

Frequently Asked Questions (FAQ)

What is “Hi-Scan Pro”? What is “Carman Scan 1”?

The “Hi-Scan Pro” (“Hyundai Intelligent Scanner Professional”) was the official Hyundai and Kia diagnostic scan tool until it has been replaced by the GDS (“Global Diagnostic System”) in 2006. It is the only system that allows to perform diagnostic routines on OBD-1 Hyundai and Kia vehicles made before 1996.

The “Carman Scan 1” scanner is technically identical to the “Hi-Scan Pro”, but features software supporting virtually all brands of vehicles. The CS1 is particularly strong in its support for Japanese vehicles.

CASCADE can emulate both devices, provided it is fed with the corresponding software.

Is it possible to use registered versions of *Carman Scan 1* software with CASCADE?

At the moment, CS1 software is only supported in its trial mode. Using registered versions of CS1 software requires proper emulation of the device serial number, something that CASCADE is not capable of at this time.

Are vehicles using VPW or PWM interfaces supported?

American-style VPW and PWM interfaces are not supported by any of the interfaces that can be used with CASCADE.

Will the reprogramming cartridges downloadable from Hyundai/Kia work with CASCADE?

That depends. For the demo version: **Clearly not!** The demo version is limited in time and amount of data transfer and is virtually **guaranteed to break your car** if you use it to reprogram your ECU, so **DON'T DO IT!** As for the registered version: It could work, but I have never tested it, and **I cannot be held liable for any damage you cause to your vehicle through the use of CASCADE**. Do not use the reprogramming cartridges unless you have the capability to restore your ECU's flash memory to its original state! If you don't know what that means, **DON'T DO IT!**

Wow, that sounds scary! Should I subject my car to this CASCADE thing at all?

While I disclaim all responsibility for damages caused by the use of CASCADE, I dare say that using it to perform purely diagnostic functions is perfectly safe. The features of the diagnostic software supported by CASCADE often allow to do more than perform purely diagnostic routines, though, and if you choose to avail yourself of them, you should have at least a rough idea of what you are doing. The diagnostic software is designed for professionals and does not always try to keep you from doing something stupid, so please exercise caution.

The *Hi-Scan Pro* software downloads from Hyundai/Kia are said to be only applicable to American-market vehicles. Does that mean they won't work on my European/Asian model?

While this is not the case for all manufacturers, Hyundai/Kia models seem to have little enough variations between markets for the American software to work with all models. At least that is the case with my European Hyundai XG 30, which seems to have no problem posing as an American "XG 300". That said, apart from generally recommending not to use the reprogramming software provided by Hyundai/Kia with CASCADE, I especially recommend not to use it on non-American vehicles!

Does CASCADE support "VAG-COM 409.1"-compatible interfaces?

These interfaces are currently supported as K/L interfaces only. CAN support might be added in a future release.

Does CASCADE support ELM327-based interfaces?

The ELM327 chip is not flexible enough to support more than a small subset of the commonly used communication protocols, so I have decided not to support it.

Features and Limitations

CASCADE provides virtually all of the functionality of the original device, including communication using non-standard protocols or CAN bus, and it even has features that the original device is missing:

- **Saving and loading of the device state** allows you to quickly access frequently used functions. You won't have to wade through several layers of menus if you always diagnose the same make or model of car. (registered version only)
- **Recording and replaying of diagnostic sessions.** When you have to deal with a particularly puzzling problem, you will be able to review the session in its entirety, and perhaps spot stuff that you missed. (registered version only)
- **Special hints** that make connecting to problematic control units easier: CASCADE tells you if data is being transmitted, what communications mode and speed is currently being used, and it gives you hints on when to turn the ignition on and off.

There are, however, a few limitations as well:

- No support of oddball communications standards. Occasionally, the diagnostic software tries to use extremely low baud rates (around 20 Bauds) or "bitbanging" to communicate with ECUs. These modes are not (well) supported by FTDI chips and will thus not work when used with CASCADE.
- No baud rate measuring. The original device is capable of determining the transmission speed of a K/L diagnostic session automatically (although I have doubts as to how well that works in practice), but with CASCADE you will have to set the speed manually if the default doesn't work. That means that in the worst case you have to try a few times until you can connect to the ECU.
- No automatic pin switching. The original device's diagnostic interface is able to connect to ECUs with the K line on pins other than 7 on the OBD connector. The low-price USB interfaces used with CASCADE do not have that capability, so it may be required to physically modify the USB interface in order to be able to connect to such ECUs.
- The oscilloscope functionality does not work.

Glossary

Here we try to offer you concise explanations for technical terms.

CAN bus

The “Controller Area Network” bus is a relatively recent (by automotive standards) way for control units to talk to each other, and is nowadays (since the mid-2000s) also used to perform diagnostic functions. It has, in fact, been mandatory for new vehicles in certain markets since 2008. To talk to an ECU via CAN bus, you need a K+CAN interface.

ECU

“Engine Control Unit” or “Electronic Control Unit”. These are the computers that control your car. There is usually one for every major subsystem, such as engine, drivetrain, brakes, airbags, etc. When performing a diagnostic session, these are the units you want to talk with.

FTDI

“Future Technology Devices International” is a manufacturer of USB-to-serial converters. FTDI chips are generally more flexible than other brands when it comes to unusual modes of communication, a feature that is very important when talking to motor vehicles. CASCADE only supports diagnostic interfaces with FTDI chips.

K/L (also known as “K line”)

K/L is a mode of data transfer that uses so-called “UART signaling”, which is similar to a legacy PC serial port, although with different voltage levels. K/L has been commonly used in vehicles up to the mid-2000s and is still often used for secondary systems such as brakes or airbags. To talk to an ECU through K/L, you need a K/L or K+CAN interface.

Loading the Diagnostic Software

Loading a diagnostic software image

First, choose the diagnostic software you want to run. CASCADE supports *Hi-Scan Pro*/*Carman Scan* I ROM packs in binary format, as LHA archive (usually with a .DAT extension), and with a self-extracting RAR wrapper (.EXE file; this is how Hyundai S-System is shipped). Any file that is not a plain binary ROM image will be unpacked automatically.



Main Screen

On the top left you see the emulated LCD screen. Below are the emulated function keys and the hint display, where CASCADE will show you tips for acquiring a successful connection with your vehicle. Further down are the record/replay buttons, the “Grab Keyboard” checkbox, and the machine status indicator.

☒ Grab Keyboard

The “Grab Keyboard” checkbox is normally enabled and makes sure that you can use the diagnostic software using the keyboard, which is much more convenient than using the on-screen buttons. In cases in which you need the keyboard for other purposes (such as when entering a custom baud rate), you can uncheck it to make the keyboard available to the user interface.

RUNNING

If the machine status indicator says “RUNNING”, the system is operational. If it says “STOPPED”, the system has been halted. Usually, that means you have not loaded a diagnostic software image yet.

Status LEDs

<input checked="" type="checkbox"/> serial	<input type="checkbox"/> break	<input type="checkbox"/> beep	<input type="checkbox"/> rec
<input type="checkbox"/> data rx	<input type="checkbox"/> eeprom	<input type="checkbox"/> CAN	<input type="checkbox"/> play
<input type="checkbox"/> data tx	<input type="checkbox"/> echo	<input type="checkbox"/> iface	

Status LEDs

On the right you see the status LEDs that give you a glimpse of what is going on internally:

- “serial” is lit when the serial port is activated.
- “data rx” and “data tx” light up as data is being received or sent, respectively.
- “break” is on when an ISO-9141 “slow init” or ISO-14230 “fast init” is performed, that is when the diagnostic software attempts to establish a connection with an ECU via K line.
- “eeprom” turns on when the non-volatile memory is accessed, for instance on start-up or when changing the diagnostic software system setup.
- “echo” is on if CASCADE has determined that the running diagnostic software expects all transmitted bytes to be sent back (echoed); this is mostly “tourist information”, CASCADE changes the setting automatically.

- “beep” lights up in cases where the original device would beep, which I have determined to be far less annoying. 😊
- “CAN” indicates that the interface has been switched to CAN bus mode. If this LED is off, the system is in K/L mode.
- “iface” shows if an interface is connected to your computer and being used by CASCADE. If this LED is off, communication is not possible. Usually, it is off because no suitable interface is connected, or the FTDI drivers have not been installed.
- “rec” turns on while recording a session, and “play” when replaying one.

Keypad

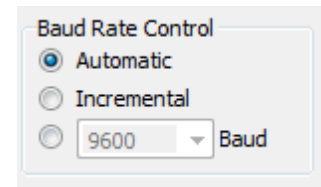
Below the LEDs, you find the keypad used to control the diagnostic software. All these buttons are mapped to keys on your keyboard, which is the easier and thus recommended way to use them. The mapping is as follows:

Hi-Scan/CS1 button	CASCADE key
ON/OFF	F10
*	B (backlight control, not functional in CASCADE)
SHIFT	SHIFT (left or right)
HELP	F12
left/right/up/down	left/right/up/down cursor key
0 ... 9	0 ... 9 (main keyboard or numeric keypad)
NO	N
YES	Y
ESC	ESC key
UNDO	backspace key
ENTER	RETURN or ENTER (numeric keypad)



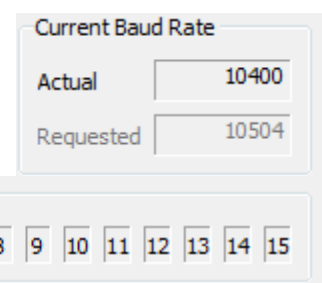
Baud Rate Control

Below the keys you will find one of the most important features of CASCADE: The transmission speed (baud rate) control. Although the speed can often be determined automatically, in many cases it is important to set the correct speed to succeed in communicating with your vehicle’s electronics.



The “Baud Rate Control” box defaults to “Automatic”, meaning it will trust the diagnostic software to be able to set the speed correctly without human intervention. This works well for vehicles adhering strictly to the standards, but in many cases, you will have to help CASCADE by setting the speed manually. To do so, you can click on the third radio button near the number field that, by default, says “9600”. Here, you can select the correct baud rate – if you know it – or simply try different settings until you succeed in connecting to the ECU you wish to diagnose. You are not restricted to the predefined baud rates (although these are the most common ones and should thus be tried first), but can also key in a custom baud rate. To do this, deselect the “Grab Keyboard” checkbox and enter your chosen baud rate, then select the “Grab Keyboard” checkbox again. (Note that all this only applies to K/L mode; if your control unit speaks CAN, you will not have to bother with this.)

To the right, in the “Current Baud Rate” box, you can see the communication speed actually being used (“Actual”), and the one the diagnostic software thinks should be used (“Requested”). Note that there may be a slight difference between these two values even when baud rate control is set to “Automatic”. This is because of differences between the devices’s serial port and the FTDI USB-to-serial converter. Don’t be concerned, the difference is usually around 1%, which is completely harmless and will not cause any problems connecting.

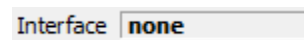


K Line

One shortcoming of CASCADE is that it cannot switch wires on your USB interface, while the original device's interface is capable of doing so. Usually, that does not pose a problem because most vehicles have at least some components attached to the standard pin 7; some manufacturers, however, connect secondary control units to other pins on the diagnostic connector, meaning – unfortunately – that these cannot be connected to without modifying the interface hardware, i.e. rewiring the line connected to pin 7 to a different pin.

While CASCADE is not capable of doing that for you, it can at least give you a hint about which pin might be the correct one. If you try to connect to an ECU, and the “K Line” indicator shows a different pin than 7, you might want to investigate if your vehicle perhaps uses non-standard pin assignments. Note, however, that the heuristics used by CASCADE are not 100% foolproof, so you should consult a [wiring diagram for your vehicle](#) to make sure you use the right pin before connecting a modified USB interface to your vehicle. (Again, none of this applies to vehicles diagnosed over the CAN bus, which always use the standard pin assignment.)

Interface name

A screenshot of a software interface showing a dropdown menu labeled 'Interface' with the word 'none' selected inside it.

Below the K line indicator you can see the name of the interface chip CASCADE is connected to. If this says “none”, CASCADE was not able to find any interface. The reasons are as detailed above, in the description of the “iface” LED.

Menus

“File” Menu

Here, you can load a different diagnostic software (“Load ROM”), load and save states (registered version only), or quit the application.

“Machine” Menu

This menu allows you to control the scanner system, namely to reset it without erasing the non-volatile memory (“Reset”), and to reset it and also clear the non-volatile memory (“Factory Reset”).

“Help” Menu

In the help menu, “Online Help” leads you to this page; the “About” box tells you about the software version and, depending on whether you have a registered or a demo version, your registration details or your hardware ID. The demo version also has a “Buy Now” entry in this menu that allows you to buy a registered, unlimited version via PayPal.

Limitations of the Demo Version

The demo version has a number of limitations that are supposed to encourage you to buy a registered version while still allowing you to evaluate CASCADE's feature set and compatibility with your automotive and computing hardware:

- Limited run time. The demo version will only run for a few minutes, then it will reset the diagnostic software.
- Limited data transfer. After having transferred a certain amount of data (meaning you have successfully connected to an ECU), the demo version will reset the diagnostic software.
- No saving/loading of states, no recording/replaying of sessions.

Troubleshooting

Problems connecting to the ECU

Establishing the connection is the most critical part of a diagnostic session. If it doesn't work immediately, try some of the suggestions below. Don't give up prematurely; although such vehicles probably exist, I have not yet encountered a K/L or CAN passenger car that cannot be diagnosed with CASCADE.

K/L and baud rate

The most common problem when trying to contact a control unit via K/L interfacing is wrong data transmission speed. While in many cases the correct speed is known beforehand and will be selected automatically, in some cases it is not. The diagnostic software tries to measure the baud rate, which is a capability the FTDI chip has as well, but my experiments have shown these measurements to be extremely inaccurate. Therefore, in CASCADE you may have to manually set the baud rate until you find the one that is being used. Sorry about that.

So what speed should you use? In most cases, the speed is either 9600 or 10400 Baud. Mitsubishi vehicles often use 15625 Baud. If these rules of thumb don't lead to success, you will have to experiment, or consult the Internet.

Non-standard pin assignments for K/L ECUs

Some manufacturers connect the K line of ECUs that are not part of the standard OBD2 diagnostics routine to pins other than the standard-mandated number 7. A common pattern in Hyundai and Mitsubishi vehicles seems to be to have the ABS system on pin 8 and the airbag on pin 12. If you cannot connect to an ECU, it may be connected to a non-standard pin. Unfortunately, that means you will have to physically modify your interface if you want to diagnose these ECUs. You would have to cut the lead to pin seven and reroute it to the correct pin, or you will have to fashion an adapter that allows you to jumper the K line to different pins.

To find out what pins the various ECUs are connected to in your vehicle, you will have to consult the wiring diagrams. You may be able to find free copies of those through realfsm.com. Be aware that connecting the diagnostic interface to the wrong pin may cause damage to your vehicle! Even though such damage will probably be limited to a blown fuse, it's better to be safe than sorry.

Ignition toggling

Generally, all ECUs require you to turn on the ignition before you can connect and diagnose them. It is, however, important to know that many ECUs fall asleep if you don't make a connection attempt within a certain time after turning the ignition on. In some cases, this time frame is in the order of a few seconds. If the connection attempt takes too long, e.g. because the diagnostic software has to try a few modes of communication before finding the right one, it may be necessary to turn the ignition on and off again *while the connection attempt is in progress*. This is quite tricky, and therefore CASCADE will attempt to assist you in it. When there is a good occasion to toggle the ignition, CASCADE will show the hint "Ignition off/on" in yellow in the hint box. This is not an accurate science, though, and you may be more successful toggling the ignition a bit earlier or later.

This issue seems to affect older vehicles more than more recent ones, but even vehicles with CAN bus diagnostics sometimes exhibit this behavior.

ISO-14230 (“fast init”) vehicles

There is a generation of vehicles that require use of the so-called “fast init” connection method, which relies on very accurate timing, to the order of a few milliseconds. While this might not sound very tricky given the speed of modern computers, the non-realtime nature of PC operating systems makes it so. In practice that means that even if everything (speed, pin assignment, ignition etc.) is correct, connecting to a “fast init” ECU can take a few tries, sometimes more, sometimes less, so don’t give up!

Mitsubishi peculiarities

Older Mitsubishi vehicles have to be coerced into diagnostic mode by wiring pin 1 of the OBD connector to ground. I have observed this on a 1997 Mitsubishi Colt ECU. On the other hand, a 2005 Mitsubishi Lancer did not require any such tricks. I suspect that this peculiarity is limited to pre-OBD2 vehicles.

Problems on the PC side

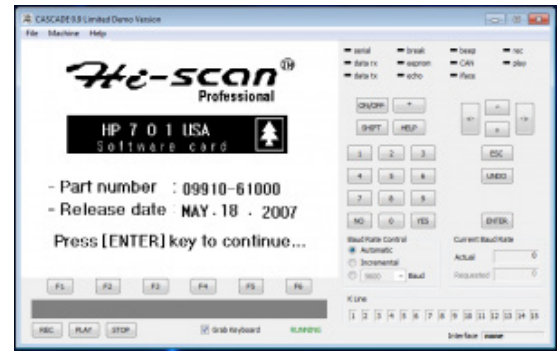
Interface problems

If you cannot connect to your car, the “iface” indicator stays off and the “Interface” box keeps saying “none”, one of the following things could be wrong:

- No interface plugged in. You need to have a supported K/L or K+CAN 1.4 interface with FTDI chip connected to your computer via USB.
- No FTDI drivers installed. You have to download the [drivers from FTDI](#) and install them. This step may have been performed automatically if you are using Windows 7.
- You are using an incompatible interface. Make sure your interface uses an FTDI USB-to-serial converter and is connected via USB.

What is CASCADE?

CASCADE, the “Car Scanner Device Emulator”, allows you to use the same diagnostic software that runs on high-end “*Hi-Scan Pro*” and “*Carman Scan I*” car scanners to diagnose your car, with only your PC or notebook computer and a very affordable generic USB diagnostic interface.



What are the requirements?

- An 800 MHz or faster x86 PC running Windows XP or Windows 7. Unless you are able to park your vehicle in your living room, you will probably want to use a notebook computer. 😊
- A generic K/L interface with FTDI USB-to-serial chip (for vehicles with K/L line diagnostics), **or**
- A K+CAN 1.4 interface with FTDI USB-to-serial chip (for both vehicles with K/L line and CAN bus diagnostics).
- FTDI chip drivers for Windows, which can be downloaded from [FTDI's website](#) ([direct link](#)).

Where do I get the diagnostic software?

Hi-Scan Pro software can be downloaded after free registration from the service website of *Hyundai Motors America* and *Kia Motors America*. Please refer to [this page](#) for details.

“Carman Scan 1” software must be acquired from an authorized reseller.

What interfaces are supported?

CASCADE supports K/L and K+CAN 1.4 interfaces with an FTDI serial-to-USB converter chip. Examples are:

- “OBDII USB Car Diagnostic Cable – Blue”
- “K+CAN1.4 USB Car Diagnostic Cable”



What vehicles can be diagnosed?

CASCADE generally supports all vehicles that allow diagnosis via K/L or CAN bus. The support for specific models depends on the diagnostic software being used. The *Hi-Scan Pro* software releases support Hyundai or Kia vehicles sold on the American market from model year 1990 up to about 2007; for *Carman Scan I* software, the manufacturer provides a [vehicle coverage list](#); it supports virtually all makes and models of vehicles, up to about model year 2010.