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2016 FORD Edge OEM Service and Repair Workshop Manual

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Flexible Data Rate Controller Area Network (FD-CAN)

With the addition of more modules, network traffic has increased. This has created the need for an additional CAN (controller area network) to manage the increased bus data carried on each network.

The FD-CAN (Flexible Data Rate Controller Area Network) operates at a maximum data transfer speed of 2 Mbps and is designed for real-time powertrain and driver feature information transfer and control. Modules on FD-CAN (Flexible Data Rate Controller Area Network) communicate using bussed messages. The FD-CAN (Flexible Data Rate Controller Area Network) uses an unshielded twisted pair cable, data bus (+) and data bus (-) circuits which allows sharing of information between all modules on the network.

The GWM (gateway module A) transfers messages between the diagnostic scan tool and the modules on the FD-CAN (Flexible Data Rate Controller Area Network) .

The GWM (gateway module A) translates the diagnostic messages from the DIAG1 network to the FD-CAN (Flexible Data Rate Controller Area Network) allowing communication between the modules and the diagnostic scan tool.

High Speed Controller Area Network 1, 2, 3 and 4 (HS-CAN1, HS-CAN2, HS-CAN3 and HS-CAN4)

The High Speed-Controller Area Networks (HS-CANs) operate at a maximum data transfer speed of 500 Kbps and are designed for real-time powertrain, audio, multimedia and driver feature information transfer and control. Modules on the HS-CANs communicate using bussed messages and use unshielded twisted pair cable, data bus (+) and data bus (-) circuits which allows sharing of information between all modules on each network.

The GWM (gateway module A) transfers messages between the diagnostic scan tool and the modules on the HS-CANs.

The GWM (gateway module A) translates the diagnostic messages from the DIAG1 network to the HS-CANs allowing communication between the modules and the diagnostic scan tool.

Medium Speed Controller Area Network 1 (MS-CAN1)

Successful communication of a message can usually be identified by the slight spike at the end of a message transmission. Any signals that are significantly different than the normal CAN (controller area network) waveform may cause network Diagnostic Trouble Codes (DTCs) (U-codes) to set or may cause a complete network outage.

High Speed Controller Area Network (HS-CAN) and Medium Speed Controller Area Network (MS-CAN) Fault Tolerance Normal Operation
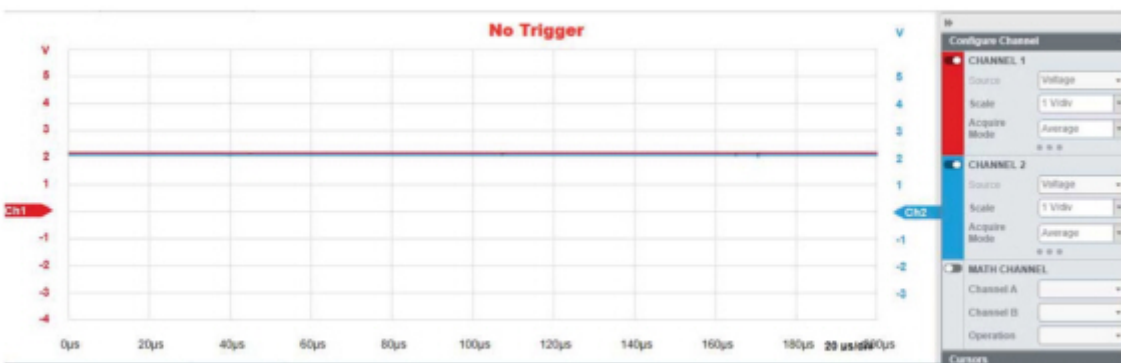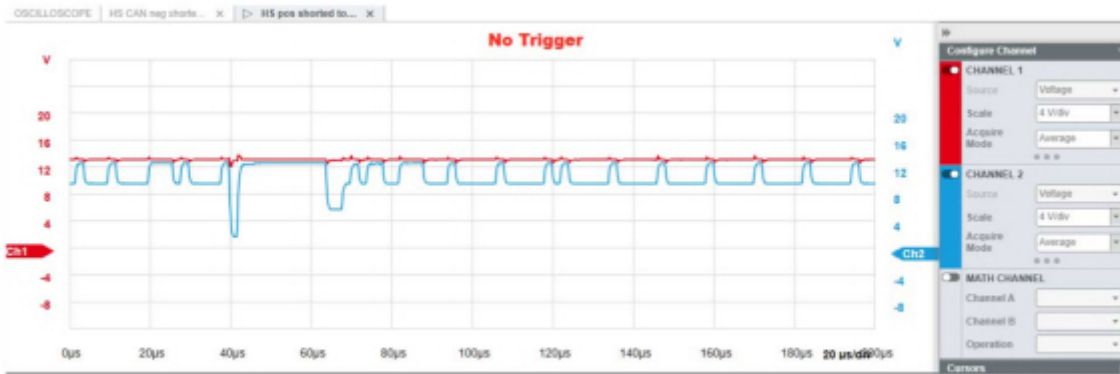

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The data (+) and data (-) circuits are each regulated to approximately 2.5 volts during neutral or rested network traffic. As messages are sent on the data (+) circuit, voltage is increased by approximately 1.0 volt. Inversely, the data (-) circuit is reduced by approximately 1.0 volt when a message is sent.

Successful communication of a message can usually be identified by the slight spike at the end of a message transmission. Any signals that are significantly different than the normal CAN (controller area network) waveform may cause network Diagnostic Trouble Codes (DTCs) (U-codes) to set or may cause a complete network outage.

CAN Circuits Shorted Together

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In the event the data (+) circuit becomes shorted to battery voltage, the data (+) circuit is pulled high (12V) and the data (-) circuit falls to abnormally high voltage (above 5V) during communication and reaches battery voltage (12V) for peak voltage. Communication may continue but at a degraded level.

CAN (-) Circuit Shorted to Battery Voltage

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In the event the data (-) circuit becomes shorted to battery voltage, both the data (+) and data (-) circuits are pulled high (12V) and all communication capabilities are lost.

Controller Area Network (CAN) Multiplex Messages

The network communication message chart provides a high level description of key network messages for all communication networks on the vehicle. This information can be used to determine which modules are involved in completing a function including display of messages, status updates and commands.

Comparative functional checks can be performed without the use of test equipment to determine if faults exist in GWM (gateway module A) data translation and transfer paths. Specifically, this is accomplished by verifying that another feature/function works correctly which uses the same message translation paths

			• PDM (passenger door module)
			• DSM (driver front seat module)
			• FCIM (front controls interface module)
			• PRB (power running board)
			• SCMG (driver multi-contour seat module)
			• SCMH (passenger multi-contour seat module)
			• SODL (side obstacle detection control module LH)
			• SODR (side obstacle detection control module RH)

Communication Message Chart

Network Message	Originating Module	Network Type	Receiving Module(s)
4WD (four-wheel drive) auto lamp display	TCCM (transfer case control module)	FD-CAN (Flexible Data Rate Controller Area Network)	• ABS (anti-lock brake system) module • IPMA (image processing module A) • PCM (powertrain control module) • SOBDMC (secondary on-board diagnostic control module C) • TCM (transmission control module) • VDM (vehicle dynamics control module) • GWM (gateway module A)

A/C (air conditioning) clutch status (battery management)	GWM (gateway module A)	HS-CAN2 (high-speed controller area network 2)	• GSM (gear shift module) • SCCM (steering column control module)
A/C (air conditioning) clutch status (battery management)	GWM (gateway module A)	MS-CAN (medium speed-controller area network) 1	• DDM (driver door module) • HVAC (heating, ventilation and air conditioning) module • PDM (passenger door module)
A/C (air conditioning) clutch status (engine data)	PCM (powertrain control module)	FD-CAN (Flexible Data Rate Controller Area Network)	• GWM (gateway module A)
A/C (air conditioning) clutch status (engine data)	GWM (gateway module A)	HS-CAN3 (high-speed controller area network 3)	• ACM (audio front control module) • APIM (SYNC module) • IPC (instrument panel cluster) • TRM (trailer module) / TBM (trailer brake control module)
ABS (anti-lock brake system) active	ABS (anti-lock brake system) module	FD-CAN (Flexible Data Rate Controller Area Network)	• IPMA (image processing module A) • PCM (powertrain control module) • PSCM (power steering control module) • SOBDMC (secondary on-board diagnostic control module C) • TCCM (transfer case control module)

ABS (anti-lock brake system) fault	GWM (gateway module A)	HS-CAN2 (high-speed controller area network 2)	- RCM (restraints control module) - SASM (steering angle sensor module)
ABS (anti-lock brake system) fault	GWM (gateway module A)	HS-CAN3 (high-speed controller area network 3)	- APIM (SYNC module) - IPC (instrument panel cluster) - TRM (trailer module) / TBM (trailer brake control module)
Accelerator pedal position	PCM (powertrain control module)	FD-CAN (Flexible Data Rate Controller Area Network)	- ABS (anti-lock brake system) module - Driver Status Monitor Camera Module [CMR (Camera Module - Rear)] - IPMA (image processing module A) - PSCM (power steering control module) - SOBDMC (secondary on-board diagnostic control module C) - TCCM (transfer case control module) - TCM (transmission control module) - VDM (vehicle dynamics control module) - GWM (gateway module A)
Accelerator pedal position	GWM (gateway module A)	HS-CAN1 (high-speed controller area network 1)	- BCM (body control module) - BECM (battery energy control module)

			- BECM (battery energy control module) - DCACA (Direct Current/Alternating Current Converter Module A) - DCDC (direct current/direct current converter control module) - PACM (pedestrian alert control module) - GWM (gateway module A)
Accessory delay	GWM (gateway module A)	FD-CAN (Flexible Data Rate Controller Area Network)	- ABS (anti-lock brake system) module - Driver Status Monitor Camera Module [CMR (Camera Module - Rear)] - IPMA (image processing module A) - PCM (powertrain control module) - PSCM (power steering control module) - SOBDMC (secondary on-board diagnostic control module C) - TCCM (transfer case control module) - TCM (transmission control module) - VDM (vehicle dynamics control module)

			• PDM (passenger door module)
			• RTM (radio transceiver module)
			• SCMG (driver multi-contour seat module)
			• SCMH (passenger multi-contour seat module)
Accessory delay	GWM (gateway module A)	MS-CAN (medium speed-controller area network) 2	• RGTM (rear gate trunk module)
ACM (audio front control module) configuration	ACM (audio front control module)	HS-CAN3 (high-speed controller area network 3)	• APIM (SYNC module)
ACM (audio front control module) track information	ACM (audio front control module)	HS-CAN3 (high-speed controller area network 3)	• APIM (SYNC module) • IPC (instrument panel cluster)
Active noise audio status	ACM (audio front control module)	HS-CAN3 (high-speed controller area network 3)	• DSP (audio digital signal processing module)
Active park assist chime request	IPMA (image processing module A)	FD-CAN (Flexible Data Rate Controller Area Network)	• ABS (anti-lock brake system) module • PCM (powertrain control module) • PSCM (power steering control module) • GWM (gateway module A)

Adaptive cruise control follow mode display	IPMA (image processing module A)	FD-CAN (Flexible Data Rate Controller Area Network)	- Driver Status Monitor Camera Module [CMR (Camera Module - Rear)] - GWM (gateway module A)
Adaptive cruise control follow mode display	GWM (gateway module A)	HS-CAN3 (high-speed controller area network 3)	- APIM (SYNC module) - IPC (instrument panel cluster)
Adaptive headlamp fault	HCM (headlamp control module)	HS-CAN2 (high-speed controller area network 2)	- SCCM (steering column control module) - GWM (gateway module A)
Adaptive headlamp fault	GWM (gateway module A)	FD-CAN (Flexible Data Rate Controller Area Network)	- IPMA (image processing module A)
Adjustable speed limiter chime request	PCM (powertrain control module)	FD-CAN (Flexible Data Rate Controller Area Network)	- ABS (anti-lock brake system) module - IPMA (image processing module A) - SOBDMC (secondary on-board diagnostic control module C) - TCCM (transfer case control module) - TCM (transmission control module) - GWM (gateway module A)
Adjustable speed limiter chime request	GWM (gateway module A)	HS-CAN1 (high-speed	- ACCM (air conditioning control module)