
PACCAR & DEALER
TMC
Technical &
Maintenance
Conference

ABS & ESC – myth and reality

Presented by Knorr-Bremse

ABS & ESC – myth and reality

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ADVANCED ELECTRONIC BRAKING

Agenda

- Definitions
- Elements & Configurations
- Operation
- Servicing
- Upgrading fleet - Retrofit
- Enhancements

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Definitions

- **ABS** Anti-lock Braking System
  - *Antilock Braking System is a reactive Electronic Braking System that monitors & controls wheel slip during vehicle braking. Reducing the wheel slip improves vehicle directional stability & control during braking.* (Brake modulation only, and a key element in Electronic Braking Systems)
- **RSP** Roll Stability Program, **RSC** Roll Stability Control
  - *Roll Stability Program is a reactive Electronic Braking System that provides lateral stabilization of the vehicle in a critical roll-over driving situation.* (Brake modulation to reduce lateral acceleration)
- **ESP** Electronic Stability Program, **ESC** Electronic Stability Control, & **DSC** Dynamic Stability Control ,
  - *Electronic Stability Program is a predictive Electronic Braking System with automatic lateral & longitudinal stabilization of the vehicle in a critical directional(slip & skid) & roll-over driving situation.* (Engine retardation, independent Brake modulation to reduce lateral acceleration & provide directional stability)
- **TEBS** Trailer Electronic Brake System
  - *Trailer Electronic Braking System incorporates Roll Stability Program, is a reactive Electronic Brake System with automatic stabilization of the Trailer in a critical driving situation.* (independent Brake modulation to reduce lateral acceleration & provide directional stability)

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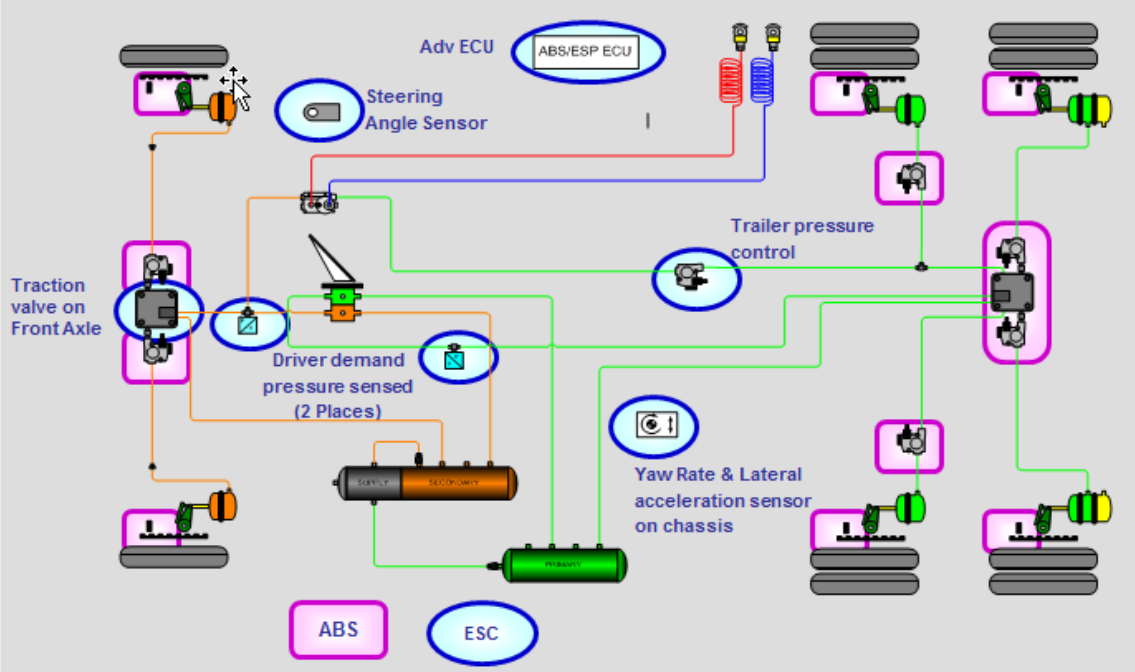
Elements & Configurations - Truck

- ABS
- ECU
- PMV
- WSS
- 6S/6M
- RSP
- LAS
- ESP
- SAS
- YRS
- CAN



Elements & Configurations - Truck

Summary of Parts in ABS, RSP & ESC systems		ABS only	Roll-Only Stability Systems (RSP/RSC)	Full-Stability Systems (ESP/ESC)
Electronic Control Unit	Computer monitoring and controlling the Braking system.	✓	✓	✓
Pressure Modulation Valve	PMV's are operated by the ECU to modify driver applied air pressure to the service brakes during ABS, ATC, RSP or ESC activation.	✓	✓	✓
Wheel-Speed Sensor	Enables the system to monitor vehicle speed and wheel lock-up to optimize braking. Aids directional control.	✓	✓	✓
Lateral-Acceleration Sensor	Measures the tendency to roll by sensing the side forces acting on the vehicle		✓	✓
Steering-Angle Sensor	First indicator of a potential critical maneuver; captures the driver's intended direction of the vehicle			✓
Brake-Pressure Sensor	Measures driver braking to accurately supplement the driver throughout the maneuver			✓
Load Sensor*	Helps verify weight distribution, enabling appropriate application of braking power			✓
Yaw Rate Sensor	Senses vehicle spin to verify that the vehicle is following the driver's intended course			✓

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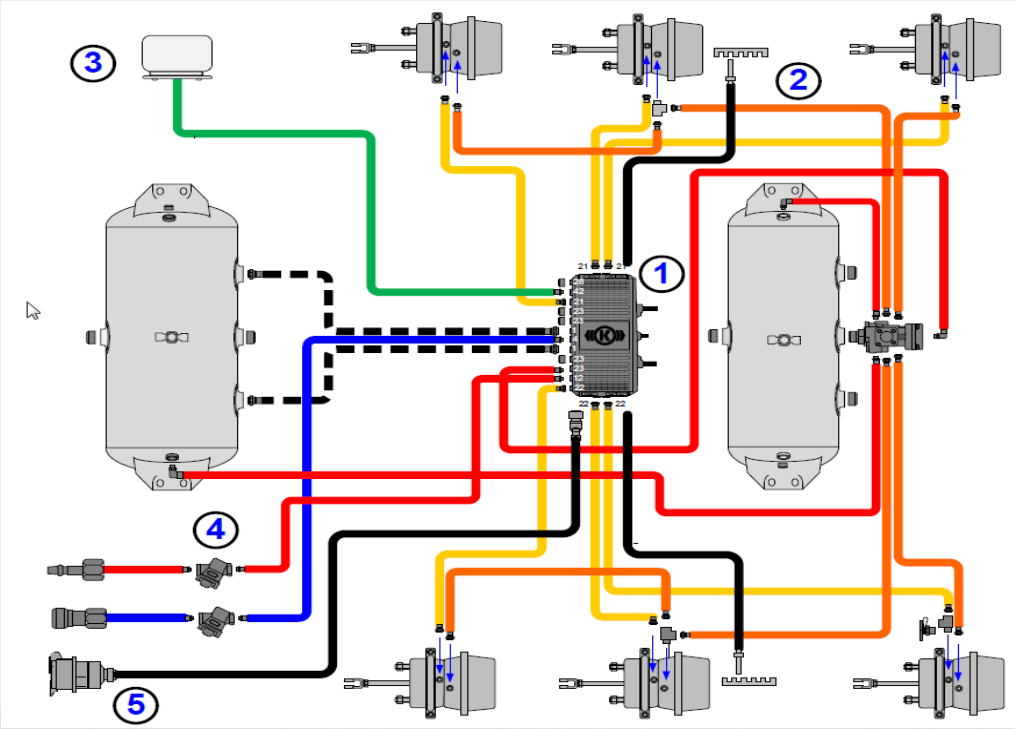
Elements & Configurations - Trailer

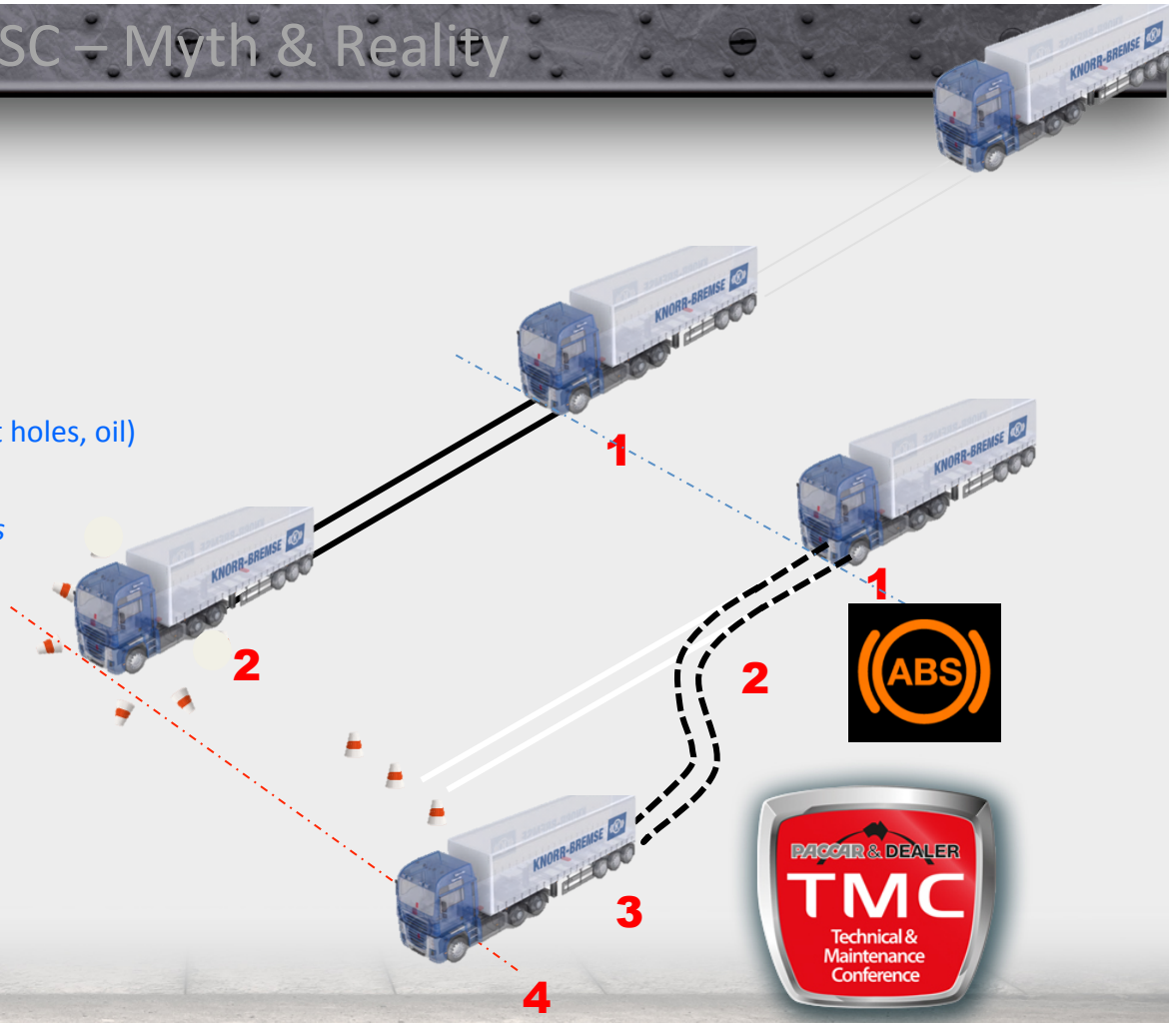
- TABS
- TEBS (1)
- RSP
- YRS
- LAS
- PMV
- WSS (2)
- 2S/2M
- CAN (5)
- TEPM



Operation - Truck & Trailer

ABS – Reactive System

- Situations system addresses
  - Harsh Braking
  - Poor Driving habits
  - Varying Road Conditions (ice, gravel, pot holes, oil)
- How it works
  - *Monitors wheel speed & modulates brakes*
  - *Brake pulsing to minimize wheel lockup*
  - *maintain directional control*
- What to expect
  - Pulsing sensation
  - Dash lamp luminates
  - Audible noise from PMV exhausting
  - Directional Stability
  - Longer stopping distance



Operation - Truck & Trailer

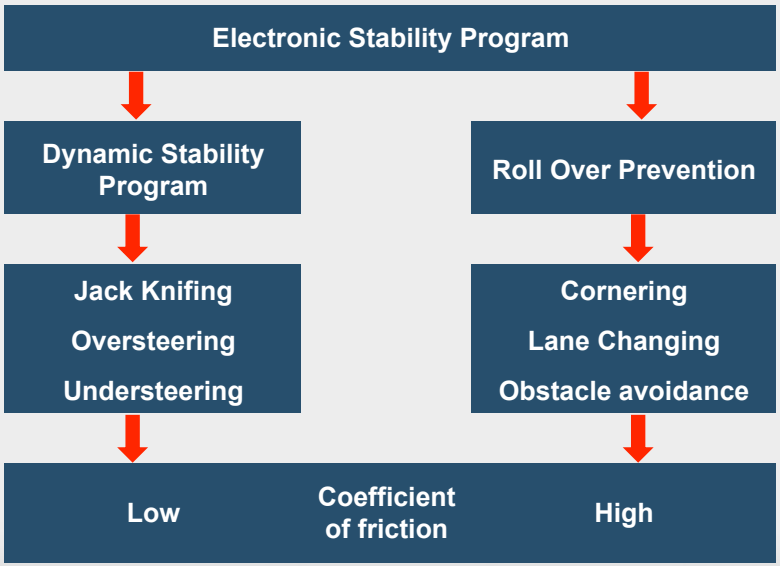
ABS – Reactive System

- What the system can & can't address
  - *Different surface conditions gravel, ice, wet, dry, etc*
  - *Reduced Tyre Wear*
  - *Poorly maintained Vehicles*
  - *Poorly maintained roads*
- How will you know it's there.
  - *Operator's Manual,*
  - *Cabin Sticker/Placard*
- System Contingencies
  - In-cab Dash ABS Lamp displays.
  - Conventional Pneumatic Brake system
- Effectiveness Safety & Economics
  - Reduces Accidents & associated Recovery Costs
  - Improves Road Safety for All Road Users
  - The operation of ABS relies on a well maintained Vehicle

Operation - Truck & Trailer

ESP/RSP/TEBS – Predictive System

- Situations system addresses



ESP Performance – All Surfaces & Situations

	Examples	Typical Maneuvers	Results	RSC Only	ESP
Dry Surfaces	Concrete, dry asphalt	Exit ramp, obstacle avoidance, lane change	Rollover	✓	✓
Slippery Surfaces	Wet asphalt, packed snow, ice, gravel	Exit ramp, obstacle avoidance, lane change	Under-steer, over-steer, jackknife, loss of control, rollover		✓
Surface Transitions	Patchy Ice, snow	Lane change, lane correction	Under-steer, over-steer, jackknife, loss of control, rollover		✓
	Gravel shoulder	Vehicle drift, driver drowsiness	Jackknife, loss of control, rollover		✓

Operation - Truck & Trailer

ESP/RSP/TEBS – Predictive System

- Situations system addresses

Vehicle enters curve **without ESP**
& rolls at ~38kph.

Vehicle enters curve **with ESP**
& rolls at ~64kph.

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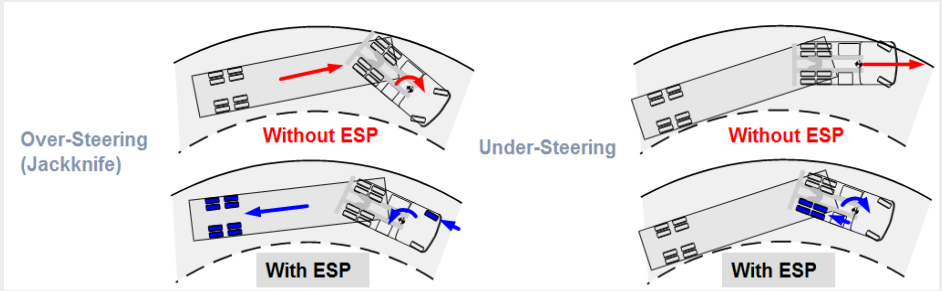
Operation - Truck & Trailer

ESP/RSP/TEBS – Predictive System

- How it works
  - Vehicle's yaw condition is evaluated from YRS
  - Drivers desired direction evaluated from SAS
  - Control increase or decrease of individual wheel brake pressure.
- What to expect
  - Engine de-throttle (over rides Driver input)
  - Dash lamp luminates
  - Independent wheel end braking
  - Braking independent of driver input
  - Braking may be severe depending on the Intervention Level
  - Slowing of the vehicle
  - Directional Stability maintained
  - Vehicle Combination behaves as Driver expects



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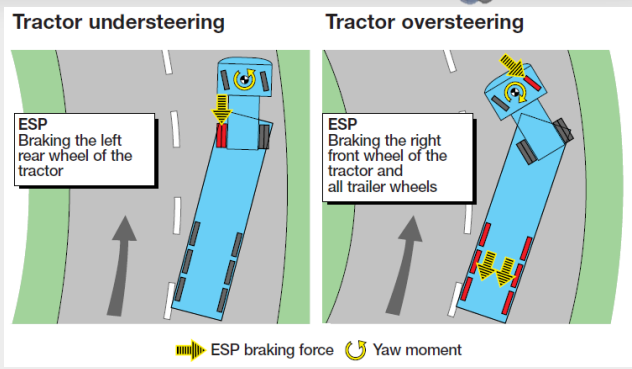
Operation - Truck & Trailer

ESP/RSP/TEBS – Predictive System

- What the system can & can't address
  - *Different surface conditions gravel, ice, wet, dry, etc*
  - *Reduced Tyre Wear*
  - *Poorly maintained Vehicles*
  - *Poorly maintained roads*
  - *Operator's Manual,*
  - *Cabin Sticker/Placard*
- System Contingencies
  - In-cab Dash ABS/ESP Lamp displays.
  - Conventional Pneumatic Brake system
- Effectiveness Safety & Economics
  - Reduces Roll Over Accidents & associated Recovery Costs
  - Improves Road Safety for All Road Users
  - The operation of ESP relies on a well maintained Vehicle
  - May override poor driving habits
  - Interventions are minimized with safe driving habits



Operation - Truck & Trailer

Limitations – ABS,RSP,ESP,TEBS

- It is aid to the unforeseen situation
- It won't make up for bad driving or maintenance habits
- It won't keep you awake or alert
- It won't help you avoid obstacles, like high curbs
- It won't stop you from going to fast
- It won't stop all accidents
- Poor Tyre care
- It does rely on good system maintenance
- It will aid in maintaining directional stability
- It will improve road safety for Drivers, fleets and other road users.
- Configuration compatibility may affect performance
- It will improve the bottom line Economics

The pairing of a trailer stability system with a tractor based system will provide the maximum amount of stability available on a vehicle today. This comes from the added brake utilization of a trailer equipped with a stability system.

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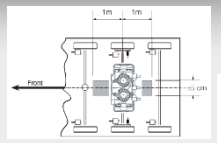
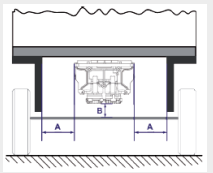
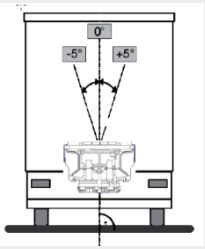
Installation - Truck & Trailer

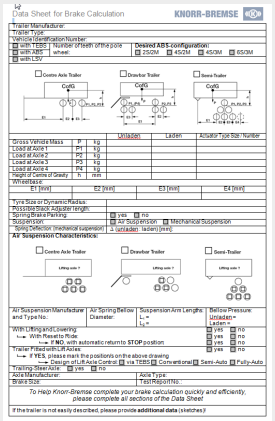
ABS/ESC/RSP/TEBS

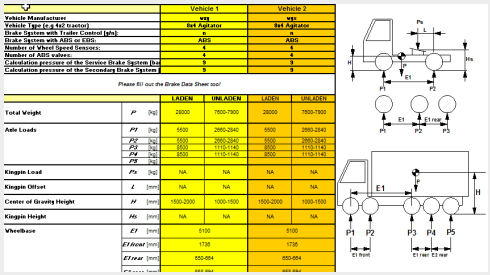
- System & sub-system Design
- Specification – Devils in the Details
- Installation guidelines
- End-of-line requirements
- Trouble Shooting (common faults)
- Regulatory requirements SARN & Compliance plate

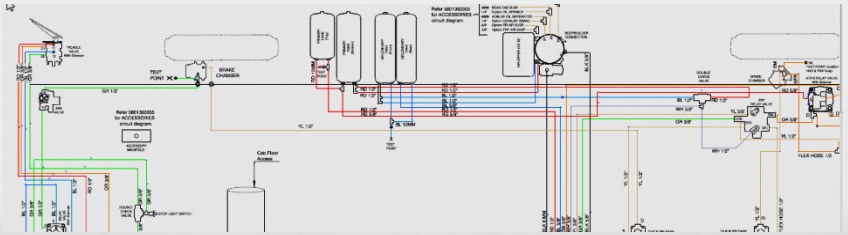








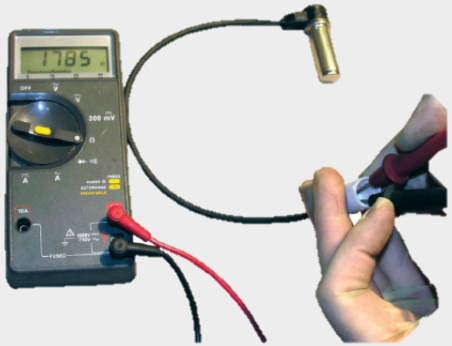




Servicing - Truck & Trailer

Serviceability

- ECU - ABS, RSP, ESP
- TABS
- TEBS
- PMV
- SAS
- YRS
- LAS
- WSS
- Air Supply
- Air Filtration
- Diagnostic Tools, software, & Equipment



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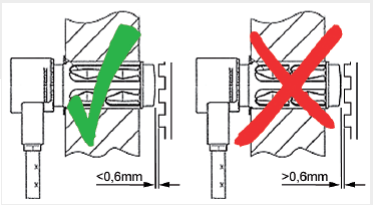
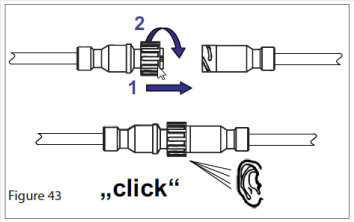
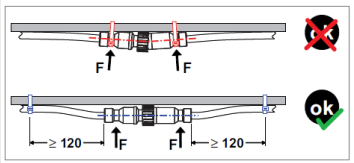
Servicing - Truck & Trailer

Common faults

- Wheel speed sensor setting, plugs & harness condition
- Sensor Ring (Tone wheel) Condition(damage & foreign matter)
- Wiring (plugs, cut, shorting…)
- Air system integrity (moisture, foreign matter)
- Silencers & Filters
- Brake Shoe's (wear & adjustment)
- Brake assembly (slacks, s-cam, air chamber)
- Tyres (sizes, condition, pressure, etc)
- Power supply maintained & dedicated (12 or 24V or MV)
- ABS light globe in Cabin
- Wheel End Maintained (sensor ring, bearing run-out, WSS)
- PMV checks & maintenance (startup checks, wiring, silencer/filter)
- Diagnostic Equipment







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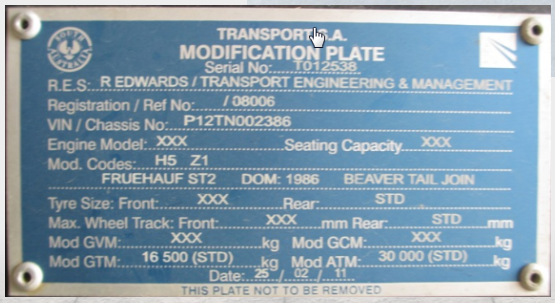
Fleet Upgrade Truck & Trailer

Retrofitting

- Viability – Truck conversion to ABS to ESC
- Viability – Trailer conversion to ABS to ESC
- Application considerations
- ABS ready Axles
- Power supply 12-32Volts
- Compliance Plate amended
- EOL equipment
- Installers Skill set



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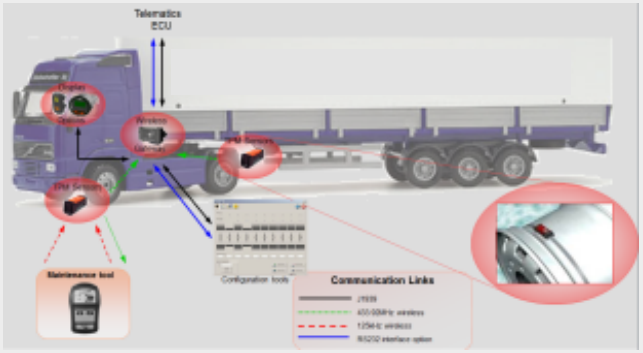
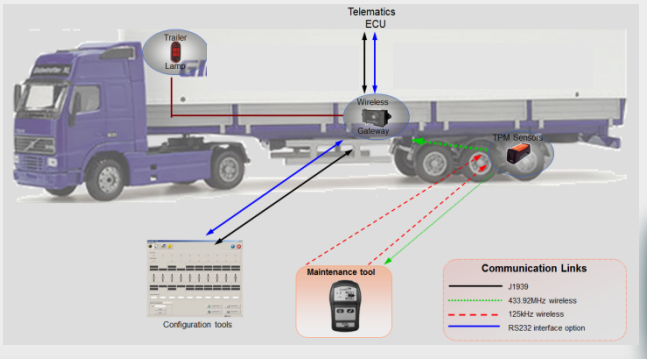
Enhancements

- Multi Volt 9-32V
- Active Cruise Control with Braking
- Tyre Pressure Monitoring
- Telematics Data Management
- Integrated Trailer Brake Assist Docking
- Lane Departure Warning
- CAN Communications & Relay Modules Truck & Trailer
- On-board Mass Monitoring
- Steering Axle Lock
- Axle Lift & Reset to Ride Control
- Customizing functions via ADL





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