

# 2019 CarMD® Vehicle Health Index™



## The 2019 CarMD Vehicle Health Index

The CarMD® Vehicle Health Index™ reports on the most common check engine light-related problems, repairs and associated costs. CarMD distributes this index each April during Car Care Awareness Month to provide auto repair professionals with the tools to remind vehicle owners about the importance of paying attention to maintenance needs and inspections to help avoid unforeseen problems. Published annually since 2011, this Index provides consumers, media and the automotive industry with year-over-year car repair data, shedding light on trends related to the type and cost of repairs. In this Index you will find:

- The 10 most common check engine-related vehicle repairs in the U.S. – 2018
- 10-year history of U.S. car repair costs, including parts & labor – 2009 to 2018
- Breakdown of car repair issues by region (West, Midwest, Northeast, South) – 2018
- 10 most expensive check engine light repairs – 2018
- 10 least expensive check engine light repairs – 2018

## What is Distinctive About CarMD's Index?

For nearly two decades, CarMD has built a comprehensive and dynamic database of failures, fixes and repairs related to vehicles' on-board diagnostics (OBD-II or OBD2), required on all cars, light trucks, vans and SUVs sold in the United States since 1996. The system provides health and safety information for roughly 80% of a vehicle's systems to trigger the check engine light when a problem is found; alerting the driver to issues that affect emissions, fuel economy, drivability and cost of ownership. CarMD's database stems from the cars themselves and the professionals who service them. Each CarMD® Vehicle Health Index™ draws from this database and CarMD's network of Automotive Service Excellence (ASE)-certified technicians who have validated related failures and fixes. As a result, CarMD is able to provide unbiased data on repair costs and trends in Index form. This 2019 Index statistically analyzes more than 11.4 million failures and recommended repairs for vehicles in the U.S., over the past year.

# Summary of Findings

In 2018, U.S. vehicle owners saw a 6.5% increase in the average cost to repair check engine issues, comprised of an 11% increase in labor and 3.5% increase in average parts costs. Car repair costs were also up across all four U.S. regions.

In 2018 – for the first time since CarMD has reported on these rankings – we saw a tie in the no.1 most common check engine light repair, with “replace ignition coil(s) and spark plug(s)” and “replace oxygen sensor” each accounting for 5.81% of repairs. Rounding out the five most common repairs are no.3 “replace catalytic converter(s),” no.4 “tighten or replace loose or damaged gas cap” and no.5 “replace EVAP purge control valve.”

The most expensive repair seen in 2018 by CarMD’s network was “replace engine,” costing as much as \$7,150. However, drivers should not panic when their car’s check engine light comes on because this repair only accounted for one-half of 1% of repairs.

Some of the least expensive repairs included “replace gas cap,” and “replace electronic throttle control system (ETCS) fuse” – both which typically cost under \$50.

Our data reports an increase in ignition coil issues, with this recommended repair moving from the no. 7 to no. 5 most common repair. There were also slightly fewer mass air flow sensor, oxygen sensor and EVAP purge control valve replacements in 2018. The increase in cars needing the combined repair to “replace ignition coil(s) and spark plug(s)” is a good indicator that automotive service professionals should pay close attention to these parts on their customers’ vehicles, and parts stores should look at related inventory.

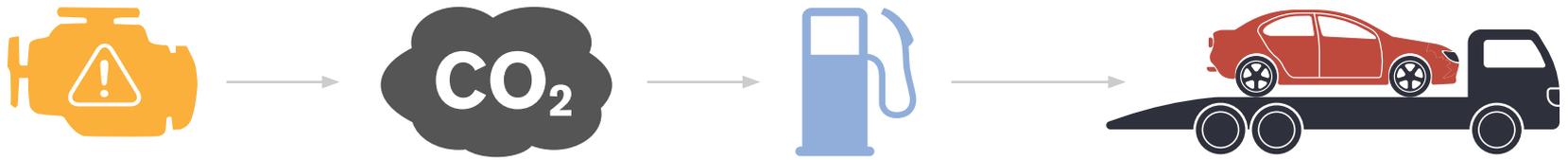


**Additional, customized reports are available upon request.**

Please visit [www.carmd.com/wp/vehicle-data-services](http://www.carmd.com/wp/vehicle-data-services) for more information.

# Check Engine Light Insight At a Glance

The **check engine light** is designed to come on when a vehicle's computer sees a problem that affects emissions or drivetrain issues. It could be as simple as a loose gas cap or severe such as engine failure. **Ignore it and you'll hurt the car's fuel economy, harm the environment and end up at the repair shop.**



## I'm Not Panicking, You're Panicking...

Don't panic when the check engine light comes on, but get it diagnosed as soon as possible. A blinking or flashing check engine light can indicate a more serious problem such as an engine misfire that needs immediate attention.

The good news – one of the most common reasons the check engine light comes on is a loose, damaged or missing gas cap costing \$0 to \$25 to repair. The bad news – it can cost thousands if it ends up being an engine or catalytic converter problem.



### Top 5 Check Engine Repairs in 2018

1. Ignition Coil(s) and Spark Plug(s) (5.81%)
2. Oxygen Sensor (5.81%)
3. Catalytic Converter (4.93%)
4. Gas Cap (4.18%)
5. Ignition Coil (3.64%)

### National Average

The average cost to repair a check engine light problem in the U.S. in 2018 was \$381.



## The ABCs of DTCs – How Do You Know What's Wrong?

Diagnostic trouble codes (DTCs) are **5-digit alphanumeric codes** that identify the vehicle's trouble area. The first character is a letter that defines the main system where the problem occurred. The second character is a number that identifies the type of code. The third IDs the affected system, and the fourth and fifth characters define the section of the system that's malfunctioning.

The most common DTC in 2018 was **P0420**, which indicates Catalyst B1 Deterioration, which often indicates a faulty oxygen sensor or catalytic converter.

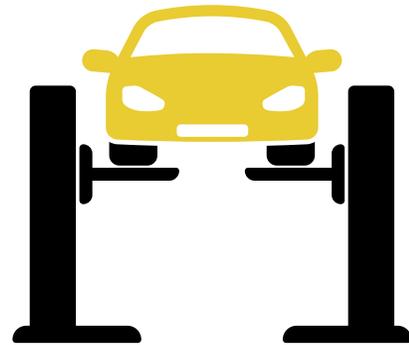
Automotive repair technicians use a diagnostic tool to see what DTCs the car has and use it as a starting point to determine what repairs the car needs.



For more information on check engine light health, Please visit [www.carmd.com](http://www.carmd.com)

# 10 Most Common Check Engine Repairs in the U.S.

Calendar Year 2018



Rank	Vehicle Repair	Total Average Repair Cost (Parts & Labor)	% 2018 Repairs	Change in Rank Since 2017
1	Replace Ignition Coil(s) and Spark Plug(s)	\$391.42	5.81%	No. 2
TIE	Replace Oxygen Sensor(s) (O <sub>2</sub> S)	\$244.04	5.81%	No Change
3	Replace Catalytic Converter(s) with new OE Catalytic Converter(s)	\$1,371.17	4.93%	No Change
4	Inspect for Loose Fuel Cap and Tighten or Replace as Necessary	\$25.86	4.18%	No Change
5	Replace Ignition Coil(s)	\$217.91	3.64%	No. 7
6	Replace Evaporative Emissions (EVAP) Purge Control Valve	\$149.52	3.61%	No. 5
7	Replace Mass Air Flow (MAF) Sensor	\$340.58	3.60%	No. 6
8	Replace Evaporative Emissions (EVAP) Purge Solenoid	\$153.70	2.78%	No Change
9	Replace Fuel Injector(s)	\$449.73	2.71%	No Change
10	Replace Thermostat	\$244.61	2.40%	No Change

(Ten most common vehicle repairs are based on 11,419,150 repairs recommended in calendar year 2018 on 1996-2018 model year vehicles. This data applies to > 85% of cars, light trucks, minivans, SUVs and hybrids on the road in the U.S. – foreign and domestic. Source: CarMD.com Corp.)

# Most Common Repairs

These were the most common repairs needed when the check engine light came on in U.S. vehicles during calendar year 2018:

**1** There was a tie for the most commonly diagnosed car repair, with each of the of the following accounting for 5.81% of recommended repairs in 2018:

- **“Replace ignition coil(s) and spark plug(s).”** This is an example of how ignoring a smaller problem, like a spark plug can snowball into the need for more than one repair. Spark plugs and ignition coils work together to help the engine start, and keep running. Faulty spark plugs can trigger ignition coil failure, which is why they are often replaced simultaneously. High underhood temperatures and age can also cause them to fail. The cost to replace ignition coil(s) and spark plug(s) in 2018 was \$391.
- **“Replace oxygen sensor(s).”** Important to a car’s engine performance and to the environment, the O<sub>2</sub> sensor measures the amount of unburned oxygen in the exhaust and tells a car’s computer when there is either too much, or not enough fuel as compared with oxygen for ideal operation. O<sub>2</sub> sensors can fail prematurely due to lack of maintenance like neglecting oil changes or engine contamination from internal coolant leaks. Many drivers ignore the O<sub>2</sub> sensor because their car often seems like it’s driving just fine, but in reality it’s reducing your fuel economy and slowly doing more damage to your car. The average cost to replace an O<sub>2</sub> sensor in 2018 was \$245.

**3** The third most common repair, **“replace catalytic converter(s),”** accounted for 4.93% of repairs in 2018. In most cases, a catalytic converter won’t fail unless a related root cause – such as a faulty spark plug – is ignored for too long. The average cost to replace a catalytic converter in 2018 was \$1,371.

**4** **“Tighten or replace fuel cap” was the fourth most common repair.** It accounted for 4.18% of repairs in 2018. Missing or damaged gas caps can cost time and money, triggering the check engine light and a repair shop visit. If left unchecked, a gas cap problem can cause reduced fuel economy and harm the environment. The average cost to replace a loose gas cap is \$26, and most can be purchased at the local auto parts store.

**5** The no. 5 most common repair (3.64%) in 2018 was **“replace ignition coil(s) – up from no. 7 last year.** Ignition coils help the engine start and keep running. They take the battery’s 12-volt current and step it up to ignite the spark plugs. Your car may have only one ignition coil, or as many as it has cylinders. Several conditions can contribute to an ignition coil’s failure, including faulty spark plugs, high underhood temperatures and age. A driver should pay attention to possible symptoms surrounding engine coil failure as it will soon affect other vehicle systems, such as the costly catalytic converter, and can leave them stranded by the roadside. The cost to replace ignition coil(s) in 2018 was \$220.

# Most Common Repairs

These were the most common repairs needed when the check engine light came on in U.S. vehicles during calendar year 2018:

**6** The sixth most common check engine-related repair is “replace evaporative emissions (EVAP) purge control valve.” Down one spot this year, this valve is part of the car’s EVAP system, which prevents fuel tank vapors from escaping into the atmosphere. When the engine is warmed up, its computer gradually opens the purge valve to allow fuel vapor to be moved from the charcoal canister to be burned in the engine. If the purge flow is less or more than is expected, the car’s computer turns on the “check engine” light. When purge valves get stuck they often need to be replaced, which is a fairly simple fix. The average cost to replace an EVAP purge control valve is \$150.

**7** “Replace Mass Airflow Sensor” is now the seventh most common repair (3.60%) – down one spot from no. 6 last year. The MAF is responsible for metering the air coming into a car’s engine and determining how much fuel to inject into the engine. When malfunctioning, it can lower fuel economy by as much as 25%. It costs on average \$341 on average to repair, but is vital to saving dollars at the pump.

**8** The eighth most frequent check engine repair (2.78%) in 2018 was “replace evaporative emissions (EVAP) purge solenoid.” It helps control how much fuel vapor escapes into the atmosphere from your car. The purge solenoid is controlled by the engine control module or powertrain control module, and can be left partially open. The average cost to replace an EVAP purge solenoid, including parts and labor, in 2018 was \$155.

**9** The no. 9 most frequent repair in 2018 (2.78%) was “replace fuel injector(s).” Fuel injectors help make sure the car’s fuel comes out as a fine mist so it can mix with the air passing into the cylinder. Some vehicles have more than one fuel injector, which is called multi-point fuel injection. A failing fuel injector can cause engine performance issues, poor idling; engine misfires and reduced fuel economy. The average cost to replace fuel injector(s) on a vehicle in 2018 was \$450.

**10** The tenth most common repair was “replace thermostat” (2.40%). The car’s thermostat regulates the engine coolant temperature to warm and cool to ideal “operating temperature.” It opens and closes as needed to regulate temperature. When a thermostat fails, it often gets stuck open. If the vehicle’s computer doesn’t see the engine coolant temperature rise to “operating temperature” within a fixed amount of time, it will set the check engine light. A vehicle’s thermostat can rust and fail if the coolant is not changed at recommended mileage intervals, or the vehicle is subjected to extreme temperatures. The average cost to replace a thermostat was \$245 in 2018.

## National Repair Costs & Data

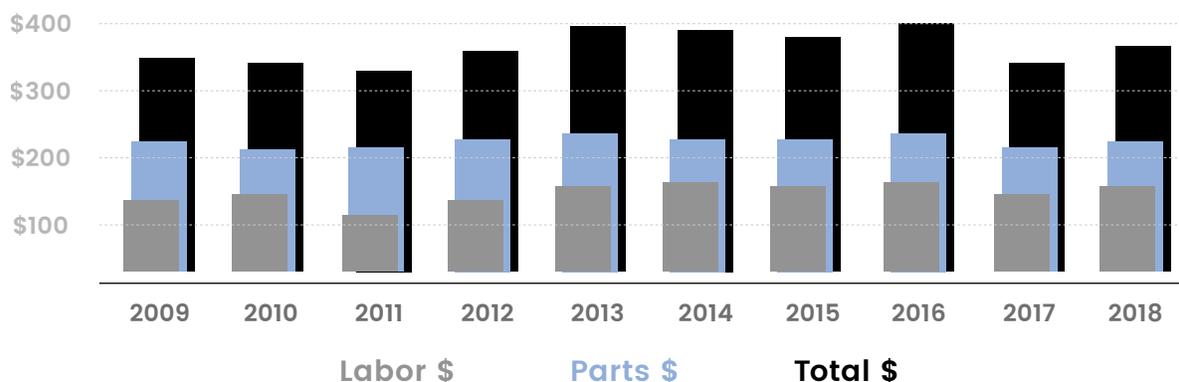
In 2018, we saw national labor, parts and total check engine light repair costs trend up. Labor costs were up 11% year-over-year from 2017 to 2018. Parts costs were up 3.5%. While auto repair costs are on the rise, they are still more than 4% below the 10-year high of \$397 in 2016. Costs trend up and down due to a range of factors, including cost of labor, cost of parts, how long a repair takes to perform and type of repair. It's not necessarily indicative of an increase in what the shop is charging.

### U.S. Average Car Repair Cost Trends 2009–2018 (10-Year History)

Source: CarMD.com Corp.

Year	Labor	Parts	Total Average Repair Cost
2018	\$157.04	\$223.81	\$380.85
2017	\$141.16	\$216.29	\$357.45
2016	\$162.46	\$235.41	\$397.87
2015	\$155.15	\$232.16	\$387.31
2014	\$161.61	\$228.77	\$390.38
2013	\$157.23	\$235.26	\$392.49
2012	\$138.96	\$228.88	\$367.84
2011	\$118.61	\$215.32	\$333.93
2010	\$143.61	\$212.44	\$356.05
2009	\$138.37	\$221.13	\$359.50

Repair Costs 2009 - 2018



# Regional Repair Costs & Data

In 2018, the national average for automotive repair labor costs increased 11% from \$357 to \$381.

- Repair costs were up down across all regions of the U.S., with the west seeing the largest increase (8%) and vehicle owners in the Midwest only having to pay about 1% more for repairs.
- Vehicle owners in the West paid the most for check engine-related car repairs (\$387) – nearly 6% more than drivers in the Midwest, who paid the least (\$366).



## Regional Average Check Engine-Related Repair Costs 2018 vs. Previous Year

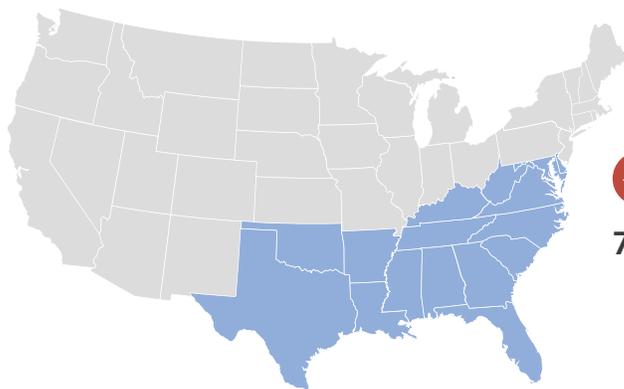
Source: CarMD.com Corp.

Region	Total Average Repair Costs (2017)	Total Average Repair Costs (2018)	Percentage Increase from 2017 to 2018
South	\$357.71	\$385.46	Up 7.8%
West	\$358.05	\$386.78	Up 8.0%
Midwest	\$361.11	\$366.31	Up 1.0%
Northeast	\$362.17	\$379.76	Up 4.9%

# Southern Repair Costs & Data

## The 10 Most Common Check Engine Vehicle Repairs in the Southern U.S. – 2018

Rank	Vehicle Repair	Total Average Repair Cost (Parts&Labor)	% 2018 Southern U.S. Repairs	Change In Rank Since 2017
1	Replace Ignition Coil(s) and Spark Plug(s)	\$391.56	6.00%	2
2	Replace Oxygen Sensor(s) (O <sub>2</sub> S)	\$246.09	5.63%	1
3	Replace Catalytic Converter(s) with new OE Catalytic Converter(s)	\$1,354.79	5.18%	No Change
4	Inspect for Loose Fuel Cap and Tighten or Replace as Necessary	\$25.41	4.15%	No Change
5	Replace Ignition Coil(s)	\$218.54	3.95%	6
6	Replace Mass Air Flow (MAF) Sensor	\$340.12	3.79%	5
7	Replace Evaporative Emissions (EVAP) Purge Control Valve	\$148.57	3.43%	No Change
8	Replace Fuel Injector(s)	\$461.88	2.81%	9
9	Replace Evaporative Emissions (EVAP) Purge Solenoid	\$155.71	2.56%	8
10	Replace Thermostat	\$241.58	2.39%	No Change



7.8%

**\$385.46**

Average cost to repair a vehicle's check engine light problem in the Southern U.S. in 2018.

Ten most common vehicle repairs in the Southern U.S. are based on 4,604,435 repairs in 2018 in AL, AR, DC, DE, FL, GA, KY, LA, MD, MS, NC, OK, TN, VA, SC, TX and WV. This data applies to roughly 85% of cars, light trucks, minivans and SUVs on the road in the U.S. – foreign and domestic. Source: CarMD.com Corp.

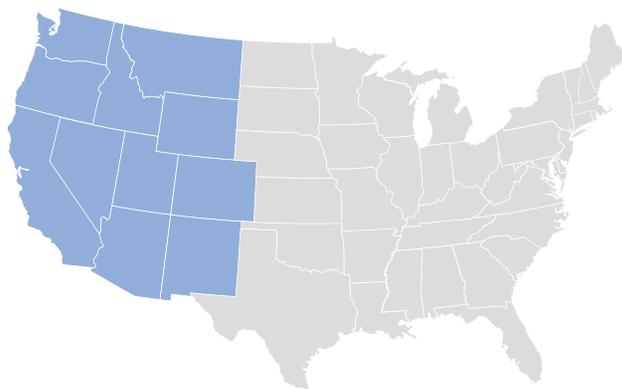
## Western Repair Costs & Data

### The 10 Most Common Check Engine Vehicle Repairs in the Western U.S. – 2018

Rank	Vehicle Repair	Total Average Repair Cost (Parts&Labor)	% 2018 Western U.S. Repairs	Change In Rank Since 2017
1	Replace Oxygen Sensor(s) (O <sub>2</sub> S)	\$257.11	5.27%	No Change
2	Replace Ignition Coil(s) and Spark Plug(s)	\$389.03	5.04%	No Change
3	Replace Catalytic Converter(s) with new OE Catalytic Converter(s)	\$1,385.59	4.99%	No Change
4	Inspect for Loose Fuel Cap and Tighten or Replace as Necessary	\$25.36	4.77%	No Change
5	Replace Mass Air Flow (MAF) Sensor	\$352.59	4.21%	No Change
6	Replace Ignition Coil(s)	\$220.85	3.67%	No Change
7	Replace Evaporative Emissions (EVAP) Purge Control Valve	\$151.41	3.33%	No Change
8	Replace Thermostat	\$244.46	2.64%	10
9	Replace Fuel Injector(s)	\$483.18	2.57%	No Change
10	Replace Evaporative Emissions (EVAP) Purge Solenoid	\$153.19	2.50%	8



8.0%



# \$386.78

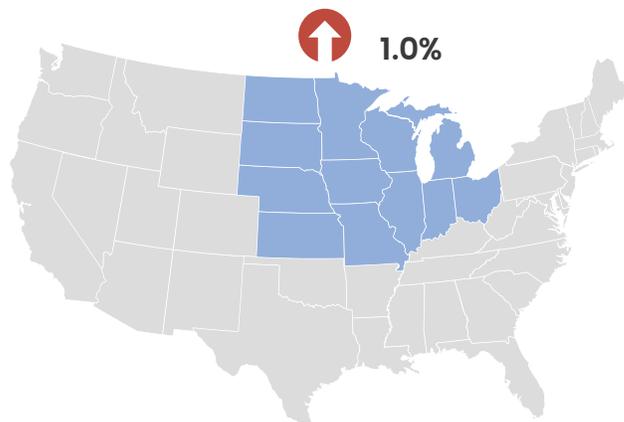
Average cost to repair a vehicle's check engine light problem in the Western U.S. in 2018.

Ten most common vehicle repairs in the Western U.S. are based on 2,972,172 repairs in 2018 in AK, AZ, CA, CO, HI, ID, MT, NM, NV, OR, UT, WA and WY. This data applies to roughly 85% of cars, light trucks, minivans and SUVs on the road in the U.S. – foreign and domestic. Source: CarMD.com Corp.

## Midwestern Repair Costs & Data

### The 10 Most Common Check Engine Vehicle Repairs in the Midwestern U.S. – 2018

Rank	Vehicle Repair	Total Average Repair Cost (Parts&Labor)	% 2018 Midwestern U.S. Repairs	Change In Rank Since 2017
1	Replace Oxygen Sensor(s) (O <sub>2</sub> S)	\$237.95	6.19%	No Change
2	Replace Catalytic Converter(s) with new OE Catalytic Converter(s)	\$1,335.13	4.98%	3
3	Replace Ignition Coil(s) and Spark Plug(s)	\$390.77	4.80%	2
4	Inspect for Loose Fuel Cap and Tighten or Replace as Necessary	\$25.20	4.31%	No Change
5	Replace Evaporative Emissions (EVAP) Purge Control Valve	\$147.92	3.90%	7
6	Replace Mass Air Flow (MAF) Sensor	\$332.15	3.45%	5
7	Replace Ignition Coil(s)	\$220.21	3.39%	6
8	Replace Evaporative Emissions (EVAP) Purge Solenoid	\$151.38	3.21%	No Change
9	Replace Fuel Injector(s)	\$492.44	2.90%	No Change
10	Replace Thermostat	\$246.44	2.38%	No Change



**\$366.31**

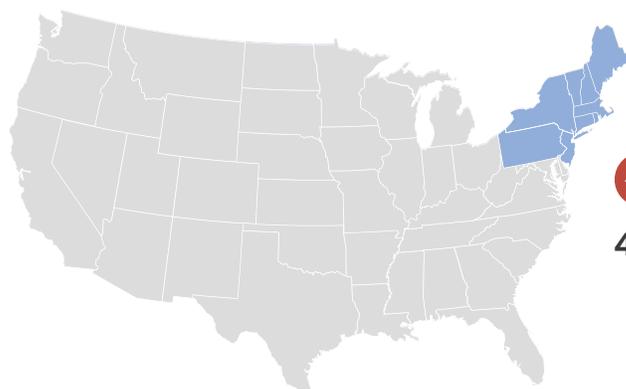
Average cost to repair a vehicle's check engine light problem in the Midwestern U.S. in 2018.

Ten most common vehicle repairs in the Midwestern U.S. are based on 3,493,423 repairs in 2018 in IA, IL, IN, KS, MI, MN, MO, ND, NE, OH, SD and WI. This data applies to roughly 85% of cars, light trucks, minivans and SUVs on the road in the U.S. – foreign and domestic. Source: CarMD.com Corp.

# Northeastern Repair Costs & Data

## The 10 Most Common Check Engine Vehicle Repairs in the Northeastern U.S. – 2018

Rank	Vehicle Repair	Total Average Repair Cost (Parts&Labor)	% 2018 Northeastern U.S. Repairs	Change In Rank Since 2017
1	Replace Oxygen Sensor(s) (O <sub>2</sub> S)	\$262.71	6.77%	No Change
2	Replace Catalytic Converter(s) with new OE Catalytic Converter(s)	\$1,304.67	5.60%	No Change
3	Inspect for Loose Fuel Cap and Tighten or Replace as Necessary	\$24.04	5.28%	4
4	Replace Ignition Coil(s) and Spark Plug(s)	\$384.77	4.92%	3
5	Replace Ignition Coil(s)	\$221.08	3.88%	6
6	Replace Mass Air Flow (MAF) Sensor	\$349.56	3.81%	5
7	Replace Evaporative Emissions (EVAP) Purge Control Valve	\$153.30	3.78%	No Change
8	Replace Evaporative Emissions (EVAP) Purge Solenoid	\$153.37	2.90%	No Change
9	Replace Fuel Injector(s)	\$468.31	2.31%	No Change
10	Replace Thermostat	\$255.49	2.22%	New To List



4.9%

**\$379.76**

Average cost to repair a vehicle's check engine light problem in the Northeastern U.S. in 2018.

Ten most common vehicle repairs in the Northeastern U.S. are based on 1,731,657 repairs in 2018 in CT, MA, ME, NH, NJ, NY, PA, RI and VT. This data applies to roughly 85% of cars, light trucks, minivans and SUVs on the road in the U.S. – foreign and domestic. Source: CarMD.com Corp.

# Most Expensive Car Repairs

The **most expensive repair** in the CarMD database in 2018 was “replace engine” (\$7,150). This repair is indicative of the fact that cars are being made to outlast parts such as their engine. The good news is that most expensive repairs remain extremely rare in terms of percentage of occurrence. The five **most expensive repairs** combined only **account for less than one half of one percent (0.41%) of all repairs** seen by CarMD’s network of thousands of certified technicians last year.



## The 10 Most Expensive Check Engine–Related Vehicle Repairs in the U.S. – 2018

Rank	Vehicle Repair	Most Expensive Repair Cost (Parts & Labor)
1	Replace Engine	\$7,150
2	Replace Electronic Power Steering (EPS) Control Unit	\$5,201
3	Replace Transmission Assembly and Reprogram Electronic Control Module (ECM)	\$5,130
4	Replace Transmission and Torque Converter	\$5,051
5	Replace Audio and Visual (AV) Control Unit	\$4,293
6	Replace Transmission Case and Torque Converter	\$4,245
7	Replace Hybrid Battery and Reprogram Engine Control Module (ECM)	\$4,149
8	Replace Compuvalve Module	\$4,105
9	Replace Transmission Assembly	\$3,905
10	Replace Hybrid Battery	\$3,798

Ten most/least expensive repairs are based on 11,418,533 repairs recommended and input into the CarMD database by the company’s team of factory trained repair professionals in 2018. This data is for model year 1996 to 2018 OBD2 cars, light trucks, minivans and SUVs in the U.S. – foreign and domestic. Source: CarMD.com Corp.

# Least Expensive Car Repairs

The least expensive repair is “Inspect for Loose Fuel Cap and Tighten or Replace as Necessary” at an average cost of \$25. The ten least expensive repairs account for roughly 5% of all needed repairs.



## The 10 Least Expensive Check Engine–Related Vehicle Repairs at or Under \$70 In the U.S. – 2018

Rank	Vehicle Repair	Most Expensive Repair Cost (Parts & Labor)
1	Inspect for Loose Fuel Cap and Tighten or Replace as Necessary	\$25
2	Replace Fuel Tank Gas Cap	\$28
3	Replace Electronic Throttle Control System (ETCS) Fuse	\$47
4	Perform DTC Confirmation Procedure	\$51
5	Replace Electronic Engine Control (EEC) Fuse	\$52
6	Inspect For Correct Air Filter and Air Box is Securely Latch Properly	\$57
7	Clean Ground Wire	\$59
8	Replace Oil Cap	\$66
9	Perform Steering Angle Sensor Calibration Procedure	\$67
10	Inspect for Faulty Vacuum Hose(s) Between EGR Valve and BPT Valve and Repair as Necessary	\$68

Ten most/least expensive repairs are based on 11,418,533 repairs recommended and input into the CarMD database by the company’s team of factory trained repair professionals in 2018. This data is for model year 1996 to 2018 OBD2 cars, light trucks, minivans and SUVs in the U.S. – foreign and domestic. Source: CarMD.com Corp.

# Index Methodology

CarMD has compiled the industry's most comprehensive database of OBD2-related problems and associated fixes uploaded by automotive technicians and vehicle owners since 1996.

The data for the 2019 CarMD® Vehicle Health Index™ was procured from repairs uploaded to the CarMD diagnostic database from Jan. 1, 2018 to Dec. 31, 2018. The data comes directly from the vehicles themselves to the CarMD database without any human interface. This database is also used to support products such as CarMD PRO SCAN, an automated network inspection solution for technicians.

The data was collected and analyzed was from between Mar. 1, 2019 and Mar. 25, 2019.

Virtually all makes and models of cars, light trucks, minivans, SUVs and hybrids made since 1996 – 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 vehicles that experience more failures or whose owners seek guidance from sources that report to the CarMD database.

The 2019 Index statistically analyzes 11,418,533 repairs. Each recommended repair has also been reviewed and validated by CarMD's team of ASE-certified Master Technicians and then output based on a probability algorithm that takes into account the vehicle's year, make, model, mileage, postal code, DTCs and similar vehicle problems to produce a most likely repair.

Because the data stems from those U.S. vehicle owners and automotive technicians who elected to use the diagnostic devices and/or upload data into the CarMD database; 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 technicians may have a larger quantity of logged repairs; however, all have been averaged into the overall Index findings. For regional data, CarMD used the U.S. Census Bureau Regions and Division Map to define regions.

Repair costs are based on parts and dealer list 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 an independent consulting company to create and maintain the database for compiling and generating this Index.

On a daily basis, CarMD's 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, subsequent CarMD Vehicle Health Index reports will draw from an updated sampling of diagnostic trouble codes, expert fixes and repair costs.

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