# Консультации и техническое обучение от alflash

## *Вебинар как новое приложение Интернета*

Участие в Вебинарах позволяет в удобной форме знакомиться с разнообразной и полезной информацией без отрыва от работы и семьи, а также и без особых финансовых затрат.

В онлайн можно проконсультироваться по конкретной тематике при диагностике и/или ремонте реального автомобиля, получить ответы на интересующие вопросы, участвовать в обсуждениях и проводить обучение.

В режиме реального времени доступны не только полноценный просмотр и прослушивание соответствующих информационных материалов, но и есть возможность задавать вопросы, комментировать содержание, общаться с коллегами и другими зрителями.

Проведение дискуссий и слётов по обмену опытом, «очных» конференций, организация Мастер-классов по обучению и передаче опыта – еще одна немаловажная возможность этого инструмента.

Технические требования.

- Наличие в компьютере последней версии Flash Player http://get.adobe.com/ru/flashplayer/
- Актуальные интернет браузеры MozzilaFirefox http://www.mozilla.com/ru/firefox/

ИЕ http://www.microsoft.com/rus/windows/internet-explorer/

- Наличие последней версии Java: http://java.com/ru/
- Минимальная скорость подключения к залу 56 Кб. Рекомендуемая скорость от 1 мегабита

# OBD-II и EOBD

## Вчера, сегодня, завтра

## Серия Вебинаров

## Практическая диагностика системы управления двигателем

Лекции
AUTOMOTIVE
Библиотека
INTERNATIONAL
TOYOTA
Учебные модули
ТЕХНО-ВИДЕО
ТЕХОБСЛУЖИВАНИЕ
www.bosch.ua
BOSCH

Новые "улики",

заключительный "аккорд"

и … продолжение

# Тема дня

# *Mazda CX-7*

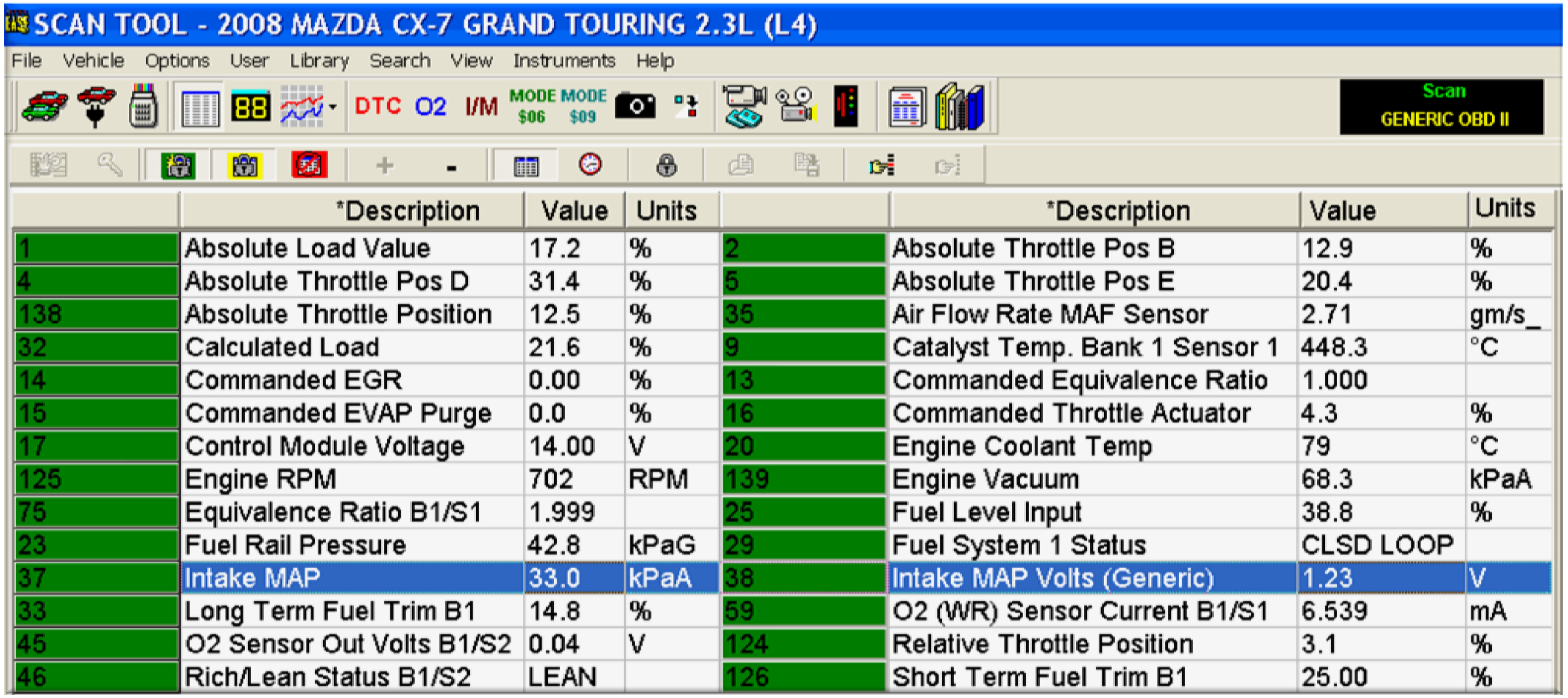
# и

# код неисправности системы VVT (DTC P0012)

8 - 15 - … марта 2012

# Mazda CX-7 “DTC P0012* CMP Timing Over-Retarded”

Generic OBD-II Scandata



SCAN TOOL - 2008 MAZDA CX-7 GRAND TOURING 2.3L (L4)

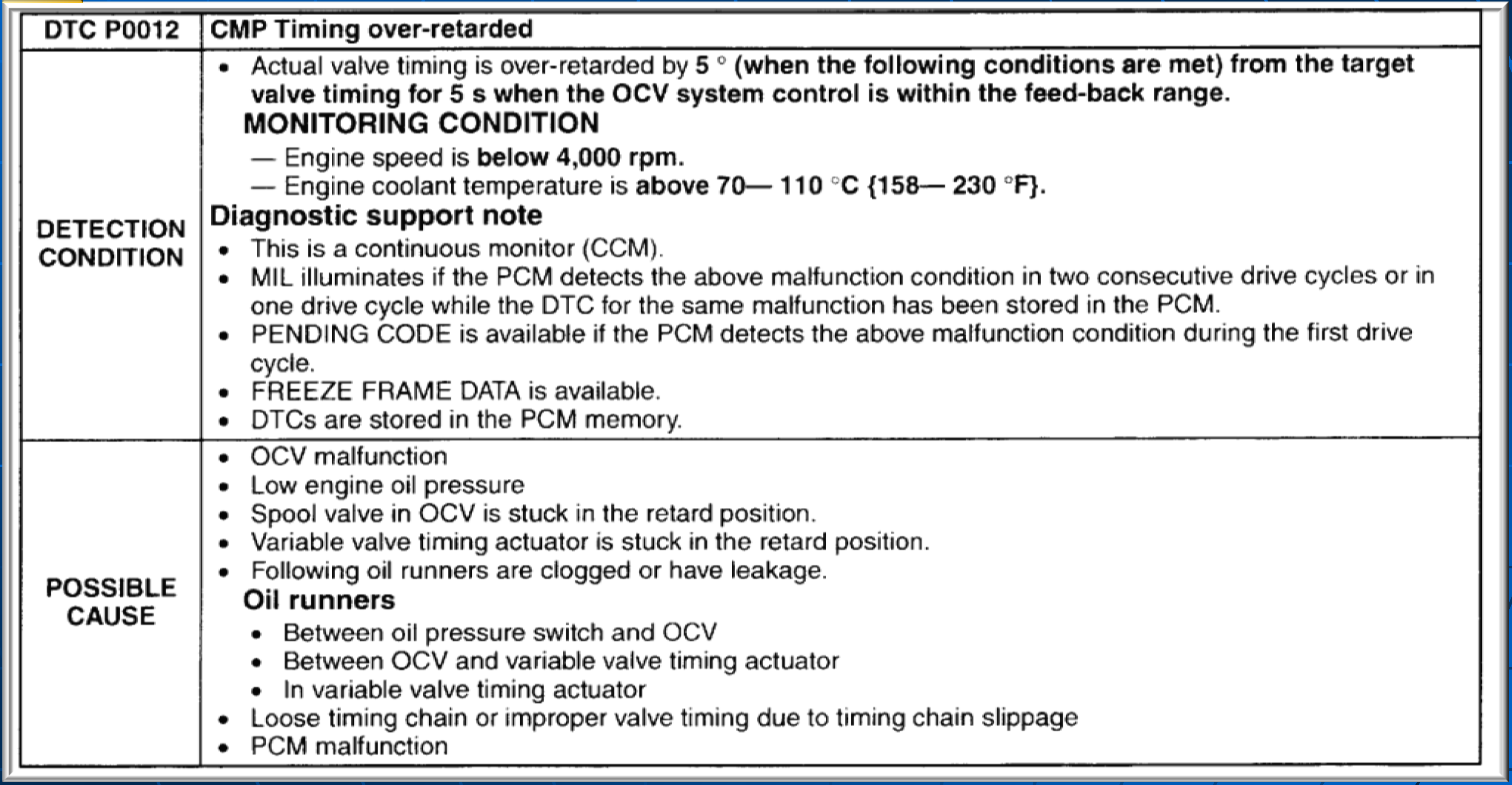
| | *Description | Value | Units | | *Description | Value | Units |
|---|---|---|---|---|---|---|---|
| 1 | Absolute Load Value | 17.2 | % | 2 | Absolute Throttle Pos B | 12.9 | % |
| 4 | Absolute Throttle Pos D | 31.4 | % | 5 | Absolute Throttle Pos E | 20.4 | % |
| 138 | Absolute Throttle Position | 12.5 | % | 35 | Air Flow Rate MAF Sensor | 2.71 | gm/s_ |
| 32 | Calculated Load | 21.6 | % | 9 | Catalyst Temp. Bank 1 Sensor 1 | 448.3 | °C |
| 14 | Commanded EGR | 0.00 | % | 13 | Commanded Equivalence Ratio | 1.000 | |
| 15 | Commanded EVAP Purge | 0.0 | % | 16 | Commanded Throttle Actuator | 4.3 | % |
| 17 | Control Module Voltage | 14.00 | V | 20 | Engine Coolant Temp | 79 | °C |
| 125 | Engine RPM | 702 | RPM | 139 | Engine Vacuum | 68.3 | kPaA |
| 75 | Equivalence Ratio B1/S1 | 1.999 | | 25 | Fuel Level Input | 38.8 | % |
| 23 | Fuel Rail Pressure | 42.8 | kPaG | 29 | Fuel System 1 Status | CLSD LOOP | |
| 37 | Intake MAP | 33.0 | kPaA | 38 | Intake MAP Volts (Generic) | 1.23 | V |
| 33 | Long Term Fuel Trim B1 | 14.8 | % | 59 | O2 (WR) Sensor Current B1/S1 | 6.539 | mA |
| 45 | O2 Sensor Out Volts B1/S2 | 0.04 | V | 124 | Relative Throttle Position | 3.1 | % |
| 46 | Rich/Lean Status B1/S2 | LEAN | | 126 | Short Term Fuel Trim B1 | 25.00 | % |

* Actual Valve Timing is Over-Retarded by 5 from the Target Valve Timing for 5 s when the OCV System Control is within the Feed-back Range.

* Для справки

# Mazda CX-7 “DTC P0012 CMP Timing Over-Retarded”

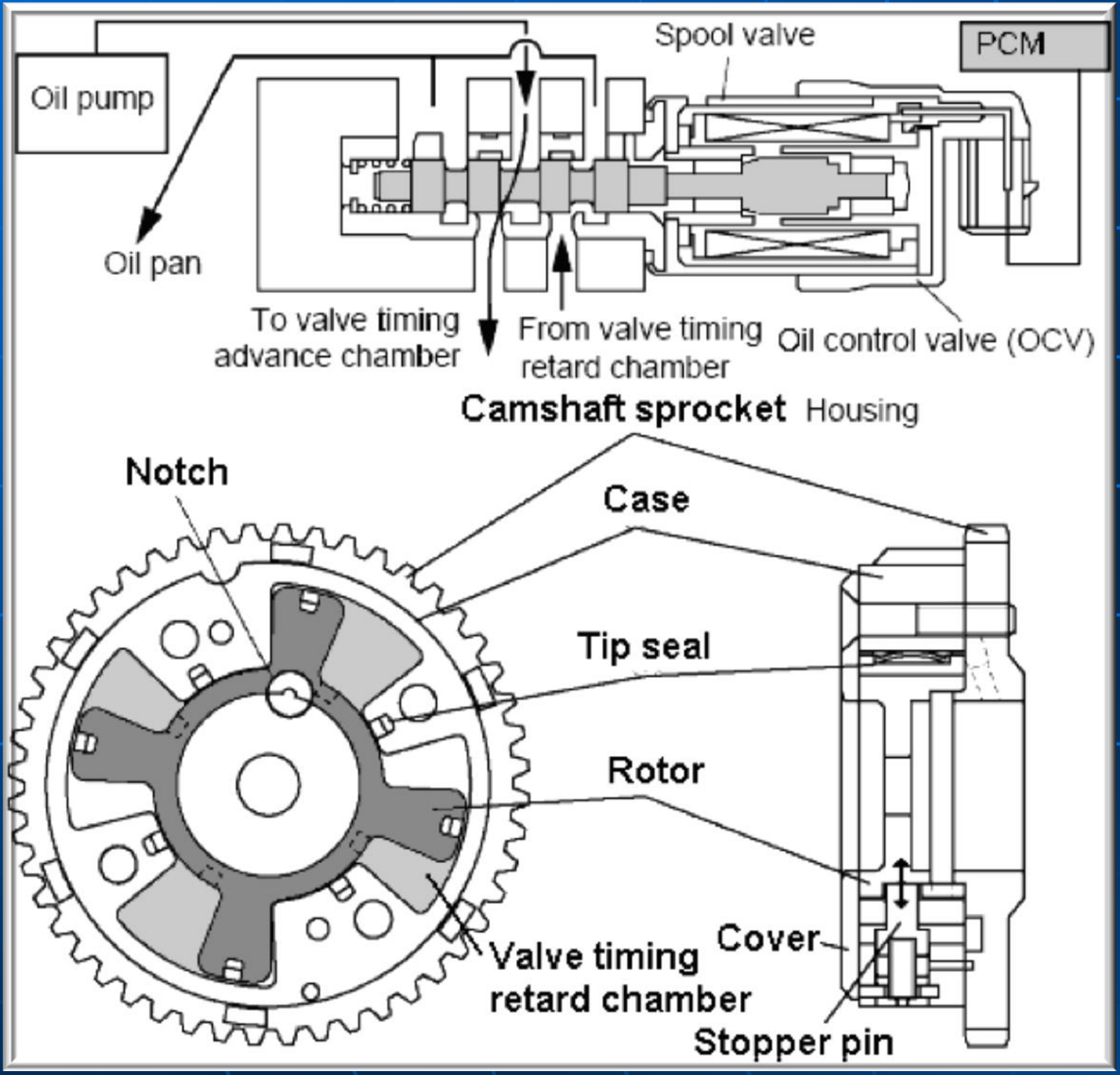
## Условия определения неисправности и возможные причины

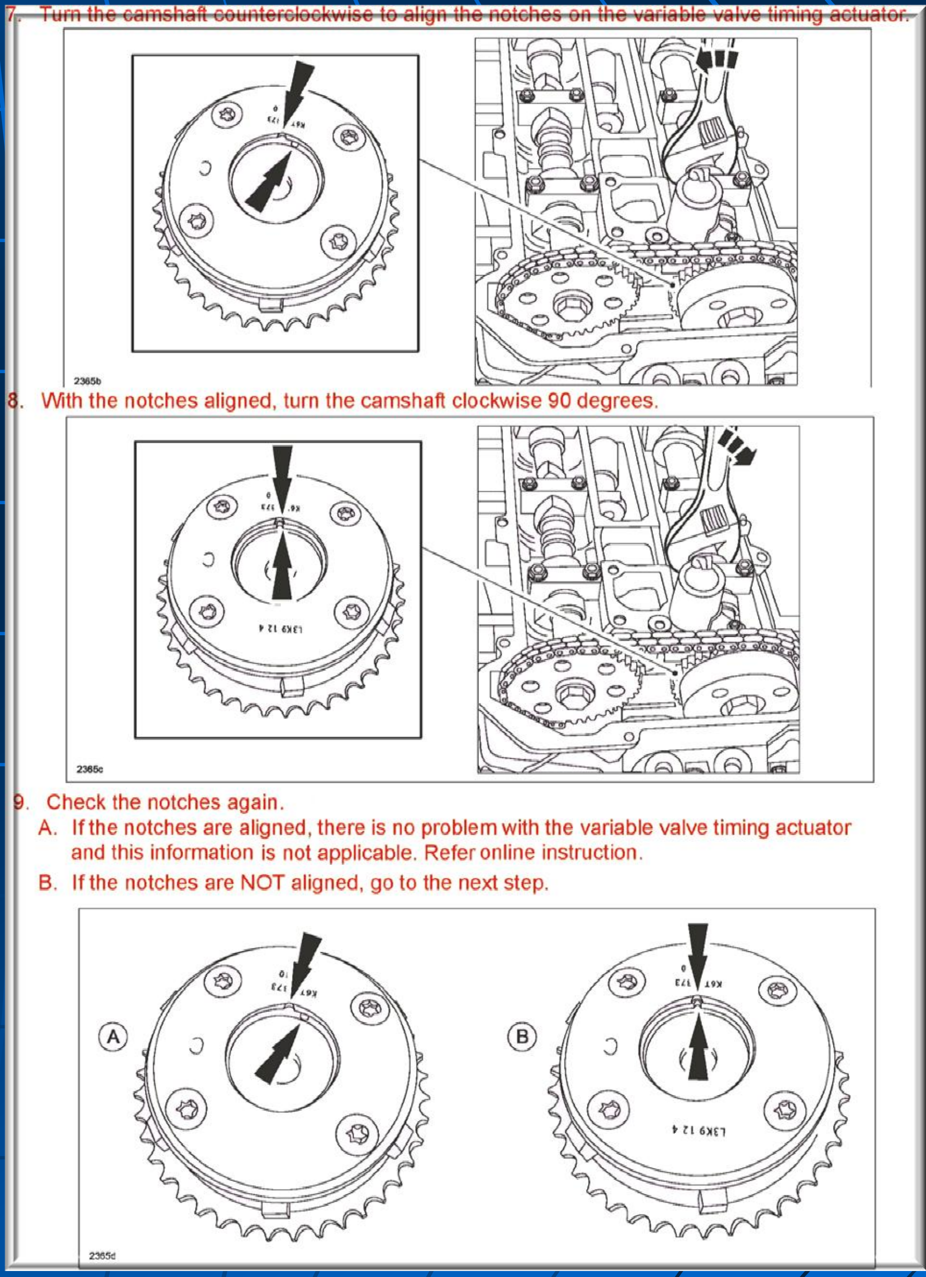


| **DTC P0012** | **CMP Timing over-retarded** |
|---|---|
| **DETECTION CONDITION** | • Actual valve timing is over-retarded by **5 ° (when the following conditions are met) from the target valve timing for 5 s when the OCV system control is within the feed-back range.**<br>**MONITORING CONDITION**<br>— Engine speed is **below 4,000 rpm.**<br>— Engine coolant temperature is **above 70— 110 °C {158— 230 °F}.**<br>**Diagnostic support note**<br>• This is a continuous monitor (CCM).<br>• MIL illuminates if the PCM detects the above malfunction condition in two consecutive drive cycles or in one drive cycle while the DTC for the same malfunction has been stored in the PCM.<br>• PENDING CODE is available if the PCM detects the above malfunction condition during the first drive cycle.<br>• FREEZE FRAME DATA is available.<br>• DTCs are stored in the PCM memory. |
| **POSSIBLE CAUSE** | • OCV malfunction<br>• Low engine oil pressure<br>• Spool valve in OCV is stuck in the retard position.<br>• Variable valve timing actuator is stuck in the retard position.<br>• Following oil runners are clogged or have leakage.<br>**Oil runners**<br>• Between oil pressure switch and OCV<br>• Between OCV and variable valve timing actuator<br>• In variable valve timing actuator<br>• Loose timing chain or improper valve timing due to timing chain slippage<br>• PCM malfunction |

* Для справки

# Устройство гидравлического привода системы переменного ГРМ


Spool valve
PCM
Oil pump
Oil pan
To valve timing advance chamber
From valve timing retard chamber
Oil control valve (OCV)
Camshaft sprocket
Housing
Notch
Case
Tip seal
Rotor
Cover
Valve timing retard chamber
Stopper pin


7. Turn the camshaft counterclockwise to align the notches on the variable valve timing actuator.

2365b

8. With the notches aligned, turn the camshaft clockwise 90 degrees.

2365c

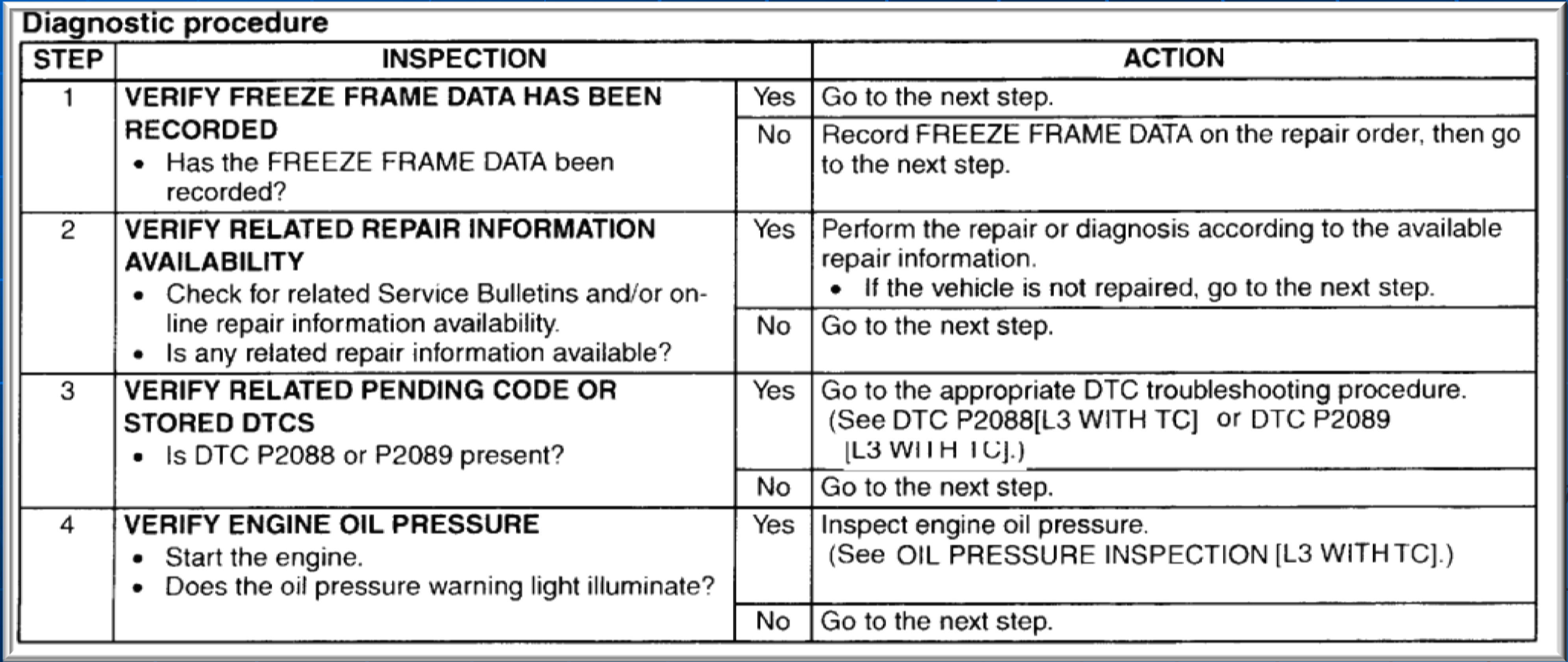
9. Check the notches again.
   - A. If the notches are aligned, there is no problem with the variable valve timing actuator and this information is not applicable. Refer online instruction.
   - B. If the notches are NOT aligned, go to the next step.

2365d

* Для справки

# Mazda CX-7 “DTC P0012 CMP Timing Over-Retarded”

## Последовательность проверок при диагностике

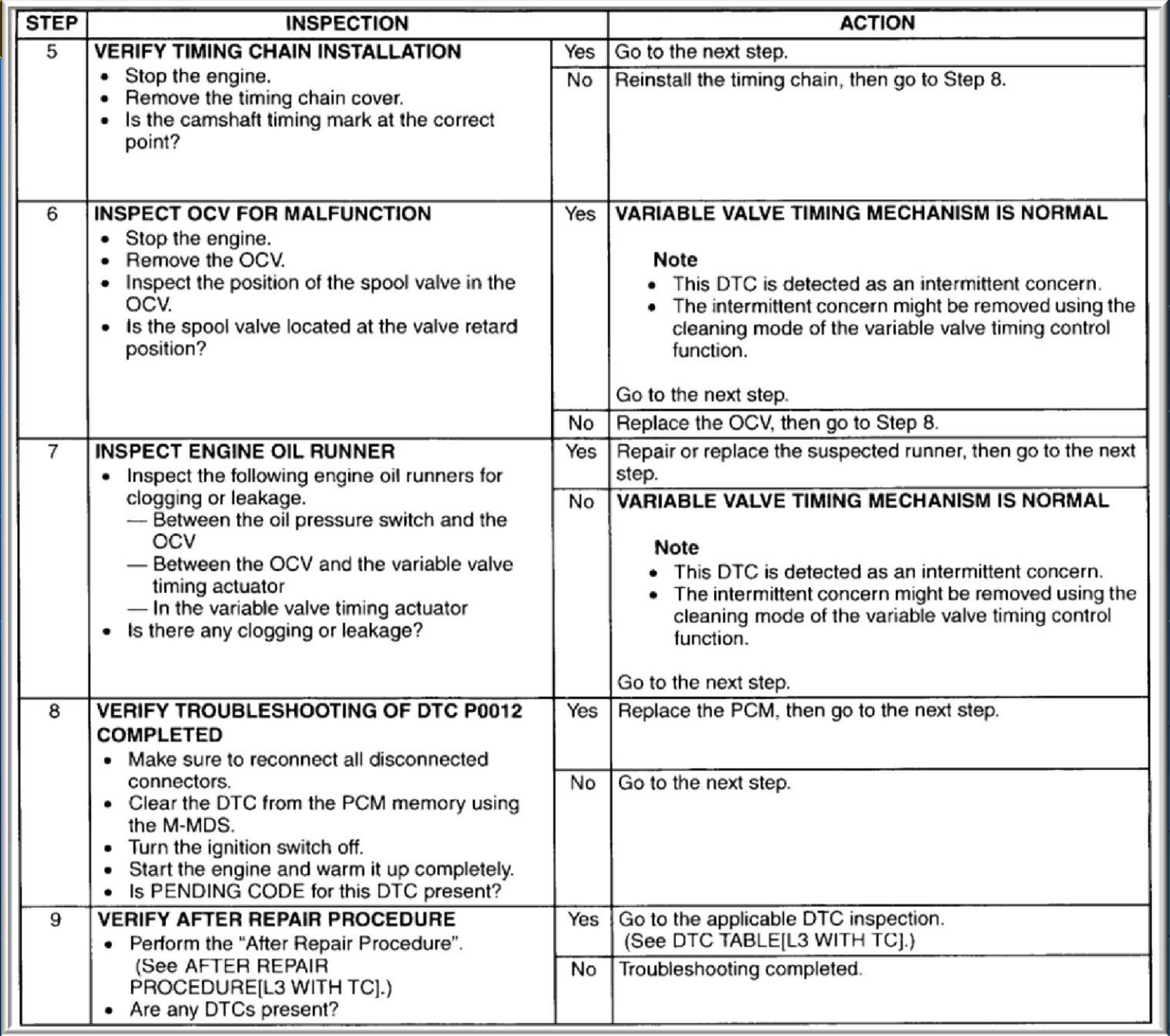


Diagnostic procedure

| STEP | INSPECTION | | ACTION |
|---|---|---|---|
| 1 | **VERIFY FREEZE FRAME DATA HAS BEEN RECORDED**<br>• Has the FREEZE FRAME DATA been recorded? | Yes | Go to the next step. |
| | | No | Record FREEZE FRAME DATA on the repair order, then go to the next step. |
| 2 | **VERIFY RELATED REPAIR INFORMATION AVAILABILITY**<br>• Check for related Service Bulletins and/or on-line repair information availability.<br>• Is any related repair information available? | Yes | Perform the repair or diagnosis according to the available repair information.<br>• If the vehicle is not repaired, go to the next step. |
| | | No | Go to the next step. |
| 3 | **VERIFY RELATED PENDING CODE OR STORED DTCS**<br>• Is DTC P2088 or P2089 present? | Yes | Go to the appropriate DTC troubleshooting procedure. (See DTC P2088[L3 WITH TC] or DTC P2089 [L3 WITH TC].) |
| | | No | Go to the next step. |
| 4 | **VERIFY ENGINE OIL PRESSURE**<br>• Start the engine.<br>• Does the oil pressure warning light illuminate? | Yes | Inspect engine oil pressure. (See OIL PRESSURE INSPECTION [L3 WITH TC].) |
| | | No | Go to the next step. |

* Для справки

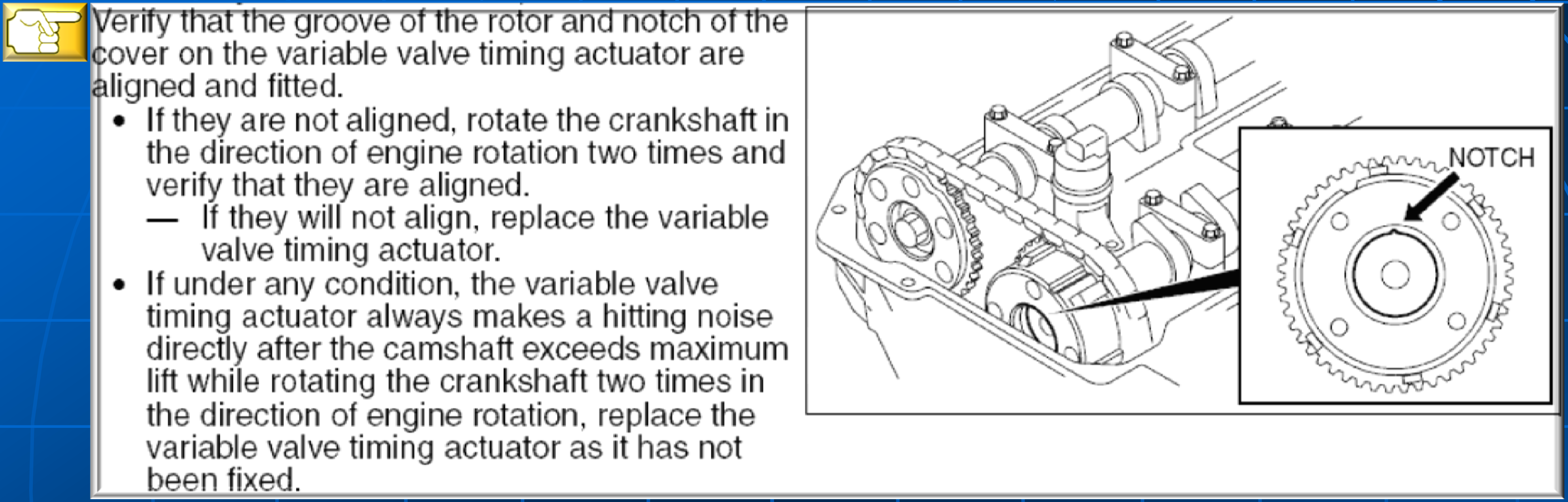
# Последовательность проверок при диагностике (продолжение)



| STEP | INSPECTION | | ACTION |
|---|---|---|---|
| 5 | **VERIFY TIMING CHAIN INSTALLATION**<br>• Stop the engine.<br>• Remove the timing chain cover.<br>• Is the camshaft timing mark at the correct point? | Yes | Go to the next step. |
| | | No | Reinstall the timing chain, then go to Step 8. |
| 6 | **INSPECT OCV FOR MALFUNCTION**<br>• Stop the engine.<br>• Remove the OCV.<br>• Inspect the position of the spool valve in the OCV.<br>• Is the spool valve located at the valve retard position? | Yes | **VARIABLE VALVE TIMING MECHANISM IS NORMAL**<br>**Note**<br>• This DTC is detected as an intermittent concern.<br>• The intermittent concern might be removed using the cleaning mode of the variable valve timing control function.<br>Go to the next step. |
| | | No | Replace the OCV, then go to Step 8. |
| 7 | **INSPECT ENGINE OIL RUNNER**<br>• Inspect the following engine oil runners for clogging or leakage.<br>— Between the oil pressure switch and the OCV<br>— Between the OCV and the variable valve timing actuator<br>— In the variable valve timing actuator<br>• Is there any clogging or leakage? | Yes | Repair or replace the suspected runner, then go to the next step. |
| | | No | **VARIABLE VALVE TIMING MECHANISM IS NORMAL**<br>**Note**<br>• This DTC is detected as an intermittent concern.<br>• The intermittent concern might be removed using the cleaning mode of the variable valve timing control function.<br>Go to the next step. |
| 8 | **VERIFY TROUBLESHOOTING OF DTC P0012 COMPLETED**<br>• Make sure to reconnect all disconnected connectors.<br>• Clear the DTC from the PCM memory using the M-MDS.<br>• Turn the ignition switch off.<br>• Start the engine and warm it up completely.<br>• Is PENDING CODE for this DTC present? | Yes | Replace the PCM, then go to the next step. |
| | | No | Go to the next step. |
| 9 | **VERIFY AFTER REPAIR PROCEDURE**<br>• Perform the "After Repair Procedure".<br>(See AFTER REPAIR PROCEDURE[L3 WITH TC].)<br>• Are any DTCs present? | Yes | Go to the applicable DTC inspection.<br>(See DTC TABLE[L3 WITH TC].) |
| | | No | Troubleshooting completed. |

* Для

# Проверка TIMING ACTUATOR (фрагм.)



Verify that the groove of the rotor and notch of the cover on the variable valve timing actuator are aligned and fitted.

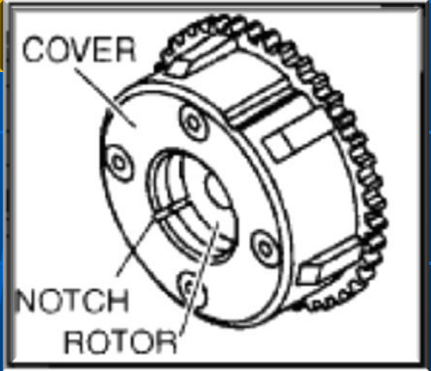
- If they are not aligned, rotate the crankshaft in the direction of engine rotation two times and verify that they are aligned.
  — If they will not align, replace the variable valve timing actuator.
- If under any condition, the variable valve timing actuator always makes a hitting noise directly after the camshaft exceeds maximum lift while rotating the crankshaft two times in the direction of engine rotation, replace the variable valve timing actuator as it has not been fixed.

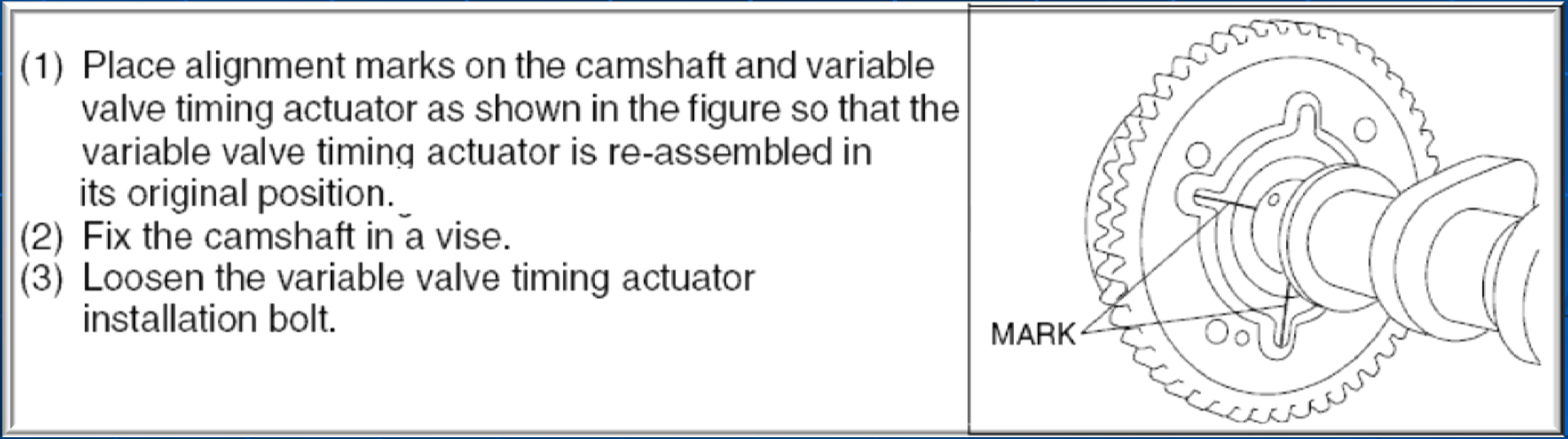
Confirm that notch of the rotor and bump of the cover at the variable valve timing actuator are aligned and fitted.
If the notch and the bump are not aligned, turn the crankshaft clockwise two rotations. Verify that the bump and the notch are aligned. " If the bump and notch are still not aligned, replace the variable valve timing actuator. "
If, when turning the crankshaft, there is a hitting noise from the variable valve timing actuator each time the cam passes the fully lifted position, it means that the actuator is not secured. Replace the actuator.

Убедитесь, что вырез на роторе и впадина на крышке актюатора выровнены и совпадают.
Если нет, то сделайте два оборота коленвала по часовой стрелке и проверьте снова.
Если снова не совпадают, то замените гидравлический привод (актюатор).
Если при вращении слышен скречет и другие шумы - замените.

* Для справки

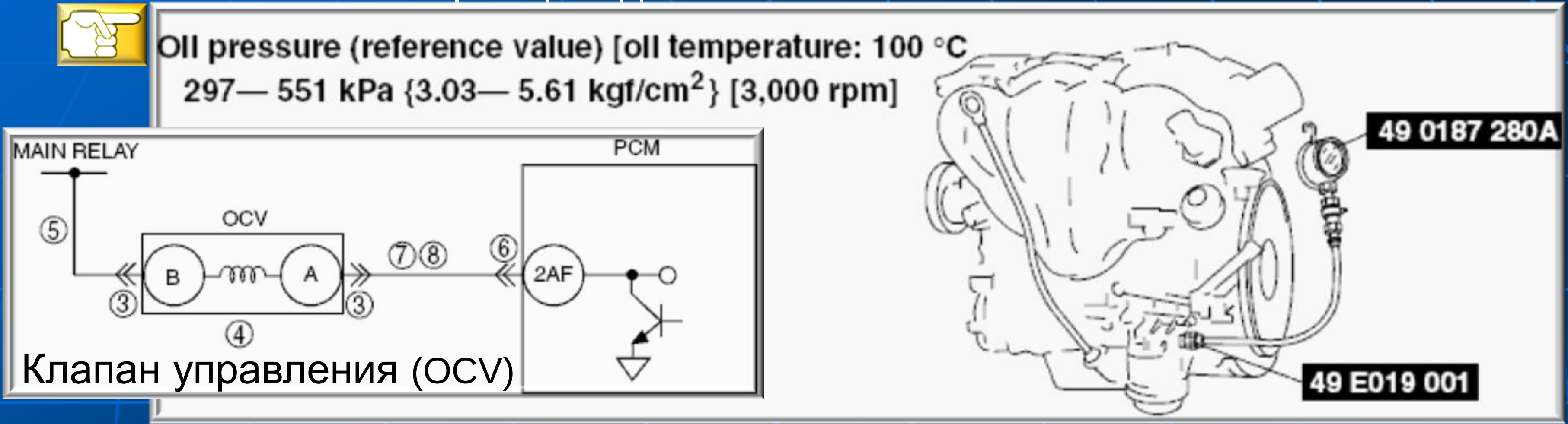
# Установка TIMING ACTUATOR





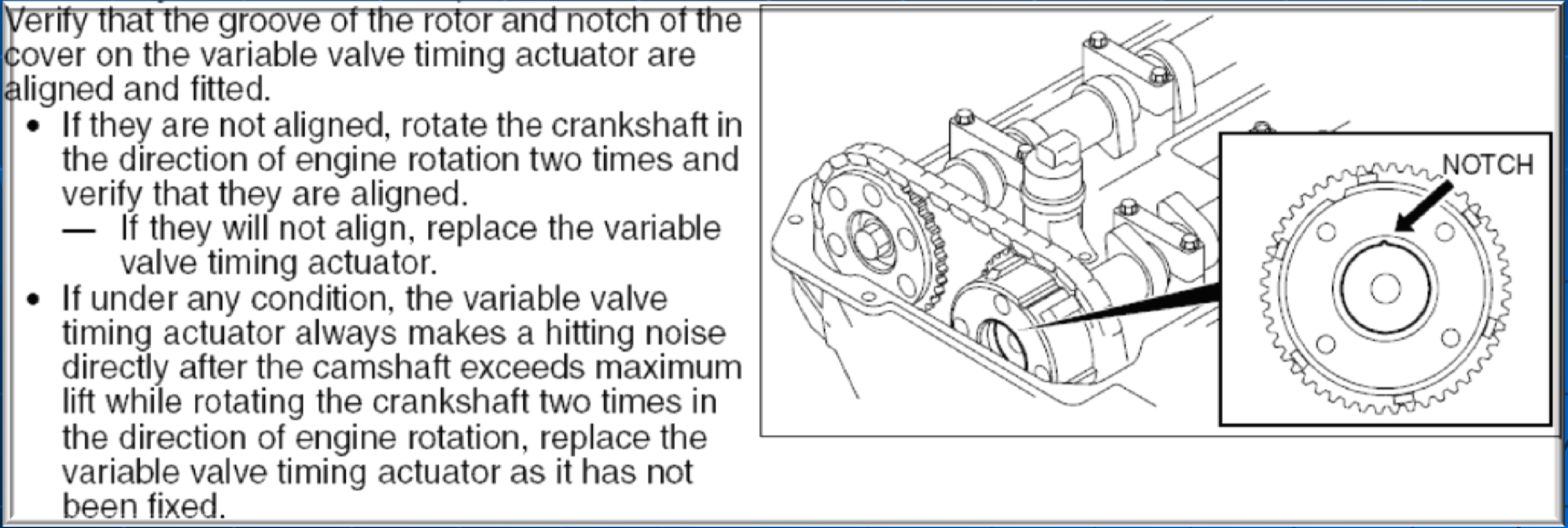
(1) Place alignment marks on the camshaft and variable valve timing actuator as shown in the figure so that the variable valve timing actuator is re-assembled in its original position.
(2) Fix the camshaft in a vise.
(3) Loosen the variable valve timing actuator installation bolt.

# Проверка давления масляного насоса



**Oil pressure (reference value) [oil temperature: 100 °C**
**297— 551 kPa {3.03— 5.61 kgf/cm$^2$} [3,000 rpm]**

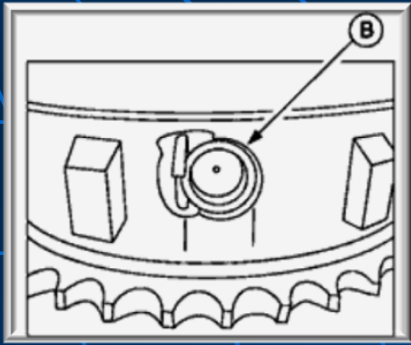
Клапан управления (OCV)



Verify that the groove of the rotor and notch of the cover on the variable valve timing actuator are aligned and fitted.

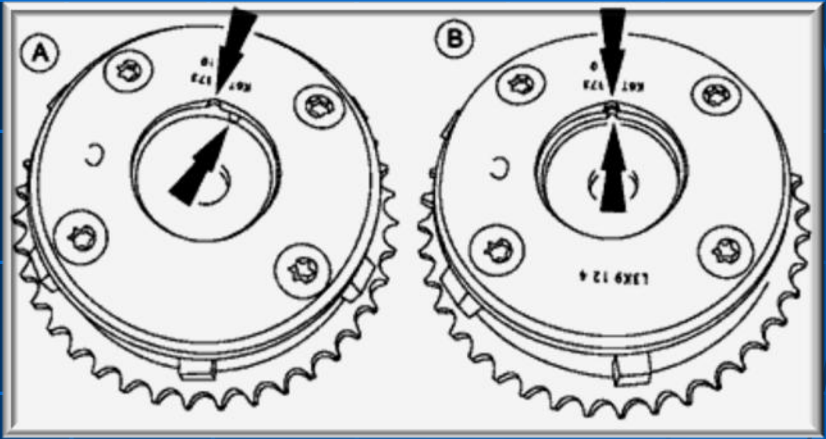
- If they are not aligned, rotate the crankshaft in the direction of engine rotation two times and verify that they are aligned.
  - If they will not align, replace the variable valve timing actuator.
- If under any condition, the variable valve timing actuator always makes a hitting noise directly after the camshaft exceeds maximum lift while rotating the crankshaft two times in the direction of engine rotation, replace the variable valve timing actuator as it has not been fixed.

* Для справки



**TSB**: 0101011 от 23 февраля 2011
APPLICABLE MODEL: … 2007 Mazda CX-7 vehicles…

Inspect the variable valve timing actuator for damage around the stopper pin cap or a missing stopper pin cap (B), spring and stopper…
…Turn the crankshaft clockwise so that the notches on the variable valve timing actuator can be checked.



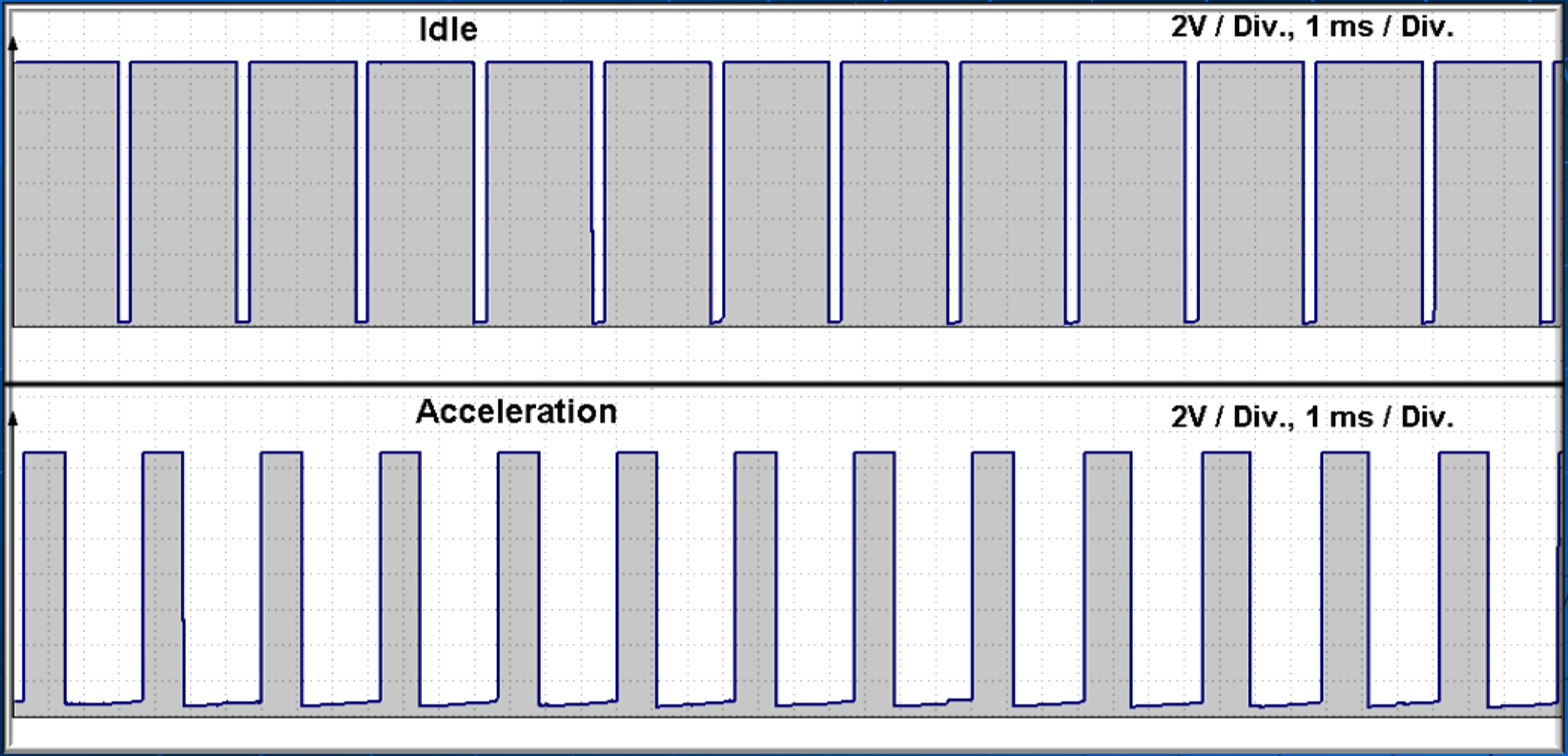
…If the notches are aligned, there is no problem with the variable valve timing actuator.
Turn the camshaft counterclockwise to align the notches on the variable valve timing actuator.
With the notches aligned, turn the camshaft clockwise 90 degrees.

Если “метки” совпадают, то проблемы нет.
Поверните распредвал против часовой стрелке, чтобы их выровнять.
После этого поверните распредвал по часовой стрелке.

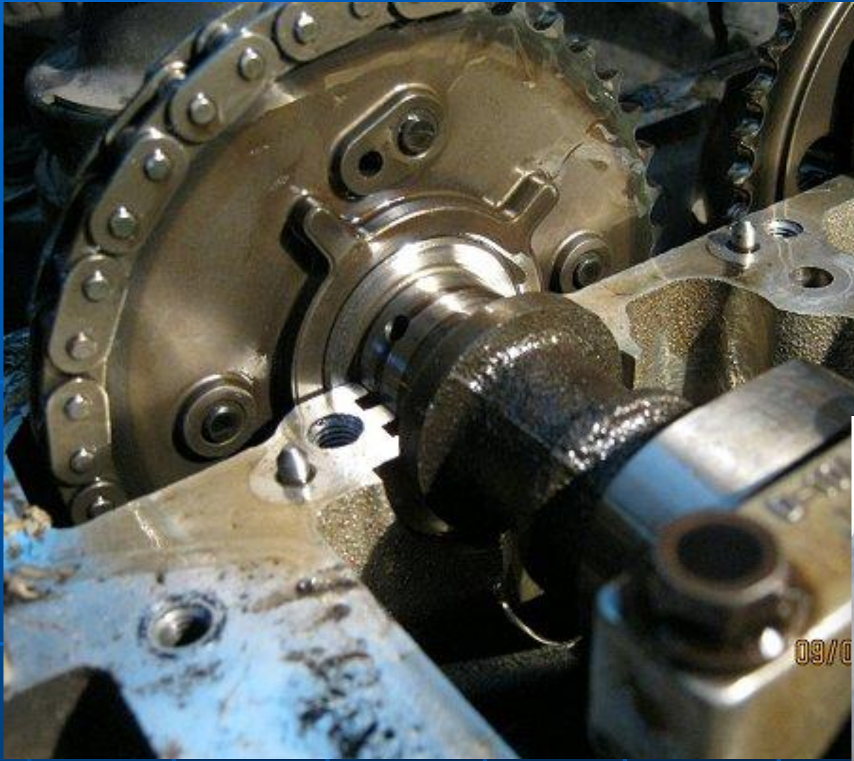
**TSB**: 0101011 от 28 ноября 2006 APPLICABLE MODEL: … 2007 Mazda CX-7 vehicles
A pending code of P0012 is stored in PCM memory with no MIL illumination.
Reprogram the PCM to the latest calibration: L33L/M/N/P-18-88 (Labor: 0.3 Hour)

* Для справки

# Waveform of OCV Operation



* Для справки



Результаты на 9 марта 2012:
трещина в месте концентратора напряжения.
Вопросы:
-диапазон подвижности ротора
-состояние “фиксатора” положения?

Mazda CX-7

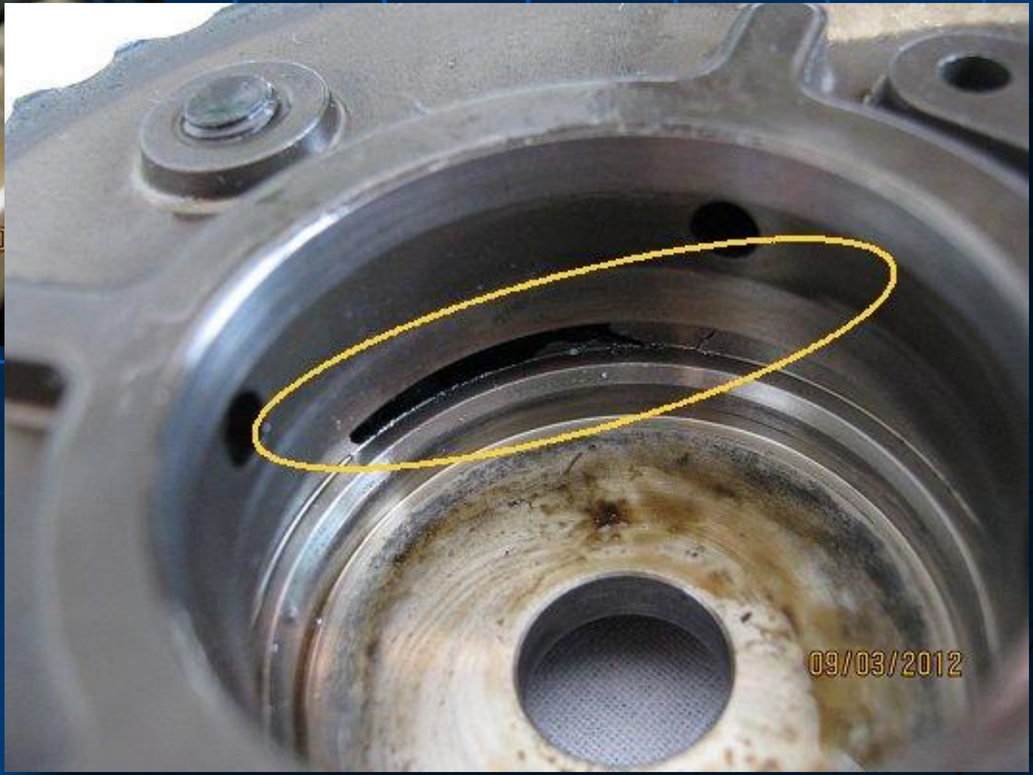
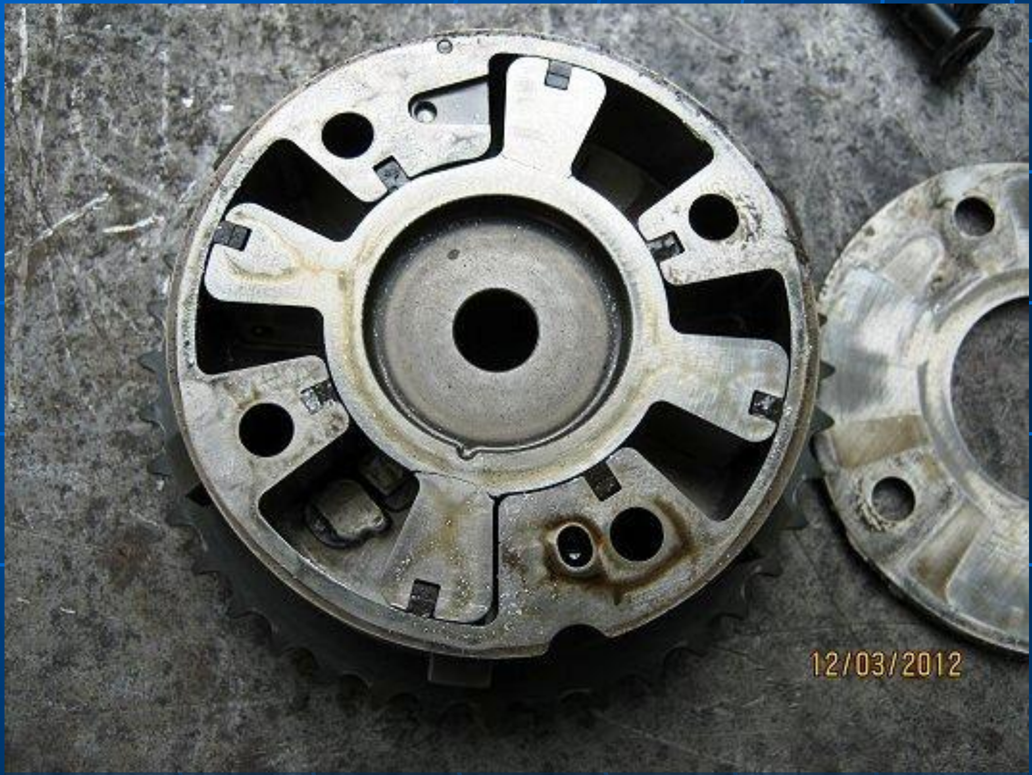


Photo by qyrec

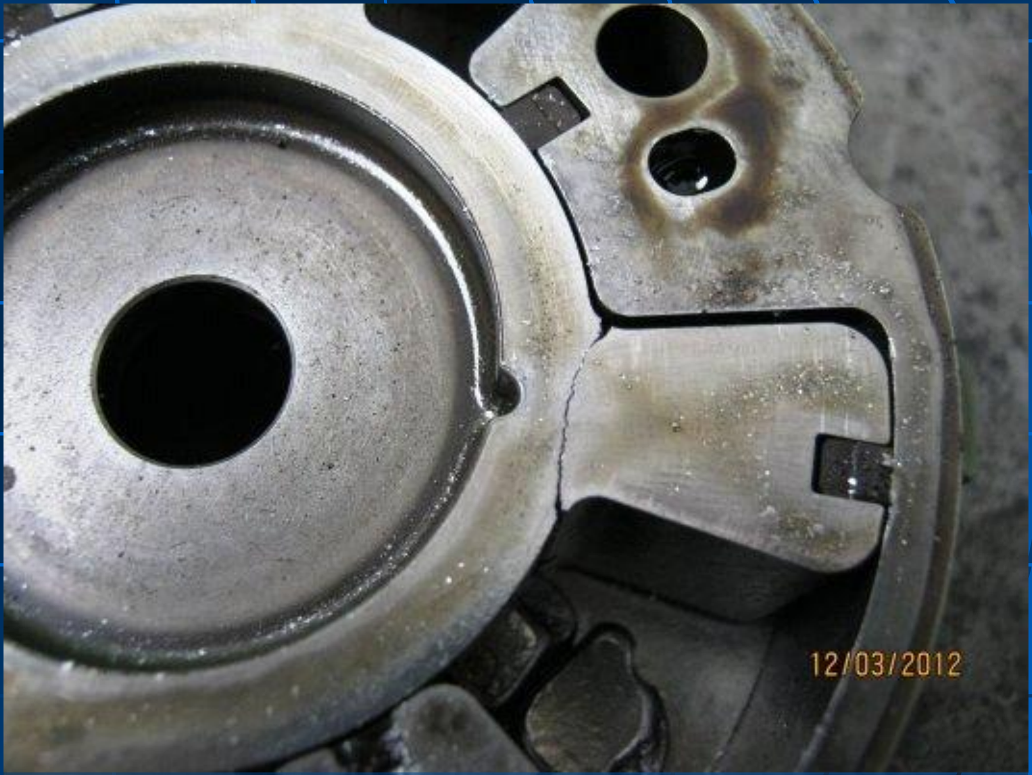
* Для справки

# CX-7 VVT Actuator Interior

## (“Ужасы нашего городка» или «Третий акт марлезонского балета”)



Variable Timing Actuator ▲

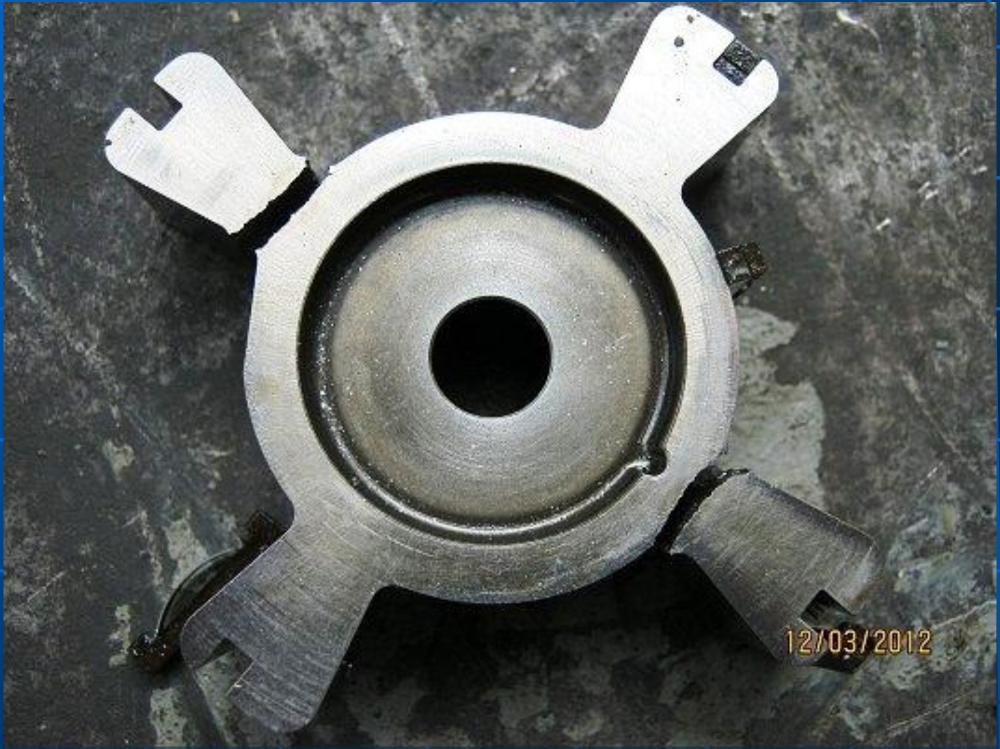


One of the fissure damages ▲

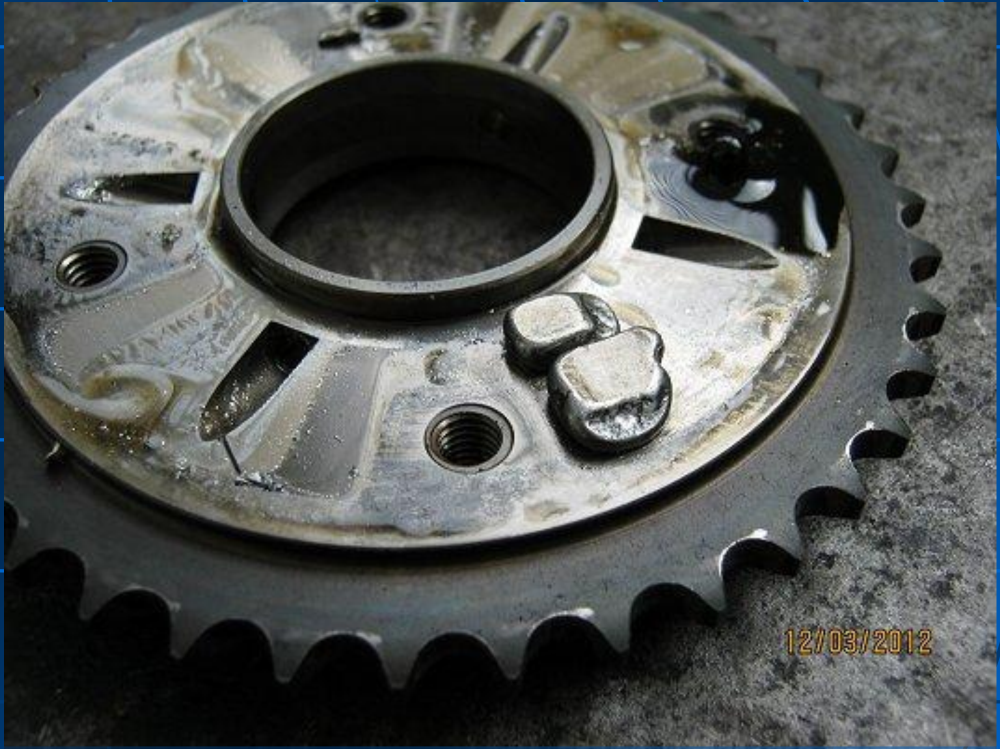
* Для справки

# CX-7 VVT Actuator Interior

## (“Ужасы нашего городка» или «Третий акт марлезонского балета”)



The Rotor is cracked ▲

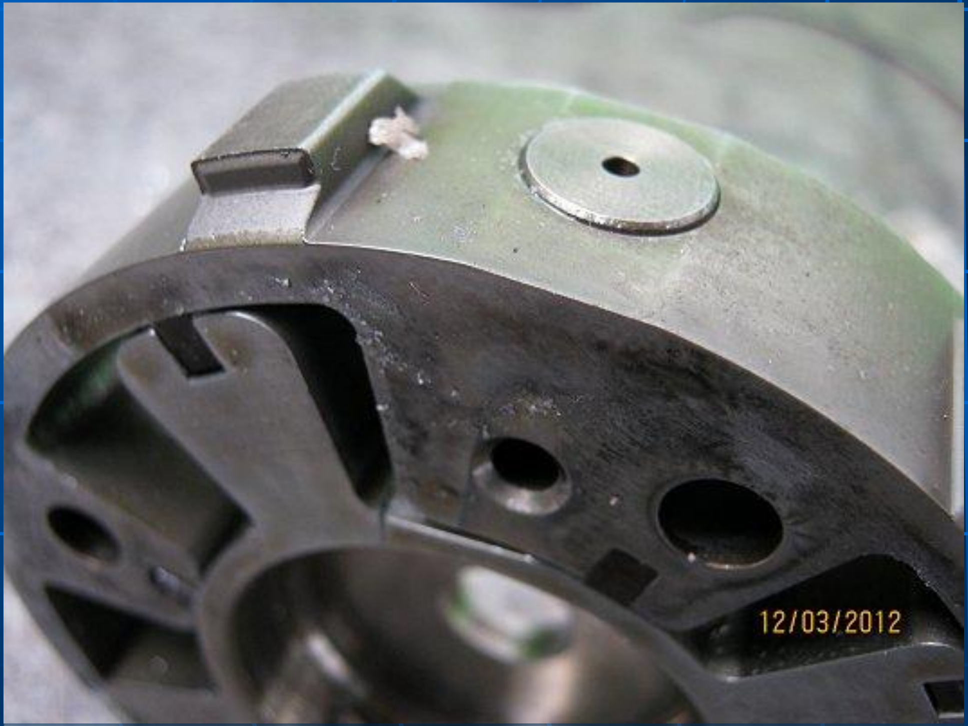


▲ Camshaft Housing & Sprocket

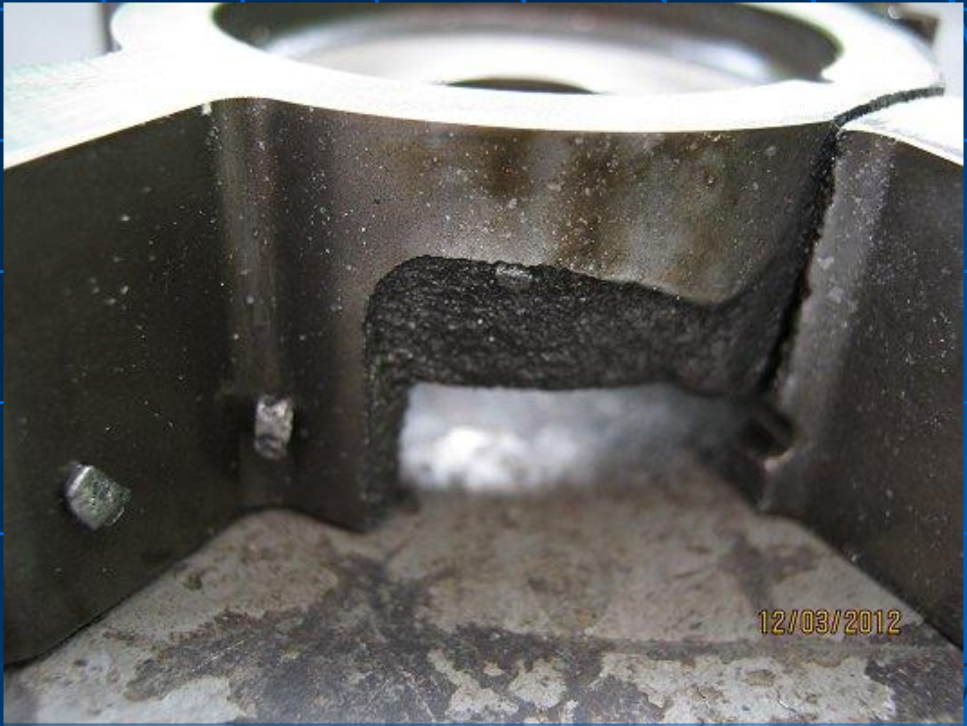
* Для справки

# CX-7 VVT Actuator Interior

## (“Ужасы нашего городка» или «Третий акт марлезонского балета”)



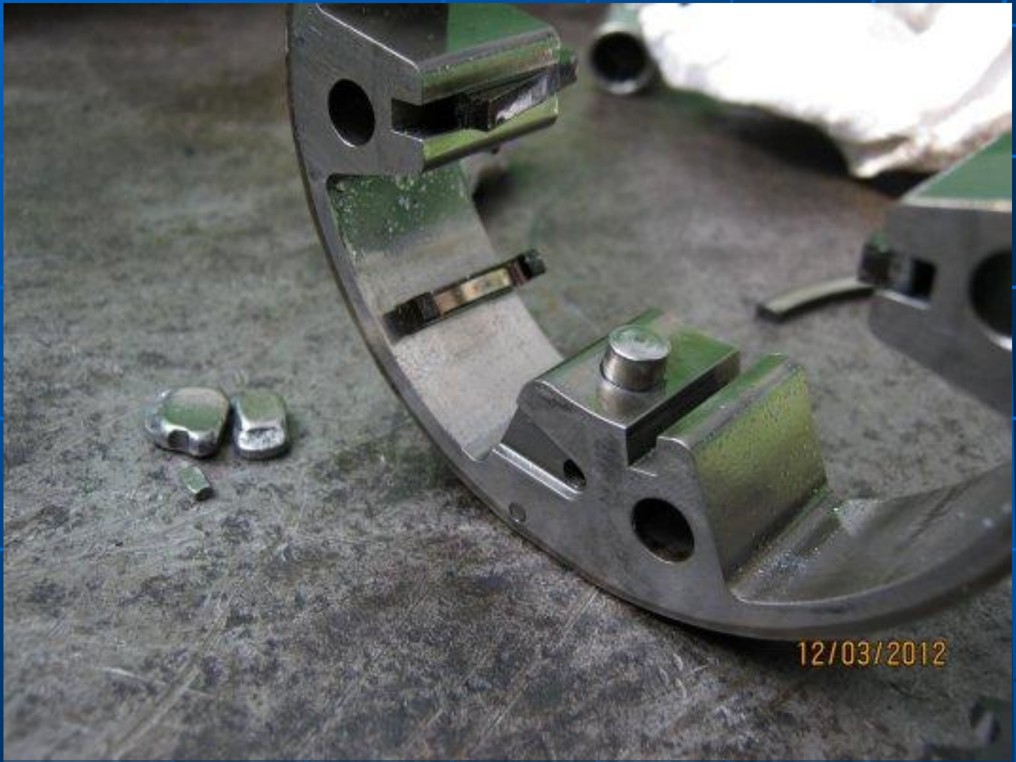
Stopper Pin Cap ▲



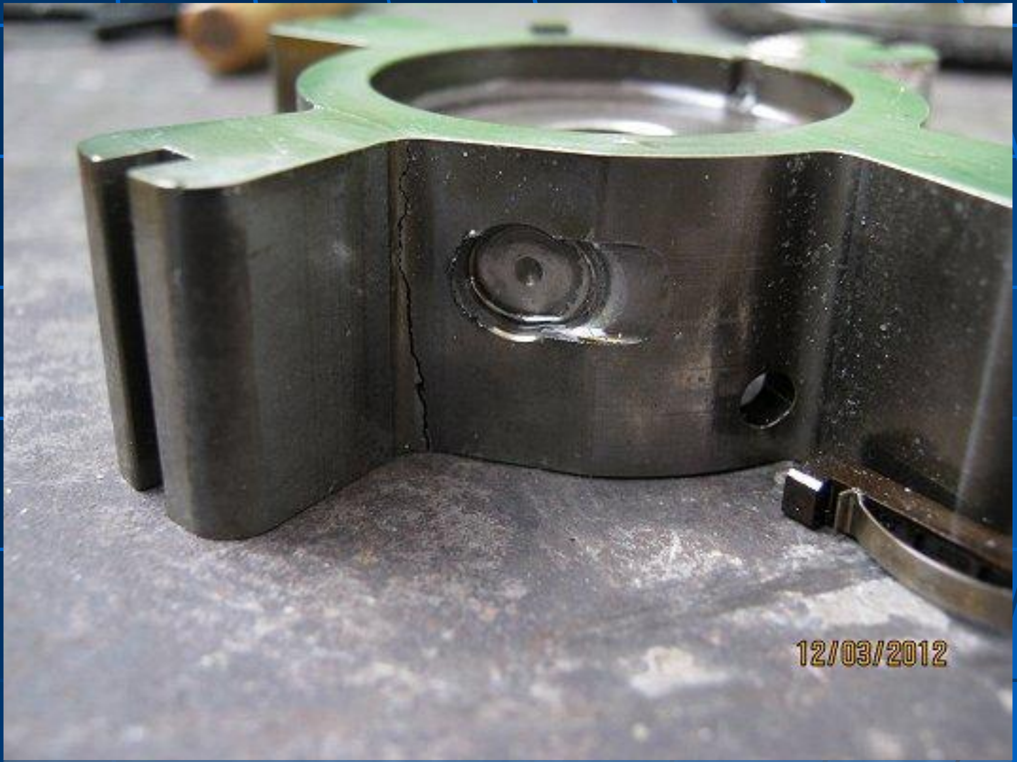
No comments▲

* Для справки

# CX-7 VVT Actuator Interior
# (“Ужасы нашего городка» или «Третий акт марлезонского балета”)



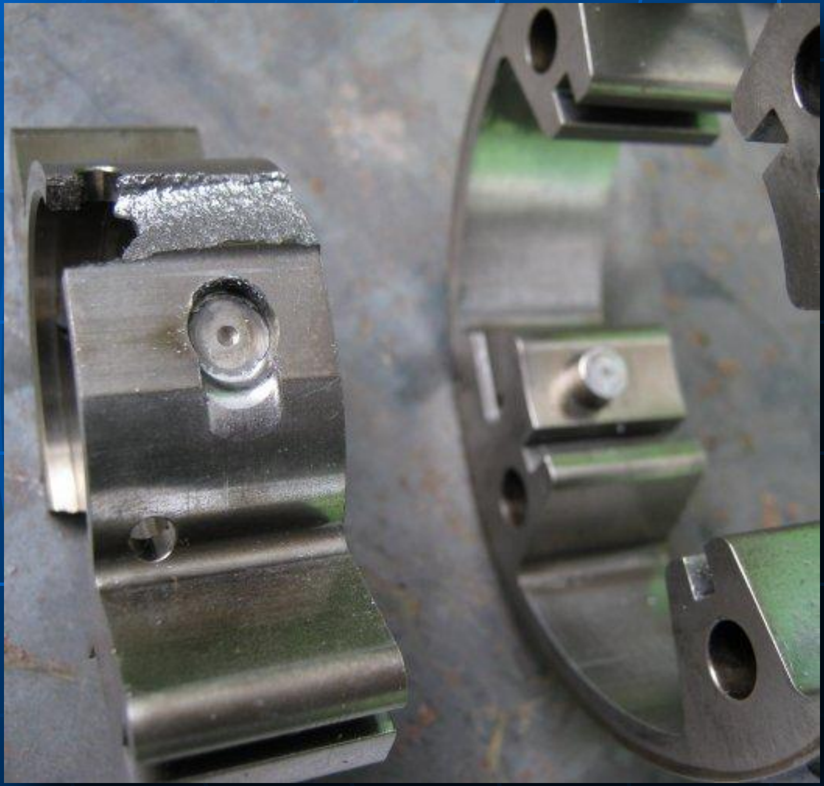
Stopper Pin ▲

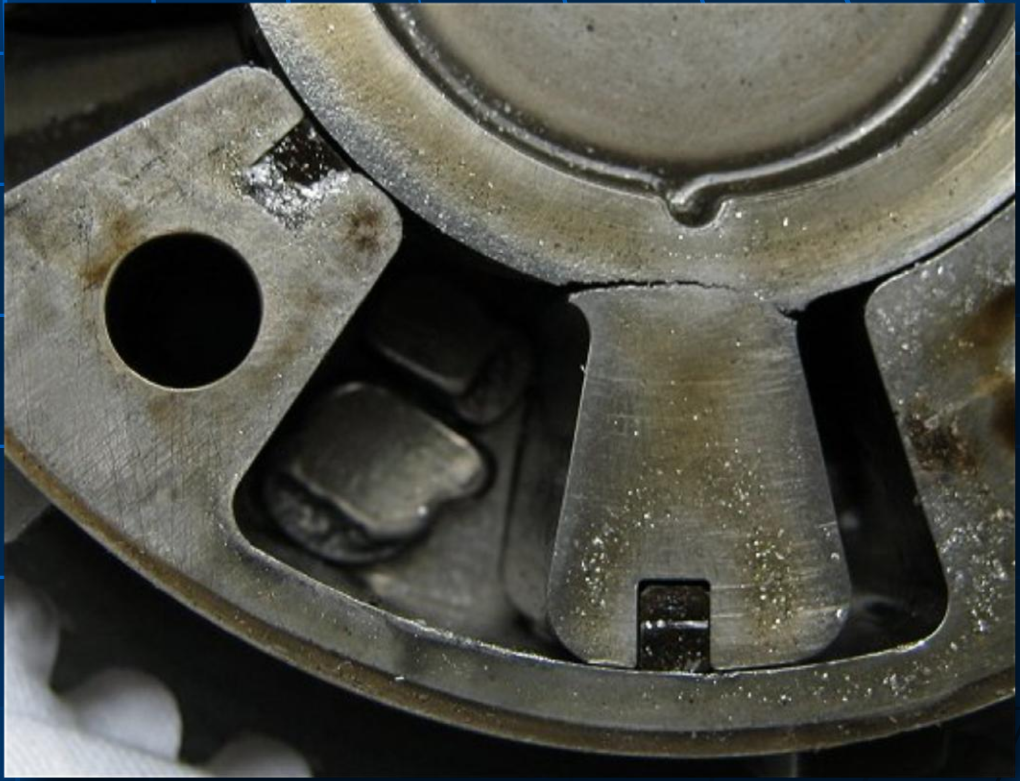


Stopper Pin Hole

* Для справки

# CX-7 VVT Actuator Interior
# (“Ужасы нашего городка» или «Третий акт марлезонского балета”)



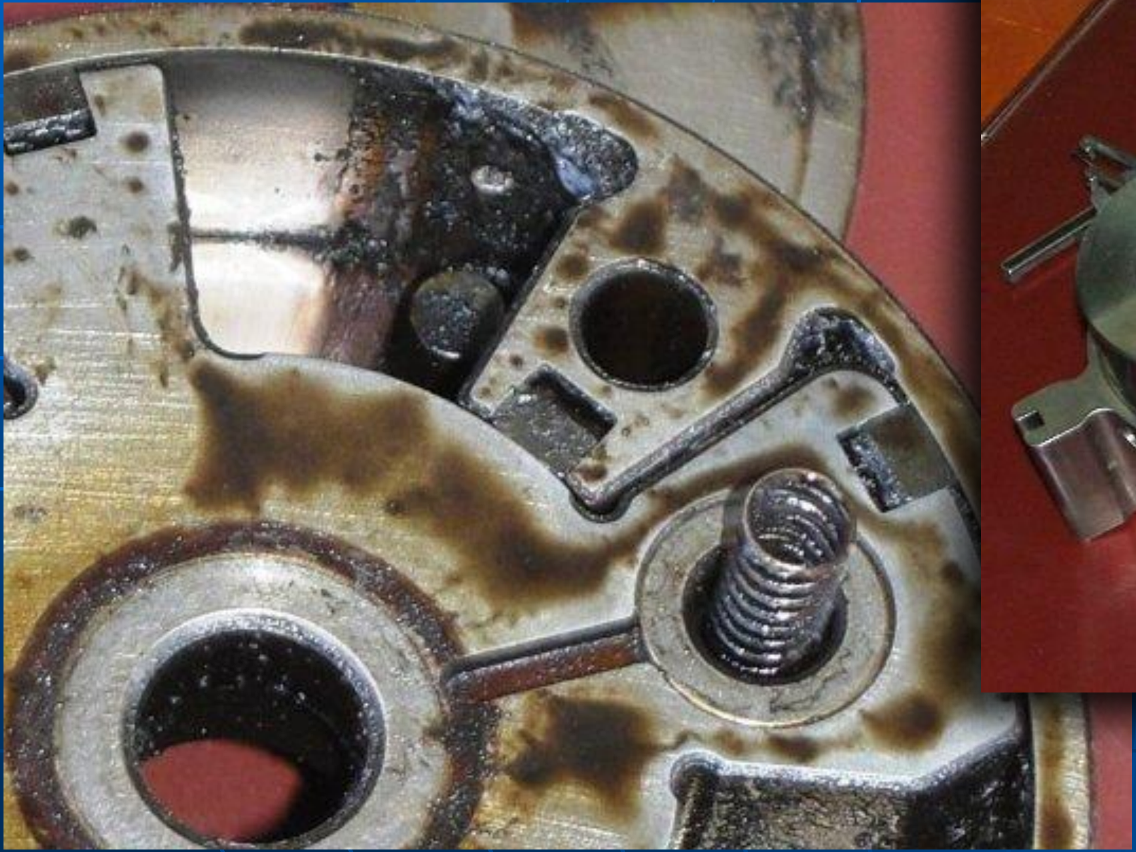


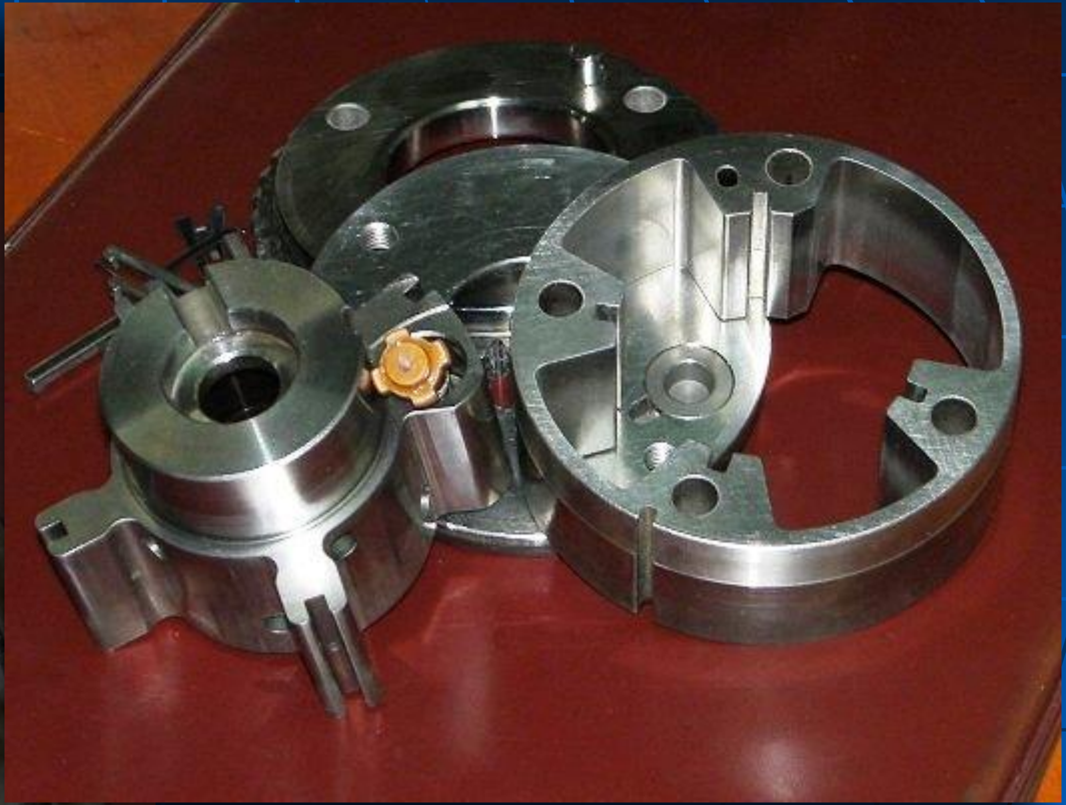
Darkness …

* Для справки

# For example VVT Actuators Interior (other)

▼ Toyota Avensis

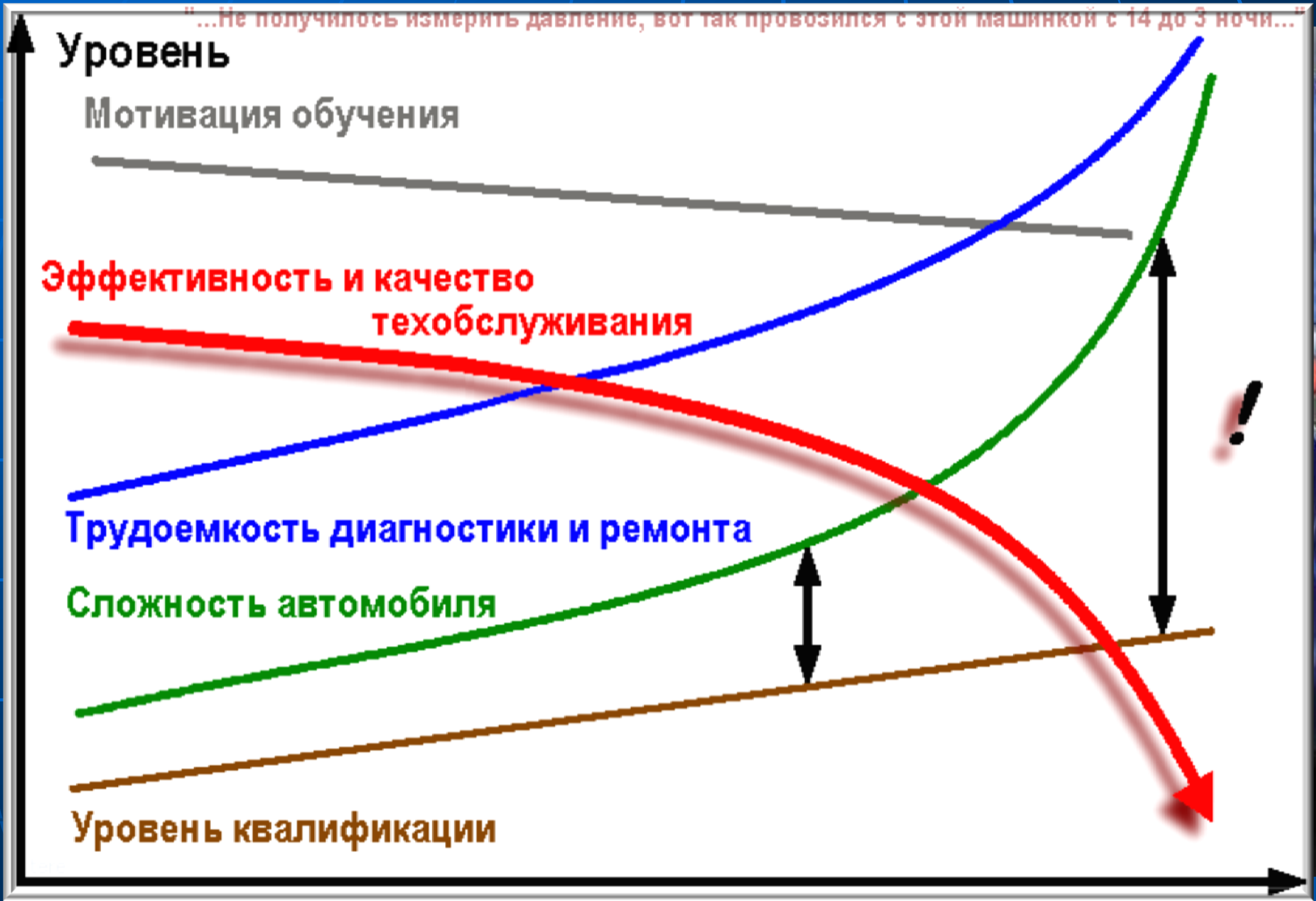




Nissan X-Trail ▲

* Для справки

# Причины* и следствия
(послесловие)



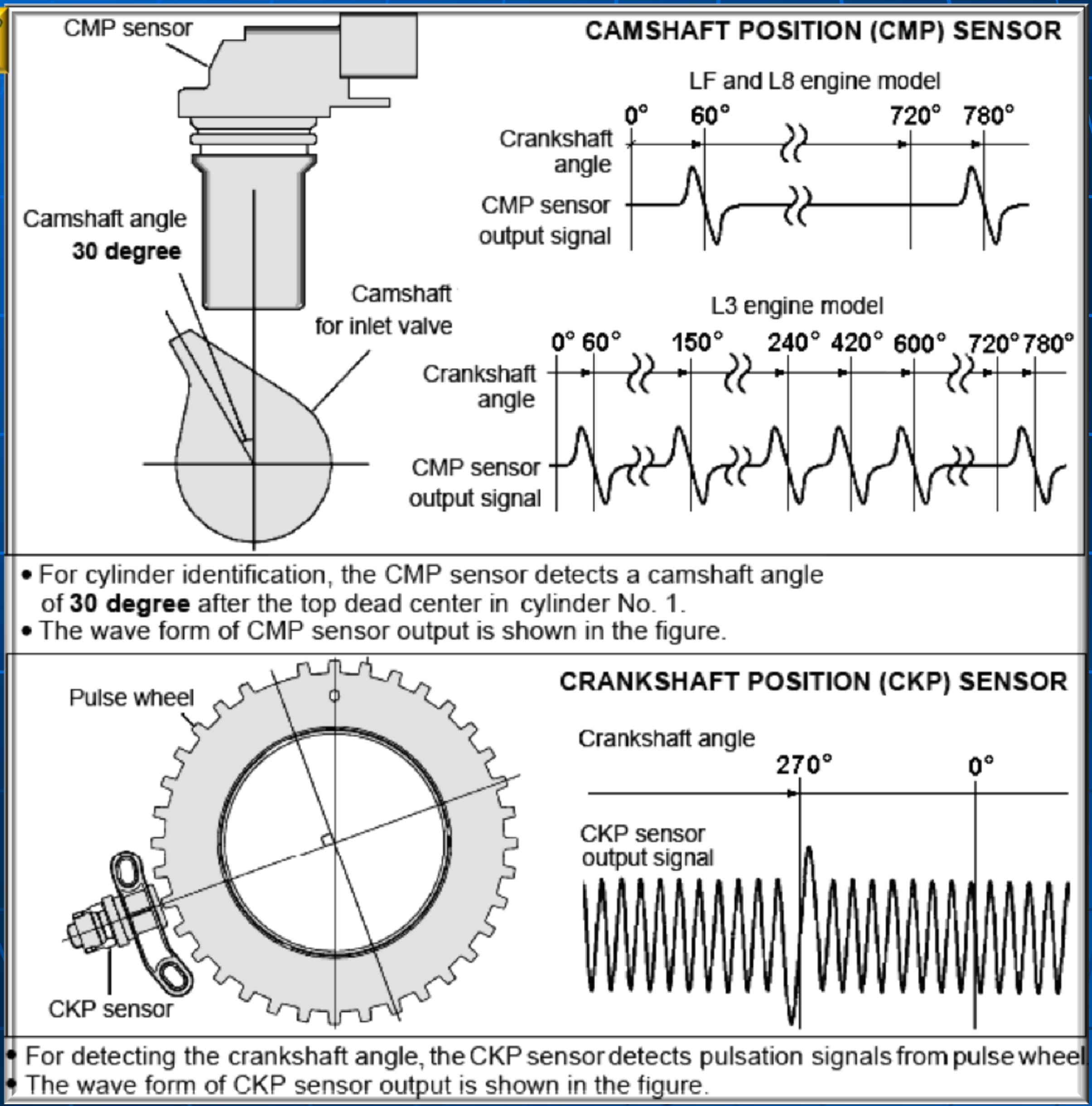
"...Не получилось измерить давление, вот так провозился с этой машинкой с 14 до 3 ночи..."

mazda
mazda CX-7

- Низкий уровень профессиональной подготовки
- Отсутствие качественных БД
- Неправильная организация работ
- Безответственность
- Отсутствие нужного инструмента и/или диагностического оборудования
- Недостаточная мотивация

140
160
alflash

# Note.


CAMSHAFT POSITION (CMP) SENSOR
CMP sensor
Camshaft angle
30 degree
Camshaft
for inlet valve
LF and L8 engine model
0°
60°
720°
780°
Crankshaft
angle
CMP sensor
output signal
L3 engine model
0° 60°
150°
240°
420°
600°
720°
780°
Crankshaft
angle
CMP sensor
output signal
CRANKSHAFT POSITION (CKP) SENSOR
Pulse wheel
CKP sensor
Crankshaft angle
270°
0°
CKP sensor
output signal

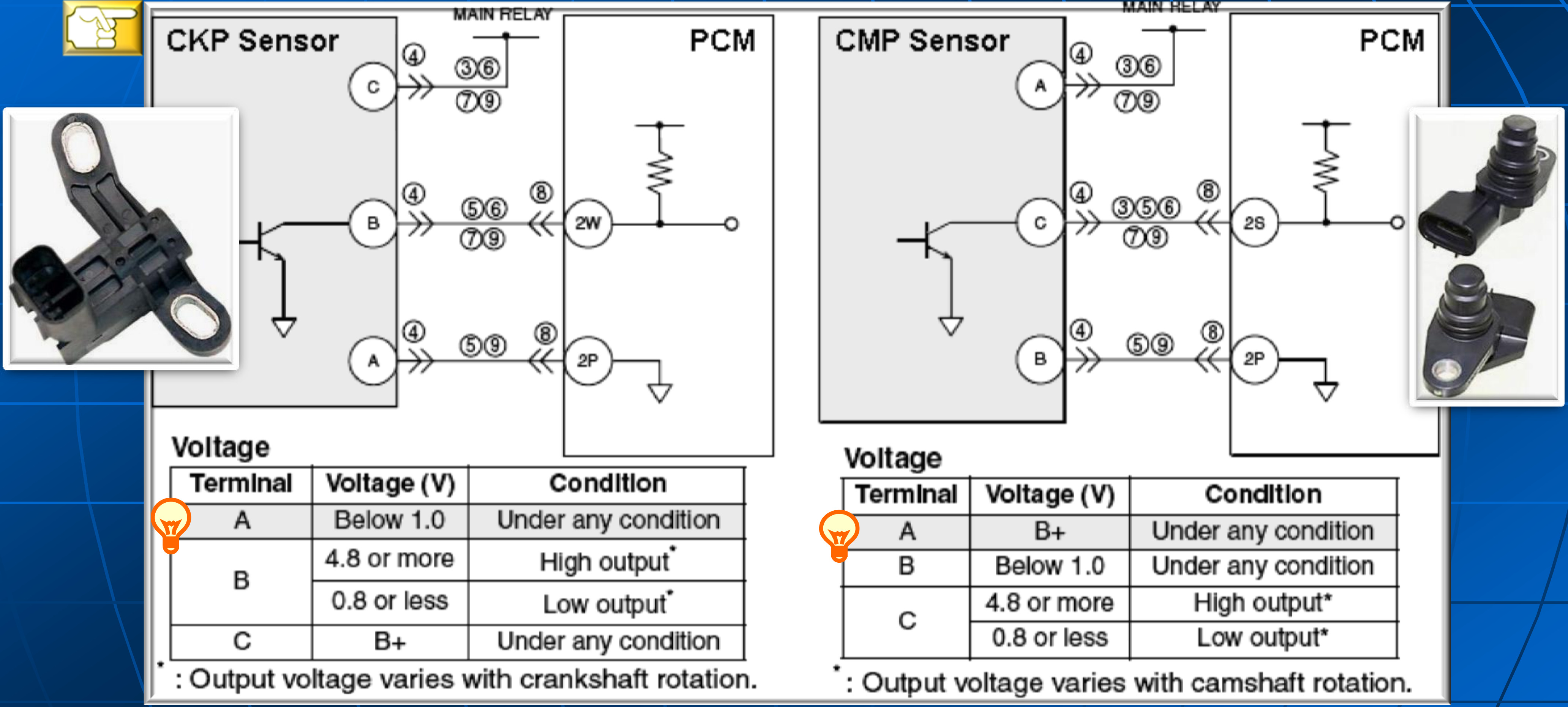
- For cylinder identification, the CMP sensor detects a camshaft angle of **30 degree** after the top dead center in cylinder No. 1.
- The wave form of CMP sensor output is shown in the figure.

- For detecting the crankshaft angle, the CKP sensor detects pulsation signals from pulse wheel
- The wave form of CKP sensor output is shown in the figure.

◄ L3 Engine 2002 MY
CMP & CKP Waveform

* Для справки

# Note.


CKP Sensor
MAIN RELAY
PCM
C
④
③⑥
⑦⑨
B
④
⑤⑥
⑦⑨
⑧
2W
A
④
⑤⑨
⑧
2P
CMP Sensor
MAIN RELAY
PCM
A
④
③⑥
⑦⑨
C
④
③⑤⑥
⑦⑨
⑧
2S
B
④
⑤⑨
⑧
2P

Voltage

| Terminal | Voltage (V) | Condition |
|---|---|---|
| A | Below 1.0 | Under any condition |
| B | 4.8 or more | High output* |
| | 0.8 or less | Low output* |
| C | B+ | Under any condition |

* : Output voltage varies with crankshaft rotation.

Voltage

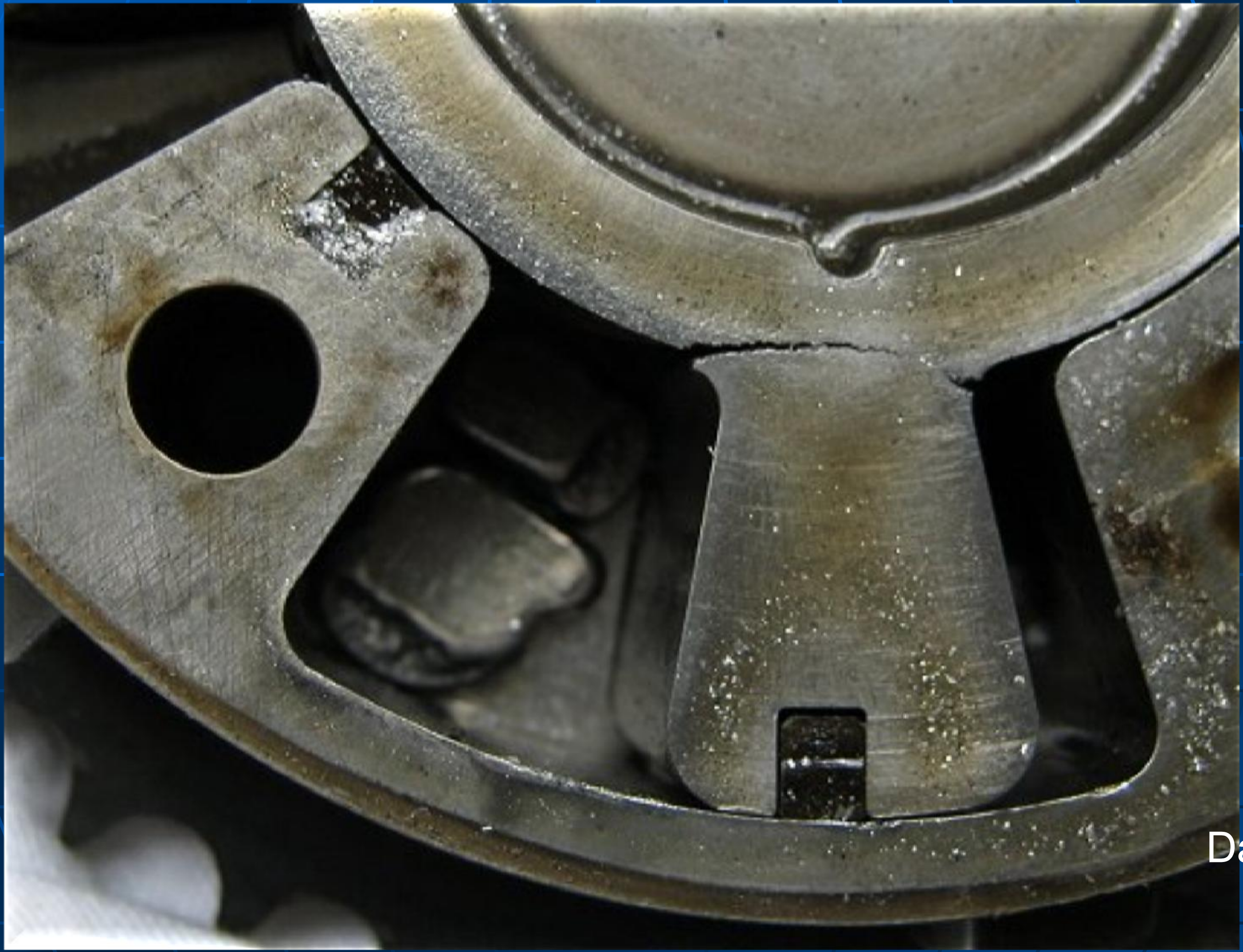
| Terminal | Voltage (V) | Condition |
|---|---|---|
| A | B+ | Under any condition |
| B | Below 1.0 | Under any condition |
| C | 4.8 or more | High output* |
| | 0.8 or less | Low output* |

* : Output voltage varies with camshaft rotation.

▲ L3 Engine CX-7 2007 MY

* Для справки

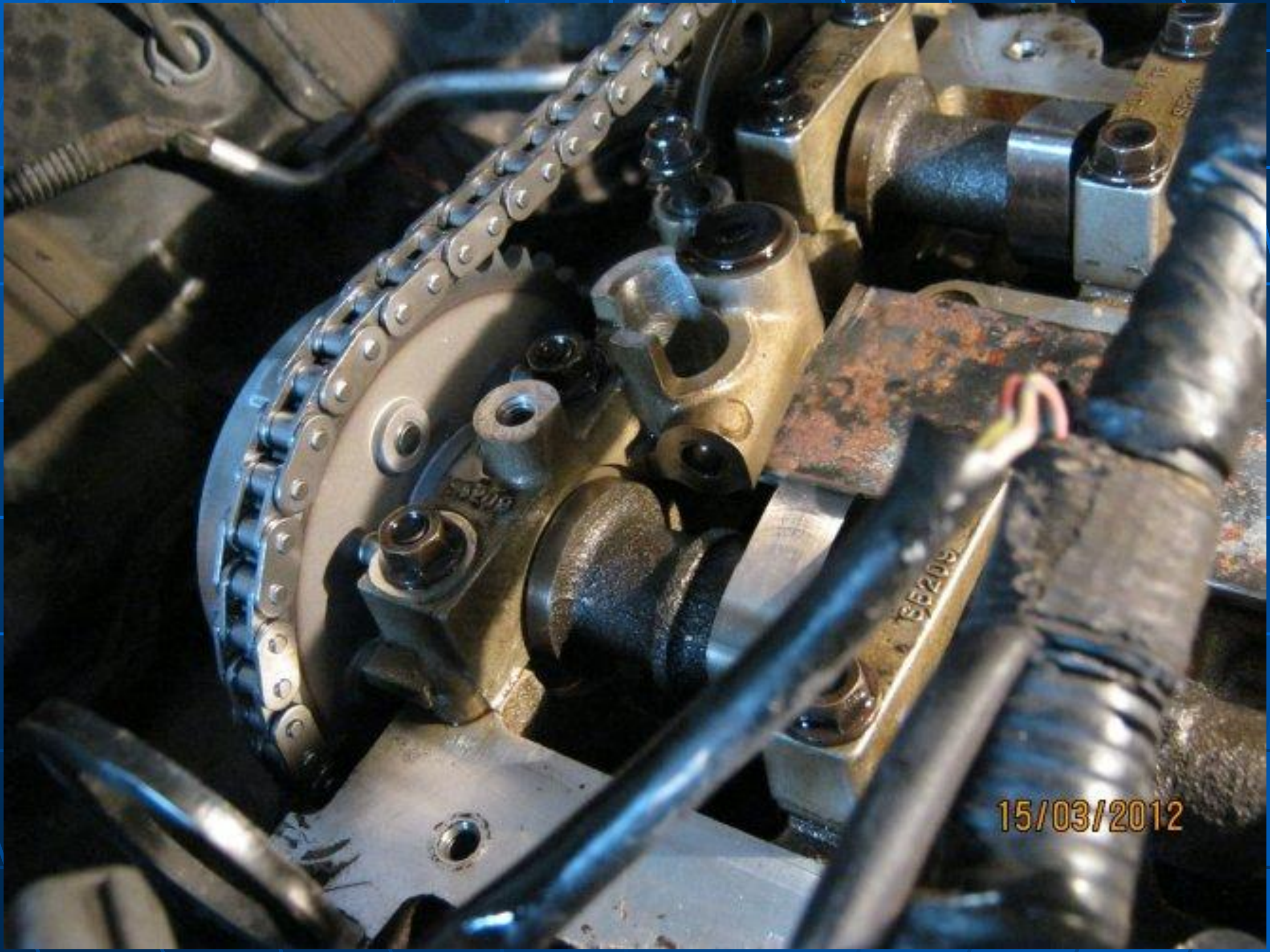
# CX-7 VVT Actuator Interior
# (“Ужасы нашего городка» или «Третий акт марлезонского балета”)



Darkness …

* Для справки

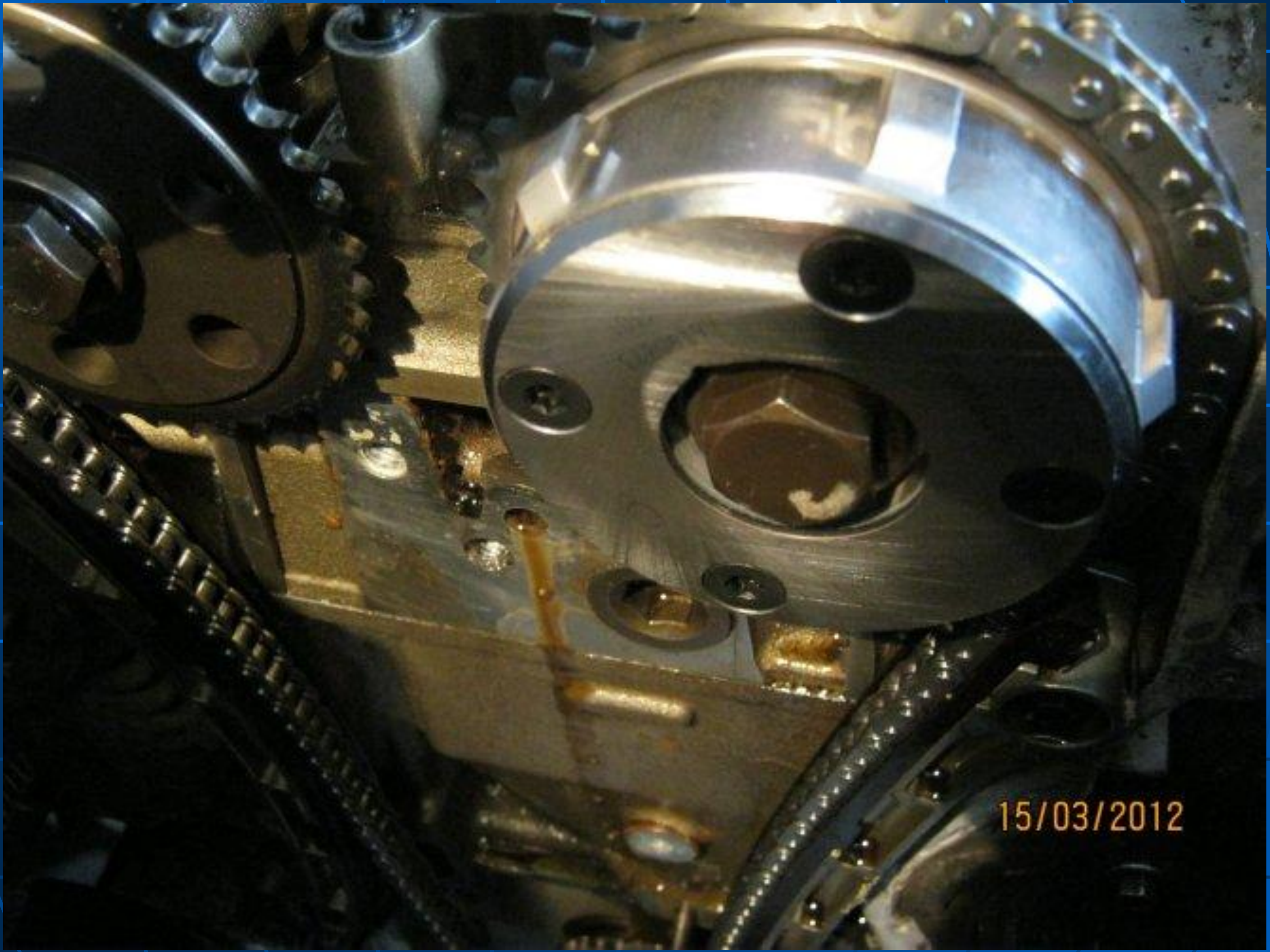
# CX-7 VVT Actuator



Новый актюатор установлен

* Для справки

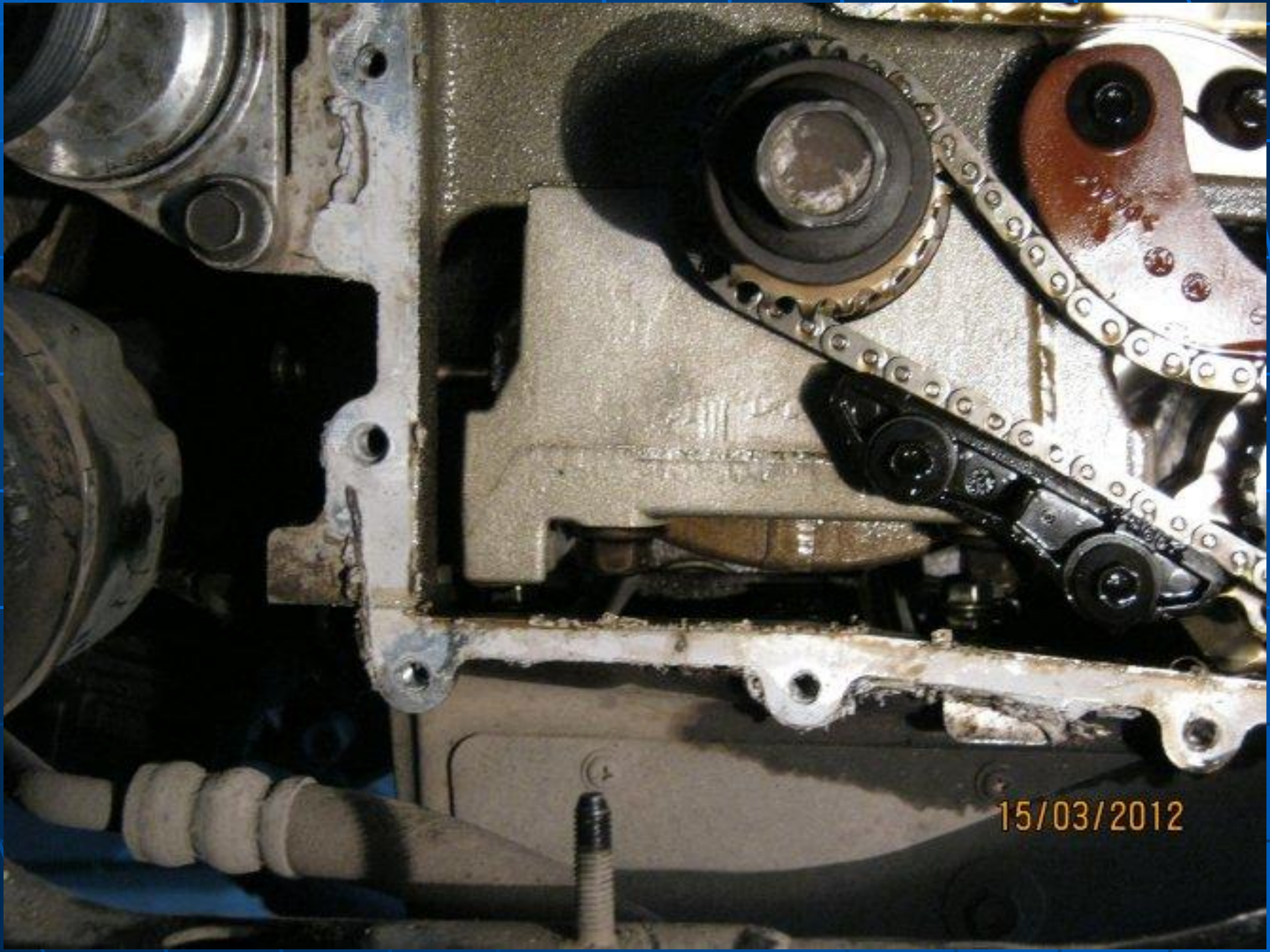
# CX-7 new VVT Actuator


15/03/2012

Новый актюатор

* Для справки

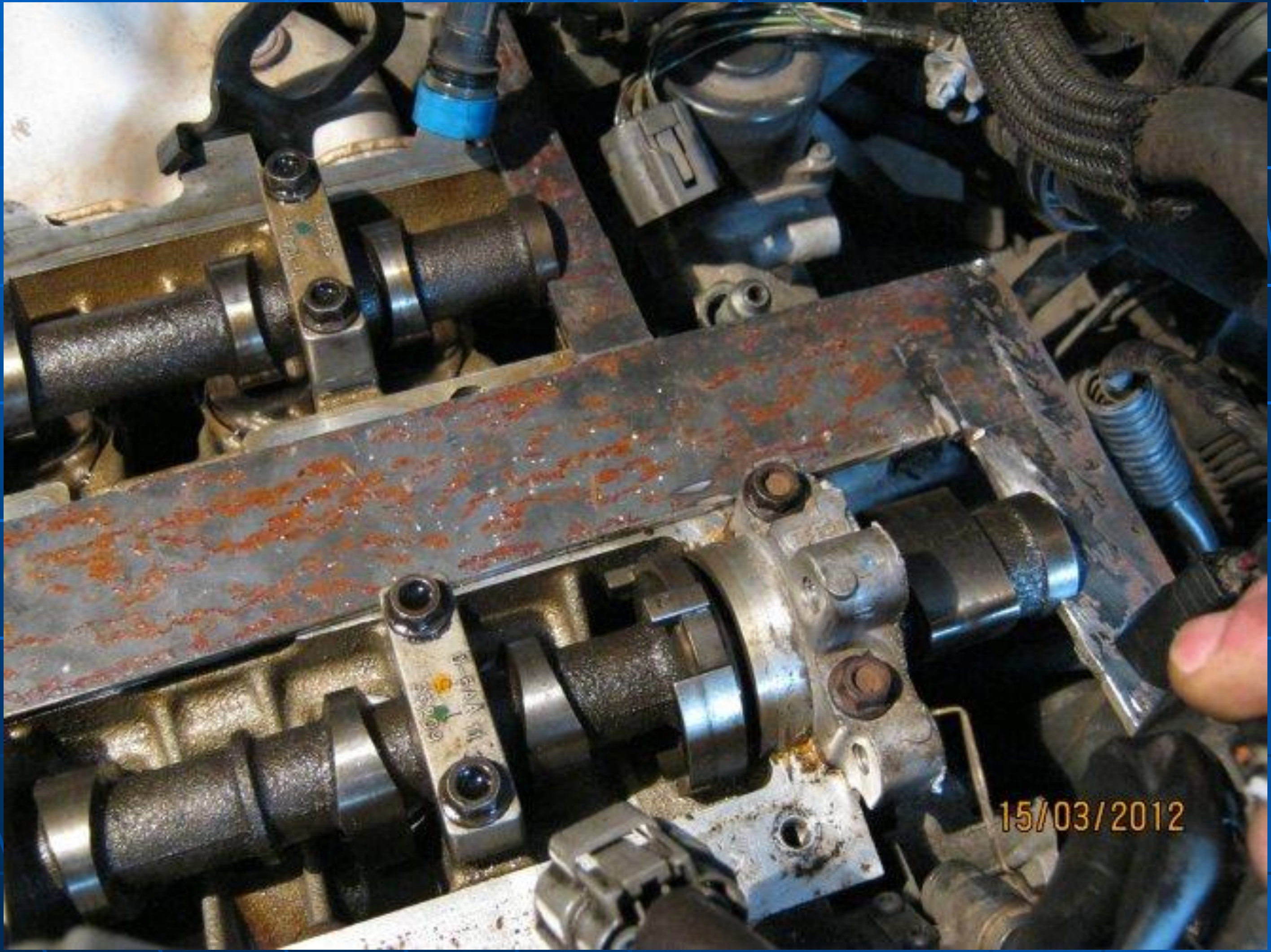
# Oil Pump Chain

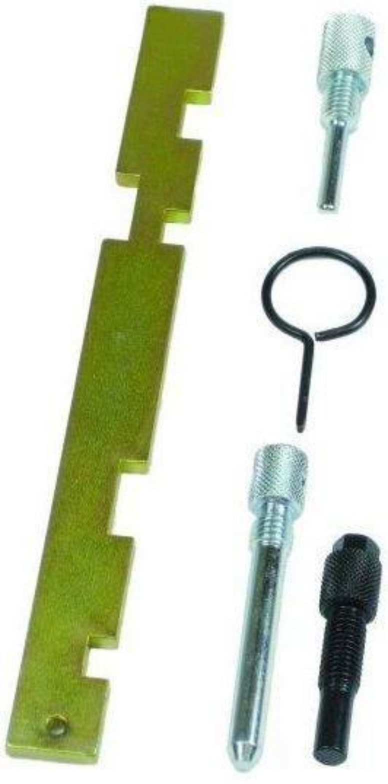


15/03/2012

* Для справки

# Self-made Camshaft alignment Tool

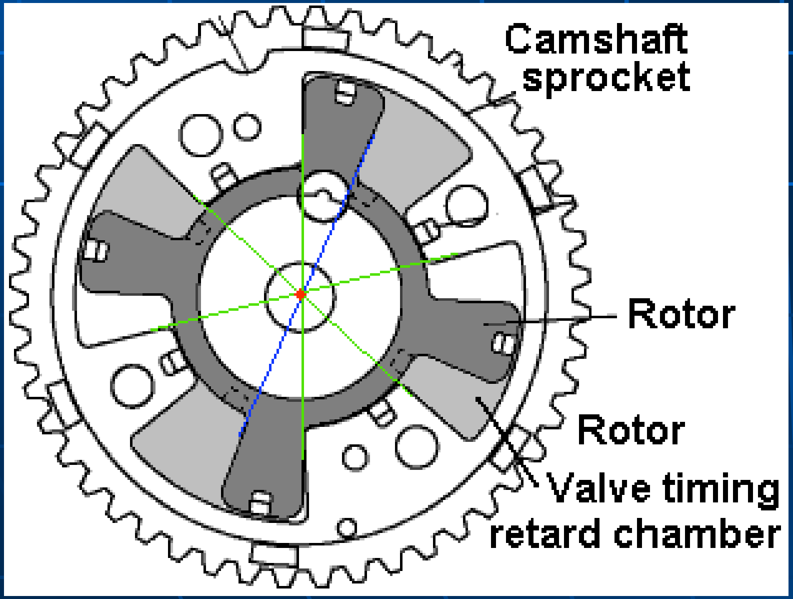

15/03/2012

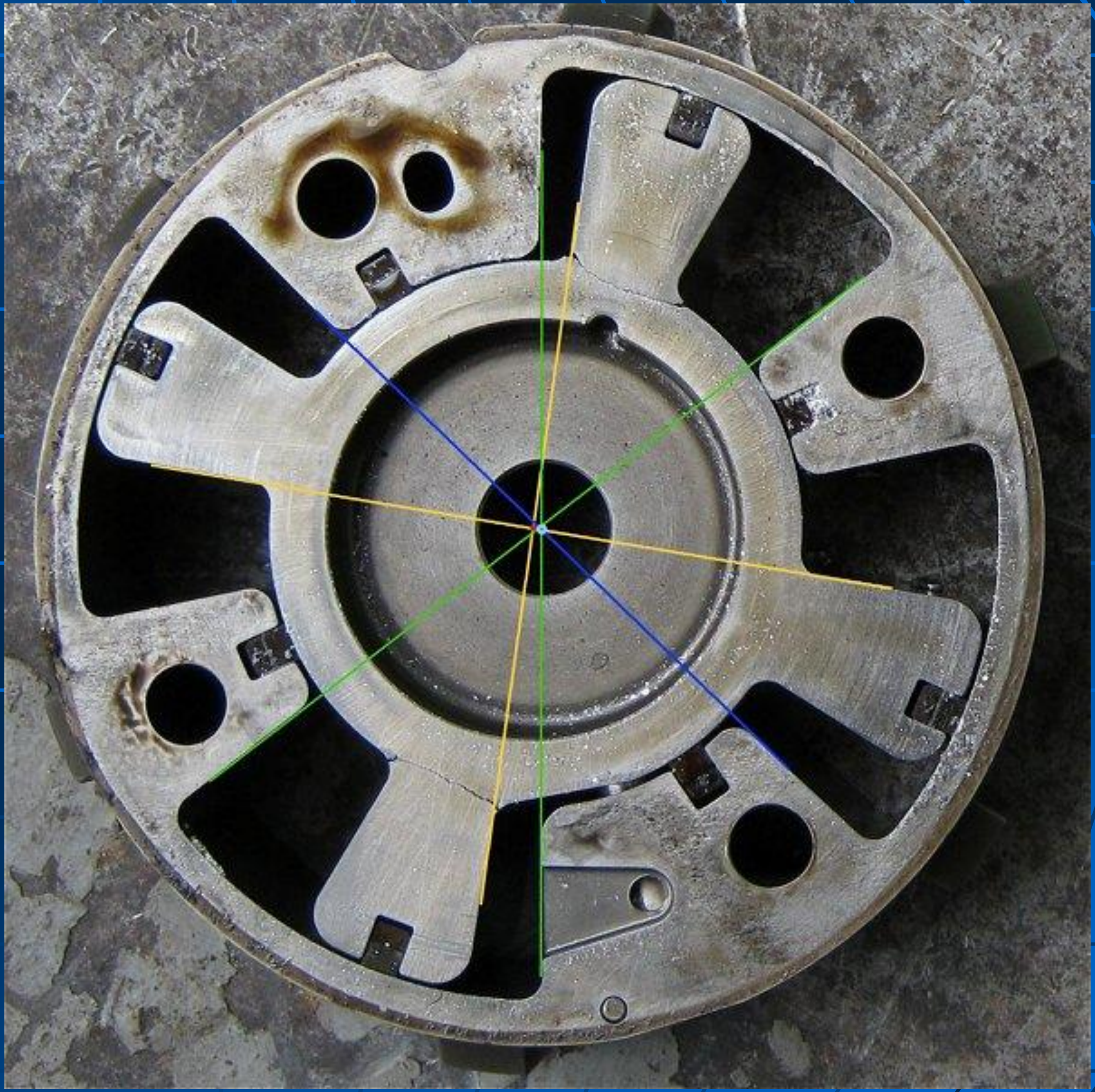


* Для справки

# CX-7 VVT Actuator Interior

P.S.

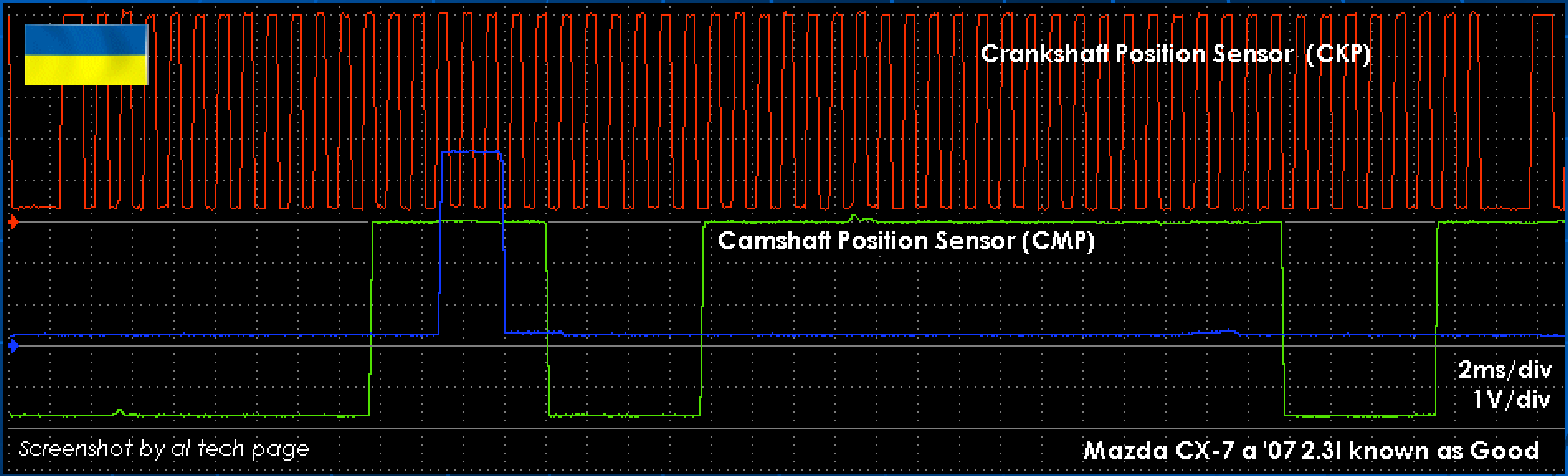

Camshaft sprocket
Rotor
Rotor
Valve timing retard chamber



* Для справки

P.S.S.

# CKP vs. CMP vs. Ignition Waveform of Mazda CX-7 (known as good)

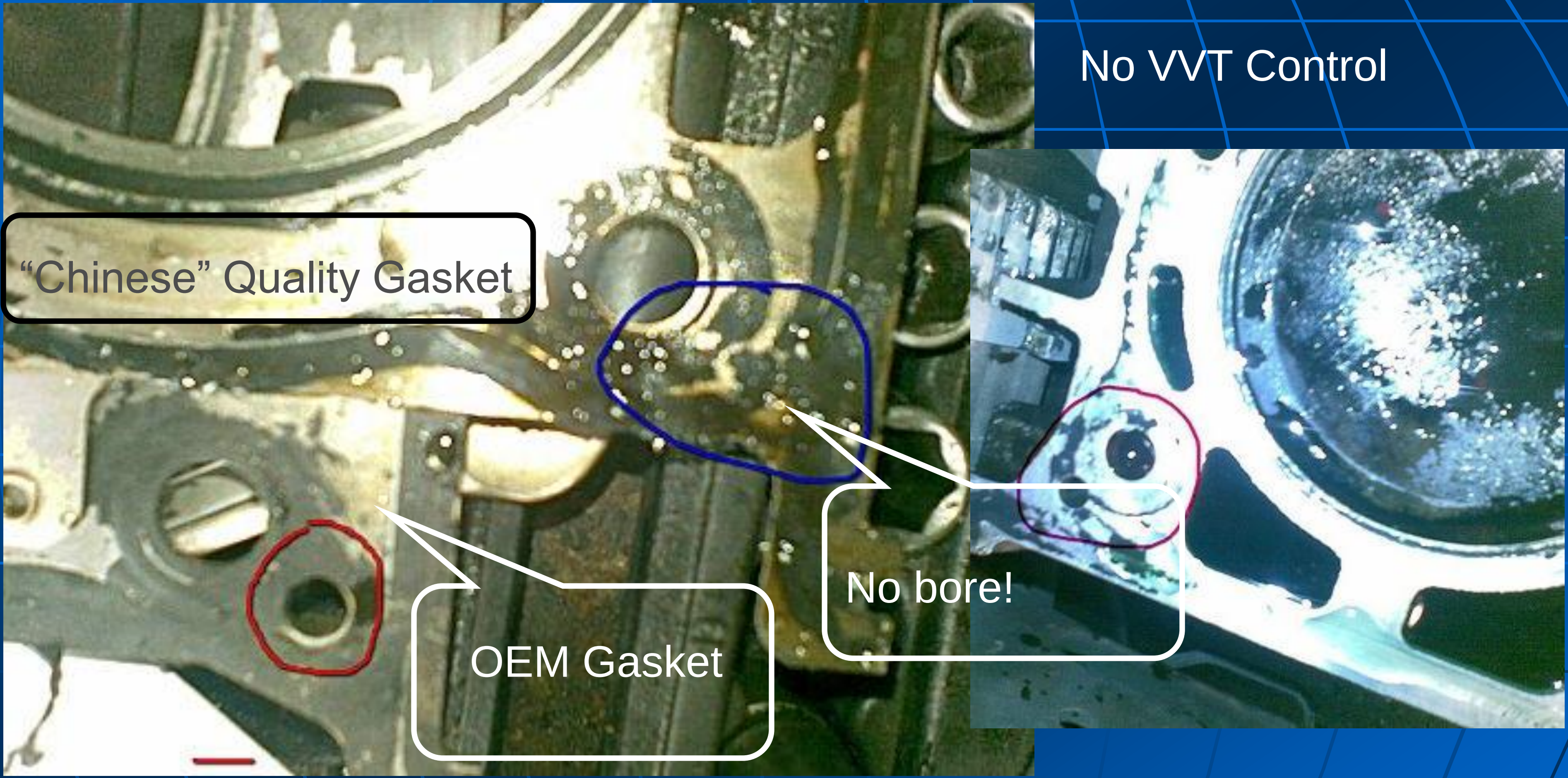


Data courtesy AVTEL

* Для справки

# Проблемы других Mazda CX-7

No VVT Control

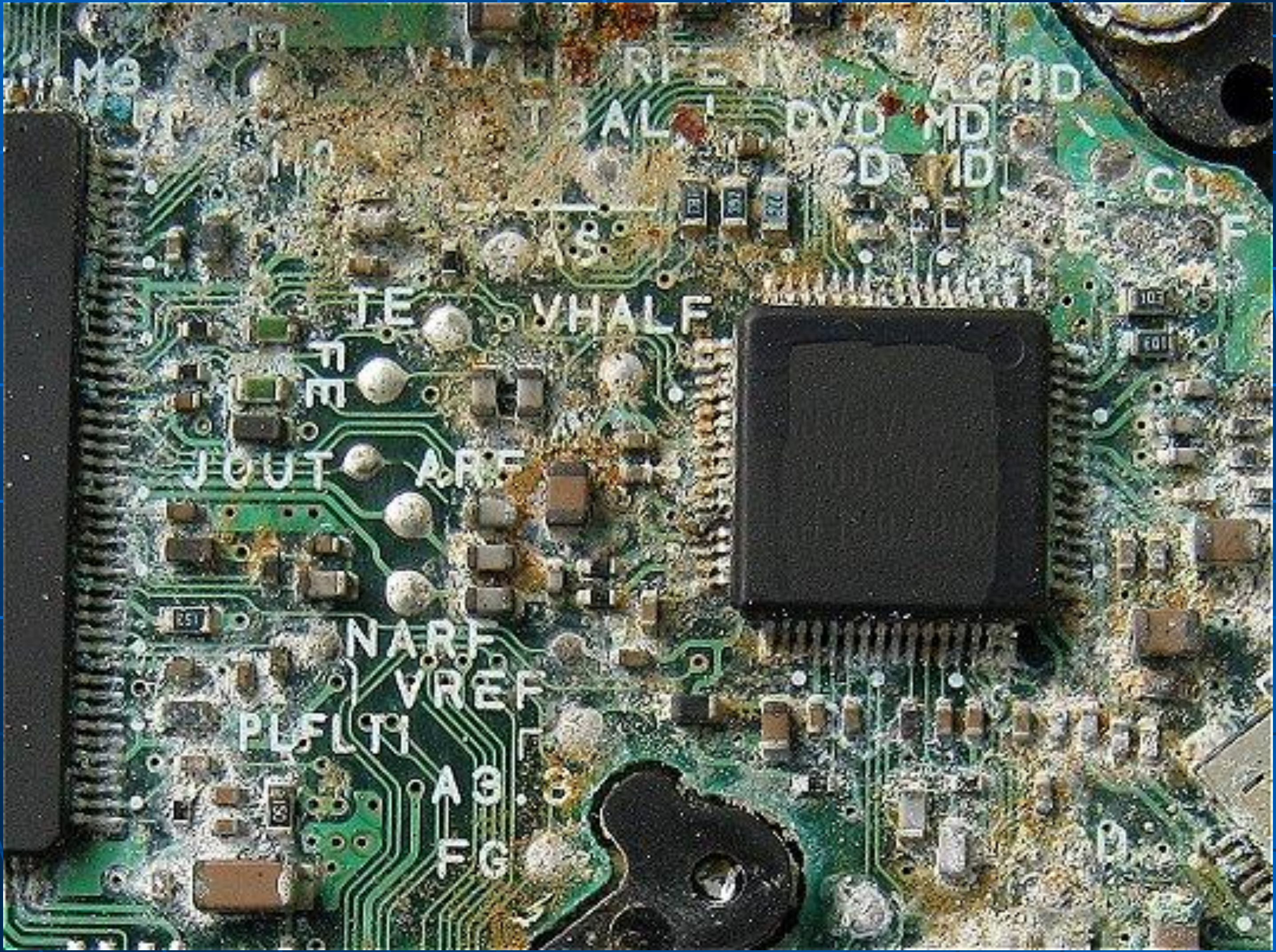

“Chinese” Quality Gasket
OEM Gasket
No bore!

В «левой» китайской прокладке головки нет отверстия для масляного канала

* Для справки

P.S.

# Mazda CX-7 Printed Circuit Board Corrosion


DVD
MD
CD
TE
VHALF
FE
JOUT
ARF
NARF
VREF
PLFLTI
A3
FG

* Для справки

## Консультации и техническое обучение от alflash

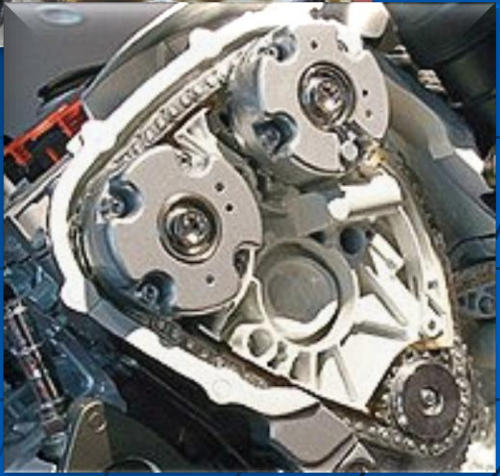
## Анонс Вебинара из серии “Диагностике электронных систем”

photo by al tech page

# “Системы переменного газораспределения”

(“30 лет в строю”)

- Назначение
- Варианты конструкции
- Причины неисправности и
- Методика и способы проверки (сканером и “вручную”)



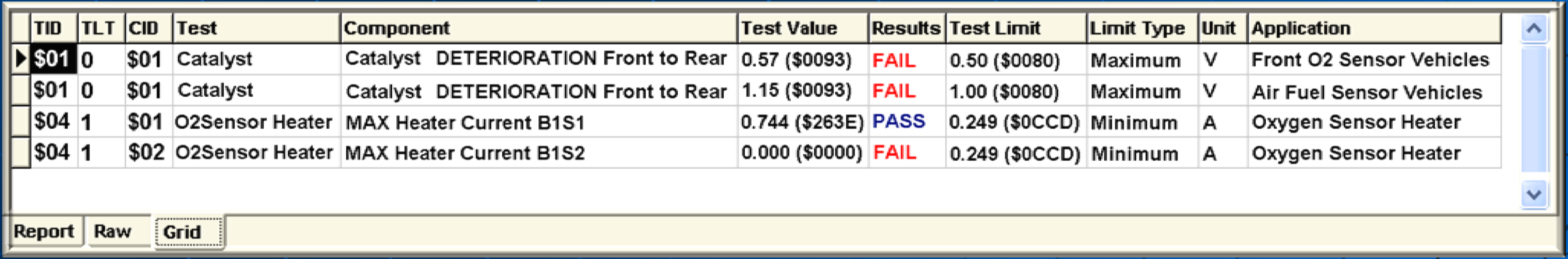
Консультации и техническое обучение от alflash

Анонс Вебинара из серии “Диагностике электронных систем”

# *Анализ данных режима Mode $06*

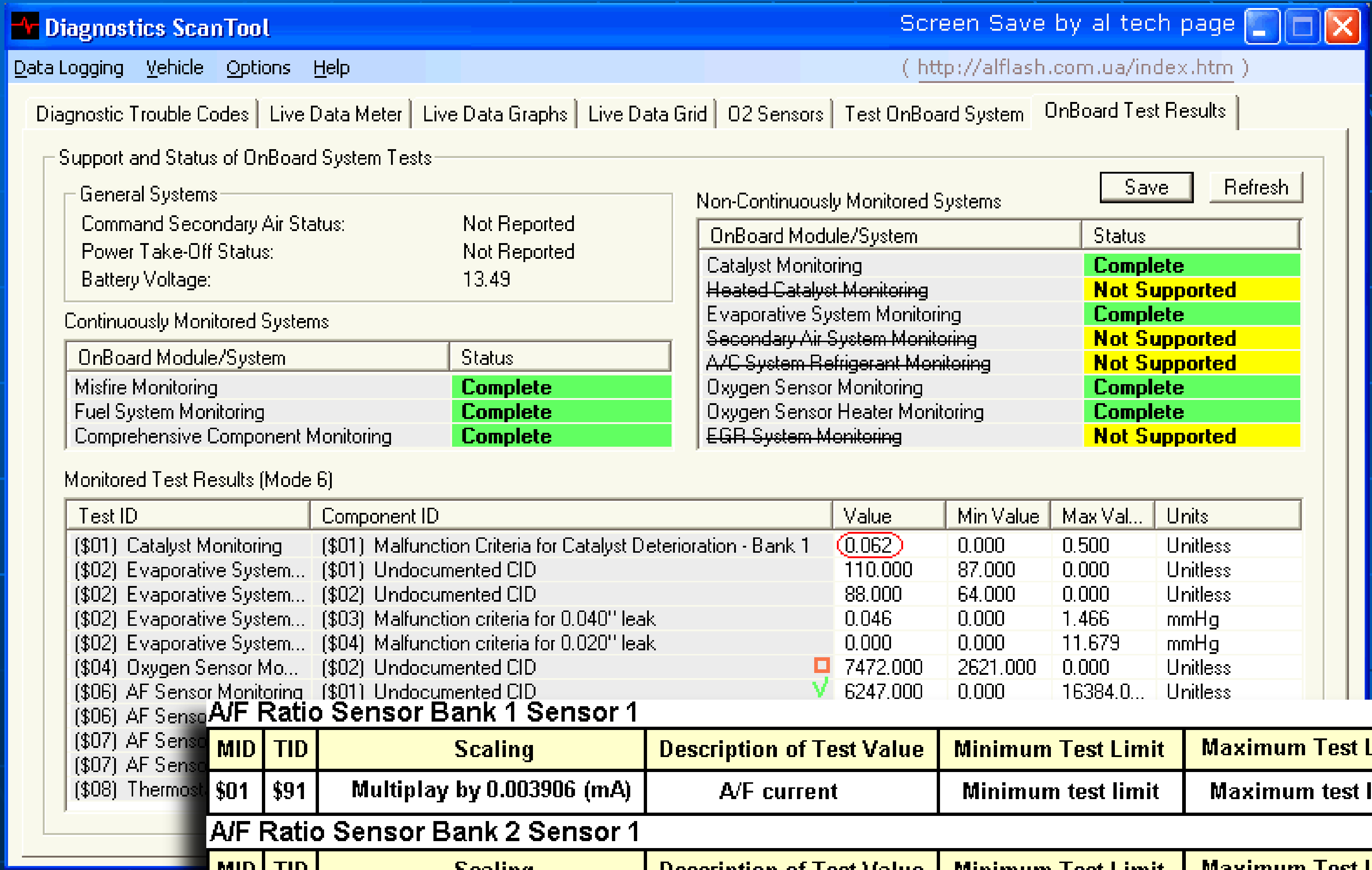
- Стратегия поиска причин наиболее массовых неисправностей
- Рекомендации и “тактика” проверок в ситуациях, когда ECM не обнаруживает неисправности, хотя в автомобиле присутствуют проблемы.

*“… Режим Mode#06 позволяет специалисту анализировать результаты выполнения ECM  самопроверок (MID, TID, CID, TLT), узнавать допустимые пределы и критерии неисправности (TLT), нынешнее состояние и остаточный моторесурс компонентов систем управления двигателем. Например, проблемы катализаторов, O2S, термостата, EVAP и прочего могут обнаруживаться при сравнении реальных параметров с пределами теста.  А это позволяет оценить их “остаточный моторесурс” и степень изношенности…”*



| | TID | TLT | CID | Test | Component | Test Value | Results | Test Limit | Limit Type | Unit | Application |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ▶ | $01 | 0 | $01 | Catalyst | Catalyst DETERIORATION Front to Rear | 0.57 ($0093) | FAIL | 0.50 ($0080) | Maximum | V | Front O2 Sensor Vehicles |
| | $01 | 0 | $01 | Catalyst | Catalyst DETERIORATION Front to Rear | 1.15 ($0093) | FAIL | 1.00 ($0080) | Maximum | V | Air Fuel Sensor Vehicles |
| | $04 | 1 | $01 | O2Sensor Heater | MAX Heater Current B1S1 | 0.744 ($263E) | PASS | 0.249 ($0CCD) | Minimum | A | Oxygen Sensor Heater |
| | $04 | 1 | $02 | O2Sensor Heater | MAX Heater Current B1S2 | 0.000 ($0000) | FAIL | 0.249 ($0CCD) | Minimum | A | Oxygen Sensor Heater |

# Консультации и техническое обучение от alflash
# Анонс Вебинара из серии “Диагностике электронных систем”


Diagnostics ScanTool
Screen Save by al tech page
Data Logging
Vehicle
Options
Help
( http://alflash.com.ua/index.htm )
Diagnostic Trouble Codes
Live Data Meter
Live Data Graphs
Live Data Grid
O2 Sensors
Test OnBoard System
OnBoard Test Results
Save
Refresh

Support and Status of OnBoard System Tests

General Systems

| | |
|---|---|
| Command Secondary Air Status: | Not Reported |
| Power Take-Off Status: | Not Reported |
| Battery Voltage: | 13.49 |

Continuously Monitored Systems

| OnBoard Module/System | Status |
|---|---|
| Misfire Monitoring | **Complete** |
| Fuel System Monitoring | **Complete** |
| Comprehensive Component Monitoring | **Complete** |

Non-Continuously Monitored Systems

| OnBoard Module/System | Status |
|---|---|
| Catalyst Monitoring | **Complete** |
| ~~Heated Catalyst Monitoring~~ | **Not Supported** |
| Evaporative System Monitoring | **Complete** |
| ~~Secondary Air System Monitoring~~ | **Not Supported** |
| ~~A/C System Refrigerant Monitoring~~ | **Not Supported** |
| Oxygen Sensor Monitoring | **Complete** |
| Oxygen Sensor Heater Monitoring | **Complete** |
| ~~EGR System Monitoring~~ | **Not Supported** |

Monitored Test Results (Mode 6)

| Test ID | Component ID | Value | Min Value | Max Val... | Units |
|---|---|---|---|---|---|
| ($01) Catalyst Monitoring | ($01) Malfunction Criteria for Catalyst Deterioration - Bank 1 | 0.062 | 0.000 | 0.500 | Unitless |
| ($02) Evaporative System... | ($01) Undocumented CID | 110.000 | 87.000 | 0.000 | Unitless |
| ($02) Evaporative System... | ($02) Undocumented CID | 88.000 | 64.000 | 0.000 | Unitless |
| ($02) Evaporative System... | ($03) Malfunction criteria for 0.040" leak | 0.046 | 0.000 | 1.466 | mmHg |
| ($02) Evaporative System... | ($04) Malfunction criteria for 0.020" leak | 0.000 | 0.000 | 11.679 | mmHg |
| ($04) Oxygen Sensor Mo... | ($02) Undocumented CID | 7472.000 | 2621.000 | 0.000 | Unitless |
| ($06) AF Sensor Monitoring | ($01) Undocumented CID | 6247.000 | 0.000 | 16384.0... | Unitless |
| ($06) AF Senso | | | | | |
| ($07) AF Senso | | | | | |
| ($07) AF Senso | | | | | |
| ($08) Thermost | | | | | |

## A/F Ratio Sensor Bank 1 Sensor 1

| MID | TID | Scaling | Description of Test Value | Minimum Test Limit | Maximum Test Limit |
|---|---|---|---|---|---|
| $01 | $91 | Multiplay by 0.003906 (mA) | A/F current | Minimum test limit | Maximum test limit |

## A/F Ratio Sensor Bank 2 Sensor 1

| MID | TID | Scaling | Description of Test Value | Minimum Test Limit | Maximum Test Limit |
|---|---|---|---|---|---|
| $05 | $91 | Multiplay by 0.003906 (mA) | A/F current | Minimum test limit | Maximum test limit |

Консультации и техническое обучение от alflash

Курс “OBD-II / EOBD: вчера, сегодня, завтра”

# *Диагностическая программа* Toyota Techstream

## Установка, возможности, режимы и правила использования, практика и особенности применения

«Практическая диагностика системы управления двигателем»

al tech page - www.alflash.com.ua

Консультации и техническое обучение от alflash

# «Практическая диагностика систем управления двигателем»

"Learning has no Limit" (Confucius)
Episode
Technical Information System
File Function Setup TIS User Help
Connect to Vehicle
TIS
New Users Demo
Software Registration
Log Out
E-Learning Course by al tech page
CHECK ENGINE
entrata
uscita
4904

Серия Вебинаров,

форум,

онлайн консультации

## OBD-II и EOBD