

OBD2 Explained (2021)

On-Board Diagnostics (OBD2) is a self-diagnostic automotive electronic system, indicating and reporting possible problems within the vehicle. The OBD2 port can be used to collect lots of insightful data and provide the driver/user with additional feature.

This definitive guide introduces you to several aspects of **On-Board Diagnostics** (OBD). The simple introduction aims to give you all the information you need about the OBD2 and its key elements.

Additionally, we support it with attractive visuals for easy understanding and making it simpler for you to share it further.

Table of Contents

- What is OBD?
- Why is it important and how to use it?
- Where to find OBD2 port?
- Difference between OBD 1 and OBD2
- Where to buy OBD2 accessories?

- History of On-Board Diagnostics
- What is WWH-OBD?
- OBD2 signal protocols
- OBD2 Diagnostic Connector
- What is OBD2 scanner
- Is my car OBD2 compatible?
- OBD2 and AutoPi

What is OBD?

On-Board Diagnostics (OBD) is an automotive electronic system, which is capable of a **self-diagnosis**, indicating and reporting the possible problem within the vehicle. It gives you or the technician the opportunity to easily access the information about the '**health**' of your car and solve the problem.

It provides vehicle protocols and system checks, all in possible connectivity via **Bluetooth** or **WiFi**.

The OBD stands for On-Board Diagnostics. Basically, it helps you with the diagnosis of the current health of your car and can **predict any future damage or accident**. An important part to know is the 'ECU' that is practically the vehicle's brain, in regards to the gathering of the information.

Read more about the [ECU](#) and how to [discover hidden functions in your car](#).

Why is it important and how to use it?

On-Board Diagnostics (OBD) is very important and helpful for either your personal car usage or your business [fleet management](#). It provides and measures the **overall health** of the vehicle/s and **driving pattern**.

It is highly recommended to use in businesses with a high volume and usage of vehicles on a daily basis.

Personal use:

- OBD is mostly used in personal use as an indicator of the current health of the car.
- However, based on the provider, you can adjust it for plenty of possible benefits such as Parental Control,

[Crash Detection](#), [Remote Start](#), and much more.

Business/fleet management use:

- It is possible to see the overall health of each vehicle, but also what parts of the vehicle are wearing down and therefore, need to be replaced. It will also indicate what parts are wearing down faster than others.
- Diagnosis of the problems within the vehicle even before they appear.
- It supports the effectiveness of fleet management and proactivity.
- OBD measures several aspects of the car, such as speed, idling time, driving behavior, and more.

Find out more about what options you have when it comes to OBD2 configuration for personal use [here](#).

Find out more about what options you have when it comes to OBD2 configuration for business use [here](#).

Did you know? = Approximately 1.35 million people die each year as a result of road traffic crashes. [Source](#).

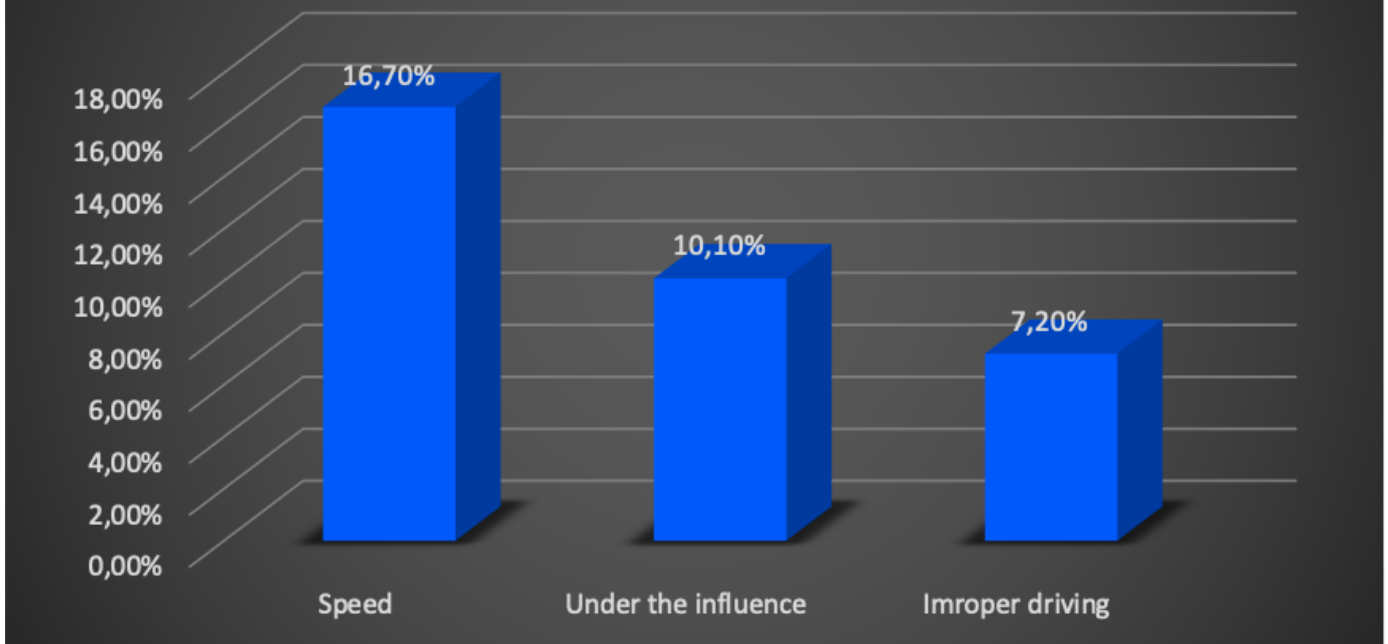
According to the **U.S. Department of Transportation**, most

road accidents happen due to driving too fast, the influence of drugs alcohol, or others, and failure to keep in the proper line. Out of the total number of fatal accidents (51 490);

- 16,7% of them happen because of drivers driving too fast and not according to the surface and/or their abilities.
- 10,10% of accidents happen due to irresponsible drivers under the influence of drugs, alcohol, or medicine.
- 7,20% of accidents happen due to the failure to keep in the proper line.

The chart below shows the percentages of accidents explained above.

The reason and number of accidents in %



The numbers of accidents are rising and therefore we **highly recommend** to take your precautions and stay safe/safer.

One of the best options is to get the AutoPi telematics unit, which can help you monitor, notify, or even prevent some of the failures of your car.

The AutoPi telematics unit has plenty of functionalities and these are just some of them, that can help or even prevent the main reasons for accidents, mentioned above;

- Collision Prevention Assistance
- Crash Detection

- Detect abusive driving

If you want to see other options and read more about these specific features, click [here](#).

Where to find OBD2 port?

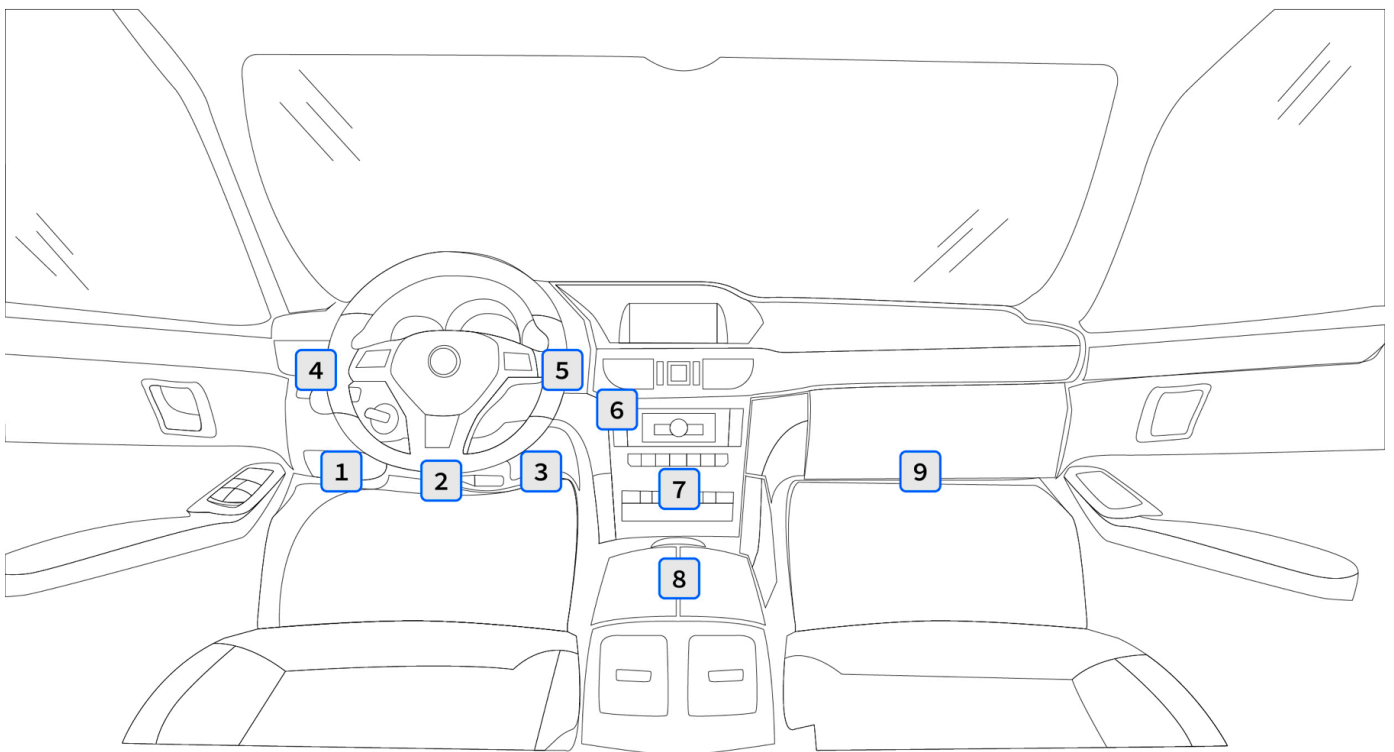
If you are struggling to find an **OBD2 port**, you are at the right place. In a classic passenger vehicle, in most cases, you can find it under the dashboard panel and steering wheel.

The port itself can vary all the way from 6 pin, to 9 pin and to the maximum of 16 pin configuration. The location of the port varies from car to car, however, it is usually located at the same place, **under the steering wheel** of a vehicle.

As you can see on the picture, OBD2 port is usually located under the dashboard, beneath the steering wheel (see numbers 1-3 on the picture). It is possible for some car models that the port will not be located there. Therefore,

look at other areas to locate the OBD2 port (see numbers 4-9 on the picture).

See the picture below to navigate you to find the OBD2 port location.



The location of the OBD 2 port depends on the type of the car. However, it can usually be found under the steering wheel, either on the left or right side.

You can also check out our video on how to get started with AutoPi Telematics Unit, where we also showcase how to fins

and connect your AutoPi dongle. See it [here](#).

Difference between OBD and OBD2

OBD

OBD, also known as OBD1, is connected to the console of a car. OBD used to be mainly used before the 1990s and is considered as the older version of OBD2.

OBD 2

OBD2, also known as OBD II, is remotely connected to the car and comes with many more features and advances than OBD1.

See the visual explanation of the difference between the OBD and OBD2 below.

The difference between OBD 1 and OBD 2

OBD 1

VS

OBD 2

Supports cars manufactured in
and before 1995



Supports cars manufactured in
and after 1996

Connects to the console



Bluetooth or WiFi

Low



High

Low



High

Basic



Advanced



Did you know? = 93% of the world's fatalities on the roads occur in low- and middle-income countries, even though these countries have approximately 60% of the world's vehicles. [Source.](#)

Where to buy OBD2 accessories?

There are several shops online to buy your **OBD2 accessories**. However, we highly recommend the [AutoPi shop](#), due to its high quality, price, efficiency, and other benefits.

You can find OBD2 power cable or OBD 2 extension cable, as well as other accessories. If you have any questions regarding the purchase of one of the products, do not hesitate to contact us at sales@autopi.io.

History of OBD and OBD2

The history of OBD goes all the way back to the 1960s when several organizations have started talking about how **necessary** it is to have On Board Diagnosis to detect emission failures.

More precisely, the organizations that stood behind it were the California Air Resources Board (CARB), the International Organization for Standardization (ISO), the Environmental Protection Agency (EPA), and the Society of Automotive Engineers (SAE).

In 1982 California Air Resources Board started developing regulations on requiring all vehicles to have an OBD port.

Timeline

1968 - Volkswagen introduced the first OBD computer system with scanning capability

1975 - Datsun started using the On-Board Computers in consumer vehicles

1980 - General Motors (GM) implemented an interface and protocol to test the Engine Control Module (ECM).

1988 - The California Air Resources Board required to have at least a simple OBD capability in all vehicles sold in California from the models of 1988 and newer

1994 - The California Air Resources Board pushed it further and issued the OBD 2 specification, sold in California from the model year 1996

1996 - All cars sold in the United States needed to be OBD 2 compatible

2001 - The European Union makes it mandatory for manufacturers to include the EOBD in all gasoline vehicles sold in the European Union

2004 - The European Union makes it mandatory for manufacturers to include the EOBD in all diesel vehicles sold in the European Union

2006 - All vehicles manufactured in Australia and New Zealand were required to be OBD 2 compatible

2008 - All vehicles sold in the United States were required to use the signaling standard ISO 15765-4

TIMELINE OF OBD 1 AND OBD2



Timeline

-
- A vertical timeline with a black line and colored dots. The dots are blue for 1968, 1980, and 1994, and red for 1975 and 1988. The text is positioned to the left or right of the line.
- 1968**
Volkswagen introduced the **first OBD computer system** with scanning capability
 - 1975**
Datsun started using the **On Board Computers** in consumer vehicles
 - 1980**
General Motors (GM) implemented an interface and protocol to test the **Engine Control Module** (ECM)
 - 1988**
The California Air Resources Board **required** to have at least a simple OBD capability in **all vehicles** sold in California from the models of 1988 and newer
 - 1994**
The California Air Resources Board pushed it further and issued the OBD 2 specification

issued the OBD 2 specification,
sold in California from model
year 1996

1996

All cars sold in United States
needed to be **OBD 2 compatible**

2001

The European Union makes it
mandatory for manufacturers
to include the EOBD in **all
gasoline vehicles** sold in the
European Union

2004

The European Union makes it
mandatory for manufacturers to
include the EOBD in **all diesel
vehicles** sold in European Union

2006

All vehicles manufactured in
Australia and New Zealand were
required to be OBD 2
compatible

2008

All vehicles sold in United States
were **required** to use the
signaling standard ISO 15765-4

AutoPi.io

What is WWH-OBD?

WWH-OBD is an acronym for **World Wide Harmonized On-Board Diagnostics**. It is implemented by the United Nations

and used as an international standard, as part of the Global Technical Regulations (GTR) mandate.

Vehicle data monitoring such as emissions output and engine fault codes are also included. Starting in 2014, vehicle manufacturers are **obligated** to implement a WWD-OBD diagnostic system.

Did you know? = Almost 3,700 people are killed globally every day in crashes involving cars, buses, trucks, motorcycles, bicycles, or pedestrians. [Source.](#)

OBD2 signal protocols

When it comes to OBD2 interface, there are 5 signaling protocols. Vehicles usually implement only one of the protocols.

SAE J1850 PWM (pulse-width modulation) - 41.6kB/sec,
Standard of the Ford Motor Company

- Pin 2: Bus +
- Pin 10: Bus -
- High Voltage is +5 V
- 12 bytes message length, including CRC
- Employs a multi-master arbitration scheme called Carrier Sense Multiple Access with Non-Destructive Arbitration

SAE J1850 VPW (variable pulse width) - 10.4/41.6 kB/sec,
standard of General Motors

- Pin 2: Bus +
- Bus idles low
- High voltage is +7 V
- The decision point is +3.5 V
- 12 bytes message length, including CRC
- Employs CSMA/NDA

ISO 9141-2 - The protocol has an asynchronous serial data rate of 10.4 kbps. It is a bit similar to RS-232, but the signal levels vary. Usually used in Chrysler, European and Asian vehicles.

- Pin 7: K-line
- Pin 15: L-line is optional
- UART signaling
- K-line idles high - 510-ohm resistor to Vbatt
- The dominant state is driven low with an open collector driver
- Max 260 bytes message length. Max 255 data field.

ISO 14230 KWP2000 (Keyword Protocol 2000)

- Pin 7: K-line
- Pin 15: L-line is optional
- Physical layer identical to ISO 9141-2
- Data rate of 1.2 to 10.4 kBaud
- Up to 255 bytes of message length in the data field

ISO 15765 - 250 kbit/s or 500 kbit/s. The CAN protocol was developed by Bosch. Usually used outside the [automotive industry](#).

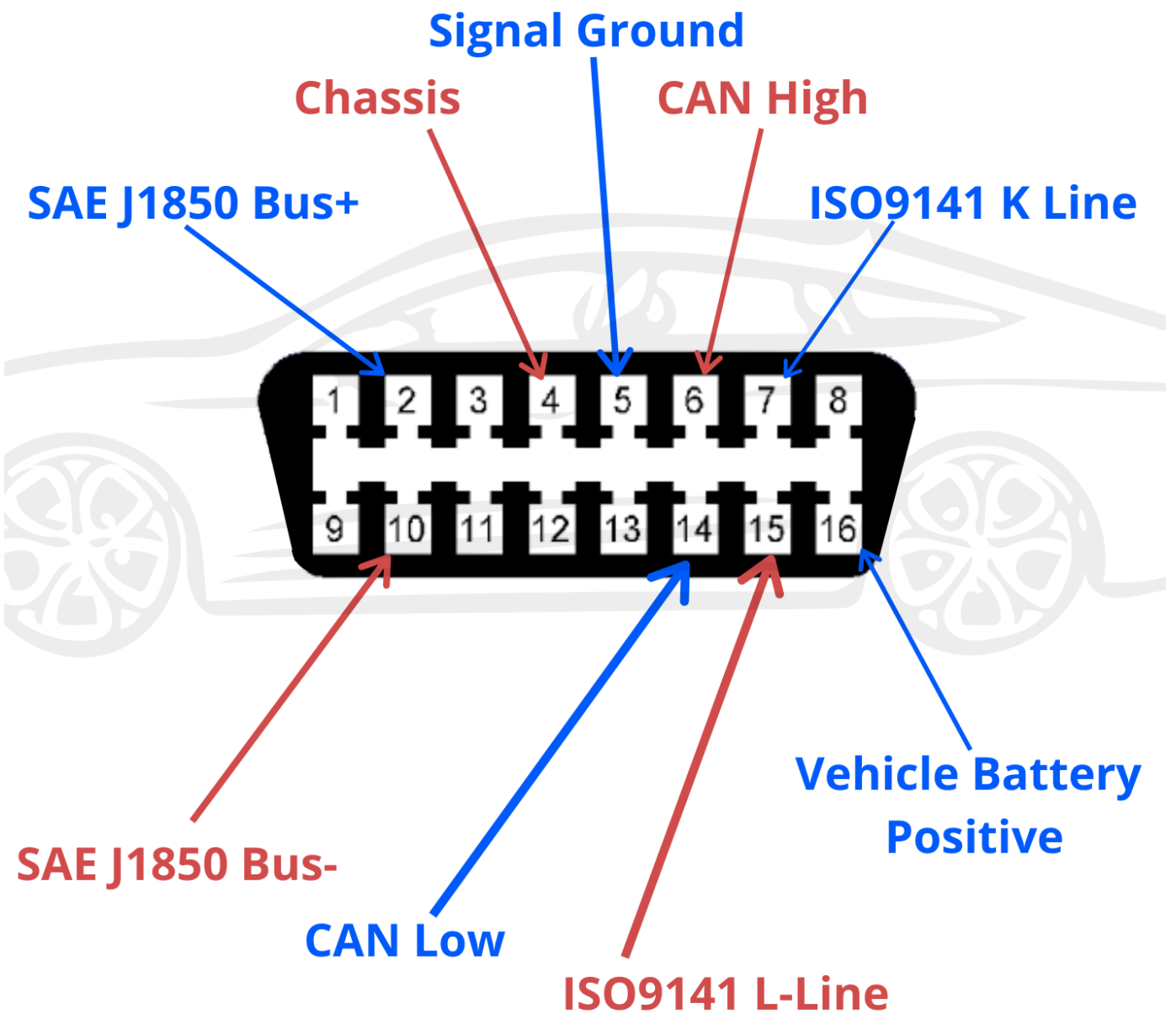
- Pin 6: CAN high
- Pin 14: CAN low

All OBD2 pinouts use the same connector. However, different pinouts are used for different purposes, except pin 4 and 16.

OBD2 Diagnostic Connector

On the picture below is a female 16-pin (2x8) J1962 connector, which is a standardized hardware interface. In contrast to the OBD1 connector, which could be found under the hood of the vehicle, OBD2 connector is in most cases **required** to be within 2 feet (0,61m) of the steering wheel.

OBD 2 connector pinout



OBD2 and data access

You can retrieve lots of data through the OBD2 port. More specifically, it gives you access to status information and **Diagnostic Trouble Codes** (DTCs) for Powertrain and Emission Control Systems. But, that's not all.

You can also access the **Vehicle Identification Number** (VIN), Calibration Identification Number, Emissions Control System counters, and Ignition counter.

In other words, a mechanic can connect the scanning tool to your car through the OBD2 port and read the trouble codes and analyze the problem.

The best-case scenario is when the mechanic can detect the problem even before it occurs and fix it straight away.

What is OBD2 scanner

OBD2 scanner is a tool that can prevent you from spending a lot of money when having a tiny problem with your car. Simply connect the OBD2 scanner to an OBD2 port in your

car and see what it says and what kind of data it displays.

It can help you get the information before you actually go to the mechanic and you will have the upper hand to not get taken advantage of, as you already are aware of the current situation of the car.

Even though OBD2 scanners are great, you can get the AutoPi telematics unit for a little bit higher price, but with much higher functionality and many more benefits. It is also an open-source, which means it can be adjusted in regards to your criteria and personal wishes.

Is my car OBD2 compatible?

Are you wondering if your car is OBD2 compatible? The quick answer is probably **yes**. But let's look at it closely. All vehicles built and sold in the United States after 1995 (starting January 1st, 1996) were required to be OBD2 compatible.

Even the late models of 1995 might be OBD2 compatible. From 2004 and later, all cars in Europe were required to be OBD2 compatible, and from 2006 and later in Australia and New Zealand.

Check out space under the steering wheel, either on the left or the right side, where the OBD2 port should be located. You should also be able to find a note on a sticker under the hood if the car is OBD2 compatible.

If you are still unsure if your car is OBD2 compatible, then check out [this article](#), where you can click on a specific country you live in and find out if your car model is compatible.

What does OBD2 data logging mean?

You already know what OBD means (On-Board Diagnostics) and what is the difference between OBD and OBD2.

OBD2 data logging is basically the process of gathering the

data from your car to a server. Briefly, it's the transformation of codes into visuals and graphs. The data can be collected through the OBD2 port in your vehicle into your smartphone or laptop.

The AutoPi 3rd generation telematics unit will do everything for you. Contact us to find out more.

How does it work?

OBD2 Data Logger

OBD2 allows OBD2 PIDs that you can easily record and decode across most of the vehicle.

It contains three simple steps to log OBD2 data:

1. Set up your OBD2 logger with a list of OBD2 PIDs
2. Connect it to your vehicle with OBD2 adapter into the OBD2 port and start logging
3. Extract the SD and decode the data through the free software/API

There are four main benefits of OBD2 data logging:

1. **Driver/vehicle part optimization** - OBD2 data allows you to monitor and optimize your driving behavior as well as your vehicle itself
2. **Rare issue diagnostics** - OBD2 data allows you to monitor rare issues within your vehicle that can occur while driving
3. **Fleet management** - OBD2 data allows you to monitor and measure several aspects such as driver's behavior research, current location, vehicle's current 'health', fuel cost reduction and more
4. **Data control and custom integration** - OBD2 data logger records the raw time series data that can be extracted or uploaded to your own server

OBD2 and AutoPi

You can use the OBD2 port to connect the AutoPi dongle and communicate with **Electronic Control Units** (ECU).

If you are interested as a private person, check out what you can do with AutoPi on [this page](#). If you are interested in fleet management, then we recommend you to check out [this page](#).

However, if you are interested in our product or simply have any additional questions, do not hesitate to contact us.

sales@autopi.io