

CarMD[®]

FOR THE LIFE OF YOUR CAR

Vehicle Health Index™

...The Data Behind the Diagnostics

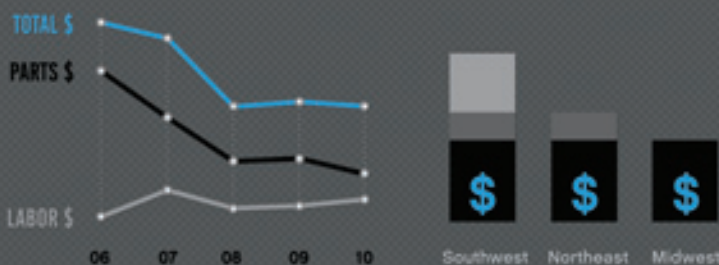


April 2011

NOTE: Under Embargo Until April 27, 2011 @ 12 a.m. (ET)



AVERAGE REPAIR COST



www.CarMD.com

Welcome to the First Annual CarMD[®] Vehicle Health Index[™]

CarMD.com Corp., is pleased to debut the CarMD[®] Vehicle Health Index[™]. This unbiased collection of never before released vehicle health and reliability data reveals the most common failures illuminating the “CHECK ENGINE” light, along with the most common repairs and costs for each incident. Beginning in 1996, the U.S. government mandated on-board diagnostics for all foreign and domestic cars, light trucks, minivans and SUVs sold in the United States. This universal technology detects malfunctions, sets a diagnostic trouble code (DTC) and turns on the “CHECK ENGINE” light if there is a problem. The system provides vital health and safety information for approximately 80 percent of a vehicle’s systems, and is currently installed on roughly 85 percent of the vehicles nationwide.

In addition to diagnostic trouble code data, CarMD has compiled the most comprehensive database of “fixes” or recommended repairs that correspond to each trouble code scenario. The Index statistically analyzes roughly 200,000 fixes and 80,000 diagnostic trouble code scenarios. On a daily basis, a nationwide network of thousands of Automotive Service Excellence (ASE) certified technicians recommend, confirm and upload repairs and costs by region to the CarMD database. As a result, CarMD has built the largest, most up-to-date database of diagnostic trouble codes, expert fixes and repair costs. This first annual Index includes data from 2010, and benchmarking data from 1996-2009.

“As the average age of vehicles continues to grow, we believe this information will be useful in maintaining and evaluating new and used vehicles,” said Art Jacobsen, director, CarMD. “The Index will help consumers make better-informed purchase and repair decisions, and ultimately stay one step ahead of what may happen to their vehicle in the future.”

SUMMARY OF FINDINGS → TOP 5 (MOST COMMON)

The majority of the [top 5 most common failures and fixes](#) in the index are related to **durability vs. faulty parts**, supporting industry statistics that consumers are **holding onto cars longer** and **manufacturers are making vehicles to last longer**. The data also demonstrates that **durable parts, which should last longer, are failing more frequently due to lack of maintenance**. As vehicles age, the index repeatedly illustrates the impact of maintenance on **gas mileage, safety, the environment and costs**. Ignoring small problems is fueling more expensive repairs. Additionally, as hybrids are aging and approaching 10 years on the market, the cost of repairs is still high. And, for the first time since on-board diagnostics was added to vehicles, gas cap is no longer the top fix for “check engine” problems. In fact, 4 of the top 5 fixes (replace O2 sensor, catalytic converter, spark plug and mass air flow sensor) are related to vehicle durability.

Automotive CHECK ENGINE Light Repairs in 2010

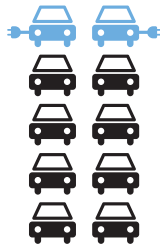
1. **9.34%** Replace **O2 Sensor**
2. **9.28%** Inspect for **Loose Fuel Cap**
3. **6.40%** Replace **Catalytic Converter**
4. **4.36%** Replace **Mass Air Flow Sensor**
5. **3.71%** Replace **Spark Plugs/Wires**

(MEDIA NOTES: This document is provided on an embargoed basis for longer-lead media. Additional information, including Index press release, detailed data, logos, graphics and interviews are available upon request.)

¹ According to R.L. Polk, the average age of a passenger vehicle is now a record 10.6 years old.

HIGHLIGHTS APRIL 2011 INDEX

Hybrids account for 2 of the top 10 most expensive repairs in 2010. The 2nd most expensive vehicle fix for 2010 is “replace hybrid inverter assembly” (>\$7,000). “Replace hybrid battery,” (>\$2,700) is no. 6.



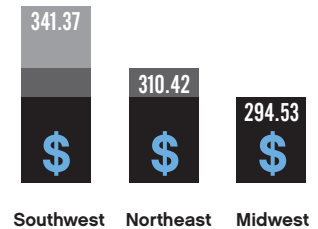
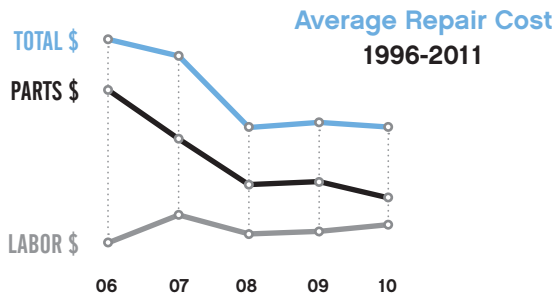
Replace Hybrid Inverter Assembly

> \$7,000

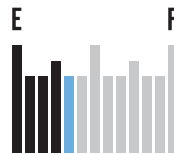
Replace Hybrid Battery

> \$2,700

Overall repair costs are down nearly 16% from a high point in 2006. Vehicle owners in Southwest pay **10% more** for vehicle repairs than in Northeast and 16% more than those in Midwest.



No. 1 repair in '10, “replace Oxygen Sensor,” can lead to a 40 percent reduction in gas mileage if ignored. Faulty O2 sensor costs less than \$200, including parts and labor.



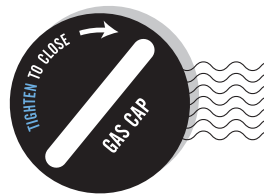
Faulty Oxygen Sensor Causes

40% REDUCTION MPG

Replacing Oxygen Sensor Cost

< \$200

From 1996-2009, loose, missing or damaged gas cap was no. 1 reason for “check engine” related repairs. Bumped to No. 2 in 2010, **loose, damaged or missing gas caps cause 147 million gallons of gas to evaporate each year.**



→ 147 MILLION GALLONS OF EVAPORATED GAS

No. 3 most common repair, “Replace catalytic converter(s),” **points to consumers needlessly putting off maintenance.** They normally won’t fail unless related parts, like a spark plug, are ignored too long. Replacements costs upwards of >\$2,000.



DELAY =

Replacement Costs Upwards of

> \$2,000

QUICK SNAPSHOT APRIL 2011 INDEX

Most Common Fixes or Repairs

- The most common repair in 2010 was “**replace Oxygen Sensor.**” The sensor monitors the amount of unburned oxygen in the exhaust and tells a car’s computer when there is either too much, or not enough fuel. What does it mean to the average driver? A faulty O2 sensor costs less than \$200 to fix, including parts and labor, but **can lead to a 40 percent reduction in gas mileage** if ignored.
- From 1996-2009, a loose, missing or damaged **gas cap** was the no. 1 reason for “check engine” related repairs. Now ranked as the 2nd most common repair, loose, damaged or missing gas caps cause **147 million gallons of gas to evaporate each year.** Simply tightening the cap for free or replacing it for a couple dollars is the fix, but **if left unchecked can result in a 0.5% decrease in gas mileage** and harm the environment.
- As the 3rd most common repair, “**Replace catalytic converter(s)**” accounted for more than 6% of repairs in 2010, and appeared in the top three fixes for all geographic regions studied. In most cases, a **catalytic converter won’t fail unless a related part – such as a spark plug – is ignored for too long.** This supports findings from the 2010 CarMD survey that found **64% of U.S. adults who ever owned/leased a vehicle admitted to having put off automotive maintenance/repair at one time or another.** The data demonstrate it’s best to address small problems early. If a catalytic converter is damaged, it will cost upwards of \$2,000 to fix.
- **The 4th most common repair is replace the Mass Air Flow Sensor (MAF),** which measures the amount of air supplied to the engine and determines how much fuel should be delivered to the engine. When malfunctioning, it may result in a lack of power, hesitation, surges during acceleration and lower MPG by 10 to 25%. It costs approximately \$375 to fix, but is vital to saving dollars at the pump.
- The **small but mighty spark plug rounds out the top 5 fixes.** Responsible for igniting a car’s air/fuel ratio, spark plugs are essential and when they fail they can cause a “misfire,” **reduce gas mileage by at least 2 percent, and ultimately result in melting/permanent damage to your catalytic converter(s).** If you do it yourself, replacing a spark plug can cost under \$10. Having it done by certified mechanic costs a couple hundred dollars or so, but can save thousands.

TOP 5 FIXES – 2010

Rank	Type of Fix	Percent
1	Replace O2 Sensor	9.34%
2	Inspect For Loose Fuel Cap	9.28%
3	Replace Catalytic Converter	6.40%
4	Replace Mass Air Flow (MAF) Sensor	4.36%
5	Replace Spark Plugs	3.71%

Most Common Type of Vehicle Failures

- In 2010, the most common type of vehicle failure was an **Engine Misfire (13.8%)**
- While often easy and affordable to address if diagnosed early, a Misfire can be one of the most severe diagnostic trouble code in a vehicle. **It is a serious problem that drivers should never ignore, especially when accompanied by a flashing “check engine” light, which means you are doing mechanical damage by continuing to drive.**
- **If ignored, it can significantly impact gas mileage** and cause mechanical damage resulting in much more expensive failures such as to the catalytic converter, which is one of the most expensive repairs (ranked no. 12 at over \$1,000).

TOP 10 FAILURES – 2010

Rank	Type of Failure	Percent
1	Engine Misfire	13.8%
2	Evaporative Emissions System Leak	8.3%
3	System Too Lean	6.7%
4	Evaporative Emissions System Failure	5.7%
5	Catalytic Converter Failure	4.0%
6	Exhaust Gas Recirculation (EGR) System Failure	3.8%
7	Oxygen (O2) Sensor Failure	3.4%
8	Coolant Thermostat Below Regulating Temp	2.5%
9	Mass Air Flow Sensor (MAF) Failure	1.6%
10	Camshaft Position Sensor (CMP) Failure	0.9%

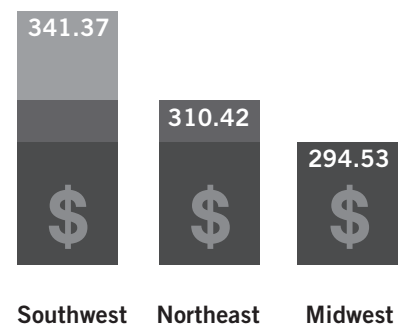
Repair Costs

- The CarMD® Vehicle Health Index™ illustrates that **hybrid repairs can be very pricey due to a limited number of available parts and people trained** to work on them. The 2nd most expensive vehicle repair for 2010 is “replace hybrid inverter assembly” (>\$7,000) and no. 6 is “Replace hybrid battery,” (>\$2,700). While hybrid repairs tend to be much more expensive than fixing gas-powered cars, they do occur much less frequently. As ‘green’ vehicles continue to become more popular, and the technology becomes standard in the marketplace, the repair costs will come down.
- **Overall repair costs are down nearly 16%** from a high point in 2006, mirroring the automotive industry's downsizing and repair shop closures as well as professional technicians becoming more adept at using on-board diagnostics to perform more efficient repairs.
- **In 2010, consumers paid about 1% less for total auto repair costs versus 2009**, with a 4% increase in labor and a 3.6% dip in parts costs.

- Drivers in the Southwest pay about **10% more** than drivers in the Northeast and **16% more** than drivers in the Midwest for repairs. Southwest labor costs are higher as are the type of repairs due to dry air, build up and dust, such as clogged mass airflow sensor, which shows up more frequently and increases costs.
 - The average cost of vehicle repairs from 1996 to 2010 in the **U.S.** was **\$305.56** per repair
 - The average cost of vehicle repairs from 1996 to 2010 in the **Southwestern U.S.** was **\$341.37** per repair
 - The average cost of vehicle repairs from 1996 to 2010 in the **Northeastern U.S.** was **\$310.42** per repair
 - The average cost of vehicle repairs from 1996 to 2010 in the **Midwestern U.S.** was **\$294.53** per repair

U.S. NATIONAL AVERAGE REPAIR COSTS – 1996 TO 2010

Region	Parts	Labor	Total Average Repair Cost
U.S.	\$202.28	\$103.27	\$305.56
Northeast	\$209.96	\$100.46	\$310.42
Midwest	\$189.98	\$104.55	\$294.53
Southwest	\$212.60	\$128.77	\$341.37



Most Expensive Fixes

- The **most expensive fix** in the CarMD database from 1996 to 2010 is “**remove cylinder and inspect/replace as needed**” (\$8,200). And while “remove cylinder and inspect/replace as needed” is the most expensive fix, it is not a common fix, representing only one tenth of one percent (0.1%) of repairs in the CarMD fix database.
- Conversely, the **least expensive fix** – also one of the most common – is “**inspect gas cap/tighten or replace as needed**” (< \$3.00 to fix in most cases).
- Two of the top 12 most expensive fixes are for hybrid vehicles, including “replace hybrid inverter assembly” (>\$7,300) and “replace hybrid battery” (>\$2,730).

Most Common Diagnostic Trouble Codes (DTCs)

- **P0171 “System Too Lean”** is the most common diagnostic trouble code (DTC) for 1996-2010 vehicles.
- A P0171 code may be triggered by a range of issues from a dirty air filter to a faulty Mass Air Flow sensor, which measures the amount of air supplied to the engine and is therefore used to also help determine how much fuel should be delivered to the engine.; it may result in lack of power or even hesitation or surge upon acceleration.
- If not fixed, a P0171 code, as well as most DTCs, can lead to expensive repairs and headaches down the road.

DETAILED INDEX DATA APRIL 2011 INDEX

THE TOP 25 MOST COMMON VEHICLE REPAIRS IN THE U.S. – 2010

Rank	Vehicle Fix	Total	% 2010 Fixes
1	Replace Oxygen Sensor(s) (O2S)	\$238.71	9.34%
2	Inspect for Loose Fuel Cap & Tighten or Replace as Necessary	\$0.80	9.28%
3	Replace Catalytic Converter(s) with new OE Catalytic Converter(s)	\$1,001.74	6.40%
4	Replace Mass Air Flow (MAF) Sensor	\$376.69	4.36%
5	Replace Spark Plug Wires & Spark Plugs	\$311.40	3.71%
6	Replace Exhaust Gas Recirculation (EGR) Valve & Clean All EGR ports	\$288.19	2.85%
7	Replace Engine Coolant Temperature Sensor (ECT)	\$132.62	2.65%
8	Replace Ignition Coil(s)	\$213.16	2.58%
9	Replace Intake Manifold Gasket(s)	\$326.74	2.05%
10	Remove Aftermarket Alarm	\$75.85	1.96%
11	Replace Camshaft Position Sensor (CMP)	\$181.11	1.73%
12	Replace Fuel Injector(s)	\$518.16	1.67%
13	Replace Positive Crankcase Ventilation (PCV) Valve & Hose	\$97.86	1.58%
14	Inspect for Vacuum Leak at Evaporative Emissions (EVAP) Purge Solenoid & Repair as Necessary	\$70.83	1.49%
15	Replace Thermostat	\$147.54	1.43%
16	Inspect for Faulty Vacuum Hose(s) at EVAP System & Repair as Necessary	\$98.64	1.29%
17	Replace Positive Crankcase Ventilation (PCV) Valve, Tube & Grommet	\$84.65	1.17%
18	Inspect for Faulty Wiring at Engine Harness & Repair as Necessary	\$126.31	1.12%
19	Replace Differential Pressure Feedback (DPFE) Sensor	\$185.31	1.07%
20	Replace Ignition Coil(s) & Spark Plug(s)	\$393.32	1.07%
21	Replace Evaporative Emissions (EVAP) Purge Solenoid	\$144.33	1.04%
22	Reprogram Engine Control Module (ECM)	\$88.83	0.97%

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THE TOP 25 MOST COMMON VEHICLE REPAIRS IN THE U.S. – 2010 (CONTD.)

Rank	Vehicle Fix	Total	% 2010 Fixes
23	Replace Crankshaft Position Sensor (CKP)	\$180.42	0.95%
24	Replace Air/Fuel Ratio Sensor (AFR)	\$295.26	0.94%
25	Inspect for Faulty Vacuum Hose(s) & Repair as Necessary	\$78.38	0.84%

(Top 25 most common vehicle repairs are based on fixes in 2010. This data applies to roughly 80% of cars, light trucks, minivans and SUVs on the road in the U.S. – foreign and domestic. Source: CarMD.com Corp.)

THE TOP 25 MOST COMMON VEHICLE REPAIRS & ASSOCIATED REPAIR COSTS IN THE U.S. – 1996 TO 2010

Rank	Vehicle Fix	Avg. Repair Cost (Parts & Labor)	% U.S. Vehicle Repairs
1	Inspect for Loose Fuel Cap & Tighten or Replace as Necessary	\$3.00	10.21%
2	Replace Oxygen Sensor(s) (O2S)	\$233.42	9.26%
3	Replace Catalytic Converter(s) with new OE Catalytic Converter(s)	\$980.38	6.37%
4	Replace Mass Air Flow (MAF) Sensor	\$369.83	4.92%
5	Replace Spark Plug Wires & Spark Plugs	\$300.60	3.83%
6	Replace Exhaust Gas Recirculation (EGR) Valve & Clean All EGR ports	\$283.92	2.77%
7	Replace Ignition Coil(s)	\$208.41	2.57%
8	Replace Intake Manifold Gasket(s)	\$316.47	2.27%
9	Replace Engine Coolant Temperature Sensor (ECT)	\$128.35	2.02%
10	Replace Fuel Injector(s)	\$579.55	1.99%
11	Replace Camshaft Position Sensor (CMP)	\$184.05	1.59%
12	Replace Positive Crankcase Ventilation (PCV) Valve & Hose	\$93.36	1.57%
13	Replace Differential Pressure Feedback (DPFE) Sensor	\$180.54	1.50%
14	Remove Aftermarket Alarm	\$73.84	1.41%
15	Replace Thermostat	\$145.00	1.38%

Table continues on page 8

**THE TOP 25 MOST COMMON VEHICLE REPAIRS & ASSOCIATED REPAIR COSTS
IN THE U.S. – 1996 TO 2010 (CONTD.)**

Rank	Vehicle Fix	Avg. Repair Cost (Parts & Labor)	% U.S. Vehicle Repairs
16	Replace Positive Crankcase Ventilation (PCV) Valve, Tube & Grommet	\$79.66	1.16%
17	Reprogram Engine Control Module (ECM)	\$84.93	1.15%
18	Inspect for Vacuum Leak at Evaporative Emissions (EVAP) Purge Solenoid & Repair as Necessary	\$66.84	1.11%
19	Inspect for Faulty Vacuum Hose(s) at EVAP System & Repair as Necessary	\$92.97	1.03%
20	Replace Crankshaft Position Sensor (CKP)	\$185.57	1.03%
21	Replace Evaporative Emissions (EVAP) Purge Solenoid	\$139.59	1.02%
22	Replace Air/Fuel Ratio Sensor (AFR)	\$287.44	0.97%
23	Replace Engine Control Module (ECM)	\$738.63	0.94%
24	Replace Ignition Coil(s) & Spark Plug(s)	\$380.12	0.94%
25	Inspect for Faulty Wiring at Engine Harness & Repair as Necessary	\$119.47	0.90%

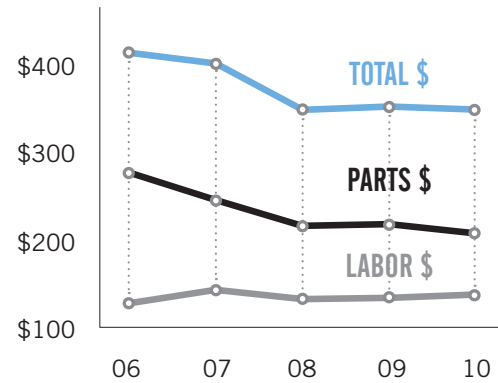
(Top 25 most common vehicle repairs are based on 170,732 fixes input from 1996-2010. This benchmarking data applies to roughly 80% of cars, light trucks, minivans and SUVs on the road in the U.S. – foreign and domestic. Source: CarMD.com Corp.)

U.S. NATIONAL AVERAGE FOR REPAIR COSTS – 1996 TO 2010

U.S. Region	Parts	Labor	Total Average Repair Cost
All U.S. Regions	\$103.27	\$202.28	\$305.56
Northeast	\$102.46	\$209.96	\$310.42
Midwest	\$104.55	\$189.98	\$294.53
Southwest	\$128.77	\$212.60	\$341.37

U.S. NATIONAL AVERAGE FOR REPAIR COSTS – 2006 TO 2010 (5-YEAR HISTORY)

Year	Labor	Parts	Total Average Repair Cost
2010	\$143.61	\$212.44	\$356.04
2009	\$138.37	\$221.13	\$359.50
2008	\$135.21	\$220.98	\$356.19
2007	\$152.92	\$256.98	\$409.91
2006	\$131.06	\$291.30	\$422.36



THE TOP 10 MOST COMMON TYPE OF VEHICLE FAILURES IN THE U.S. – 1996 TO 2010

Rank	Type of Vehicle Failure for 1996 to 2010	Percentage
1	Engine Misfire	10.34%
2	Evaporative Emissions System Leak	9.49%
3	System Too Lean	7.85%
4	Catalytic Converter Failure	5.05%
5	Evaporative Emissions System Failure	5.52%
6	Exhaust Gas Recirculation (EGR) System Failure	3.70%
7	Oxygen (O2) Sensor Failure	3.61%
8	Coolant Thermostat Failure	2.16%
9	Camshaft Position Sensor (CMP) Failure	0.92%
10	Air Injection System Failure	0.83%

(Top 10 most common vehicle problems are based on 81,132 diagnostic trouble code scenarios for all 50 states plus the District of Columbia from 1996-2010 – foreign and domestic. This benchmarking data applies to roughly 80% of cars, light trucks, minivans and SUVs on the road. Source: CarMD.com Corp.)

THE TOP 10 MOST COMMON TYPE OF VEHICLE FAILURES IN THE U.S. – 2010

Rank	Type of Vehicle Failure for 2010	Percentage
1	Engine Misfire	13.8%
2	Evaporative Emissions System Leak	8.3%
3	System Too Lean	6.7%
4	Evaporative Emissions System Failure	5.7%
5	Catalytic Converter Failure	4.0%
6	Exhaust Gas Recirculation (EGR) System Failure	3.8%
7	Oxygen (O2) Sensor Failure	3.4%
8	Coolant Thermostat Failure	2.5%
9	Mass Air Flow Sensor (MAF) Failure	1.6%
10	Camshaft Position Sensor (CMP) Failure	0.9%

(Top 10 most common vehicle problems are based on 81,132 diagnostic trouble code scenarios for all 50 states plus the District of Columbia from 1996-2010 – foreign and domestic. This benchmarking data applies to 80% of cars, light trucks, minivans and SUVs on the road. Source: CarMD.com Corp.)

THE TOP 15 MOST EXPENSIVE VEHICLE FIXES IN THE U.S. – 1996 TO 2010

Rank	Type of Vehicle Failure for 2010	Total Cost (Parts & Labor)
1	Remove Cylinder & Inspect for Faulty Components. Replace As Necessary.	\$8,216.97
2	Replace Hybrid Inverter Assembly	\$7,391.57
3	Replace Inverter Assembly w/Converter	\$3,921.68
4	Replace Transmission Assembly & Reprogram Electronic Control Module (ECM)	\$3,699.34
5	Replace Cylinder Head Assembly & Replace Spark Plug(s)	\$3,608.36
6	Replace Camshaft & Lifter(s)	\$3,077.74
7	Replace Gas Mass Sensor	\$3,055.21
8	Replace Injection Pump	\$2,974.54
9	Replace Transmission & Torque Converter	\$2,867.96

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THE TOP 15 MOST EXPENSIVE VEHICLE FIXES IN THE U.S. – 1996 TO 2010 (CONTD.)

Rank	Type of Vehicle Failure for 2010	Total Cost (Parts & Labor)
10	Replace Hybrid Battery	\$2,731.87
11	Replace Integrated Motor Assist (IMA) Battery	\$2,701.62
12	Replace Catalytic Converter(s) with new OE Catalytic Converter(s) & replace Engine Control Module (ECM)	\$2,691.91
13	Replace Fuel Injection Pump	\$2,444.69
14	Inspect Transmission & Repair as Necessary	\$2,177.28
15	Replace Torque Converter	\$1,765.15

(Top 15 most expensive fixes are based on roughly 200,000 fixes input into the CarMD and OBDFix databases by ASE certified technicians from 1996-2010. This benchmarking data is for 1996-2010 cars, light trucks, minivans and SUVs in the U.S. – foreign and domestic. Source: CarMD.com Corp.)

THE TOP 15 MOST EXPENSIVE VEHICLE FIXES IN THE U.S. – 2010

Rank	Type of Vehicle Failure for 2010	Total Cost (Parts & Labor)
1	Remove Cylinder & Inspect for Faulty Components. Replace As Necessary.	\$5,393.07
2	Replace Hybrid Inverter Assembly w/Converter	\$3,926.01
3	Replace Cylinder Head Assembly & Replace Spark Plug(s)	\$3,781.87
4	Replace Transmission Assembly & Reprogram Electronic Control Module (ECM)	\$3,627.90
5	Replace Transmission & Torque Converter	\$2,968.02
6	Replace Hybrid Battery	\$2,731.87
7	Replace Integrated Motor Assist (IMA) Battery	\$2,603.31
8	Replace Catalytic Converter(s) with new OE Catalytic Converter(s) & replace Engine Control Module (ECM)	\$2,588.31
9	Replace Fuel Injection Pump	\$2,502.34
10	Clean Ground Wire	\$1,893.47
11	Replace Torque Converter	\$1,887.00
12	Replace Cylinder Head Assembly	\$1,826.68

Table continued on page 12

THE TOP 15 MOST EXPENSIVE VEHICLE FIXES IN THE U.S. – 2010 (CONTD.)

Rank	Type of Vehicle Failure for 2010	Total Cost (Parts & Labor)
13	Inspect Transmission & Repair as Necessary	\$1,798.41
14	Replace Turbo-Charger Assembly	\$1,623.44
15	Replace Rocker Arm Assembly(s)	\$1,560.96

(Top 15 most expensive fixes are based on roughly 80,000 fixes input into the CarMD and OBDFix databases by ASE certified technicians in 2010. This data is for OBD2 cars, light trucks, minivans and SUVs in the U.S. – foreign and domestic. Source: CarMD.com Corp.)

THE TOP 25 MOST COMMON DIAGNOSTIC TROUBLE CODES (DTCS) FOR FOREIGN AND DOMESTIC VEHICLES ACROSS THE U.S. – 1996 TO 2010

Rank	DTC	Code Description	Percent of all fixes 1996-2010
1	P0171	System Too Lean	5.5%
2	P0420	Catalyst System Efficiency Below Threshold	4.1%
3	P0300	Random/Multiple Cylinder Misfire Detected	3.9%
4	P0442	Evaporative Emission System Leak Detected (small leak)	2.7%
5	P0455	Evaporative Emission System Leak Detected (large leak)	2.7%
6	P0174	System Too Lean	2.3%
7	P0401	Exhaust Gas Recirculation Flow Insufficient Detected	2.3%
8	P0128	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)	2.2%
9	P0440	Evaporative Emission System	2.2%
10	P0301	Cylinder 1 Misfire Detected	1.6%
11	P0303	Cylinder 3 Misfire Detected	1.3%
12	P0456	Evaporative Emission System Leak Detected (very small leak)	1.2%
13	P0135	O2 Sensor Heater Circuit	1.1%
14	P0304	Cylinder 4 Misfire Detected	1.1%
15	P0302	Cylinder 2 Misfire Detected	1.1%
16	P0141	O2 Sensor Heater Circuit	1.1%

Table continued on page 12

THE TOP 25 MOST COMMON DIAGNOSTIC TROUBLE CODES (DTCs) FOR FOREIGN AND DOMESTIC VEHICLES ACROSS THE U.S. – 1996 TO 2010 (CONTD.)

Rank	DTC	Code Description	Percent of all fixes 1996-2010
17	P0446	Evaporative Emission System Vent Control Circuit	1.1%
18	P0441	Evaporative Emission System Incorrect Purge Flow	1.0%
19	P0430	Catalyst System Efficiency Below Threshold	1.0%
20	P0340	Camshaft Position Sensor "A" Circuit	0.9%
21	P0410	Secondary Air Injection System	0.8%
22	P0449	Evaporative Emission System Vent Valve/Solenoid Circuit	0.8%
23	P0172	System Too Rich	0.8%
24	P0101	Mass or Volume Air Circuit Range Performance	0.7%
25	P0406	Exhaust Gas Recirculation Sensor "A" Circuit High	0.7%

(Top 25 common DTCs are based on 81,132 diagnostic trouble code scenarios for all 50 states plus the District of Columbia from 1996-2010. This benchmarking data applies to roughly 80% of cars, light trucks, minivans and SUVs on the road. Source: CarMD.com Corp.)

TOP 25 MOST COMMON DIAGNOSTIC TROUBLE CODES (DTCs) IN THE U.S. NORTHEAST REGION – 1996 TO 2010

Rank	NE DTC	Code Description	% NE DTCs 1996-2010
1	P0171	System Too Lean	4.5%
2	P0420	Catalyst System Efficiency Below Threshold	3.9%
3	P0300	Random/Multiple Cylinder Misfire	3.2%
4	P0442	Evap Emission System Leak (Small)	2.8%
5	P0455	Evap Emission System Leak (Large)	2.7%
6	P0128	Coolant Thermostat (Below Regulating Temp)	2.1%
7	P0440	Evap Emission System	2.1%
8	P0401	EGR Flow Insufficient	1.9%
9	P0174	System Too Lean	1.8%
10	P0456	Evap Emission System Leak (Very Small)	1.2%
11	P0303	Cylinder 3 Misfire	1.2%
12	P0301	Cylinder 1 Misfire	1.1%
13	P0441	Evap Emission System Incorrect Purge Flow	1.1%
14	P0410	Secondary Air Injection	1.0%
15	P0302	Cylinder 2 Misfire	1.0%
16	P0135	O2 Sensor Heater Circuit	1.0%
17	P0430	Catalyst System Efficiency Below Threshold	1.0%
18	P0304	Cylinder 4 Misfire	1.0%
19	P0141	O2 Sensor Heater Circuit	1.0%
20	P0446	Evap Emission System Vent Control	0.9%
21	P0449	Evap Emission System Vent Valve/Solenoid	0.9%
22	P0305	Cylinder 5 Misfire	0.7%
23	P0306	Cylinder 6 Misfire	0.7%
24	P0101	Mass Air Flow Circuit Range/Performance	0.7%
25	P0340	Camshaft Position Sensor "A" Circuit	0.7%

(Top 25 common DTCs are based on roughly 19,000 diagnostic trouble codes in the Northeast region of the U.S. from 1996-2010. Northeast includes: CT, DE, DC, IL, IN, ME, MD, MA, MI, NH, NJ, NY, PA, CT and VT. Source: CarMD.com Corp.)

TOP 10 MOST COMMON TYPE OF VEHICLE FAILURE IN THE U.S. NORTHEAST REGION – 1996 TO 2010

Rank	Type of Vehicle Failure in the Northeast	% NE Failures – 1996 to 2010
1	Engine Misfire	9.9%
2	Evaporative Emissions System Leak	6.7%
3	Evaporative Emissions System Failure	5.0%
4	System Too Lean	4.3%
5	Catalytic Converter Failure	3.8%
6	Exhaust Gas Recirculation (EGR) System Failure	2.7%
7	Oxygen (O2) Sensor Failure	2.6%
8	Coolant Thermostat Below Regulating Temperature	2.1%
9	Mass Air Flow Sensor (MAF) Failure	1.3%
10	Secondary Air Injection System Malfunction	1.0%

(Top 10 most common vehicle problems are based on roughly 19,000 diagnostic trouble codes in the Northeast region of the U.S. from 1996-2010. Northeast includes: CT, DE, DC, IL, IN, ME, MD, MA, MI, NH, NJ, NY, PA, CT and VT. Source: CarMD.com Corp.)

Top 25 Most Common Diagnostic Trouble Codes (DTCs) in the U.S. Midwest Region – 1996 to 2010

Rank	Midwest DTC	Code Description	Percentage of Midwest DTCs 1996-2010
1	P0171	System Too Lean	5.1%
2	P0300	Random Multiple Cylinder Misfire	3.7%
3	P0420	Catalyst System Efficiency Below Threshold	3.5%
4	P0442	Evap Emission Leak (Small)	2.7%
5	P0455	Evap Emission Leak (Large)	2.6%
6	P0440	Evap Emission System	2.5%
7	P0128	Coolant Thermostat (Below Regulation Temp)	2.4%
8	P0174	System Too Lean	2.2%
9	P0401	Exhaust Gas Recirculation Flow Insufficient	2.0%
10	P0410	Secondary Air Injection System	1.2%
11	P0446	Evap Emission System Vent Control	1.2%
12	P0301	Cylinder 1 Misfire	1.2%
13	P0303	Cylinder 3 Misfire	1.1%
14	P0141	O2 Sensor Heater Circuit	1.1%
15	P0430	Catalyst System Efficiency Below Threshold	1.0%
16	P0304	Cylinder 4 Misfire	1.0%
17	P0302	Cylinder 2 Misfire	0.9%
18	P0102	Mass or Volume Air Flow Circuit Low	0.9%
19	P0449	Evap Emission Syst. Vent Valve / Solenoid Circuit	0.9%
20	P0404	EGR Circuit Range / Performance	0.9%
21	P0456	Evap System Leak Detected (Very Small)	0.9%
22	P0306	Cylinder 6 Misfire	0.7%
23	P0340	Camshaft Position Sensor "A" Circuit	0.7%
24	P0172	System Too Rich	0.7%
25	P0135	O2 Sensor Heater Circuit	0.7%

(Top 25 common DTCs are based on roughly 14,000 diagnostic trouble codes in the Northeast region of the U.S. from 1996-2010. Midwest includes: IL, IA, IN, KS, MI, MN, MO, NE, ND, OH, SD and WI. Source: CarMD.com Corp.)

TOP 10 MOST COMMON TYPE OF VEHICLE FAILURE IN THE U.S. MIDWEST REGION – 1996 TO 2010

Rank	Type of Vehicle Failure in the Midwest	% Midwest Failures – 1996 to 2010
1	Engine Misfire	11.0%
2	Evaporative Emissions System Leak	8.7%
3	Exhaust Gas Recirculation (EGR) System Failure	4.0%
4	System Too Lean	3.9%
5	Catalytic Converter Failure	3.5%
6	Oxygen (O2) Sensor Failure	3.0%
7	Coolant Thermostat Below Regulation Temperature	2.4%
8	System Too Rich	1.4%
9	Secondary Air Injection	1.2%
10	Mass Air Flow Sensor Failure	0.9%

(Top 10 most common vehicle problems are based on roughly 19,000 diagnostic trouble codes in the Northeast region of the U.S. from 1996-2010. Midwest includes: IL, IA, IN, KS, MI, MN, MO, NE, ND, OH, SD and WI. Source: CarMD.com Corp.)

TOP 25 MOST COMMON DIAGNOSTIC TROUBLE CODES (DTCS) IN THE U.S. SOUTHWEST REGION – 1996 TO 2010

Rank	SW DTC	Code Description	Percentage of Midwest DTCs 1996-2010
1	P0420	Catalyst System Efficiency Below Threshold	4.8%
2	P0171	System Too Lean	3.9%
3	P0301	Cylinder 1 Misfire	3.2%
4	P0401	Exhaust Gas Recirculation Flow Insufficient	2.1%
5	P0442	Evap Emission Leak (Small)	2.0%
6	P0128	Coolant Thermostat (Below Regulation Temp)	1.9%
7	P0455	Evap Emission Leak (Large)	1.8%
8	P0300	Random Multiple Cylinder Misfire	1.6%
9	P0304	Cylinder 4 Misfire Detected	1.6%
10	P0303	Cylinder 3 Misfire Detected	1.4%
11	P0440	Evap Emission System	1.3%
12	P0456	Evap Emission Leak (Very Small)	1.2%
13	P0340	Camshaft Position Sensor "A" Circuit	1.1%
14	P0302	Cylinder 2 Misfire Detected	1.1%
15	P0441	Evap Emission System Incorrect Purge Flow	1.1%
16	P0430	Catalyst System Efficiency Below Threshold	1.1%
17	P0172	System Too Rich	1.0%
18	P0135	O2 Sensor Heater Circuit	0.9%
19	P0335	Crankshaft Position Sensor "A" Circuit	0.8%
20	P0141	O2 Sensor Heater Circuit	0.8%
21	P0102	Mass or Volume Air Circuit Low	0.7%
22	P0410	Secondary Air Injection System	0.7%
23	P0305	Cylinder 5 Misfire Detected	0.7%
24	P0306	Cylinder 6 Misfire Detected	0.7%
25	P0133	O2 Sensor Circuit Slow Response	0.7%

(Top 25 common DTCs are based on roughly 26,000 diagnostic trouble codes in the Southwest region of the U.S. from 1996-2010. The Southwest U.S. Region is defined as AZ, CO, CA, NV, NM and UT. Source: CarMD.com Corp.)

TOP 10 MOST COMMON TYPE OF VEHICLE FAILURE IN THE U.S. SOUTHWEST REGION – 1996 TO 2010

Rank	Type of Vehicle Failure in the Southwest	% SW Failures – 1996 to 2010
1	Engine Misfire	11.4%
2	Evaporative Emissions System Leak	5.2%
3	Exhaust Gas Recirculation (EGR) Flow Insufficient	4.9%
4	Catalyst System Efficiency Below Threshold	4.9%
5	Coolant Thermostat Failure	2.6%
6	System Too Lean	2.6%
7	Camshaft Position Sensor (CMP) Failure	1.5%
8	Crankshaft Position Sensor (CKP) Failure	0.9%
9	Transmission System Failure	0.7%
10	System Too Rich	0.7%

(Top 10 common vehicle failures are based on roughly 26,000 diagnostic trouble codes in the Southwest region of the U.S. from 1996-2010. The Southwest U.S. Region is defined as AZ, CO, CA, NV, NM and UT / Source: CarMD.com Corp.)

TOP 10 MOST COMMON VEHICLE “CHECK ENGINE” LIGHT REPAIRS IN THE U.S. NORTHEAST REGION – 1996 TO 2010

Rank	Repairs in the Northeast	% NE Repairs – 1996 to 2010
1	Inspect For Loose Fuel Cap & Tighten/Replace As Necessary	11.8%
2	Replace O2 (Oxygen) Sensor(s)	10.5%
3	Replace Catalytic Converter(s)	7.3%
4	Replace Mass Air Flow (MAF) Sensor	4.6%
5	Replace Spark Plug Wires & Spark Plugs	4.1%
6	Replace Ignition Coil(s)	2.5%
7	Replace EGR Valve & Clean all EGR Ports	2.5%
8	Replace Engine Coolant Temperature (ECT) Sensor	2.2%
9	Replace Intake Manifold Gasket(s)	2.0%
10	Replace Fuel Injector(s)	1.9%

(Top 10 most common vehicle “check engine” repairs are based on roughly 40,000 fixes in the Northeast region of the U.S. from 1996-2010. Northeast includes: CT, DE, DC, IL, IN, ME, MD, MA, MI, NH, NJ, NY, PA, CT and VT. Source: CarMD.com Corp.)

TOP 10 MOST COMMON VEHICLE “CHECK ENGINE” LIGHT REPAIRS IN THE U.S. MIDWEST REGION – 1996 TO 2010

Rank	Repairs in the Midwest	% Midwest Repairs – 1996 to 2010
1	Inspect For Loose Fuel Cap & Tighten/Replace As Necessary	10.9%
2	Replace O2 (Oxygen) Sensor(s)	9.2%
3	Replace Catalytic Converter(s)	5.9%
4	Replace Mass Air Flow (MAF) Sensor	4.7%
5	Replace Spark Plug Wires & Spark Plugs	4.2%
6	Replace EGR Valve & Clean all EGR Ports	3.0%
7	Replace Intake Manifold Gasket(s)	2.8%
8	Replace Fuel Injector(s)	2.4%
9	Replace Ignition Coil(s)	2.3%
10	Replace Engine Coolant Temperature (ECT) Sensor	2.1%

(Top 10 common vehicle “check engine” repairs are based on roughly 26,000 fixes in the Midwest region of the U.S. from 1996-2010. Midwest includes: IL, IA, IN, KS, MI, MN, MO, NE, ND, OH, SD and WI. Source: CarMD.com Corp.)

TOP 10 MOST COMMON VEHICLE “CHECK ENGINE” LIGHT REPAIRS IN THE U.S. SOUTHWEST REGION – 1996 TO 2010

Rank	Repairs in the Southwest	% Southwest Repairs – 1996 to 2010
1	Replace O2 (Oxygen) Sensor(s)	8.5%
2	Inspect For Loose Fuel Cap & Tighten/Replace As Necessary	8.1%
3	Replace Mass Air Flow (MAF) Sensor	6.0%
4	Replace Catalytic Converter(s)	5.9%
5	Replace Spark Plug Wires & Spark Plugs	3.8%
6	Replace Ignition Coil(s)	2.8%
7	Replace EGR Valve & Clean all EGR Ports	2.6%
8	Replace Intake Manifold Gasket(s)	2.3%
9	Replace Engine Coolant Temperature (ECT) Sensor	1.9%
10	Replace Fuel Injector(s)	1.9%

(Top 10 common vehicle “check engine” repairs are based on roughly 41,000 fixes in the Southwest region of the U.S. from 1996-2010. The Southwest U.S. Region is defined as AZ, CO, CA, NV, NM and UT. Source: CarMD.com Corp.)

METHODOLOGY APRIL 2011 INDEX

CarMD has compiled the industry's most comprehensive database of Diagnostic Trouble Codes downloaded by automotive technicians and vehicle owners since 1996. The data for the 2011 CarMD® Vehicle Health Index™ was procured from a network of thousands of Automotive Service Excellence (ASE) certified technicians who have input and validated failures and fixes into the CarMD and OBDFix diagnostic databases from January 1, 1996 to December 31, 2010.

The data was pulled and analyzed between Jan. 15, 2011 and Feb. 8, 2011.

Virtually all 1996 to 2010 makes and models of cars, light trucks, minivans and SUVs – foreign and domestic – with on board diagnostic second generation (OBD2) technology are included in the Index. Those makes and models with more registered vehicles on the road may have a larger statistical weighting in the index findings, as will those vehicles that experience more failures.

In addition to diagnostic trouble code data, CarMD has compiled the most comprehensive database of “fixes” or recommended repairs that correspond to each trouble code scenario. The 2011 Index statistically analyzes roughly 170,000 fixes and 82,000 diagnostic trouble code scenarios. Each scenario and fix has also been reviewed and validated by CarMD's internal team of ASE Technicians and then output based on a probability algorithm that takes into account the vehicle's year, make, model, mileage, zip code, DTCs and similar vehicle problems to produce a most likely fix. Because the data stems from those U.S. vehicle owners and automotive technicians who elected to use the diagnostic devices and upload data into the CarMD and OBDFix databases, no estimates of theoretical sampling error can be calculated.

All 50 U.S. states, plus the District of Columbia, are represented in this Index. The states with larger registered vehicle populations and participating ASE certified may have a larger number of DTC and fix scenarios, however, all have been averaged into the overall Index findings. The data in the Index is applicable to more than 80 percent of the vehicles on the road, giving a unique perspective on vehicles driven in the U.S.

Repair costs are based on retail MSRP plus 10% markup. Labor rates are procured from several sources, including the Undercar Digest National and Regional Hourly Shop Labor Rate reports, as well as the average amount of time required for each repair. Both are updated annually.

CarMD has contracted with Metafuse, Inc. to create and maintain the database for compiling and generating this Index. In most cases, percentages were rounded to the nearest tenth. In the instances of a tie for most common fix, DTC or type of failure, percentages were expanded by rounding to the nearest 100th.

On a daily basis, CarMD's nationwide network of thousands of automotive service excellence (ASE) technicians recommend, confirm and upload repairs and costs by region to the CarMD database. As a result, subsequent CarMD Vehicle Health Index reports will draw from a larger sampling of diagnostic trouble codes, expert fixes and repair costs.

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