



Service Data

SD-64-4976

AutoVue® Lane Departure Warning (LDW) System by Bendix CVS

1.0 DESCRIPTION

The AutoVue® Lane Departure Warning (LDW) System by Bendix CVS gives drivers the ability to combat lane drift related to drowsiness/fatigue, distractions, and/or extreme lightning conditions.

At speeds above 37 mph (59 kph), the AutoVue system tracks visible lane markings including both solid and dashed shoulder lines, center lines, and lines between lanes.

When an unexpected lane change takes place—a lane change without an activated turn signal – the system alerts (audible or haptic) the driver to make a correction.

1.1 SYSTEM COMPONENTS

The system components include a digital camera mounted near the middle of the windshield inside the cab and pointed toward the road, a bracket to attach the camera to the windshield, an enable/disable switch (typically with status lamps), a driver alert system (speakers and/or a vibrating seat), and a central processing unit in the overhead console.

Some vehicles connect the AutoVue LDW system to the vehicle's telematics communication system (See Appendix A: SafetyDirect® by Bendix CVS system).



WARNING

The AutoVue LDW system is intended only as an aid for a conscientious and alert driver. It may not provide any warning of unintended lane departures under certain conditions. Do not rely solely on the system to safely operate the vehicle. It does not warn of all possible hazards. For example, the system cannot help prevent an accident if the driver is impaired or not driving safely.

Ultimate responsibility for the safe operation of the vehicle remains with the driver at all times.



Figure 1 – AutoVue® LDW System by Bendix CVS (boxes added to illustrate active lane detection)

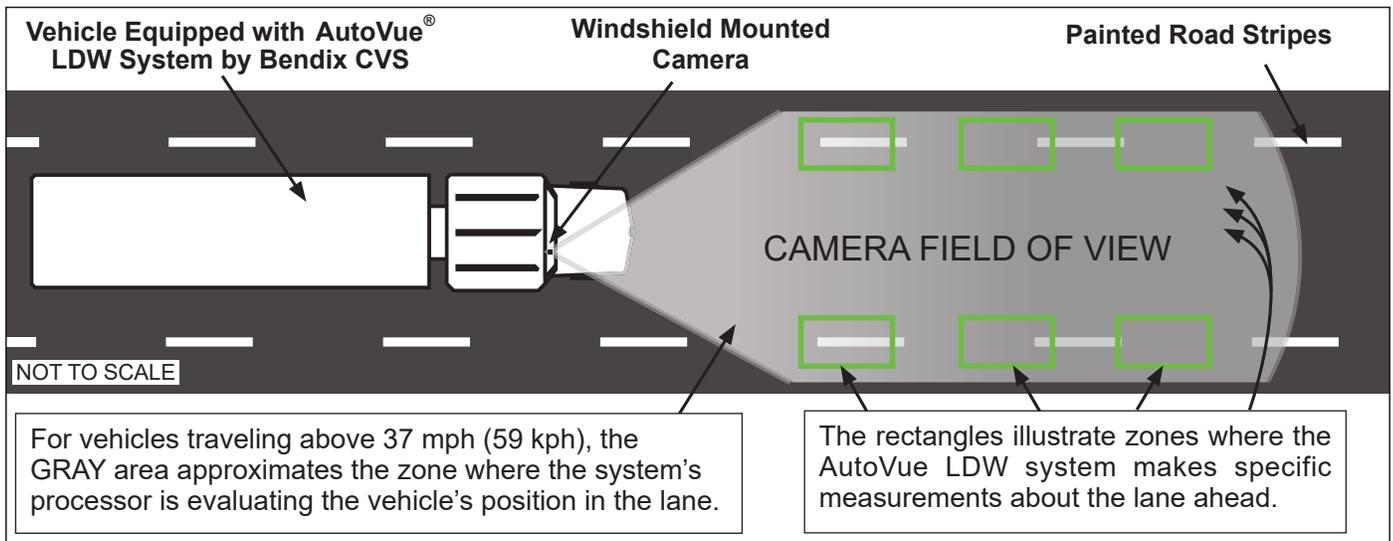


Figure 2 – AutoVue LDW System - Operational View

GENERAL SAFETY GUIDELINES



WARNING! PLEASE READ AND FOLLOW THESE INSTRUCTIONS



TO AVOID PERSONAL INJURY OR DEATH:

When working on or around a vehicle, the following guidelines should be observed **AT ALL TIMES**:

- ▲ Park the vehicle on a level surface, apply the parking brakes, and always block the wheels. Always wear personal protection equipment.
- ▲ Stop the engine and remove the ignition key when working under or around the vehicle. When working in the engine compartment, the engine should be shut off and the ignition key should be removed. Where circumstances require that the engine be in operation, **EXTREME CAUTION** should be used to prevent personal injury resulting from contact with moving, rotating, leaking, heated, or electrically charged components.
- ▲ Do not attempt to install, remove, disassemble, or assemble a component until you have read, and thoroughly understand, the recommended procedures. Use only the proper tools and observe all precautions pertaining to use of those tools.
- ▲ If the work is being performed on the vehicle's air brake system, or any auxiliary pressurized air systems, make certain to drain the air pressure from all reservoirs before beginning ANY work on the vehicle. If the vehicle is equipped with a Bendix® AD-IS® air dryer system, a Bendix® DRM™ dryer reservoir module, a Bendix® AD-9si®, AD-HF®, or AD-HFi™ air dryer, be sure to drain the purge reservoir.
- ▲ Following the vehicle manufacturer's recommended procedures, deactivate the electrical system in a manner that safely removes all electrical power from the vehicle.
- ▲ Never exceed manufacturer's recommended pressures.
- ▲ You should consult the vehicle manufacturer's operating and service manuals, and any related literature, in conjunction with the Guidelines above.
- ▲ Never connect or disconnect a hose or line containing pressure; it may whip and/or cause hazardous airborne dust and dirt particles. Wear eye protection. Slowly open connections with care, and verify that no pressure is present. Never remove a component or plug unless you are certain all system pressure has been depleted.
- ▲ Use only genuine Bendix® brand replacement parts, components, and kits. Replacement hardware, tubing, hose, fittings, wiring, etc. must be of equivalent size, type, and strength as original equipment and be designed specifically for such applications and systems.
- ▲ Components with stripped threads or damaged parts should be replaced rather than repaired. Do not attempt repairs requiring machining or welding unless specifically stated and approved by the vehicle and component manufacturer.
- ▲ Prior to returning the vehicle to service, make certain all components and systems are restored to their proper operating condition.
- ▲ For vehicles with Automatic Traction Control (ATC), the ATC function must be disabled (ATC indicator lamp should be ON) prior to performing any vehicle maintenance where one or more wheels on a drive axle are lifted off the ground and moving.
- ▲ The power **MUST** be temporarily disconnected from the radar sensor whenever any tests **USING A DYNAMOMETER** are conducted on a vehicle equipped with a Bendix® Wingman® system.

WARNING

Due to the inherent limitations of image recognition technology, the lane departure warning (LDW) technology—on rare occasions—may not be able to detect or may misinterpret lane markings. At these times, alerts may not occur, or erroneous alerts may occur.

IMPORTANT

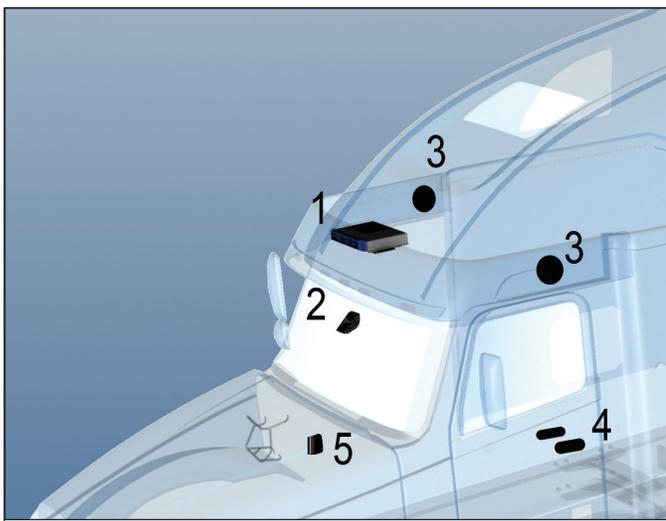
It is the responsibility of the driver to remain vigilant and change driving practices depending on traffic and road conditions.

WARNING

Bendix active and supportive safety technologies, including AutoVue® LDW by Bendix CVS, do not replace the need for safe drivers. No commercial vehicle safety technology replaces the most important safety component of all—a skilled, alert professional driver exercising safe driving habits, as well as continuous, comprehensive driver training. Ultimate responsibility for the safe operation of the vehicle remains with the driver at all times.

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Kit Contents		
Key	Description	Qty
1	Lane Departure Warning processor	1
2	Camera with windshield bracket	1
3	Two 3½-inch speakers with covers (optional)	2
4	Vibrating seat motors (optional)	2
5	Enable/disable switch	1



Figure 3 – AutoVue® LDW System by Bendix CVS

The system uses speakers to emit a distinctive sound on the appropriate side (or optional vibration from the driver's seat if a non-audible warning is preferred).

The AutoVue® LDW system by Bendix CVS is optimized to reduce false alarms. However, the driver may use the enable/disable switch to temporarily silence the alarms.



Figure 4 – AutoVue® Camera

The AutoVue LDW system has two lamps: an amber status lamp and a green enable/disable lamp. There is also a switch to permit the driver to temporarily disable the system. Some vehicles have the lamps and switch combined. See Figure 5 below.

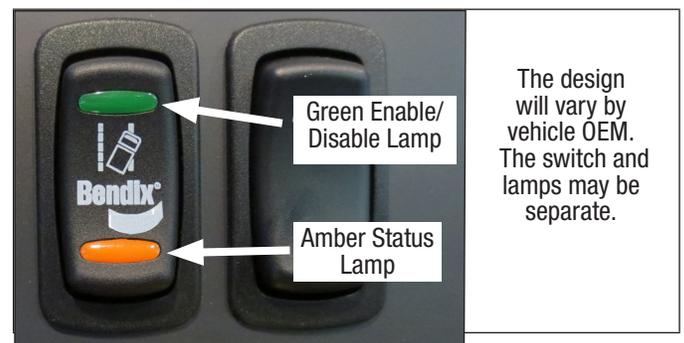


Figure 5 – Example of an AutoVue System Switch

**2.0 SYSTEM OPERATION:
WHAT TO EXPECT WHEN USING THE AUTOVUE® LDW SYSTEM BY BENDIX CVS**

What to Expect in Normal Operating Conditions				
	Situation	Green Enable/Disable Lamp	Amber Status Lamp	Typical System Actions
At Start-Up	Self-test at power-up.	On and remains illuminated.	On and remains illuminated.	Starting the vehicle supplies power to the system. At start-up, the system performs a self-test, then sounds two chirps through [first the left, then the right] the speakers. For vehicles which have systems with vibrating seat motors, the same sequence is followed to indicate the system is ready. Once the vehicle is running and the system is ready, the green ENABLED lamp and amber STATUS lamp illuminate.
	Driver may test the enable/disable switch: press ONCE.	Lamp off.	Lamp off.	None.
	Driver may test the enable/disable switch: press AGAIN.	Lamp illuminated.	Lamp illuminated.	None.
On the Road	Active system Diagnostic Trouble Code (DTC) is present.	Lamp off.	Lamp illuminated.	System disabled. (Awaits system service).
	Vehicle exceeds 37 mph (59 kph), lane markings on both sides are being tracked, and there are no active system DTCs.	Lamp remains illuminated.	Lamp off.	None. (System is now active).
	(With turn signal ON) Driver changes lanes.	Lamp remains illuminated.	Lamp off.	None.
	(With turn signal OFF) Driver drifts out of lane/ changes lanes.	Lamp remains illuminated.	Lamp off.	The speaker on the side of the vehicle towards which it is moving/drifted will emit a “rumble strip” sound. (If installed, driver’s seat vibration will also/instead be activated.)
	Vehicle slows to 37 mph (59 kph), or below, and/or one or both lane markings are no longer able to be tracked by the system.	Lamp remains illuminated.	Lamp illuminated.	None (system is NOT active).
	Driver temporarily disables the system by pressing the disable switch (for example, construction areas with poorly marked lines may cause multiple false alerts.)	Lamp off.	Lamp off.	The system will automatically re-enable after 15 minutes.

Table 1 – Operational Scenarios with the AutoVue LDW System

2.1 POTENTIAL FALSE AND MISSED ALERTS

In certain unusual traffic or roadway conditions, the AutoVue® LDW system by Bendix CVS may issue a false alert. Drivers should take into account the road conditions, and any other factors they are encountering, as they choose how to react to any alerts they receive from the AutoVue LDW system.

Overview of Potential Issues	
Issue	Description
A system Diagnostic Trouble Code (DTC) is present.	If the AutoVue LDW system finds a problem at power-up or during operation, it will set a DTC and will disable the system. The amber lamp will be ON, and the green lamp OFF. Use J1939 detection software to find the Diagnostic Trouble Code (DTC). Go to the <i>Troubleshooting Section</i> (page 7) to find the recommended repair.
System cannot discover right and left lane markings.	<ul style="list-style-type: none"> Mis-installed camera (incorrect placement, not level, loose, etc. See page 6 for full details of camera installation specifications.) Note: When re-mounting a camera bracket, use Bendix windshield adhesive - Bendix part number 493088201 - do not use substitutes. Road markings are hard to see (faded/missing lane markings, standing water, snow, or mud/sand/dirt/debris on the road). Inclement weather (heavy rain, fog, snow, smoke, ice or sleet, etc. is blocking the lane markings). Camera's view is not clear (glass not clean, chipped or cracked, not installed where the windshield wiper cleans the glass, or other distortion). Headlight(s) are not operating or are mis-aimed. Sun glare or other light source blinds the camera, obscures the lane markings, or makes other road markings (e.g. tar strips) look like lane markings.
NOTE: These are potential situations and responses that might occur when using the AutoVue LDW system. All possible situations and responses are not covered here.	

Table 2 – Examples of Potential Issues

2.2 SETTING DIAGNOSTIC TROUBLE CODES (DTCs)

The AutoVue LDW system is self-monitoring and if any malfunction is detected, a DTC will be set and the driver will be alerted by the amber status lamp being illuminated, and the green enabled lamp will be OFF. See the *Troubleshooting Section* (page 7), for more information.

2.3 MAINTENANCE

In normal use, the AutoVue LDW system needs only a clean, properly maintained windshield to ensure a clear view of the road ahead.

2.4 CAMERA AND ELECTRONIC CONTROL UNIT (ECU) INTERCHANGEABILITY

AutoVue LDW systems are vehicle make and model specific. Each part number is customized to a windshield configuration and offset. When troubleshooting, or when replacing cameras or Electronic Control Units (ECUs), only use replacements with the same part number (or a direct superceding replacement number supplied by Bendix).

2.5 ALERT VOLUME

Default audible alert levels are pre-set at the factory. Alert volumes and Start-up Chirp volumes are adjustable with Bendix® ACom® PRO™ Diagnostic Software.



Bendix®-brand Electronic Control Units (ECUs) are not designed to store data for purposes of accident reconstruction and Bendix® ACom® PRO™ Diagnostic Software is not intended to retrieve data for purposes of accident reconstruction. Bendix makes no representations as to the accuracy of data or video retrieved and interpreted from ECUs for purposes of accident reconstruction. Bendix does not offer accident reconstruction services or interpretation of stored data. Bendix ECUs are not protected from fire, loss of power, impact damage, or other conditions that may be sustained in a crash situation and may cause data to be unavailable or irretrievable.

2.6 WINDSHIELD MOUNTING INFORMATION

Top of Windshield

Make*	Model	Camera Location Code	
Freightliner®	Argosy®	1	
	Cascadia® P3 (AM)	8	
	Cascadia P3 (OEM)	10	
	Century®/Columbia®	1	
	Classic XL®	2	
	Coronado®		
	FL70		
	M2 106 (AM)		
	M2 114SD (AM)		
	Freightliner®	M2 106 (OEM)	12
		M2 112 (OEM)	
M2 114SD (OEM)			
New Cascadia® P4			
Hino®	195	13	
	268	2	
	338		
International®	9100/9200/9400	2	
	9900		
	DuraStar®/4000 Series		
	LT/ProStar®		
	TranStar®/8000 Series	9	
	LoneStar®		
WorkStar®/7000 Series	2		
Kenworth®	T270	1	
	T370		
	T600/800 Curved Windshield	3	
	T600/800 Flat Windshield	7	
	T660	3	
	T680	9	
	T700	2	
T880	9		
Mack®	Pinnacle™	2	
	Vision®		
Peterbilt	220	2	
	348		
	367 Flat Windshield		
	384/386 Curved Windshield		
	384/386 Flat Windshield LDW Only		
	384/386 Flat Windshield SafetyDirect® by Bendix CVS Enabled		
	385		
	387/587		
	388/389		
	579	9	
Sterling®	A-Line	2	
Volvo	VN	2	
Western Star®	4700	2	
	4900		

Center Line

A

B

Notch in the Camera Bracket

“Torpedo” Level Rests on the Bracket Tabs

Left: Use only Bendix windshield adhesive when re-mounting a camera bracket.

To determine the correct point on the windshield to line up to the notch in the camera bracket, use the Make/Model columns of the table (left) to find the Camera Location Code. The second table (below) shows the correct vertical and horizontal offset to use for each Code.

Camera Location Code	Horizontal Offset “A”	Vertical Offset “B”
1	9 ± 0.25 in.	2 ± 0.5 in.
2	6 ± 0.25 in.	2 ± 0.5 in.
3	9 ± 0.25 in.	3 ± 0.5 in.
7	7 ± 0.25 in.	3 ± 0.5 in.
8	7 ± 0.25 in.	2 ± 0.5 in.
9	6 ± 0.25 in.	3 ± 0.5 in.
10	8 ± 0.25 in.	2 ± 0.5 in.
12	0 ± 0.25 in.	3 ± 0.5 in.
13	6 ± 0.25 in.	4 ± 0.5 in.

* All trademarks shown here are the property of their respective owners and are used for reference only.

Figure 6 – Locating the Correct Point to Mount the Camera Bracket

3.0 TROUBLESHOOTING

3.1 GENERAL SAFETY GUIDELINES

Read and follow the General Safety Guidelines, shown on page 2 of this document.

3.2 DIAGNOSTIC TROUBLE CODES (DTCs)

Use a J1939 detection software to find the DTC(s).



System Problems. If a problem with the AutoVue® LDW system by Bendix CVS is detected, it should be serviced as soon as possible to restore full functionality.

3.3 TABLE OF AUTOVUE LDW SYSTEM DIAGNOSTIC TROUBLE CODES (DTCs)

Refer to the DTC(s) found and determine the action(s) to take.

Table of Diagnostic Trouble Codes (DTCs), Causes, and Recommended Actions					
SPN	FMI	DTC Name	Condition Found	Suggested Remedial Action(s)	Action to Clear the DTC
0084	02	Vehicle Speed Value Not Found	The J1939 Data Bus speed value is not present. LDW is disabled. No warnings are generated.	<ul style="list-style-type: none"> Check J1939 Data Bus connection. Is the vehicle's J1939 Data Bus functioning? If no problems were found during the checks above, replace the processor and re-test. 	The J1939 Data Bus speed value is present.
0084	15	Vehicle Speed Value Out-of-Range	The J1939 Data Bus speed value is outside the expected range. LDW is disabled. No warnings are generated.	<ul style="list-style-type: none"> Check J1939 Data Bus connection. Is the vehicle's J1939 Data Bus functioning? If no problems were found during the checks above, replace the processor and re-test. 	J1939 Data Bus speed value is within the expected range.
0628	31	SYS Related Parameters Not Found in Non-Volatile Memory (NVM)	Processor internal parameter block in Non-Volatile Memory (NVM) is corrupted. LDW is disabled. No warnings are generated.	<ul style="list-style-type: none"> Initiate an ignition cycle to save parameters and reset the system. If the ignition cycle does not clear the Diagnostic Trouble Code (DTC), replace the processor and re-test. 	NVM contains expected calibration parameter block.

Table 3 – Diagnostic Trouble Codes

Table of Diagnostic Trouble Codes (DTCs), Causes, and Recommended Actions

SPN	FMI	DTC Name	Condition Found	Suggested Remedial Action(s)	Action to Clear the DTC
0639	02	J1939 Data Bus Receive Failure	Processor is not receiving messages on the J1939 Data Bus. LDW is disabled. No warnings are generated.	<ul style="list-style-type: none"> • Check for damaged or reversed J1939 wiring. • Check for corroded or damaged connectors and loose connections. • Using procedures described by the vehicle manufacturer, verify the presence of the J1939 link. • Check for other devices inhibiting J1939 communications. • If no problems were found during the checks above, replace the processor and re-test. 	Ability to successfully receive on the J1939 Data Bus.
0886	09	Radar COMM Failure (Only Reported on SafetyDirect® by Bendix CVS Portal, Not Logged in the Bendix® ACom® PRO™ Diagnostic Software)	Radar message is not received while the vehicle is moving at speeds greater than 30 mph. Following distances, Forward Collision Warnings (FCW), and Collision Mitigation Braking (CMB) events are not detected.	<ul style="list-style-type: none"> • Check J1939 Data Bus connection to the Radar. 	J1939 Data Bus ACC1 message successfully received.
1702	02	Switch Failure	Private communications input message signals switch failure or discrete momentary switch input is stuck in the 'pressed' state for more than 60 seconds. LDW is disabled. No warnings are generated.	<ul style="list-style-type: none"> • Check the wiring between the enable/disable switch and the processor. • Test by temporarily installing a known good switch. • If no problems were found with the wiring, and the test with a good switch did not clear the Diagnostic Trouble Code (DTC), replace the processor and re-test. 	J1939 LDW switch message field no longer reports error state. Discrete momentary switch is unstuck.
1703	03	Right Speaker is Shorted to Power	Resistance from right speaker positive or negative output pins to power input is less than 10Ω during sound generation. LDW is disabled. No warnings are generated.	<ul style="list-style-type: none"> • Check the wiring between the right speaker and the processor. • Test by temporarily installing a known good speaker in the right speaker location. • If no problems were found with the wiring, and the test with a good speaker did not solve the problem, replace the processor and re-test. 	System reset is required. Resistance from right speaker positive or negative output pins to power input is greater than 10Ω during sound generation.

Table of Diagnostic Trouble Codes (DTCs), Causes, and Recommended Actions

SPN	FMI	DTC Name	Condition Found	Suggested Remedial Action(s)	Action to Clear the DTC
1703	05	Right Speaker has an Open Circuit	Resistance between right speaker output pins is greater than 40 Ω during sound generation. LDW is disabled. No warnings are generated.	<ul style="list-style-type: none"> • Check the wiring between the right speaker and the processor. • Test by temporarily installing a known good speaker in the right speaker location. • If no problems were found with the wiring, and the test with a good speaker did not clear the Diagnostic Trouble Code (DTC), replace the processor and re-test. 	Resistance between right speaker output pins is less than 40 Ω for 15 seconds.
1703	06	Right Speaker is Shorted to Ground	Resistance between right speaker positive or negative output pins and ground is less than 10 Ω during sound generation. <i>OR</i> Short circuit condition between right speaker positive and negative output pins has a resistance of less than 1 Ω during sound generation. LDW is disabled. No warnings are generated.	<ul style="list-style-type: none"> • Check the wiring between the right speaker and the processor. • Test by temporarily installing a known good speaker in the right speaker location. • If no problems were found with the wiring, and the test with a good speaker did not clear the DTC, replace the processor and re-test. 	System reset is required. Resistance between right speaker positive or negative output pins and ground is greater than 10 Ω during sound generation. <i>OR</i> System reset is required. Resistance between right speaker positive and negative output pins is greater than 4 Ω during sound generation.
1704	03	Left Speaker is Shorted to Power	Resistance from left speaker positive or negative output pins to power input is less than 10 Ω during sound generation. LDW is disabled. No warnings are generated.	<ul style="list-style-type: none"> • Check the wiring between the left speaker and the processor. • Test by temporarily installing a known good speaker in the left speaker location. • If no problems were found with the wiring, and the test with a good speaker did not clear the Diagnostic Trouble Code (DTC), replace the processor and re-test. 	System reset is required. Resistance from left speaker positive or negative output pins to power input is greater than 10 Ω during sound generation.

Table of Diagnostic Trouble Codes (DTCs), Causes, and Recommended Actions

SPN	FMI	DTC Name	Condition Found	Suggested Remedial Action(s)	Action to Clear the DTC
1704	05	Left Speaker Has an Open Circuit	Resistance between left speaker output pins is greater than 40Ω during sound generation. LDW is disabled. No warnings are generated.	<ul style="list-style-type: none"> • Check the wiring between the left speaker and the processor. • Test by temporarily installing a known good speaker in the left speaker location. • If no problems were found with the wiring, and the test with a good speaker did not clear the DTC, replace the processor and re-test. 	Resistance between left speaker output pins is less than 40Ω for 15 seconds.
1704	06	Left Speaker is Shorted to Ground	Resistance between left speaker positive or negative output pins and ground is less than 10Ω during sound generation. <i>OR</i> Short circuit condition between left speaker positive and negative output pins has a resistance of less than 1Ω during sound generation. LDW is disabled. No warnings are generated.	<ul style="list-style-type: none"> • Check the wiring between the left speaker and the processor. • Test by temporarily installing a known good speaker in the left speaker location. • If no problems were found with the wiring, and the test with a good speaker did not clear the DTC, replace the processor and re-test. 	System reset is required. Resistance from left speaker positive or negative output pins and ground is greater than 10Ω during sound generation. <i>OR</i> System reset is required. Resistance between left speaker positive and negative output pins is greater than 4Ω during sound generation.

Table of Diagnostic Trouble Codes (DTCs), Causes, and Recommended Actions

SPN	FMI	DTC Name	Condition Found	Suggested Remedial Action(s)	Action to Clear the DTC
1705	02	Turn Signal Input Remains High	Turn signal input is stuck at high level for more than three (3) seconds.	<ul style="list-style-type: none"> • Check the wiring between the processor and the turn signal. • Verify that the common wire of the turn signal/brake lamp circuit was not used. • Replace any non-functioning turn signal bulb(s). • Test by temporarily installing a known good turn signal flasher. • Connect a test lamp or multi-meter to the turn signal wires one at a time (orange for left, white for right) and notice the state of the test lamp or the voltage readout on the multi-meter. With the ignition on, test and observe the following. • Readings should be off or 0V when the turn signal is off. • Readings should pulse to 12V when the turn signal is on. • If the signal pulses with both turn signals, turn the signal off before continuing. • Readings should be 0V when the service brake pedal is applied. • Readings should be 0V when the parking brake is disengaged. • Readings should be 0V when the headlights are ON. • If the turn signal circuit does not pass any of the above tests, you must relocate the turn signal connection. • If no problems were found with the wiring/bulbs, and the test with a good signal flasher did not clear the Diagnostic Trouble Code (DTC), replace the processor and re-test. 	Turn signal input is low for three (3) seconds.
1705	03	Input Voltage is Too High	Input voltage is above 16V.	<ul style="list-style-type: none"> • Measure the ignition voltage. Ensure that the ignition voltage is not greater than 16 VDC. Check the vehicle battery and associated components. • Inspect for damaged wiring, damaged or corroded connectors and loose connections. Check the wiring between the ignition and the processor. • If no problems were found during the checks above, replace the processor and re-test. 	Input voltage is below 16V.

Table of Diagnostic Trouble Codes (DTCs), Causes, and Recommended Actions

SPN	FMI	DTC Name	Condition Found	Suggested Remedial Action(s)	Action to Clear the DTC
1705	04	The Input Voltage is Too Low	Input voltage is below 9.5V.	<ul style="list-style-type: none"> • Check the ignition voltage. • Measure the ignition voltage under load. Ensure that the ignition voltage is greater than 10 VDC (volts DC). Check the vehicle battery and associated components. Inspect for damaged wiring, damaged or corroded connectors, and loose connections. Check the condition of the fuse. • Check the wiring between the ignition and the processor. • If no problems were found during the checks above, replace the processor and re-test. 	Input voltage is above 9.5V.
1705	05	Enabled Lamp or Status Lamp Output Open	Resistance from enabled or status output to ground is greater than 140kΩ while output is not energized.	<ul style="list-style-type: none"> • Check the wiring between the processor and the switch or status lamp. • Test by temporarily installing a known good switch/status lamp. • If no problems were found with the wiring, and the test with a good switch/status lamp did not clear the Diagnostic Trouble Code (DTC), replace the processor and re-test. 	Resistance from enabled or status output to ground is less than 140 kΩ for 1.8 seconds while output is not energized. <i>OR</i> AutoVue® Lane Departure Warning System by Bendix CVS is configured not to expect the status lamp connection.
(Note: the green “enabled” lamp output will not illuminate if this DTC is present.)					
1705	06	Enable Lamp or Status Lamp Output Short to Power	Current into enabled or status output pin is greater than 4.5A while the output is energized.	<ul style="list-style-type: none"> • Check the wiring between the processor and the switch or status lamp. • Test by temporarily installing a known good switch/status lamp. • If no problems were found with the wiring, and the test with a good switch/status lamp did not clear the DTC, replace the processor and re-test. 	System reset is required. Current into enable or status output is less than 4.5A while the output is energized.
(Note: the green “enabled” lamp output will not illuminate if this DTC is present.)					

Table of Diagnostic Trouble Codes (DTCs), Causes, and Recommended Actions

SPN	FMI	DTC Name	Condition Found	Suggested Remedial Action(s)	Action to Clear the DTC
1705	14	Battery line pin A11 (red/yellow) Wire Not Connected (Only Reported on SafetyDirect® by Bendix CVS Portal, Not Logged in the Bendix® ACom® PRO™ Diagnostic Software)	The processor detected no constant battery power input. The SafetyDirect ignition off process cannot be executed.	<ul style="list-style-type: none"> Check the wiring between the processor Pin A11 and the battery positive (+) terminal. 	Constant battery power is detected by the processor for 5 seconds.
1705	31	Internal Failure	Internal programming failure.	<ul style="list-style-type: none"> Initiate an ignition cycle to save parameters and reset the system. If the ignition cycle does not clear the Diagnostic Trouble Code (DTC), replace the processor and re-test. 	System reset is required. CAN configuration parameters consistent with internal programming.
520194	06	Enable Lamp, Status Lamp, or Mute Output Shorted to Ground	Voltage at the low side driver output to ground is less than 2.5VDC while the output is not energized.	<ul style="list-style-type: none"> Check the mute wiring connections, the processor,¹ and the radio mute. Verify the radio is correctly configured to support mute line discrete input. 	Voltage at the low side driver output to ground is greater than 3.7 VDC for more than 1.8 seconds while the output is not energized. OR AutoVue® Lane Departure Warning System by Bendix CVS is configured not to expect the mute output connection.
520195	15	Semaphore Error Log Failure	New Error Log Semaphore entries are not recorded in Non-Volatile Memory (NVM). Lane Departure Warning (LDW) is disabled. No warnings are generated.	<ul style="list-style-type: none"> Delete Error logs. Initiate an ignition cycle to reset the system. Replace processor and re-test. 	System reset is required. Successfully access Error Log in NVM.

Table of Diagnostic Trouble Codes (DTCs), Causes, and Recommended Actions

SPN	FMI	DTC Name	Condition Found	Suggested Remedial Action(s)	Action to Clear the DTC
520196	09	Turn Indicator Signal Not Found	J1939 Data Bus turn indicator value not present. LDW is not suppressed from turn indicator state.	<ul style="list-style-type: none"> • Check J1939 Data Bus connection. • Is the vehicle's J1939 Data Bus functioning? • If no problems were found during the checks above, replace processor and re-test. 	J1939 Data Bus turn indicator value is received by processor. OR AutoVue® Lane Departure Warning System by Bendix CVS is configured to expect turn indicator state from discrete inputs.
520197	09	LDW Enable Switch Signal Not Found	J1939 Data Bus LDW enable switch value not present. LDW is disabled. No warnings are generated.	<ul style="list-style-type: none"> • Check J1939 Data Bus connection. • Is the vehicle's J1939 Data Bus functioning? • Test by temporarily installing a known good LDW enable switch. • If no problems were found during the checks above, replace processor and re-test. 	J1939 Data Bus LDW enable switch value is received by processor. OR AutoVue is configured to expect LDW switch state from discrete input.
520198	15	SafetyDirect® web portal by Bendix CVS Statistics Log Failure	SafetyDirect Statistics Log entries are not recorded in NVM. Warnings continue to generate.	<ul style="list-style-type: none"> • Delete SafetyDirect (SD) Event logs. • Update Software. • Initiate an ignition cycle to reset the system. 	System reset is required. Successfully write to Statistics Log.
520199	02	I2C Bus Failure	Internal failure of I2C Bus. The processor does not receive accelerometer data from camera.	<ul style="list-style-type: none"> • Check the RS-232 cable between the telematics device and the processor. • Check camera cable for noise on the ground wire. 	Connect the cable. System reset is required. I2C Bus failure clears.

For all other DTCs, or problems after re-testing a replacement ECU, contact the Bendix Tech Team.

For direct telephone technical support, the Bendix Tech Team is available at 1-800-AIR-BRAKE (1-800-247-2725) option 2, Monday through Thursday from 8:00 a.m. - 6:00 p.m. and Friday from 8:00 a.m. - 5:00 p.m. ET. Follow the instructions in the recorded message.

The Bendix Tech Team can also be reached by email at: techteam@bendix.com.

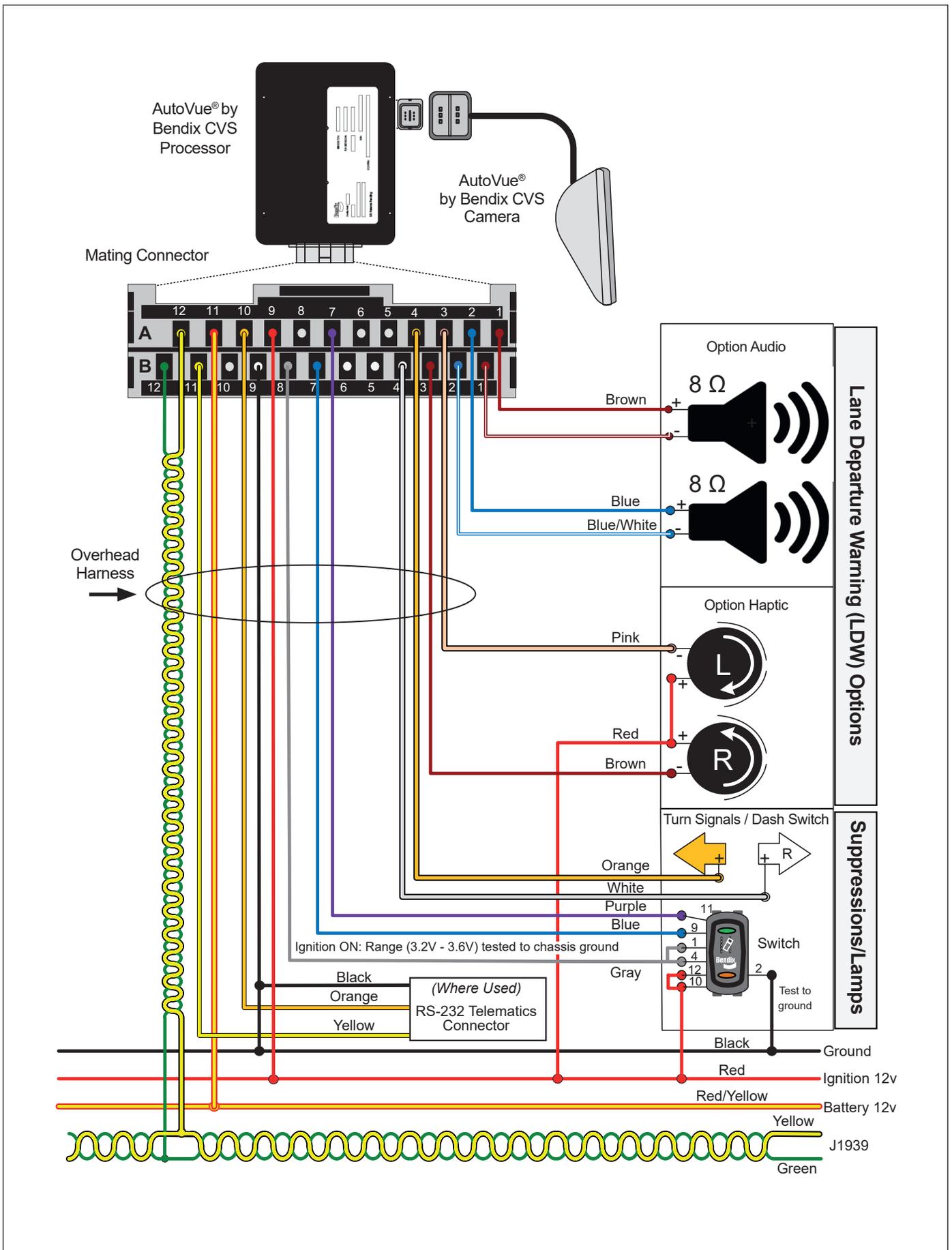


Figure 7 – AutoVue® LDW System by Bendix CVS - Wiring Diagram

3.4 ADVANCED TROUBLESHOOTING

Refer to the AutoVue® Lane Departure Warning (LDW) system by Bendix CVS wiring diagram on page 15, during these procedures.

General. Inspect the camera and its lens for any damage, and the wiring for any pinching or cuts. If a camera bracket appears to have been reinstalled, check if the bracket is level by removing the camera (slide upwards), and use a torpedo level on the bracket tabs (See Figure 6, on page 6). Note that the other vehicle cab accessories must be carefully installed since mounting screws, etc. that penetrate locations where the AutoVue system components or wiring are routed can cause shorts or wiring breaks.

If you do not have the capability to read the J1939 error codes it is recommended to—in turn—swap out components with known good system components in the following order: 1) switch; 2) processor; and 3) camera.

In practice, this would result in:

- Temporarily replacing the switch with a known good switch, then re-test. If this does not correct the problem put the original switch back in.
- Temporarily replace the processor box with a known working unit. If this does not correct the problem put the original box back in.
- Temporarily replace the camera with a known working unit. If this does not correct the problem put the original camera back in.

If after temporarily replacing all the major components the green lamp still fails to illuminate, hardware issues have been eliminated and the technician can focus elsewhere (wiring, mis-installation, etc.) for the source of the problem.

Confirm the processor part number:

Potentially a processor may have been programmed for one vehicle model but was mis-installed or moved to a different vehicle model. Call Bendix to verify that you have the correct processor part number on the vehicle.

In cases where –after start-up– an Enable/Disable switch is pressed but the “enable” (green) and “status” (amber) lamps remain on:

1. Conditions: Vehicle parked, with the ignition on. Using a voltmeter, connect the positive (+) lead to gray wire and the negative lead (-) to a good chassis ground; do not use the black wire on switch for ground.
 - The voltage reading should be between 3.2V to 3.6 V.
2. Using a voltmeter, connect the positive (+) lead to the switch pin black wire and the negative lead (-) to a good chassis ground.
 - The voltage reading should be between -0.10V to 0.1 V.
3. If the above voltages are not correct, turn off the ignition and remove the switch from the switch socket.
4. Using an ohmmeter, connect the positive (+) lead to the gray wire, and the negative lead (-) to a good chassis ground; do not use the black wire.
 - The resistance reading should be between 30 k Ω and 70 k Ω .
5. If the resistance reading is less than 30 k Ω , disconnect the main connector from the processor and recheck the resistance of the gray wire. If the resistance is still less than 30 k Ω , then a short may exist in the wiring harness (for example, a screw may have been driven into the wire).
6. If the resistance reading is greater than 70 k Ω , an open circuit may exist in the wiring harness.
7. Using an ohmmeter, connect the positive (+) lead to the black wire and the negative lead (-) to a good chassis ground.
 - The resistance reading should be less than 1 Ω .
 - If the resistance reading is greater than 1 Ω , an open circuit may exist in the wiring harness.
8. If the above voltages are correct, turn off the ignition and remove the switch from the switch socket.
9. Using an ohmmeter, connect the positive (+) lead to blue wire and the negative lead (-) to a good chassis ground; do not use the black wire.
 - The resistance reading should be greater than 10 k Ω ,
10. Using an ohmmeter, connect the positive (+) lead to violet wire and the negative lead (-) to a good chassis ground; do not use the black wire.
 - The resistance reading should be greater than 10 k Ω .

In cases where—after start-up—an Enable/Disable switch is pressed but the “enable” (green) lamp remains on and the “status” (amber) lamp does not remain on:

With the vehicle parked, the ignition on, and all AutoVue® Lane Departure Warning (LDW) by Bendix CVS system components (camera, processor, and switch) connected.

1. Turn off the ignition and remove the switch from the switch socket.
2. Using an ohmmeter, connect the positive (+) lead to blue wire and the negative lead (-) to a good chassis ground; do not use the black wire.
 - The resistance reading should be greater than 10kΩ.
3. If the resistance is less than 10kΩ, disconnect the main connector from the processor and recheck the resistance on the blue wire. If the resistance is still less than 10kΩ, then a short may exist in the wiring harness (a screw may have been driven into the wire). If the resistance is greater than 10kΩ, temporarily replace the processor with a known good unit and re-test.
4. Reconnect the main connector to the processor and recheck the resistance on the blue wire. If the resistance is greater than 10kΩ, temporarily replace the processor with a known good unit and re-test.

3.5 CLEARING DIAGNOSTIC TROUBLE CODES (DTCs)

Once the problem has been found and resolved, clear the AutoVue® LDW system by Bendix CVS DTCs by cycling the ignition power.

APPENDIX A - SAFETYDIRECT® BY BENDIX CVS

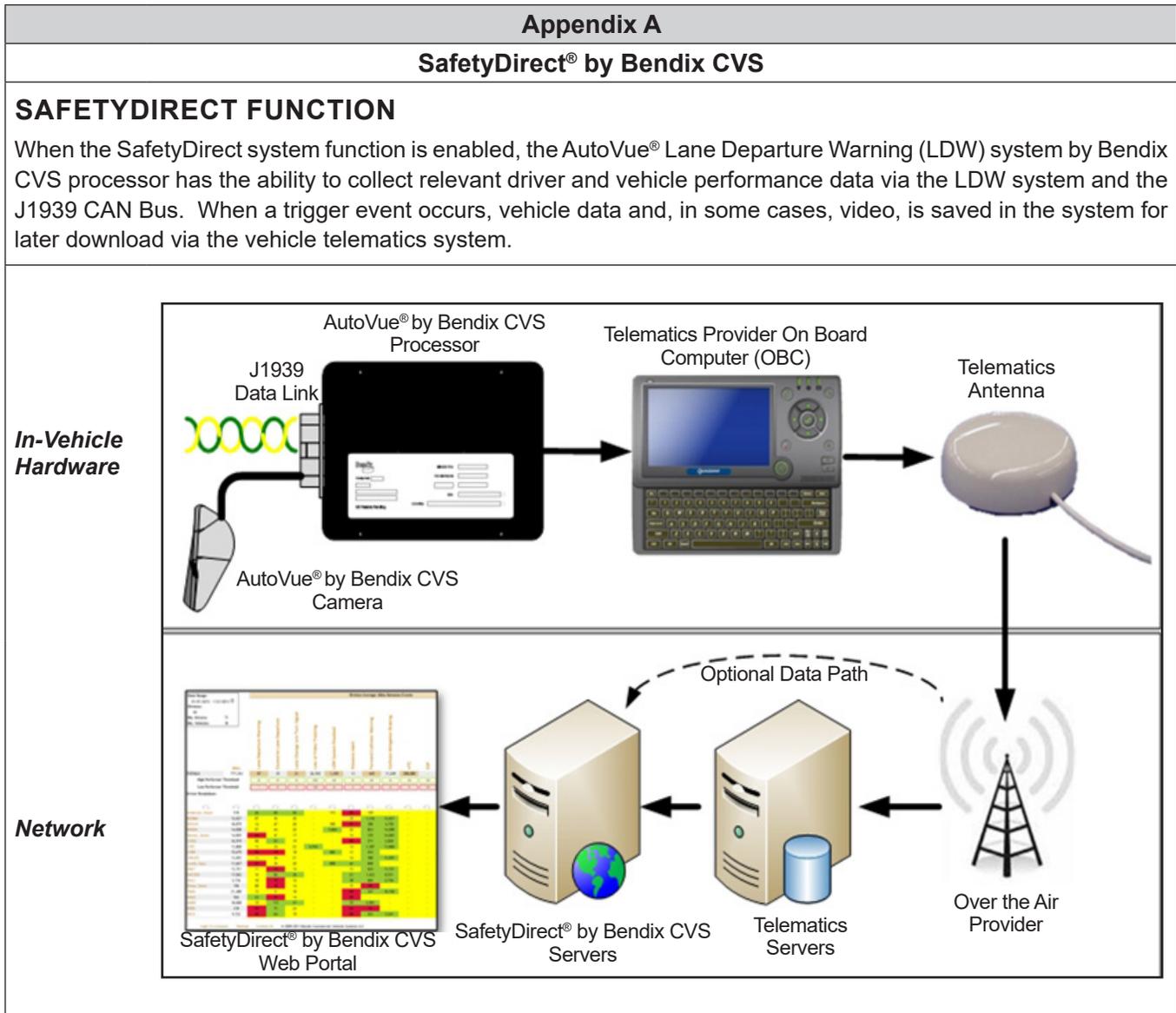


Figure 8 – AutoVue® LDW System Communication with SafetyDirect® by Bendix CVS System

**ADDITIONAL SUPPORT AT
BENDIX.COM/1-800-AIR-BRAKE (1-800-247-2725), OPTION 2**

For the latest information, and for downloads of the Bendix® ACom® PRO™ Diagnostic Software, and its User Guide, visit the Bendix website at www.bendix.com.

For direct telephone technical support, the Bendix Tech Team is available at 1-800-AIR-BRAKE (1-800-247-2725) option 2, Monday through Thursday, 8:00 A.M. to 6:00 P.M. and Friday, 8:00 A.M. to 5:00 P.M. ET. Follow the instructions in the recorded message.

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