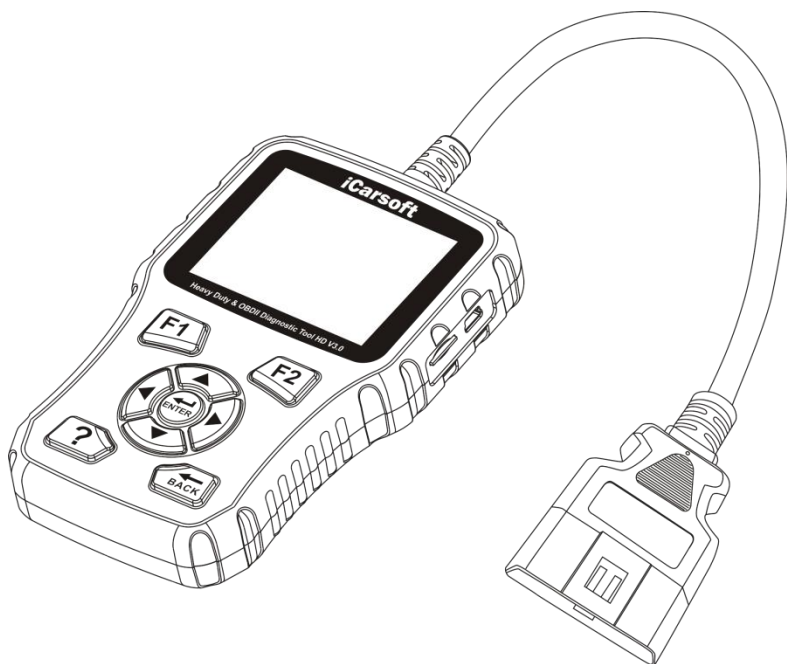


# ***iCarsoft***

## **Heavy Duty Diagnostic Tool**

### **HD V3.0**

### **User Manual**





## Disclaimer

All information, illustrations, and specifications contained in this manual are based on the latest information available at the time of publication. The right is reserved to make change at any time without notice.

## Safety Precautions and Warnings

To prevent personal injury or damage to vehicles and/or the HD V3.0, please read this user's manual first carefully and observe the following safety precautions at a minimum whenever working on a vehicle:

- Always perform automotive testing in a safe environment.
- Do not attempt to operate or observe the tool while driving a vehicle. Operating or observing the tool will cause driver distraction and could cause a fatal accident.
- Wear safety eye protection that meets ANSI standards.
- Keep clothing, hair, hands, tools, test equipment, etc. away from all moving or hot engine parts.
- Operate the vehicle in a well-ventilated work area: Exhaust gases are poisonous.
- Put blocks in front of the drive wheels and never leave the vehicle unattended while running tests.
- Use extreme caution when working around the ignition coil, distributor cap, ignition wires and spark plugs. These components create hazardous voltages when the engine is running.
- Put the transmission in P(for A/T) or N(for M/T) and make sure the parking brake is engaged.
- Keep a fire extinguisher suitable for gasoline/ chemical/ electrical fires nearby.
- Don't connect or disconnect any test equipment while the ignition is on or the engine is running.
- Keep the HD V3.0 dry, clean, free from oil/ water or grease. Use a mild detergent on a clean cloth to clean the outside of the HD V3.0, when necessary.

## Table of contents

1	Introduction .....	1
2	General Information .....	1
2.1	On-Board Diagnostics (OBD) II .....	1
2.2	Diagnostic Trouble Codes (DTCs) .....	2
2.2.1	OBDII DTC .....	2
2.2.2	DTCs for J1587 /J1708 and J1939 .....	3
2.3	J1708/J1587/J1939 .....	4
2.4	OBD Definitions .....	5
3	Product Descriptions .....	6
3.1	Outline of HD V3.0 .....	7
3.2	Specifications .....	8
3.3	Accessories .....	9
3.4	Power supply .....	9
4	Connections & General Operations .....	11
4.1	Connections .....	11
4.2	Battery .....	12
4.3	DTC Library .....	13
4.4	Settings .....	13
4.5	About .....	14
5	Diagnose .....	14
5.1	Truck OBD Diagnosing .....	16
5.1.1	Read DTC .....	17
5.1.2	Clear DTC .....	18
5.1.3	Live Data .....	18
5.2	Car OBDII Diagnosing .....	19
5.2.1	Read Codes .....	19
5.2.2	Erase Codes .....	20
5.2.3	I/M Readiness .....	21
5.2.4	Live Data .....	21
5.2.5	View Freeze Frame .....	21
5.2.6	Oxygen sensor test .....	21
5.2.7	On-board monitor test .....	22
6	How to Upgrade HD V3.0 .....	22
6.1	Upgrading flowchart .....	22
6.2	User registration .....	23
6.3	Upgrading: .....	24
7	FAQ .....	24

# 1 Introduction

The HD V3.0 is specially developed by iCarsoft for heavy duty vehicles, which support all 10 modes of OBDII test (EVAP, O2 Sensor, I/M Readiness, MIL Status, VIN info, and On – board monitors testing etc.) for a complete diagnosis and enables users to read DTCs, clear DTCs and view the datastream with a live color graphing. It covers a wide range of vehicles since it offers multiple data bus protocols, such as J1587 and J1939. It can be connected to PC through the USB cable or upgrade to keep updated with the latest software version.

Notice: HD V3.0 may automatically reset while being disturbed by strong static electricity. THIS IS A NORMAL REACTION.

## 2 General Information

### 2.1 On-Board Diagnostics (OBD) II

The first generation of On-Board Diagnostics (called OBD I) was developed by the California Air Resources Board (ARB) and implemented in 1988 to monitor some of the emission control components on vehicles. As technology evolved and the desire to improve the On-Board Diagnostic system increased, a new generation of On-Board Diagnostic system was developed. This second generation of On-Board Diagnostic regulations is called “OBD II”.

The OBD II system is designed to monitor emission control systems and key engine components by performing either continuous or periodic tests of specific components and vehicle conditions. When a problem is detected, the OBD II system turns on a warning lamp (MIL) on the vehicle instrument panel to alert the driver typically by the phrase of “Check Engine” or “Service Engine Soon”. The system will also store important information about the detected malfunction so that a technician can accurately find and fix the problem. Here below follow three pieces of such valuable information:

1. Whether the Malfunction Indicator Light (MIL) is commanded ‘on’ or ‘off’;

2. Which, if any, Diagnostic Trouble Codes (DTCs) are stored;
3. Readiness Monitor status.

## **2.2 Diagnostic Trouble Codes (DTCs)**

Diagnostic Trouble Codes (DTCs) are codes that are stored by the on-board computer diagnostic system in response to a problem found in the vehicle. These codes identify a particular problem area and the intended to provide you with a guide as to where a fault might be occurring within a vehicle.

### **2.2.1 OBDII DTC**

OBD II Diagnostic Trouble Codes consist of a five-digit alphanumeric code. The first character, a letter, identifies which control system sets the code. The second character, a number, 0-3; other three characters, a hex character, 0-9 or A-F provide additional information on where the DTC originated and the operating conditions that caused it to set. Here below is an example to illustrate the structure of the digits:

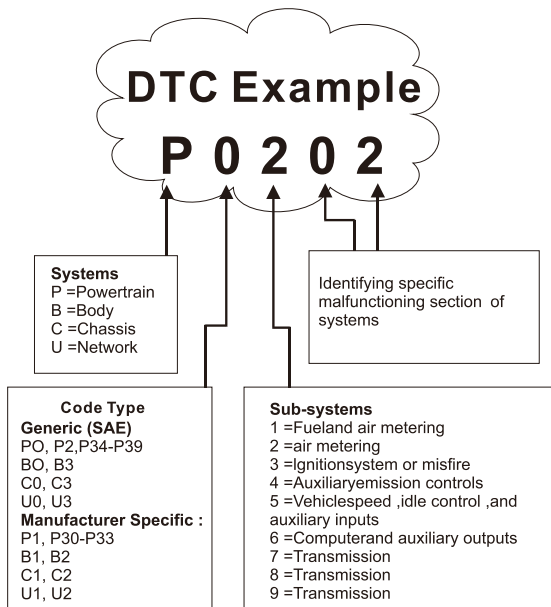


Figure 2-1

### 2.2.2 DTCs for J1587 /J1708 and J1939

This section explains the basic elements of fault codes for J1587 / J1708 and J1939 data bus protocols, how to view these codes on HD V3.0, and what they mean. Each fault code on HD V3.0 contain three distinct pieces of information, as described below.

J1587 /J1708 fault codes consist of the following, in this order:

- **Subsystem Identifier (SID)** – Indicates what function on the ECU has failed.
- **Failure Mode Indicator (FMI)** – Indicates in what way the function failed.
- **Occurrence (OC)** – Indicates the occurrence times of fault codes.

J1939 fault codes consist of the following, in this order:

- **Suspect Parameter Number (SPN)** – Indicates what function on the

ECU has failed.

- **Failure Mode Indicator (FMI)** – Indicates in what way the function failed.
- **Occurrence (OC)** – Indicates the occurrence times of fault codes.

## **2.3 J1708/J1587/J1939**

SAE J1708, SAE J1587 and SAE J1939 are automotive diagnostic protocol standard developed by the Society of Automotive Engineers (SAE).

### **SAE J1708**

SAE J1708 is a standard used for serial communications between ECUs on a heavy duty vehicle and also between a computer and the vehicle. With respect to Open System Interconnection model (OSI), J1708 defines the physical layer. Common higher layer protocols that operate on top of J1708 are SAE J1587 and SAE J1922.

### **SAE J1587**

SAE J1587 is an automotive diagnostic protocol standard developed by the Society of Automotive Engineers (SAE) for heavy-duty and most medium – duty vehicles built after 1985. The J1587 protocol uses different diagnostic connectors. Up to 1995, individual OEMs used their own connectors. From 1996 to 2001, the 6-pin Deutsch-connector was standard. Beginning in 2001, most OEMs converted to the 9-pin Deutsch. Some OEMs still use the 6-pin Deutsch. It has mostly been used for US made vehicles, and also by Volvo. SAE J1708 makes up the physical and data link layers while SAE J1587 makes up the transport and application layers with respect to the OSI model. SAE J1587 is used in conjunction with SAE J1708 for automobile communication.

### **SAEJ1939**

SAE J1939 is the vehicle bus standard used for communication and diagnostics among vehicle components, originally by the car and heavy duty truck industry in the United States.

SAE J1939 is used in the commercial vehicle area for communication throughout the vehicle. With a different physical layer it is used between the tractor and trailer. This is specified in ISO 11992.



SAE J1939 can be considered the replacement for the older SAE J1708 and SAE J1587 specifications.

SAE J1939 has been adopted widely by diesel engine manufacturers. One driving force behind this is the increasing adoption of the engine Electronic Control Unit (ECU), which provides one method of controlling exhaust gas emissions within US and European standards. Consequently, SAE J1939 can now be found in a range of diesel-powered applications: vehicles (on – and off - road), marine propulsion, power generation and industrial pumping.

Applications of J1939 now include off-highway, truck, bus, and even some passenger car applications.

## 2.4 OBD Definitions

**Powertrain Control Module (PCM)** -- OBD II terminology for the on-board computer that controls engine and drive train.

**Malfunction Indicator Light (MIL)** -- Malfunction Indicator Light (Service Engine Soon, Check Engine) is a term used for the light on the instrument panel. It is to alert the driver and / or the repair technician that there is a problem with one or more of vehicle's systems and may cause emissions to exceed federal standards. If the MIL illuminates with a steady light, it indicates that a problem has been detected and the vehicle should be serviced as soon as possible. Under certain conditions, the dashboard light will blink or flash. This indicates a severe problem and flashing is intended to discourage vehicle operation. The vehicle onboard diagnostic system cannot turn the MIL off until the necessary repairs are completed or the condition no longer exists. DTC-Diagnostic Trouble Codes (DTC) that identifies which section of the emission control system has malfunctioned.

**Enabling Criteria** -- Also termed Enabling Conditions. They are the vehicle – specific events or conditions that must occur within the engine before the various monitors will set, or run. Some monitors require the vehicle to follow a prescribed " drive cycle " routine as part of the enabling criteria. Drive cycles vary among vehicles and for each monitor in any particular vehicle. Please refer to the vehicle's factory service manual for specific enabling procedures.

**OBD II Drive Cycle** -- A specific mode of vehicle operation that provides conditions required to set all the readiness monitors applicable to the vehicle

to the “ready” condition. The purpose of completing an OBD II drive cycle is to force the vehicle to run its onboard diagnostics. Some form of drive cycle needs to be performed after DTCs have been erased from the PCM’s memory or after the battery has been disconnected. Running through a vehicle’s complete drive cycle will “set” the readiness monitors so that future faults can be detected. Drive cycles vary depending on the vehicle and the monitor that needs be reset. For vehicle specific drive cycle, consult the service manual.

**Freeze Frame Data** -- When an emissions related fault occurs, the OBD II system not only sets a code but also records a snapshot of the vehicle operating parameters to help in identifying the problem. This set of values is referred to as Freeze Frame Data and may include important engine parameters such as engine RPM, vehicle speed, air flow, engine load, fuel pressure, fuel trim value, engine coolant temperature, ignition timing advance, or closed loop status.

**Fuel Trim (FT)** -- Feedback adjustments to the base fuel schedule. Short-term fuel trim refers to dynamic or instantaneous adjustments. Long-term fuel trim refers to much more gradual adjustments to the fuel calibration schedule than short-term trim adjustments. These long-term adjustments compensate for vehicle differences and gradual changes that occur over time.

## **3 Product Descriptions**

### 3.1 Outline of HD V3.0

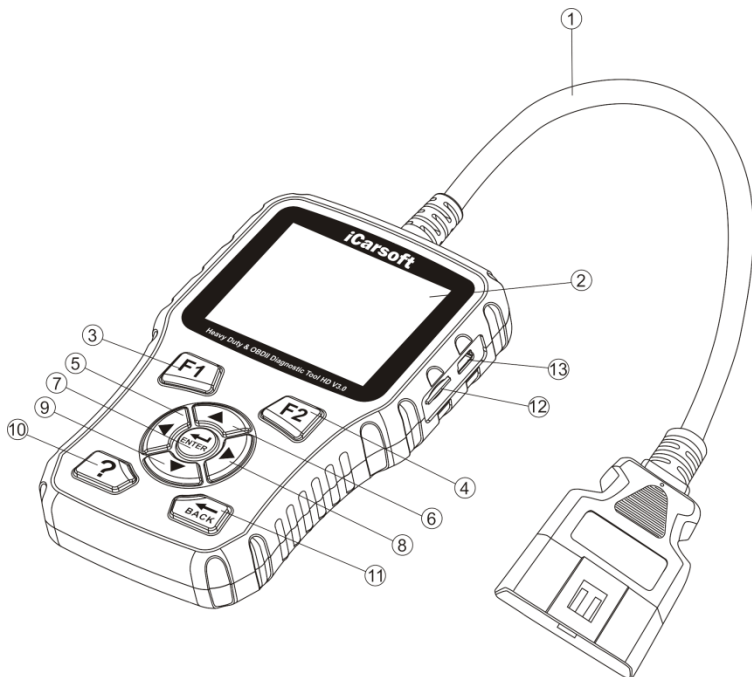




Figure 3-1

Table3-1:

No.	Name	Descriptions
①	<b>Cable with OBD II Connector</b>	Connects the HD V3.0 to the vehicle's Data Link Connector (DLC).
②	<b>LCD display</b>	Indicates test result
③	<b>F1 Function button</b>	In case of special use
④	<b>F2 Function button</b>	In case of special use

⑤/⑧	 <b>button</b>	Move cursor right or left for selection ; Or turn page up or down when more than one page is displayed.
⑥/⑨	 <b>button</b>	Move cursor up or down for selection
⑦	<b>Enter button</b>	Confirms a selection (or action) from a menu list.
⑩	<b>? button</b>	Shows help information for test results or user operation.
⑪	<b>Back button</b>	Returns to the previous menu
⑫	<b>Storage Card Slot</b>	Holds the system of the scan tool.
⑬	<b>USB port</b>	Connects the scan tool for power supply and update the software if needed.

## 3.2 Specifications

Table3-2:

Item	Description
<b>Display</b>	2.8 "TFT 262K true color, 320 x 240 QVGA LCD display
<b>Input voltage range</b>	8-32V
<b>Operating current</b>	< 100mA@12V(Typical)
<b>Power consumption</b>	<1.2W(Typical)
<b>Operating temperature</b>	32°F ~122°F / 0°C -50°C
<b>Storage temperature</b>	-4°F ~158°F / -20°C -70°C @RH60 %
<b>Outline dimension</b>	4.7' x 3.2' x 1.0' / 121 x 82 x 26mm LWH
<b>Weight</b>	<17.6 oz (500g)

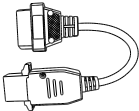
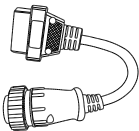
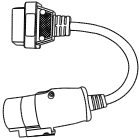
### 3.3 Accessories

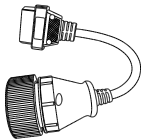
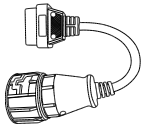
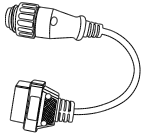

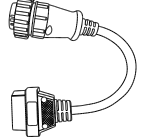
Table3-3:

Name	Description
<b>User manual</b>	Instruction on tool operations
<b>Data Cable</b>	Allows easy update via a PC and internet connection
<b>6PIN and 9PIN DLC adaptor</b>	Connects tools with Vehicle to use

HD V3.0 also supports the following optional adaptor kits, which can be purchased separately by contacting the dealer if necessary.

Table3-4:

Name	outline	Description
<b>Optional adaptors</b>		1) 8Pin V2 for VOLVO
		2) 16Pin for SCANIA
		3) 30Pin V2 for IVECO

	4) 37Pin for MAN
	5) 12Pin for MAN
	6) 7Pin for KNORR WABCO TRAILER
	7) 12Pin for RENAULT
	8) 14Pin OBD

### 3.4 Power supply

The power of the Diagnostic Tool is provided via the vehicle's Data Link Connector (DLC). Follow the steps below to power it up:

1. Find DLC on heavy duty vehicle:
  - The DLC is the connector where diagnostic code readers interface with the vehicle's on-board computer and usually located in the driver's cab.
  - A plastic DLC cover may be found for some vehicles and you need

to remove it before plugging DLC. If it cannot be found, refer to the vehicle's service manual for the location.

2. Connect the data link connector to the interface of the data link connector of the heavy duty.

## 4 Connections & General Operations

### 4.1 Connections

1. Turn the ignition off.
2. Locate the heavy duty vehicle's DLC.
3. Select the desired diagnostic adaptor according to your vehicle's DLC.
4. Plug one end of 6pin or 9pin DLC diagnostic adaptor into the included OBD II 16pin connector, and connect the other end to the heavy duty truck's DLC.
5. Turn the ignition on. Engine can be off or running.
6. After finishing, the system will enter the main menu interface, as shown in Figure 4-1.

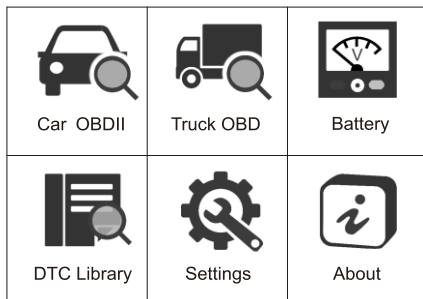








Figure 4-1

The following table briefly describes the functions of the main menu of the diagnostic tool.

Table4-1:

Function icon	Name	Descriptions
	Car OBDII	To diagnose your car OBD II.
	Truck OBD	To diagnose your heavy-duty truck
	Battery	Displays the voltage of the data link connector (DLC)
	DTC Library	Select DTC Library icon to view the definition of the DTC.
	Settings	Set the language, unit, buzzer, etc. of the diagnostic tool.
	About	It mainly includes software version, hardware version, serial number, support protocol.

**CAUTION:** Don't connect or disconnect any test equipment with ignition on or engine running.

## 4.2 Battery

On battery voltage page, it shows the voltage of Data Link Connector (DLC), which is approximately the vehicle battery's status. Especially, it can observe the voltage while engine start.



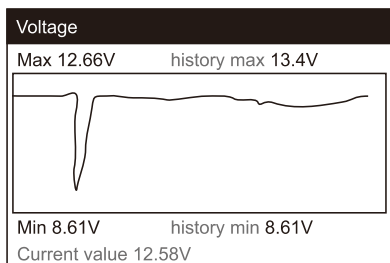


Figure 4-2

### 4.3 DTC Library

Select DTC Library icon from the main screen, press ENTER. Press LEFT / RIGHT button to move the highlight bar to different position. Press UP / DOWN button to alter the value, and press [ENTER] button, the screen will display definition of the DTC.

DTC Library	
P 0 0 0 0	
◀	Left
▶	Right
▲ ▼	Change Digit
ENTER	Confirm
BACK	Exit

Figure 4-3

### 4.4 Settings

Select "Settings" icon on the main menu and press [ENTER] button. The system will enter the system setup screen:

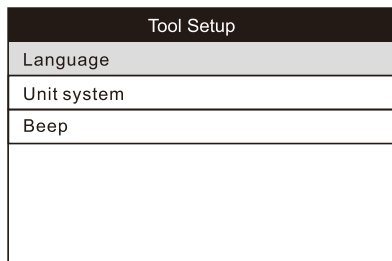


Figure 4-4

- 1) **Language:** Configure the system language to your preference.
- 2) **Unit system:** Set the measurement unit system.
- 3) **Beep:** Turn ON/OFF the Beeper. Once Beeper is set to ON, 🔔 will appear at bottom of the screen.

## 4.5 About

Select About icon on the main screen, press ENTER. On the Tool Information page, there are software version, hardware version and product serial number etc..

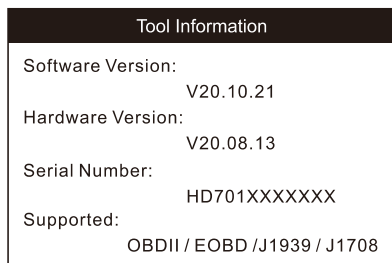


Figure 4-5

## 5 Diagnose

From the main menu, select the car OBDII or truck OBD icon.

If a heavy-duty truck is diagnosed, the system will continue scanning the

protocols the truck supports and then enter the system selection screen. See figure 5-1.

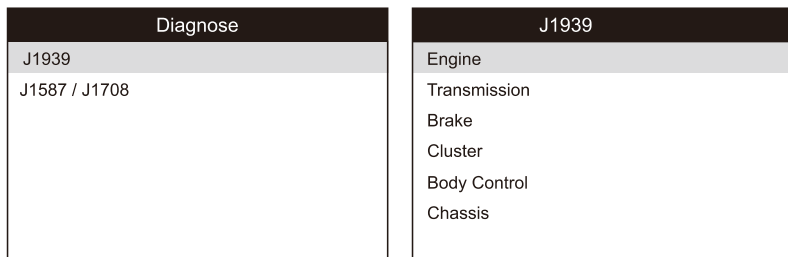


Figure 5-1

For detailed operations, please refer to Chapter 5.1 "**Truck OBD Diagnosing**".

If a vehicle equipped with **Car OBDII** is tested, the system will enter the function selection screen once scanning has finished successfully. See figure 5-2

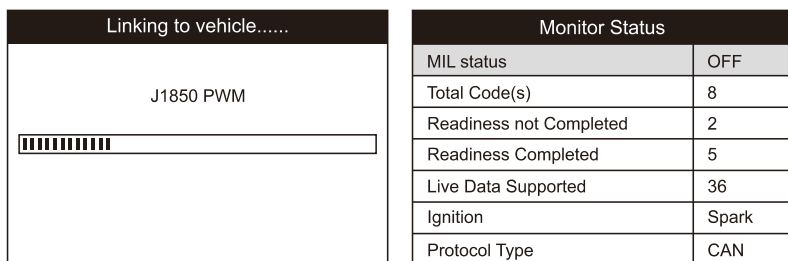


Figure 5-2

Press [ENTER] to enter the system selection screen. For detailed operations, please refer to Chapter 5.2 "**Car OBDII Diagnosing**".

## 5.1 Truck OBD Diagnosing

Follow the diagnosis flowchart shown as below to proceed:

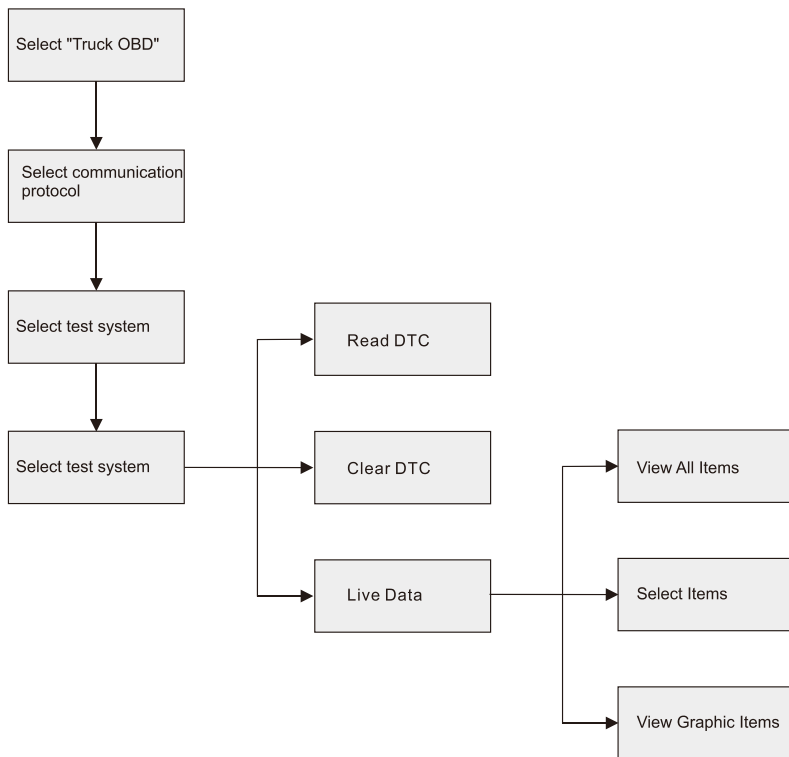


Figure 5-3

In Figure 5-4, use [▲] / [▼] button to select the desired system and press ENTER to access:

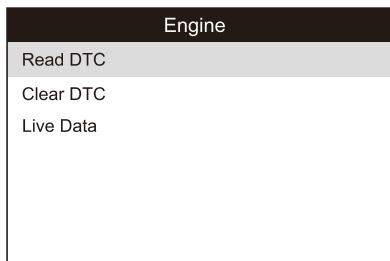


Figure 5-4

### 5.1.1 Read DTC

This option is used to read the current activated or historical activated codes.

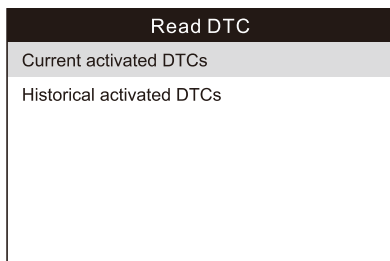


Figure 5-5

Generally, there are three elements for one J1939 DTC (See Figure 5-6):

**Suspect Parameter Number (SPN)** – Indicates what function on the ECU has failed.

**Failure Mode Indicator (FMI)** – Indicates in what way the function failed.

**Occurrence (OC)** - Indicates the occurrence times of the current DTC.

Read DTC		
SPN0100	Count=1	1/6
FMI=4 Voltage Below Normal, Or Shorted TO LOW Source		
SPN 100 Engine Oil Pressure		

Indicates there are total 6 codes and SPN0100 is the first code to display.

Further descriptions on current DTC

Figure 5-6

Whereas, if we choose [J1587/1708], the fault code includes:

**Subsystem Identifier (SID)** – Indicates what function on the ECU has failed.

**Failure Mode Indicator (FMI)** – Indicates in what way the function failed.

**Occurrence (OC)** - Indicates the occurrence times of the current DTC.

Press [◀/▶] to view the next or previous trouble code; press [BACK] to exit and return to the function screen.

### 5.1.2 Clear DTC

This option allows you to clear the existing or historic trouble codes.

Note: After clearing, you should retrieve trouble codes once more or turn ignition on and retrieve codes again. If there are still some trouble codes in the system, please troubleshoot the code using a factory diagnosis guide, then clear the code and recheck.

### 5.1.3 Live Data

This option enables you to read the real-time data stream in character or graphic form.

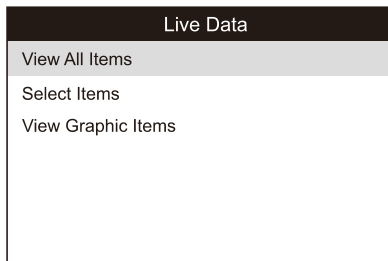


Figure 5-7

- A. **View All Items:** To view all data stream items.
- B. **Select Items:** Select the desired data stream items, and then press [ENTER] to read the value of the selected items.
- C. **View Graphic Items:** Select the desired data stream item and press [ENTER] to display it in live graphic form.(Note: Max. 1 item is supported.)

## 5.2 Car OBDII Diagnosing

Press [ENTER] in Figure 5-2, a screen similar to Figure 5-8 will appear:

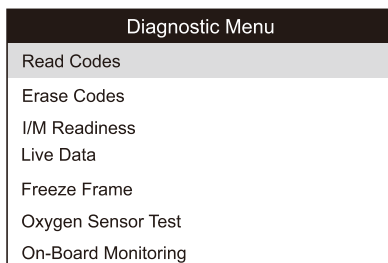


Figure 5-8

### 5.2.1 Read Codes

This option is used to read the current, pending or permanent trouble codes. If the trouble code is found, the system will display the detailed

description of the trouble code:

Read Codes
Current DTCs (Mode 03)
Pending DTCs (Mode 07)
Permanent DTCs (Mode 0A)

Figure 5-9

Current DTCs	
P0102	3/12
Mass or Volume Air Flow A Circuit Low	

Figure 5-10

In Figure 5-10, 3/12 indicates there are total 12 codes and P0102 is the third code to display.

If the DTC is defined by the manufacturer, a screen similar to Figure 5-11 will appear. In this case, press ENTER to select the manufacturer from the list and the screen will show the detailed content of the trouble code.

Current DTCs	
C102D	1/15
The code is defined by the manufacture, Press [ENTER] to select the manufacture.	

Figure 5-11

## 5.2.2 Erase Codes

It is used to clear all existing trouble codes.

Notes: Before performing this function, make sure to retrieve and record the trouble codes.

After clearing, you should retrieve trouble codes once more or turn ignition on



and retrieve codes again. If there are still some trouble codes in the system, please troubleshoot the code using a factory diagnosis guide, then clear the code and recheck.

### **5.2.3 I/M Readiness**

I/M refers to Inspection and Maintenance that is legislated by the Government to meet federal clean-air standards. I/M Readiness indicates whether or not the various emissions-related systems on the vehicle are operating properly and are ready for Inspection and Maintenance testing.

The purpose of the I/M Readiness Monitor Status is to indicate which of the vehicle's Monitors have run and completed their diagnosis and testing, and which ones have not yet run and completed testing and diagnosis of their designated sections of the vehicle's emissions system.

The I/M Readiness Monitor Status function also can be used (after repair of a fault has been performed) to confirm that the repair has been performed correctly, and / or to check for Monitor Run Status.

Note: N/A means not available on this vehicle; INC means incomplete or not ready and OK means completed or Monitor ok.

### **5.2.4 Live Data**

This item enables you to view all data stream items and the live waveform of all selected items.

### **5.2.5 View Freeze Frame**

When an emission-related fault occurs, certain vehicle conditions are recorded by the on-board computer. This information is referred to as freeze frame data. Freeze Data is a snapshot of the operating conditions at the time of an emission-related fault.

Note: If DTCs were erased, Freeze Data may not be stored in vehicle memory depending on vehicle.

### **5.2.6 Oxygen sensor test**

The results of oxygen sensor test are not live values but instead the

results of the ECU's last oxygen sensor test. For live oxygen sensor readings, refer to any of the live sensor screens such as Graph Screen.

Not all test values are applicable to all vehicles. Therefore, the list generated will vary depending on vehicle. In addition, not all vehicles support the Oxygen Sensors screen.

### **5.2.7 On-board monitor test**

This function can be utilized to read the results of on-board diagnostic monitoring tests for specific components / systems.

## **6 How to Upgrade HD V3.0**

### **6.1 Upgrading flowchart**

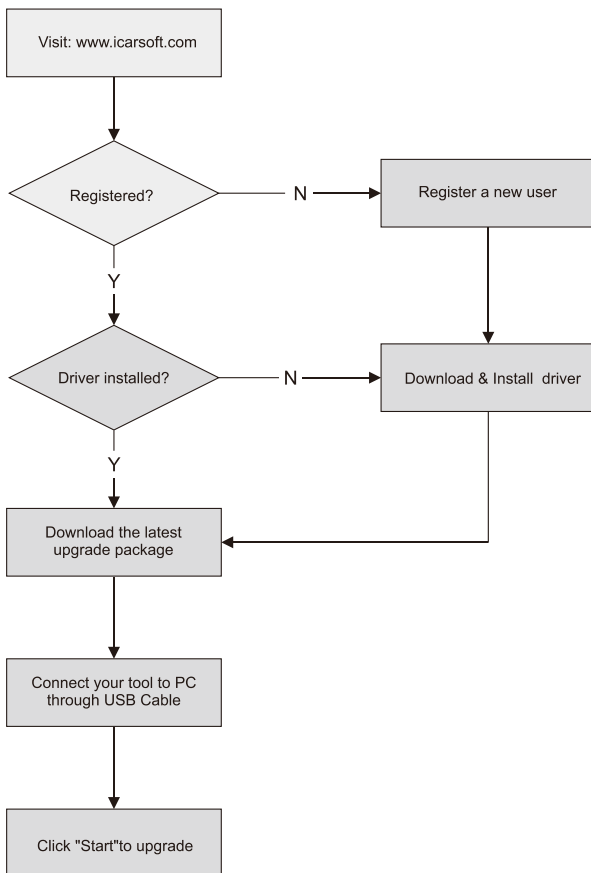


Figure 6-1

## 6.2 User registration

As you buy a HD V3.0, please visit [www.icarsoft.com](http://www.icarsoft.com) to register. Only after successfully registered, you can logon at the site and can download the HD V3.0 driver & latest version program of HD V3.0.

## 6.3 Upgrading:

Log on [www.icarsoft.com](http://www.icarsoft.com), download the latest version of the HD V3.0 upgrade package and decompress the software to local disk.

Connect the HD V3.0 to computer through USB cable and run the HD V3.0 Upgrade Tool.exe, the following window will appear:

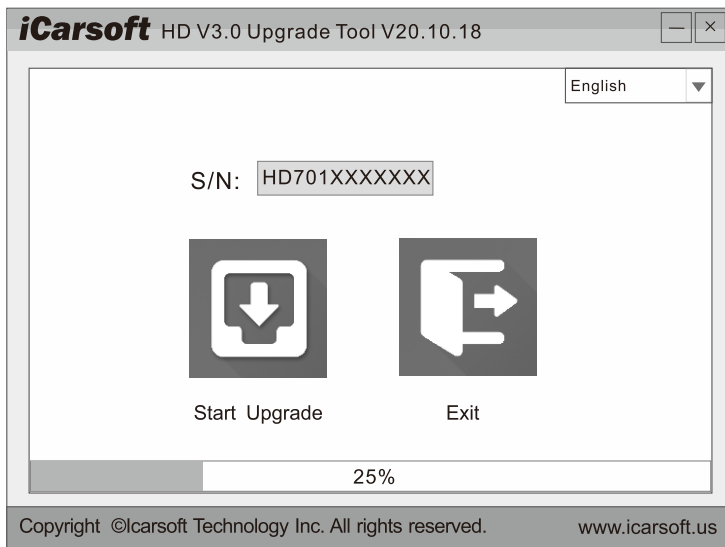


Figure 6-2

Select the language, and then click " Start Upgrade", a progress bar will appear at the bottom of the screen. When a message of upgrade success pops out, click "Exit" and then unplug the USB cable to complete upgrade.

## 7 FAQ

Here we list some frequently asked questions and answers relating to HD V3.0.

**Question:** System halts when reading data stream. What is the reason?

**Answer:** It may be caused by a slackened connector. Please turn off the diagnostic tool firmly connect the connector, and switch on it again.

**Question:** Screen of main unit flashes at engine ignition start.

**Answer:** Caused by electromagnetic disturbance and this is normal phenomenon.

**Question:** There is no response when communicating with on-board computer.

**Answer:** Please confirm the proper voltage of power supply and check if the throttle has been closed, the transmission is in the neutral position, and the water is in proper temperature.

**Question:** Why are there so many fault codes?

**Answer:** Usually, it caused poor connection or fault circuit grounding.

Note: All pictures illustrated here are for reference and demonstration purpose only and this User's Manual is subject to change without prior notice.



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2020-11-03  
Version: A0