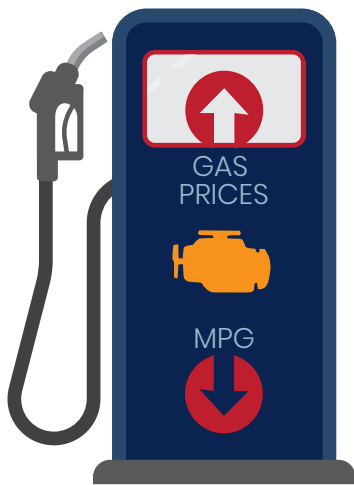


## 5 Most Common **Check Engine Light-Related** Repairs in 2020 & Average Cost to Make That Repair

Each of these issues will negatively impact fuel economy if ignored, which is important to keep in mind as the average price for a gallon of gas in the U.S. is up from **\$1.95/gallon in April 2020** to **\$2.88/gallon in April 2021** and inch toward **\$4.00** in parts of the country, including California.



- 1 Replace catalytic converter(s) with new OE catalytic converter(s), **\$1,383**
- 2 Replace oxygen sensor(s), **\$243**
- 3 Replace ignition coil(s) and spark plug(s), **\$389**
- 4 Replace mass air flow sensor. **\$336**
- 5 Tighten or replace fuel cap, **\$25**

# CarMD<sup>®</sup>

## 2021 Vehicle Health Index<sup>™</sup>

This year marks the 11th anniversary of the **CarMD Vehicle Health Index**, which examines check engine light-related problems, repairs and associated costs on cars, light trucks, SUVs and minivans on the road in the United States.

Having built the most comprehensive and dynamic database of failures and repairs related to vehicle on-board diagnostic systems, CarMD is uniquely qualified to provide unbiased data on repair costs and trends. CarMD distributes this Index each April during Car Care Awareness Month to remind vehicle owners about the importance of paying attention to maintenance needs and inspections to help avoid unforeseen problems.

This Index also serves to provide the automotive industry with year-over-year data, shedding light on trends related to the type and cost of repairs. This data can be used to identify emerging issues and drive automotive aftermarket decisions from parts purchase forecasting to repair shop pricing to customer education.

In 2020, an IHS Market report, which tracks vehicle registrations, reported that the average age of vehicles in the U.S. has climbed to an all-time high of 11.9 years with 1 in 4 cars and trucks at least 16 years old. In this latest Vehicle Health Index, CarMD examines the most common problems by vehicle age and looks at which model year vehicles are most likely to need check engine light-related repairs.



# 2021 CarMD® Vehicle Health Index™



## What is Distinctive About CarMD's Index?

This is the first and most comprehensive industry report to provide consumers and the automotive aftermarket with year-over-year check engine light repair insight. Since 1996, every vehicle sold in the United States has been required to have an on-board diagnostic (OBDII) system. It monitors roughly 80% of a vehicle's systems to trigger the check engine light and alert drivers about issues related to emissions, fuel economy, drivability and cost of ownership. CarMD's data comes directly from each vehicle's OBDII system, reported by vehicle owners and the professionals who service them. From this data, CarMD has built a database of failures and repairs related to a vehicle's on-board diagnostic system. Each CarMD Vehicle Health Index draws from this database, and CarMD's nationwide network of Automotive Service Excellence (ASE)-certified technicians who have validated related failures and fixes.



**Perform a FREE Vehicle Inspection –  
Proactive Service Information, Predictive  
Failures, Recalls, TSBs and more**

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## Who can benefit from this Index?

### AUTOMOTIVE AFTERMARKET

This data can inform B2B parts manufacturers and automotive aftermarket retail buyers as they extrapolate year-over-year and trends related to vehicle diagnostic data and related parts failures. The auto parts industry can use this data to be sure the right parts are available in the right quantities.

### REPAIR SHOPS

When used in conjunction with other resources such as [Innova Repair Solutions](#) and the [CarMD PRO SCAN](#) pre- and post-inspection resource, this Index can provide insight to repair professionals on the type of parts most likely needed a when a car rolls into the service bay. It can also help them see if their parts and labor pricing is in line with the average repair costs in their regions.

### VEHICLE OWNERS

The CarMD Vehicle Health Index provides a way to educate drivers about the importance of heeding warning lights, common repairs and related symptoms to improve vehicle life and cost of ownership. When used with resources such as [CarMD Garage](#), it can help owners better understand and budget for repairs.

### USED CAR BUYERS AND SELLERS

Knowing which model year (MY) vehicles are most likely to need check engine light repairs can help used car buyers and sellers decide when to buy, when to sell and when extended warranties might be worth the investment.

# Summary of Findings:

## This 2021 Index statistically analyzes more than 13.9 million failures and recommended repairs for vehicles in the U.S., over the past calendar year

The year 2020 brought many financial challenges for people across the country, which led folks to hold on to older vehicles longer than ever before, and seek to cost effectively keep their cars and trucks running for as long as possible.

### **COSTS TO REPAIR:**

In 2020 car repair costs were down 1.6% overall. Labor costs were down 2.8% year-over-year from 2019 to 2020, and parts costs were down about 1%. Many factors likely played a role in this decrease, including the economy, competition among repair shops, and an increase in DIY automotive repairs during the pandemic. CarMD anticipates an increase in parts costs next year given the material shortage resulting from shutdown-related supply chain issues.

### **TYPES OF REPAIRS:**

In 2020, for the second consecutive year since CarMD has reported these rankings, “replace catalytic converter” was the most common check engine light repair, accounting for 5.65% of repairs. Catalytic converters are costly repairs that don’t

typically fail unless maintenance and other repairs are ignored, or a vehicle is up there in age. This can be partially explained by the upward trend in average vehicle age from 11.7 years in 2018 to 11.8 years in 2019 and 11.9 years in 2020. As people keep their cars and trucks longer, the automotive aftermarket will need to adjust related parts forecasts accordingly.

### **MOST EXPENSIVE:**

New this year CarMD broke down the Index by vehicle model year. MY 2006 vehicles were most likely to need an expensive catalytic converter replacement, which accounted for 7.74% of MY 2006 repairs at an average cost of \$1,445.

### **MOST/LEAST LIKELY:**

Model year 2007 vehicles were most likely to need check engine light repairs, accounting for 10% of problems seen by CarMD last year. Not surprisingly, vehicles that are less than 3 years old didn’t experience many check engine light issues, accounting for fewer than 1% of needed repairs reported to CarMD.

### **BIGGEST MOVES:**

Our data reports an increase in percentage of mass air flow sensors (MAF sensors) needing replacement, while fuel cap issues continue to trend down. MAF sensors moved from the no. 5 to the no. 4 most common repair and 4.28% of repairs in 2019 to 4.51% of repairs in 2020. Gas cap issues dropped again moving from the no. 4 to no. 5 most frequent repair and dropping from 4.57% to 4.44% of repairs. When CarMD first started tracking these issues, loose, damaged or missing gas caps accounted for more than 9% of repairs and ranked second. Automotive aftermarket retailers and parts manufacturers can use this information along with other industry data to have meaningful discussions about inventory and parts forecasting.

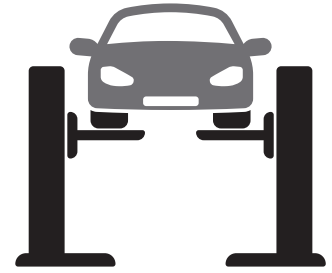
The year’s Vehicle Health Index as well as historical reports are available [here](#).



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

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

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



## 2020

Rank	Vehicle Repair	Total Avg. Repair Cost	% of 2020 Repairs	Change in Rank since 2019
#1	Replace Catalytic Converter(s) with new OE Catalytic Converter(s)	\$1,383.29	5.65%	No change
#2	Replace Oxygen Sensor(s) (O2S)	\$243.61	5.57%	No change
#3	Replace Ignition Coil(s) and Spark Plug(s)	\$389.43	5.32%	No change
#4	Replace Mass Air Flow (MAF) Sensor	\$336.37	4.51%	Up from no. 5
#5	Inspect for Loose Fuel Cap and Tighten or Replace as Necessary	\$25.01	4.44%	Down from no. 4
#6	Replace Ignition Coil(s)	\$214.83	3.97%	No change
#7	Replace Evaporative Emissions (EVAP) Purge Control Valve	\$142.10	3.57%	No change
#8	Replace Fuel Injector(s)	\$448.41	2.67%	No change
#9	Replace Thermostat	\$236.33	2.27%	Up from no. 10
#10	Replace Evaporative Emissions (EVAP) Purge Solenoid	\$148.81	2.22%	Down from no. 9

(Ten most common vehicle repairs are based on 13,944,931 repairs recommended in calendar year 2020 on 1996-current 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 illuminated on U.S. vehicle dashboards during calendar year 2020:

## 1. Replace Catalytic Converter

The most commonly diagnosed, “replace catalytic converter(s),” accounted for 5.65% of repairs in 2020. A catalytic converter usually won’t fail unless a related root cause – such as a faulty spark plug – is ignored for too long. But as consumers hold on to their cars longer with the average vehicle age at nearly 12 years, vehicles will outlast parts like catalytic converters. Model year 2006 vehicles, which are now 25 years old, are most likely to need a new catalytic converter.



### SYMPTOMS

Failing catalytic converters may cause the vehicle to experience reduced acceleration, sluggish engine performance, dark exhaust smoke and heat under the engine.

### REPAIR COST

The average cost to replace a catalytic converter in 2020 was \$1,383. There have been several news reports of catalytic converter thefts in the past year, including in California, Minnesota, Ohio, Oklahoma Texas and Washington. Experts attribute this to an increase in pandemic-related financial struggles, uptick in the value of precious metals and greater demand.

## 2. Replace Oxygen Sensor

This was the 2nd most common repair totaling 5.57% of CEL repairs.



### SYMPTOMS

O2 sensors can fail prematurely due to lack of maintenance like neglecting oil changes. Many drivers ignore the O2 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.

### REPAIR COST

The average cost to replace an O2 sensor in 2019 was \$244.

## 3. Replace Ignition Coil(s) and Spark Plug(s)

This was the 3rd most common repair accounting for 5.32% of repairs. This is an example of how ignoring a smaller problem like a spark plug can snowball into the need for more than one repair, adding ignition coil-related costs to the total repair bill.



### SYMPTOMS

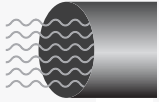
Spark plugs and ignition coils work together to help the engine start, and keep running. Faulty spark plugs can trigger ignition coil failure, which is why they are often replaced simultaneously. Symptoms include slow acceleration, loss of power, poor fuel economy, engine misfires and trouble starting the car.

### REPAIR COST

The average cost to replace ignition coil(s) and spark plug(s) in 2019 was \$389. An ignition coil replacement by itself costs about \$215 while a spark plug job costs \$244 on average, so there is some cost savings by doing the repairs together.

## 4. Replace Mass Air Flow Sensor

This was the 4th most common repair in 2020 (4.51%) – up from the no. 5 spot last year and no. 7 spot the year prior.



### SYMPTOMS

The MAF sensor is responsible for metering the air coming into a car's engine and determining how much fuel to inject into the engine. Some of the symptoms are stalling and hesitation during acceleration. When malfunctioning, it can lower fuel economy by as much as 25%.

### REPAIR COST

The average cost to replace a MAF sensor in 2020 is \$336.

## 5. Tighten or Replace Fuel Cap

This was the 5th most common repair comprising 4.44% of repairs in 2020 and continuing its drop in the rankings.



### SYMPTOMS

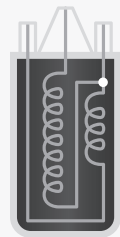
Missing or damaged gas caps can cost time and money, triggering the check engine light and a repair shop visit. If left unchecked, a gas cap problem can reduce fuel economy and harm the environment.

### REPAIR COST

The average cost to replace a gas cap in 2020 is \$25.

## 6. Replace Ignition Coil(s)

This was the 6th most common CEL repair in 2020 accounting for 3.97% of repairs.



### SYMPTOMS

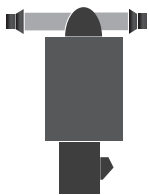
Ignition coils help the engine start and keep running. They take the battery's 12-volt current and step it up to ignite the spark plugs. Your car may have only one ignition coil, or as many as it has cylinders. Symptoms may include rough idling – particularly at low speeds – or trouble starting the car, resulting from 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.

### REPAIR COST

The average cost to replace ignition coil(s) in 2020 is \$214.

## 7. Replace Evaporative Emissions (EVAP) Purge Control Valve

This was the 7th most common check engine-related repair with 3.57% of needed repairs.



### SYMPTOMS

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 may idle roughly or inconsistently. Since many of the most common problems share similar symptoms, it is important to properly diagnose check engine light issues.

### REPAIR COST

The average cost to replace an EVAP purge control valve in 2020 is \$142.

## 8. Replace Fuel Injector(s)

This was the 8th most frequent repair in 2020 with 2.67% of repairs.



### SYMPTOMS

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.

### REPAIR COST

The average cost to replace fuel injector(s) in 2020 was \$448.

## 9. Replace Thermostat

This was the 9th most common repair with 2.27% of repairs in 2020.



### SYMPTOMS

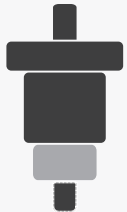
The car's thermostat regulates the engine coolant temperature to warm and cool to ideal "operating temperature." It opens and closes as needed to regulate temperature. When a thermostat fails, it often gets stuck open. If the vehicle's computer doesn't see the engine coolant temperature rise to "operating temperature" within a fixed amount of time, it will set the check engine light and overheat. 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.

### REPAIR COST

The average cost to replace a thermostat in 2020 was \$236.

## 10. Replace Evaporative Emissions (EVAP) Purge Solenoid

This was the 10th most common repair and while this fix moved down from the 9th most frequent repair a year ago, it still accounts for 2.22% of recommended repairs.



### SYMPTOMS

Your car's EVAP purge solenoid 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. It operates on a duty cycle and could be left partially open. A bad EVAP purge solenoid will also cause rough idling and difficulty starting the car.

### REPAIR COST

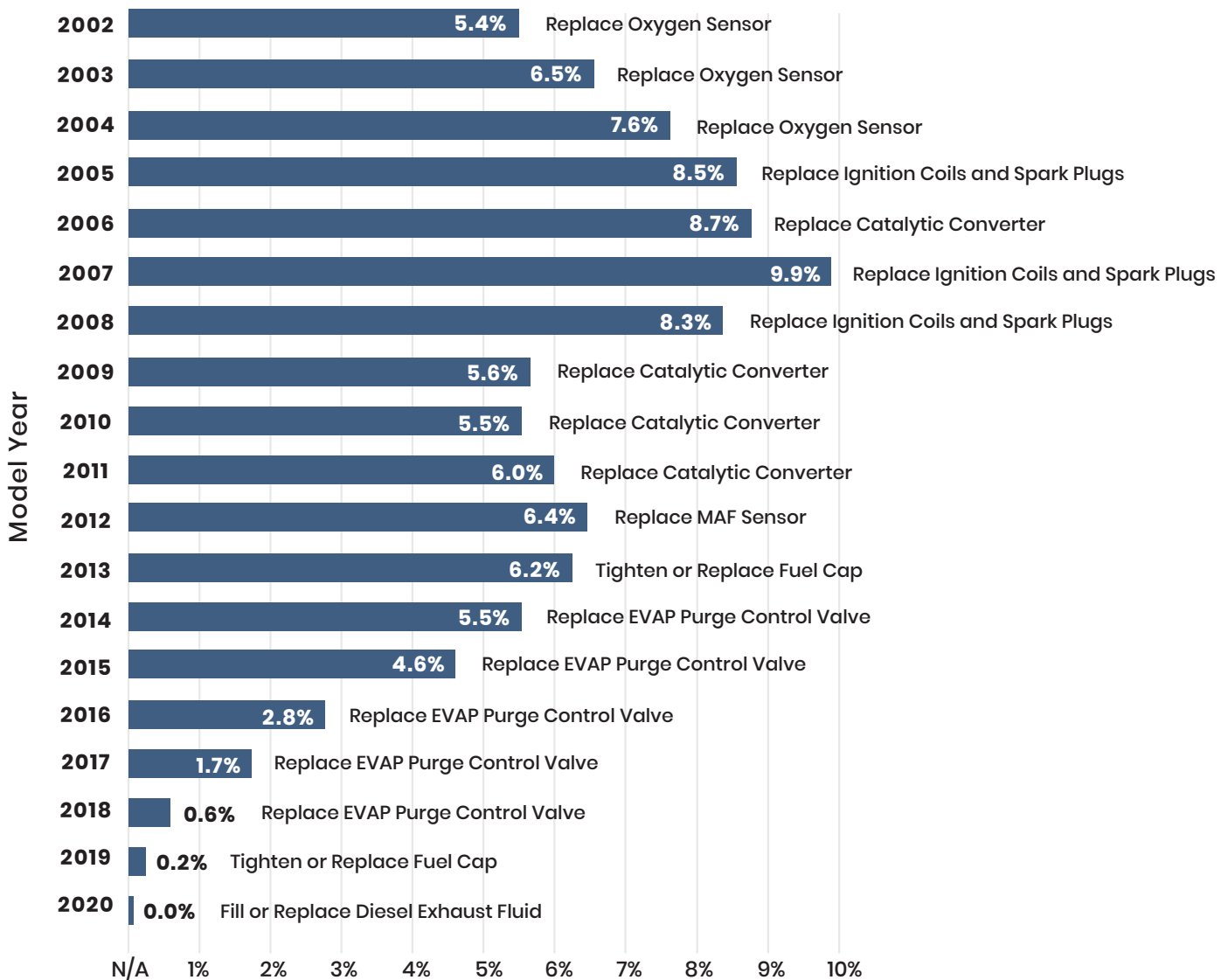
The average cost to replace an EVAP purge solenoid in 2020 was \$149.



# How does Age Affect Frequency and Type of Repairs?

With the average vehicle age nearing 12 years old and 1 in 4 vehicles on the road aged 16 years old or older, CarMD thought it would be interesting to study which model year (MY) vehicles are most likely to experience a check engine light and which are prone to catalytic converter replacement, a more common issue as average vehicle age increases.

We looked at two decades of model years and found that 2007 vehicles were most likely to need a check engine light-related repair over the past year. Vehicles purchased in the last three years (MY 2021, 2020 and 2019) didn't move the needle when it comes to check engine light issues.



% of Check Engine Light Repairs by Model Year & Most Common Fix in Calendar Year 2020

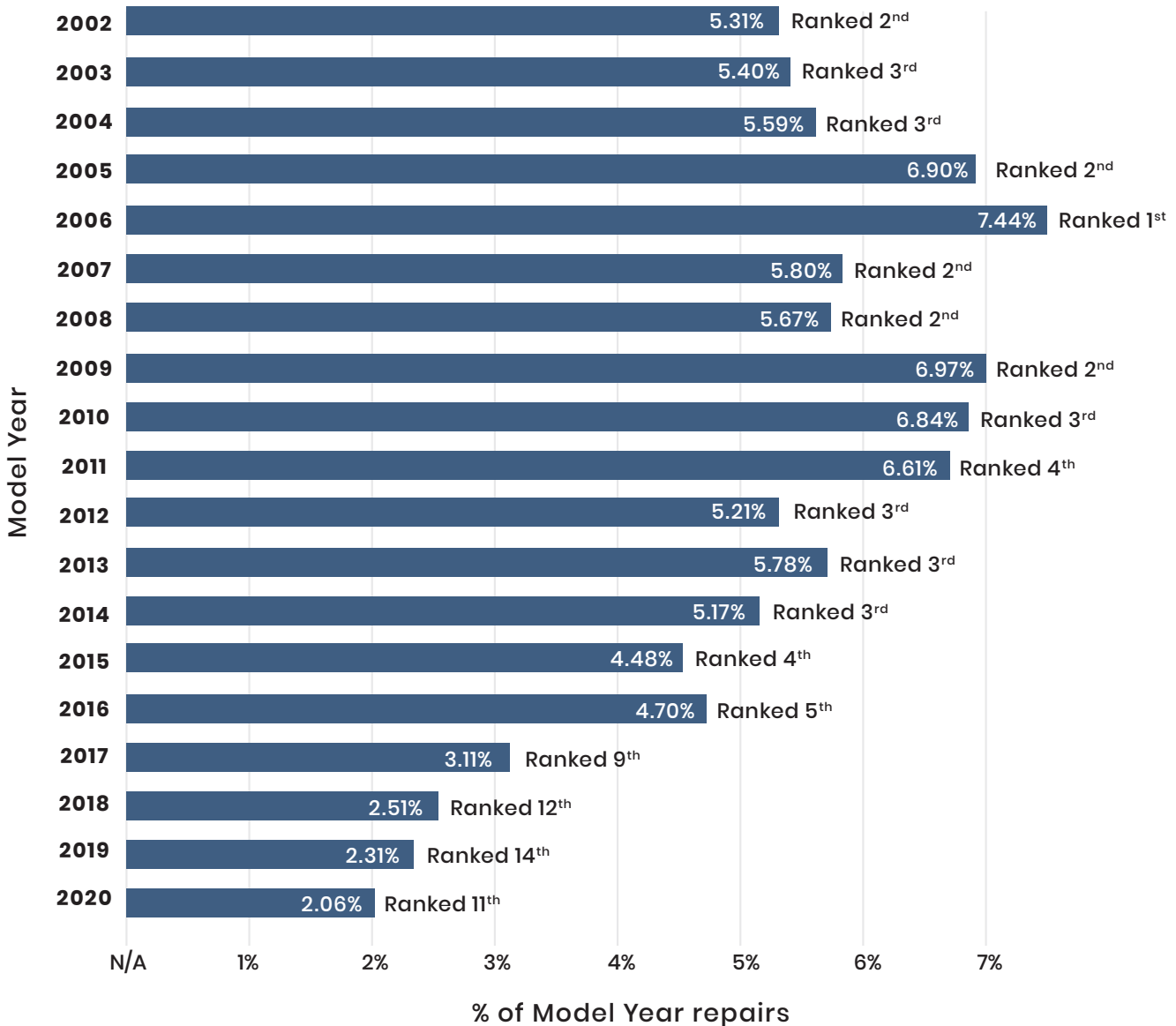
# Catalytic Converter Repairs

## How common is it to have to repair the catalytic converter by model year?



According to the National Insurance Crime Bureau, the pandemic has seen a rapid rise in catalytic converter theft because they contain precious metals such as rhodium that can be sold to metal recyclers. In 2019, an average of 282 catalytic converters were stolen every month; in 2020 the average had risen to 1,203.

Model year 2006 vehicles were most likely to need a catalytic converter replacement, which is a more common occurrence once a vehicle is over 10 years old. The following is a breakdown of catalytic converter repairs by vehicle age.



# National Repair Costs

In 2020, during the COVID-19 shutdown, average check engine light repair costs dropped slightly – down 1.6% overall. Labor costs were down 2.8% year-over-year from 2019 to 2020, and parts costs were down about 1%. Many factors likely played a role in this decrease, including the economy, competition and an increase in DIY automotive repairs during the pandemic once things started to open up. CarMD predicts an increase in parts costs next year given the material shortage resulting from shutdown-related supply chain issues.



## U.S. Average CEL Car Repair Cost Trends 2009–2020

Source: CarMD.com Corp

Year	Labor	Parts	Total Average Repair Cost
2009	\$138.37	\$221.13	<b>\$359.50</b>
2010	\$143.61	\$212.44	<b>\$356.05</b>
2011	\$118.61	\$215.32	<b>\$333.93</b>
2012	\$138.96	\$228.88	<b>\$367.84</b>
2013	\$157.23	\$235.26	<b>\$392.49</b>
2014	\$161.61	\$228.77	<b>\$390.38</b>
2015	\$155.15	\$232.16	<b>\$387.31</b>
2016	\$162.46	\$235.41	<b>\$397.87</b>
2017	\$141.16	\$216.29	<b>\$357.45</b>
2018	\$157.04	\$223.81	<b>\$380.85</b>
2019	\$148.26	\$236.64	<b>\$384.90</b>
2020	\$144.09	\$234.68	<b>\$378.77</b>

# Regional Repair Costs

Repair costs were down in all four regions of the U.S., with drivers in the South seeing the biggest decrease – down 2.7%.

- Vehicle owners in the West paid the most for check engine-related car repairs (\$396.82). Vehicle owners in the Midwest paid the least on average (\$354.88).
- The region with the highest average labor expense for a check engine light repair was the South (\$145.75). The region with the lowest average labor expense for a check engine light repair was the Northeast (\$136.80). This is not hourly rate, but rather the average amount of labor time charged for a related repair. This can be impacted by regional labor rates and what an individual shop charges to do the repair.

## 2020 Average Cost to Repair a Check Engine Light Issue - By Region

**West: \$396.82**

Average Labor Cost: \$143.65

Average Parts Cost: \$253.17

**Midwest: \$354.88**

Average Labor Cost: \$142.83

Average Parts Cost: \$212.05

**Northeast: \$375.68**

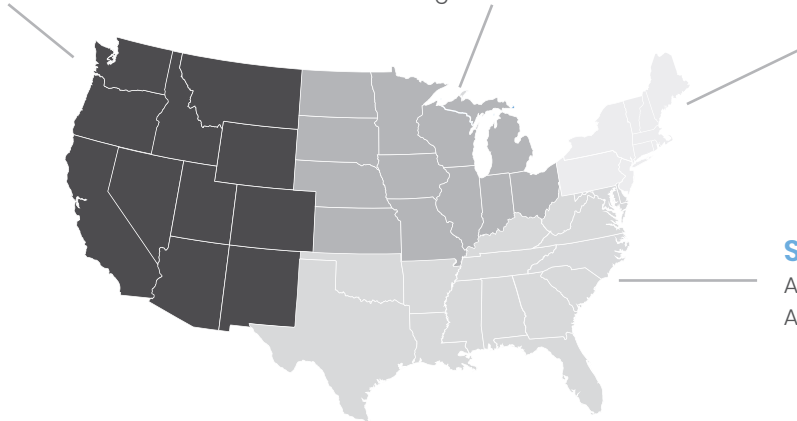
Average Labor Cost: \$136.80

Average Parts Cost: \$238.88

**South: \$381.87**

Average Labor Cost: \$145.75

Average Parts Cost: \$236.12



## Yearly Comparison of Regional Average Check Engine-Related Repair Costs

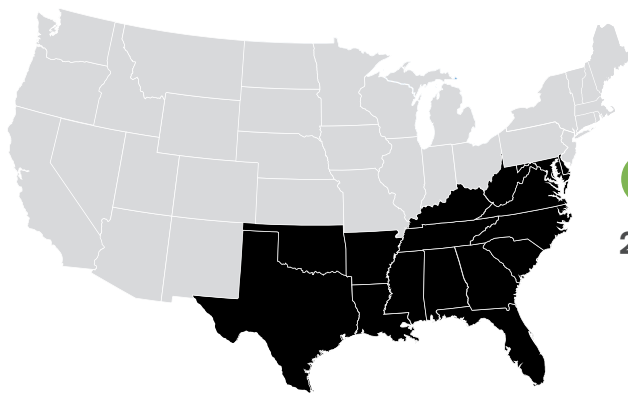
Source: CarMD.com Corp.

Region	Total Average Repair Costs (2019)	Total Average Repair Costs (2020)	Percentage Change from 2019 to 2020
South	\$392.47	\$381.87	Down 2.7%
West	\$398.26	\$396.82	Down 0.36%
Midwest	\$360.44	\$354.88	Down 1.5%
Northeast	\$384.08	\$375.68	Down 2.2%

# Southern Repair Costs & Data

## The 10 Most Common Check Engine Vehicle Repairs in the Southern U.S. – 2020

Rank	Vehicle Repair	Total Average Repair Cost (Parts & Labor)	% 2020 Southern U.S. Repairs	Change In Rank Since 2019
#1	Replace Ignition Coil(s) and Spark Plug(s)	\$389.90	5.96%	Up from no.2
#2	Replace Catalytic Converter(s) with new OE Catalytic Converter(s)	\$1,368.40	5.76%	Down from no. 1
#3	Replace Oxygen Sensor(s) (O2S)	\$240.46	5.32%	No change
#4	Replace Mass Air Flow (MAF) Sensor	\$336.13	4.59%	No change
#5	Replace Ignition Coil(s)	\$212.21	4.27%	Up from no. 6
#6	Inspect for Loose Fuel Cap and Tighten or Replace as Necessary	\$25.21	4.14%	Down from no. 5
#7	Replace Evaporative Emissions (EVAP) Purge Control Valve	\$140.46	3.48%	No change
#8	Replace Fuel Injector(s)	\$437.07	2.80%	No change
#9	Replace Thermostat	\$233.56	2.24%	No change
#10	Replace Evaporative Emissions (EVAP) Purge Solenoid	\$149.99	2.02%	No change



2.7%

**\$381.87**

Average cost to repair a vehicle's check engine light problem in the Southern U.S. in 2020.

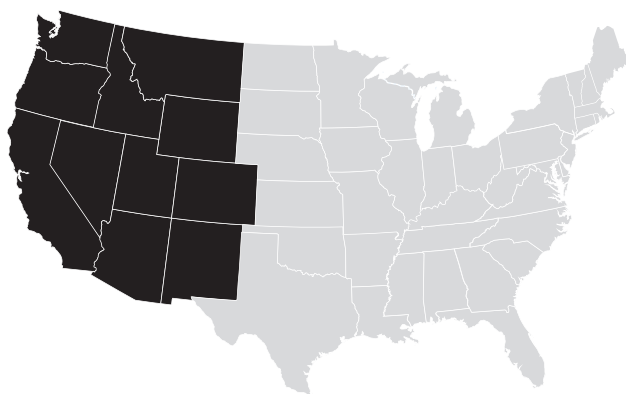


(Ten most common vehicle repairs in the Southern U.S. are based on 6,080,621 repairs in 2020 in AL, AR, DC, DE, FL, GA, KY, LA, MD, MS, NC, OK, TN, VA, SC, TX and WV. This data applies to roughly 85% of cars, light trucks, minivans and SUVs on the road in the U.S. – foreign and domestic. Source: CarMD.com Corp.)

# Western Repair Costs & Data

## The 10 Most Common Check Engine Vehicle Repairs in the Western U.S. – 2020

Rank	Vehicle Repair	Total Average Repair Cost (Parts & Labor)	% 2020 Western U.S. Repairs	Change In Rank Since 2019
#1	Replace Catalytic Converter(s) with new OE Catalytic Converter(s)	\$1,452.48	5.77%	No change
#2	Replace Oxygen Sensor(s) (O2S)	\$256.23	5.33%	No change
#3	Replace Mass Air Flow (MAF) Sensor	\$351.17	5.10%	Up from no. 4
#4	Replace Ignition Coil(s) and Spark Plug(s)	\$389.78	4.82%	Up from no. 5
#5	Inspect for Loose Fuel Cap and Tighten or Replace as Necessary	\$25.43	4.59%	Down from no. 3
#6	Replace Ignition Coil(s)	\$218.62	3.99%	No change
#7	Replace Evaporative Emissions (EVAP) Purge Control Valve	\$146.18	3.06%	No change
#8	Replace Fuel Injector(s)	\$477.30	2.52%	No change
#9	Replace Thermostat	\$235.97	2.37%	No change
#10	Replace Evaporative Emissions (EVAP) Purge Solenoid	\$152.19	1.94%	Not listed in 2019



0.36%

**\$396.82**

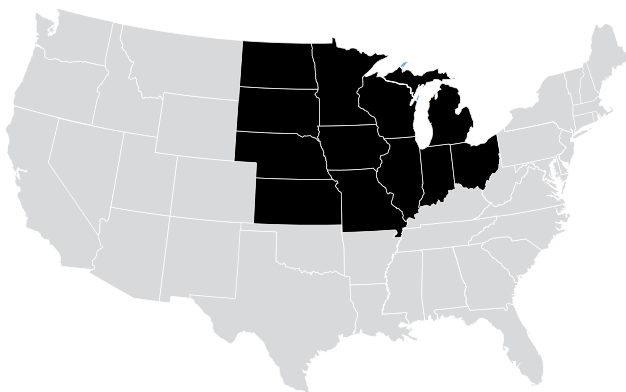
Average cost to repair a vehicle's check engine light problem in the Western U.S. in 2020.

(Ten most common vehicle repairs in the Western U.S. are based on 4,006,026 repairs in 2020 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. – 2020

Rank	Vehicle Repair	Total Average Repair Cost (Parts & Labor)	% 2020 Midwestern U.S. Repairs	Change In Rank Since 2019
#1	Replace Oxygen Sensor(s) (O2S)	\$230.28	5.84%	No Change
#2	Replace Catalytic Converter(s) with new OE Catalytic Converter(s)	\$1,337.12	5.39%	No Change
#3	Replace Ignition Coil(s) and Spark Plug(s)	\$390.83	4.60%	Up from no. 4
#4	Inspect for Loose Fuel Cap and Tighten or Replace as Necessary	\$24.91	4.50%	Down from no. 3
#5	Replace Evaporative Emissions (EVAP) Purge Control Valve	\$138.43	4.12%	No Change
#6	Replace Mass Air Flow (MAF) Sensor	\$310.79	3.94%	No Change
#7	Replace Ignition Coil(s)	\$215.83	3.30%	No Change
#8	Replace Fuel Injector(s)	\$447.97	2.91%	Up from no. 9
#9	Replace Evaporative Emissions (EVAP) Purge Solenoid	\$144.06	2.73%	Down from no. 8
#10	Replace Thermostat	\$235.49	2.30%	No Change



1.5%

# \$354.88

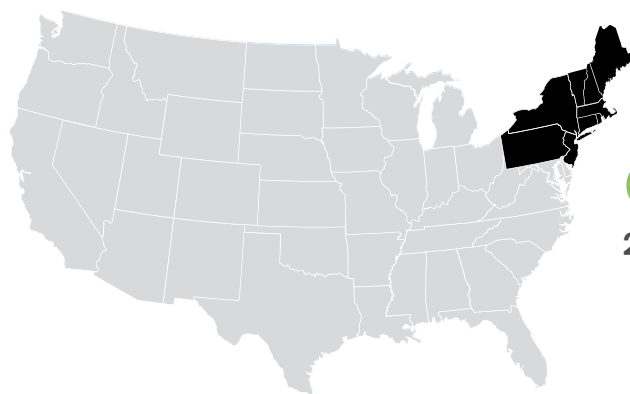
Average cost to repair a vehicle's check engine light problem in the Midwestern U.S. in 2020

(Ten most common vehicle repairs in the Midwestern U.S. are based on 2,935,693 repairs in 2020 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. – 2020

Rank	Vehicle Repair	Total Average Repair Cost (Parts & Labor)	% 2020 Northeast U.S. Repairs	Change In Rank Since 2019
#1	Replace Oxygen Sensor(s) (O2S)	\$261.45	6.29%	No change
#2	Replace Catalytic Converter(s) with new OE Catalytic Converter(s)	\$1,343.74	6.19%	No change
#3	Inspect for Loose Fuel Cap and Tighten or Replace as Necessary	\$23.46	5.81%	No change
#4	Replace Ignition Coil(s) and Spark Plug(s)	\$382.70	4.74%	No change
#5	Replace Mass Air Flow (MAF) Sensor	\$337.15	4.55%	No change
#6	Replace Ignition Coil(s)	\$218.84	3.97%	No change
#7	Replace Evaporative Emissions (EVAP) Purge Control Valve	\$146.09	3.96%	No change
#8	Replace Evaporative Emissions (EVAP) Purge Solenoid	\$148.09	2.45%	No change
#9	Replace Fuel Injector(s)	\$433.09	2.24%	No change
#10	Replace Thermostat	\$242.24	2.11%	No change



2.2%

**\$375.68**

Average cost to repair a vehicle's check engine light problem in the Northeastern U.S. in 2020.



(Ten most common vehicle repairs in the Northeastern U.S. are based on 1,643,451 repairs in 2020 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.)



# 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 2021 CarMD® Vehicle Health Index™ was procured from repairs uploaded to the CarMD diagnostic database from Jan. 1, 2020 to Dec. 31, 2020. This year's index also reviewed past indices for a historical look at 10 years of data. 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. 4, 2021 and Mar. 22, 2021.

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 2021 Index statistically analyzes 13,944,931 recommended repairs for vehicles experiencing a check engine light in 2020. 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 percent 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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