

# VERT Association

## Human Factors: Tampering and Manipulation of Soft- and Hardware

December 15<sup>th</sup> 2016

Tehran | تهران

## ○ Tampering and Manipulation of Soft- and Hardware



## Agenda

- Introduction
- OBD on modern Trucks EURO V and EURO VI
- Manipulation of Electronic Control Units
- Emission reduction systems on modern trucks
- Manipulation on SCR
- Manipulation on DPF
- Conclusion

## ○ **OB**D on modern Trucks EURO V and EURO VI




- ODB (On Board Diagnostic)
- Control and supervision of all emissions and emission related components
- Failures are indicated to the driver AND stored permanently in the ECU
- These failures can be read out in the certified workshop
- Failures (P0-Codes) are standardized according to ISO 15031-6

## ○ OBD-electronics can be manipulated

- ODB (On Board Diagnostic) is a useful tool but:
- Electronic can be manipulated. Devices are commercially available for eg:
  - Devices to „adjust“ ODB values, reset failures are commercial available
  - Read and clear error codes
  - New mechanical key number programming
  - Vehicle identification key programming
  - Mileage adjustment via OBD
  - EEPROM chip read and immobilizer initialization
  - Oil/Service reset
  - CVT learning/Value reset


■ ...

# Odometer Adjustment

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Home - Products - [OBDSTAR] - OBDSTAR Mileage Tool - Christmas Sale OBDSTAR X300M Special For Odometer Adjustment By OBD And OBD2 Connection Go Back



**Christmas Sale OBDSTAR X300M Special For Odometer Adjustment By OBD And OBD2 Connection**

Item No. HKSM52  
History: **350** sold 5 stars, 52 reviews.

Manufacturer: OBDSTAR

Latest price: ~~US\$249.00~~  
**Buy it Now: US\$239.00**   
Quantity:

**In Stock**

Shipping: **Free Shipping** Express Shipping Service  
Estimated delivery time: 3-5 Days. [See details >](#)

Weight: 1.0KG  
Package: 31cm\*21cm\*8cm ( Inch:12.2\*8.27\*3.15 )  
Returns: Return for refund within 30 days, buyer pays return shipping. [Read details >](#)

**Related Download Files:**

- [how-to-use-obdstar-x300m.pdf](#) (403.1K)
- [obdstar-one-key-upgrade-guide.pdf](#) (495.8K)
- [obdstar-products-register-guide.pdf](#) (547.4K)
- [obdstar-products-upgrade-manual.pdf](#) (795.2K)

**419** diggs.

# Software Update



7% off

## Christmas Sale OBDSTAR X300 DP PAD With Android System Full Version For Immobilizer+Mileage adjustment+EEPROM/PIC adapter +OBDII

Item No. SP283

History: 4 sold



5 stars, 2 reviews.

Manufacturer: OBDSTAR

Latest price: ~~US\$929.00~~

**In Stock**

Buy it Now: **US\$863.00**

You save US\$66.00

Quantity:

**Buy It Now**

Shipping:  US\$42.50 Express Shipping Service  
Estimated delivery time: 3-5 Days. [See details >](#)

Weight: 2.0KG

Returns: Return for refund within 30 days, buyer pays return shipping. [Read details >](#)

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### Manufacturer Specifications

[Reviews \(2\)](#)

[Write a Review](#)

[After-sales Service](#)

X300 DP is a convenient device, combining Android system, immobilizer, diagnose and special function, which closely follows the global trend and greatly meets the demand of users. In addition, abundant and powerful maintenance database and car testing video have realized easier operation and real success. Furthermore, Remote guide strengthens the communication between end users and technicians, without worries about after -sell service.

## ○ Emission Reduction Systems on Heavy Duty Trucks

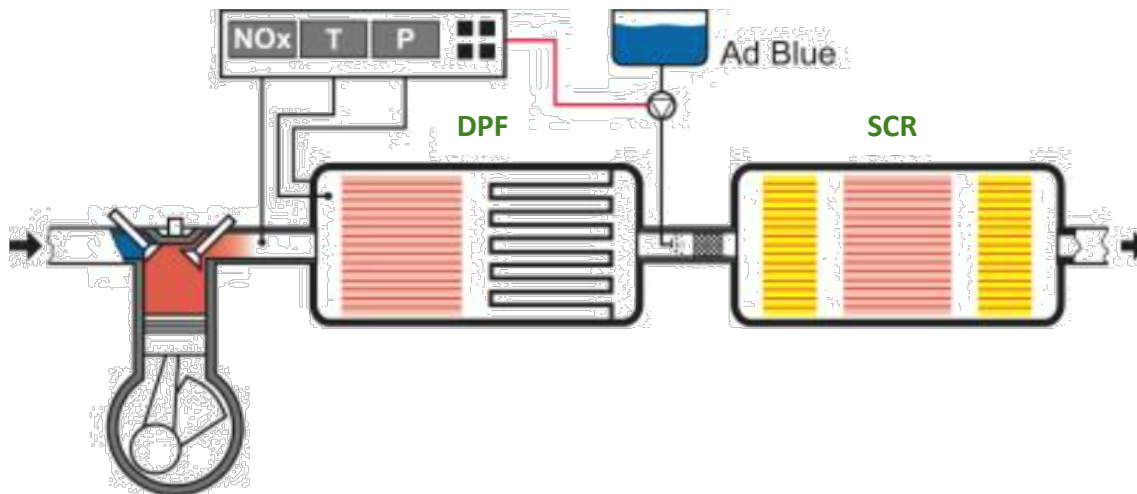
- The most relevant systems are:
- SCR Systems (Selective Catalytic Reduction)
- Diesel Oxidation Catalysts
- Diesel Particulate Filters





## ○ Emission Reduction Systems on Heavy Duty Trucks

- Most used technology for EURO 6 is SCRT<sup>®</sup>



- DPF - closed filter structure – manipulation only via hardware
- SCR - Open structure with chemical reaction  
AdBlue is needed – can be manipulated via software

## ○ Disabling of SCR Functionality

- Example: 8 IN 1 Truck AdBlue OBD Emulator
- Commercially available
- Cost apr. 25 – 60 USD
- for Mercedes MAN Scania Iveco DAF Volvo Renault Ford, ...



## ○ Disabling of SCR Functionality

- Example: SCR Emulator V5 NOx
- Price apr. 60 EURO
- Applications: DAF, Iveco, MAN, Mercedes-Benz, Renault, Volvo, Scania and FORD trucks
- Functions: cut off usage of AdBlue
- It emulates whole system safely including NOx sensor so there will be no OBD DTC errors
- *Source: Advertising from website*



Cardiag Inc. © 2014. All Rights Reserved.

Source:  
<https://www.cardiag.com/product/scr-emulator-v5-nox/>

## ○ SCR Emulator V5 Nox Product Description

- SCR Emulator V5 NOx (5th generation) another brand new product designed to emulate SCR (Selective Catalytic Reduction) systems on trucks with EURO 4 and EURO 5 exhaust pollution control systems. This device allows you to override SCR systems on trucks made by DAF, Iveco, MAN, Mercedes-Benz, Renault, Volvo, Scania and FORD. SCR Emulator V5 NOx is able to override all components of SCR systems like DEF (Diesel Exhaust Fluid) pumps, temperature sensors, level sensors and also it is able to override NOx (nitrous oxide) sensors and exhaust temperature sensors. Due to complete override of whole SCR system you can be sure that there will be no power (horsepower and torque figures remain the same) loss on trucks engine and gearbox will not go into limp mode. Also you need to know that SCR Emulator V5 NOx doesn't generate any DTC (Diagnostic Trouble Code) errors on trucks OBD (On-Board Diagnostics) system. This is a CAN (Controller Area Network) device so it can be easily connected to any supported truck without any special knowledge or adaptors. SCR Emulator V5 NOx is a very easy to use and useful device that will save you a lot of money and time if you're using your truck in countries where are no strict environmental rules like in EU. If you have a damaged SCR system on your truck this tool will help you reach any truck workshop without any discomfort. Driving through a country where are no DEF refill stations? Forget this problem, this emulator will solve it for you. V5 is user friendly as all previous versions of SCR emulators, we will provide necessary instructions to connect this device properly to your truck.

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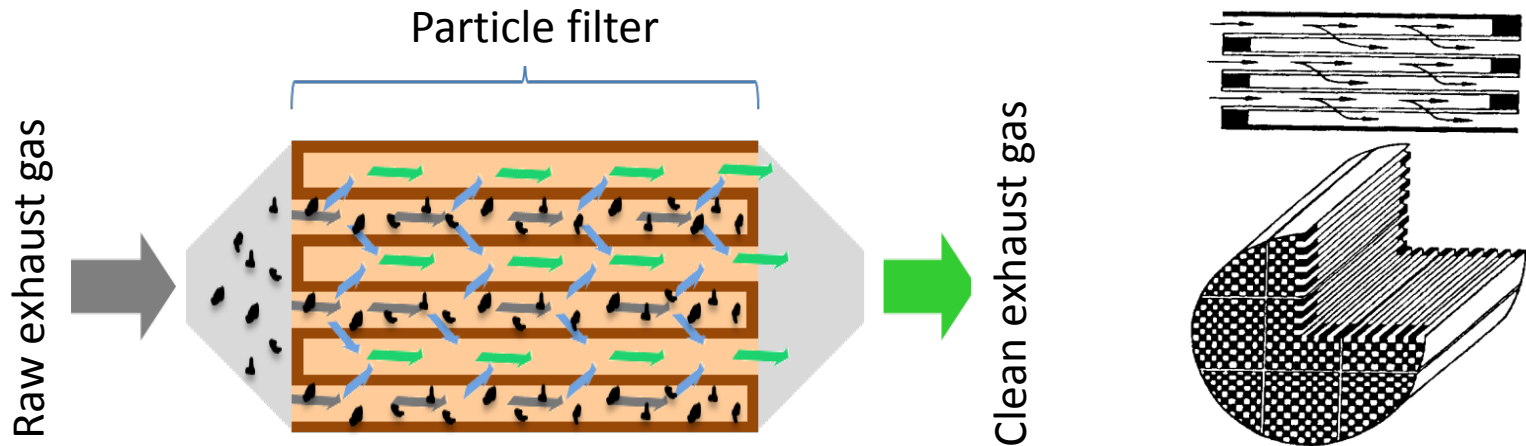
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## ○ Effect on Emission by emulating NO<sub>x</sub> Sensors

- Modern trucks have aligned SRC Systems with engine raw emission
- They are very effective on NO<sub>x</sub> reduction
- Without AdBlue support (reason of emulating NO<sub>x</sub> sensors) the NO<sub>x</sub> emission are going up for factors
- Example: 90 % Efficiency on SCR will lead to 2.0 g/kWh NO<sub>x</sub> (EURO V)  
If the NO<sub>x</sub> sensor is emulated to cut off AdBlue consumption  
NO<sub>x</sub> will increase to 20 g /kWh
- This is double is high as Emission level EURO I
- It **cannot** seen from the outside, gas test analyzers are needed

## ○ Technical Concept of a Diesel Particulate Filter

“Closed” Filter Systems are holding > 99% of the particles back



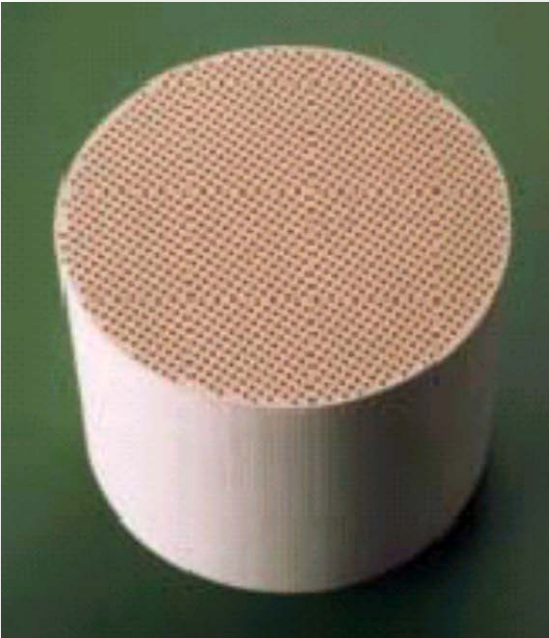
- Channels are reciprocally closed
- Exhaust gas is forced to penetrate the porous, air permeable, walls
- Soot particles are held back and collected on the walls of the filter material



## ○ Technical Concept of a Diesel Particulate Filter

Extruded cordierite and silicon carbide filter monoliths

**Cordierite**



**Silicon carbide**



## ○ Technical Concept of a Diesel Particulate Filter

Extruded cordierite and silicon carbide filter monoliths



**Satelliten-Filter**



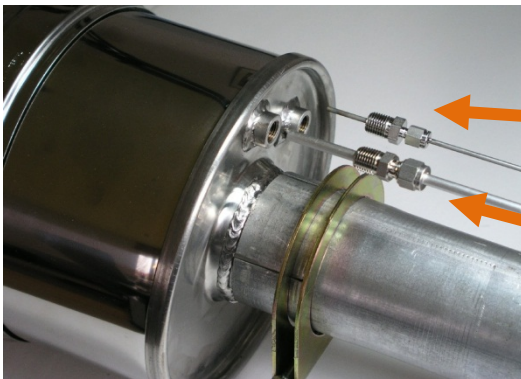
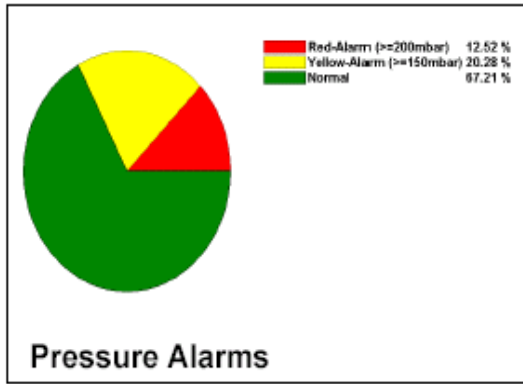
**Filtertasche**



**Filter-Box**



# Electronical Controlling of the Filter Systems



Temperature sensor

Backpressure sensor

DPF Inlet Module with sensor connections

## ○ Manipulation of DPF

- Software manipulation alone **cannot** increase emission
- It can reset failure or simulate dismantled systems
- Manipulation of DPF has to be done physically!
- Drilling holes in ceramic, dismantling filters ....



## ○ Visual inspection of manipulated DPF systems

Particle filters (DPF) eliminate ultrafine particles



- Filters attains **filtration rate exceeding 98%** for particles in the toxic size range of 10nm - 500 nm
- If the filter is missing or manipulated it **can be seen easily** by visual inspection

## ○ Visual inspection of manipulated DPF systems

Particle filters (DPF) eliminate soot



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## ○ Visual inspection of manipulated DPF systems

Particle filters (DPF) eliminate soot



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## ○ Conclusion

- Devices for ECU manipulation are commercially available
- Insite Inspection are mandatory to secure improvement on air quality
- By emulating SCR (NOx sensors) the emission are far worse than the current fleet in Iran
- SRC can be manipulated via software, DPF via hardware manipulation
- DPF in-use control is easy
- SCR in-use control much more difficult
- Actions have to be taken to secure the effectiveness of new emission regulation by in-use inspections





## ○ What does VERT® stand for?

- Non-profit organization to eliminate particles and harmful substances from internal combustion engines
- Certification of diesel particle filters with Best Available Technology (VERT® filterlist)
- International membership out of manufacturers of DPF and SCR systems, testing devices, substrate producers, chassis builders, engine manufacturers and others
- Acting as partner of Megacities to support and execute pollution reduction programs from road traffic and nonroad

### **VERT® is a Trade Mark**

for Particle Filters based on Best Available Technology

