11/5/05
2004

Memorandum

US Department
Of Transportation

National Highway
Traffic Safety
Administration

Vehicle Research and Test Center P.O. Box 937
East Liberty, Ohio 43319
(937) 666-4511

Subject: DRAFT FIELD REPORT: VRTC-DCD2042
"A Determination of Throttle Performance Degradation on Certain 1999-2002 GM Pickup Trucks"

Date: DEC 22 2004

From: Michael W. Monk
Director, Vehicle Research & Test Center

Reply to Attn. Of: NVS-310

To: Kathleen C. DeMeter
Director, Office of Defects Investigation

NVS-210

Attached is a draft copy of the subject report. The final report will be submitted within 30 days after receipt of comments from the Office of Defects Investigation.

Attachment

#

RECEIVED
2004 DEC 30 P 3:31

1/5/05
dsay

DRAFT FIELD REPORT: VRTC-DCD2042
"A Determination of Throttle Performance Degradation on Certain 1999-2002 GM Pickup Trucks"

DEC 22 2004

Michael W. Monk
Director, Vehicle Research & Test Center
NVS-310

Kathleen C. DeMeter
Director, Office of Defects Investigation
NVS-210

Attached is a draft copy of the subject report. The final report will be submitted within 30 days after receipt of comments from the Office of Defects Investigation.

Attachment

#

NVS-310:JHHAGUE:jaw:937-666-4511, ext. 265:12/17/2004
Copies to: NVS-310 Chron
Hague
Gardner
Willke
Kirkbride
VRTC-DCD2042 File

Date Mailed:_____

CONCURRENCES
RTG SYMBOL
INITIALS/SIG T.G.
DATE 12-17-04
RTG SYMBOL
INITIALS/SIG JHH
DATE 12-17-04
RTG SYMBOL NVS-313
INITIALS/SIG KLK
DATE 12/20/04
RTG SYMBOL
INITIALS/SIG
DATE
RTG SYMBOL
INITIALS/SIG
DATE
RTG SYMBOL
INITIALS/SIG
DATE
RTG SYMBOL
INITIALS/SIG
DATE

GRID

Form DOT F 1320.65 (Rev. 5/83)
Supersedes previous edition

OFFICIAL FILE COPY

DRAFT

1/5/05
dlm

Draft Memorandum Report

A Determination of Throttle Performance Degradation on Certain 1999-2002 GM Pickup Trucks

December 2004

VRTC-DCD2042 (EA02-015)
Throttle Control Sticking on Certain 1999-2002 GM Pickups and SUVs

This examination was performed at the Vehicle Research and Test Center (VRTC) in response to a request from the Office of Defects Investigation (ODI), National Highway Traffic Safety Administration (NHTSA). The ODI has received complaints alleging that the throttle blade of the subject vehicles can stick in the closed position or less frequently in a partially open position. Excessive accelerator pedal force may be needed to overcome the sticking condition, resulting in accelerator pedal overshoot and vehicle surge, possibly resulting in a crash or injury. The subject vehicles were 1999 through 2002 Chevrolet Silverado and Tahoe, GMC Sierra and Yukon, and Cadillac Escalade equipped with 4.8 L 5.3 L, or 6.0 L V-8 engines equipped with mechanical throttle bodies. Figure 1 is a photograph of a subject vehicle.

The throttle body on the subject vehicles is an aluminum alloy casting which contains the throttle blade. The throttle blade (throttle) is connected to the accelerator pedal by a shaft, bell crank, and throttle cable. Depressing the accelerator pedal causes the throttle in the throttle body to open, allowing more air into the engine, causing the engine to produce more power. Releasing the accelerator pedal allows a throttle return spring to close the throttle, causing the engine to produce less power.

Figure 1 - Subject Vehicle- 2000 MY GMC Sierra

According to the ODI, sources at GM indicated that it had been determined that a "gummy coke deposit" can form on the bore of the throttle body. These deposits can cause the throttle to stick in the closed position and cause a higher than expected throttle opening effort. GM stated that these deposits are the result of engine oil compounds that enter the intake manifold through the positive crankcase ventilation

system of the engine. These deposits accumulate gradually through engine usage. GM issued a technical service bulletin (GM TSB 02-06-04-054B) that addressed this condition. A copy of this service bulletin is included in Attachment 1.

The objective of this test program was to inspect the throttle control system in a sample population of subject vehicles in order to quantify the amount of force required to move the accelerator pedal from the idle position and to determine how much, if any, was caused by throttle body stiction. An additional objective was to determine if excessive accelerator pedal force and/or extraordinary control input were required to safely operate these vehicles when maneuvering in close quarters.

The vehicles used for this test program included those owned by consumers and those available for sale on independent used vehicle resale lots.

A list of registered vehicle owners for 1999 Chevrolet and GMC pick-up trucks was purchased from the Ohio Bureau of Motor Vehicles (OBMV). Eighty-six owners, living within a radius of approximately 60 miles from VRTC, were arbitrarily selected from the OBMV list. A letter, which included a questionnaire and a prepaid postage return-mail envelope, was mailed to these owners. The letters identified VRTC, described the alleged defect, and requested that the owner fill out and return the included questionnaire. The letter also indicated that someone from VRTC might contact them by telephone during the next few weeks to speak to them about inspecting the throttle system on their vehicle. The purpose of the letter was to

establish credibility for the questionnaire and potential telephone call from VRTC so that the vehicle owner would not mistake the telephone call for a telemarketing scheme.

The purpose of the telephone call was to obtain permission to inspect their vehicle. If the owners agreed, an appointment was made for the authors to inspect the throttle system on the subject vehicle. Attachment 2 includes a sample copy of the letter and questionnaire.

Ten of the 86 questionnaires mailed were returned having been marked "return to sender." Seventy-three responses were received from the remaining 76 recipients. Of those 73 responses, six indicated they no longer owned the subject vehicle, 12 indicated they had no throttle problems, and the remaining 55 indicated that they had experienced the problem related to the throttle.

The 20 consumer or privately owned vehicles (POVs) used in this test program were arbitrarily chosen from those vehicles whose owners: a) indicated they had experienced the problem, b) listed a telephone number in the local telephone number directories, c) answered their telephone when VRTC called, and d) agreed to have their vehicles inspected.

In addition to the 20 POVs, another 11 subject vehicles, arbitrarily selected from those available on local used vehicle resale lots, were inspected

When an appointment was made, the authors met with the owner or resale lot operator, documented the vehicle information, and examined the throttle system using the procedure outlined on the vehicle data sheet. A copy of this data sheet is included in Attachment 3. The exterior of each vehicle and the FMVSS label on the doorjamb were photographed.

It was desired to perform the inspection initially on a cold engine, followed by a warm engine, but not all vehicles were available for inspection with a "cold" engine. However, all of the vehicles were inspected with the engines warmed up, i.e. with the engine at normal operating temperature, when the maximum amount of the throttle stiction was expected to occur.

Since the engine would be operated, the inspection began with checking the engine oil and coolant levels, along with measuring and recording the temperature of the throttle body.

With the engine off and cold (if possible), the accelerator pedal was pushed at the middle of pedal with a hand-held force gauge. The maximum force required to move the accelerator pedal off the idle position was measured and recorded. The force required to keep the accelerator pedal slightly above the idle position was also measured and recorded. Figure 2 is a photograph of an accelerator pedal in a subject vehicle being depressed with the force gauge.

Some degree of throttle stiction is normal and exists in all vehicles. In order to determine whether the source of the stiction was the throttle or the throttle actuation system, the force required to open the throttle at the throttle body was also measured.

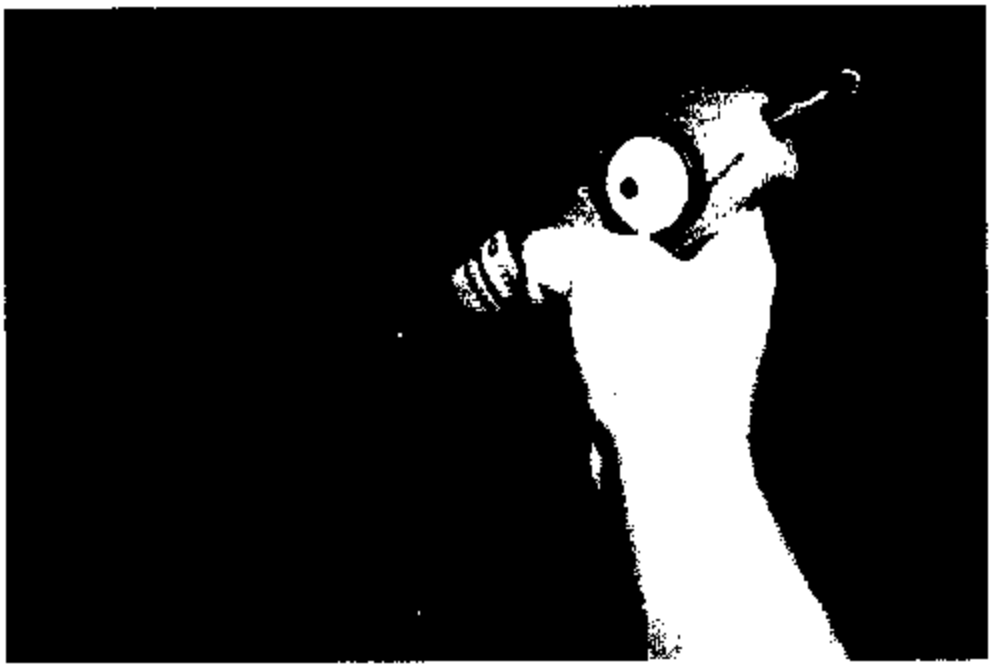


Figure 2- Measuring Accelerator Pedal Force of a Subject Vehicle with a Hand-Held Force Gauge

The plastic intake manifold cover was removed by removing the two fasteners that attach it to the engine. The throttle cable was disconnected from the throttle bell crank. One end of an adapter cable, designed and fabricated by VRTC, was connected to the throttle bell crank and the other end was connected to the force gauge. The maximum force required to move the throttle from the idle position, by pulling along an axis similar to the axis of the throttle cable of the vehicle ("on axis"), was measured and recorded. The sustained force, along this axis, required to keep the throttle slightly above the idle position was also measured and recorded.

Although the "on axis" measurements were of primary interest, the "pull" measurements were also taken along an axis orthogonal to the throttle bore and planar with the throttle blade ("off axis"). It was postulated that by comparing the "on axis" force with the "off axis" force, the extent of any throttle bore "gummy coke deposits" could be predicted. However, an analysis of the "off axis" measurements indicated that detailed laboratory examinations would be needed to produce useful information concerning the condition of the throttle bore based upon "off axis" measurements.

Figure 3 is a photograph of an "or-axis" measurement being taken on a typical subject vehicle (Note: For photographic clarity the pull axis has been elevated slighted above the true "on axis" alignment.).

The throttle cable was reconnected to the throttle body. The service brake was applied, the engine in the vehicle was started, and the transmission selector lever was moved to the Drive position. The maximum force required to move the throttle off the idle position and the force required to keep the throttle slightly above the idle position were measured and recorded as above when the engine was off.

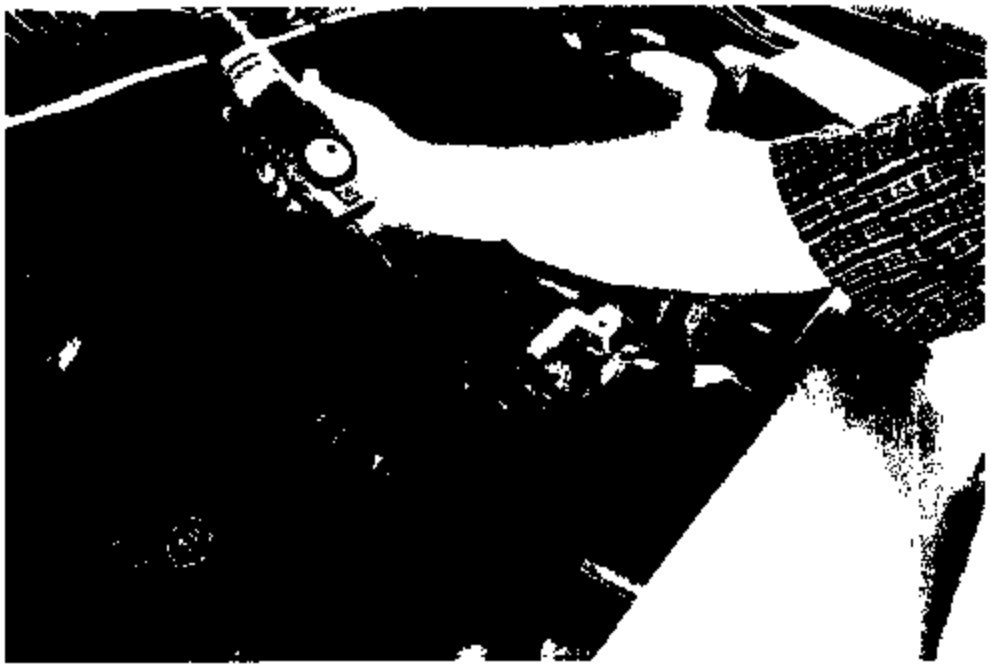


Figure 3 - Using a Hand-Held Force Gauge to Measure the Force Required to Open a Throttle on a Subject Vehicle

The engine was turned off and the throttle cable of the vehicle was again disconnected from the throttle bell crank. The adapter cable was attached as before. The engine was re-started and the maximum force required to move the throttle lever from the idle position and the sustained force required to keep the throttle slightly above the idle position were measured and recorded as above when the engine was off.

The engine was turned off. The throttle cable was reconnected and the hood was closed. The engine was restarted and allowed to warm up to normal operating temperature. The procedure that had been performed on the cold engine was repeated on the warm engine.

After all measurements were recorded, the throttle cable was reattached to the throttle body. The intake manifold cover was re-installed and the throttle system was checked for proper operation.

The authors then drove the vehicle, using maneuvers similar to those that a consumer may perform when pulling into or backing out of a parking space, garage, or driveway.

The pedal force measurements were used to quantify the stiction of the throttle system. The stiction force of the throttle system, as used in this report, is the difference between the maximum force required to open the throttle from the idle position and the sustained force required to keep the throttle slightly above the idle position.

As stated before, not all of the vehicles were made available for inspection with a "cold" engine. However, all of the vehicles were inspected with the engines warmed up, i.e. with the engine at normal operating temperature. For a subject vehicle with the engine running at normal operating temperature, the typical maximum pedal force observed to open the throttle from the idle position was 5.0 lb_f. The sustained pedal force required to keep the throttle slightly above idle was typically 4.5 lb_f. Attachment 4 contains spreadsheets of the throttle-system stiction found in the POVs (Group 1), dealer vehicles (Group 2), and both groups combined (Group 3). Included in each spreadsheet is a summary of basic statistics for that group.

Throttle-system stiction of about 0.5 lb_f was found in 16 of the 31 vehicles tested. This amount of stiction force may be considered typical of normally functioning vehicles due to the "built-in friction" of the throttle actuating system. Eight other vehicles exhibited throttle-system stictions of 1.0 to 1.5 lb_f and the seven remaining vehicles exhibited throttle-system stictions of 2.0 to 4.5 lb_f. The average throttle-system stiction for the 31 vehicles inspected was 1.3 lb_f, with a standard deviation of 1.1 lb_f.

It should be noted that the throttle activation system (accelerator pedal assembly, throttle cable, cruise control, etc) was not the source of elevated stiction in any of the vehicles inspected.

Based on the inspection and the driving of the 31 subject vehicles, it is the authors' opinion that these vehicles do not require excessively high accelerator pedal force or any other extraordinary control input to be operated safely. The elevated forces required to actuate the throttle in a few of the vehicles, although possibly an annoyance to the operator, do not require an unreasonable effort by the operator.

Thad A. Gardner
VRTC Defects Analysis Group

James H. Hague
VRTC Defects Analysis Group

ATTACHMENT 1

Technical Service Bulletin GM TSB 02-06-04-054B

Index for this General Motors TSB | Next page

Service Bulletin

File In Section: 06 - Engine/Propulsion System
Bulletin No.: 02-06-04-054B
Date: March, 2003

[redacted]TECH

Subject: Increased Accelerator Pedal Effort, Idle Instability (Clean Throttle Body and Adjust Blade)

Models: 1999-2002 Chevrolet Silverado
2000-2002 Chevrolet Suburban, Tahoe
2002 Chevrolet Avalanche
1999-2002 GMC Sierra
2000-2002 GMC Yukon, Yukon XL
with 4.8L or 5.3L V8 Engine (VINs V, T, Z — RPOs LR4, LM7, L59)

This bulletin is being revised to add condition information. Please discard Corporate Bulletin Number 02-06-04-054A (Section 06-Engine).

Condition

Some customers may comment on an idle instability and/or a higher than expected accelerator pedal effort from the idle position.

Cause

Condition may be caused by deposits in the throttle body bore and on the throttle plate.

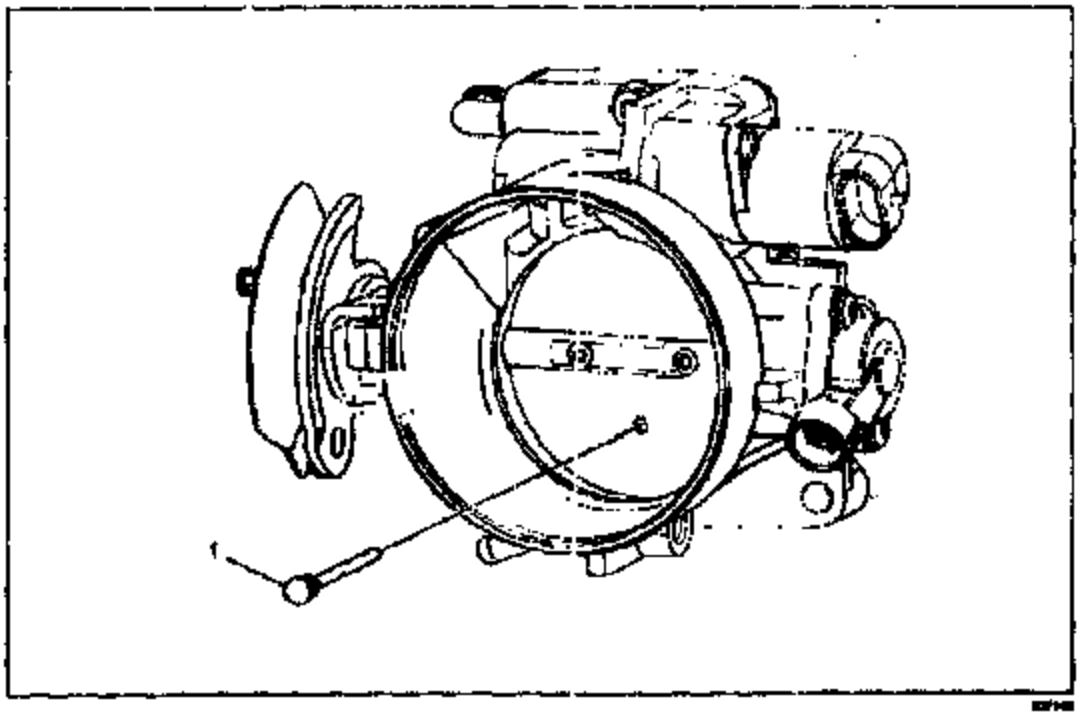
Correction

Important: This procedure only applies to cable actuated throttle bodies on the models listed above. This procedure should not be performed on electronically controlled throttle bodies or on any vehicle or engine that is not listed above in the Models section.

1. Verify that the cause for this condition is not a damaged or binding throttle cable.
2. Remove the air intake duct. Refer to Air Cleaner Duct Replacement.
3. Inspect the vehicle for installation of a fixed orifice PCV valve, refer to Corporate Bulletin Number 01-06-01-029B for PCV valve identification. Vehicles undergoing this throttle body procedure MUST use a Fixed Orifice PCV Valve, P/N 12572717.
4. Clean throttle body bore and throttle valve plate of carbon using a shop rag and an appropriate cleaner. Refer to Engine Controls Repair Procedures - Throttle Body Cleaning Procedure.

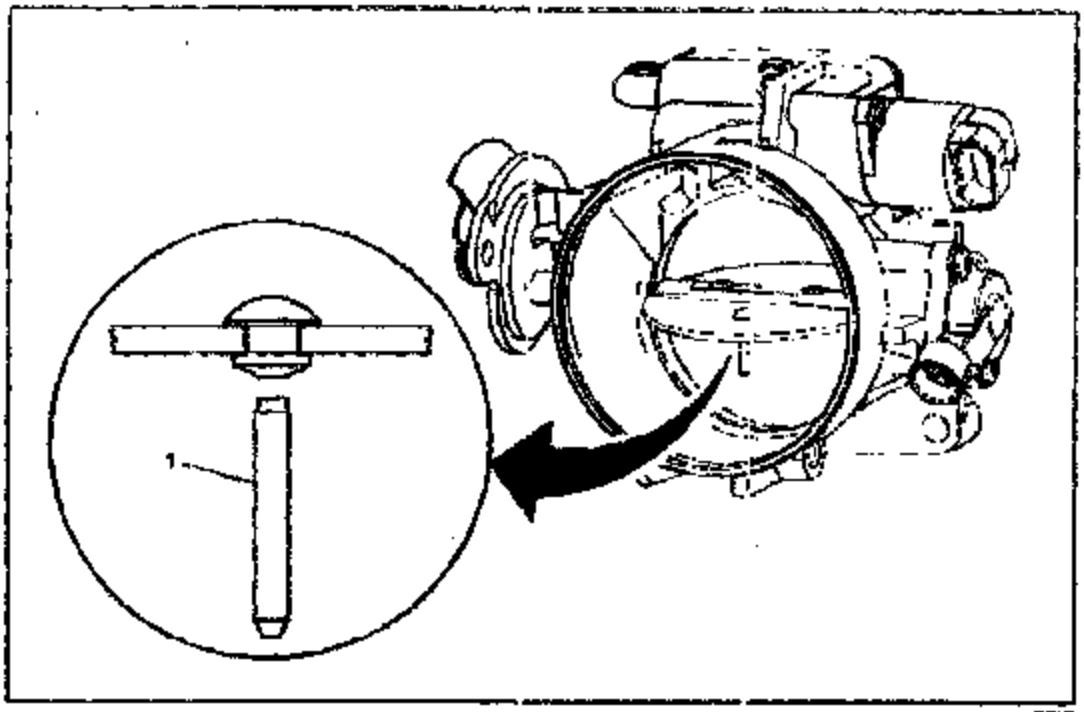
Index for this General Motors TSB | Previous page | Next page

6. Select the correct plug for the size of the air bypass hole in the throttle body being serviced. Use a 1/8-inch (.125") drill bit to determine which plug to use.
   - Vehicles built before introduction of the Fixed Orifice PCV Valve will have a 3.75 mm (.150") air bypass hole in the throttle plate. The 1/8-inch drill bit is smaller than the air bypass hole in these throttle bodies and can be inserted into the bypass hole. To plug the air bypass hole in these vehicles requires the yellow plug. P/N 12580749.
   - Vehicles built after introduction of the Fixed Orifice PCV Valve will have a 2.6 mm (.104") air bypass hole in the throttle plate. The 1/8-inch drill bit is larger than the air bypass hole in these throttle bodies and cannot be inserted into the bypass hole. To plug the air bypass hole in these vehicles requires the red plug. P/N 12561011.



8. Insert the appropriate plug (1) into the air bypass hole in the throttle plate. Insert the "tail" end of the plug through the throttle plate air bypass hole.

Index for this General Motors TSB | Previous page | Next page



7. Open the throttle plate to allow access to the tail end of the plug. Pull the tail section to securely position the plug into the air bypass hole and trim excess material (1) from plug.
8. Turn ignition key to the on position, with engine off.
9. Use the Tech 2 Scan tool to read initial TPS voltage.

Important: TPS voltage cannot exceed .69V. If the vehicle has an initial TPS voltage greater than .61V, replace the Throttle Body Assembly. This part is currently on parts restriction. Contact the General Motors Powertrain Quality Center at 866-864-7654 for assistance.

10. Using the Tech 2 Scan tool and a T15 driver to rotate the Minimum Air Rate screw, increase TPS voltage by.08 Volts (Refer to TPS Voltage Chart below).
11. Turn ignition key to the off position. Verify that the accelerator pedal moves freely - Depress the accelerator pedal to the floor and release.
12. Install the air intake duct. Refer to Air Cleaner Duct Replacement.
13. Start engine.
14. Using the Tech 2 scan tool, monitor TPS voltage and verify the TPS voltage is no greater than 0.69V.
15. Road Test Vehicle.

Important: If an increased accelerator pedal effort condition still exists after performing this bulletin, throttle body replacement may be required. Please contact the General Motors Powertrain Quality Center at 866-864-7654 for assistance, as the throttle body is currently on a parts restriction program.

Index for this General Motors TSB | Previous page

TPS Voltage Chart

Initial TPS Voltage	TPS Voltage After .06 Volt Increase
0.45V	0.53V
0.47V	0.55V
0.49V	0.57V
0.51V	0.59V
0.53V	0.61V
0.55V	0.63V
0.57V	0.65V
0.59V	0.67V
0.61V	0.69V

If initial TPS voltage is greater than .61V Replace Throttle Body Assembly

Parts Information

Part Number	Description	Qty
12580748	Plug, Throttle Plate - Yellow	1
12581010	Plug, Throttle Plate - Red	1

Parts are currently available from GMSPO.

Warranty Information

For vehicles repaired under warranty use

Labor Operation	Description	Labor Time
J3984	Throttle Body - Clean and Adjust	0.5 hr

GM bulletins are intended for use by professional technicians, NOT a "do-it-yourselfer". They are written to inform those technicians of conditions that may cause a vehicle to require diagnosis or service and to provide information that could assist in the performance of a vehicle. Properly trained technicians have the equipment, tools, safety instructions, and know-how to do a job properly and safely. If a condition is described, DO NOT assume that this bulletin applies to your vehicle, or that your vehicle will have that condition. See your GM dealer for information on whether your vehicle may benefit from the information.

ASE TEST PREP SUPPORT VOLUNTARY TECHNICIAN CERTIFICATION

ATTACHMENT 2

Sample Copy of Consumer Letter and Questionnaire

«Owner_Name»
«Address»
«City», «State» «Zip»

Dear Owner/User of a GM Light Duty Truck:

The National Highway Traffic Safety Administration (NHTSA), is conducting an investigation involving accelerator pedal operation in certain General Motors (GM) vehicles. The subject vehicles include 1999 Chevrolet Silverado and GMC Sierra pick-up trucks. NHTSA is investigating allegations of accelerator pedal sticking in the closed (or idle) position resulting in an increased pedal effort to open the throttle. When this occurs, the increased effort may cause accelerator overshoot and vehicle surge.

The Ohio Bureau of Motor Vehicles has identified you as an owner of a subject vehicle*. Please complete the attached questionnaire as soon as possible and return it to the Vehicle Research and Test Center** in the enclosed return-mail envelope (no postage needed). This questionnaire will be used to assess the scope and magnitude of this alleged safety problem.

Please call my administrative assistant, Judy Weiser, at 1-800-262-8309 if you have any questions. Thank you in advance for your cooperation.

Sincerely,

Thad Gardner
Project Engineer

* Your personal information is protected by the Privacy Act which prohibits us from disclosing your name, telephone number, and address to anyone without your explicit authorization

** The Vehicle Research and Test Center is located in East Liberty, Ohio and is listed in the White Pages under: "US Government of: Dept. of Transportation: National Highway Traffic Safety Admin."

VRTC Questionnaire EA02-015

Vehicle description: «Model_Year» «Ma‹e» Truck

VIN: «VIN»

Do you still own/use the vehicle? YES [ ] NO [ ]

<u>Alleged Defect Description</u>: Sticking of the accelerator pedal in the closed (or idle) position resulting in an increased pedal effort to open the throttle.

1. Name:
2. Primary driver's age bracket: under 20[ ] 20 to 40[ ] 41 to 60[ ] over 60[ ]
3. Day Time Telephone: (__ __ __) __ __ __ - __ __ __ __
4. Other Telephone: (__ __ __) __ __ __ - __ __ __ __
5. Current Odometer Reading (if known):_____
6. Transmission type: AUTO [ ] MANUAL [ ]
7. During your ownership of the vehicle, has the vehicle ever a problem with the operation of the throttle pedal as described above?

   YES [ ] NO [ ] If NO, please skip to Question 10.
8. Does the vehicle continue to exhibit the problem?

   YES [ ] NO [ ] If NO, please skip to Question 10.
9. Approximately how often does the problem occur?

   Daily [ ] Weekly [ ] Monthly [ ]
10. Do you have any additional comments or information not covered by the questions above?

11. Thank you for your help. If we need to contact you, what are the best times for us to call? _____

ATTACHMENT 3

Sample Vehicle Data Sheet

Date: _____ Veh. Test Nº

DCD2042 Vehicle Survey Data Sheet

Owner Name _____Address: _____Ph#_____

Model year: _____ Make: _____ Model: _____ Trim line:_____

VIN: _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ Mfr date:_____

Odometer: _____ Engine: _____ Transmission: Auto( ) Manual( )

Engine Oil Level ___ Engine Coolant Level ___ Check Engine Light: On( ) Off( )

Throttle Body Temp (as found)_____

(1) Pedal Force (engine off)_____

(2) Pedal Force (engine on)_____

(3) Body Force (engine off)------OnAx_____OffAx_____

(4) Body Force (engine on)-------OnAx_____

Notes:

Throttle Body Temp (warm_____

(5) Pedal Force (engine on)_____

(6) Pedal Force (engine off)_____

(7) Body Force (engine off)-------OnAx_____OffAx_____

(8) Body Force (engine on)--------OnAx_____

Notes:

ATTACHMENT 4

Table of Stiction Results

Group 1

Veh#	Dif	POV/Dealer
11	0.5	POV
12	0.5	POV
13	1.0	POV
14	0.5	POV
15	0.5	POV
16	0.5	POV
17	0.5	POV
18	1.0	POV
19	0.5	POV
20	1.0	POV
21	2.0	POV
22	0.5	POV
23	0.5	POV
24	4.5	POV
25	3.0	POV
26	2.5	POV
27	3.0	POV
28	1.5	POV
29	1.5	POV
30	2.5	POV

Group 1 POV	
Mean	1.4
Median	1.0
Standard Deviation	1.2
Range	4.0
Minimum	0.5
Maximum	4.5
Count	20.0

Group2

Veh#	Dif	POV/Dealer
1	1.5	Dealer
2	0.5	Dealer
3	0.5	Dealer
4	1.0	Dealer
5	1.0	Dealer
6	0.5	Dealer
7	0.5	Dealer
8	0.5	Dealer
9	0.5	Dealer
10	0.5	Dealer
31	4.0	Dealer

Group 2 Dealer Vehicles	
Mean	1.0
Median	0.5
Standard Deviation	1.0
Range	3.5
Minimum	0.5
Maximum	4.0
Count	11.0

Group 3

Veh#	Dif
1	1.5
2	0.5
3	0.5
4	1.0
5	1.0
6	0.5
7	0.5
8	0.5
9	0.5
10	0.5
11	0.5
12	0.5
13	1.0
14	0.5
15	0.5
16	0.5
17	0.5
18	1.0
19	0.5
20	1.0
21	2.0
22	0.5
23	0.5
24	4.5
25	3.0
26	2.5
27	3.0
28	1.5
29	1.5
30	2.5
31	4.0

Group 3 All Vehicles	
Mean	1.3
Median	0.5
Standard Deviation	1.1
Range	4.0
Minimum	0.5
Maximum	4.5
Count	31.0