



Vehicle Health Index™

2024



AT A GLANCE

Check Engine Light Repair Trends



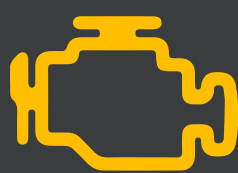
More Drivers Are Ignoring Dash Lights

In a recent survey of U.S. vehicle owners, CarMD found that nearly half (49%) reported there is currently an illuminated warning light on their vehicle's dashboard, such as the check engine light, ABS, TPMS or oil pressure light.



22% reported having a TPMS light on

This is understandable since the survey was conducted in January, when cold temperatures can cause low tire pressure.



20% reported having a check engine light on and 11% had an illuminated ABS light



This is nearly double the number of people from the last time CarMD surveyed drivers about their vehicle's dashboard warning lights.

April is Car Care Awareness Month

CarMD publishes this report each April during Car Care Awareness Month to remind vehicle owners about the importance of paying attention to maintenance and warning lights. Here's what you need to know:

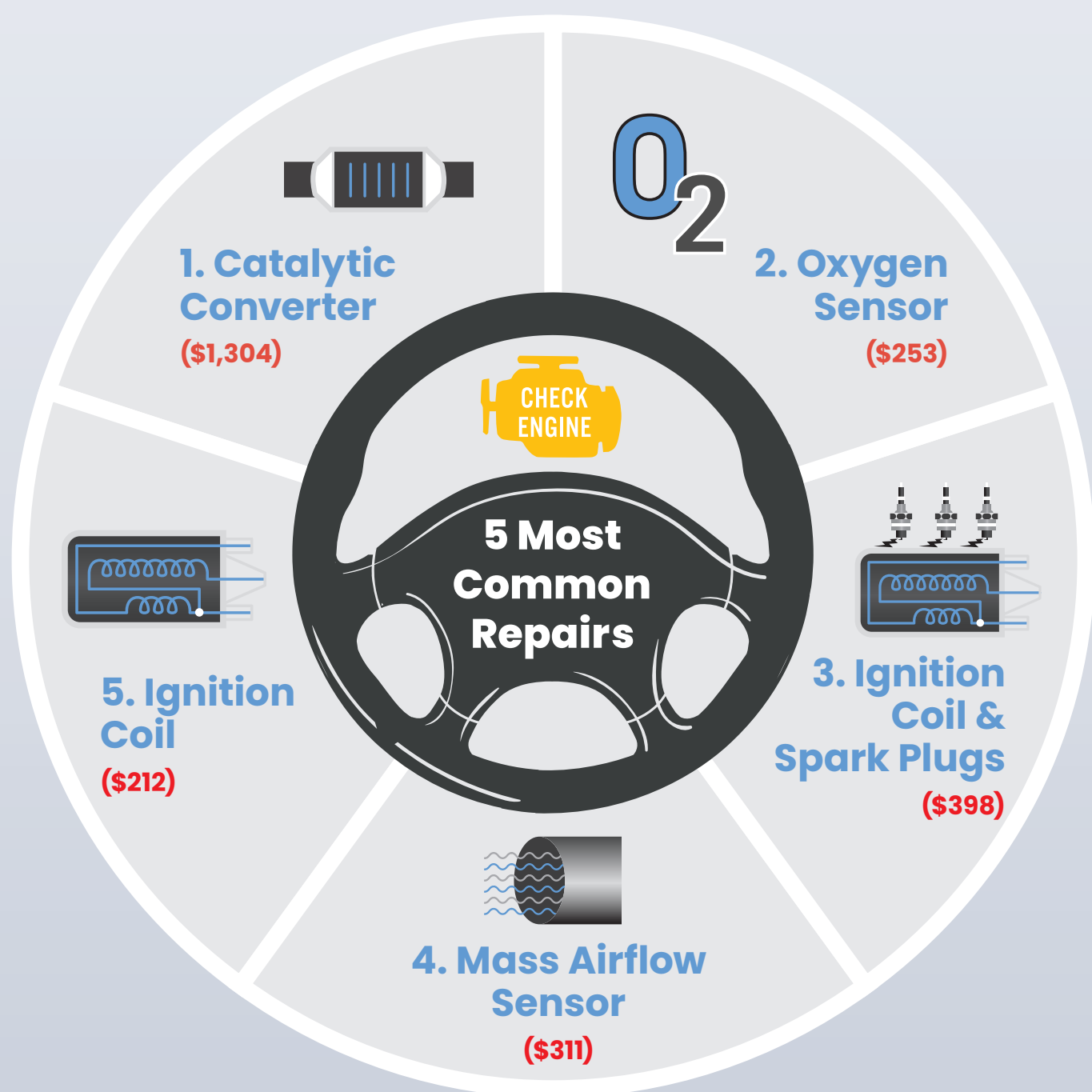


+ The **Check Engine Light** is designed to come on when a vehicle's computer sees a problem that impacts emissions or drivetrain issues. You won't be able to re-register your vehicle is the light is on.

+ **Don't Panic!** It might be something serious like a failing engine, but it's more likely to be an O2 sensor.

+ **Don't Ignore it!** Driving with the check engine light on will hurt your car's fuel economy and can lead to more expensive repairs.

Average cost of a CEL repair in 2023? **\$424**



End of an Era!

GAS CAP is no longer among the five most common fixes – the first time since CarMD started tracking Check Engine light repairs back in 2011.



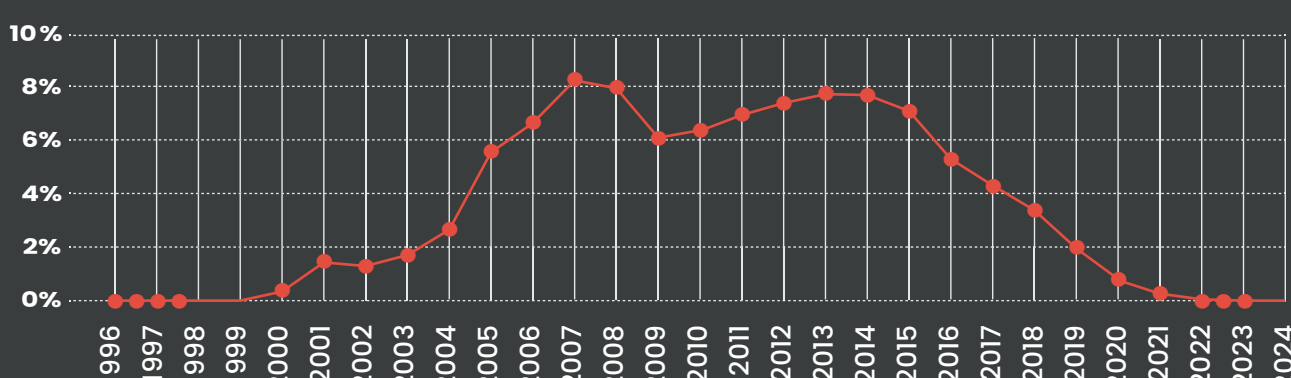
Vehicle Age Impacts Check Engine Light Problems

CarMD found that a 16-year-old model year 2007 vehicle is most likely to need a CEL-related repair with new (still under warranty) cars and trucks least likely to have issues. Here's the breakdown:



% of Check Engine Light Repairs in 2023

By Model Year (Source: CarMD)



The average vehicle age is at another all-time high of 12.5 years, impacting the type and cost of repairs. The 2024 CarMD Vehicle Health Index analyzes more than 15 million failures and recommended repairs for vehicles in the U.S., over the past calendar year, and related trends.

CALENDAR YEAR 2023

The 10 Most Common Check Engine Vehicle Repairs in the U.S.



The most common check engine repair in 2023 was “replace catalytic converter,” which is likely due to the increase in average vehicle age. This is a part that usually only fails on aging vehicles.

For the first time since CarMD started tracking check engine light-related repair trends, a loose, damaged or missing gas cap is no longer among the top five repairs. Some possible reasons for this drop include consumer education, as well as more EVs and cars with capless fuel tanks.

Moving to the list of top 10 repairs is “replace ABS wheel speed sensor.” Some possible reasons for an uptick in this anti-lock braking system repair include an aging vehicle fleet, increased vehicle complexity, and more advanced design of newer sensors. These modern sensors may offer better performance and accuracy but can be susceptible to certain issues. For example, some vehicles now use magnetic sensors, which may be more sensitive to debris or magnetic interference.

RANK	VEHICLE REPAIR	TOTAL AVERAGE REPAIR COST (PARTS & LABOR)	% 2023 REPAIRS	CHANGE IN RANK SINCE 2022
1	Replace Catalytic Converter(s)	\$1,304.21	5.89%	No change
2	Replace Oxygen Sensor(s)	\$252.62	5.75%	No change
3	Replace Ignition Coil(s) and Spark Plug(s)	\$398.27	4.62%	No change
4	Replace Mass Air Flow (MAF) Sensor	\$311.09	4.00%	No change
5	Replace Ignition Coil(s)	\$211.64	3.74%	Up from no. 7
6	Replace Evaporative Emissions (EVAP) Canister Purge Control Valve	\$140.90	3.56%	No change
7	Inspect for Loose Fuel Tank Cap and Tighten or Replace as Necessary	\$25.20	3.28%	Down from no. 5
8	Replace ABS Wheel Speed Sensor	\$271.11	2.52%	New to list
9	Replace Fuel Injector(s)	\$445.62	2.41%	Down from no. 8
10	Reprogram Powertrain Control Module (PCM)	\$109.05	1.79%	No change

(10 most common vehicle repairs are based on 15,311,443 repairs recommended in calendar year 2023 on 1996-2023 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.)

2023

10 Most Common Check Engine Light Repairs

1. Replace Catalytic Converter

The most diagnosed fix, “replace catalytic converter(s),” accounted for 5.89% of repairs in 2023. A catalytic converter usually won’t fail unless a related root cause – like a faulty spark plug or O2 sensor – is ignored. As consumers keep their cars longer, vehicles will outlast parts like catalytic converters.



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 2023 was \$1,304 because they contain precious metals.

2. Replace Oxygen Sensor

The second most common repair was “replace oxygen sensor(s),” totaling 5.57% of CEL repairs.



SYMPTOMS

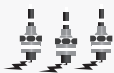
O2 sensors can fail prematurely due to lack of maintenance that leads to a clogged air filter. Many drivers ignore the O2 sensor because their car often seems like it’s driving fine, but it’s reducing your fuel economy and slowly doing more damage to your car.

REPAIR COST

The average cost to replace an O2 sensor in 2023 was \$253.

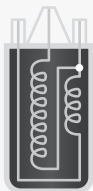
3. Replace Ignition Coil(s) and Spark Plug(s)

The 3rd most common repair was “replace ignition coil(s) and spark plug(s),” accounting for 4.62% 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.

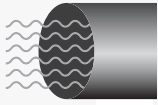


REPAIR COST

The average cost to replace ignition coil(s) and spark plug(s) in 2023 was \$398.

4. Replace Mass Air Flow Sensor

The 4th most common repair in 2023 was “replace Mass Air Flow (MAF) Sensor” (4.00%).



SYMPTOMS

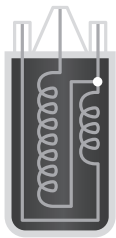
The MAF sensor meters the air coming into a car’s engine and ECU to help determine how much fuel to inject into the engine. Some of the symptoms are stalling and hesitation during acceleration. When malfunctioning, it can lower fuel economy by as much as 25%.

REPAIR COST

The average cost to replace a MAF sensor in 2023 was \$311.

5. Replace Ignition Coils

The 5th most common repair in 2023 was “replace Ignition Coil(s),” comprising 3.74% 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 – often at low speeds – or trouble starting the car, high under hood 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 2023 was \$212.

6. Replace Evaporative Emissions (EVAP) Purge Control Valve

The 6th most common check engine-related repair in 2023 was “replace evaporative emissions (EVAP) purge control valve” (3.56% of needed repairs).



SYMPTOMS

This valve is part of the car’s EVAP system, which prevents fuel vapors from escaping into the atmosphere. When the engine is warmed up, its computer opens the purge valve to allow fuel vapor to be moved from the charcoal canister to be burned in the engine. A faulty valve or corroded connector can cause EVAP purge control valve problems. If the purge flow is less or more than expected, the car may idle roughly and see decreased gas mileage. Since many of the most common problems share similar symptoms, it’s important to diagnose check engine light issues.

REPAIR COST

The average cost to replace an EVAP purge control valve in 2023 was \$141.

7. Tighten or Replace Fuel Cap

The 7th most common repair was “tighten or replace fuel cap,” comprising 3.28% of repairs in 2023 dropping out of the “top 5” repairs for the first time since CarMD began tracking check engine light repair trends in 2011. Gas cap-related issues continue to decrease due to more vehicles have capless gas tanks or plug-in hybrid / EV options, and general consumer education that gas caps are frequent culprits when the check engine light is on.



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 2023 was \$25. Tightening it is free.

8. Replace ABS Wheel Speed Sensor

The 8th most common repair in 2023 was “replace ABS wheel speed sensor” (2.53%).



SYMPTOMS

The ABS Wheel Speed Sensor monitors the rotational speed of each wheel. Some symptoms of a failing anti-lock braking system wheel speed sensor include an illuminated ABS warning light on the vehicle’s dash, issues maintaining traction when the roads are slippery, pulsating or vibrating sensations when applying the brakes, inaccurate speedometer readings, and eventual failure of the anti-lock braking system if ignored.

REPAIR COST

The average cost to replace the ABS Wheel Speed Sensor in 2023 was \$271.

9. Replace Fuel Injector(s)

The 9th most common repair in 2023 (2.41%) was “replace fuel injector(s).”



SYMPTOMS

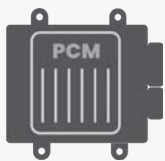
Fuel injectors help make sure the car’s fuel comes out as a fine mist so it can mix with the air passing into the cylinder. Some vehicles have more than one fuel injector, which is called multi-point fuel injection. A failing fuel injector can cause engine performance issues, poor idling, engine misfires and reduced fuel economy.

REPAIR COST

The average cost to replace fuel injector(s) in 2023 was \$446.

10. Reprogram Powertrain Control Module (PCM)

Rounding out the 10 most common repairs: “reprogram powertrain control module (PCM).” It accounted for 1.91% of recommended repairs.



SYMPTOMS

Reprogramming the ECM is rarely needed as a stand-alone fix. Reprogramming or resetting the PCM is usually required after a module is replaced or needs to have adaptations reset to accommodate the changing condition of new parts in operation. This procedure is often recommended in TSBs or factory repair manuals.

REPAIR COST

The average cost to reprogram the PCM in 2023 was \$109, basically an hour of labor.

2009 - 2023

U.S. Average Check Engine Light Repair Cost Trends

In 2023 car repair costs were up 5.1% overall, comprised of \$143.98 in labor costs and \$280.35 in parts costs, totaling just over \$424 on average – an all-time high since CarMD began tracking check engine light-related car repair costs.

Labor costs were only up about 1%. But in a continuing upward trajectory, parts costs were up over 7%. Factors that likely played a role in this increase include more technology in cars, increases in the cost of consumer goods, and more expensive parts failing as vehicle owners hold onto their cars and trucks longer than ever before.



Year	Labor	Parts	Total Average Repair Cost
2009	\$138.37	\$221.13	\$359.50
2010	\$143.61	\$212.44	\$356.05
2011	\$118.61	\$215.32	\$333.93
2012	\$138.96	\$228.88	\$367.84
2013	\$157.23	\$235.26	\$392.49
2014	\$161.61	\$228.77	\$390.38
2015	\$155.15	\$232.16	\$387.31
2016	\$162.46	\$235.41	\$397.87
2017	\$141.16	\$216.29	\$357.45
2018	\$157.04	\$223.81	\$380.85
2019	\$148.26	\$236.64	\$384.90
2020	\$144.09	\$234.68	\$378.77
2021	\$143.35	\$249.22	\$392.57
2022	\$142.66	\$261.05	\$403.71
2023	\$143.98	\$280.35	\$424.33

Regional Repair Costs

Repair costs were up in all four regions of the U.S. in calendar year 2023, with drivers in the South seeing the biggest increase – up 5.6%.

Vehicle owners in the West paid the most for check engine-related car repairs (\$437). Vehicle owners in the Midwest paid the least on average (\$393).

The region with the highest average labor expense for check engine light repairs was the South (\$145.71). The region with the lowest average labor expense for a check engine light repair was the Northeast (\$139.11). This is not an hourly rate, but the average amount of labor time charged for a related repair. It can be impacted by regional labor rates, what an individual shop charges to do the repair, and how difficult the repairs are.

The region with the highest average parts cost for car repairs was the West (\$292.60), while vehicle owners in the Midwest saw the lowest average parts costs (\$250.20). This can partially be explained by the type of repair. The most common fix on cars in the West was “replace catalytic converter” while in the Midwest the much more affordable “replace O2 sensor” was most common.

2023 Average Cost to Repair a Check Engine Light Issue – By Region

West: \$436.65

Average Labor Cost: \$144.05
Average Parts Cost: \$292.60

Midwest: \$393.22

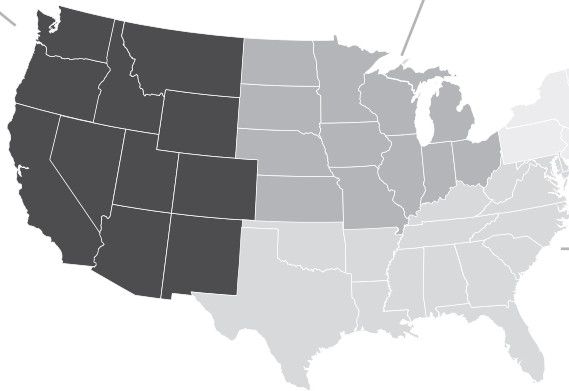
Average Labor Cost: \$143.03
Average Parts Cost: \$250.20

Northeast: \$421.65

Average Labor Cost: \$139.11
Average Parts Cost: \$282.54

South: \$432.31

Average Labor Cost: \$145.71
Average Parts Cost: \$286.60



Yearly Comparison of Regional Average Check Engine-Related Repair Costs

Source: CarMD.com Corp.

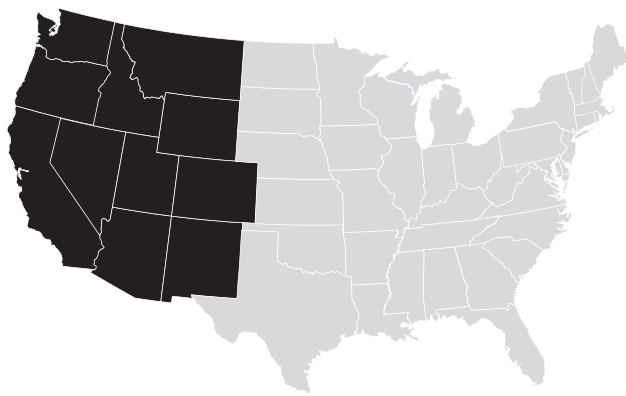
Region	Total Average Repair Costs (2021)	Total Average Repair Costs (2022)	Total Average Repair Costs (2023)	Percentage Change from 2022 to 2023
South	\$396.02	\$409.38	\$432.31	Up 5.6%
West	\$406.79	\$415.74	\$436.65	Up 5.0%
Midwest	\$366.35	\$375.64	\$393.22	Up 4.7%
Northeast	\$389.55	\$403.85	\$421.65	Up 4.4%

2023

Western Repair Costs & Data

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

Rank	Vehicle Repair	Total Average Repair Cost (Parts & Labor)	% 2023 Western U.S. Repairs	Change In Rank Since 2022
1	Replace Catalytic Converter(s)	\$1,396.82	5.66%	No Change
2	Replace Oxygen Sensor(s) (O2S)	\$262.69	5.33%	No Change
3	Replace Mass Air Flow (MAF) Sensor	\$333.19	4.22%	No Change
4	Inspect for Loose Fuel Tank Cap and Tighten or Replace as Necessary	\$25.81	4.18%	Up from no. 5
5	Replace Ignition Coil(s) and Spark Plug(s)	\$397.88	4.10%	Down from no. 4
6	Replace Ignition Coil(s)	\$217.02	3.62%	No Change
7	Replace Evaporative Emissions (EVAP) Canister Purge Control Valve	\$143.81	3.40%	No Change
8	Replace Fuel Injector(s)	\$467.73	2.22%	No Change
9	Reprogram Powertrain Control Module (PCM)	\$108.53	2.07%	Up from no. 10
10	Replace Thermostat	\$247.31	2.03%	Down from no. 9



5.0%

\$436.65

Average cost to repair a vehicle's check engine light problem in the Western U.S. in 2023.

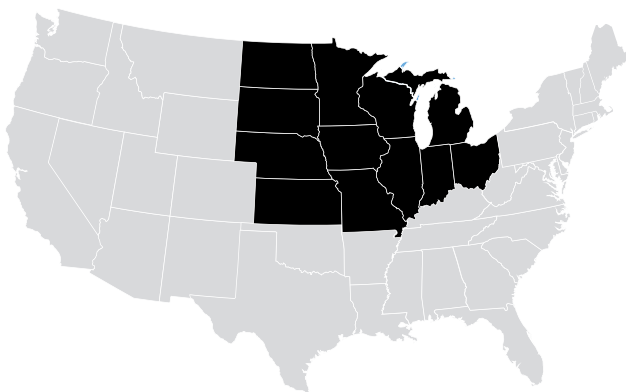
(10 most common vehicle repairs in the Western U.S. are based on 4,119,676 diagnosed repairs in 2023 in AK, AZ, CA, CO, HI, ID, MT, NM, NV, OR, UT, WA and WY. Source: CarMD.com Corp.)

2023

Midwestern Repair Costs & Data

The 10 Most Common Check Engine Vehicle Repairs in the midwestern U.S.

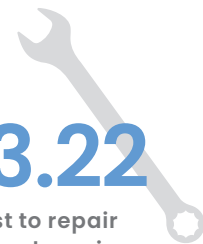
Rank	Vehicle Repair	Total Average Repair Cost (Parts & Labor)	% 2023 Midwestern U.S. Repairs	Change In Rank Since 2022
1	Replace Oxygen Sensor(s) (O2s)	\$237.64	5.84%	No Change
2	Replace Catalytic Converter(s)	\$1,277.48	5.18%	No Change
3	Replace Evaporative Emissions (EVAP) Canister Purge Control Valve	\$136.45	4.48%	No Change
4	Replace Ignition Coil(s) and Spark Plug(s)	\$399.85	3.99%	No Change
5	Inspect for Loose Fuel Tank Cap and Tighten or Replace as Necessary	\$25.14	3.80%	Up from no. 6
6	Replace Mass Air Flow (MAF) Sensor	\$291.24	3.54%	Down from no. 5
7	Replace Ignition Coil(s)	\$212.91	2.91%	No Change
8	Replace ABS Wheel Speed Sensor	\$274.57	2.80%	New to List
9	Replace Fuel Injector(s)	\$425.79	2.43%	Down from no. 8
10	Replace Thermostat	\$248.73	1.99%	Down from no. 9



4.7%

\$393.22

Average cost to repair a vehicle's check engine light problem in the Midwestern U.S. in 2023.



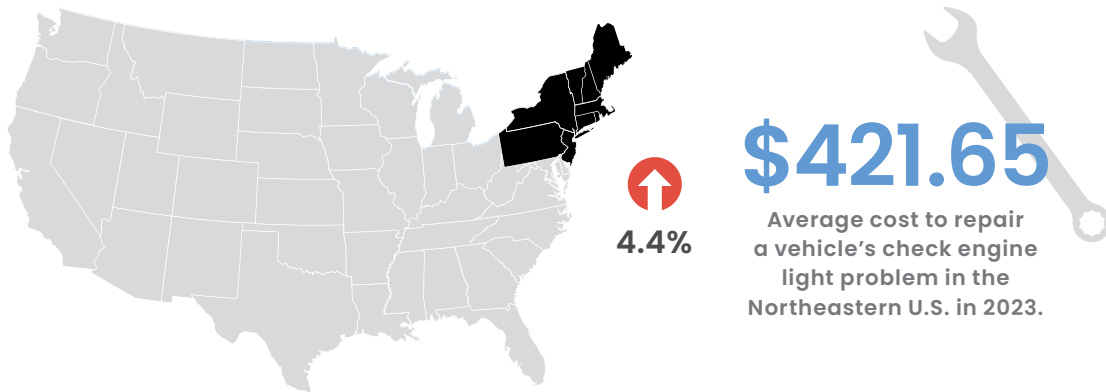
(10 most common vehicle repairs in the Midwestern U.S. are based on 3,015,994 repairs in 2023 in IA, IL, IN, KS, MI, MN, MO, ND, NE, OH, SD and WI. Source: CarMD.com Corp.)

2023

Northeastern Repair Costs & Data

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

Rank	Vehicle Repair	Total Average Repair Cost (Parts & Labor)	% 2023 Northeast U.S. Repairs	Change In Rank Since 2022
1	Replace Oxygen Sensor(s) (O2S)	\$270.35	6.16%	Up from no. 2
2	Replace Catalytic Converter(s)	\$1,303.76	5.91%	Down from no. 1
3	Inspect for Loose Fuel Tank Cap and Tighten or Replace as Necessary	\$24.55	5.01%	No Change
4	Replace Evaporative Emissions (EVAP) Canister Purge Control Valve	\$142.40	4.12%	Up from no. 6
5	Replace Ignition Coil(s) and Spark Plug(s)	\$396.65	3.97%	No Change
6	Replace Mass Air Flow (MAF) Sensor	\$321.82	3.83%	Down from no. 5
7	Replace Ignition Coil(s)	\$217.09	3.51%	No Change
8	Replace ABS Wheel Speed Sensor	\$286.78	2.75%	New to List
9	Replace Fuel Injector(s)	\$450.75	1.95%	Up from no. 9
10	Reprogram Powertrain Control Module (PCM)	\$108.28	1.95%	No Change



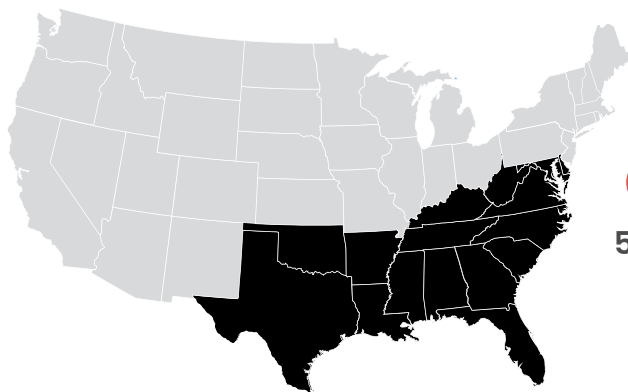
(10 most common vehicle repairs in the Northeastern U.S. are based on 1,759,817 repairs in 2023 in CT, MA, ME, NH, NJ, NY, PA, RI and VT. Source: CarMD.com Corp.)

2023

Southern Repair Costs & Data

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

Rank	Vehicle Repair	Total Average Repair Cost (Parts & Labor)	% 2023 Southern U.S. Repairs	Change In Rank Since 2022
1	Replace Catalytic Converter(s)	\$1,304.21	5.89%	No Change
2	Replace Oxygen Sensor(s) (O2S)	\$252.62	5.57%	No Change
3	Replace Ignition Coil(s) and Spark Plug(s)	\$398.27	4.62%	No Change
4	Replace Mass Air Flow (MAF) Sensor	\$311.09	4.00%	No Change
5	Replace Ignition Coil(s)	\$211.64	3.74%	No Change
6	Replace Evaporative Emissions (EVAP) Canister Purge Control Valve	\$140.90	3.56%	No Change
7	Inspect for Loose Fuel Tank Cap and Tighten or Replace as Necessary	\$25.20	3.28%	No Change
8	Replace ABS Wheel Speed Sensor	\$271.11	2.53%	New to List
9	Replace Fuel Injector(s)	\$445.62	2.41%	Down from no. 8
10	Reprogram Powertrain Control Module (PCM)	\$109.05	1.91%	No Change



5.6%

\$432.31

Average cost to repair a vehicle's check engine light problem in the Southern U.S. in 2023.

(10 most common vehicle repairs in the Southern U.S. are based on 6,524,267 repairs in 2023 in AL, AR, DC, DE, FL, GA, KY, LA, MD, MS, NC, OK, TN, VA, SC, TX and WV. Source: CarMD.com Corp.)

Who can benefit from CarMD's data?

- + **AUTOMOTIVE AFTERMARKET** – The CarMD Index can inform B2B parts manufacturers and aftermarket retail buyers to see year-over-year parts failure trends for parts quantity forecasting.
- + **REPAIR SHOPS** – Repair professionals can see the type of parts most likely to be needed when a car rolls into the service bay and if their pricing is in line with average repair costs in their region.
- + **VEHICLE OWNERS** – This report can educate drivers about the importance of addressing dashboard warning lights for better fuel economy and vehicle reliability. Visit CarMD.com to hear about new resources coming soon to help consumers stay on top of vehicle maintenance and repairs.

What is distinctive about CarMD's Index?

Published annually since 2011, the CarMD Vehicle Health Index 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 car, light truck, SUV, minivan and hybrid sold in the United States has been required to have an on-board diagnostic (OBDII) system. It triggers the check engine light to alert drivers about issues related to emissions, fuel economy and drivability.

CarMD is uniquely qualified to provide unbiased data on repair costs and trends having built the most dynamic database of failures and repairs related to vehicle on-board diagnostic systems. The data comes directly from each vehicle's OBDII system, reported by millions of vehicle owners and the professionals who service them. The failure and fix data are validated by CarMD's network of Automotive Service Excellence (ASE)-certified technicians.

The 2024 CarMD Vehicle Health Index statistically analyzes more than 15.3 million failures and recommended repairs for vehicles in the U.S., over the past calendar year. The year's Index and historical reports are available [here](#).



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 2024 CarMD® Vehicle Health Index™ was procured from repairs uploaded to the CarMD diagnostic database from Jan. 1, 2023 to Dec. 31, 2023. The data comes directly from the vehicles themselves to the CarMD database without any human interface.

The data was collected and analyzed between Feb. 9, 2024 and Mar. 18, 2024.

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 CarMD.

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 considers 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.

Repair costs are based on parts and dealer list plus 10% markup. Labor rates are procured from several sources, including technicians and shops utilizing Innova and CarMD cloud-based services, as well as the average amount of time required for each repair.

CarMD’s nationwide network 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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