



**Countries:** CANADA, CHILE, COLOMBIA, UNITED STATES, MEXICO, NICARAGUA, PERU, PUERTO RICO, PANAMA  
**Document ID:** IK0800223  
**Availability:** ISIS, Bus ISIS, FleetISIS, Body Builder  
**Revision:** 7  
**Major System:** ELECTRICAL SYSTEM  
**Created:** 2/24/2010  
**Current Language:** English  
**Last Modified:** 9/2/2014  
**Other Languages:** [Français](#), [Español](#),  
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**Viewed:** 13562

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Coding Information

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**Title: Accelerator Position Sensor/Idle Validation Switch APS / IVS Diagnostics DLCII equipped engine control systems**

**Applies To: All DLCII equipped engines 2003-2006 including VT275, VT365, DT466E and 570E engine. Vehicles included, but not limited to: CF500 and 600, Workhorse™ brand chassis'. 4200,4300,4400,7400,7500, 8500, CE Bus, RE Bus, FE Bus, 1552 and 1652 SC,**

**DESCRIPTION**

Two new APS sensors (Accelerator Position Sensor) have been developed and released for use with pre-2010 emissions International Engines. The new sensors listed below contain "non-contact" hall-effect idle validation sensors. This replaces the open/closed IVS switches in the old sensors . As a result of this new design, the normal resistance measurements performed for the potentiometer and idle validation switch on the previous "contact" sensor are no longer applicable. A technician can continue to perform resistance measurement tests on the engine harness with the sensor unplugged (open circuit), but should rely solely upon the voltage measurement tests, with a breakout harness installed, at the ECM and APS sensor, and the new sensor connected.

**SYMPTOMS**

- APS/ IVS fault codes present
- Engine speed restricted to idle
- Erratic automatic transmission operation
- Engine warning lights illuminated

**POSSIBLE DIAGNOSTIC TROUBLE CODES**

VT275, VT365, DT466/570 EGR 2004-2007 engines

DTC	MODULE	DESCRIPTION
131	ECM	APS signal voltage out-of-range LOW . < 0.147 V for more than 0.35 seconds.
132	ECM	APS signal voltage out-of-range HIGH. > 4.55 V for more than 0.35 seconds.
133	ECM	APS signal in-range fault.
134	ECM	APS and IVS disagree.
135	ECM	Idle validation switch circuit fault

**PARTS INFORMATION**

Please refer to TSI letter 10-08-01 for parts details including cross reference information. Follow link: [TSI letter 10-08-01](#)

## DIAGNOSTICS

There can be various conditions that can cause APS/IVS related issues. As with any performance related fault, a thorough description of the issue, from the operator is critical.

- Is the fault sensitive to road conditions, such as rough terrain, hills, etc ?
- Is the fault temperature sensitive ?
- Does the fault occur, when coming to a stop, or when accelerating or cruising ?
- Do any other faults occur at the same time, such as loss of dash cluster, or other in cab accessories ?
- Is there other codes, that can be attributed to this issue?
- Are there faults regarding the IAT (intake air temperature) sensor, BAP(barometric air pressure sensor)?

If any circuit issues are suspected, a thorough visual inspection of all circuitry for shorts, and opens is critical, as intermittent issues are usually caused by wiring faults. Any harness mounting points should be disassembled and inspected. Where harnesses pass by sharp edges, or possible points of abrasion should be inspected and if required, repaired.

Whenever connector inspection has been performed, and tested satisfactory, always apply a light coating of dielectric grease upon reconnection, being careful to properly lock connectors.

If idle validation faults are an issue, testing of the ignition voltage supply to the sensor should be performed.

## COMPONENT FUNCTION/DESCRIPTION

When the ignition is ON, the ECM continuously monitors the APS/IVS circuits for expected voltages. The ECM also compares the APS and IVS signals for differences. If the signals are not what the ECM expects to see, the ECM sets Diagnostic Trouble Codes.

### APS

The ECM supplies a regulated 5 V signal from ECM chassis connector Pin X4-4 to APS connector Pin C. The APS returns a variable voltage signal (depending on pedal position) from the APS connector Pin A to ECM Pin X4-18. The APS is grounded at Pin B from the ECM Pin X4-24.

### APS Auto-Calibration

The ECM learns the lowest and highest pedal positions by reading and storing the minimum and maximum voltage levels from the APS. In this manner the ECM auto-calibrates the system to allow maximum pedal sensitivity. The ECM auto-calibrates as the ignition switch is on, but when the ignition switch is turned OFF, these values are lost. When the key is turned on again, this process starts over. When the pedal is disconnected (or a new one is installed), the pedal does not need to be calibrated. It simply auto-calibrates the new pedal assembly whenever the key is turned on again.

### IVS

The ECM expects to receive one of two signals through the ECM chassis connector Pin X4-12 from APS/IVS connector Pin D:

- 0 V when the pedal is at the idle position.
- B+ when the pedal is depressed

The IVS receives a 12 V ignition voltage at Pin F from the ignition fuse in the power distribution box. When the pedal is not in the idle position (throttle applied), the IVS supplies a 12 V signal to the ECM.

The ECM compares APS/IVS inputs to verify when the pedal is in the idle position. If the APS signal at Pin X4-18 indicates throttle is being applied, the ECM expects to see 12 V at the IVS. If the APS signal indicates throttle is not applied, the ECM expects to see 0 V at the IVS. The timing process is critical between the APS and IVS sensors. For this reason, it is very difficult to determine if the APS/IVS assembly is working correctly when using a Digital Multimeter (DMM).

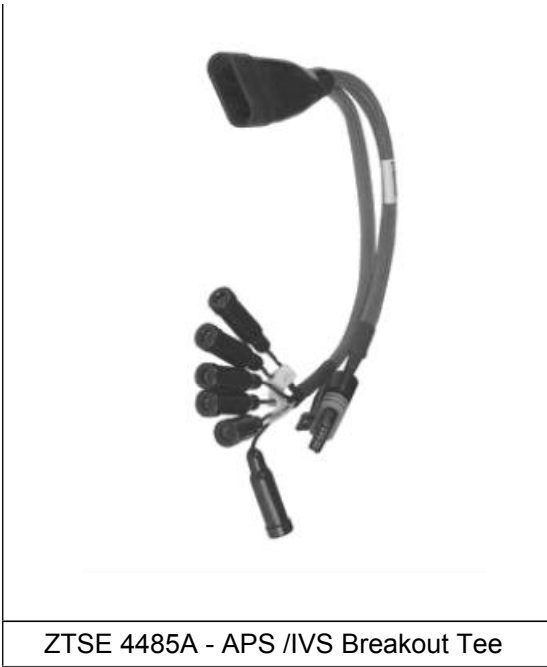
### Fault Detection / Management

When the key is on, the ECM continuously monitors the APS/IVS circuits for expected voltages. It also compares the APS and IVS signals for conflict. If the signals are not what the ECM expects to see, Diagnostic Trouble Codes (DTCs) will be set. Any detected malfunction of the APS/IVS sensor circuit will illuminate the amber ENGINE lamp. If the ECM detects an APS signal Out of Range HIGH or LOW, the engine will ignore the APS signal and operate at low idle. If a disagreement in the state of IVS and APS is detected by the ECM and the ECM determines that it is an IVS fault, the ECM will only allow a maximum of 50% APS to be commanded. If the ECM cannot discern if it is an APS or IVS fault, the engine will be allowed to operate at low idle only. .

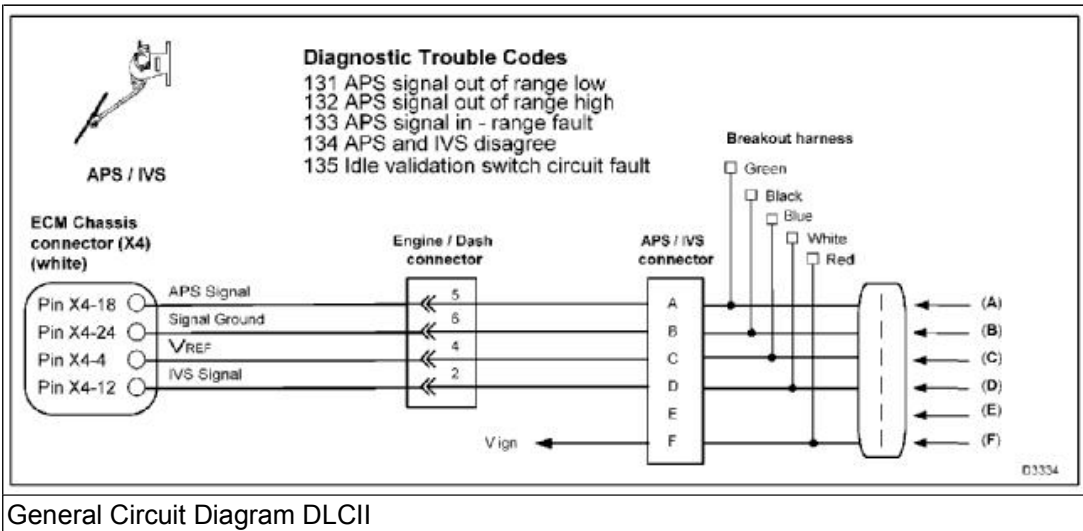
## TROUBLESHOOTING

### NOTE:

When performing diagnostic tests, be sure to refer to the correct circuit diagram manuals, found on ISIS, for the vehicle you are working on.



ZTSE 4485A - APS / IVS Breakout Tee



General Circuit Diagram DLCII

**Connector Voltage Checks**

(Check with Sensor Connector disconnected, and Ignition Key On)

Test Points	Specification	Comments
A to GND	< 0.25V	If greater than 0.25V, signal is shorted to V <sub>REF</sub> or B+.
B to GND	0V	Signal ground no voltage expected.
C to GND	5 ± 0.5V	Voltage > spec, wire shorted to B+
D to GND	< 0.25V	Voltage > 0.25V, IVS signal wire shorted to V <sub>REF</sub> or B+
F to GND	12V ± 1.5V	Voltage < 10.5V check circuit for open or resistance.

**Harness Resistance Checks**

(Install breakout box on chassis harness only. Connect ZTSE-4485 - APS/ IVS Break Out Tee to chassis harness only.)

Test Points	Specification	Comments
X4-18 to A	< 5 ohm	If > 5 ohm, check for APS signal wire open.
X4-24 to B	< 5 ohm	If > 5 ohm, signal ground open.
X4-4 to C	< 5 ohm	If > 5 ohm, V <sub>REF</sub> wire open.
X4-12 to D	< 5 ohm	If > 5 ohm, IVS signal wire open.
Fuse to F	< 5 ohm	If > 5 ohm, IVS power wire open.

Operation Voltage Checks for APS/IVS Sensor with breakout box (Check with breakout box installed [X4 only] to ECM and Chassis harness. Inspect for bent pins or corrosion.)				
Position	APS Test Points (+) X4-18 to (-) X4-24		IVS Test Points (+) X4-12 to (-) X4-24	
	Voltage	% APS	Voltage	Comments
Low Idle	0.64V to 0.66V	0 %	0 V	IVS toggles just off idle
High Idle	3.84V to 3.86V	98% to 102%	B+	

**NOTE:**

If any of the circuit readings are not within the required specifications, keep in mind, that the IAT (Intake Air Temp.) sensor, is spliced with the signal ground and BAP (Barometric Air Press.) sensor circuits are spliced with the 5 volt reference circuits, of the APS/IVS. These circuits should also be inspected, as they can affect the APS/IVS function/readings.

**NOTE:**

If all circuit and operational tests have been performed, and all wiring/components have been inspected and are deemed to be satisfactory, yet the issue is still unresolved, open a tech service case file for further diagnostic assistance.

**ADDITIONAL RELATED IKNOW DOCUMENTS:**

[IK0800218](#) Accelerator Position Sensor/Idle Validation Switch APS /IVS Diagnostics, 3-Box equipped engine control systems

[IK0800219](#) DLC equipped vehicles Accelerator Position Sensor/IdleValidation Switch APS / IVS Diagnostics NavPak™, CEC equipped engine control systems

[IK0800226](#) Accelerator Position Sensor/ Idle Validation Switch APS / IVS Diagnostics, MaxxForce® equipped engine control systems

[IK0800227](#) Accelerator Position Sensor / Idle Validation Switch APS / IVS Diagnostics MaxxForce® 11 and 13 engines

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