IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF MICHIGAN
SOUTHERN DISTRICT

MICHIGAN MOTOR TECHNOLOGIES LLC Plaintiff, v. VOLKSWAGEN AKTIENGESELLSCHAFT and VOLKSWAGEN GROUP OF AMERICA, INC., Defendant.	C.A. No. 2:19-cv-10485-DML-SDD **JURY TRIAL DEMANDED**

SECOND AMENDED COMPLAINT FOR PATENT INFRINGEMENT

Michigan Motor Technologies LLC ("MMT" or "Plaintiff"), for its Amended Complaint against Defendants Volkswagen Aktiengesellschaft ("VWAG" or "Defendant") and Volkswagen Group of America, Inc. ("VWGOA" or "Defendant") (collectively "Defendants"), alleges the following:

NATURE OF THE ACTION

1. This is an action for patent infringement arising under the Patent Laws of the United States, 35 U.S.C. § 1 et seq.

THE PARTIES

2. Plaintiff is a Limited Liability Company organized under the laws of the State of Michigan with a place of business at 2360 Orchard Lake Road, Suite 100, Sylvan Lake, Michigan 48320.

3. Upon information and belief, Volkswagen Aktiengesellschaft is a Corporation organized and existing under the laws of Germany, with its principal place of business at Berliner Ring 2, 38440 Wolfsburg, Germany.

4. Upon information and belief, Volkswagen Group of America, Inc. is a Corporation organized and existing under the laws of the State of New Jersey and a wholly owned subsidiary of Volkswagen Aktiengesellschaft. Volkswagen Group of America, Inc. has its principal place of business at 2200 Ferdinand Porsche Dr., Herndon, VA 20171.

JURISDICTION AND VENUE

5. This is an action for patent infringement arising under the Patent Laws of the United States, Title 35 of the United States Code.

6. This court has subject matter jurisdiction under 28 U.S.C. §§ 1331 and 1338(a).

7. Venue is proper in this judicial district under 28 U.S.C. § 1400(b). On information and belief, Defendants have committed acts of infringement in this District and have regular and established places of business within this District.

8. On information and belief, Defendant VWGOA has a place of business at 3800 Hamlin Road, Auburn Hills, MI 48326.

9. On information and belief, Defendants are subject to this Court's general and specific personal jurisdiction because Defendants have sufficient minimum contacts within the State of Michigan and this District, pursuant to due process and/or Michigan Long Arm Statute because Defendants purposefully availed themselves of the privileges of conducting business in the State of Michigan and in this District, because Defendants regularly conduct and solicit business within the State of Michigan and within this District, and because Plaintiff's causes of action arise directly from Defendants' business contacts and other activities in the State of Michigan and this District.

COUNT – I INFRINGEMENT OF U.S. PATENT NO. 6,588,260

10. The allegations set forth in the foregoing paragraphs 1-9 are incorporated into this First Claim for Relief.

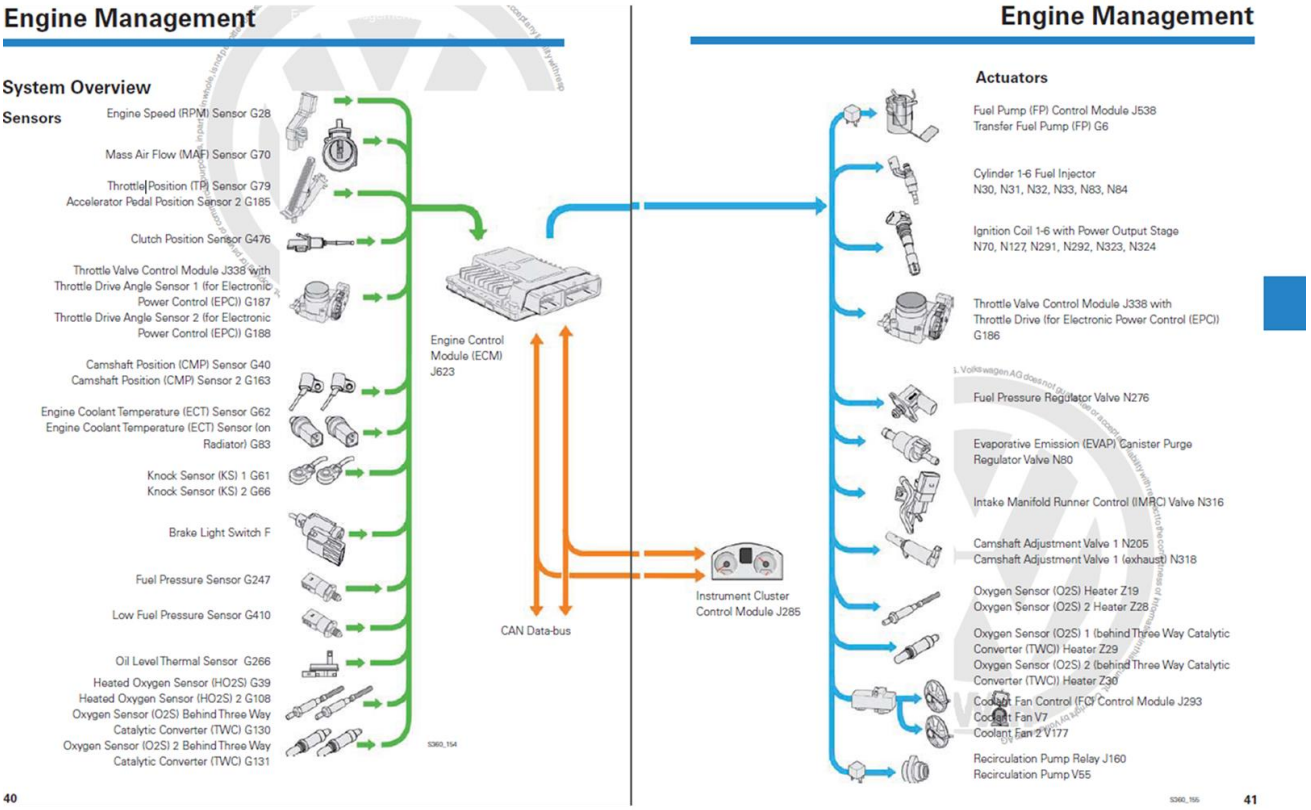
11. On July 8, 2003, U.S. Patent No. 6,588,260 ("the '260 patent") entitled "Electronic Throttle Disable Control Test System," was duly and legally issued by the United States Patent and Trademark Office. A true and correct copy of the '260 patent is attached as Exhibit 1.

12. Plaintiff is the assignee and owner of the right, title and interest in and to the '260 patent, including the right to assert all causes of action arising under said patents and the right to any remedies for infringement of them.

13. Upon information and belief, Defendants have directly infringed at least claim 1 of the '260 patent by making, using, selling, importing and/or providing and causing to be used the at least the 2015-2018 3.6L Touareg (collectively the "'260 patent Accused Instrumentalities").

14. In particular, claim 1 of the '260 patent recites an electronic throttle control apparatus for testing integrity of a motor drive electronics disable feature comprising: a PCM having drive electronics for controlling a motor coupled to an electronic throttle plate, said PCM having control logic to disable said drive electronics and return said electronic throttle plate to a default position, determine a default throttle position sensor (TPS) output voltage corresponding to said default position, command a full closing motor voltage, compare a full closing TPS output voltage to said default TPS output voltage, and engage failure mode management when said full closing TPS output voltage and said default TPS output voltage are significantly different from each other.

15. Upon information and belief, the ’260 patent Accused Instrumentalities infringe at least claim 1 of the ’260 patent. The ’260 patent Accused Instrumentalities comprise an electronic throttle control apparatus (*Figure 1*) for testing integrity of a motor drive electronics disable feature (*Figure 2*) comprising: a PCM having drive electronics for controlling a motor coupled to an electronic throttle plate (*Figure 3*), said PCM having control logic to disable said drive electronics and return said electronic throttle plate to a default position (*Figure 4*), determine a default throttle position sensor (TPS) output voltage corresponding to said default position, command a full closing motor voltage, compare a full closing TPS output voltage to said default TPS output voltage (*Figure 5*), and engage failure mode management when said full closing TPS output voltage and said default TPS output voltage are significantly different from each other (*Figure 6*).



Volkswagen SSP 823603

As shown above, there is a Throttle Valve Control Module (J338), which in conjunction with the Throttle Drive Angle Sensor (G187) and Throttle Drive Angle Sensor 2 (G188), constitutes an electronic throttle control apparatus.

Figure 1

2015 Volkswagen Touareg (7P5) V6-3.6L (CGRA)

Vehicle » A L L Diagnostic Trouble Codes (DTC) » Testing and Inspection » P Code Charts » P0638 » Engine Control Module, 2016 MY

ENGINE CONTROL MODULE, 2016 MY

Engine Control Module, 2016 MY

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0634 Control Module Internal Temperature "A" Too High	Engine Coolant Pump Over-Temperature Power Stage	Power stage temperature > 170° C	Ignition on	0.5 s Continuous	2 DCY	If a sensor/component DTC is also set, diagnose that code BEFORE replacing the ECM. Replace the Engine Control Module (J623) . Refer to appropriate repair manual.
	Supplementary Coolant Pump Over-Temperature Power Stage	Power stage temperature > 150° C				
	Fuel Pump Control (FPC) Over-Temperature Power Stage		Engine speed > 80 RPM			
P0638 Throttle Actuator Control Range/Performance Bank 1	Throttle Actuator Rationality Check Close Movement	Time to close to reference point > 0.6 s And Deviation to reference point > 2.88%	Engine speed 0 RPM Vehicle speed 0 km/h ECT > -20° C IAT > -20° C Case 1: Ignition on Case 2: Engine shut-off-time > 5.0 s Number of checks 3.0 [-]	5.0 s Multiple	2 DCY	Check the Throttle Valve Control Module (GX3) . Refer to ⇒ [Throttle Valve Control Module (GX3), Checking]
	Throttle Actuator Signal Range Check @ Mechanical Stop Low	TPS 1 signal voltage < 0.40; > 0.80 V Or TPS 2 signal voltage < 4.20; > 4.60 V	Engine speed 0 RPM Vehicle speed 0 km/h Case 1: Ignition on ECT -20 - 115° C IAT -20 - 143° C Case 2:	0.3 s Multiple		

testing integrity of a motor drive electronics disable feature

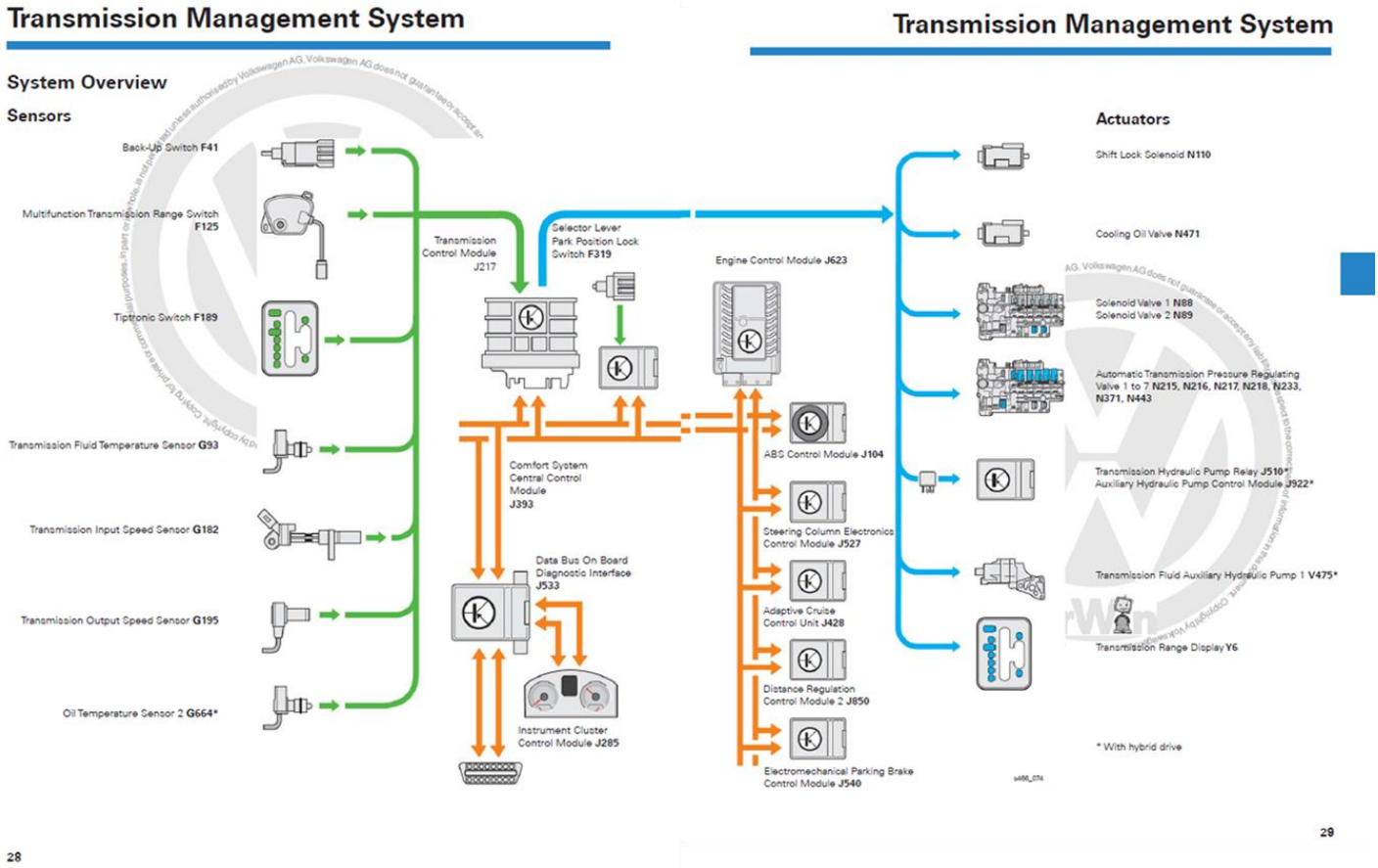
As shown above, there is an Electronic Throttle Control (ETC)[J388] system which tests integrity of a motor drive electronics disable feature.

The PCM/ECM uses the Throttle Drive Angle Sensor (G187) and Throttle Drive Angle Sensor 2 (G188) to monitor the actual throttle blade position and when the actual position is out of range

with the target position, the ECM (J623) will set the DTC P0638. Bank 1 refers to the side of the engine with cylinder number one, however most vehicles use one throttle body for all cylinders. This code is similar to code P0639. Most throttle bodies of this type are not serviceable and need to be replaced. The throttle body is spring actuated to hold it at an open position in the event of a motor failure; in some cases, with a complete failure, the throttle will be unresponsive, and the vehicle will only be capable of driving at a slow speed.

https://www.obd-codes.com/p0638

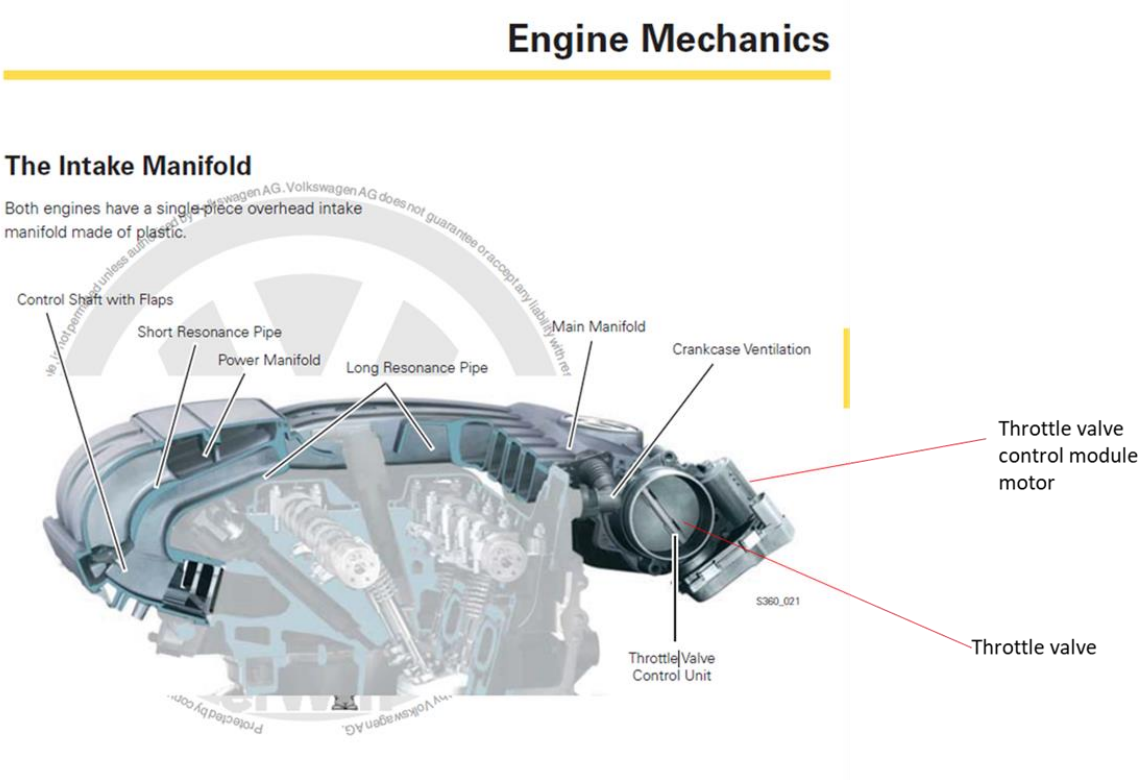
Figure 2



Volkswagen SSP 823603

The PCM (powertrain control module) comprises the ECM (J623) and the Transmission Control Module TCM (J217) (shown above).

The PCM, shown above, has drive electronics for controlling a throttle valve control module motor coupled to an electronic throttle plate/throttle valve (shown below).



Volkswagen SSP 823603

Figure 3

2015 Volkswagen Touareg (7P5) V6-3.6L (CGRA)

Vehicle » A L L Diagnostic Trouble Codes (DTC) » Testing and Inspection » P Code Charts » P2106 » Engine Control Module, 2016 MY

ENGINE CONTROL MODULE, 2016 MY

Engine Control Module, 2016 MY

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2106 Throttle Actuator Control System - Forced Limited Power	Throttle Actuator Short To Battery Plus / Short To Ground	Internal check failed		0.5 s Continuous	2 DCY	Check the Throttle Valve Control Module (GX3) . Refer to ⇒ [Throttle Valve Control Module (GX3), Checking]
	Throttle Actuator Open Circuit		Duty cycle > 80.0% Or Deviation throttle value angles vs. throttle value set point > 4.0 - 50.0%			
	Throttle Actuator Temperature / Current Monitoring					
	Throttle Actuator Functional Check					
P2122 Throttle/Pedal Position Sensor/Switch "D" Circuit Low	Accelerator Pedal Position (APP) Sensor 1 Out Of Range Low	Signal voltage < 0.65 V		0.5 s Continuous	2 DCY	Check the Accelerator Pedal Module (GX2) . Refer to ⇒ [Accelerator Pedal Module (GX2), Checking].
P2123 Throttle/Pedal Position Sensor/Switch "D" Circuit High	Accelerator Pedal Position (APP) Sensor 1 Out Of Range High	Signal voltage > 4.89 V		0.5 s Continuous	2 DCY	Check the Accelerator Pedal Module (GX2) . Refer to ⇒ [Accelerator Pedal Module (GX2), Checking].

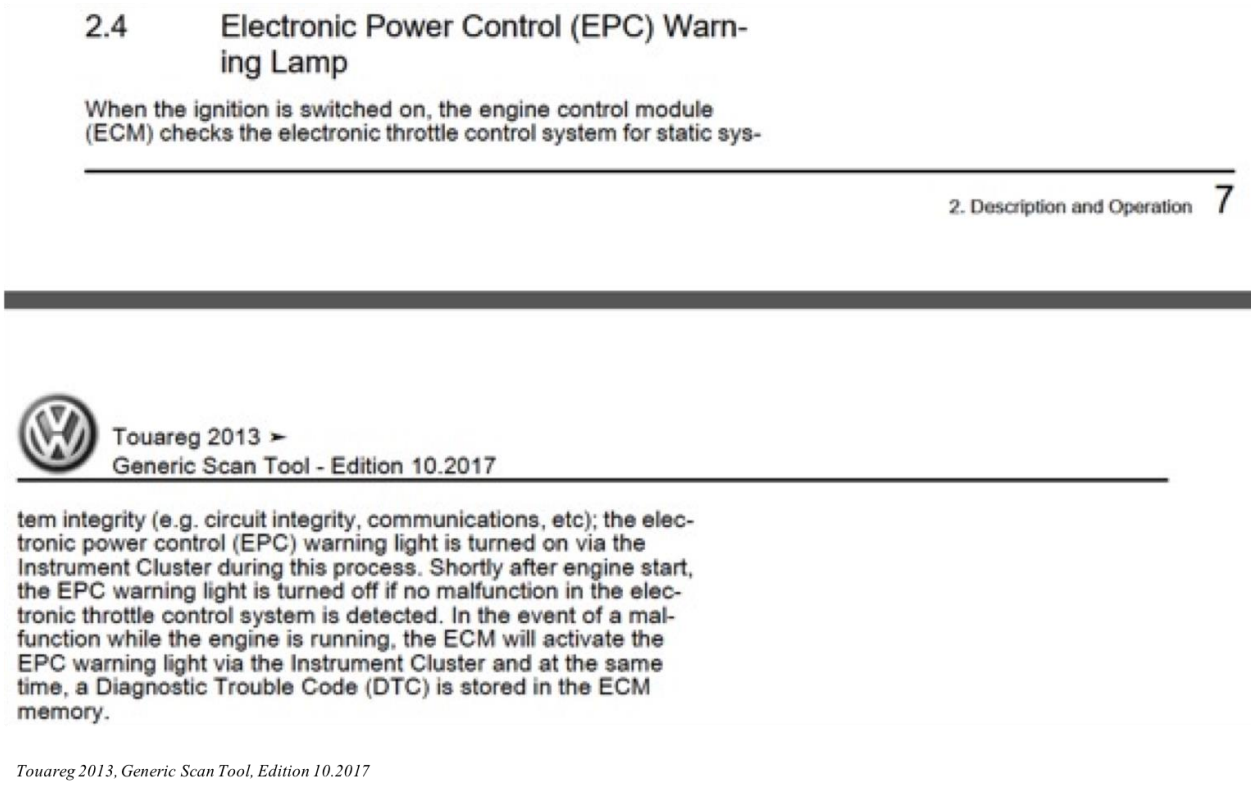
DTC P2106 is exemplary of the DTCs that are more specific that will typically accompany DTC P0652.

https://www.obd-codes.com

For example, as shown above, control logic in the ECM issues a command which controls the throttle actuator control system - limiting power where there is a sensor or circuit error or failure of the throttle valve functionality check affecting the Throttle Valve Control Module (J388) (shown above) (disable drive electronics).

When there is an error detected during continuous monitoring (P2106, above), or when the ECM performs specific checks (P0638, below), a Throttle Actuator Rationality Check for Close Movement (Default Position) or a Throttle Actuator Signal Range Check at the low mechanical stop, the ECM Turns on the Electronic Power Control (EPC) warning lamp and the ECM returns the electronic throttle plate to a default position.

Further, the ECM relinquishes control of the Throttle Valve Control Module (J388) which remains in a default position.



2.4 Electronic Power Control (EPC) Warning Lamp

When the ignition is switched on, the engine control module (ECM) checks the electronic throttle control system for static system integrity (e.g. circuit integrity, communications, etc); the electronic power control (EPC) warning light is turned on via the Instrument Cluster during this process. Shortly after engine start, the EPC warning light is turned off if no malfunction in the electronic throttle control system is detected. In the event of a malfunction while the engine is running, the ECM will activate the EPC warning light via the Instrument Cluster and at the same time, a Diagnostic Trouble Code (DTC) is stored in the ECM memory.

Touareg 2013, Generic Scan Tool, Edition 10.2017

Figure 4

For example, as demonstrated by DTC P0638 included below. The ECM makes a determination of the amount of time required to reach a reference point (default position of the electronic throttle plate) and the deviation from the reference point. On information and belief, the control logic in the ECM disables the drive electronics for controlling the throttle motor by not supplying power to the throttle motor, whereby the electronic throttle plate is returned to a default position. DTC P0638 also demonstrates that the ECM commands full motor closing voltage (signal range check at mechanical stop) and compares that to TPS 1 output voltage (< 0.40; > 0.80 V) or TPS 2 output voltage (< 4.20; > 4.60 V). Any significant difference from these voltage ranges are considered out of range, resulting in at least DTC P0638. The algorithms executed by the ECM for DTC P0638 and DTC P2106 differ, as such errors during a continuous monitor (see P2106 above); however, DTC P0638 algorithms are typically performed during initialization or shut down.

2015 Volkswagen Touareg (7P5) V6-3.6L (CGRA)

Vehicle » A L L Diagnostic Trouble Codes (DTC) » Testing and Inspection » P Code Charts » P0638 » Engine Control Module, 2016 MY

ENGINE CONTROL MODULE, 2016 MY

Engine Control Module, 2016 MY

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0634 Control Module Internal Temperature "A" Too High	Engine Coolant Pump Over-Temperature Power Stage	Power stage temperature > 170° C	Ignition on	0.5 s Continuous	2 DCY	If a sensor/component DTC is also set, diagnose that code BEFORE replacing the ECM. Replace the Engine Control Module (J623) . Refer to appropriate repair manual.
	Supplementary Coolant Pump Over-Temperature Power Stage	Power stage temperature > 150° C				
	Fuel Pump Control (FPC) Over-Temperature Power Stage		Engine speed > 80 RPM			
P0638 Throttle Actuator Control Range/Performance Bank 1	Throttle Actuator Rationality Check Close Movement	Time to close to reference point > 0.6 s And Deviation to reference point > 2.88%	Engine speed 0 RPM Vehicle speed 0 km/h ECT > -20° C IAT > -20° C Case 1: Ignition on Case 2: Engine shut-off-time > 5.0 s Number of checks 3.0 [-]	5.0 s Multiple	2 DCY	Check the Throttle Valve Control Module (GX3) . Refer to ⇒ [Throttle Valve Control Module (GX3), Checking]
	Throttle Actuator Signal Range Check @ Mechanical Stop Low	TPS 1 signal voltage < 0.40; > 0.80 V Or TPS 2 signal voltage < 4.20; > 4.60 V	Engine speed 0 RPM Vehicle speed 0 km/h Case 1: Ignition on ECT -20 - 115° C IAT -20 - 143° C Case 2:	0.3 s Multiple		

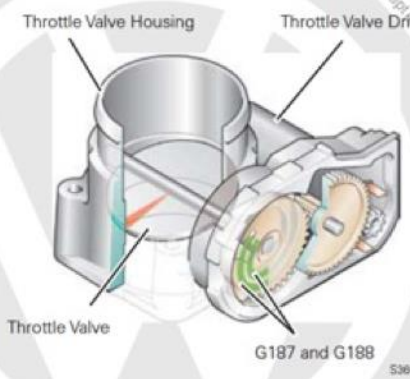
https://www.obd-codes.com

For example, as shown above, there are two checks for P0638; one is determined from the amount of time to reach a reference point (default position) and the deviation from the reference point. The second is a command for full motor closing voltage (signal range check at mechanical stop) is compared to TPS 1 output voltage (< 0.40; > 0.80 V) or TPS 2 output voltage (< 4.20; > 4.60 V) and any deviation from these voltage ranges are considered out of range and will set the DTC. These checks differ from errors detected during a continuous monitor (see above) and are typically performed during initialization or shut down.

Figure 5

The Throttle Drive Angle Sensor 1 G187 and Throttle Drive Angle Sensor 2 G188 in the Throttle Valve Control Unit

These sensors determine the current position of the throttle valve and send this information to the ECM.



Signal Utilization

The ECM recognizes the position of the throttle valve from the angle sensors signals. The signals from the two sensors are redundant, meaning that both sensors provide the same signal.

Effects of a Signal Failure

Example 1

The ECM receives an implausible signal or no signal at all from an angle sensor:

- An entry is made in the DTC memory and the error light for electric throttle operation is switched on
- Systems which affect torque, (e.g. cruise control system or engine drag torque control), are switched off
- The load signal is used to monitor the remaining angle sensor
- The accelerator pedal responds normally

Example 2

The ECM receives an implausible signal or no signal from both angle sensors:

- An entry is made for both sensors in the DTC memory and the error light for electric throttle operation is switched on
- The throttle valve drive is switched off
- The engine runs only at an increased idle speed of 1,500 RPM and no longer reacts to the accelerator pedal

Volkswagen SSP 823603

2015 Volkswagen Touareg (7P5) V6-3.6L (CGRA)

Vehicle » A L L Diagnostic Trouble Codes (DTC) » Testing and Inspection » P Code Charts » P2106 » Engine Control Module, 2016 MY

ENGINE CONTROL MODULE, 2016 MY

Engine Control Module, 2016 MY

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2106 Throttle Actuator Control System - Forced Limited Power	Throttle Actuator Short To Battery Plus / Short To Ground	Internal check failed	Duty cycle > 80.0% Or Deviation throttle value angles vs. throttle value set point > 4.0 - 50.0%	0.5 s Continuous	2 DCY	Check the Throttle Valve Control Module (GX3) . Refer to ⇒ [Throttle Valve Control Module (GX3), Checking].
	Throttle Actuator Open Circuit					
	Throttle Actuator Temperature / Current Monitoring					
	Throttle Actuator Functional Check					
P2122 Throttle/Pedal Position Sensor/Switch "D" Circuit Low	Accelerator Pedal Position (APP) Sensor 1 Out Of Range Low	Signal voltage < 0.65 V		0.5 s Continuous	2 DCY	Check the Accelerator Pedal Module (GX2) . Refer to ⇒ [Accelerator Pedal Module (GX2), Checking].
P2123 Throttle/Pedal Position Sensor/Switch "D" Circuit High	Accelerator Pedal Position (APP) Sensor 1 Out Of Range High	Signal voltage > 4.89 V		0.5 s Continuous	2 DCY	Check the Accelerator Pedal Module (GX2) . Refer to ⇒ [Accelerator Pedal Module (GX2), Checking].

For example, as shown above, engine failure mode management P2106 (throttle actuator control system-forced limited power) is engaged when a full closing TPS output voltage indicates a deviation of throttle angle values (as indicated by throttle output voltage [TPS1 output voltage signal) opposed to throttle value set point > 4% - 50%).

Figure 6

Based upon the totality of the foregoing evidence, and based further upon information and belief, the ’260 patent Accused Instrumentalities include “an apparatus for testing integrity of a motor drive electronics disable feature comprising: a PCM having drive electronics for controlling a

motor coupled to an electronic throttle plate, said PCM having control logic to disable said drive electronics and return said electronic throttle plate to a default position, determine a default throttle position sensor (TPS) output voltage corresponding to said default position, command a full closing motor voltage, compare a full closing TPS output voltage to said default TPS output voltage, and engage failure mode management when said full closing TPS output voltage and said default TPS output voltage are significantly different from each other."

COUNT II – INFRINGEMENT OF U.S. PATENT NO. 6,443,128

16. The allegations set forth in the foregoing paragraphs 1 through 15 are incorporated into this Second Claim for Relief.

17. On September 3, 2002, U.S. Patent No. 6,443,128 ("the '128 patent"), entitled "Method of Controlling an Internal Combustion Engine," was duly and legally issued by the United States Patent and Trademark Office. A true and correct copy of the '128 patent is attached as Exhibit 2.

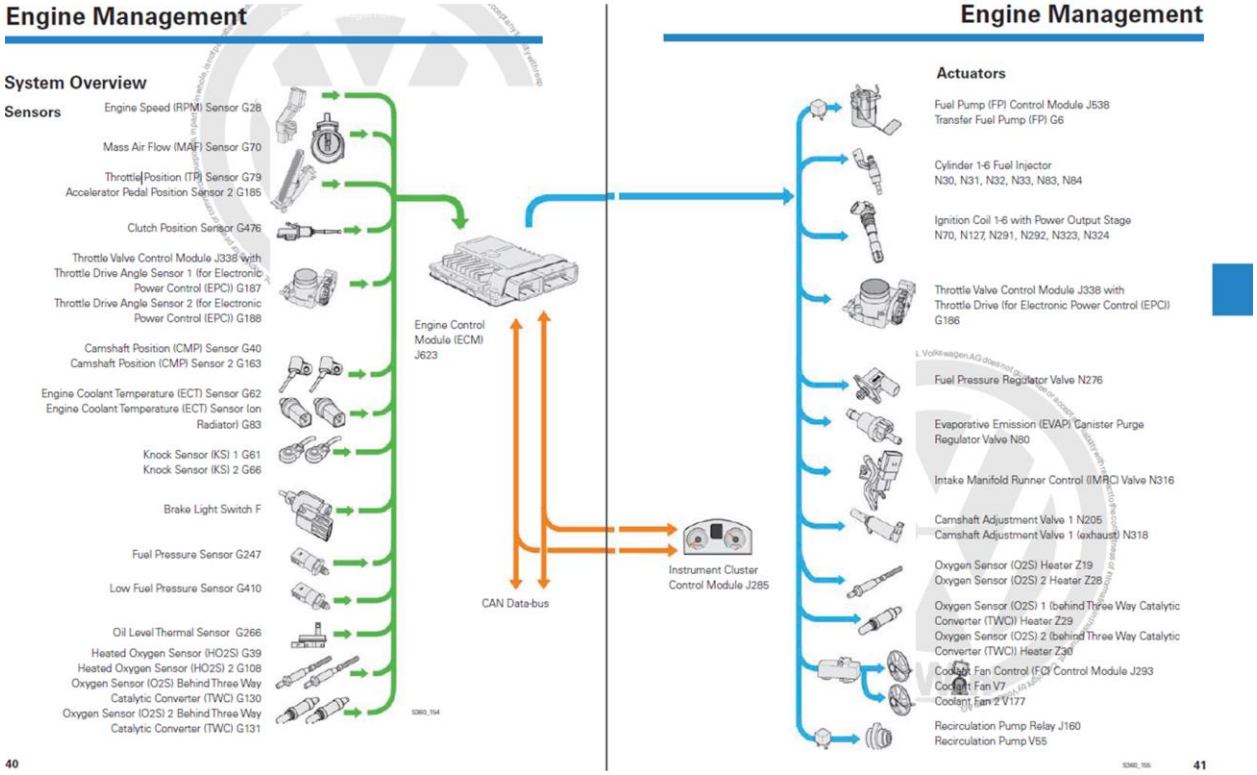
18. Plaintiff is the assignee and owner of the right, title and interest in and to the '128 patent, including the right to assert all causes of action arising under said patents and the right to any remedies for infringement of them.

19. Upon information and belief, Defendants have directly infringed at least claim 1 of the '128 patent by making, using, selling, importing and/or providing and causing to be used the 2015-2018 3.6L Touareg (the "'128 patent Accused Instrumentalities").

20. In particular, claim 1 of the '128 patent recites a method of controlling an internal combustion engine, the engine having an engine controller and an electronically controlled throttle including a throttle control motor driven by a throttle control circuit, the method comprising: determining a throttle position command for the throttle control motor; applying the throttle position command to the throttle control motor with the throttle control circuit; detecting an open circuit condition in the throttle control circuit; detecting a closed circuit condition in the throttle control circuit; after detection of the closed circuit condition, clipping the throttle

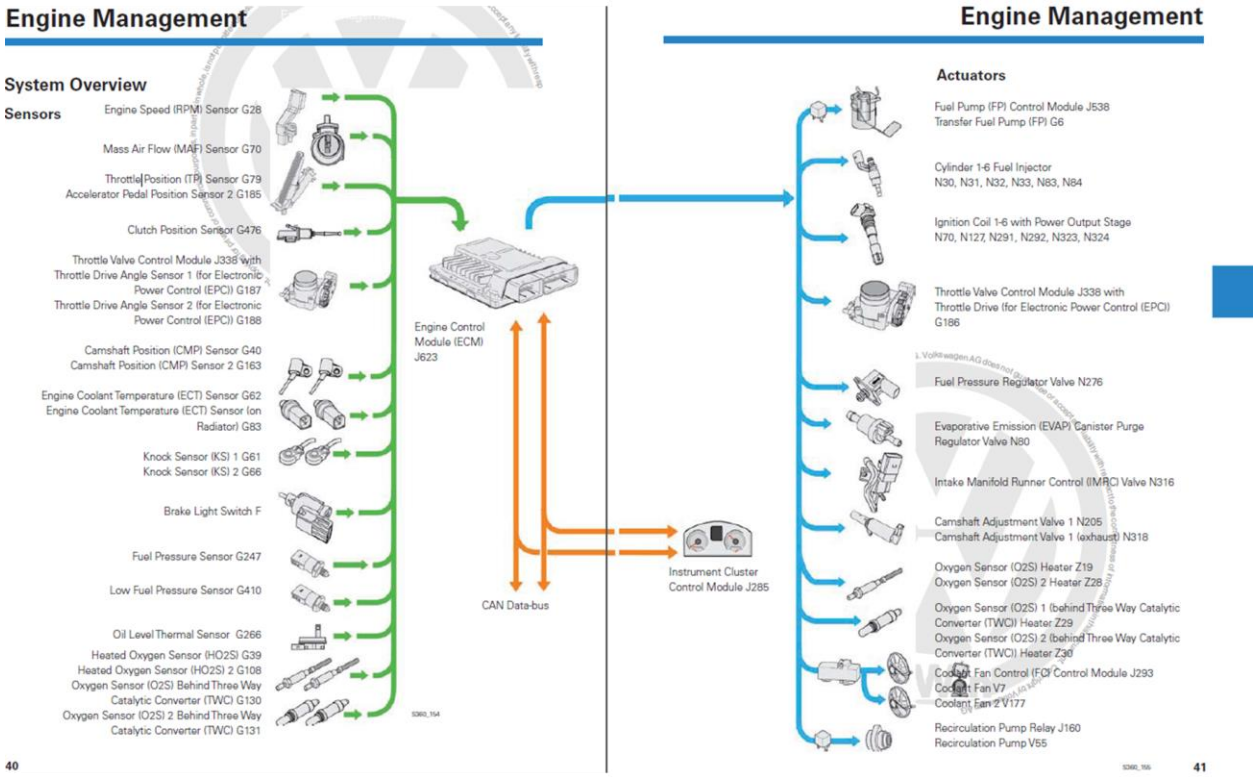
position command; and applying the clipped throttle position command to the throttle control motor with the throttle control circuit.

21. On information and belief, the '128 patent Accused Instrumentalities infringe at least claim 1 of the '128 patent. The '128 patent Accused Instrumentalities practice a method of controlling an internal combustion engine (*Figure 7*), the engine having an engine controller and an electronically controlled throttle including a throttle (*Figure 8*) control motor driven by a throttle control circuit (*Figure 8*), the method comprising: determining a throttle position command for the throttle control motor (*Figure 9*); applying the throttle position command to the throttle control motor with the throttle control circuit (*Figure 10*); detecting an open circuit condition in the throttle control circuit (*Figure 11*); detecting a closed circuit condition in the throttle control circuit (*Figure 11*); after detection of the closed circuit condition, clipping the throttle position command (*Figure 12*); and applying the clipped throttle position command to the throttle control motor with the throttle control circuit (*Figure 12*).

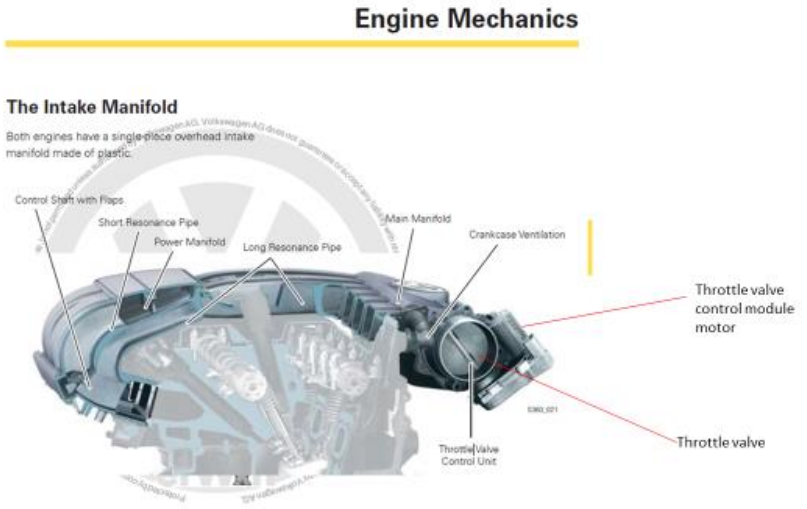


The Engine Control Module (J623) provides a method of controlling an internal combustion engine.

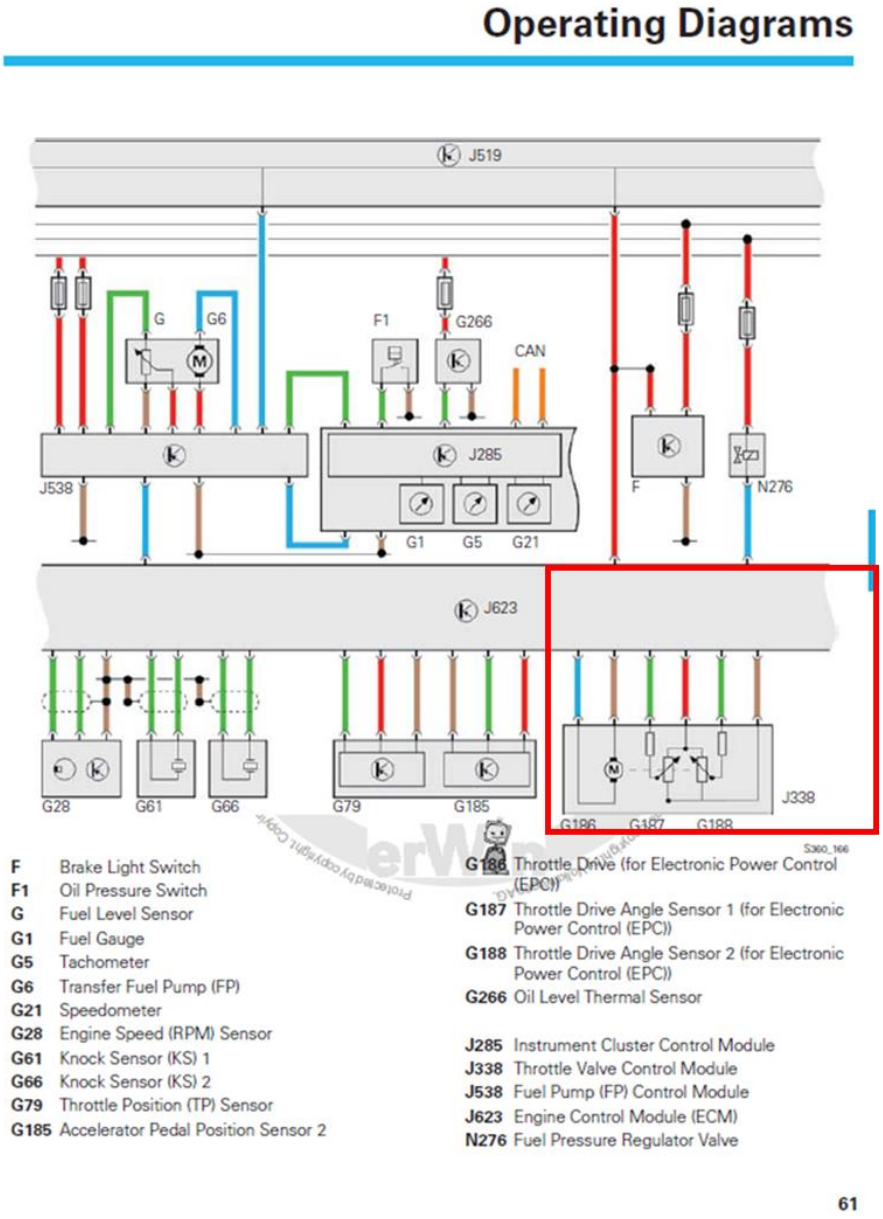
Figure 7



The ’128 patent Infringing Instrumentalities comprise an Engine controller, the ECM (J623) and an electronically controlled throttle (J338).

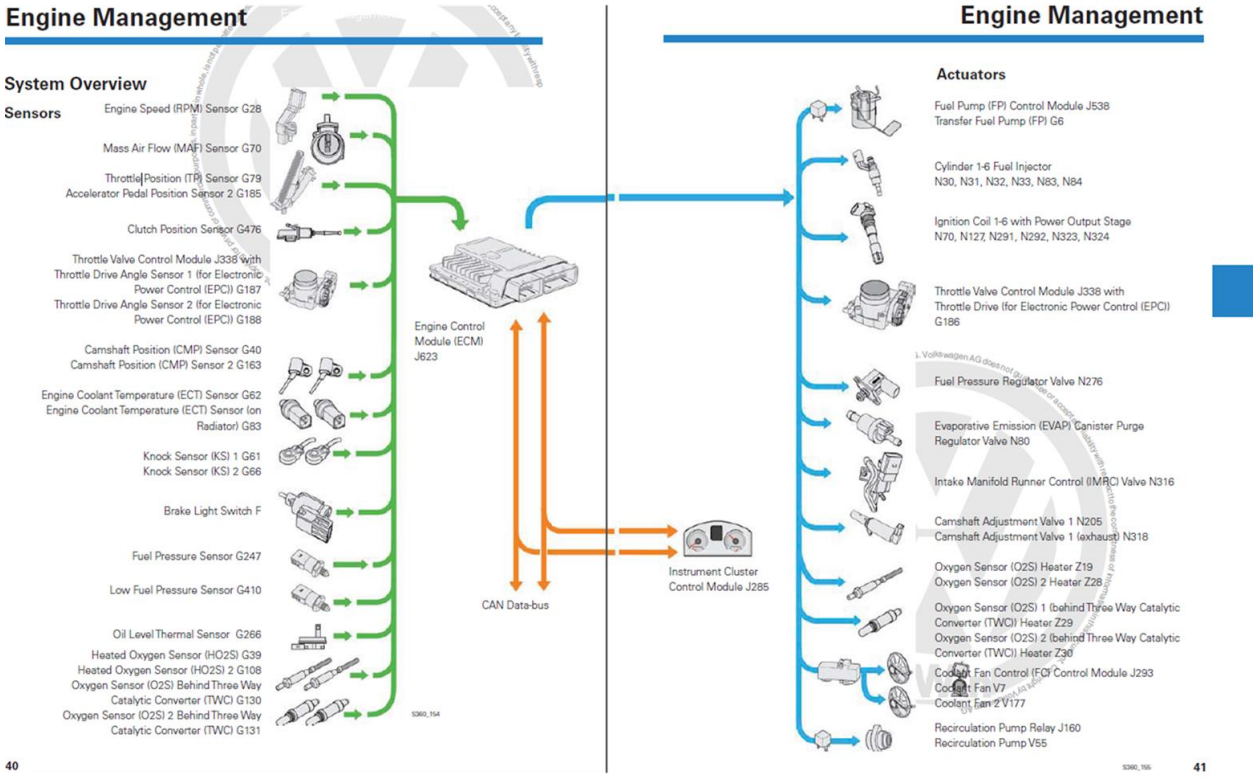


The method practiced by the '128 patent Infringing Instrumentalities comprises an electronically controlled throttle (J338) including a throttle control motor driven by a throttle control circuit.



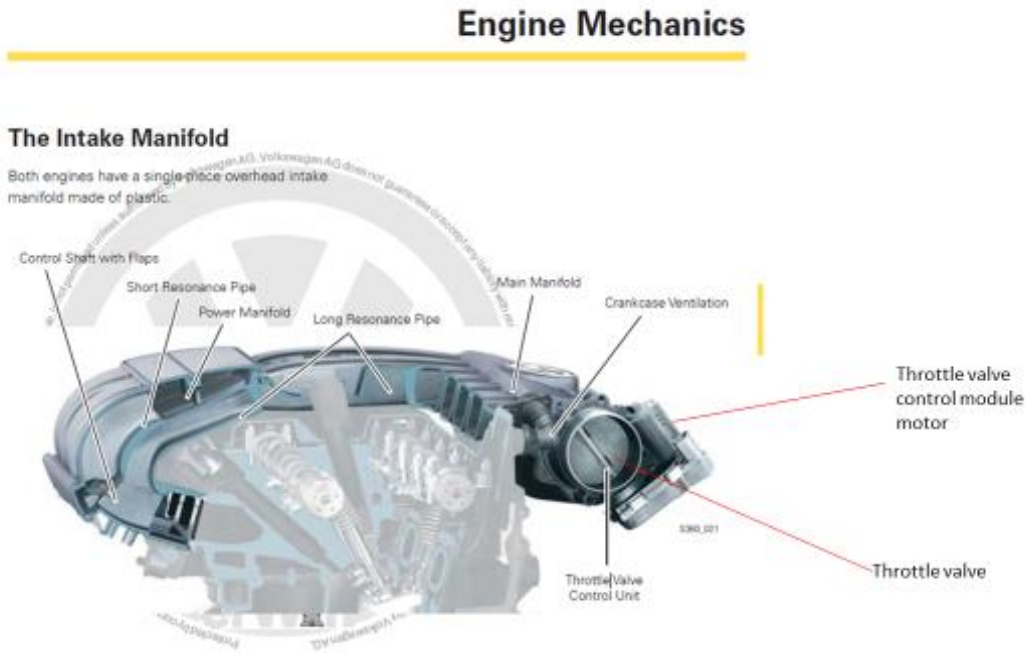
The electronically controlled throttle includes a throttle control motor (J338) driven by a throttle control circuit. *See above.*

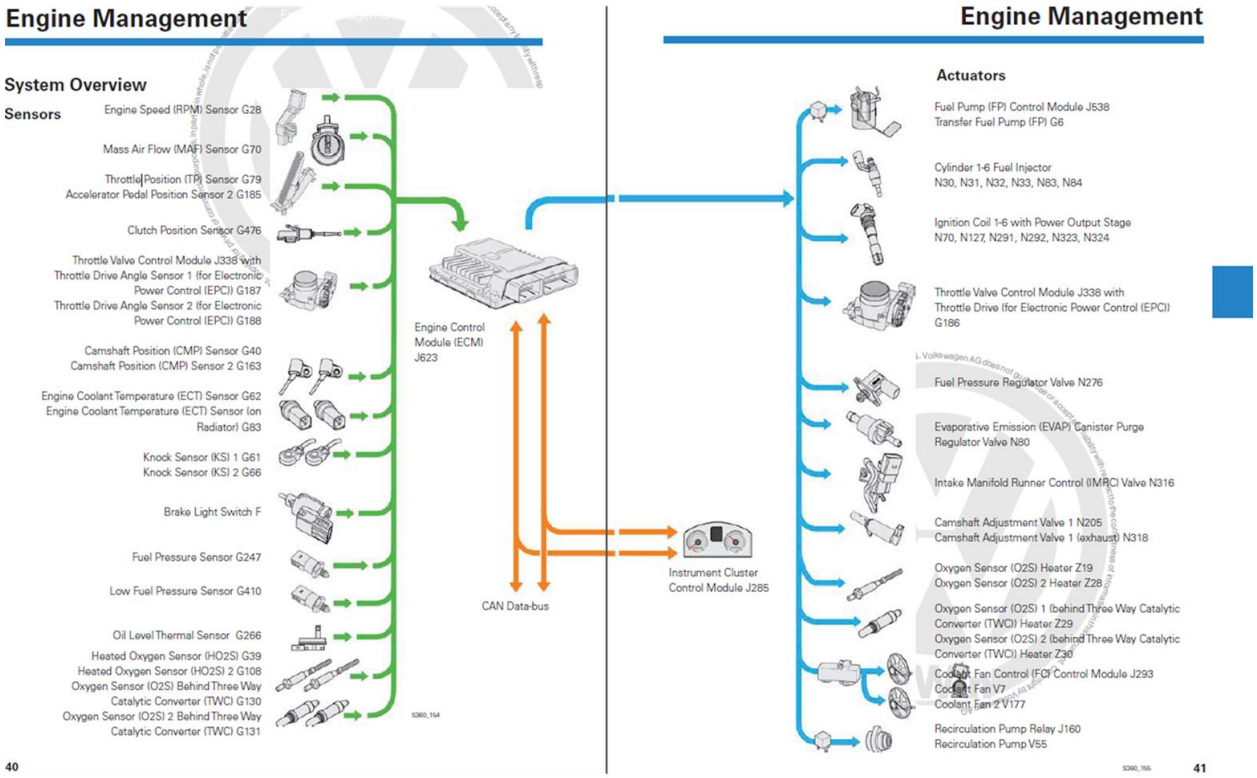
Figure 8



The throttle position command is sent to the Electronic Throttle Control module from the ECM (J623) by way of a motor operation signal. The throttle position command is derived from the accelerator pedal position sensor 2 (G185).

Figure 9





The throttle position command (from the Accelerator Pedal Position Sensor 2 G185) is applied to the throttle valve control module (J388) motor (shown below) with the throttle control circuit (shown above).

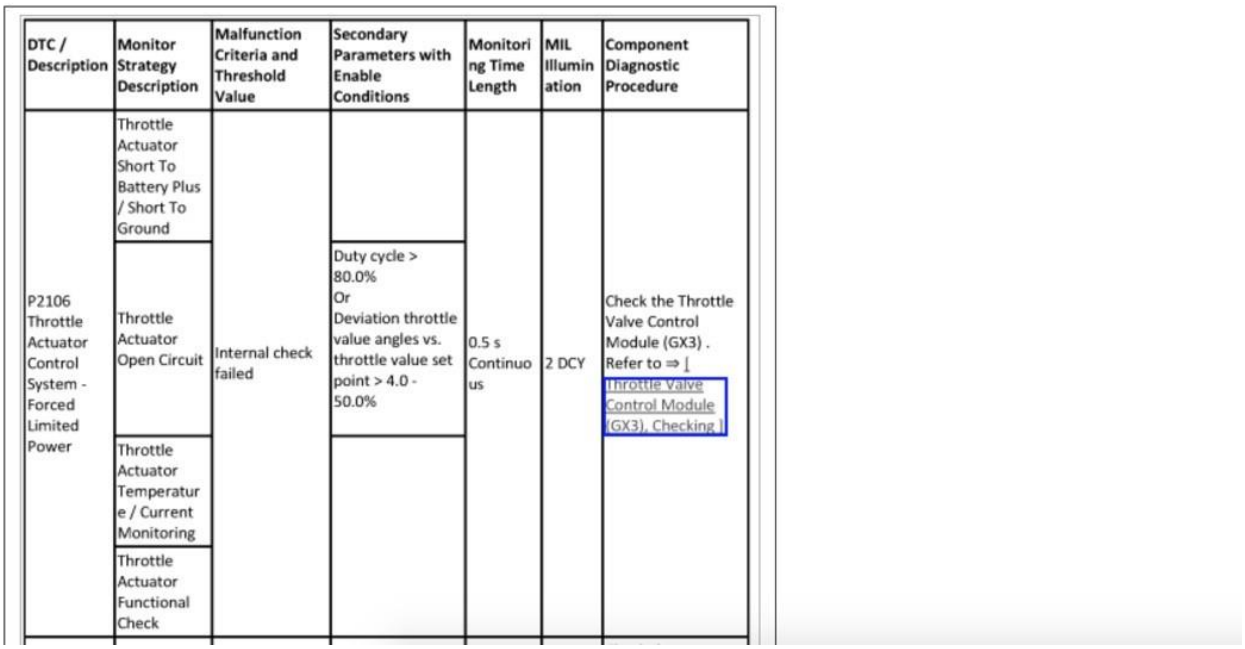
Figure 10

2015 Volkswagen Touareg (7P5) V6-3.6L (CGRA)

Vehicle » A L L Diagnostic Trouble Codes (DTC) » Testing and Inspection » P Code Charts » P2106 » Engine Control Module, 2016 MY

ENGINE CONTROL MODULE, 2016 MY

Engine Control Module, 2016 MY



DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2106 Throttle Actuator Control System - Forced Limited Power	Throttle Actuator Short To Battery Plus / Short To Ground	Internal check failed		0.5 s Continuous	2 DCY	Check the Throttle Valve Control Module (GX3) . Refer to ⇒ [Throttle Valve Control Module (GX3), Checking]
	Throttle Actuator Open Circuit		Duty cycle > 80.0% Or Deviation throttle value angles vs. throttle value set point > 4.0 - 50.0%			
	Throttle Actuator Temperature / Current Monitoring					
	Throttle Actuator Functional Check					

DTC P2106 Throttle Actuator Control System - Forced Limited Power – The monitor strategy looks for an open circuit condition in the throttle actuator, therefore, detecting open circuitry in the throttle control circuit.

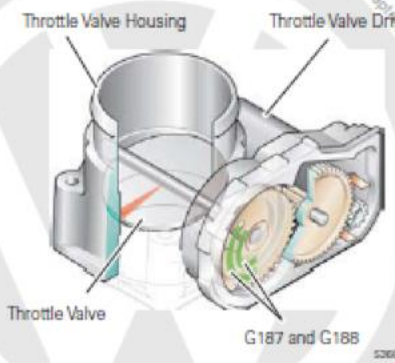
Figure 11

The Throttle Drive Angle Sensor 1 G187 and Throttle Drive Angle Sensor 2 G188 in the Throttle Valve Control Unit

These sensors determine the current position of the throttle valve and send this information to the ECM.

Signal Utilization

The ECM recognizes the position of the throttle valve from the angle sensors signals. The signals from the two sensors are redundant, meaning that both sensors provide the same signal.



Effects of a Signal Failure

Example 1

The ECM receives an implausible signal or no signal at all from an angle sensor:

- An entry is made in the DTC memory and the error light for electric throttle operation is switched on
- Systems which affect torque, (e.g. cruise control system or engine drag torque control), are switched off
- The load signal is used to monitor the remaining angle sensor
- The accelerator pedal responds normally

Example 2

The ECM receives an implausible signal or no signal from both angle sensors:

- An entry is made for both sensors in the DTC memory and the error light for electric throttle operation is switched on
- The throttle valve drive is switched off
- The engine runs only at an increased idle speed of 1,500 RPM and no longer reacts to the accelerator pedal

2015 Volkswagen Touareg (7P5) V6-3.6L (CGRA)

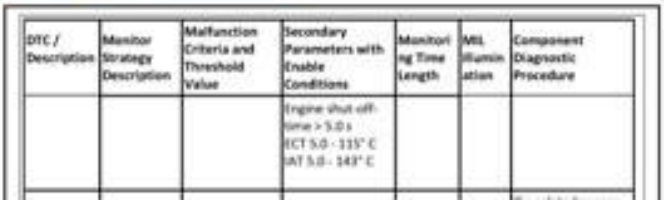
Vehicle » A L L Diagnostic Trouble Codes (DTC) » Testing and Inspection » P Code Charts » P0638 » Engine Control Module, 2016 MY

ENGINE CONTROL MODULE, 2016 MY

Engine Control Module, 2016 MY

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0634 Control Module Internal Temperature "A" Too High	Engine Coolant Pump Over-Temperature Power Stage	Power stage temperature > 170° C	Ignition on	0.5 s Continuous	2 DCY	If a sensor/component DTC is also set, diagnose that code BEFORE replacing the ECM. Replace the Engine Control Module (J623) . Refer to appropriate repair manual.
	Supplementary Coolant Pump Over-Temperature Power Stage	Power stage temperature > 150° C				
	Fuel Pump Control (FPC) Over-Temperature Power Stage		Engine speed > 80 RPM			
P0638 Throttle Actuator Control Range/Performance Bank 1	Throttle Actuator Rationality Check Close Movement	Time to close to reference point > 0.6 s And Deviation to reference point > 2.88%	Engine speed 0 RPM Vehicle speed 0 km/h ECT > -20° C IAT > -20° C Case 1: Ignition on Case 2: Engine shut-off-time > 5.0 s Number of checks 3.0 [-]	5.0 s Multiple	2 DCY	Check the Throttle Valve Control Module (GX3) . Refer to ⇒ [Adapting Throttle Control Module (GX3): Checking]
	Throttle Actuator Signal Range Check @ Mechanical Stop Low	TPS 1 signal voltage < 0.40; > 0.80 V Or TPS 2 signal voltage < 4.20; > 4.60 V	Engine speed 0 RPM Vehicle speed 0 km/h Case 1: Ignition on ECT -20 - 115° C IAT -20 - 143° C Case 2:	0.3 s Multiple		

Zoom Sized for Print



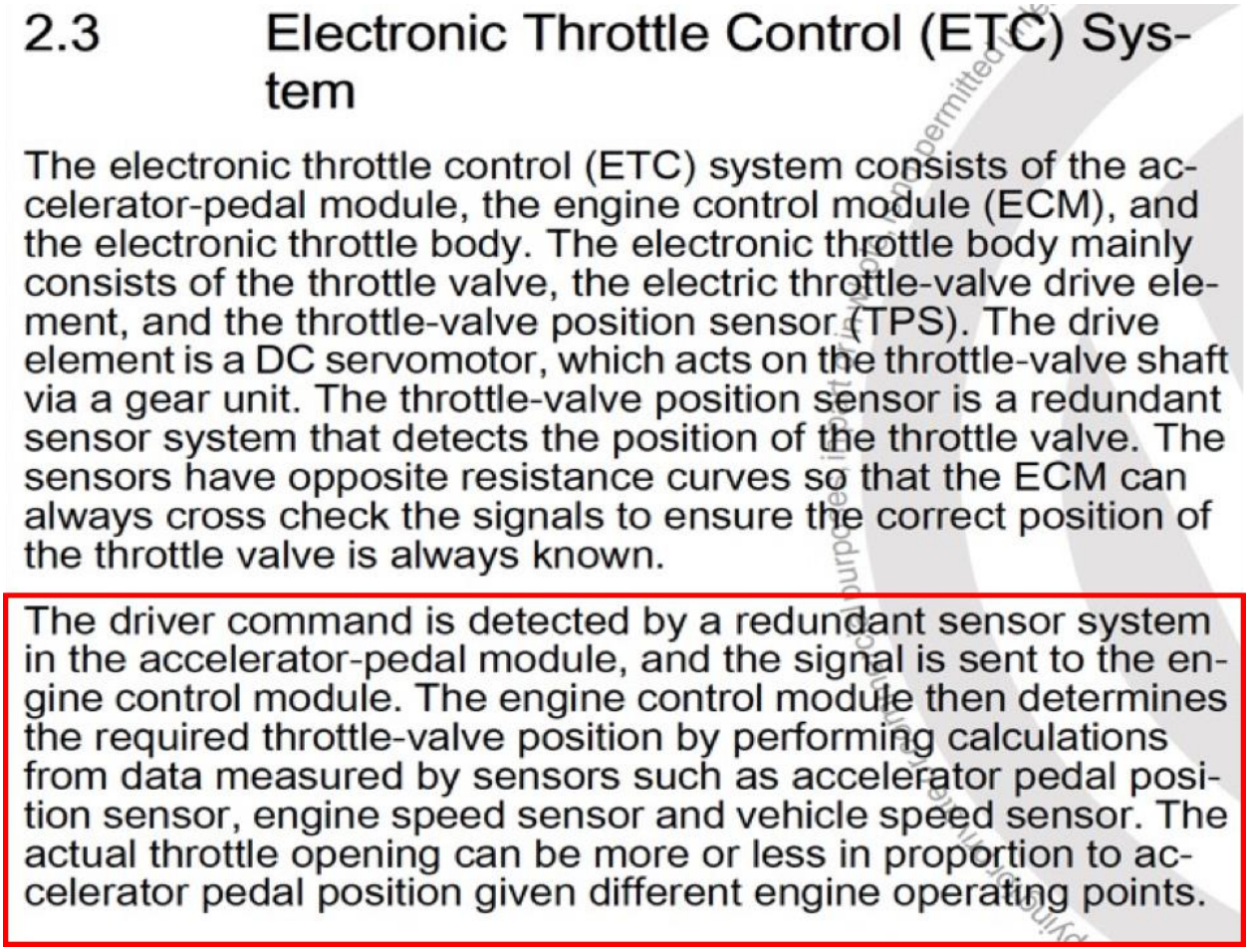
DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			Engine shut-off-time > 5.0 s ECT 5.0 - 115° C IAT 5.0 - 143° C			

A circuit which removes the peak of a waveform is known as a clipper. A clipper is designed to prevent the output of a circuit from exceeding a predetermined voltage level. *https://www.allaboutcircuits.com/textbook/semiconductors/chpt-3/clipper-circuits/*

Clipping prohibits a surge in engine power which results from an Accelerator Pedal Position Sensor 2 (G185) signaling to the Throttle Valve Control Module (J338) through the Electronic Control Module (ECM; J623)) that a sharp increase in power is needed. An open circuit condition in the throttle control circuit, may result in a driver applying more pressure to the

accelerator pedal thereby causing the Accelerator Pedal Position Sensor 2 (G185) to send a higher voltage signal to the ECM. On information in belief, the ECM creates a throttle position command based on the throttle position sensor. However, if there is a malfunction detected by the system, such as an open circuit condition in one drive cycle, which is later followed by a closed circuit condition, then the throttle position command will be clipped to a throttle position command. On information and belief, the clipped throttle position command is applied to the throttle control motor with the throttle control circuit.

The throttle position command is limited or clipped prior to application to the throttle control motor, resulting in smooth changing of the applied throttle position command.



2.3 Electronic Throttle Control (ETC) System

The electronic throttle control (ETC) system consists of the accelerator-pedal module, the engine control module (ECM), and the electronic throttle body. The electronic throttle body mainly consists of the throttle valve, the electric throttle-valve drive element, and the throttle-valve position sensor (TPS). The drive element is a DC servomotor, which acts on the throttle-valve shaft via a gear unit. The throttle-valve position sensor is a redundant sensor system that detects the position of the throttle valve. The sensors have opposite resistance curves so that the ECM can always cross check the signals to ensure the correct position of the throttle valve is always known.

The driver command is detected by a redundant sensor system in the accelerator-pedal module, and the signal is sent to the engine control module. The engine control module then determines the required throttle-valve position by performing calculations from data measured by sensors such as accelerator pedal position sensor, engine speed sensor and vehicle speed sensor. The actual throttle opening can be more or less in proportion to accelerator pedal position given different engine operating points.

The throttle position command is limited or clipped prior to application to the throttle control motor, resulting in smooth changing of the applied throttle position command. “The actual throttle opening can be more or less in proportion to accelerator pedal position given different engine operating points.”

P0121 Throttle/ Pedal Position Sensor/Switch "A" Circuit Range/ Performance	Throttle Position Sensor 1 Rationality Check	• TPS 1 – TPS 2 > 5.10 – 6.30% • And • Actual TPS 1 calculated value > actual TPS 2 calculated value • Or • TPS 1 calculated value > 9.0%	• Engine speed > 480 RPM	• 0.3 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.32 Throttle Valve Control Module GX3 , Checking", page 893 .

Figure 12

Based upon the totality of the foregoing evidence, and based further upon information and belief, the '128 patent Accused Instrumentalities practice a method for controlling an internal combustion engine, the engine having an engine controller and an electronically controlled throttle including a throttle control motor driven by a throttle control circuit, the method comprising: determining a throttle position command for the throttle control motor; applying the throttle position command to the throttle control motor with the throttle control circuit; detecting an open circuit condition in the throttle control circuit; detecting a closed circuit condition in the throttle control circuit; after detection of the closed circuit condition, clipping the throttle position command; and applying the clipped throttle position command to the throttle control motor with the throttle control circuit.

COUNT III – INFRINGEMENT OF U.S. PATENT NO. 6,612,287

22. The allegations set forth in the foregoing paragraphs 1 through 21 are incorporated into this Third Claim for Relief.

23. On September 2, 2003 U.S. Patent No. 6,612,287 ("the '287 patent"), entitled "Electronic Throttle Position Feedforward System," was duly and legally issued by the United States Patent and Trademark Office. A true and correct copy of the '287 patent is attached as Exhibit 3.

24. Plaintiff is the assignee and owner of the right, title and interest in and to the '287 patent, including the right to assert all causes of action arising under said patents and the right to any remedies for infringement of them.

25. Upon information and belief, Defendants have directly infringed at least claim 1 of the ’287 patent by making, using, selling, importing and/or providing and causing to be used the 2012-2018 Tiguan, 2012-2018 Audi A3, 2012-2018 Audi A4, 2012-2018 Audi A5, 2012-2018 Audi A6, 2016-2018 Audi TT, 2015-2018 Audi S3, 2015-2018 VW Golf, 2012-2018 VW Golf GTI, 2015-2018 VW Golf R, 2015-2018 Golf Sportwagon, 2013-2018 Jetta GLI, 2014-2018 VW Jetta Sedan, 2014-2018 VW Passat, 2012-2017 WV CC, 2012-2018 VW Beetle, 2018 VW Atlas, 2015- 2018 Audi Q3, 2012-2018 Audi Q5, and 2017-2018 Porsche Macan with the EA888 engines (the “’287 patent Accused Instrumentalities”).

26. In particular, claim 1 of the ’287 patent recites a method for controlling a positioning device of an internal combustion engine, the method comprising the steps of: providing an electronic motor for actuating said positioning device with a torque being applied to said motor over the positioning range and said torque changing sign thereby defining a torque reversal point; detecting a commanded position of said positioning device; determining whether said positioning device's command is in the region of said torque reversal point; forming a drive signal for the motor on the basis of said commanded position for said positioning device; and changing said drive signal to abruptly change the motor voltage when said commanded position is in said region of said torque reversal point.

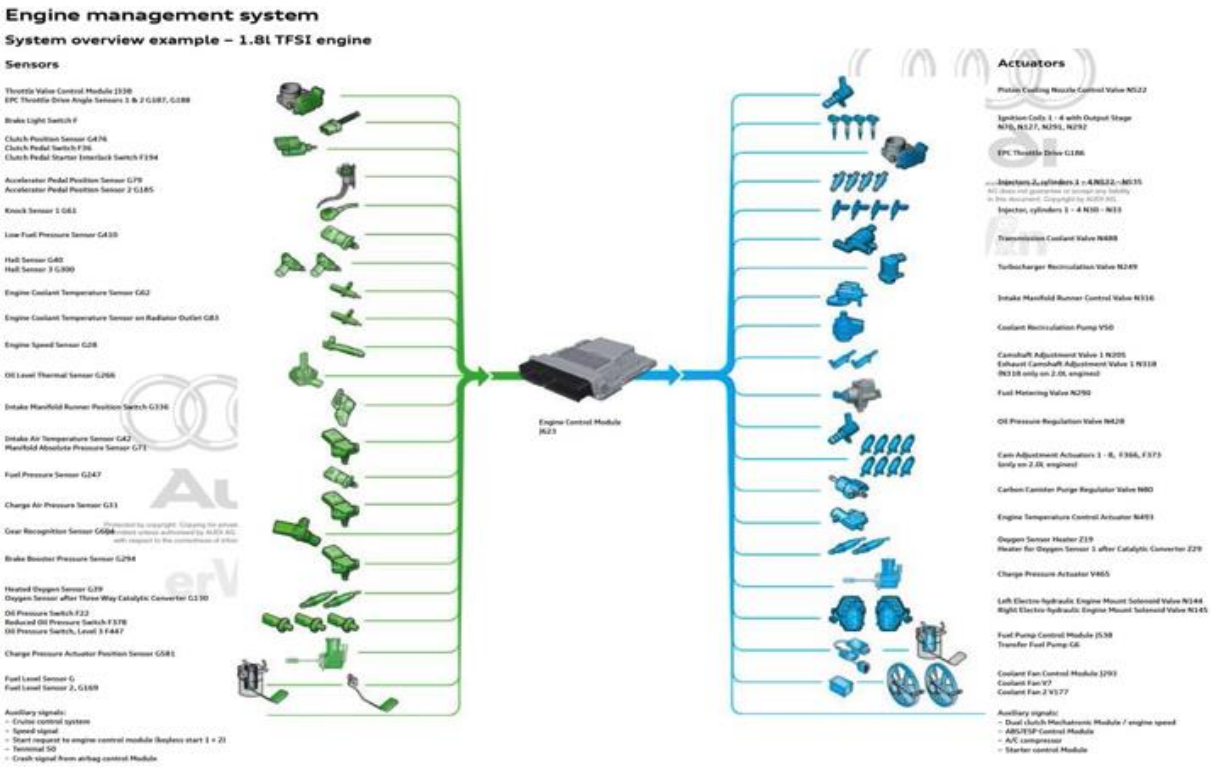
27. On information and belief, the Accused Instrumentalities infringe claim 1 of the ’287 patent. The ’287 patent Accused Instrumentalities practice a method controlling a positioning (*Figure 13*) device of an internal combustion engine (*Figure 13*), the method comprising the steps of: providing an electronic motor (*Figure 13*) for actuating said positioning device with a torque being applied to said motor over the positioning range and said torque changing sign thereby defining a torque reversal point (*Figure 13*); detecting a commanded

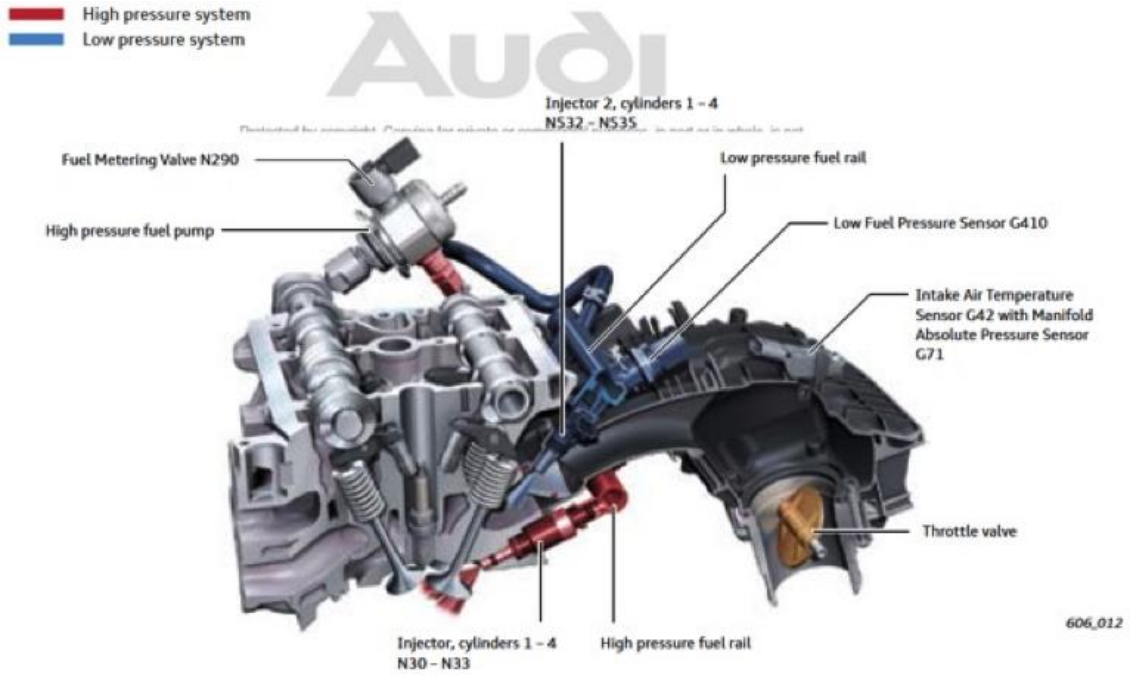
position of said positioning device (*Figure 13*); determining whether said positioning device's command is in the region of said torque reversal point (*Figure 13*); forming a drive signal for the motor on the basis of said commanded position for said positioning device (*Figure 13*); and changing said drive signal to abruptly change the motor voltage when said commanded position is in said region of said torque reversal point (*Figure 13*).

2.3 Electronic Throttle Control (ETC) System

The electronic throttle control (ETC) system consists of the accelerator-pedal module, the engine control module (ECM), and the electronic throttle body. The electronic throttle body mainly consists of the throttle valve, the electric throttle-valve drive element, and the throttle-valve position sensor (TPS). The drive element is a DC servomotor, which acts on the throttle-valve shaft via a gear unit. The throttle-valve position sensor is a redundant sensor system that detects the position of the throttle valve. The sensors have opposite resistance curves so that the ECM can always cross check the signals to ensure the correct position of the throttle valve is always known.

The driver command is detected by a redundant sensor system in the accelerator-pedal module, and the signal is sent to the engine control module. The engine control module then determines the required throttle-valve position by performing calculations from data measured by sensors such as accelerator pedal position sensor, engine speed sensor and vehicle speed sensor. The actual throttle opening can be more or less in proportion to accelerator pedal position given different engine operating points.





The positioning device (throttle valve) is within the Throttle Valve Control Module J338 shown above.

The Engine Control Module (ECM) controls the positioning device (throttle valve) of an internal combustion position. The positioning device (throttle valve) is within the Throttle Valve Control Module J338 shown above.

Figure 13

COUNT IV – INFRINGEMENT OF U.S. PATENT NO. 6,763,804

28. The allegations set forth in the foregoing paragraphs 1 through 27 are incorporated into this Forth Claim for Relief.

29. On July 20, 2004, U.S. Patent No. 6,763,804 ("the '804 patent"), entitled "Electronic Throttle Servo Overheat Protection System," was duly and legally issued by the United States Patent and Trademark Office. A true and correct copy of the '804 patent is attached as Exhibit 4.

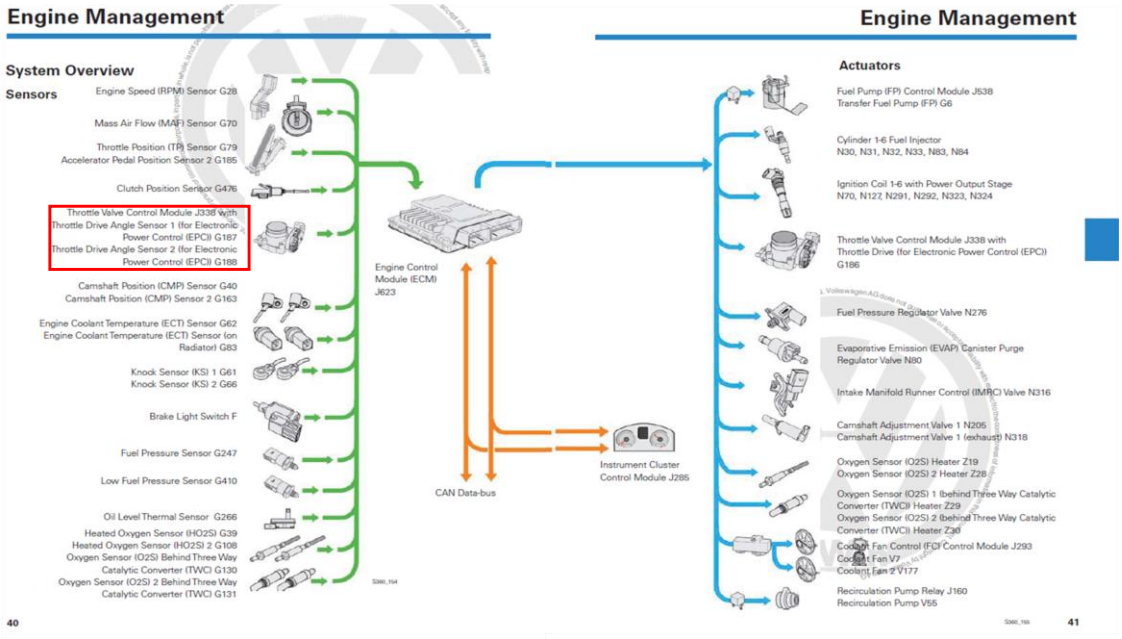
30. Plaintiff is the assignee and owner of the right, title and interest in and to the '804 patent, including the right to assert all causes of action arising under said patents and the right to any remedies for infringement of them.

31. Upon information and belief, Defendants have directly infringed at least claims 1 and 11 of the '804 patent by making, using, selling, importing and/or providing and causing to be used the 2013-2018 Passat, 2012-2016 CC, 2012-2017 Touareg, 2018-2019 Atlas, and 2012-2016 Porsche Cayenne (the "'804 patent Accused Instrumentalities").

32. In particular, claim 1 of the '804 patent recites a method for controlling a positioning device of an internal combustion engine, the method comprising the steps of: providing an electric motor for actuating the positioning device; commanding the positioning device to change to a commanded position; detecting a control effort required to change to said commanded position; determining whether said control effort exceeds a threshold for a predetermined time period; and reducing said control effort when said control effort exceeds said threshold for said predetermined time period; wherein commanding the positioning device to

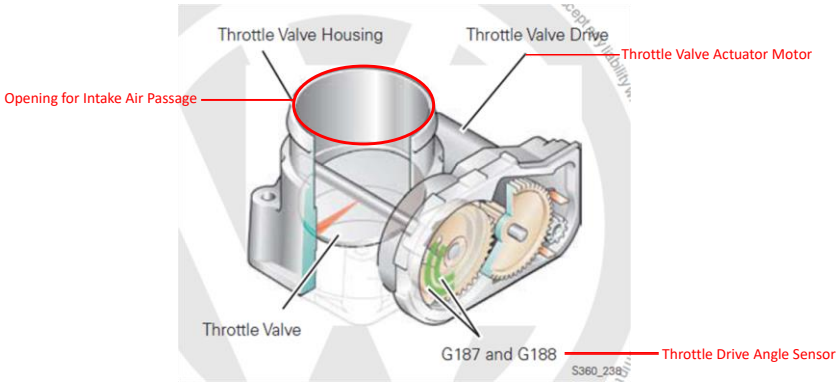
change to said commanded position comprises at least one of commanding the positioning device to open to a hold open mode and commanding the positioning device to close to a hold close mode.

33. On information and belief, the ’804 patent Accused Instrumentalities infringe at least claim 1 of the ’804 patent. The ’804 patent Accused Instrumentalities practice a method for controlling a positioning device of an internal combustion engine (*Figure 14*), the method comprising the steps of: providing an electric motor for actuating the positioning device (*Figure 15*); commanding the positioning device to change to a commanded position (*Figure 16*); detecting a control effort required to change to said commanded position (*Figure 17*); determining whether said control effort exceeds a threshold for a predetermined time period (*Figures 16-18*); and reducing said control effort when said control effort exceeds said threshold for said predetermined time period (*Figure 19*); wherein commanding the positioning device to change to said commanded position comprises at least one of commanding the positioning device to open to a hold open mode and commanding the positioning device to close to a hold close mode (*Figure 20*).



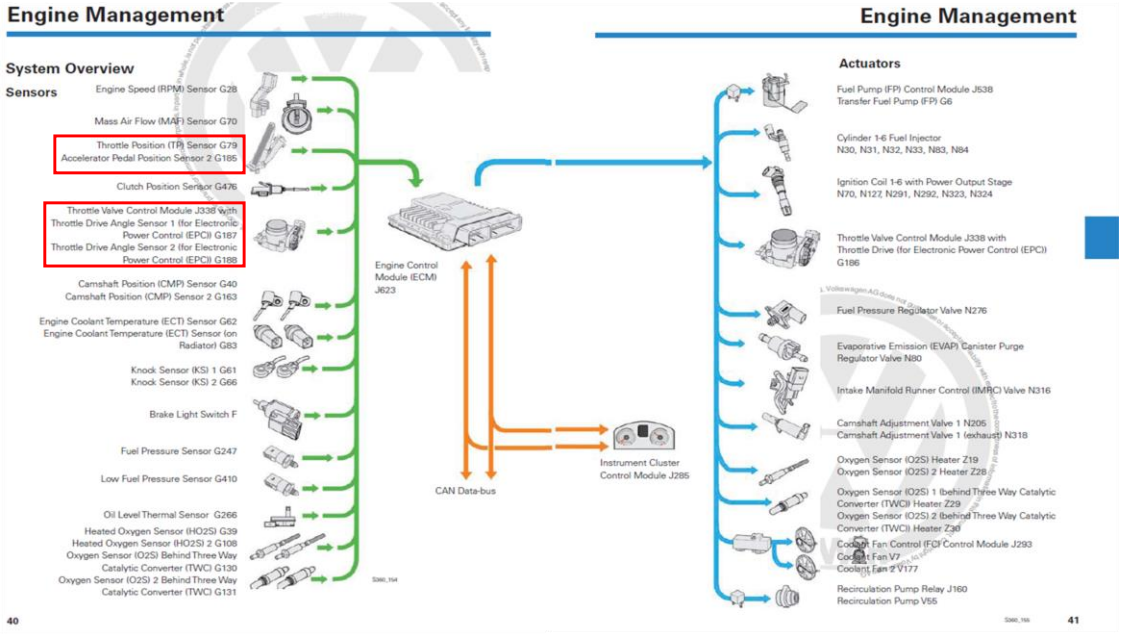
For example, as shown above the Engine Control Module (ECM) J623 controls a positioning device, the Throttle Valve Control Module J338 of an internal combustion engine (VW 3.2L & 3.6L).

Figure 14



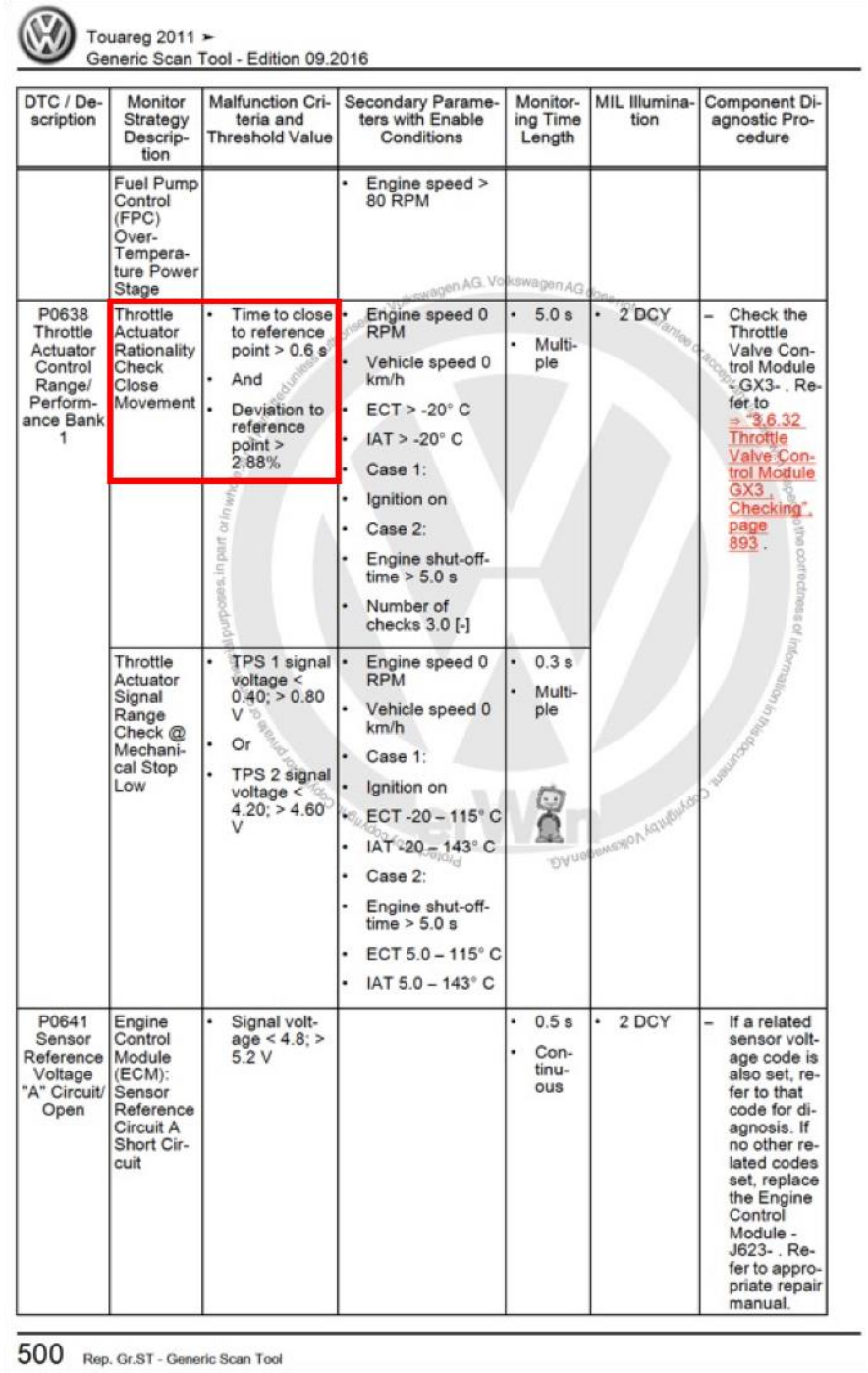
For example, as shown above, a positioning device, the Throttle Valve Control Module J338 of an internal combustion engine (VW 3.2L & 3.6L), is actuated via a Throttle Valve Actuator Motor.

Figure 15



For example, as shown above, a positioning device, the Throttle Valve Control Module J338 of an internal combustion engine (VW 3.2L & 3.6L), is actuated via a Throttle Valve Actuator Motor as commanded by the ECM, to change to a commanded position (based on the driver demand commanded from the Accelerator Position Sensor 2 G185).

Figure 16



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Fuel Pump Control (FPC) Over-Temperature Power Stage		• Engine speed > 80 RPM			
P0638 Throttle Actuator Control Range/ Performance Bank 1	Throttle Actuator Rationality Check Close Movement	• Time to close to reference point > 0.6 s • And • Deviation to reference point > 2.88%	• Engine speed 0 RPM • Vehicle speed 0 km/h • ECT > -20° C • IAT > -20° C • Case 1: • Ignition on • Case 2: • Engine shut-off-time > 5.0 s • Number of checks 3.0 [-]	• 5.0 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.32 Throttle Valve Control Module GX3 , Checking", page 893 .
	Throttle Actuator Signal Range Check @ Mechanical Stop Low	• TPS 1 signal voltage < 0.40; > 0.80 V • Or • TPS 2 signal voltage < 4.20; > 4.60 V	• Engine speed 0 RPM • Vehicle speed 0 km/h • Case 1: • Ignition on • ECT -20 – 115° C • IAT -20 – 143° C • Case 2: • Engine shut-off-time > 5.0 s • ECT 5.0 – 115° C • IAT 5.0 – 143° C	• 0.3 s • Multiple		
P0641 Sensor Reference Voltage "A" Circuit/ Open	Engine Control Module (ECM): Sensor Reference Circuit A Short Circuit	• Signal voltage < 4.8; > 5.2 V		• 0.5 s • Continuous	• 2 DCY	– If a related sensor voltage code is also set, refer to that code for diagnosis. If no other related codes set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.

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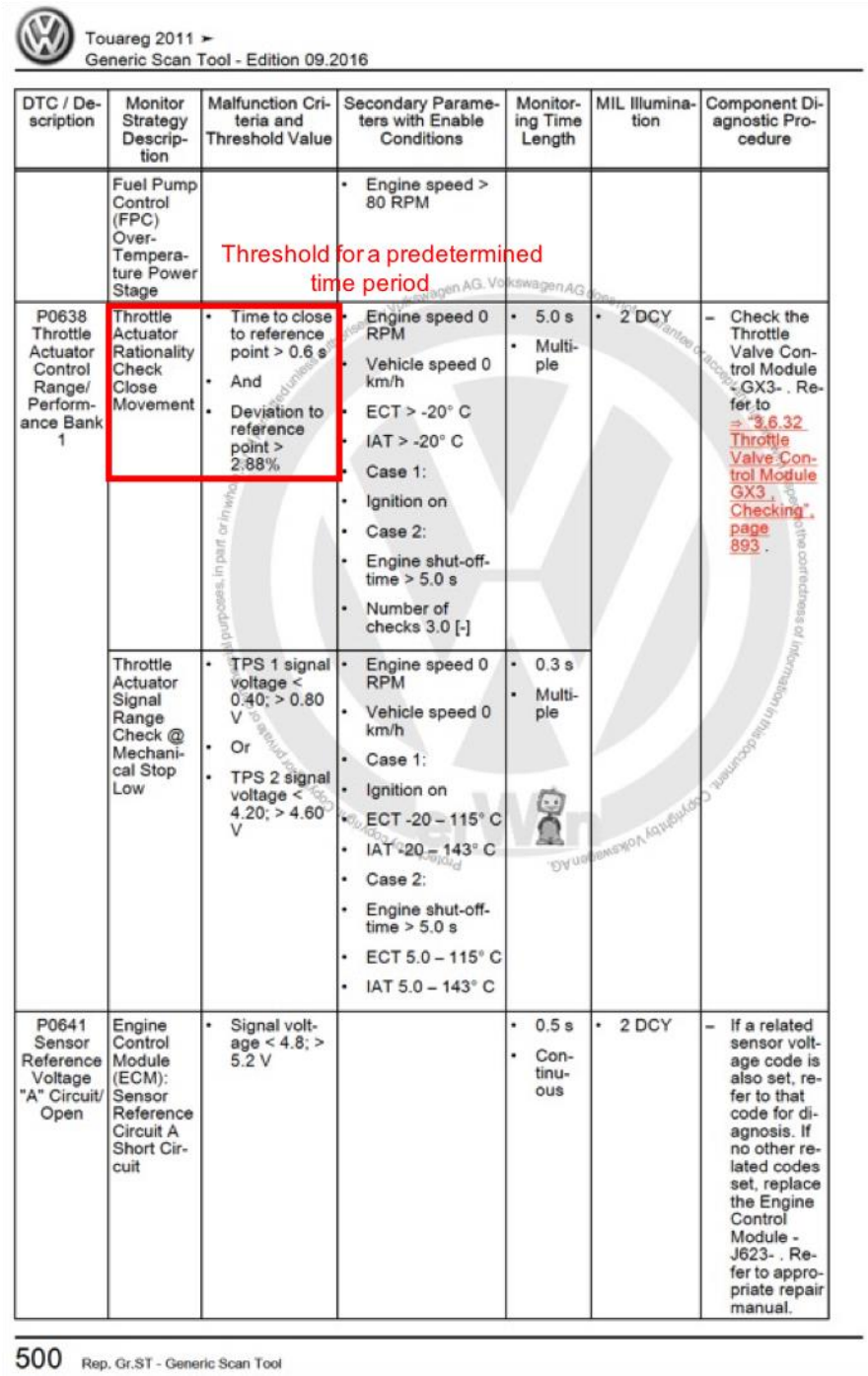
For example, control effort corresponds to the amount of motor torque that the Throttle Valve Control Module J338 requires to change the position of the throttle valve and this is related to the time it takes the Throttle Valve Control Module J338 to close to a reference point. The commanded position is determined by the Engine Control Module (ECM) J623 based on information from the Accelerator Position Sensor 2 G185 derived from driver demand, to change

to a commanded position (based on the driver demand commanded from the Accelerator Position Sensor 2 G185).

Figure 17



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Fuel Pump Control (FPC) Over-Temperature Power Stage	Threshold for a predetermined time period	• Engine speed > 80 RPM			
P0638 Throttle Actuator Control Range/ Performance Bank 1	Throttle Actuator Rationality Check Close Movement	• Time to close to reference point > 0.6 s • And • Deviation to reference point > 2.88%	• Engine speed 0 RPM • Vehicle speed 0 km/h • ECT > -20° C • IAT > -20° C • Case 1: • Ignition on • Case 2: • Engine shut-off-time > 5.0 s • Number of checks 3.0 [-]	• 5.0 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.32 Throttle Valve Control Module GX3 , Checking", page 893 .
	Throttle Actuator Signal Range Check @ Mechanical Stop Low	• TPS 1 signal voltage < 0.40; > 0.80 V • Or • TPS 2 signal voltage < 4.20; > 4.60 V	• Engine speed 0 RPM • Vehicle speed 0 km/h • Case 1: • Ignition on • ECT -20 – 115° C • IAT -20 – 143° C • Case 2: • Engine shut-off-time > 5.0 s • ECT 5.0 – 115° C • IAT 5.0 – 143° C	• 0.3 s • Multiple		
P0641 Sensor Reference Voltage "A" Circuit/ Open	Engine Control Module (ECM): Sensor Reference Circuit A Short Circuit	• Signal voltage < 4.8; > 5.2 V		• 0.5 s • Continuous	• 2 DCY	– If a related sensor voltage code is also set, refer to that code for diagnosis. If no other related codes set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.

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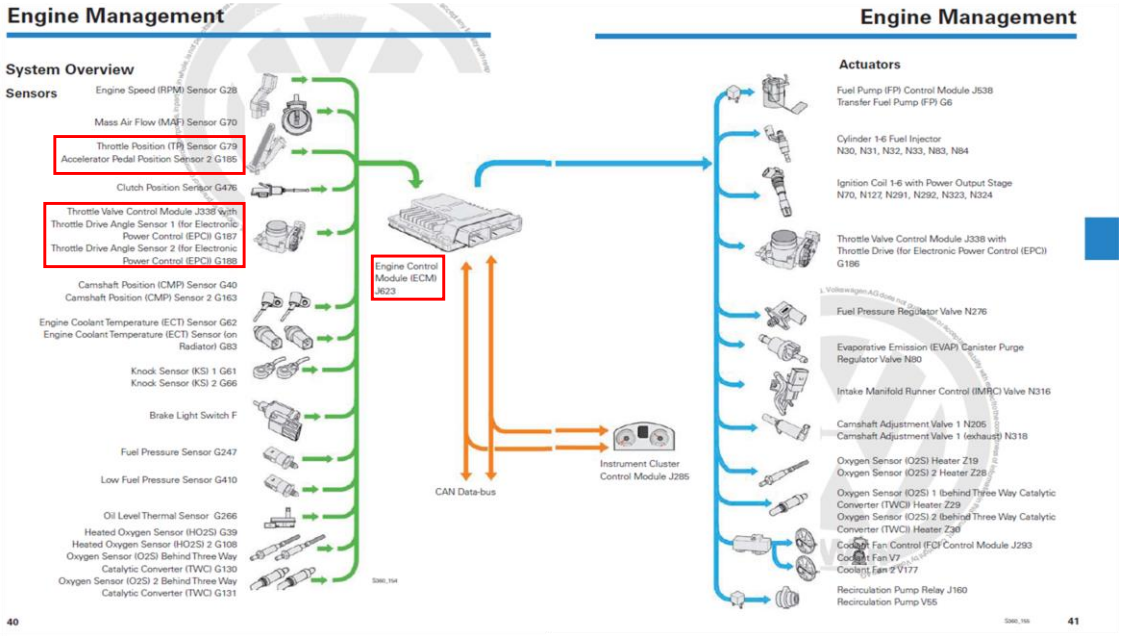
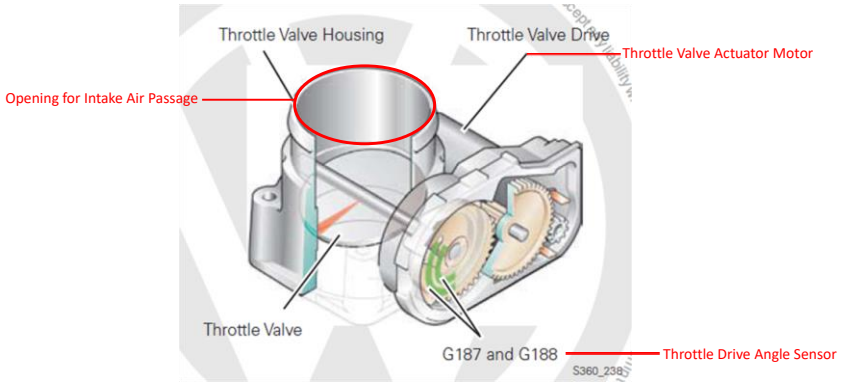
For example, as shown above, the threshold value demonstrates a determination being made by the Engine Control Module (ECM) J623 regarding whether a control effort exceeds a threshold for a predetermined time period.

Upon information and belief, the claim limitation "determining whether said control effort exceeds a threshold for said predetermined time period" is satisfied.

Figure 18

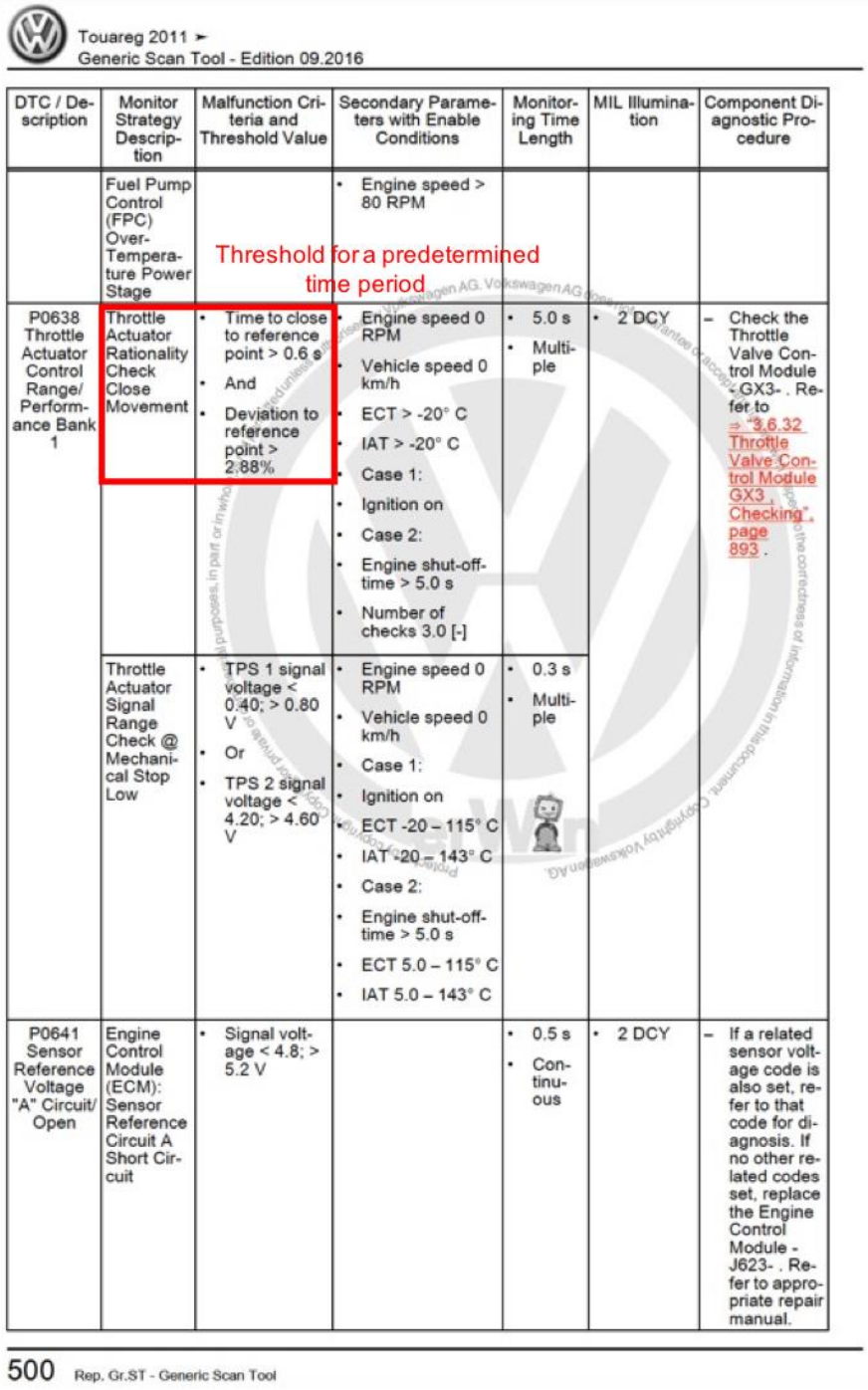




2.3 Electronic Throttle Control (ETC) System

The electronic throttle control (ETC) system consists of the accelerator-pedal module, the engine control module (ECM), and the electronic throttle body. The electronic throttle body mainly consists of the throttle valve, the electric throttle-valve drive element, and the throttle-valve position sensor (TPS). The drive element is a DC servomotor, which acts on the throttle-valve shaft via a gear unit. The throttle-valve position sensor is a redundant sensor system that detects the position of the throttle valve. The sensors have opposite resistance curves so that the ECM can always cross check the signals to ensure the correct position of the throttle valve is always known.

The driver command is detected by a redundant sensor system in the accelerator-pedal module, and the signal is sent to the engine control module. The engine control module then determines the required throttle-valve position by performing calculations from data measured by sensors such as accelerator pedal position sensor, engine speed sensor and vehicle speed sensor. The actual throttle opening can be more or less in proportion to accelerator pedal position given different engine operating points.



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Fuel Pump Control (FPC) Over-Temperature Power Stage	Threshold for a predetermined time period	• Engine speed > 80 RPM			
P0638 Throttle Actuator Control Range/ Performance Bank 1	Throttle Actuator Rationality Check Close Movement	• Time to close to reference point > 0.6 s • And • Deviation to reference point > 2.88%	• Engine speed 0 RPM • Vehicle speed 0 km/h • ECT > -20° C • IAT > -20° C • Case 1: • Ignition on • Case 2: • Engine shut-off-time > 5.0 s • Number of checks 3.0 [-]	• 5.0 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.32 Throttle Valve Control Module GX3 , Checking", page 893 .
	Throttle Actuator Signal Range Check @ Mechanical Stop Low	• TPS 1 signal voltage < 0.40; > 0.80 V • Or • TPS 2 signal voltage < 4.20; > 4.60 V	• Engine speed 0 RPM • Vehicle speed 0 km/h • Case 1: • Ignition on • ECT -20 – 115° C • IAT -20 – 143° C • Case 2: • Engine shut-off-time > 5.0 s • ECT 5.0 – 115° C • IAT 5.0 – 143° C	• 0.3 s • Multiple		
P0641 Sensor Reference Voltage "A" Circuit/ Open	Engine Control Module (ECM): Sensor Reference Circuit A Short Circuit	• Signal voltage < 4.8; > 5.2 V		• 0.5 s • Continuous	• 2 DCY	– If a related sensor voltage code is also set, refer to that code for diagnosis. If no other related codes set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.

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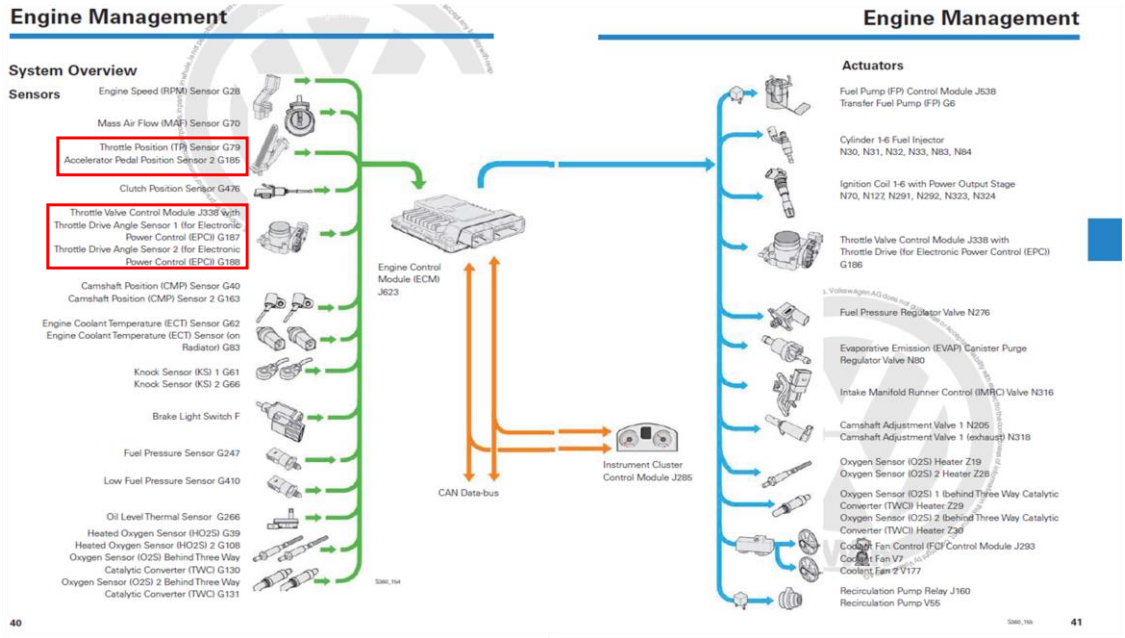
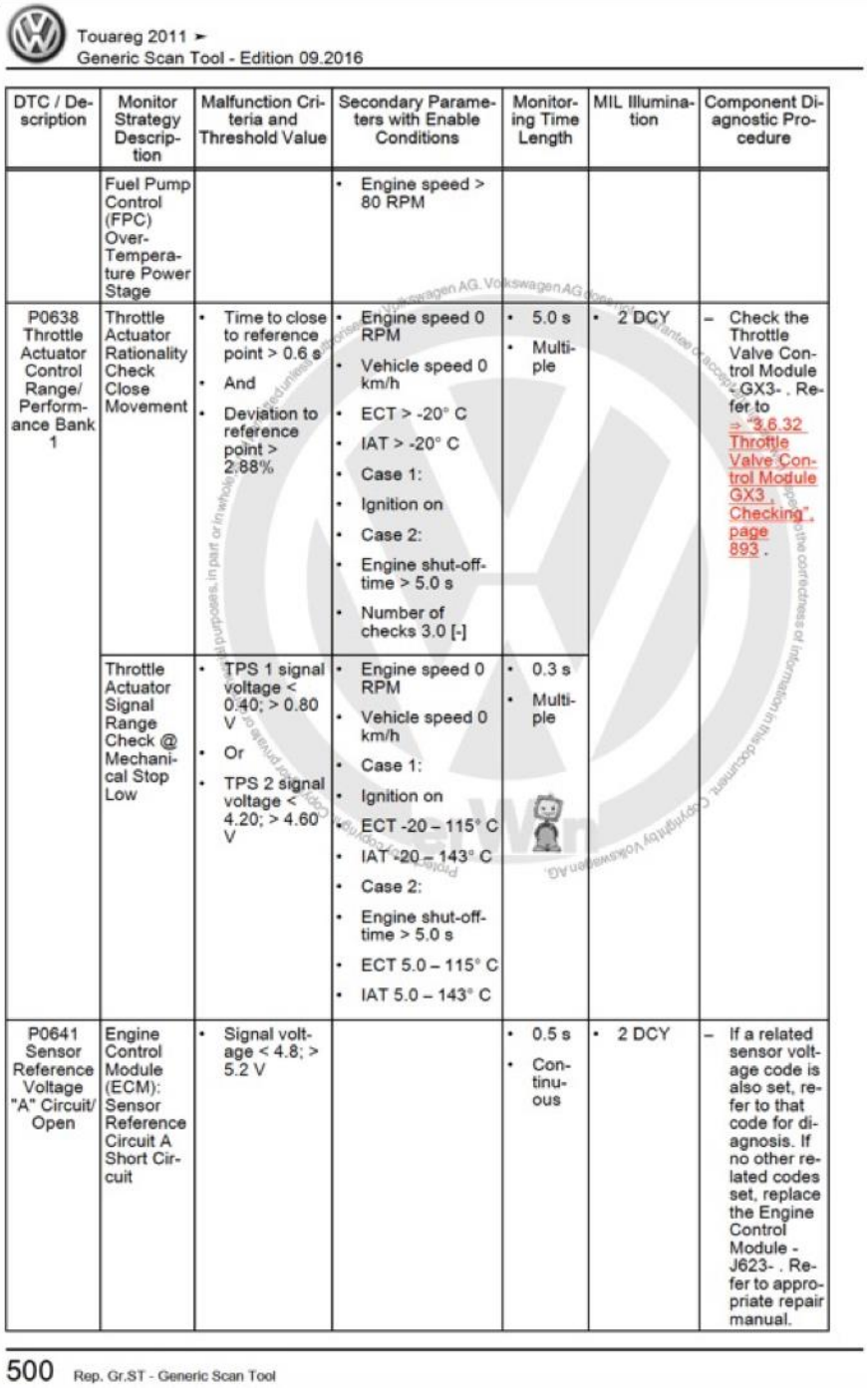
Control effort is provided by the Throttle Valve Actuator Motor based on the signal sent by the Engine Control Module (ECM) J623. The ECM signal is derived from the Accelerator Position Sensor 2 G185 based on driver demanded acceleration input. The throttle valve is actuated by the Throttle Valve Actuator Motor, sending a Throttle Drive Angle Sensor signals (1 & 2) to the ECM. The Throttle Actuator Control Rationality check shows a threshold valve. The Throttle Valve Actuator Motor will attempt to close the throttle valve within a time limit with feedback

from the Throttle Drive Angle Sensor signals (1 & 2), if the Throttle Drive Angle Sensor signals (1 & 2) indicate a time greater than the time limit, then the DTC will set.

On information and belief, the ECM hardware and software perform the step of "reducing said control effort when said control effort exceeds a threshold for a period."

Figure 19





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Generic Scan Tool - Edition 09.2016

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Fuel Pump Control (FPC) Over-Temperature Power Stage		• Engine speed > 80 RPM			
P0638 Throttle Actuator Control Range/ Performance Bank 1	Throttle Actuator Rationality Check Close Movement	• Time to close to reference point > 0.6 s • And • Deviation to reference point > 2.88%	• Engine speed 0 RPM • Vehicle speed 0 km/h • ECT > -20° C • IAT > -20° C • Case 1: • Ignition on • Case 2: • Engine shut-off-time > 5.0 s • Number of checks 3.0 [-]	• 5.0 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.32 Throttle Valve Control Module GX3 , Checking", page 893 .
	Throttle Actuator Signal Range Check @ Mechanical Stop Low	• TPS 1 signal voltage < 0.40; > 0.80 V • Or • TPS 2 signal voltage < 4.20; > 4.60 V	• Engine speed 0 RPM • Vehicle speed 0 km/h • Case 1: • Ignition on • ECT -20 – 115° C • IAT -20 – 143° C • Case 2: • Engine shut-off-time > 5.0 s • ECT 5.0 – 115° C • IAT 5.0 – 143° C	• 0.3 s • Multiple		
P0641 Sensor Reference Voltage "A" Circuit/ Open	Engine Control Module (ECM): Sensor Reference Circuit A Short Circuit	• Signal voltage < 4.8; > 5.2 V		• 0.5 s • Continuous	• 2 DCY	– If a related sensor voltage code is also set, refer to that code for diagnosis. If no other related codes set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.

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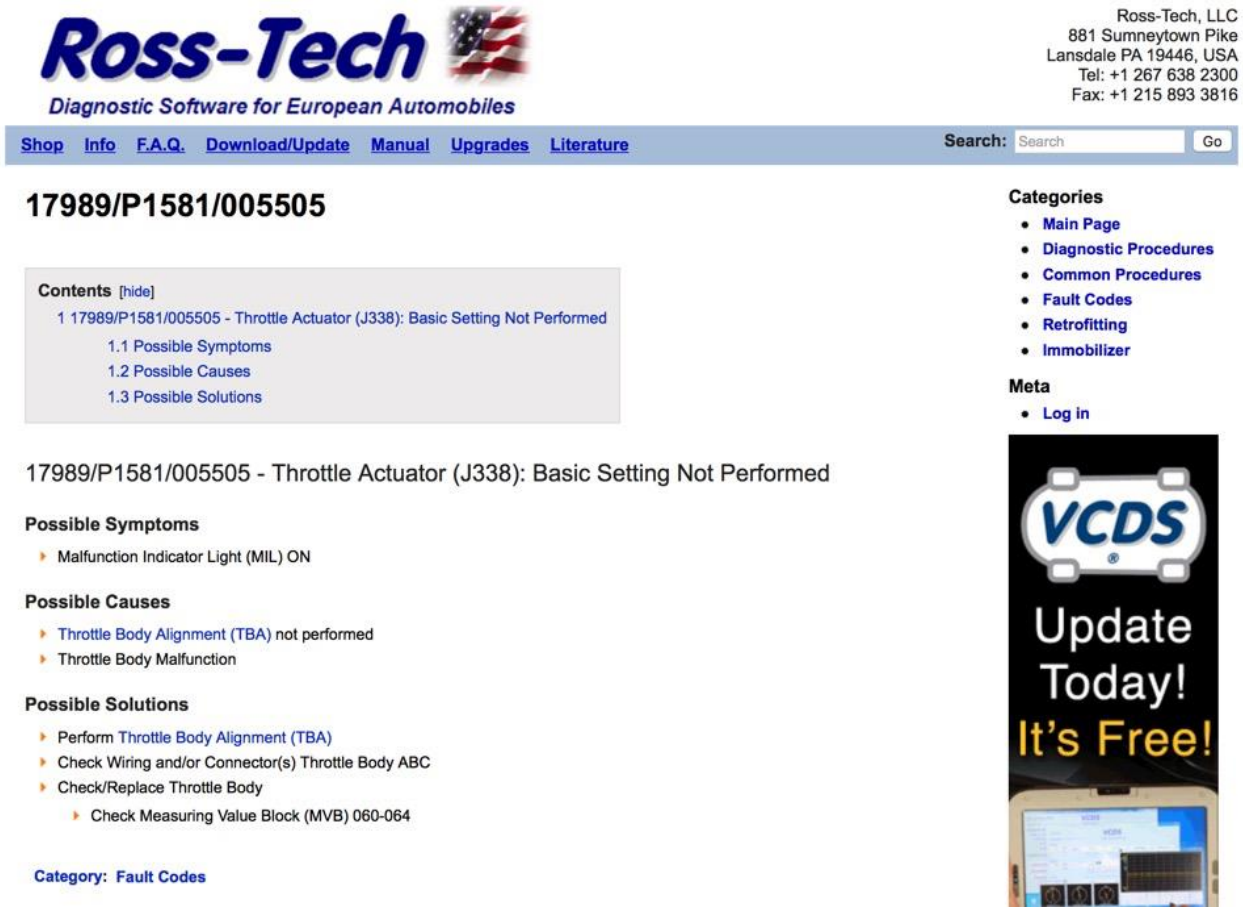


http://wiki.ross-tech.com/wiki/index.php/17989/P1581/005505

For example, as shown above, the positioning device, Throttle Valve Control Module J338, is commanded by Engine Control Module (ECM) J623, to change to a commanded position (upper position or lower position) comprising at least one of the commands to the positioning device to open to a hold open mode (upper position) and one of the commands to the positioning device to close to a hold close mode (mechanical stop low).

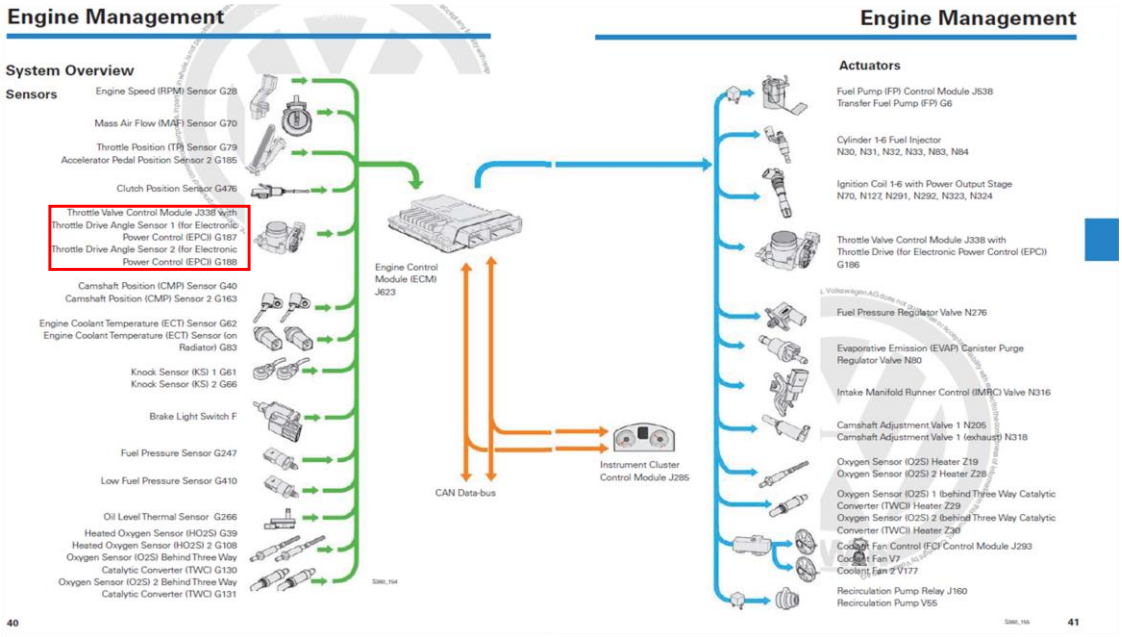
On information and belief, the ECM hardware and software perform the step of "commanding the positioning device to at least one of a hold open mode or a hold close mode."

Figure 20

34. Claim 11 of the '804 patent recites a system for controlling a positioning device of an internal combustion engine to prevent overheat conditions, the system comprising: an electric motor for actuating the positioning device with a control effort; a control effort detector coupled to said electric motor and intended to detect said control effort; and a controller coupled

to said electric motor and said control effort detector, said controller including control logic operative to command the positioning device to change to a commanded position, detect a control effort required to change to said commanded position, determine whether said control effort exceeds a threshold for a predetermined time period, and reduce said control effort when said control effort exceeds said threshold for said predetermined time period; wherein said controller further includes control logic operative to command the positioning device to close to said commanded position in a hold close mode.

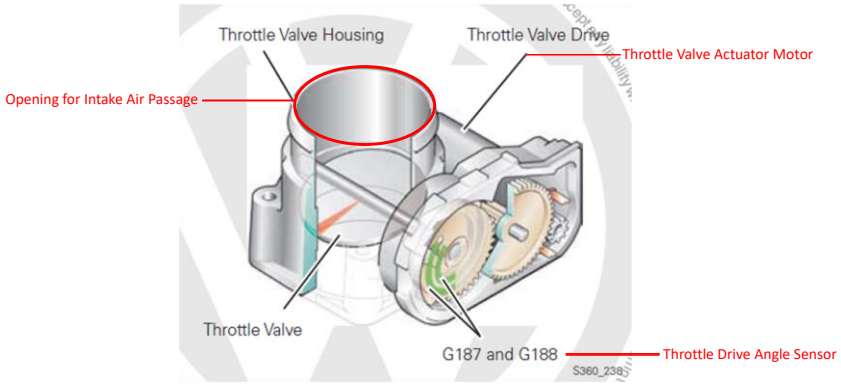
35. On information and belief, the ’804 patent Accused Instrumentalities infringe claim 11 of the ’804 patent. The ’804 patent Accused Instrumentalities comprise a system for controlling a positioning device of an internal combustion engine to prevent overheat conditions (*Figure 21*), the system comprising: an electric motor for actuating the positioning device with a control effort (*Figure 22*); a control effort detector coupled to said electric motor and intended to detect said control effort (*Figure 23*); and a controller coupled to said electric motor and said control effort detector, said controller including control logic operative to command the positioning device to change to a commanded position, detect a control effort required to change to said commanded position, determine whether said control effort exceeds a threshold for a predetermined time period, and reduce said control effort when said control effort exceeds said threshold for said predetermined time period (*Figure 24*); wherein said controller further includes control logic operative to command the positioning device to close to said commanded position in a hold close mode (*Figures 24-25*).



2.3 Electronic Throttle Control (ETC) System

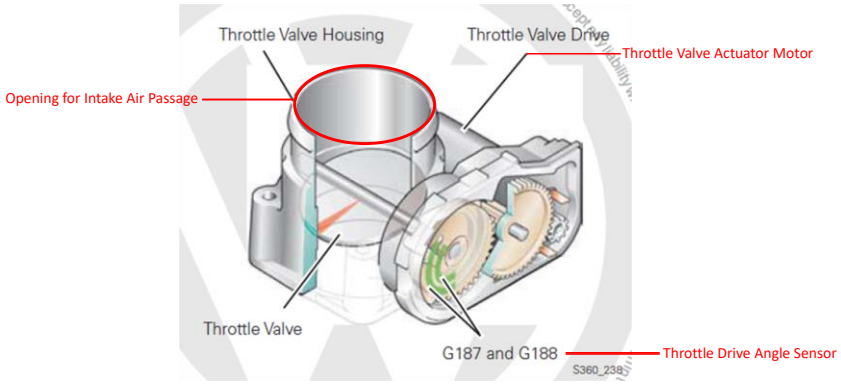
The electronic throttle control (ETC) system consists of the accelerator-pedal module, the engine control module (ECM), and the electronic throttle body. The electronic throttle body mainly consists of the throttle valve, the electric throttle-valve drive element, and the throttle-valve position sensor (TPS). The drive element is a DC servomotor, which acts on the throttle-valve shaft via a gear unit. The throttle-valve position sensor is a redundant sensor system that detects the position of the throttle valve. The sensors have opposite resistance curves so that the ECM can always cross check the signals to ensure the correct position of the throttle valve is always known.

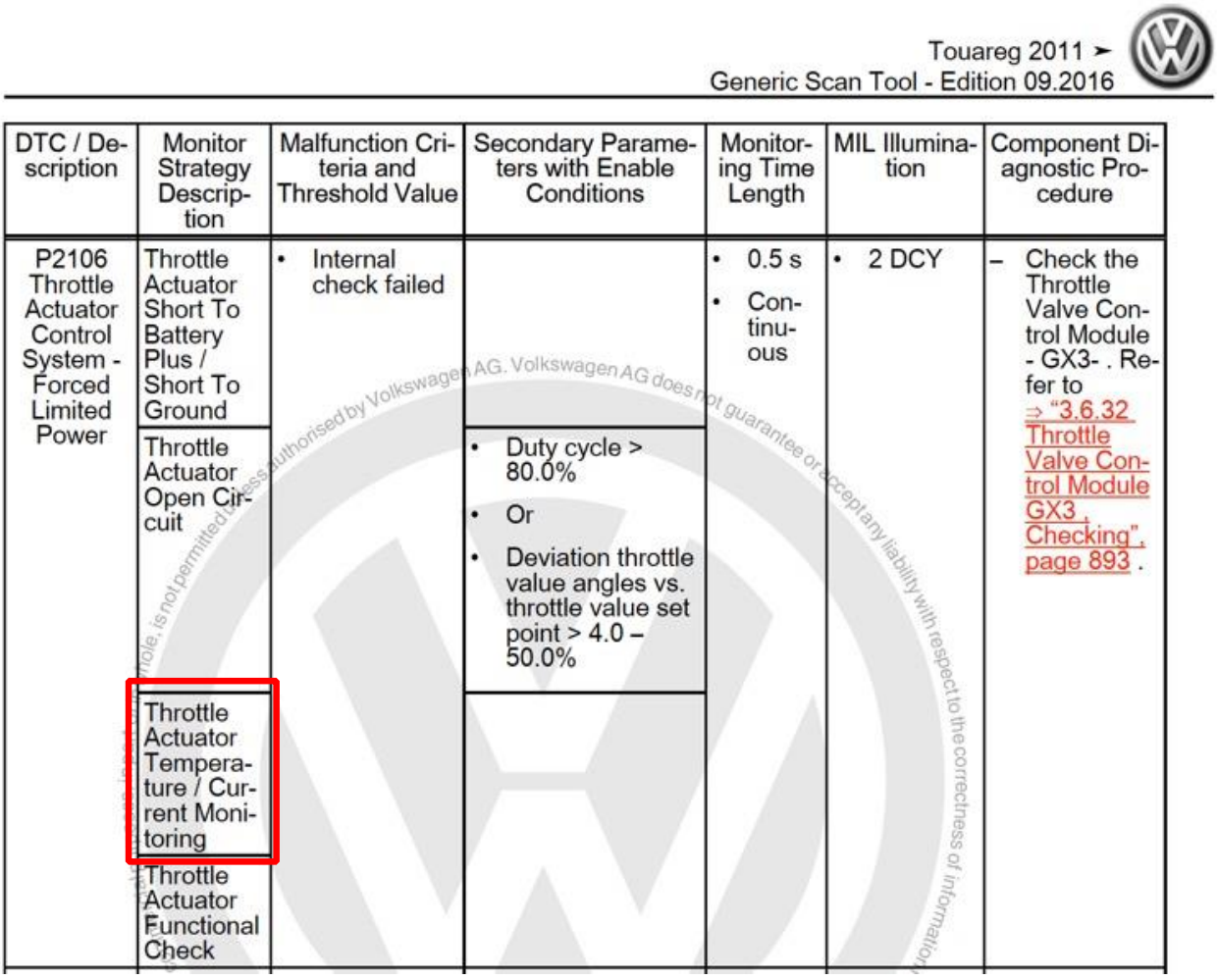
The driver command is detected by a redundant sensor system in the accelerator-pedal module, and the signal is sent to the engine control module. The engine control module then determines the required throttle-valve position by performing calculations from data measured by sensors such as accelerator pedal position sensor, engine speed sensor and vehicle speed sensor. The actual throttle opening can be more or less in proportion to accelerator pedal position given different engine operating points.



For example, as shown above the Engine Control Module (ECM) J623 controls a positioning device, the Throttle Valve Control Module J338 of an internal combustion engine (VW 3.2L & 3.6L), which comprises a system for controlling a positioning device of an internal combustion engine to prevent overheat condition.

Figure 21



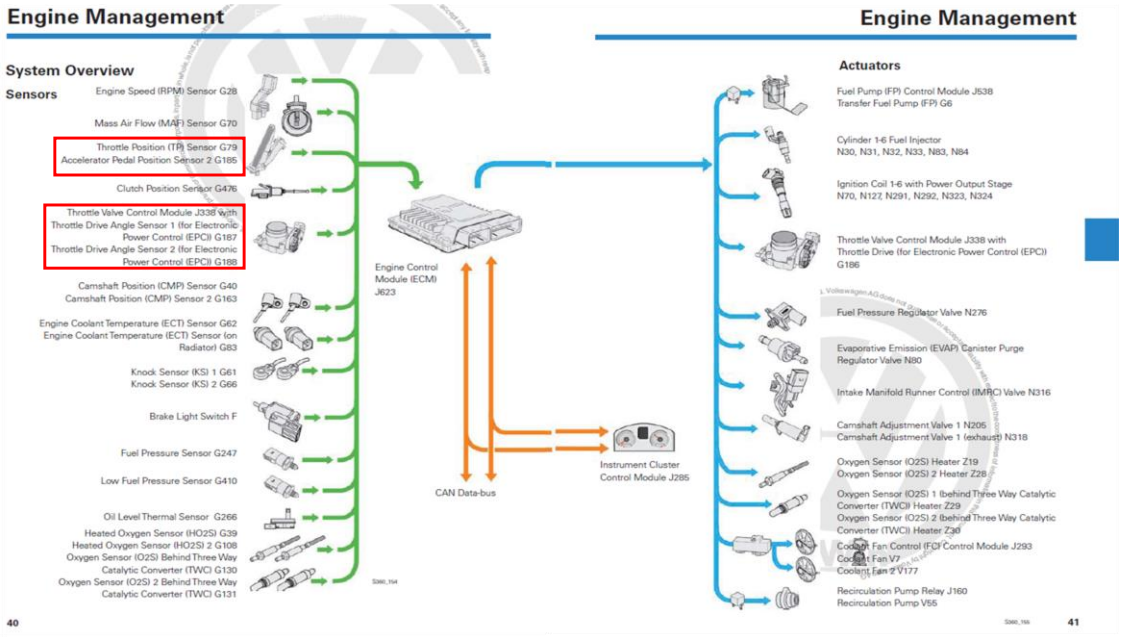


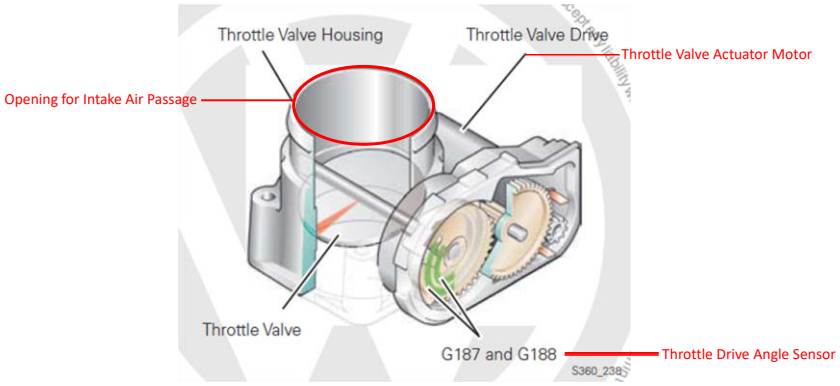
DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2106 Throttle Actuator Control System - Forced Limited Power	Throttle Actuator Short To Battery Plus / Short To Ground	• Internal check failed		• 0.5 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.32 Throttle Valve Control Module GX3 , Checking", page 893 .
	Throttle Actuator Open Circuit		• Duty cycle > 80.0% • Or • Deviation throttle value angles vs. throttle value set point > 4.0 – 50.0%			
	Throttle Actuator Temperature / Current Monitoring					
	Throttle Actuator Functional Check					

For example, as shown above, a positioning device, the Throttle Valve Control Module J338 of an internal combustion engine (VW 3.2L & 3.6L), is actuated via a Throttle Valve Actuator Motor with control effort indicated by the amount of current required to actuate the motor.

Figure 22

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2106 Throttle Actuator Control System - Forced Limited Power	Throttle Actuator Short To Battery Plus / Short To Ground	• Internal check failed		• 0.5 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.32 Throttle Valve Control Module GX3 , Checking", page 893 .
	Throttle Actuator Open Circuit		• Duty cycle > 80.0% • Or • Deviation throttle value angles vs. throttle value set point > 4.0 – 50.0%			
	Throttle Actuator Temperature / Current Monitoring					
	Throttle Actuator Functional Check					

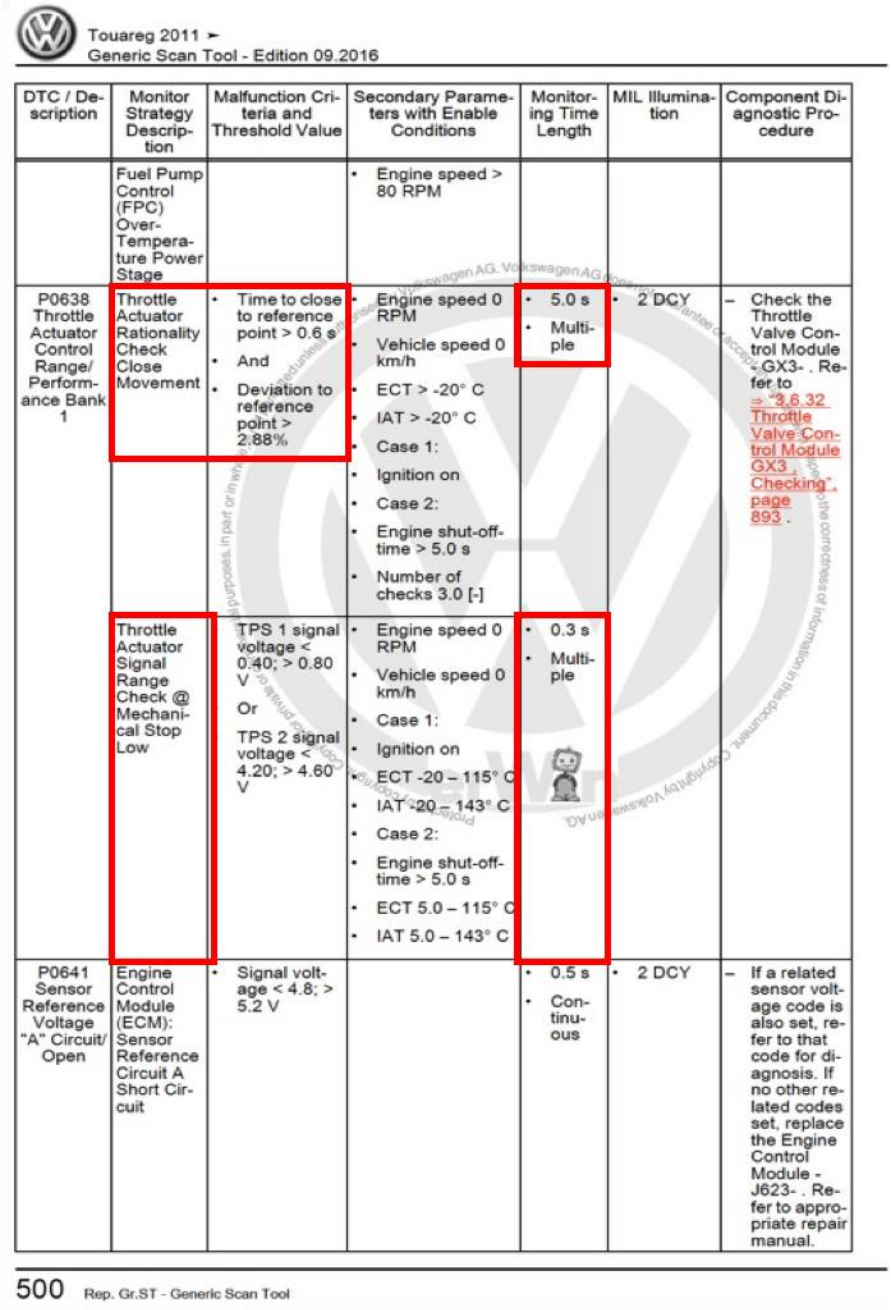




For example, as shown above, a control effort detector in the Engine Control Module (ECM) J623 is coupled to the Throttle Valve Actuator Motor and utilizes a diagnostic strategy (DTC P2106) to detect control effort indicated by the amount of current required to actuate the motor.

Figure 23

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2106 Throttle Actuator Control System - Forced Limited Power	Throttle Actuator Short To Battery Plus / Short To Ground	• Internal check failed		• 0.5 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.32 Throttle Valve Control Module GX3 , Checking", page 893 .
	Throttle Actuator Open Circuit		• Duty cycle > 80.0% • Or • Deviation throttle value angles vs. throttle value set point > 4.0 – 50.0%			
	Throttle Actuator Temperature / Current Monitoring					
	Throttle Actuator Functional Check					



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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Fuel Pump Control (FPC) Over-Temperature Power Stage		• Engine speed > 80 RPM			
P0638 Throttle Actuator Control Range/Performance Bank 1	Throttle Actuator Rationality Check Close Movement	• Time to close to reference point > 0.6 s • And • Deviation to reference point > 2.88%	• Engine speed 0 RPM • Vehicle speed 0 km/h • ECT > -20° C • IAT > -20° C • Case 1: • Ignition on • Case 2: • Engine shut-off-time > 5.0 s • Number of checks 3.0 [-]	• 5.0 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.32 Throttle Valve Control Module GX3 , Checking", page 893 .
	Throttle Actuator Signal Range Check @ Mechanical Stop Low	TPS 1 signal voltage < 0.40; > 0.80 V Or TPS 2 signal voltage < 4.20; > 4.60 V	• Engine speed 0 RPM • Vehicle speed 0 km/h • Case 1: • Ignition on • ECT -20 – 115° C • IAT -20 – 143° C • Case 2: • Engine shut-off-time > 5.0 s • ECT 5.0 – 115° C • IAT 5.0 – 143° C	• 0.3 s • Multiple		
P0641 Sensor Reference Voltage "A" Circuit/Open	Engine Control Module (ECM): Sensor Reference Circuit A Short Circuit	• Signal voltage < 4.8; > 5.2 V		• 0.5 s • Continuous	• 2 DCY	– If a related sensor voltage code is also set, refer to that code for diagnosis. If no other related codes set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.

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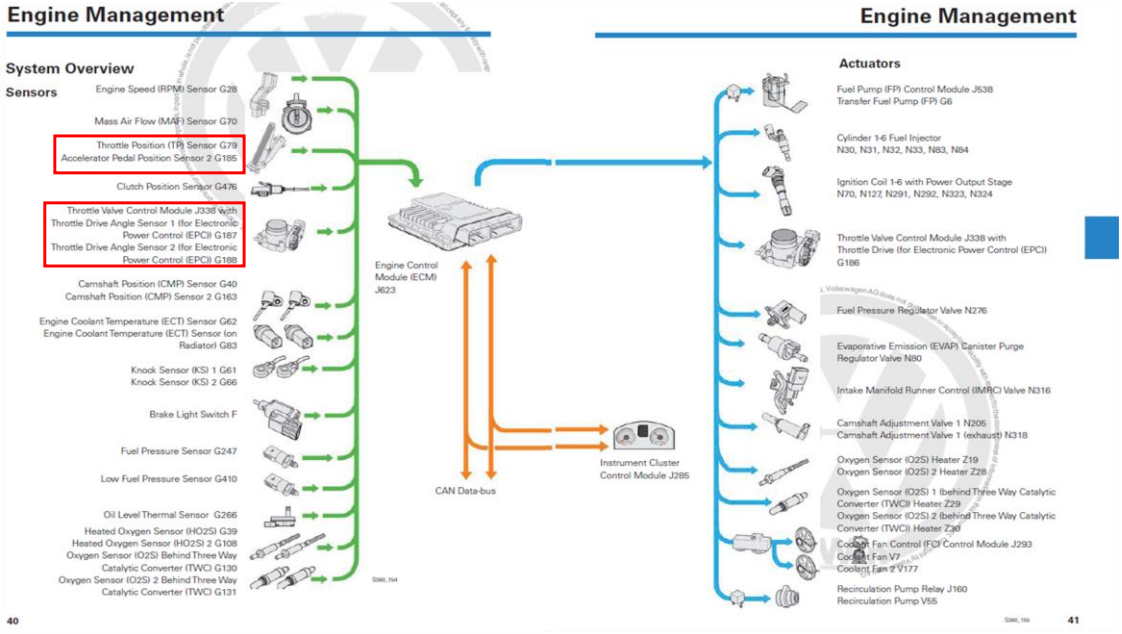
For example, as shown above, a control effort detector in the Engine Control Module (ECM) J623 is coupled to the Throttle Valve Actuator Motor and includes software-implemented control logic operative to command the positioning device to change to a commanded position (P0638), detect a control effort required to change to said commanded position (P2106), determine whether said control effort exceeds a threshold (Throttle Actuator Temperature/Current Monitoring), continuously monitor which continuously monitors the Throttle Actuator Control System, for a predetermined time period (Time to close to reference point > 0.6 s), and reduce

said control effort when said control effort exceeds said threshold for said predetermined time period.

On information and belief, the ECM hardware and software "reduce[s] said control effort when said control effort exceeds said threshold for said predetermined time period."

Figure 24



For example, as shown above (and in Figure 36), the Engine Control Module (ECM) J623 is a controller with control logic to command the positioning device, the Throttle Valve Control Module J338, to close to said commanded position in a hold close mode (P0638).

Figure 25

Based upon the totality of the foregoing evidence, and based further upon information and belief, the '804 patent Accused Instrumentalities practice a method for controlling a positioning device of an internal combustion engine, the method comprising the steps of: providing an electric motor for actuating the positioning device; commanding the positioning device to change to a commanded position; detecting a control effort required to change to said commanded position; determining whether said control effort exceeds a threshold for a predetermined time period; and reducing said control effort when said control effort exceeds said threshold for said predetermined time period; wherein commanding the positioning device to change to said commanded position comprises at least one of commanding the positioning device to open to a hold open mode and commanding the positioning device to close to a hold close mode.

DIRECT INFRINGEMENT, INDIRECT INFRINGEMENT,

DAMAGES AND WILLFUL INFRINGEMENT

36. The allegations set forth in the foregoing paragraphs 1 through 35 are incorporated into this Fifth Claim for Relief.

37. Defendants were made aware of the patents-in-suit at least as early as March 4, 2015, when it was provided notice of the patents via letter.

38. Upon information and belief Defendants' conduct in making, using, selling, offering to sell and/or importing the Accused Instrumentalities directly infringes at least claim 1 of the '260 patent; claim 1 of the '128 patent; claims 1 and 11 of the '804 patent; and claim 1 of the '287 patent pursuant to 35 U.S.C. § 271(a). Infringement of these representative claims is alleged solely for illustrative pleading purposes. Michigan Motor reserves the right to assert infringement of additional claims of the Patents-in-Suit as this action proceeds.

39. Upon information and belief, since at least the time of receiving this Amended Complaint, Defendants have induced and continue to induce others to infringe at least claim 1 of the '260 patent; claim 1 of the '128 patent; claim 1 of the '287 patent; and claims 1 and 11 of the '804 patent under 35 U.S.C. § 271(b) by, among other things, and with specific intent or willful blindness, actively aiding and abetting others to infringe, including but not limited to Defendant's partners and customers, whose use of the Accused Instrumentalities constitutes direct infringement of at least the aforementioned claims. Infringement of these representative claims is alleged solely for illustrative pleading purposes. Michigan Motor reserves the right to assert infringement of additional claims of the Patents-in-Suit as this action proceeds.

40. In particular, Defendants' actions that aid and abet others such as their partners and customers to infringe include distributing the Accused Instrumentalities and providing

materials and/or services related to the Accused Instrumentalities. On information and belief, the Defendants have engaged in such actions with specific intent to cause infringement or with willful blindness to the resulting infringement because Defendants have had actual knowledge of the patents-in-suit and that its acts were inducing infringement of said patents since at least the time of receiving this Amended Complaint.

41. Upon information and belief, each Defendant is liable as a contributory infringer of the Patents-in-Suit under 35 U.S.C. § 271(c) by offering to sell, selling and importing into the United States the Accused Instrumentalities to be especially made or adapted for use in infringement of the Patents-in-Suit. The Accused Instrumentalities are material components for use in practicing the Patents-in-Suit and are specifically made and are not a staple article of commerce suitable for substantial non-infringing use.

42. On information and belief, since Defendants received notice of the patents, Defendants' infringement has been and continues to be willful.

43. Michigan Motor has been harmed by the Defendants' infringing activities.

JURY DEMAND

Pursuant to Rule 38 of the Federal Rules of Civil Procedure, Plaintiff demands a trial by jury on all issues triable as such.

PRAYER FOR RELIEF

WHEREFORE, Plaintiff demands judgment for itself and against Defendants as follows:

A. An adjudication that Defendants have infringed the '260, '128, '804, and '287 patents;

B. An award of damages to be paid by Defendants adequate to compensate Plaintiff for Defendants' past infringement of the '260, '128, '804, and '287 patents;

C. and any continuing or future infringement through the date such judgment is entered, including interest, costs, expenses and an accounting of all infringing acts including, but not limited to, those acts not presented at trial;

D. A declaration that this case is exceptional under 35 U.S.C. § 285, and an award of Plaintiff's reasonable attorneys' fees; and

E. An award to Plaintiff of such further relief at law or in equity as the Court deems just and proper.

Dated: January 6, 2020

/s/ Eric A. Bean
Eric A. Bean
ebean@jackiergould.com
JACKIER GOULD, P.C.
121 West Long Lake Rd., Suite 200
Bloomfield Hills, MI 48304
Telephone: (248) 433-2577
Facsimile: (248) 642-5241

/s/ Timothy Devlin
Timothy Devlin (DE 4241)
Robyn T. Williams
tdevlin@devlinlawfirm.com
rwilliams@devlinlawfirm.com
DEVLIN LAW FIRM LLC
1306 N. Broom Street, First Floor
Wilmington, DE 19806
Telephone: (302)-449-9010

Attorneys for Plaintiff
MICHIGAN MOTOR TECHNOLOGIES LLC