ABS Operator's Manual

Bendix® Antilock Brake Systems

With Optional Advanced Antilock Braking Features:

• Automatic Traction Control (ATC)

and

• Bendix® ESP® Electronic Stability System

This booklet contains important operational and safety information that benefits you and subsequent owners.

⚠WARNING

Read, understand and follow the information in this manual, particularly the Important Safety Information about ABS (page 5) and ESP (page 9).

Sources of Additional Information about your Bendix® ABS System

Consult the vehicle manufacturer's documentation.

Visit **www.bendix.com** for free downloads of the Service Data sheets listed below,

or order paper copies of these publications from the Literature Center at www.bendix.com.

SD-13-4863 Bendix® EC-60™ ABS/ATC Controllers (Standard and Premium) Service Data Sheet

SD-13-4869 Bendix® EC-60™ ABS/ATC/ESP Controllers (Advanced) Service Data Sheet

or

Contact the Bendix Tech Team at

techteam@bendix.com or

1-800-AIR-BRAKE (1-800-247-2725).

Representatives are available
Mon. - Fri. 8:00 a.m. to 6:00 p.m. EST.

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See opposite page for sources of more information.

Understanding Bendix® Antilock Braking Systems (ABS) For Air Braked Vehicles

What Is ABS?

ABS is an electronic control system that improves vehicle stability and steerability by preventing wheel lock during braking.

How Does ABS Work?

The ABS system monitors wheel rotation, and if it detects any wheel locking up, the system automatically reduces the brake pressure at that wheel. If necessary, the ABS system automatically modulates braking forces at one or more of the wheel ends. The system maintains lateral stability by preventing wheel lock during braking.

What Is The Optional ABS Off-Road Mode?

This is an optional ABS feature operated by a dash-mounted switch for use when operating your vehicle "off-road" on soft surfaces. Below 25 mph (40.2 kmh), this feature improves ABS performance under off-road operating conditions. If your vehicle is equipped with this feature, toggle the switch to the "ABS off-road" position when operating on soft surfaces. Always remember to turn the ABS off-road feature off when driving on a firm road surface. A new ignition cycle, or a second depression of the Off-road switch, will turn this function off and restore normal ABS functionality and (if installed) full ESP functionality. For more details on optional ATC and ESP features, see pages 6 and 7 of this manual.

WARNING! The ABS Off-Road mode should not be used on normal, paved road surfaces because vehicle stability and steerability may be reduced. The ABS indicator lamp will flash slowly to indicate to the driver that the ABS off-road mode is engaged.

CAUTION: When the ABS Off-Road mode is engaged, stability functions are disabled at speeds below 25 mph (40.2 kmh). The ATC/ESP indicator lamp will illuminate to indicate that the stability systems are disabled.

Important Safety Information About Bendix® Antilock Braking Systems (ABS)

Braking With ABS

- **Do not pump your brakes.** Use steady, even brake applications. Apply the brake pedal with the same pressure as you would without ABS. If you are towing a vehicle that is not equipped with ABS, you may need to adjust your braking applications in some instances. See below.
- **Do not attempt to modulate your brake applications to prevent wheel lock.** The system controls braking pressure automatically and independently at each wheel end to prevent wheel lock-up.

Limitations Of ABS

- **ABS does not apply the brakes automatically.** It's still up to you to apply the brakes at the right time and with the right amount of pedal force. A basic ABS system only starts to do its job after you apply the brake pedal. **Note:** The Bendix® ESP® stability system (if equipped on your vehicle) **can** reduce the throttle and **may** apply some or all of the brakes selectively to maintain vehicle stability. See page 7.
- **ABS is not a substitute for safe driving.** Even with ABS, you must remain alert, react appropriately and in a timely manner, and drive defensively. Don't take unnecessary risks. Cautious driving practices, such as maintaining an adequate distance away from the vehicle ahead, not speeding, anticipating obstacles and adjusting your vehicle's speed for traffic, weather and road conditions, are essential for safe operation.

Towed Vehicles Without ABS

Some towed vehicles, especially older trailers built before 2001, may not be equipped with their own ABS systems. **Use extra care when towing a vehicle that is not equipped with its own ABS system.** During emergency braking or braking on slippery surfaces, a non-ABS equipped trailer could lose its lateral stability and swing out if its wheels lock up. Use your mirrors to watch carefully and adjust your brake applications as necessary to keep your tractor and the non-ABS equipped towed vehicle in line with each other. Tractor ABS helps reduce the tendency to jackknife, but it cannot prevent a non-ABS equipped trailer from swinging out.

Understanding Automatic Traction Control (ATC)

What is ATC?

ATC is an optional feature for Bendix® ABS-equipped vehicles. ATC controls wheel spin during vehicle acceleration to improve traction.

- The ATC system will intervene automatically and apply braking pressure to a spinning wheel transferring engine power to other drive wheels that have better traction. This feature is active only at speeds below 25 mph (40.2 kmh).
- If all of the drive wheels begin to spin, the ATC system will reduce engine throttle to improve traction at all of the drive wheels.

How Do I Operate a Vehicle With ATC?

If drive wheels begin to lose traction during acceleration, ATC will engage automatically to assist the driver in accelerating the vehicle. The ATC/ESP lamp will flash rapidly to let you know whenever ATC is actively functioning.

Note: For vehicles equipped with an interaxle differential lock switch, you should consult the vehicle Operator's Manual for additional information about that feature. Typically, the driver is advised to stop the wheels from spinning and engage the interaxle differential lock switch, but you should always follow the specific instructions given in your vehicle's Operator's Manual for this feature and your vehicle's particular configuration.

What is Traction Control Override?

Another optional feature operated by a switch in the dash. When enabled the ATC lamp remains on to indicate that the ATC system has been turned off.

What Is The Optional Deep Mud/Snow Switch?

This is an optional ATC feature operated by a dash-mounted switch. This function allows greater engine power and more wheel spin during ATC operation. On vehicles equipped with this feature, toggle the switch to the "Mud/Snow" position when operating on soft road surfaces. The ATC lamp will flash slowly (every 2.5 seconds) to show that you are in the Mud/Snow mode. Whenever the ATC system intervenes, the ATC lamp will flash quickly (2.5 times per second). Always remember to turn the Mud/Snow feature off when driving on a firm road surface. A new ignition cycle, or a second depression of the Mud/Snow switch, will turn this function off.

What is Bendix® Smart ATC™?

Bendix® Smart ATC™ traction control monitors the accelerator pedal position to help provide optimum traction and vehicle stability. By determining the driver's throttle input and adapting the drive wheel behavior to the driving situation, the Smart ATC traction control allows higher wheel slip when the accelerator pedal is applied above a preset level. In addition, the wheel slip allowed by Smart ATC traction control is decreased when driving through a curve for improved stability.

Understanding The Bendix® ESP® Stability System

What Is ESP® Stability System?

The Bendix® ESP® stability system is an optional feature for Bendix® ABS-equipped vehicles that reduces the risk of rollovers, jackknifing and other loss of control situations. The ESP® system features include the Bendix® RSP® Roll Stability Program and Yaw Control.

Bendix® RSP® Roll Stability Program

What Is RSP® Roll Stability Program?

The Bendix® RSP® Roll Stability Program is a feature of the Bendix ESP stability system-equipped vehicles that reduces the risk of rollovers.

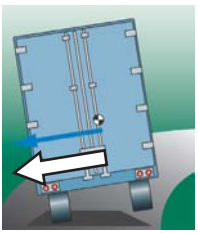
How Does RSP® System Improve Vehicle Roll Stability?

The RSP® system counteracts the tendency of a vehicle, or vehicle combination, to tip over while changing direction (typically, while turning). The lateral forces during a turn can push a truck or tractor-trailer horizontally and, if the friction between the tires and the road is sufficient, the vehicle may begin to tip and potentially could roll over.

To reduce the risk of rollover, the RSP® system detects potential rollover conditions and slows the vehicle both by reducing engine throttle (and hence, engine torque) and by applying the tractor and trailer service brakes as needed at the appropriate wheels.

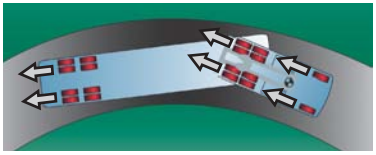
WARNING! During an RSP system intervention, the vehicle **automatically decelerates**. The RSP system can slow the vehicle with or **without you applying the brake pedal**, and **even when you are applying the throttle**.

During an RSP system intervention, you can always use your service brake pedal to increase the braking pressure that will be applied. However, if you were to apply less braking pressure than needed — or even if you release the brake pedal entirely during an intervention — the RSP system will continue to apply the necessary amount of braking pressure automatically to the appropriate wheels to mitigate a potential rollover.



A Real World Example Of How the Bendix® RSP® System Operates:

Excessive speed for road conditions creates forces that exceed the threshold at which a vehicle is likely to rollover on a higher-friction surface.



The RSP® system automatically reduces engine torque and applies the service brakes (based on the projected rollover risk) to reduce the vehicle speed, thereby reducing the tendency to roll over.

Yaw Control

What Is Yaw Control?

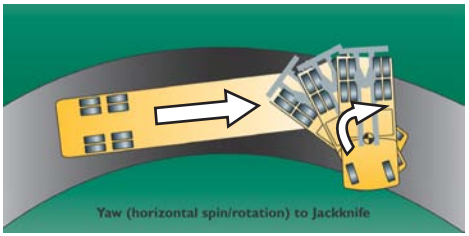
Yaw Control is a feature of the Bendix® ESP® stability system-equipped vehicles that reduces the risk of jackknifing and other loss of control situations.

If a vehicle's tires start to slide during a turn, Yaw Control counteracts the tendency of that vehicle to spin (or "yaw"), thereby reducing the risk of a jackknife or other loss of control. Many factors, including road conditions, load distribution and driving behavior, can contribute to the development of a spin.

Spins occur where either: (a) the rear wheels begin to lose their grip on the road (which could lead to a jackknife when towing a trailer), or (b) the front wheels begin to lose their grip, reducing a vehicle's ability to respond to the driver's steering inputs.

Yaw Control continually monitors the direction in which you are steering the vehicle as well as the vehicle's response to those steering inputs. If the system detects that the vehicle is beginning to spin, Yaw Control reduces the engine throttle, uses selective braking at the four corners of the vehicle, and may also use trailer braking, to help you keep the vehicle under control.

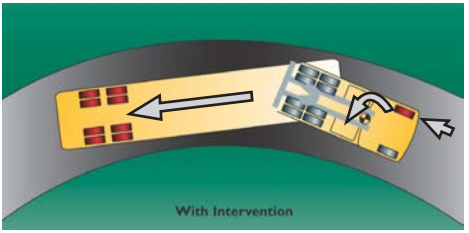
WARNING! During a Yaw Control system intervention, the vehicle **automatically decelerates.** Yaw Control can slow the vehicle with or **without you applying the brake**, and **even when you are applying the throttle.**



A Real World Example Of How Yaw Control Operates:

Excessive speed exceeds the threshold, creating a situation where a vehicle is likely to spin and jackknife.

The Bendix® Yaw Control system reduces engine throttle and selectively applies brakes to reduce the tendency to jackknife.



Important Safety Information About The Bendix® ESP® Stability System

The ESP System May Reduce Your Speed Automatically

The Bendix ESP system can make your vehicle **decelerate automatically.** The ESP system can slow the vehicle with or **without you applying the brake**, and **even when you are applying the throttle.**

To minimize unexpected deceleration and reduce the risk of a collision:

- Avoid aggressive driving maneuvers, such as sharp turns or abrupt lane changes at high speeds, which might trigger the stability system.
- Always operate your vehicle safely, drive defensively, anticipate obstacles and pay attention to road, weather and traffic conditions. ABS, ATC and ESP stability systems are no substitute for prudent, careful driving.

Limitations Of The Stability System

Your ESP stability system's effectiveness may be greatly reduced if:

- Your load shifts due to improper retention, accident damage or the inherently mobile nature of some loads (for example, hanging meat, live animals or partially laden tankers),
- Your vehicle or load has an unusually high or off-set center of gravity (CG),
- Your brakes are not properly adjusted or maintained,
- One side of your vehicle drops off the pavement at an angle that is too great to be counteracted by a reduction in speed.

To Maximize The Effectiveness Of Bendix® ESP® Stability System:

- Make sure that the weight of your load is evenly distributed, front to back and side to side, and is properly secured at all times.
- Exercise extreme caution at all times while driving, and avoid sharp turns, sudden steering inputs or abrupt lane changes at high speeds, particularly if:
    - › you haul loads that could shift,
    - › your vehicle or load has a high or off-set center of gravity (CG) when loaded, or
    - › you are towing doubles or triples.

Chassis Modifications

The ESP system was specifically calibrated and validated only for your vehicle's original configuration. If your vehicle's chassis components are altered (for example, a wheel base extension or reduction, tag axle addition or removal, a major body change such as conversion of a tractor into a truck, or an axle, suspension, or steering system component modification) the Bendix ESP stability system must be disabled at the same time by a qualified mechanic.

WARNING! If a modified vehicle does not have the ESP system disabled, serious vehicle braking and performance issues could result, which could result in a loss of control of your vehicle.

See your Vehicle's Owner's Manual or Bendix Service Data Sheet SD-13-4869 for additional important information about configuration criteria.

Steering Angle Sensor Re-Calibration

Whenever maintenance or repair work is performed to the steering mechanism, linkage, steering gear, adjustment of the wheel track, or if the steering angle sensor is replaced, a recalibration of the Steering Angle Sensor must be performed.

WARNING! If the Steering Angle Sensor is not recalibrated, the Yaw Control system will not function properly, which could result in a loss of control of your vehicle.

WARNING! When replacing a steering wheel, use **only** a vehicle manufacturer approved steering wheel and be sure that the Steering Angle Sensor is not damaged during installation. Recalibrate the Steering Angle Sensor.

WARNING! If replacement tires are used that are a different diameter from the OEM-specified tire size, the new tire size must be programmed into the ABS controller using the Bendix® ACom™ Diagnostic Software.

Yaw Rate Sensor Location and Orientation

WARNING! The **location and orientation of the Yaw Rate Sensor must not be altered.** When servicing, an identical component must be used in the same orientation (using OEM brackets & torque requirements). During installation follow the OEM leveling guidelines.

Understanding Your ABS Indicator Lamps

ABS Indicator Lamp

An amber ABS Indicator Lamp is typically located on the dashboard.

- At each vehicle ignition your ABS indicator lamp should illuminate as a bulb check for approximately three seconds and then turn off. **If the lamp does not illuminate at ignition, you should have the vehicle serviced by a qualified mechanic as soon as possible.** Note: without a functioning indicator lamp, you may not be able to determine the ABS status without using an external diagnostic tool.
- If the indicator lamp remains on for more than three seconds after ignition, or if it illuminates while you are driving, the ABS system may not be fully functional or may be completely disabled. If the ABS is completely disabled or not functioning properly, your vehicle will still have normal service braking and it still can be driven, although without the benefits of ABS. **Have the vehicle serviced by a qualified mechanic as soon as possible to restore full ABS functionality.**

- The ABS lamp is also used to indicate the optional off-road ABS mode. The lamp will flash continually when the vehicle is operating in the off-road mode. (Note: When the ABS Off-Road mode is engaged, stability functions are disabled at speeds below 25 mph (40.2 kmh). The ATC/ESP Indicator lamp will illuminate to indicate that the stability systems are disabled.) See page 4 of this manual for additional sources of information about the ABS off-road operating mode.

Trailer ABS Indicator Lamp

The Trailer ABS Indicator Lamp is also dash-mounted.

- All trailers built since March, 2001 are able to communicate with the towing vehicle and to operate the trailer ABS indicator lamp on the towing vehicle's dash. The trailer ABS indicator lamp functions just like the tractor ABS indicator lamp (on for three seconds after each vehicle ignition, then off unless a problem develops with the trailer ABS during operation).
- All new trailers built through March 1, 2009 will be equipped with an amber ABS warning lamp located on the driver's side near the rear of the trailer. The operation of the lamp varies depending on how the ABS system is powered:
  (a) Full-time powered ABS (usually obtaining power over the blue line of the J560 connector): The trailer ABS warning lamp will function just like the tractor ABS warning lamp, listed above.
  (b) Brake-light-only powered ABS: Each time the brakes are applied the warning lamp will come on for approximately 3 seconds and then turn off. If the lamp remains on during braking, ABS may not be operating. The vehicle will retain normal service braking, although without the benefits of ABS. Have the trailer serviced as soon as possible to restore ABS operation.

ATC/ESP Indicator Lamp (Optional)

If your vehicle is also equipped with the optional ABS features, ATC or Bendix® ESP® stability system, a third indicator lamp will be installed on the dash. (The same lamp is also used to indicate the ATC "Mud/Snow" mode.)

- During the bulb check at vehicle ignition your ATC/ESP indicator lamp will illuminate for approximately two and a half seconds and then turn off. If the ATC/ESP indicator lamp does not illuminate at ignition, or if it remains on steadily (not flashing) after ignition, or if it illuminates steadily (not flashing) while you are driving (except in off-road mode), the ATC or ESP system may not be fully functional or their operation may be completely disabled. If this happens, your vehicle will still have normal service braking and it still can be driven, although without the benefits of ATC or an ESP system. **Have the vehicle serviced by a qualified mechanic as soon as possible to restore full ATC/ESP functionality.**

(Continued . . .)

- The ATC/ESP indicator lamp also flashes continually (at different speeds) to show that:
  - (a) the Mud/Snow mode is being used, or
  - (b) during an ATC or ESP intervention event.
- If your vehicle is operating in the ABS off-road mode (an optional feature, available at speeds up to 25 mph), the ATC/ESP indicator lamp will illuminate and remain ON to remind you that **ESP functions are disabled** during operation in off-road mode.

	Mode		ABS Lamp	ATC/ ESP Lamp	Trailer ABS Lamp	
At Vehicle Startup	**Ignition on** - start up (trailer with PLC)		On for 3 seconds*	On for 2.5 seconds*	On for 3 seconds*	*If any of the described lamp behaviors do not occur — or if the lamp remains on during operation — have the vehicle serviced by a qualified mechanic as soon as possible to restore full system functionality.
	3 seconds after ignition (with no Diagnostic Trouble Codes)		Lamp Off*	Lamp Off*	Lamp Off*	
Special Mode Operation	ABS Off-Road Mode	Normal	Lamp flashes slowly (every 2.5 seconds)	Lamp ON (ESP is disabled)	• Uses dash switch • Not for firm road surfaces • Allows more wheel lock-up (less ABS intervention) • Mode only applies under 25 mph (Over 25 mph, the system reverts to full ABS - including ESP, and ATC/ESP lamp goes off.)	
		During an ATC Event		Flashes quickly		
	Deep Mud/ Snow/ Mode	Normal	Off	Flashes slowly (every 2.5 seconds)	• Uses dash switch • Increases allowable wheel slip during ATC interventions • Not for firm road surfaces	
		During an ATC/ ESP Event	Off	Flashes quickly		
During an Automatic Traction Control (ATC) Event				Flashes quickly	• Reduces wheel slip during acceleration at low speeds	
During an ESP Event				Flashes quickly	• System intervenes to reduce the risk of rollovers, loss of control, etc.	

See Page 2 for a list of further sources of information.

Bendix