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2006 FORD Fusion North American OEM Service and Repair Workshop Manual

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The ABS (anti-lock brake system) module continuously monitors brake pedal input, lateral vehicle motion and the rotational speed of each wheel. The PCM (powertrain control module) sends the brake pedal switch information over the FD-CAN (Flexible Data Rate Controller Area Network) . The RCM (restraints control module) sends lateral acceleration sensor information over the HS-CAN2 (high-speed controller area network 2) to the GWM (gateway module A) , the GWM (gateway module A) then sends the message to the ABS (anti-lock brake system) module over the FD-CAN (Flexible Data Rate Controller Area Network) . Wheel speed information is retrieved by the ABS (anti-lock brake system) module using 4 active wheel speed sensors. When the ABS (anti-lock brake system) module detects an impending wheel lock during a braking event, the ABS (anti-lock brake system) module modulates brake pressure to the appropriate brake calipers by opening and closing the appropriate solenoid valves inside the EBB (electric brake booster) unit while the hydraulic pump motor is activated. Once the affected wheel returns to the desired speed, the ABS (anti-lock brake system) module deactivates the hydraulic pump motor and returns the solenoid valves to their normal position.

The ABS (anti-lock brake system) module has 2 self-test options, one uses a diagnostic scan tool and the other is carried out when the ABS (anti-lock brake system) module is initialized (ignition ON). During either self-test the ABS (anti-lock brake system) module carries out a preliminary electrical check of the system sensors and activates the hydraulic pump motor for approximately one-half second. During this time, a buzzing or humming noise may be heard and a vibration may be felt in the brake pedal and is a normal condition. During the module initialized self-test, the pump motor check is carried out at approximately 10 km/h (6 mph). Any malfunction detected in the system causes the ABS (anti-lock brake system) module to set a DTC (diagnostic trouble code) , disable the ABS (anti-lock brake system) function and send a message over the FD-CAN (Flexible Data Rate Controller Area Network) to the GWM (gateway module A) . The GWM (gateway module A) then sends the message to the IPC (instrument panel cluster) over the HS-CAN3 (high-speed controller area network 3) to illuminate the ABS (anti-lock brake system) warning indicator. Diagnostic Trouble Codes (DTCs) which disable the ABS (anti-lock brake system) **do not** disable the base hydraulic power-assist braking system.

Auto Hold

The auto hold feature is activated and deactivated through the use of the steering wheel controls and the IPC (instrument panel cluster) message center. For the system to activate, the vehicle must not be moving, the driver safety belt must be buckled and the driver door must be closed.

The ABS (anti-lock brake system) module receives the driver safety belt buckle status from the RCM (restraints control module) , driver door status from the BCM (body control module) , while brake system pressure and the wheel speed are received from the ABS (anti-lock brake system) sensors. This information allows the ABS (anti-lock brake system) module to determine if the vehicle is stopped. Once the previous conditions have been met the auto hold feature can be activated. When the system is activated, the IPC (instrument panel cluster) sends an auto hold message to the GWM (gateway module A) over the HS-CAN3 (high-speed controller area network 3) and illuminates the auto hold indicator. The GWM (gateway module A) relays the message to the ABS (anti-lock brake system) module over the FD-CAN (Flexible Data Rate Controller Area Network) .

Hill Descent Control

When the Hill Descent Control switch is pressed, the IPC (instrument panel cluster) sends a hill descent braking assist message to the GWM (gateway module A) over the HS-CAN3 (high-speed controller area network 3) . The GWM (gateway module A) relays this message to the ABS (anti-lock brake system) module over the FD-CAN (Flexible Data Rate Controller Area Network) . Once the vehicle speed is between 5 km/h (3 mph) and 32 km/h (20 mph) and the transmission is in any forward gear or REVERSE, the ABS (anti-lock brake system) module uses the hydraulic pump motor and the solenoid valves to maintain the vehicle speed set by the driver. If the vehicle speed is increased or decreased outside of the operational window, the system remains active but descent speed cannot be set or maintained.

The Hill Descent Control feature requires a cool down period after sustained use. The ABS (anti-lock brake system) module continually monitors the descent speed, angle of descent, pump motor run time and solenoid valve use. Once the ABS (anti-lock brake system) module determines a cool down period is needed, the module sends a message to the GWM (gateway module A) over the FD-CAN (Flexible Data Rate Controller Area Network) . The GWM (gateway module A) relays the message to the IPC (instrument panel cluster) over the HS-CAN3 (high-speed controller area network 3) to display HILL DESCENT CONTROL OFF SYSTEM COOLING in the message center.

Hill descent control has 3 modes of operation:

- At speeds below 32 km/h (20 mph): when the hill descent control switch is pressed and conditions are correct for hill descent activation, the hill descent control system is enabled. The hill descent indicator illuminates solidly and the message center indicates hill descent control is active.
- At speeds below 32 km/h (20 mph): when the hill descent control switch is pressed and conditions are

  not

  correct for hill descent activation; the hill descent control system is enabled, the hill descent control indicator illuminates solidly and a message is displayed in the message center indicating the reason hill descent is not active.
- At speeds

  above

  32 km/h (20 mph): when the hill descent control switch is pressed, the Hill Descent Control system is not enabled and the hill descent control indicator does not illuminate. Once the vehicle slows to below 32 km/h (20 mph), the hill descent control switch must be pressed again to enable the Hill Descent Control system.

Hill Start Assist

When the vehicle is stopped on an incline greater than approximately a 5% grade, the ABS (anti-lock brake system) module holds the brake pressure for approximately 1.5 seconds while the driver transitions from the brake pedal to the accelerator pedal. This is accomplished by monitoring several HS-CAN (high-speed controller area network) messages and several sensors to determine if the vehicle is stopped and not parked, and if the vehicle is on an appropriate incline.

Refer to: Cruise Control - Vehicles With: Adaptive Cruise Control With Lane Centering - System Operation and Component Description

(419-03B Cruise Control - Vehicles With: Adaptive Cruise Control, Description and Operation).

For additional information on the collision avoidance system,

Refer to: Collision Warning and Collision Avoidance System - System Operation and Component Description

(419-03C Collision Warning and Collision Avoidance System, Description and Operation).

AdvanceTrac

The AdvanceTrac system is comprised of the traction control and ESC (electronic stability control) features.

Traction Control

The ABS (anti-lock brake system) module continuously monitors and compares the rotational speed of the drive wheels in relation to the non-driven wheels. When the drive wheels begin to spin faster than the non-driven wheels, the ABS (anti-lock brake system) module modulates brake pressure to the appropriate brake calipers by opening and closing the appropriate solenoid valves inside the EBB (electric brake booster) unit while the hydraulic pump motor is activated. At the same time, the ABS (anti-lock brake system) module calculates how much engine torque reduction is required to eliminate the wheel slip and sends this torque reduction message to the PCM (powertrain control module) over the FD-CAN (Flexible Data Rate Controller Area Network) . The ABS (anti-lock brake system) module also sends a traction event message to the GWM (gateway module A) over the FD-CAN (Flexible Data Rate Controller Area Network) which relays this message to the IPC (instrument panel cluster) over the HS-CAN3 (high-speed controller area network 3) . When the PCM (powertrain control module) receives the torque reduction message, it adjusts engine timing and decreases fuel injector pulses to reduce the engine torque to the requested level. When the IPC (instrument panel cluster) receives the traction event message, it flashes the stability-traction control indicator (sliding car icon).

Once the driven wheel speed returns to the desired speed, the ABS (anti-lock brake system) module returns the solenoid valves in the EBB (electric brake booster) unit to their normal position, deactivates the hydraulic pump motor and stops sending the traction event and torque reduction messages. The PCM (powertrain control module) returns engine timing and fuel injectors to normal operation and the IPC (instrument panel cluster) extinguishes the stability-traction control indicator (sliding car icon). Once vehicle speed exceeds 100 km/h (62 mph), traction control is accomplished only through the PCM (powertrain control module) torque control.

The traction control system can be disabled by the driver using the message center and steering wheel controls. This is independent of ABS (anti-lock brake system) which cannot be disabled by the driver. When the driver deactivates the traction control, the IPC (instrument panel cluster) responds by illuminating the stability-traction control disabled indicator (sliding car OFF icon) and by sending a message to the GWM (gateway module A) over the HS-CAN3 (high-speed controller area network 3) . The GWM (gateway module A) relays this message to the ABS (anti-lock brake system) module over the FD-CAN (Flexible Data Rate

or steering angle sensor Diagnostic Trouble Codes (DTCs) present in the ABS (anti-lock brake system) module. If there is a communication error between the ABS (anti-lock brake system) module and the PSCM (power steering control module) or the ABS (anti-lock brake system) module and the RCM (restraints control module) , ESC (electronic stability control) also is disabled. When ESC (electronic stability control) is disabled, the ABS (anti-lock brake system) module sends a message to the GWM (gateway module A) over the FD-CAN (Flexible Data Rate Controller Area Network) . The GWM (gateway module A) relays this message to the IPC (instrument panel cluster) over the HS-CAN3 (high-speed controller area network 3) to illuminate the stability-traction control indicator (sliding car icon).

Disabling AdvanceTrac

AdvanceTrac is controlled by the traction control switch in the following manner:

- Momentarily pressing the switch disables only traction control. ESC (electronic stability control) and RSC (roll stability control) remain enabled.
- Pressing the switch and holding it pressed for more than 5 seconds disables traction control and ESC (electronic stability control) , RSC (roll stability control) remains enabled.
- Pressing the switch after one or more features have been disabled enables all 3 features.

Switching the transfer case to 4WD (four-wheel drive) low locked or choosing the Rock Crawl drive mode disables all 3 features; traction control, ESC (electronic stability control) and RSC (roll stability control) .

Roll Stability Control (RSC)

The ABS (anti-lock brake system) module continuously monitors the vehicle motion relative to the intended course. This is done by using sensors to compare the steering wheel input, yaw rate sensor input, lateral accelerometer input and roll sensor input with the actual vehicle motion. The PSCM (power steering control module) sends the steering wheel angle information to the ABS (anti-lock brake system) module over the FD-CAN (Flexible Data Rate Controller Area Network) . The RCM (restraints control module) sends yaw rate sensor, lateral accelerometer and roll rate sensor information to the ABS (anti-lock brake system) module also over the HS-CAN2 (high-speed controller area network 2) through the GWM (gateway module A) . If the ABS (anti-lock brake system) module determines from the inputs the vehicle is becoming unstable, the ABS (anti-lock brake system) module modulates brake pressure to the appropriate brake calipers by opening and closing the appropriate solenoid valves inside the EBB (electric brake booster) unit while the hydraulic pump motor is activated. At the same time, the ABS (anti-lock brake system) module calculates how much engine torque reduction is required to help stabilize the vehicle and sends this torque reduction message to the PCM (powertrain control module) over the FD-CAN (Flexible Data Rate Controller Area Network) . The ABS (anti-lock brake system) module also sends a vehicle stability event message to the GWM (gateway module A) over the FD-CAN (Flexible Data Rate Controller Area Network) which relays this message to the IPC (instrument panel cluster) over the HS-CAN3 (high-speed controller area network 3) . When the PCM (powertrain control module) receives the torque reduction message, it adjusts engine timing and decreases fuel injector pulses to reduce the engine torque to the requested level. When the IPC (instrument panel cluster) receives the vehicle stability event message, it flashes the stability-traction control indicator (sliding car icon).

- **Sport**

  : for sporty driving with improved performance handling and response. This mode increases accelerator pedal response and provides a sportier steering feel. The powertrain system holds onto lower gears longer, allowing the vehicle to accelerate faster.

- **Tow-Haul**

  : improves transmission operation when towing a trailer or a heavy load.

- **Rock Crawl**

  : for off-road driving and optimum rock-climbing. Rock crawl mode engages the electronic locking differential and optimizes the throttle and transmission response to provide additional control of the vehicle.

Torque Vectoring Control

The ABS (anti-lock brake system) module continuously monitors the vehicle motion relative to the intended course. This is done by using sensors to compare the steering wheel input, the yaw rate sensor input, the lateral acceleration sensor input and the longitudinal acceleration sensor input with that of the actual vehicle motion. Steering wheel angle information is calculated by the PSCM (power steering control module) and is sent to the ABS (anti-lock brake system) module over the FD-CAN (Flexible Data Rate Controller Area Network) . Vehicle roll rate, yaw rate, lateral acceleration and longitudinal acceleration information are sent to the ABS (anti-lock brake system) module from the RCM (restraints control module) also over the HS-CAN2 (high-speed controller area network 2) through the GWM (gateway module A) . If the ABS (anti-lock brake system) module determines the vehicle is experiencing over-steer or under-steer, the module sends a torque vectoring control message over the FD-CAN (Flexible Data Rate Controller Area Network) . The GWM (gateway module A) relays this message to the PCM (powertrain control module) over the FD-CAN (Flexible Data Rate Controller Area Network) and to the IPC (instrument panel cluster) over the HS-CAN3 (high-speed controller area network 3) . When the PCM (powertrain control module) receives this message, it assists with torque vectoring control by adjusting engine timing and decreasing fuel injector pulses. When the IPC (instrument panel cluster) receives this message, it flashes the stability-traction control indicator (sliding car icon). The ABS (anti-lock brake system) module continues to monitor the sensor inputs while the PCM (powertrain control module) assists with torque vectoring control. If the ABS (anti-lock brake system) module determines PCM (powertrain control module) intervention is insufficient to control the stability event, the ABS (anti-lock brake system) module modulates brake pressure to the appropriate brake caliper(s) by opening and closing the appropriate solenoid valves inside the HCU (hydraulic control unit) while the hydraulic pump motor is activated. Once the vehicle instability has been corrected, the ABS (anti-lock brake system) module returns the solenoid valves in the HCU (hydraulic control unit) to their normal position, deactivates the hydraulic pump motor and sends another message over the FD-CAN (Flexible Data Rate Controller Area Network) indicating the event has ended. The PCM (powertrain control module) returns engine timing and fuel injectors to normal operation and the IPC (instrument panel cluster) extinguishes the sliding car icon.

Trailer Sway Control

- Vehicle speed is less than 31 km/h (20 mph) with the transfer case in high range.
- Vehicle speed is less than 15 km/h (10 mph) with the transfer case in low range.
- Vehicle speed is less than 8 km/h (5 mph) with the transmission in REVERSE.

Once activated, the trail control indicator turns green and vehicle speed is maintained at the set speed. The set speed can be increased or decreased using the plus and minus buttons on the steering wheel. Set speed may also be decreased using the brake pedal. When the brake pedal is pressed and released, the set speed matches the vehicle speed when the pedal is released. If the accelerator pedal is pressed, the vehicle accelerates normally and, once the pedal is released, the vehicle returns to the previously set speed.

The trail control feature transitions from active to enabled when any of the following occur:

- The trail control button is pressed.
- The transmission is shifted into PARK.

The trail control feature transitions from active to braking only when any of the following conditions are met:

- The driver door is opened.
- The parking brake is applied.
- A substantial service brake pedal application occurs.

When any one of the above conditions are met, the trail control feature disables the driving torque and attempts to bring the vehicle to a controlled stop using the ABS (anti-lock brake system) . If the driving torque is disabled while descending or ascending an incline the trail control feature uses the ABS (anti-lock brake system) to apply to brakes and allow the vehicle to descend the incline.

Trail Turn Assist

If equipped, the trail turn assist feature can reduce the turning radius of the vehicle by applying the brakes to the inside rear wheel in low-speed, high steering-angle maneuvers.

While in 4WD (four-wheel drive) HIGH or 4WD (four-wheel drive) LOW, the trail turn assist feature can be turned on by the driver. After the trail turn assist is turned on, the feature is activated when the following conditions are met::

- Vehicle speed is less than 19 km/h (12 mph).
- Rear differential is fully unlocked.
- Steering wheel is almost fully turned to the left or right.

After the activation conditions are met, the ABS (anti-lock brake system) module applies brake pressure to the inside rear brake caliper until the activation conditions no longer apply.

MyKey® Interaction

Through the MyKey® feature, traction control can be configured to be always on or to allow the driver to select the traction control function on or off. When the traction control function is configured to be always on

When a new EBB (electric brake booster) assembly is installed, the ABS (anti-lock brake system) module must be programmed with the current vehicle configuration information. For additional information on module programming,

Refer to: Module Configuration - System Operation and Component Description

(418-01A Module Configuration, Description and Operation).

When an ABS (anti-lock brake system) or stability control fault has been corrected or a new component has been installed, the ABS (anti-lock brake system) module must be calibrated using the ABS (anti-lock brake system) Calibration routine found on the diagnostic scan tool. ABS (anti-lock brake system) Calibration is required for the stability control sensors to learn the zero-position of the vehicle which means the vehicle must be on a level surface and not moving.

Trail Control Switch

The trail control switch is a single-pole, momentary-contact switch and is part of a 3-switch pack. The switch is wired directly to the IPC (instrument panel cluster) .

Stability Control Sensors

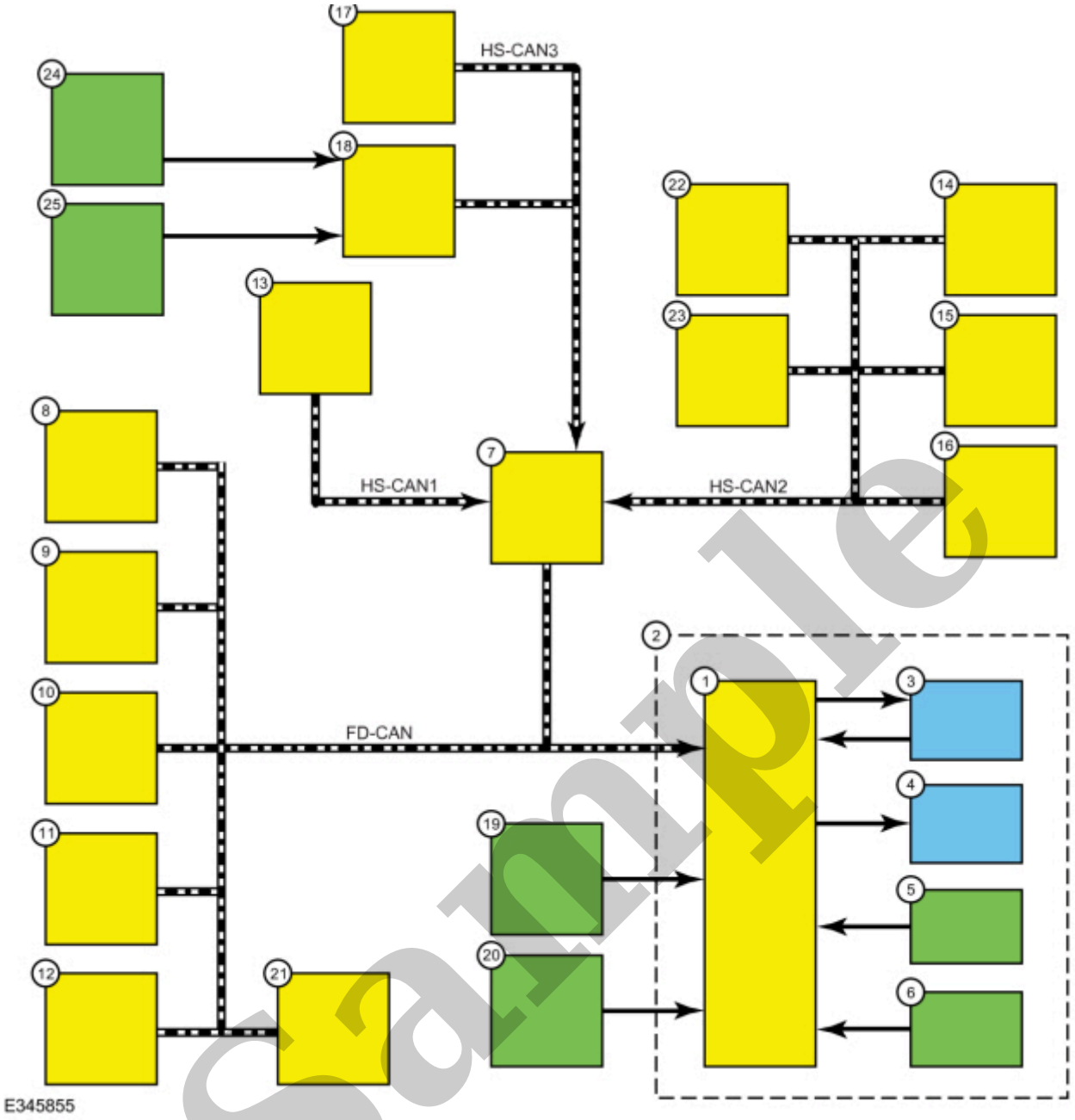
The stability control sensors for the traction control and ESC (electronic stability control) functions consist of the yaw rate sensor, lateral accelerometer, longitudinal accelerometer and roll rate sensor. The sensors are housed in the RCM (restraints control module) which sends sensor information to the ABS (anti-lock brake system) module over the HS-CAN2 (high-speed controller area network 2) . If any of the sensors are defective, a new RCM (restraints control module) must be installed.

- The yaw rate sensor measures the yaw angle which is the difference between the direction the vehicle is pointing when cornering and the direction the vehicle is actually moving.
- The longitudinal accelerometer measures the acceleration and deceleration of the vehicle as it moves forward and backward.
- The lateral accelerometer measures the force created when a vehicle corners that tends to push a vehicle sideways.
- The roll rate sensor measures the rate of rotation of the vehicle along the centerline of the vehicle from front to back.

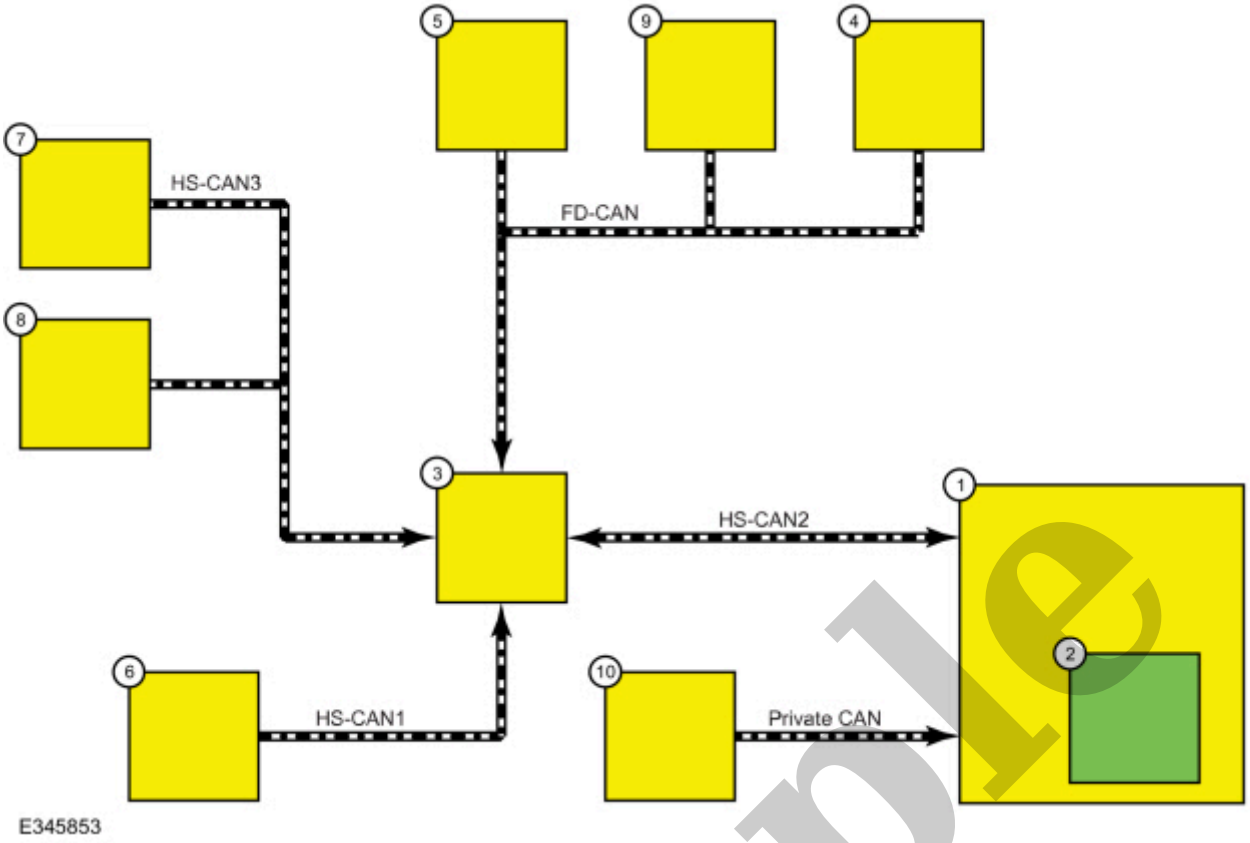
Lateral acceleration has 2 forms. The first is the centrifugal acceleration that is generated when the vehicle travels around in a circle. The second is the acceleration due to gravity. On level ground there is no lateral acceleration due to gravity. However, if the vehicle is parked sideways on a bank or incline, the sensor measures some lateral acceleration due to gravity, even though the vehicle is not moving.

Traction Control Switch

The traction control switch is a single-pole, momentary-contact switch and is part of a 3-switch pack The switch is wired directly to the IPC (instrument panel cluster) .



Item	Description
1	ABS (anti-lock brake system) module
2	EBB (electric brake booster) unit
3	Hydraulic pump motor
4	Hydraulic valve solenoids
5	Hydraulic pressure sensor



Item	Description
1	SASM (steering angle sensor module)
2	Steering wheel rotation sensor
3	GWM (gateway module A)
4	VDM (vehicle dynamics control module)
5	ABS (anti-lock brake system) module
6	BCM (body control module)
7	IPC (instrument panel cluster)
8	APIM (SYNC module)
9	PCM (powertrain control module)
10	SECM (steering effort control module)