



Inspection Bulletin

North American Standard Inspection Program

2013-02 – Antilock Brake System (ABS) Inspections

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Summary

This Inspection Bulletin provides guidance for inspecting the antilock brake system (ABS) on a bus, truck, truck tractor, trailer or dolly during a roadside inspection, and for identifying when a vehicle is in violation.

Background

Antilock brakes minimize the occurrence of wheel lockup and can prevent skidding, which helps drivers maintain directional control during stops on low-traction surfaces and in emergency stopping situations. In addition to the direct benefit of greater directional control, ABS reduces the potential for trailer swing-out and/or jack-knifing of combination vehicles.

ABS activates only in specific operating conditions and it is difficult for a driver to confirm ABS is working correctly. For this reason, ABS includes an on-board fault detection system, which activates an indicator lamp to notify the driver of any ABS malfunction. ABS malfunction lamps are yellow or amber-colored and located on the dashboard of trucks, buses and truck tractors (dashboard mounted), and on the exterior of trailers near the red, rear side marker lamp on the left side (trailer mounted). Converter dollies must have the lamp located on the left side. ABS malfunction lamps must be clearly identified with the letters ABS.

A report titled “Warning Assessment of Antilock Brake System (ABS) Malfunction Indicator Lamp Status – A Snapshot of In-Service Vehicles” *DOT-FMCSA-MCP_PSV-05-003-ABS* provides the results of inspections of ABS malfunction indicator lamps on approximately 1,000 vehicles. Despite obvious safety benefits, this study found that approximately one in six power units manufactured on or after March 1, 1997, and one in three trailers manufactured on or after March 1, 1998, were operating with a malfunction of the ABS. These results point out the need for more intensive inspection of vehicle ABS.

Required Dates for ABS Applicability

The table on the following page shows the dates when ABS was first required by U.S. and Canadian motor vehicle safety standards for various types of vehicles. Only those vehicles where ABS was required when they were originally manufactured should be inspected using the procedures described in this document. Older vehicles that have optional ABS may require a different inspection procedure to verify proper operation; regardless, they are not required to have ABS.

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System Description

Brake System Type	Vehicle Type	Dates of Manufacture When ABS First Required	
		US	Canada
Air	Truck Tractors	March 1, 1997	April 1, 2000
	Trailers, Dollies, Trucks and Buses	March 1, 1998	
Hydraulic	Trucks and Buses*	Sept. 1, 1999	

*ABS is only required on hydraulic-braked trucks and buses with a gross vehicle weight rating exceeding 10,000 pounds (4536 kilograms)

Vehicles Manufactured on or after March 1, 2001

Both U.S. and Canadian motor vehicle safety standards require that all air-braked trucks and tractors manufactured on or after March 1, 2001, and that are equipped to tow air-braked trailers and dollies must be equipped with an indicator lamp in the driver's field of view that can indicate the status of the ABS on the units that they tow. This lamp is in addition to the ABS malfunction lamp required for the ABS on the power unit itself and the external ABS malfunction lamps mounted on the sides of trailers and dollies. The standards further require that trailers and dollies, manufactured on or after March 1, 2001, have the ability to communicate their ABS status to power units that are equipped with this trailer ABS malfunction lamp so that drivers operating their vehicle in a normal seated position can be alerted to any ABS malfunctions on the units they are towing. Because both the power unit and the towed units must communicate for this feature to work properly, all units in the combination must have been manufactured with this capability.

Exempt Vehicles

Certain types of vehicles are exempt from the ABS requirements regardless of the date of manufacture:

- Any trailer that has a width of more than 102.36 inches (2.6 meters) with extendable equipment in the fully retracted position and is equipped with two short track axles in a line across the width of the trailer
- Any vehicle equipped with an axle that has a gross axle weight rating (GAWR) of 29,000 pounds (13,154 kilograms) or more
- Any truck or bus that has a speed attainable in 2 miles (3.2 kilometers) of not more than 33 mph (53.1 kph)
- Any truck that has a speed attainable in 2 miles (3.2 kilometers) of not more than 45 mph (72.3 kph), an unloaded vehicle weight that is not less than 95 percent of its gross vehicle weight rating (GVWR), and no capacity to carry occupants other than the driver and operating crew

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- Any trailer that has a GVWR of more than 120,000 pounds (54,432 kilograms) which has one or both of the following characteristics, but which is not a container chassis trailer:
 - Its brake lines are designed to adapt to separation or extension of the vehicle frame
 - Its body consists only of a platform whose primary cargo-carrying surface is not more than 40 inches (101.6 centimeters) above the ground in an unloaded condition, except that it may include sides that are designed to be easily removable and a permanent front-end structure
- Any trailer that has an unloaded vehicle weight which is not less than 95 percent of its GVWR
- Any load divider dolly

ABS Functional Status

The functional status of ABS is indicated by the ABS malfunction lamp. When power is initially provided to the ABS system, the lamp momentarily turns on to confirm the lamp is working and during this time, a self-test of the ABS is automatically conducted. If any fault is detected during the system test or if a fault is stored in memory because it occurred intermittently on previous occasions, the lamp stays on until the fault is corrected or power is disrupted; otherwise, the lamp turns off. A problem (and a violation) is present either when the ABS malfunction lamp fails to turn on when power is applied to the ABS (the malfunction lamp is failing to operate) or when the lamp turns on and stays on (the ABS system has one or more faults).

ABS Electrical Power

All towing vehicles requiring ABS, including truck tractors, trucks, trailers and dollies, must be equipped with a circuit that provides continuous electrical power to the ABS on the units that they tow. The requirement for this circuit became effective on the same dates that ABS became required (those shown in the table on page 2). In the event this required circuit is not operational, the vehicle has a violation. * ***The stop lamp circuit in the vehicle acts as a backup to provide power to the ABS on the towed unit(s) and a system operating on this backup circuit is not providing continuous electrical power. This violation is evident when the ABS malfunction lamp only activates when the brakes are applied.***

*Exception: In a combination with multiple towed units where any towed unit does not require ABS, the vehicles behind a non-ABS unit may only receive ABS power when the brakes are applied. This does not indicate a defect in the ABS system and is not a violation.

Towing vehicles not requiring ABS may rely only on their stop light circuits to power the ABS on the units they tow. In this case, the only way to inspect the ABS malfunction lamps on the units they are towing is to apply the brakes on the power unit to energize the brake light circuit throughout the combination which will activate the ABS malfunction lamps on the applicable towed units.

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Full-Time Electrical Power Tractors

Most ABS equipped power units energize the continuous power circuit for towed vehicle ABS when the ignition switch is turned on; however, in some applications the circuit is energized even when the ignition switch is in the off position. Full-time electrical power is installed on tractors towing trailers in operations needing full-time power to the trailer. Examples include tank haulers with overflow safety monitoring systems and DOD munitions haulers with mandatory GPS trailer tracking. In such cases, the external ABS malfunction lamps on the towed units will not cycle with the ignition switch or even with the brake pedal. It will be necessary to ask the driver to disconnect and then reconnect the seven-way electrical connector while you observe the ABS malfunction indicators located on the towed units. In addition, the trailer ABS malfunction lamp on the power unit dashboard may only cycle when the seven-way electrical connector is plugged in. Therefore, when performing this procedure for the towed vehicle's ABS, the trailer ABS malfunction lamp on the power unit dashboard may need to be inspected in the same manor based on the manufacturer of the power unit.

ABS Malfunction Lamp Location and Identification

While the location of the ABS malfunction lamps on trailers and dollies is fairly obvious, there is a considerable variation in the location and style of dashboard-mounted ABS malfunction lamps among power unit manufacturers and even among vehicles produced by any given manufacturer. There are many other indicator lamps on the dashboard that come on and go out when the ignition switch is activated,. Due to the lack of uniformity of the location and style of the ABS malfunction lamp, identifying it can be challenging, particularly when the lamp is inoperative. In some cases, the lamp may turn on and off very quickly and may require several cycles to correctly identify it.

If the power unit was manufactured on or after March 1, 2001, and it is equipped to tow an air-braked unit, it will also be equipped with a trailer ABS malfunction lamp, which may not be adjacent to the power unit's ABS malfunction lamp. This trailer ABS malfunction lamp may operate differently than the power unit's ABS malfunction lamp depending on whether or not the power unit is towing a unit and/or the age of the unit being towed. Depending on the manufacturer, the dash-mounted trailer ABS malfunction lamp on the tractor may not cycle when the vehicle is not pulling a trailer or pulling a trailer manufactured prior to March 2001. The light not cycling, in this case, is not a violation.

Post-Crash Inspection of ABS

The proper functionality of a vehicle's ABS can be an important factor in many crash incidents. Persons conducting a vehicle inspection in such cases are advised to confirm the status of the ABS using the procedures outlined in this bulletin and are further advised to fully identify the nature of any malfunction that may be present.

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Flashing ABS Malfunction Lamp

ABS may be inadvertently placed into a diagnostic mode during the inspection procedure, causing the ABS malfunction lamp to flash repeatedly. In this case, the power to the ABS should be turned off for two minutes and the test restarted.

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Step-by-Step Inspection Procedure

Before starting the inspection, determine the date of manufacture of each of the units being inspected and if any of the units are exempt from the ABS requirements (refer to previous pages).

1. Is the power unit required to have ABS?
 - a) If yes, go to step 2.
 - b) If no and it is not towing any units with required ABS, no ABS inspection is required.
 - c) If no but it is towing any units with required ABS, go to step 7.

2. Starting with the ignition switch off, ask the driver to turn it on or start the engine while you observe the ABS malfunction lamp for the power unit on the power unit's dashboard. It must come on then, after a few seconds, go out. Record any other response as a violation ("Power unit's ABS malfunction lamp fails to come on – Malfunction Lamp Violation" or "Power unit's ABS malfunction lamp stays on – ABS System Violation") and continue to step 3.

3. Was the power unit manufactured on or after March 1, 2001, and is it towing one or more units, all of which were manufactured on or after March 1, 2001?
 - a) If yes to both, go to step 4.
 - b) If no, go to step 5.

NOTE: Disregard the trailer ABS malfunction lamp in the power unit (skip Step 4 and go to Step 5) if any unit in the combination was manufactured prior to March 1, 2001, or there is no towed vehicle present.

4. Starting with the ignition switch off, ask the driver to turn it on or start the engine while you observe the ABS malfunction lamp for the trailer on the power unit's dashboard. If the lamp does not come on then, after a few seconds, go out, ask the driver to disconnect then reconnect the standard seven-way electrical cable between the power unit and the towed unit(s) while you observe the trailer ABS malfunction lamp on the power unit's dashboard. If it still does not cycle, record a violation. Refer to the table below for the appropriate violation assignment. Go to step 6.

Trailer ABS Malfunction Lamp in Power-Unit	Record Violation
Does not come on	On the power unit – "Trailer ABS malfunction lamp inoperative – fails to come on"
Comes on and stays on with towed unit(s) – <i>ABS malfunction lamp illuminated</i>	On the towed unit(s) with illuminated lamp(s) – "Towed unit ABS system malfunctioning"
Comes on and stays on with no towed unit(s) – <i>ABS malfunction lamp illuminated</i>	On the power unit – "Trailer ABS malfunction lamp inoperative – stays on with no faults from towed vehicle(s)"

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5. Is the power unit towing any units with required ABS? (Refer to table on page 2)
 - a) If yes, go to step 6.
 - b) If no, stop, ABS inspection is complete.

6. Starting with the ignition switch off, ask the driver to turn it on or start the engine while you observe the ABS malfunction indicator lamps on each towed unit with required ABS.
 - a) If the ABS malfunction lamps on all towed units with required ABS come on and then, after a few seconds, go out, stop. ABS inspection is complete.
 - b) If the ABS malfunction lamp on any towed unit with required ABS comes on and stays on or is already on, record the violation for that unit (“ABS malfunction lamp stays on— ABS system violation”). If the condition in step c below applies, continue; if not, stop. ABS inspection is complete.
 - c) If the ABS malfunction lamp on any towed unit with required ABS does not come on, go to step 7.

7. Starting with the ignition switch off, ask the driver to turn on the ignition switch or start the engine and then fully apply the service brake pedal and hold it while you observe the operation of the ABS malfunction lamps on each towed unit with required ABS.
 - a) If the power unit has required ABS and any of the ABS malfunction lamps on the towed units (except those units towed by other units without ABS) come on and go out or stay on when the brake is applied and held, record a violation on the power unit (“continuous electrical power circuit for towed vehicle(s) ABS not functional”).
 - b) If the power unit is not equipped with required ABS and ABS malfunction lamps on all towed units with required ABS come on and then after a few seconds go out before the brake is released, stop. ABS inspection is complete.
 - c) If the power unit is not equipped with required ABS and the ABS malfunction lamp on any towed unit with required ABS comes on and stays on while the brake pedal is applied, record a violation for that unit (“ABS malfunction lamp stays on”). If the condition in step d below applies, continue; if not, stop. ABS inspection is complete.
 - d) If the ABS malfunction lamp on any towed unit with required ABS does not come on, go to step 8.

8. Ask the driver to disconnect then reconnect the standard seven-way electrical cable between the power unit and the towed unit(s) while you observe the ABS malfunction lamps on the towed units with required ABS.
 - a) If the ABS malfunction lamps on all the towed units come on and then, after a few seconds, go out when the cable is reconnected, stop. ABS inspection is complete.
 - b) If the ABS malfunction lamp on any towed unit with required ABS does not come on, record a violation for that unit (“ABS malfunction lamp does not come on”). Stop. ABS inspection is complete.

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Inspection Flow Charts

Inspecting the ABS on a single-unit vehicle such as a truck or bus is a relatively straight forward process. It is simply a matter of determining the date of manufacture and then, if ABS is required, turning the ignition key and observing the ABS malfunction lamp. Performing an ABS inspection on a vehicle combination can be much more challenging due to the different ages of the units making up the combination, the requirements for communication among the various ABS-equipped units and the various configurations of ABS electrical power.

To aid in the inspection process with combination vehicles, two flowcharts have been prepared and are included in this bulletin. Due to manufacturing dates being different, there is a flowchart for the United States and another for Canada.

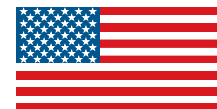
While these flowcharts aid in the ABS roadside inspection process and can serve as field reference guides, they do not include information on how to record and assign violations. The main body of this bulletin does provide that information, however, and must be referred to for that purpose.

These flowcharts are designed for roadside inspections. The information contained therein can be used by the driver as well but, in some cases, it may be necessary to have two people present to conduct the tests.

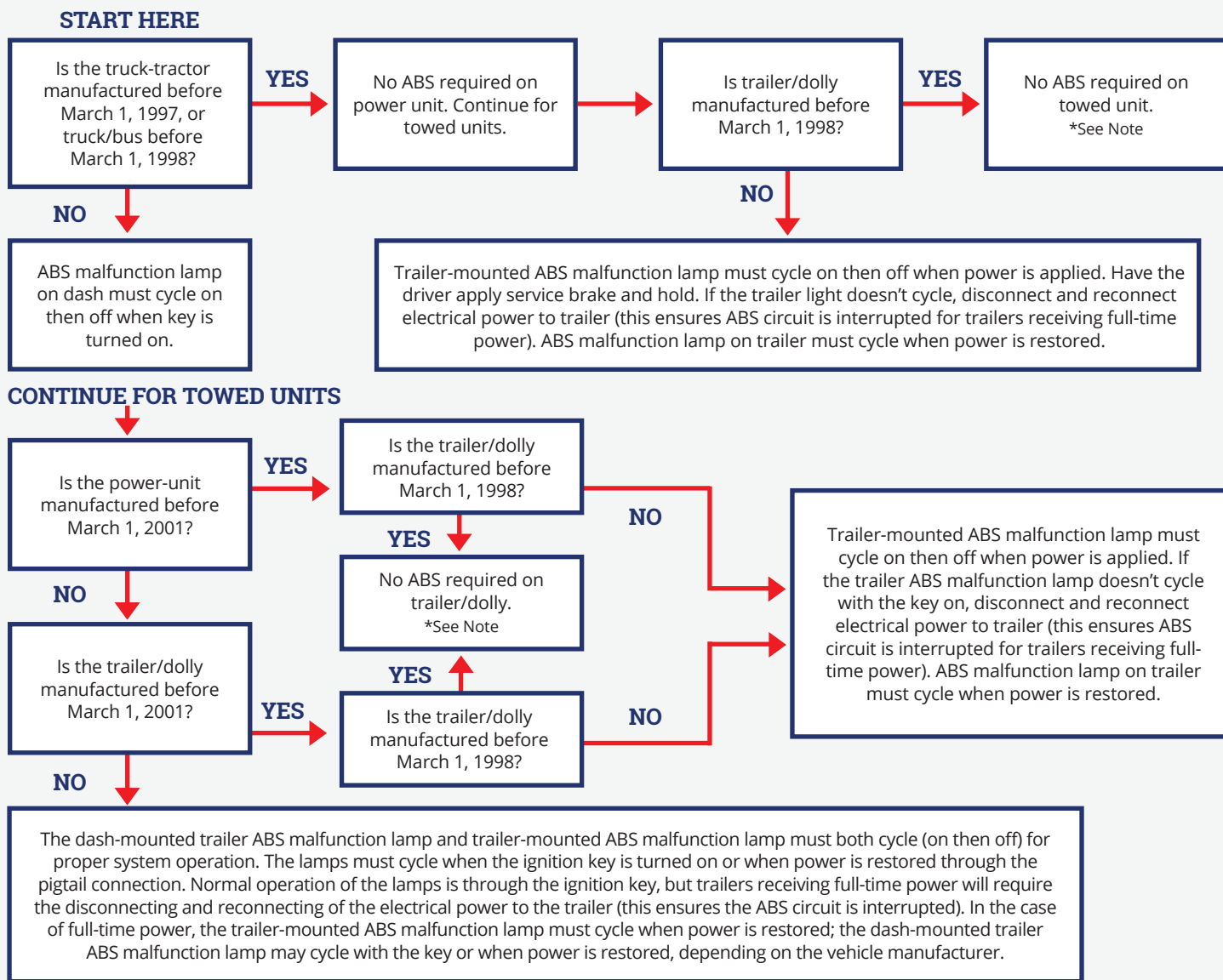


Inspection Procedure

Antilock Brake System (ABS) - U.S. Field Reference



Performing antilock brake system (ABS) inspections, whether on a single unit or combination vehicle, requires determining applicability of regulations using the date(s) of vehicle manufacture, powering the ABS system off and on and confirming whether the ABS malfunction lamps show violations. Additional steps are included for inspection of vehicles requiring ABS that are in combination with vehicles not requiring ABS as well as trailers towed by power units that provide full time power to trailers. The flowchart below summarizes the regulatory applicability, including effective dates, and the procedures for inspecting ABS on all vehicles and combinations in the United States. When required ABS malfunction lamps do not function or remain on, please refer to the Antilock Brake System (ABS) Inspection Bulletin for additional information on how to record and assign violations.



***NOTE:** If multiple units are being towed, any unit that is required to have ABS and is towed behind a vehicle manufactured before March 1, 1998, or a vehicle exempt from ABS requirements must have functional ABS (unit ABS malfunction lamp cycles on then off) upon service brake application.

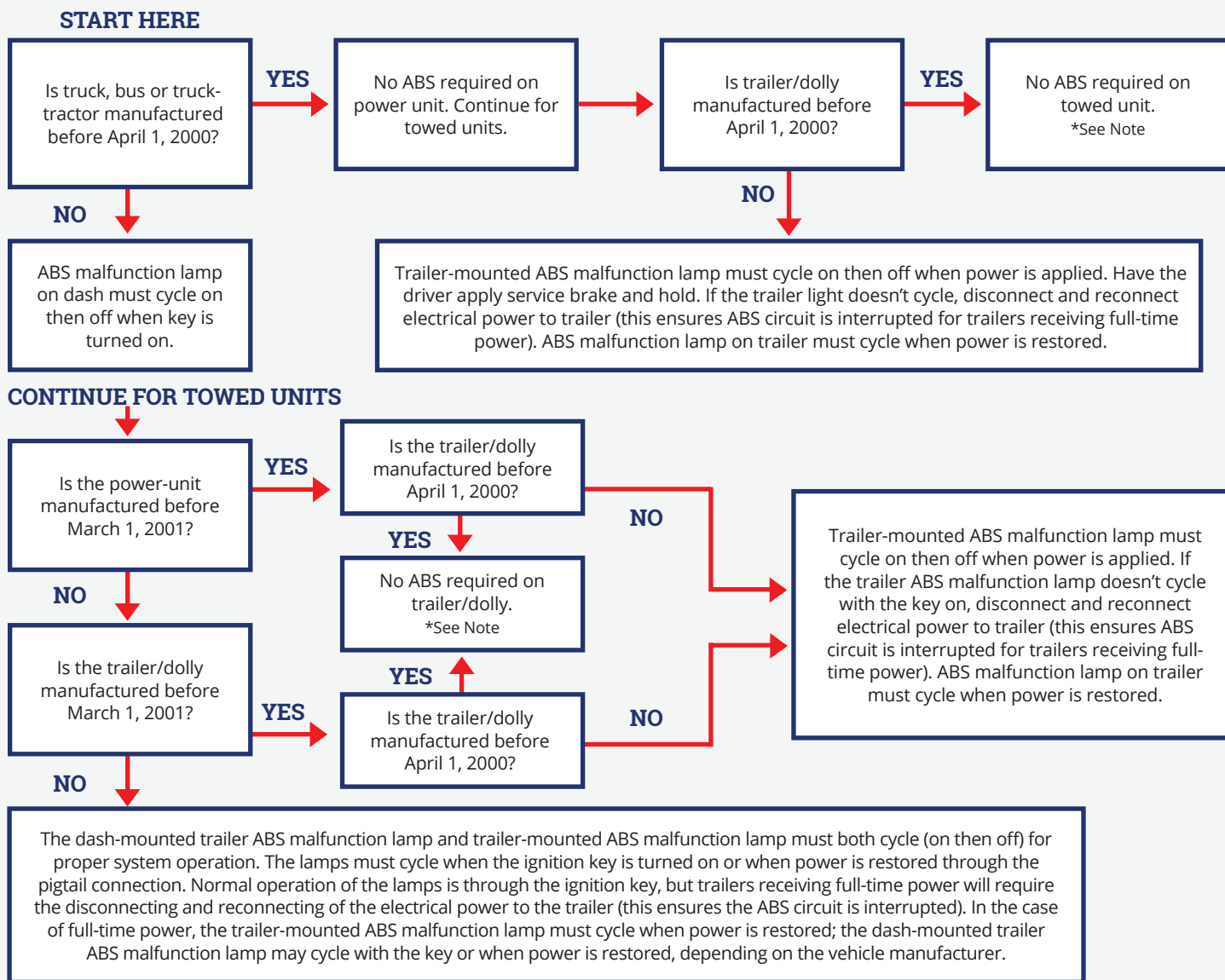


Inspection Procedure

Antilock Brake System (ABS) - Canadian Field Reference



Performing antilock brake system (ABS) inspections, whether on a single unit or combination vehicle, requires determining applicability of regulations using the date(s) of vehicle manufacture, powering the ABS system off and on, and confirming whether the ABS malfunction lamps show violations. Additional steps are included for inspection of vehicles requiring ABS that are in combination with vehicles not requiring ABS, as well as trailers towed by power units that provide full-time power to trailers. The flowchart below summarizes the regulatory applicability, including effective dates, and the procedures for inspecting ABS on all vehicles and combinations in Canada. When required ABS malfunction lamps do not function or remain on, please refer to the Antilock Brake System (ABS) Inspection Bulletin for additional information on how to record and assign violations.



***NOTE:** If multiple units are being towed, any unit that is required to have ABS and is towed behind a vehicle manufactured before April 1, 2000, or a vehicle exempt from ABS requirements must have functional ABS (unit ABS malfunction lamp cycles on then off) upon service brake application.