



Anti-Lock Braking System (ABS) Maintenance Guide

Forestry Log Haul

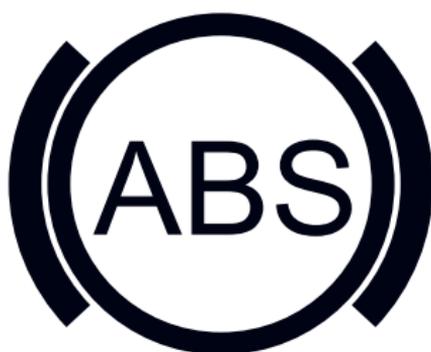


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INTRODUCTION

Since 2000, all tractor and trailers manufactured in Canada are required to have anti-lock braking system (ABS).

It is difficult to keep these systems operational in off-highway applications such as log-hauling.

The most frequent issues with these systems involve wheel-speed sensors and wiring.

This guide provides a brief overview of these issues and recommends best practices for maintaining these systems.

HOW ABS WORKS

An anti-lock braking system (ABS) is a safety system that allows vehicles to stop without wheel-lock thereby maintaining control and stability.

ABS uses wheel speed sensors to determine if one or more wheels are trying to lock up during braking.

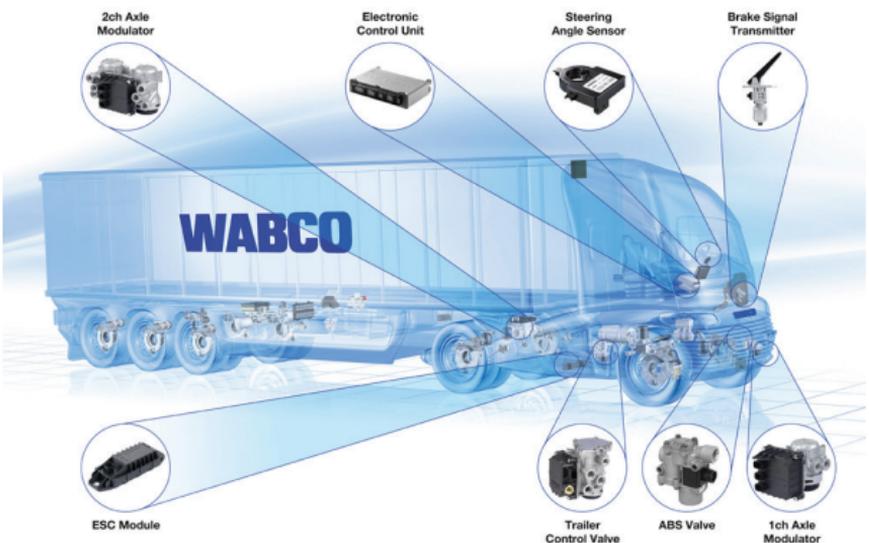


Photo credit: WABCO

FAULT DIAGNOSIS

Fault diagnosis is most easily accomplished with a fault scanning tool.



Faults can be read through blink codes (at ABS fault light), BUT are more time-consuming to diagnose.



When using the blink code method on some systems, each fault must be addressed before further faults can be diagnosed.

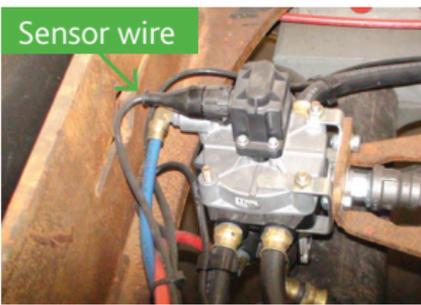
It is recommended that fleets purchase a basic scanning tool to diagnose faults on a weekly basis (Scanning tools range in price from \$300 to \$2 000).

The scanning tool will identify the location and the type of fault (e.g. front left steer wheel – wheel speed sensor issue).

WIRING AND CONNECTORS: INSPECTIONS

The wire routing is critical and determines the exposure to potential damage.

Most ABS installations are optimized by manufacturers but it is important to inspect the routing critically to see if the location could be improved or if the location has changed over time (e.g. to accommodate a shorter wire section).



Ensure that adequate strain relief exists, particularly close to connections.

The bend radius should not be less than 10 times the wire diameter. The wire should be routed straight out of connector for a minimum of 8 cm before bending.



Ensure wires are on the upper and rearward travel side of equipment members or hoses (minimize wire dangling).



Do not overtighten wires onto air hoses with tie wraps; this may cause wire pinching as hoses expand.

It is recommended that suitable hose clips or frame grommets be used to secure wire instead of tie wraps.

The most critical wire location is for the speed sensor wire between the brake chamber and sensor end.



Ideally, this wire should be located on the top side of the axle (rearward of travel direction).



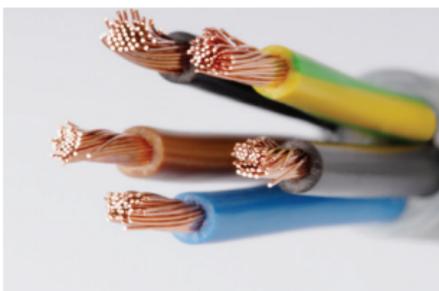
The cable routing and length must accommodate full suspension travel.

Wires should be protected with appropriate sheathing at potential chafe or exposure points (e.g. sharp edges at backing plates).



Use grommets or other protection for wires passing through metallic frame members.

Check the sensor block location and, where possible, move it so that it is in the 9 o'clock position on the right wheels and 3 o'clock on the left wheels.



This provides the greatest protection for the sensors rearward of the travel direction.

Inspect all wire connections for corrosion and ensure that each connection is correctly latched.

If corrosion exists, clean and lubricate with dielectric grease.

Visually inspect wires for cuts and abrasions, and replace as required. When replacing wire sections, ensure that the routing is acceptable, that strain relief is present, and that key points are protected and secured.



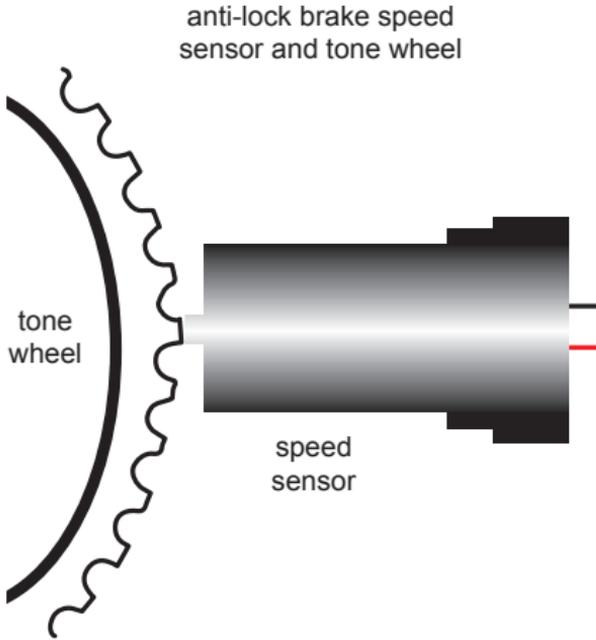
Excess wire length should be coiled appropriately (loops no smaller than 10 cm in diameter) and secured with tie wraps in a safe location.



Where possible, replace extension wires with appropriate length to minimize the amount of coiling required.

Excessively long wire harnesses can lead to electrical interference which can impact ABS performance.

WHEEL SPEED SENSORS: INSPECTIONS

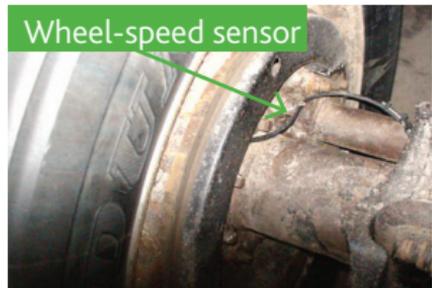
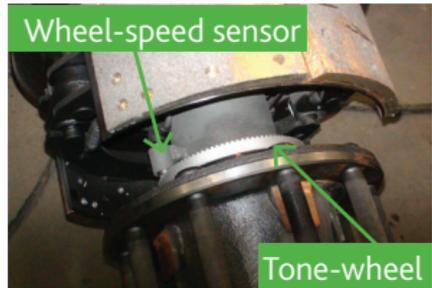


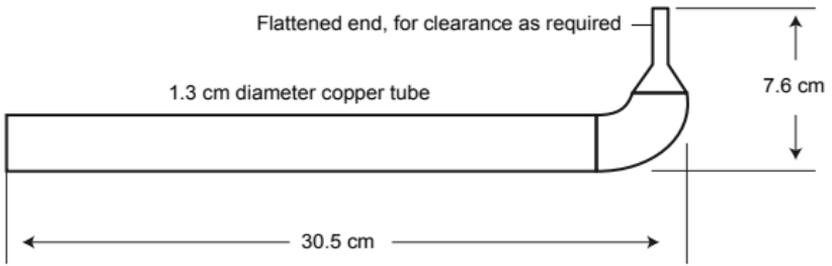
Wheel speed sensor faults are typically the most prevalent issue encountered.

These faults either originate from the wiring, faulty sensors, or the sensor backing out.

Many different intermittent faults occur as the wheel sensor starts to back out.

The first course of action in addressing this fault is to reset the sensor by pushing the sensor against its tone-wheel, which can often be accomplished without removing the wheel.





This can be done with a sensor reset tool or any other similar tool (e.g. ratchet) wedged behind the brake spider with backing plate.

However, if this does not eliminate the fault, it will be necessary to remove the wheel and replace the wheel-speed sensor.

Frequent sensor faults are either due to mud getting trapped on tone-wheel pushing out the sensor against the spring friction, or possibly a misaligned or worn wheel bearing.



To minimize the need for wheel disassembly between brake relines when addressing sensor faults, it is wise to closely examine sensors at brake re-lines, and if necessary, replace sensor. At the same time, the sensor spring clip should also be replaced and the sensor lubricated

The strategic placement and maintenance of mud-flaps has also been shown to reduce wheel-end wire and sensor damage.

PRESSURE MODULATION VALVES (PMV)

Pressure modulation valves (PMV) have been known to malfunction and in some situations block air flow to the brake chambers, thereby limit braking.

In some cases, the PMV can become partially blocked where the brakes appear to function normally but in an emergency stop, they provide inadequate pressure to the brake chambers.

The cause of this malfunction in most instances is a result of air system contamination, particularly on the trailer when the glad-hands are frequently disconnected and reconnected.



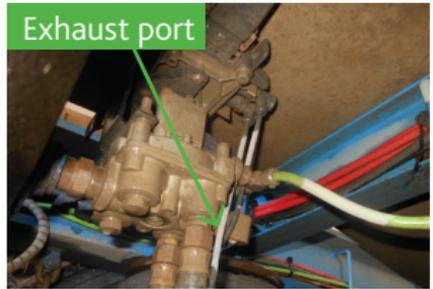
Care should be taken when disconnecting the glad-hands to prevent dirt entry.

Trailer system in-line air filters should be examined periodically and replaced every 6 months (more frequently if dirty).

Some users are finding that the stock filters are inadequate and have retrofitted larger capacity filters.

Another cause of PMV failures is believed to be the use of alcohol or other solvents to unfreeze air lines during winter, as the solvents degrade the valve seals. *This practice should therefore be eliminated.*

In addition to air system cleanliness, PMVs should be inspected periodically to ensure all electrical and air connections are secure and no air leaks are present.



In addition, the exhaust port seal should be examined to ensure it is functioning correctly and cleaned if necessary.

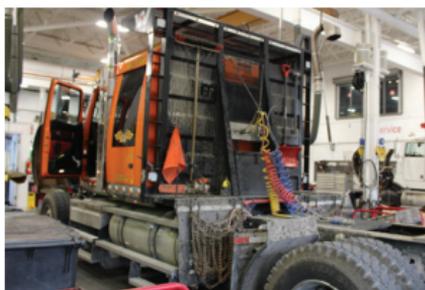
It is important to periodically check the pressure output (with a gauge) at the brake chambers to ensure that the PMV is not partially blocked.

The PMV should be oriented with the exhaust port facing downwards. Ensure the PMV is well protected from road debris and install guarding if necessary to prevent rocks damaging valve.

ELECTRONIC CONTROL UNIT (ECU)

Electronic Control Unit (ECU) faults are rare and are usually the result of excessive vibration, whereby the wire harness becomes partially unlatched leading to intermittent faults.

This issue can usually be resolved by disconnecting and reconnecting the harness (when un-powered).



It is also important to ensure that the ECU is securely installed (follow manufacturer torque recommendations – do not overtighten).

Tractor ECUs are typically only intended to be mounted in an environmentally protected location.

Trailer ECUs are more susceptible to damage due to their location, so the trailer ECU should be inspected periodically to ensure it is well protected and is free of visual damage.



It is critical that frame-mounted ECUs only be mounted where they are not subject to tire spray.

All unused ECU connectors must be covered and protected from environmental factors with appropriate plugs or caps.



RECOMMENDATIONS

Don'ts:

DON'T rely solely on ABS fault lights for fault diagnosis.

DON'T overtighten wires onto air hoses with tie wraps, as this may cause wire pinching as hoses expand.

DON'T use excessively long wire harnesses, as this can lead to electrical interference which can impact ABS performance.

DON'T use alcohol or other solvents to unfreeze air lines during winter, as the solvents degrade the valve seals.

Dos:

DO purchase a fault scanning tool for fault diagnosis.

DO inspect cables and connections frequently for damage or corrosion, and repair or replace if necessary.

DO check the sensor block location and, where possible, move it to the 9 o'clock position on the right wheels and 3 o'clock on the left wheels.

DO inspect trailer ECU for damage periodically and repair or replace if necessary.

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