



# Service Data

SD-24-2936

## Bendix® Standalone Electronic Air Control (SA-EAC) System

### INTRODUCTION

The Standalone Electronic Air Control (SA-EAC) system is a set of software functions that are integrated into a standalone version of a Bendix® Electronic Control Unit (ECU).

The SA-EAC system adds features supporting the Bendix® AD-HFi® air dryer including J1939 messaging, Diagnostic Trouble Codes (DTCs), advanced functionality, and governor control.

### DESCRIPTION

The SA-EAC system provides the basic governor operation to maintain set air pressure levels and provides advanced features, along with air system diagnostic and prognostic information.

The SA-EAC system communicates on the vehicle J1939 CAN bus and receives vehicle information including primary and secondary air pressures, engine speed, torque, and other vehicle operational conditions. The SA-EAC system also transmits compressor state, diagnostic, and prognostic information, such as cartridge lifetime prediction, on the vehicle CAN bus.

Beyond basic governor control, the SA-EAC system has advanced features to optimize air system pressure control and conserve energy. The SA-EAC system also has advanced purge operations to protect the air system against moisture.



**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.**



Figure 1 – SA-EAC

## 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.

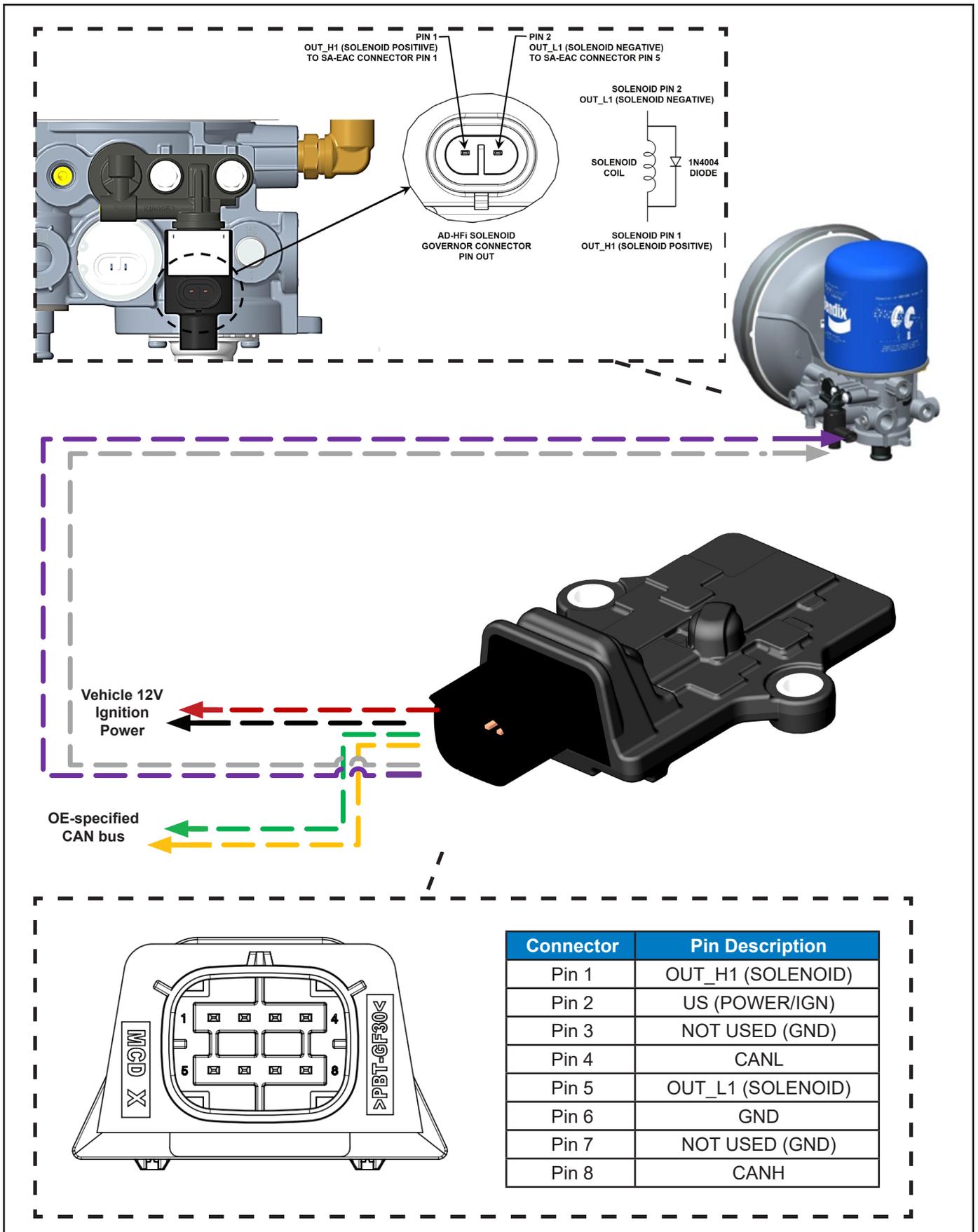


Figure 2 – SA-EAC System

## SYSTEM COMPONENTS

The Bendix® Standalone Electronic Air Control (SA-EAC) system is a set of software functions that are integrated into the SA-EAC Electronic Control Unit (ECU). See *Figure 2*.

The SA-EAC is part of the vehicle air supply system, which consists of the SA-EAC ECU, air dryer, and compressor. The SA-EAC ECU is uniquely configured for three (3) system components.



**If any of these components are replaced, they must be replaced with genuine OE service parts. Failure to do so could result in damage to other air system components.**

- 1. SA-EAC ECU:** The ECU that controls the SA-EAC system will be referred to as the SA-EAC ECU. The SA-EAC ECU receives air system pressure information from the vehicle J1939 CAN bus and controls the air compressor governor to maintain safe air pressure levels. The SA-EAC ECU monitors the air system pressure. The unit energizes and de-energizes the compressor solenoid governor to unload and load the vehicle air compressor. The SA-EAC ECU also receives engine speed, torque, and vehicle speed from the engine Electronic Control Module (ECM) to provide advanced features. The SA-EAC system sets Diagnostic Trouble Codes (DTCs) which can be displayed via Bendix® ACom® PRO™ Diagnostic Software to evaluate system status.
- 2. Air Dryer (Bendix® AD-HFi® SP Air Dryer and Bendix® AD-HFi® EP Air Dryer):** The air dryer removes water and other contaminants from the air delivered from the compressor. The SA-EAC system supports air dryers with different purge volumes, such as the AD-HFi SP or AD-HFi EP. The SA-EAC ECU parameters are specified by the OE to accommodate the appropriate purge volume. The compressor solenoid governor, part of the air dryer, is controlled by the SA-EAC ECU to load and unload the air compressor.
- 3. Air Compressor:** The air compressor delivers pressurized air to the air dryer and pressurizes the entire air brake system.

## SA-EAC SYSTEM DESCRIPTION WITH BASIC GOVERNOR AND ADVANCED FEATURES

The SA-EAC system provides basic governor control and advanced air system control features.

### BASIC GOVERNOR CONTROL

The SA-EAC system provides basic governor control that loads and unloads the compressor as needed to maintain a safe air system pressure level. When the air pressure drops below the cut-in pressure threshold, the SA-EAC system will load the compressor. When the air pressure is greater than the cut-out pressure threshold, the SA-EAC system will unload the compressor and purge the air dryer desiccant to remove moisture.

### ADVANCED FEATURES

The SA-EAC system provides advanced air system control features.

- **Energy Savings:** The SA-EAC system monitors the state of the engine and may take advantage of certain situations by engaging the compressor and charging the system, taking advantage of otherwise wasted energy. This feature may result in slight overcharging of the service system, not to exceed the OE-specified cut-out pressure.
- **Performance Enhancements:** The SA-EAC system may operate differently than a traditional pneumatic charging system. Because the SA-EAC system can monitor the air system and vehicle use, it may not always load and unload the compressor at the same pressures. Additionally, the SA-EAC system is also capable of monitoring the health of the air dryer cartridge using available vehicle data. If the SA-EAC system determines that excessive water is accumulating in the air dryer cartridge, it may unload the compressor and initiate a purge. *Refer to the Section titled: Interrupted Charge Regeneration (ICR).* This may happen at a system pressure level lower than expected. After the interrupted charge is complete, the system will automatically continue to charge as normal and will purge again when maximum pressure is reached.

- **Cartridge Lifetime Prediction (CLP):** CLP monitors the vehicle usage conditions and provides an estimate of the health and remaining life. It also provides Diagnostic Trouble Codes (DTCs) when the estimated life falls below certain threshold levels. Bendix® ACom® PRO™ Diagnostic Software supports the resetting of the CLP to "100% remaining." Resetting the CLP must only be done after servicing and replacing the cartridge.
- **Diagnostics:** The Bendix® Standalone Electronic Air Control (SA-EAC) system includes several different diagnostic features that can provide DTCs when abnormal system usage is suspected. This may include excessive compressor usage or excessive moisture build-up in the desiccant cartridge or system.

## TROUBLESHOOTING

The SA-EAC system normally operates in the basic governor mode – as described above – loading at cut-in and unloading (and regeneration) at cut-out air pressures. If there are fault conditions and/or vehicle or solenoid governor interface problems, normal operation and advanced features may be disrupted. In this case, check for the following abnormal conditions.

**CONSTANT AIR BUILD:** In certain fault conditions (e.g. the solenoid is not working properly or the air dryer is not properly connected), the SA-EAC fail safe operation is to constantly load the compressor, building air pressure. This may result in an activation of the safety valve; refer to *SD-08-12046, Bendix® AD-HF® and AD-HF® Service Data Sheet, on B2Bendix.com*. Constant air build will occur if there are compressor solenoid governor connection problems or missing or invalid vehicle CAN messages or signals.

- **Unavailable system pressure information:** Refer to the vehicle manufacturer for the CAN diagnostics process.
- **Check the compressor solenoid governor:** The SA-EAC system controls the compressor with a pneumatic solenoid. Check the connection from the SA-EAC, mox connector, and Pin 1 and Pin 5 to the solenoid match the following connections.

SA-EAC Pin	Solenoid Connector Pin
Pin 1	Pin 1
Pin 5	Pin 2

When the primary or secondary air pressure is below cut-in, Pin 1 to the solenoid should be low – or ground potential voltage – to load the compressor. When the primary or secondary air pressure is below cut-in, the electrical potential across Pin 1 and Pin 2 to the solenoid should be low – or ground potential voltage – to load the compressor.

When the primary and secondary air pressures are above cut-out, the electrical potential across Pin 1 and Pin 2 to the solenoid should be high – or positive potential voltage (nominal 12V) – to unload the compressor. If attempting to confirm this behavior from the SA-EAC, a load with 40 ohm resistance (e.g. a 1157 stop lamp bulb) must be present to check accurate behavior.

- **Invalid primary or secondary pressure signal on CAN:** The primary and secondary pressure signals are sent to the SA-EAC controller over CAN, originating from the vehicle system pressure sensors. During normal operation and when the service system is above cut-in pressure, these two (2) pressure signals should be approximately equal. If the pressure signals differ by more than one (1) bar (14.7 psi), the SA-EAC system can no longer trust the signal information and may default to constant build of air. Check the values of these signals per the vehicle manufacturer's recommendation and replace if necessary.
- **Check the Vehicle J1939 CAN Connection and Baud Rate:** The SA-EAC system requires vehicle CAN messages and signal information that controls the compressor. Check the vehicle J1939 CAN bus connections to the SA-EAC system match the following connections.

J1939 CAN	SA-EAC Pin
CAN_H	Pin 8
CAN_L	Pin 4

The SA-EAC is factory-programmed to operate at a fixed baud rate. Check to ensure the vehicle CAN and SA-EAC baud rates match.

## UNEXPECTED DIFFERENCE IN CUT-IN AND CUT-OUT

The Bendix® Standalone Electronic Air Control (SA-EAC) system has advanced features that will temporarily adjust the normal cut-in and cut-out pressure thresholds.

- **Overrun (OVR):** When there is low engine torque demand – such as when going downhill – the OVR feature will temporarily raise the cut-in and cut-out pressures.
- **Overtake (OVT):** When there is high engine torque demand – such as when overtaking/passing – the OVT feature will temporarily lower the cut-in and cut-out pressures.
- **Interrupted Charge Regeneration (ICR):** When the air dryer cartridge moisture level begins to approach oversaturation for a single charge cycle, the ICR feature will temporarily unload the compressor to initiate an air dryer purge. After this purge has completed, the charge cycle will continue again until cut-out pressure is achieved.

## SA-EAC SYSTEM INFORMATION FOR SERVICE SHOPS

- **Loaded Mode:** The SA-EAC system stays in loaded mode, continuously building air; the safety valve will activate at overpressure.
- **Cartridge Monitoring:** The SA-EAC system continues to track air dryer cartridge health and will report associated Diagnostic Trouble Codes (DTCs).
- **Service Shop:** The service shop should be aware that if vehicle conditions put the SA-EAC system into continuous load operation, the safety valve can be compromised and the air dryer cartridge can become saturated. In this case, the service person should replace the safety valve. The service person should also check for SA-EAC system mid- and high-level moisture DTCs. If a high-level DTC exists, the air dryer cartridge should be replaced. *Refer to SD-08-12046, Bendix® AD-HF® and AD-HFi® Service Data Sheet, on B2Bendix.com.*

## SA-EAC SYSTEM DIAGNOSTIC SUPPORT

### DTC DETECTION

The SA-EAC system contains self-testing diagnostic circuitry that continuously checks for proper operation and external compressor solenoid governor and wiring.

### DTC DESCRIPTION AND REPAIR INFORMATION

The SA-EAC Electronic Control Unit (ECU) DTCs are supported by Bendix® ACom® PRO™ Diagnostic Software. *Refer to Table 1. Visit B2Bendix.com for additional information and for downloads of the ACom PRO Diagnostic Software.*

Depending on the version of ACom PRO Diagnostic Software, it will display the SA-EAC ECU on its roll call and other relevant screens as *"Electronic Air Control (Standalone)."*

### DTC STORAGE / EVENT HISTORY

SA-EAC system and ACom PRO Diagnostic Software retain a record of DTCs. This record is commonly referred to as "event history." When a DTC self heals or is manually cleared, the DTC code remains in event history as an inactive DTC.

# BENDIX® STANDALONE ELECTRONIC AIR CONTROL (SA-EAC) ELECTRONIC CONTROL UNIT (ECU) DIAGNOSTIC TROUBLE CODES (DTCS) AND SERVICE INFORMATION

The SA-EAC does not include any Bendix-specified driver feedback mechanism. Some applications may include dash or other feedback as determined by the OE. Consult with the OE to interpret any driver feedback.

SPN	FMI	DTC/ Lookup Code	Description	Service Shop Information (Vehicle Level Effect)	Service Shop Information (Recommended Action)
2033	9	F10709	AIR1 message from vehicle manufacturer-specified controller not being received by SA-EAC	<p>The SA-EAC is not capable of reaching the vehicle manufacturer-specified controller.</p> <p>The SA-EAC is not receiving messages from the vehicle manufacturer-specified controller.</p> <p>Compressor is always on; air dryer safety valve may open*.</p>	<ol style="list-style-type: none"> <li>1. Check continuity of CAN wiring between SA-EAC and vehicle manufacturer-specified controller.</li> <li>2. Confirm 60 Ohms resistance on the vehicle CAN line at the SA-EAC controller by disconnecting the connector and measuring across Pin 4 and Pin 8 on the harness side of the connector (<i>See Figure 2</i>).</li> <li>3. Confirm vehicle manufacturer-specified controller messages are reaching the SA-EAC CAN bus.</li> <li>4. Check that the vehicle manufacturer-specified controller is configured to properly broadcast SA-EAC messages.</li> </ol>
1351	5	470505	Bendix® AD-HF <sup>®</sup> solenoid current below normal or open circuit	<p>Compressor is always on; air dryer safety valve may open*.</p>	<ol style="list-style-type: none"> <li>1. Perform continuity check from end to end for each solenoid pin in the harness (<i>See Figure 2</i>).</li> <li>2. Perform continuity check from Pin 1 to Pin 5 at the SA-EAC ECU harness with the solenoid disconnected. There should be no continuity from pin to pin.</li> <li>3. With solenoid connected, resistance across Pin 1 and Pin 5 should be 40 ohms.</li> </ol>

**Table 1 - SA-EAC Troubleshooting**

\* If the safety valve is open, it is recommended that the safety valve be replaced. Refer to SD-08-12046, Bendix® AD-HF<sup>®</sup> and AD-HF<sup>®</sup> Service Data Sheet, on B2Bendix.com.

\*\* If possible, confirm with a known good Electronic Control Unit (ECU) prior to replacement.

\*\*\* Refer to SD-08-12046, Bendix® AD-HF<sup>®</sup> and AD-HF<sup>®</sup> Service Data Sheet, on B2Bendix.com for cartridge replacement.

+ CLP is an extra function meant to help support applications that may experience higher than normal cartridge wear. It may be used as an indicator that more frequent cartridge changes would improve air system performance. The cartridge change interval should not exceed the time/mileage recommendations of BW8068, Recommended Service Intervals for Bendix® Air Dryers, on B2Bendix.com.

SPN	FMI	DTC/ Lookup Code	Description	Service Shop Information (Vehicle Level Effect)	Service Shop Information (Recommended Action)
1351	6	470506	Bendix® AD-HFi® solenoid short circuit	Compressor is always on; air dryer safety valve may open*.	<ol style="list-style-type: none"> <li>1. Perform continuity check from end to end for each solenoid pin in the harness (See Figure 2).</li> <li>2. Perform continuity check from Pin 1 to Pin 5 at the SA-EAC ECU harness with the solenoid disconnected. There should be no continuity from pin to pin.</li> <li>3. With solenoid connected, resistance across Pin 1 and Pin 5 should be 40 ohms.</li> </ol>
158	3	9E0003	AD-HFi solenoid voltage above normal	<p>Power source to SA-EAC is not supplying vehicle OE-specified ignition voltage.</p> <p>Compressor is always on; air dryer safety valve may open*.</p>	<ol style="list-style-type: none"> <li>1. Check that the power source can supply the vehicle OE-specified ignition voltage to the SA-EAC.</li> <li>2. Check whether the fuse for the SA-EAC power is blown (refer to vehicle OE electrical diagrams).</li> <li>3. Inspect the wiring connecting the power source to the SA-EAC.</li> <li>4. Perform continuity check from end to end for power Pin 2 and ground Pin 6 in the harness (See Figure 2).</li> </ol>
158	4	9E0004	AD-HFi solenoid voltage below normal	<p>Power source to SA-EAC is not supplying vehicle OE-specified ignition voltage.</p> <p>Compressor is always on; air dryer safety valve may open*.</p>	<ol style="list-style-type: none"> <li>1. Check that the power source can supply the vehicle OE-specified ignition voltage to the SA-EAC.</li> <li>2. Check whether the fuse for the SA-EAC power is blown (refer to vehicle OE electrical diagrams).</li> <li>3. Inspect the wiring connecting the power source to the SA-EAC.</li> <li>4. Perform continuity check from end to end for power Pin 2 and ground Pin 6 in the harness (See Figure 2).</li> </ol>

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\*\* If possible, confirm with a known good Electronic Control Unit (ECU) prior to replacement.

\*\*\* Refer to SD-08-12046, Bendix® AD-HF® and AD-HFi® Service Data Sheet, on B2Bendix.com for cartridge replacement.

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SPN	FMI	DTC/ Lookup Code	Description	Service Shop Information (Vehicle Level Effect)	Service Shop Information (Recommended Action)
524034	4	02FFE4	Bendix® AD-HFi® solenoid voltage below normal during engine idle	Power source to SA-EAC is not supplying vehicle OE specified ignition voltage for short period of time.  Compressor is always on; air dryer safety valve may open*.	<ol style="list-style-type: none"> <li>1. Check that the power source can supply the vehicle OE-specified ignition voltage to the SA-EAC.</li> <li>2. Check whether the fuse for the SA-EAC power is blown (<i>refer to vehicle OE electrical diagrams</i>).</li> <li>3. Inspect the wiring connecting the power source to the SA-EAC.</li> <li>4. Perform continuity check from end to end for power Pin 2 and ground Pin 6 in the harness (<i>See Figure 2</i>).</li> </ol>
524034	21	02FFF5	AD-HFi solenoid voltage below normal during engine start	Power source to SA-EAC is not supplying vehicle OE specified ignition voltage for short period of time.  Compressor is always on; air dryer safety valve may open*.  If only during engine start, vehicle battery could be malfunctioning.	<ol style="list-style-type: none"> <li>1. Check that the power source can supply the vehicle OE-specified ignition voltage to the SA-EAC.</li> <li>2. Check whether the fuse for the SA-EAC power is blown (<i>refer to vehicle OE electrical diagrams</i>).</li> <li>3. Inspect the wiring connecting the power source to the SA-EAC.</li> <li>4. Perform continuity check from end to end for power Pin 2 and ground Pin 6 in the harness (<i>See Figure 2</i>).</li> </ol>
522100	12	74F7EC	Controller operational defect	SA-EAC does not communicate on the CAN network.  Compressor is always on; air dryer safety valve may open*.	Replace the SA-EAC ECU per vehicle OE guideline**.
2048	12	00080C	Improper SW flashed on SA-EAC	SA-EAC does not communicate on the CAN network.  Compressor is always on; air dryer safety valve may open*.	Replace the SA-EAC ECU per vehicle OE guideline**.

**Table 1 - SA-EAC Troubleshooting**

\* If the safety valve is open, it is recommended that the safety valve be replaced. Refer to SD-08-12046, Bendix® AD-HF® and AD-HFi® Service Data Sheet, on B2Bendix.com.

\*\* If possible, confirm with a known good Electronic Control Unit (ECU) prior to replacement.

\*\*\* Refer to SD-08-12046, Bendix® AD-HF® and AD-HFi® Service Data Sheet, on B2Bendix.com for cartridge replacement.

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SPN	FMI	DTC/ Lookup Code	Description	Service Shop Information (Vehicle Level Effect)	Service Shop Information (Recommended Action)
522101	12	75F7EC	Improper SW flashed on SA-EAC	SA-EAC does not communicate on the CAN network.  Compressor is always on; air dryer safety valve may open*.	Replace the SA-EAC ECU per vehicle OE guideline**.
2048	14	00080E	SA-EAC dataset configuration performed incorrectly	SA-EAC does not communicate on the CAN network.  Compressor is always on; air dryer safety valve may open*.	Replace the SA-EAC ECU per vehicle OE guideline**.
522100	13	74F7ED	Improper dataset on the SA-EAC	SA-EAC does not communicate on the CAN network.  Compressor is always on; air dryer safety valve may open*.	Replace the SA-EAC ECU per vehicle OE guideline**.
522102	12	76F7EC	SA-EAC HW not compatible with SW	SA-EAC does not communicate on the CAN network.  Compressor is always on; air dryer safety valve may open*.	Replace the SA-EAC ECU per vehicle OE guideline**.
522100	14	74F7EE	SA-EAC dataset parameter out of range	Compressor is always on; air dryer safety valve may open*.	Replace the SA-EAC ECU per vehicle OE guideline**.
522100	31	74F7FF	SA-EAC dataset parameters for cut-in/cut-off are improper	Compressor is always on; air dryer safety valve may open*.	Replace SA-EAC ECU per vehicle OE guideline**
522103	12	77F7EC	SA-EAC memory error	SA-EAC does not communicate on the CAN network.  Compressor is always on; air dryer safety valve may open*.	Replace the SA-EAC ECU per vehicle OE guideline**.
522104	12	78F7EC	SA-EAC memory error	SA-EAC does not communicate on the CAN network.  Compressor is always on; air dryer safety valve may open*.	Replace the SA-EAC ECU per vehicle OE guideline**.

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\* If the safety valve is open, it is recommended that the safety valve be replaced. Refer to SD-08-12046, Bendix® AD-HF® and AD-HF® Service Data Sheet, on B2Bendix.com.

\*\* If possible, confirm with a known good Electronic Control Unit (ECU) prior to replacement.

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SPN	FMI	DTC/ Lookup Code	Description	Service Shop Information (Vehicle Level Effect)	Service Shop Information (Recommended Action)
521612	1	8CF5E1	Low pressure warning air circuit 1 (primary tank)	Air pressure in the primary tank is low and could lead to inadequate braking capabilities.	<ol style="list-style-type: none"> <li>1. Check the air dryer and air compressor for defect or leakage and fill up the system.</li> <li>2. Confirm accurate readings from the service brake pressure transducers (primary) per vehicle OE specification.</li> <li>3. If the DTC is still active after 15 minutes of pressurization, refer to the Air Dryer Service Data Sheet*** for diagnosing possible pneumatic supply issues.</li> </ol>
521612	18	8CF5F2	Low pressure warning air circuit 1 (primary tank) during idle	Air pressure in the primary tank is low during standstill and could lead to inadequate braking capabilities.	<ol style="list-style-type: none"> <li>1. Check the air dryer and air compressor for defect or leakage and fill up the system.</li> <li>2. Confirm accurate readings from the service brake pressure transducers (primary) per vehicle OE specification.</li> <li>3. If the DTC is still active after 15 minutes of pressurization, refer to the Air Dryer Service Data Sheet*** for diagnosing possible pneumatic supply issues.</li> </ol>
521613	1	8DF5E1	Low pressure warning air circuit 2 (secondary tank)	Air pressure in the secondary tank is low and could lead to inadequate braking capabilities.	<ol style="list-style-type: none"> <li>1. Check the air dryer and air compressor for defect or leakage and fill up the system.</li> <li>2. Confirm accurate readings from the service brake pressure transducers (primary) per vehicle OE specification.</li> <li>3. If the DTC is still active after 15 minutes of pressurization, refer to the Air Dryer Service Data Sheet*** for diagnosing possible pneumatic supply issues.</li> </ol>

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\*\* If possible, confirm with a known good Electronic Control Unit (ECU) prior to replacement.

\*\*\* Refer to SD-08-12046, Bendix® AD-HF® and AD-HF® Service Data Sheet, on B2Bendix.com for cartridge replacement.

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SPN	FMI	DTC/ Lookup Code	Description	Service Shop Information (Vehicle Level Effect)	Service Shop Information (Recommended Action)
521613	18	8DF5F2	Low pressure warning air circuit 2 (secondary tank) during idle	Air pressure in the secondary tank is low during standstill and could lead to inadequate braking capabilities.	<ol style="list-style-type: none"> <li>1. Check the air dryer and air compressor for defect or leakage and fill up the system.</li> <li>2. Confirm accurate readings from the service brake pressure transducers (primary) per vehicle OE specification.</li> <li>3. If the DTC is still active after 15 minutes of pressurization, refer to the Air Dryer Service Data Sheet*** for diagnosing possible pneumatic supply issues.</li> </ol>
521610	16	8AF5F0	Air dryer cartridge life expired	Nominal alert; 100% cartridge lifetime consumed; 0% cartridge lifetime remaining.	<ol style="list-style-type: none"> <li>1. Immediate cartridge replacement is recommended+.</li> <li>2. If the cartridge is replaced, reset the cartridge life via Bendix® ACom® PRO™ Diagnostic Software.</li> <li>3. If the DTC will not clear after resetting, replace the SA-EAC.</li> </ol>
521610	0	8AF5E0	Air dryer cartridge life beyond expired	Over-worn alert; 150% cartridge lifetime consumed; -50% lifetime overused.	<ol style="list-style-type: none"> <li>1. Replace the cartridge immediately and reset the cartridge life via ACom PRO Diagnostic Software.</li> <li>2. Inspect for possible excessive moisture and contamination in the air system+.</li> <li>3. If the DTC will not clear after resetting, replace the SA-EAC.</li> </ol>
521610	15	8AF5EF	Air dryer cartridge remaining life low	Pre-alert; 85% cartridge lifetime consumed; 15% cartridge lifetime remaining.	<ol style="list-style-type: none"> <li>1. Schedule a cartridge replacement+. Once the cartridge is replaced, reset the cartridge life via ACom PRO Diagnostic Software.</li> <li>2. If the DTC will not clear after resetting, replace the SA-EAC.</li> </ol>

**Table 1 - SA-EAC Troubleshooting**

\* If the safety valve is open, it is recommended that the safety valve be replaced. Refer to SD-08-12046, Bendix® AD-HF® and AD-HF® Service Data Sheet, on B2Bendix.com.

\*\* If possible, confirm with a known good Electronic Control Unit (ECU) prior to replacement.

\*\*\* Refer to SD-08-12046, Bendix® AD-HF® and AD-HF® Service Data Sheet, on B2Bendix.com for cartridge replacement.

+ CLP is an extra function meant to help support applications that may experience higher than normal cartridge wear. It may be used as an indicator that more frequent cartridge changes would improve air system performance. The cartridge change interval should not exceed the time/mileage recommendations of BW8068, Recommended Service Intervals for Bendix® Air Dryers, on B2Bendix.com.

SPN	FMI	DTC/ Lookup Code	Description	Service Shop Information (Vehicle Level Effect)	Service Shop Information (Recommended Action)
524033	20	01FFF4	High air consumption condition (check for leaks)	The loaded duty cycle of the compressor has been determined too high for the average driving speed of the vehicle over an extended period of time.	<ol style="list-style-type: none"> <li>1. Inspect the air system for leaks and the compressor for air delivery capacity.</li> <li>2. Inspect/replace the air dryer cartridge if necessary*** and reset the cartridge life via Bendix® ACom® PRO™ Diagnostic Software. Refer to the Air Dryer Service Data Sheet*** for diagnosing possible pneumatic supply issues.</li> </ol>
521612	0	8CF5E0	SA-EAC compressor duty cycle above normal operational range	Over time, the loaded duty cycle of the compressor has been determined to be too high.	<ol style="list-style-type: none"> <li>1. Inspect the air system for leaks and the compressor for air delivery capacity.</li> <li>2. Inspect/replace the air dryer cartridge if necessary*** and reset the cartridge life via Bendix® ACom® PRO™ Diagnostic Software. Refer to the Air Dryer Service Data Sheet*** for diagnosing possible pneumatic supply issues.</li> </ol>
521613	2	8DF5E2	System pressure too high	<p>The system air pressure exceeded the cut-out pressure by a pressure threshold and for a time threshold.</p> <p>Air dryer safety valve may open*.</p>	<ol style="list-style-type: none"> <li>1. Inspect the air system for leaks/obstructions/valve problems. Confirm the system pressure sensors are calibrated per vehicle OE specification.</li> <li>2. Using manual gauges, check the pressure in primary and secondary tanks during a charge cycle.</li> </ol>
522702	2	CEF9E2	SA-EAC system pressure mismatch between primary and secondary circuit	<p>Either the primary or secondary service brake pressure is inaccurate.</p> <p>Compressor is always on; air dryer safety valve may open*.</p>	<ol style="list-style-type: none"> <li>1. Check both primary and secondary tanks to confirm that there is not a major pressure difference between them (which may be indicative of potential leaking).</li> <li>2. Confirm accurate readings from the service brake pressure transducer (secondary) per vehicle OE specification.</li> </ol>

**Table 1 - SA-EAC Troubleshooting**

\* If the safety valve is open, it is recommended that the safety valve be replaced. Refer to SD-08-12046, Bendix® AD-HF® and AD-HF® Service Data Sheet, on B2Bendix.com.

\*\* If possible, confirm with a known good Electronic Control Unit (ECU) prior to replacement.

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SPN	FMI	DTC/ Lookup Code	Description	Service Shop Information (Vehicle Level Effect)	Service Shop Information (Recommended Action)
521614	2	8EF5E2	SA-EAC system pressure mismatch between primary and secondary circuit	AIR1 message to the SA-EAC is not sending either system pressure (primary or secondary service brake).  Compressor is always on; air dryer safety valve may open*.	<ol style="list-style-type: none"> <li>1. Check continuity of CAN wiring between the SA-EAC and Brake Control Module (BCM).</li> <li>2. Confirm accurate readings from the service brake pressure transducer (secondary) per vehicle OE specification.</li> </ol>
521611	0	8BF5E0	Excessive air compressor run time; likely excessive moisture and contamination in air tanks and potential damage to desiccant cartridge	<p>Air dryer may not be removing the proper amount of moisture in the air due to insufficient regeneration. Over time, this can lead to excessive moisture and contamination in the service brake tanks.</p> <p>This DTC suggests this issue has been persistent for a long period of time and may have caused irreparable damage to the air dryer cartridge. This condition is not reversible.</p>	<ol style="list-style-type: none"> <li>1. Inspect the air system for leaks. Review the vehicle application for high air usage which will be indicated by a high-loaded compressor duty cycle.</li> <li>2. Review the purge frequency for insufficient regeneration. Check the reservoirs for excessive moisture and contamination via the drain valves.</li> <li>3. If no excessive moisture or contamination is in the reservoirs, check the air system for function (charge and purge cycle) and confirm the safety valve is not popping off.</li> <li>4. Inspect/replace the air dryer cartridge if necessary*** and reset the cartridge life via Bendix® ACom® PRO™ Diagnostic Software.</li> <li>5. Check the air dryer safety valve*.</li> </ol>

**Table 1 - SA-EAC Troubleshooting**

\* If the safety valve is open, it is recommended that the safety valve be replaced. Refer to SD-08-12046, Bendix® AD-HF® and AD-HF® Service Data Sheet, on B2Bendix.com.

\*\* If possible, confirm with a known good Electronic Control Unit (ECU) prior to replacement.

\*\*\* Refer to SD-08-12046, Bendix® AD-HF® and AD-HF® Service Data Sheet, on B2Bendix.com for cartridge replacement.

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SPN	FMI	DTC/ Lookup Code	Description	Service Shop Information (Vehicle Level Effect)	Service Shop Information (Recommended Action)
521611	15	8BF5EF	Excessive air compressor run time; likely excessive moisture and contamination in air tanks and potential damage to desiccant cartridge	<p>The air dryer may not be removing the proper amount of moisture in the air due to insufficient regeneration. Over time, this can lead to excessive moisture and contamination in the service brake tanks.</p> <p>This DTC suggests this issue has been persistent for a long period of time and may have caused irreparable damage to the air dryer cartridge. This condition is not reversible.</p>	<ol style="list-style-type: none"> <li>1. Inspect the air system for leaks. Review the vehicle application for high air usage which will be indicated by a high-loaded compressor duty cycle.</li> <li>2. Review the purge frequency for insufficient regeneration. Check the reservoirs for excessive moisture and contamination via the drain valves.</li> <li>3. If no excessive moisture or contamination is in the reservoirs, check the air system for function (charge and purge cycle) and confirm the safety valve is not popping off.</li> <li>4. Inspect/replace the air dryer cartridge if necessary<sup>***</sup> and reset the cartridge life via Bendix® ACom® PRO™ Diagnostic Software.</li> <li>5. Check the air dryer safety valve*.</li> </ol>

**Table 1 - SA-EAC Troubleshooting**

\* If the safety valve is open, it is recommended that the safety valve be replaced. Refer to SD-08-12046, Bendix® AD-HF® and AD-HF® Service Data Sheet, on B2Bendix.com.

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SPN	FMI	DTC/ Lookup Code	Description	Service Shop Information (Vehicle Level Effect)	Service Shop Information (Recommended Action)
521611	16	8BF5F0	Excessive air compressor run time; potential excessive moisture and contamination in air tanks	<p>The air dryer may not be removing the proper amount of moisture in the air due to insufficient regeneration. Over time, this can lead to excessive moisture and contamination in the service brake tanks.</p> <p>This DTC suggests this issue has been persistent for a long period of time and may have caused irreparable damage to the air dryer cartridge. This condition is not reversible.</p>	<ol style="list-style-type: none"> <li>1. Inspect the air system for leaks. Review the vehicle application for high air usage which will be indicated by a high-loaded compressor duty cycle.</li> <li>2. Review the purge frequency for insufficient regeneration. Check the reservoirs for excessive moisture and contamination via the drain valves.</li> <li>3. If no excessive moisture or contamination is in the reservoirs, check the air system for function (charge and purge cycle) and confirm the safety valve is not popping off.</li> <li>4. Inspect/replace the air dryer cartridge if necessary*** and reset the cartridge life via Bendix® ACom® PRO™ Diagnostic Software.</li> <li>5. Check the air dryer safety valve*.</li> </ol>
524032	9	00FFE9	CAN bus network off or improperly configured for controller	<p>The SA-EAC is not capable of reaching any other CAN node in the network.</p> <p>Compressor is always on; air dryer safety valve may open*.</p>	<ol style="list-style-type: none"> <li>1. Check continuity of CAN wiring (See Figure 2).</li> <li>2. Check other connected ECUs are broadcasting as per OE specification.</li> <li>3. Check 60 ohm resistance across CAN high (Pin 8) and CAN low (Pin 4) of the network.</li> </ol>

**Table 1 - SA-EAC Troubleshooting**

\* If the safety valve is open, it is recommended that the safety valve be replaced. Refer to SD-08-12046, Bendix® AD-HF® and AD-HF® Service Data Sheet, on B2Bendix.com.

\*\* If possible, confirm with a known good Electronic Control Unit (ECU) prior to replacement.

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## TECHNICAL SUPPORT

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. The Bendix Tech Team can also be reached by email at [techteam@bendix.com](mailto:techteam@bendix.com).

## RELATED DOCUMENTATION

<b>Bendix Specifications</b>	
SD-08-12046	Bendix® AD-HF® and AD-HFi® PuraGuard® Oil Coalescing Air Dryer Service Data Sheet
<b>Society of Automotive Engineers (SAE) Documents</b>	
SAE J1939-71	Vehicle Application Layer
<b>Government Requirements</b>	
FMVSS 121	U.S. Department of Transportation, National Highway Safety Administration Federal Motor Vehicle Safety Standard 571.121
<b>Other Documentation</b>	
RP-1210A	Technology Maintenance Council (TMC) Recommended Practice for Microsoft® Windows® communications APO

**Table 2 – Related Documentation**

## ABBREVIATIONS AND DEFINITIONS

ABS	Antilock Braking System
AD-HFi EP	Air Dryer - High Flow Intelligent with Solenoid Governor, Extended Purge Tank
AD-HFi SP	Air Dryer - High Flow Intelligent with Solenoid Governor, Standard Purge Tank
ATC	Automatic Traction Control
BCM	Brake Control Module
BCVS	Bendix Commercial Vehicle Systems LLC
CAN	Controller Area Network
Cut-In	The lower air pressure threshold at which the compressor loads to build pressure
Cut-Out	The higher air pressure threshold at which the compressor unloads to stop building pressure
DTC	Diagnostic Trouble Code
EAC	Electronic Air Control
ECM	Electronic Control Module
ECU	Electronic Control Unit
GND	Electrical Ground Potential
SA	Source Address
PRV	Pressure Relief Valve

**Table 3 – Abbreviations and Definitions**

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