Technical Bulletin

Subject: Bendix® ESP® Electronic Stability System Event Counters

Bendix® ESP® consists of two systems:

• Roll Stability Program (RSP) to help mitigate vehicle rollover events, which typically occur on a dry road surface; and

• Yaw Control to address loss of stability events due to vehicle spin, which can occur on a slippery road surface, such as wet asphalt, ice, snow, etc.

See Figures 1 and 2 (on page 2) for more information.

The Bendix® ESP® electronic stability system continuously monitors a variety of vehicle parameters and sensors to determine if the vehicle is reaching a critical stability threshold. If such a situation develops, the system will quickly, and automatically intervene to assist the driver.

The system can apply tractor and trailer brakes selectively, as well as de-throttle the engine automatically (without operator intervention).

The driver is always responsible for the control and safe operation of the vehicle at all times. The Bendix ESP stability system does not replace the need for a skilled, alert professional driver, reacting appropriately and in a timely manner, and using safe driving practices.

Rollover Interventions

The Bendix ESP system uses information from the sensors on the vehicle to detect that a risk of a rollover is present. Where the conditions make a rollover likely, the system will automatically reduce the engine throttle, and if necessary, apply all vehicle brakes — steer axle, drive axles(s) and trailer — to slow the vehicle.

Loss-of-Control Interventions

When the Bendix ESP system determines that the actual vehicle path is deviating from the driver's intended path, the system will automatically reduce the engine throttle, and if necessary, apply one or more individual brakes to provide optimal vehicle control.

Stability Event Counters

The Bendix ESP stability system ECU contains **event counters** for both rollover and yaw interventions, which can be accessed using Bendix® ACom® Diagnostic software (version 5.4 and later). *See the Chart below.*

By using the ACom Diagnostics, the technician is able to display a page that shows counters that indicate the number of system interventions. The intervention levels recorded indicate the amount of work performed by the system which is, in part, determined by both the

Level	Roll System Action *(When the system detects that the vehicle is starting to have a risk of roll-over.)*	Yaw System Actions *(When the system detects that the vehicle is unstable.)*
1	Light system application (typically de-throttle only). (The driver may not notice this action.)	The system intervenes to de-throttle.
2	The system intervenes to moderately apply the brakes. (The driver may, or may not, notice.)	The system intervenes to de-throttle and/or apply the brakes.
3	The system intervenes to moderately apply the brakes.	The system intervenes to apply the moderately apply the brakes.
4	The system intervenes significantly, but not all the braking power available to the ESP system is applied.	Significant braking intervention, but not all the braking power available to the ESP system is applied.
5	The system intervenes to apply the maximum braking available to the ESP system to try to prevent a rollover.	The maximum braking available to the ESP system is applied to try to mitigate a loss-of-control.

Notes:
- Some vehicle types are typically at greater risk of rollovers/loss-of-control events, including loads with a higher center-of-gravity; sloshing or swinging cargo. Rollovers can potentially occur at low speeds with vehicles of those types.
- An intervention at any level has the potential of helping to mitigate a rollover/loss-of-control event.
- Many factors can vary the interventions for vehicles with similar vehicle spec's: the vehicle's mass, vocation, route(s); the load distribution; the lateral acceleration; the yaw rate detected; the driver's speed and steering actions.
- Optimal vehicle braking requires properly maintained foundation brakes which meet appropriate safety standards and regulations. In addition, the vehicle should be equipped with properly sized and inflated tires, with a safe tread depth.

magnitude and the length of time of the intervention. A Level One intervention represents the lowest amount of work, and a Level Five intervention the highest.

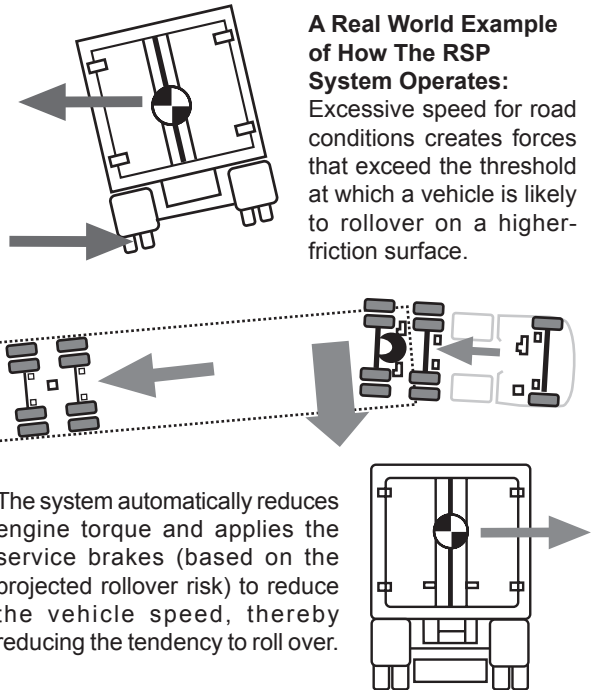
In other words, an event of a certain duration, with a given amount of brake force applied by the system, may be classified at the same intervention level as an event consisting of a shorter duration with a larger applied brake force, or an intervention with less applied brake force, but of longer duration.

Evaluating Stability Event Counters

While the counters indicate the amount of work performed by the system, many factors must be considered when attempting to evaluate the data. These include:

- A vehicle with poorly adjusted brakes may display higher intervention levels than a vehicle with properly adjusted brakes.
- Route, terrain, traffic and weather conditions may all affect the number of interventions logged.
- Mis-installed sensors, and/or incorrectly configured ECUs can cause higher counter values,

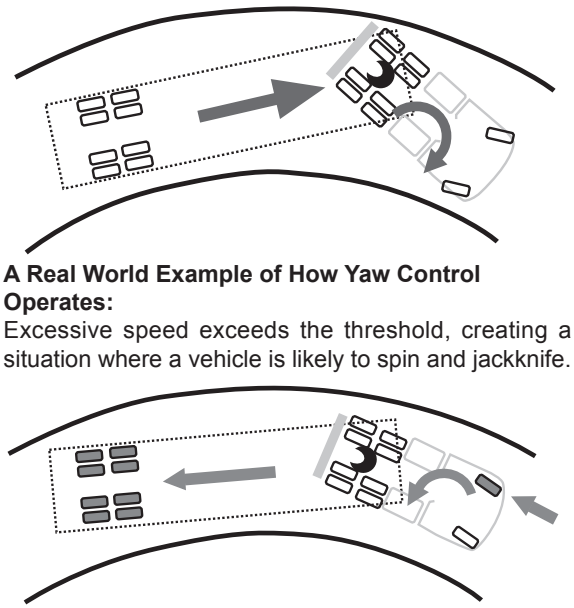
Attempts to use the raw data from stability event counters to evaluate situations, vehicles and drivers must be approached with care. In all situations, the stability event counter should only be viewed as an indicator, and is not, by itself, a vehicle or driver performance evaluation tool.



A Real World Example of How The 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 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.

FIGURE 1 - RSP EXAMPLE



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.

FIGURE 2 - YAW CONTROL EXAMPLE

⚠ The Importance of Antilock Braking System (ABS) Maintenance

Optimal Bendix® Wingman® Advanced™ system braking requires a properly maintained ABS system, without any active ABS Diagnostic Trouble Codes (DTCs). Have active DTCs repaired by a qualified technician. Any ABS DTCs will cause Wingman Advanced to deactivate.

CAUTION

Even with ESP-equipped vehicles, the driver remains responsible for ensuring vehicle stability during operation. The ESP system can only function within the limits of physics. ESP functionality mitigates potential vehicle stability incidents, but cannot prevent them in all cases. Other factors such as driving too fast for road, traffic or weather conditions, oversteering, an excessively high vehicle Center of Gravity (CG), or poor road conditions can cause vehicle instability that is beyond the capability of any stability system to mitigate. In addition, the effectiveness of ESP can be greatly reduced on vehicles towing multiple trailer combinations. For more information, contact your local Bendix representative or the Bendix Technical Assistance Team at 1-800-AIR-BRAKE (1-800-247-2725).

Reference: Bendix® EC-60™ ABS/ATC/ESP Controllers (Advanced Models) — order SD-13-4869 (BW2429)
Bendix® ACom® Diagnostics PC software — order BW2329 (Free downloads available on www.bendix.com)