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## **2017 FORD Mustang OEM Service and Repair Workshop Manual**

[Go to manual page](#)

	<ul style="list-style-type: none"> <li>Rear center seatbelt buckle status</li> </ul>			
Seatbelt (Buckle up)	Driver rear seatbelt buckle status	RCM (restraints control module)	HS-CAN2 (high-speed controller area network 2)	IPC (instrument panel cluster)
Side wind compensation	Stability-traction control mode message request	ABS (anti-lock brake system) module	FD-CAN (Flexible Data Rate Controller Area Network)	IPC (instrument panel cluster)
Sleeper seat (max recline feature)	Sleeper seat position message request	DSM (driver front seat module)	MS-CAN (medium speed-controller area network)	IPC (instrument panel cluster)
Snow plow mode	Snow plow mode	HVAC (heating, ventilation and air conditioning) module	MS-CAN (medium speed-controller area network)	IPC (instrument panel cluster)
Stability-traction control on/off	Stability-traction control on/off message request	ABS (anti-lock brake system) module	FD-CAN (Flexible Data Rate Controller Area Network)	IPC (instrument panel cluster)
AdvanceTrac	Stability-traction control chime request	ABS (anti-lock brake system) module	FD-CAN (Flexible Data Rate Controller Area Network)	IPC (instrument panel cluster)
Starting system	Starting system message request	PCM (powertrain control module)	FD-CAN (Flexible Data Rate Controller Area Network)	IPC (instrument panel cluster)

	<ul style="list-style-type: none"> <li>Trailer battery charge</li> <li>Trailer brake control status</li> </ul>			
Transmission	Transmission message request	TCM (transmission control module) (diesel)	FD-CAN (Flexible Data Rate Controller Area Network)	IPC (instrument panel cluster)
Vehicle dynamic suspension	Vehicle dynamic suspension fault	VDM (vehicle dynamics control module)	FD-CAN (Flexible Data Rate Controller Area Network)	IPC (instrument panel cluster)
Vehicle start inhibit (Over the Air [OTA] updates)	Vehicle start inhibit message display	GWM (gateway module A)	HS-CAN3 (high-speed controller area network 3)	IPC (instrument panel cluster)
Work surface (stow before driving)	Work surface latch status	BCM (body control module)	HS-CAN1 (high-speed controller area network 1)	IPC (instrument panel cluster)

## Displays

### Adaptive Cruise Control

The message center provides a display showing the ACC (adaptive cruise control) gap setting, set speed and a graphical image of a vehicle from behind. The stop and go feature (part of the ACC (adaptive cruise control) ) provides message displays to indicate the vehicle is stopped and to press resume to engage the cruise control again.

### Compass

The compass direction is displayed as a 1 or 2 character display in the message center that indicates the current direction of the vehicle (N, NE, E, SE, S, SW, W, or NW).

### Digital Speedometer

#### NOTE

empty) as opposed to the displayed DTE (distance to empty) . This difference often leads to customer complaints of incorrect or invalid DTE (distance to empty) . The following list provides some (not all) of the driving conditions that may lead to an incorrect or fluctuating DTE (distance to empty) concern:

- Changing between towing/not towing.
- Changing driving between city and highway.
- Allowing the vehicle to idle for long periods of time.
- Using the remote start feature frequently to allow the vehicle to warm up, particularly when parked on a grade.
- Parking or driving on grades.
- Inconsistent use of gasoline or E85 fuels.
- Over-fueling or not filling the tank completely (trickle filling at above full, partial filling with less than 10% of tank capacity).

The PCM (powertrain control module) uses the following network messages to control the DTE (distance to empty) .

- Fuel alcohol percent
- Fuel flow volume display
- Odometer count
- Transport mode
- Fuel level input from the IPC (instrument panel cluster)

### **Forward Collision Alert**

The message center provides a forward collision alert display when a possible forward collision is detected due to a short following distance to the vehicle in front and little or no driver intervention is detected.

### **Lane Keeping System**

The lane keeping system provides the driver with a lane keeping alert when unintentional drifting outside of the lane is detected. The IPC (instrument panel cluster) provides a lane keeping display of the vehicle in the middle of a lane with right and left lane markers to indicate the vehicle position with relation to the lane markings as well as overlay or popup messages to alert the driver when they are drifting out of the lane. The lane markers change color to indicate the condition associated with a specific condition and action or warning as controlled by the lane keeping system. The IPC (instrument panel cluster) also provides a lane keeping system message center off indicator to inform the driver that the lane keeping system is turned off. When the

below 32 km/h (21 mph), the update delays reset. When the sensed outside temperature drops, the display updates more quickly following the drop experienced by the Ambient Air Temperature (AAT) sensor.

### **PRNDM/Progressive Range Select**

The message center provides the PRNDM display indicating which gear position the transmission is currently in, selected by the driver.

The progressive range select display provides a numerical display of the transmission ranges and indicates to the driver which gear is currently selected when the driver has manually shifted to a gear (1-10).

### **Speed Sign**

The speed sign display indicates the speed limit recognized by the system as the current posted speed limit based on the last posted speed sign recognized. The IPC (instrument panel cluster) uses speed sign recognition data provided by the IPMA (image processing module A) .

### **Information-On-Demand Displays**

#### **Brake Coach ( HEV (hybrid electric vehicle) )**

The brake coach display appears in the message center after the vehicle has come to a complete stop. It coaches the driver to brake in a manner which maximizes the amount of energy returned through the regenerative braking system. The percent displayed is an indication of the regenerative braking efficiency with 100% representing the maximum amount of energy recovery. The brake coach display can be enabled or disabled through the message center settings.

#### **Diesel Exhaust Fluid Level**

The diesel exhaust fluid level gauge displays in the message center as a selectable on-demand display. It provides the driver an indication of the current diesel exhaust fluid level available.

#### **Electric Vehicle (EV) Coach ( HEV (hybrid electric vehicle) )**

The Electric Vehicle (EV) coach display provides the driver with vehicle power and power level recovered during regenerative braking. When the driver accelerates or maintains vehicle speed, the display will indicate the vehicle power level and the power level when the engine will turn on. When the driver decelerates, either by releasing the accelerator pedal or pressing the brake pedal, the display will indicate the power being used to slow the vehicle. The display also indicates the amount of energy available that the regenerative braking system can recover. For additional information, refer to the Owner Literature.

#### **Engine Hour/Engine Idle Hour**

The engine hour and engine idle hour display in the message center as a selectable on-demand display. The engine hour displays the number of hours the engine has been running, including drive hours. The engine idle hours displays the hours of engine idle.

#### **Engine Oil Life**

The trailer lighting display provides trailer running, stop and turn lights whenever a trailer is connected. The display shows an image of a trailer from the rear with individual lamps in typical locations. The lights are either filled or highlighted depending on the lamps status along with a text status for the lighting system.

### **Trip 1, Trip 2 (Gas, Diesel)**

The Trip 1 and Trip 2 displays provide a trip timer, average fuel economy and total trip distance traveled. The customer can reset the Trip data in the message center display. The Trip displays are calculated internally in the IPC (instrument panel cluster) .

### **Trip 1, Trip 2, Trip Summary ( HEV (hybrid electric vehicle) )**

The This Trip display provides a trip timer, trip average fuel economy, total trip distance traveled and distance traveled on electric power only (engine off). If the gas engine has not turned on during the calculated trip, the average fuel economy is not displayed. This Trip automatically resets with each vehicle start. This Trip is calculated internally in the IPC (instrument panel cluster) .

### **Warnings And Messages**

The message center warning messages alert the operator to possible concerns or malfunctions in the vehicle operating systems. Warning messages are generally associated with other observable outputs of the IPC (instrument panel cluster) (gauges, informational indicators and RTT (reconfigurable telltale) indicators). For example, when the ABS (anti-lock brake system) module detects a low brake fluid condition, the ABS (anti-lock brake system) module sends the IPC (instrument panel cluster) a request through the GWM (gateway module A) to illuminate the brake warning indicator and a request to display the LOW BRAKE FLUID message in the message center. This allows the message center to be a more informative supplement to the IPC (instrument panel cluster) gauges and indicators.

### **Adaptive Cruise Control**

The message center provides messages explaining the need for driver intervention and system status. The adaptive cruise control messages are supplemental to the cruise control RTT (reconfigurable telltale) indicator and the adaptive cruise control warning chime.

### **Adaptive Headlamps**

The message center provides the adaptive headlamp fault message to inform the driver of a fault with the adaptive headlamps.

### **Adaptive Steering**

The message center provides the adaptive steering messages to inform the driver of system faults. Depending on the state, the message can be either informational or a warning.

### **AdvanceTrac**

The message center provides messages to inform the driver of the AdvanceTrac system status. The messages are supplemental to the stability-traction control system indicators or RTT (reconfigurable telltale) indicators.

The IPC (instrument panel cluster) provides an informational message informing the driver of the status of the DPF (diesel particulate filter) regeneration.

### **Diesel Reduced Engine Power**

The IPC (instrument panel cluster) provides an informational message informing the driver that the PCM (powertrain control module) is reducing engine power as a result of certain engine faults.

### **Door, Hood, Power Tailgate Ajar**

The IPC (instrument panel cluster) provides door, hood and power tailgate ajar warnings to indicate the status of the doors, hood and tailgate.

### **Electronic Lock Differential (eLocker)**

The message center provides informational and fault messages to inform the driver of the ELD (electronic locking differential) status.

### **Engine Oil Life, Engine Oil Change Minder**

The instrument cluster provides messages to inform the driver about the engine oil life status, engine oil life reset status and when an engine oil change is required. The duration of the interval between engine oil changes is calculated in the PCM (powertrain control module) and varies due to driving conditions. The PCM (powertrain control module) assumes a base mileage of 16,090 km (10,000 mi) or 1 year for normal driving. However, this number is adjusted down for conditions such as high engine temperature, high engine rpm, use of flex fuel and possibly low engine oil level. The PCM (powertrain control module) calculates and provides the engine oil life percent message to the IPC (instrument panel cluster). The engine oil change minder can be reset at any time by the driver.

### **Factory Keycode**

The message center can display the original factory keycode when requested.

### **Factory/Transport Mode**

During vehicle build, some modules, such as the IPC (instrument panel cluster) and the BCM (body control module), are set in factory mode. While in the factory mode the IPC (instrument panel cluster) displays FACTORY MODE CONTACT DEALER in the message center. If the vehicle is set in factory mode, the system does not automatically exit the mode and must be manually set to either the transport or normal operation mode.

When the vehicle build is complete, the vehicle is set to transport mode. While in transport mode, the IPC (instrument panel cluster) displays TRANSPORT MODE CONTACT DEALER in the message center. Transport mode is used to reduce the drain on the battery during longer periods where the vehicle is not used. Various systems may be altered or are disabled when in the transport mode. The vehicle automatically reverts to normal operation mode after being driven 201 km (125 mi).

To deactivate factory mode,

The IPC (instrument panel cluster) provides a number of MyKey® related warnings and status messages to indicate restrictions imposed on the MyKey® user. These include MyKey® active, park aid, speed limits, and buckle up warnings among others. MyKey® displays are controlled through the IPC (instrument panel cluster) software based on the MyKey® settings configured through the center stack display and the type of key in use (MyKey® or administrator key). The MyKey® function also uses other messages received by the IPC (instrument panel cluster) for other indications such as vehicle speed for speed limiter displays.

### **Neutral Tow**

The message center provides towing system messages to indicate the status of the neutral tow feature when the neutral tow system is enabled and the vehicle is capable of free-rolling.

### **Off Road Mode**

The message center provides off road informational messages to indicate the status of the off road mode system.

### **One-Pedal Trail Control**

The message center provides operation and fault messages to indicate the status of the one-pedal trail control system.

### **Parking Aid**

The IPC (instrument panel cluster) provides messages to indicate the status of the parking aid system.

### **Passive Key And Immobilizer System**

The message center provides the starting system fault message to indicate there is a concern with the PATS (passive anti-theft system). The message center provides passive key and immobilizer system messages to indicate the key program is successful, key battery is low, key could not be programmed or failed or maximum number of keys have been programmed. The IPC (instrument panel cluster) uses the immobilizer message display messaged input from the BCM (body control module) to display the applicable message center message.

### **Pedestrian Alert ( HEV (hybrid electric vehicle) )**

The message center provides a message to inform the driver of the pedestrian alert status. The pedestrian alert provides an external sound to alert pedestrians of the vehicle's presence when the vehicle is running in electric mode.

### **Perimeter Alarm**

The message center provides the perimeter alarm warning message to indicate the perimeter alarm has been activated and to start the vehicle to stop the alarm.

### **Power Child Locks**

The IPC (instrument panel cluster) provides a power child lock warning to inform the driver the child lock feature did not function properly. The power child lock feature is activated through the rear window lockout



compensate for strong side winds that can push the vehicle out of its intended lane, similar to the trailer sway feature.

### **Sleeper Seat (Max Recline Feature)**

The message center provides a message to return the passenger seat to the upright position when the H-point lift sensor in the seat detects the passenger sleeper seat is reclined beyond the set 'normal' recline position while the vehicle is operating. The sensor is hardwired to the DSM (driver front seat module) .

### **Snow Plow Mode**

The message center provides the snow plow mode active warning to inform the customer the functionality of some electrical features like heated seats and heated steering wheel are restricted due to activation of the snow plow. This feature enables the snow plow to function at full power.

### **Stability-Traction Control On/Off**

The message center provides a stability-traction control system message to indicate the the status of the stability-traction control system or if the system has a fault and requires service.

### **Starting System**

The message center provides starting system messages to inform the driver of the starting system status and when driver intervention is required in order to start the engine.

### **Steering Wheel Lock**

The message center provides messages to inform the driver to turn the steering wheel to enable the release of the steering wheel lock or if a system fault condition is detected.

### **Stop Safely Now ( HEV (hybrid electric vehicle) )**

The message center provides a warning message, along with the hazard-stop safely now RTT (reconfigurable telltale) indicator, to inform the driver that a vehicle hazard may exist and a powertrain shutdown may be imminent or may have already occurred.

### **TPMS (tire pressure monitoring system) (Fault and Tire Training Status)**

The IPC (instrument panel cluster) provides message center displays to indicate the TPMS (tire pressure monitoring system) sensor training status or a malfunction in the TPMS (tire pressure monitoring system) .

### **Trail Control**

The message center provides operation and fault messages to indicate the status of the trail control system.

### **Trail Turn Assist**

The message center provides operation and fault messages to indicate the status of the trail turn assist feature.

### **Transmission**

The fuel level sender is mounted to the fuel pump and sender unit or the fuel level sensor. The fuel level sender is a dual sweep potentiometer style resistor connected to a float mechanism. The dual sweep design provides a second resistance measurement that reduces the intermittent loss of data due to corrosion between the resistor wires and the sweep arm. As the fuel level changes, the float rises or falls with the fuel level moving the sweep arm across the resistor wires. This movement either increases or decreases the resistance through the unit. The fuel level sensor resistance ranges from 180 ohms  $\pm$  4 ohms at empty (E) to 10 ohms  $\pm$  2 ohms at full (F). When the fuel level is low, the fuel level sensor resistance is high. When the fuel level is high, the fuel level sensor resistance is low.

Both the fuel pump and sender unit and fuel level sensor are hardwired to the IPC (instrument panel cluster) through separate signal and return circuits. The fuel level return circuits are grounded internally in the IPC (instrument panel cluster). The IPC (instrument panel cluster) provides a reference voltage on the fuel level signal circuit. As the fuel level changes, the change in resistance raises or lowers the fuel level signal voltage depending on the resistance of the fuel level sender.

### **Engine Oil Level Sensor - 5.0L**

The engine oil level (EOL) sensor is a normally open sensor hardwired to the PCM (powertrain control module). The PCM (powertrain control module) monitors the change in voltage on the sensor signal circuit. When the oil level is high, the float rises and the sensor circuit closes, pulling the voltage low. When the oil level is low, the sensor circuit opens, pulling the voltage high, signaling the PCM (powertrain control module) the engine oil level is low. If the sensor is disconnected or stuck open, the low engine oil message will display in the message center.

### **Engine Oil Pressure Sensor - 3.0L, 3.3L**

The engine oil pressure sensor is hardwired to the PCM (powertrain control module) through voltage reference (VREF), signal and return circuits. The PCM (powertrain control module) provides the sensor voltage supply on the VREF circuit and monitors the change in voltage through the signal and return circuits as the engine oil pressure changes.

### **Engine Oil Pressure Sensor - 2.7L, 3.5L, 5.0L**

The engine oil pressure sensor is a Single Edge Nibble Transmission (SENT) sensor hardwired to the PCM (powertrain control module) through VREF, signal and return circuits. The PCM (powertrain control module) monitors the voltage sent from the EOP (engine oil pressure) sensor over the signal circuit. The voltage changes as the engine oil pressure changes.

### **Steering Wheel Switch - Message Center**

The message center switch is part of the RH (right-hand) steering wheel switch and comprised of 5 buttons (up, down, OK, back and menu). The message center switch uses different resistance values associated with each button. The SCCM (steering column control module) (without adaptive steering) or SASM (steering angle sensor module) (with adaptive steering) sends out a reference voltage to the RH (right-hand) steering wheel switch on the input circuit and monitors the voltage drops. The voltage drop varies depending on the