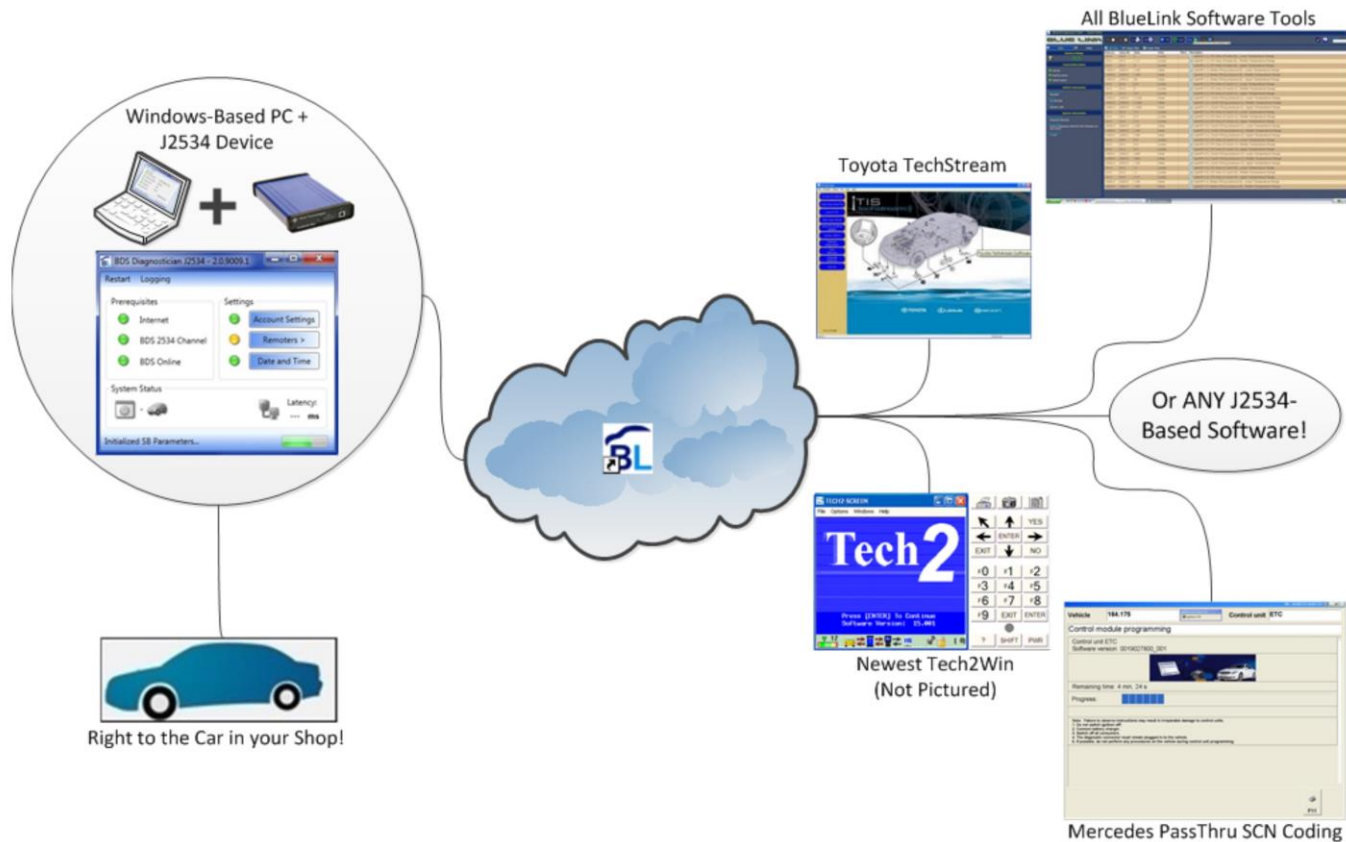
Remote Diagnostics

Remote tool interfaces:

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



Remote Diagnostics



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?



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Date: 9/13/2013
Time: 2:32PM EST
Invoice: 091320138827-I

jason.bartanen@i-car.com

Shop RO#	VEHICLE	Current Odometer
1	2012 CHEVROLET CRUZ VIN:1G1PF5SC7C7368827	33,328

Service Description: Inspection Scan	Amount
<p>Shop describes: Vehicle has front end and undercarriage damage, No Airbag deployments are reported.</p> <p><i>Perform full vehicle scan 13 modules reporting with 30 DTCs in 7 modules. Perform several body system output tests successfully.</i></p> <p>Passenger Presence Module</p> <ul style="list-style-type: none"> U0151 (00) Lost Communication with Inflatable Restraint Module B1325 (03) Control Module Power Circuit Low Voltage <p>Multimedia Player Interface Module</p> <ul style="list-style-type: none"> B1325 (03) Control Module Power Circuit Low Voltage B1325 (07) Control Module Power Circuit High Voltage U0073 (00) CAN Bus Communication Fault <p>Instrument Panel Cluster</p> <ul style="list-style-type: none"> B0158 (05) Ambient Air Temperature Sensor Circuit Open B1325 (03) Control Module Power Circuit Low Voltage B1325 (07) Control Module Power Circuit High Voltage <p>Body Control Module</p> <ul style="list-style-type: none"> B1517 (03) Battery Voltage Low B1529 (03) Control Module Voltage Reference Low B257B (03) Lighting Control Switch Voltage Low B2645 (07) Ambient Light Sensor Circuit Voltage High B2745 (02) Traction Control Switch Circuit Short B3006 (02) Hood Ajar Circuit Short C0277 (06) Brake Pedal Position Sensor Circuit Fault C0890 (03) Control Module Voltage Reference Low B151D (03) Control Module Power Circuit Low B101E (43) Electronic Control Unit Software Fault <p>Continued.....</p>	Demo



<p>Electronic Brake Control Module</p> <ul style="list-style-type: none"> 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 <p>Inflatable Restraint Sensing and Diagnostic Module</p> <ul style="list-style-type: none"> 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 <p>Radio</p> <ul style="list-style-type: none"> U0020 (00) Low Speed CAN Fault <p>Recommendations;</p> <ul style="list-style-type: none"> 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. <p>After completion:</p> <ul style="list-style-type: none"> All systems code clear Yaw rate sensor and lateral acceleration calibration. Steering angle zero point calibration Brake position sensor calibration System's function check. 	Demo
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**** Please remember to reconnect for completion scan once vehicle is complete. ****