

JAMMER PRESENTATION

PRESENTATION OF THE JAMMER BOX FUNCTIONALITIES

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Internal

JAMMER BOX PRESENTATION

1 INTRODUCTION

2 WIRING

3 USER INTERFACE

4 FAILURES

5 WORK LEFT TO BE DONE

INTRO

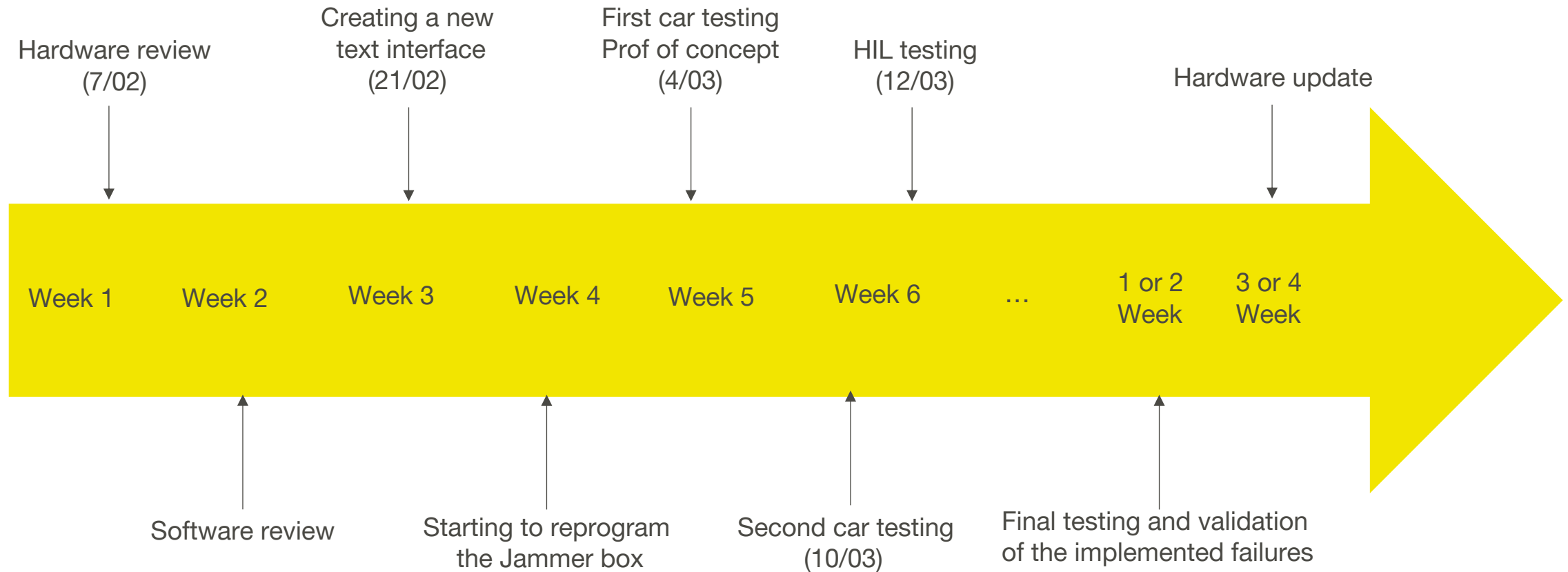
The Jammer box is a device that sends in output the signal received in input once it is under power supply.

The Jammer box contains a microcontroller that can analyse his input signal to modify send it in output. This enable us to generate specific failures.

We can connect a PC to the Jammer box to send specific request with the jammer box interface. Those request allows us to control the Jammer box and gen



JAMMER BOX -TIME LINE



JAMMER BOX – FAILURES STATE

Validated failures

XCRKAQ_EveCrkNrToothOrng
XCRKAQ_EveCrkSynLoss
XCAMAD_EveCamPosnOrng
XENPMG_EveCamCrkSynErr

XCRKAQ_EveCrkGapNotDet
XCAMSY_EveCamPatErr

XSEGAD_EveSegAdpErLim

XCRKAQ_EveCrkNoiseScb
XCRKAQ_EveCrkNoiseScg

OBD

Not OBD

XCRKAQ_EveCrkScg
XCRKAQ_EveCrkScb

XCAMAQ_EveCamScg
XCAMAQ_EveCamScb

XCRKAQ_EveCrkSpk
XCAMAQ_EveCamSpk

XCRKAQ_EvePosnEngStstLoss
XCRKAQ_EvePosnEngStstOrng
XCRKAQ_EveCrkPlsOrng

No implemented

XENPMG_EveEngSynLoss
XCAMAD_EveCamDriftOrng
XCRKAQ_EveCrkPlsBackPlaus

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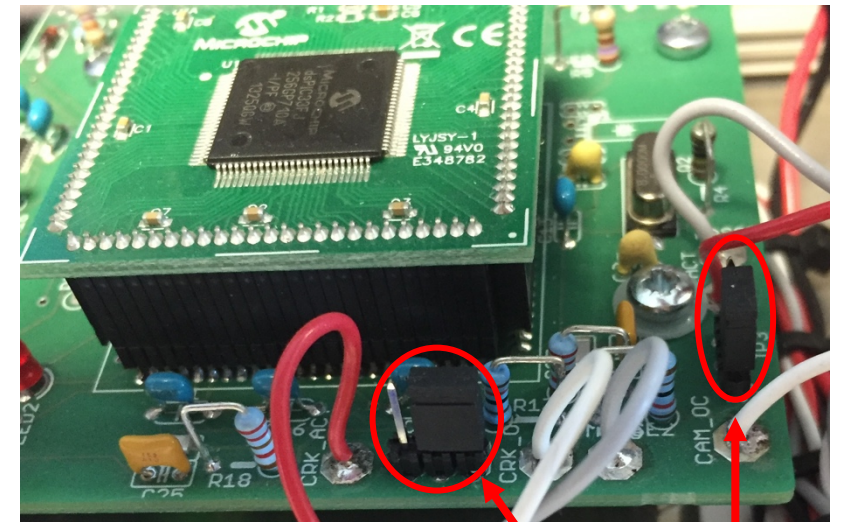
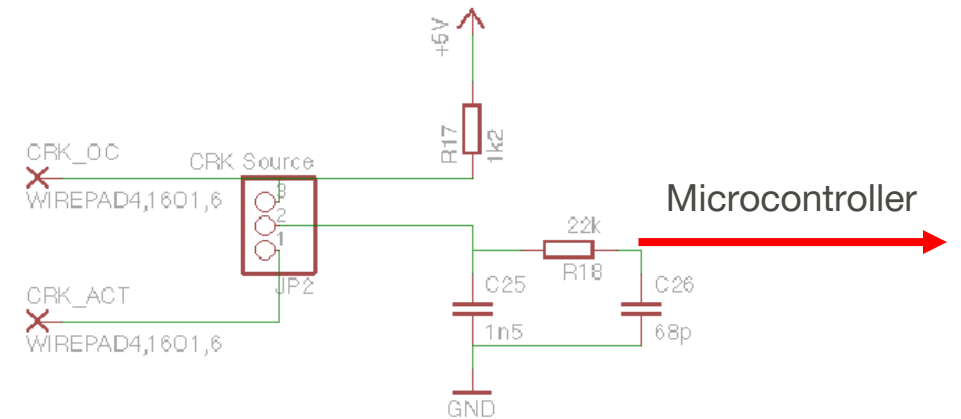
WIRING – INPUT SIGNAL BOARD CONFIGURATION

The input signals are 3 cable for the CRK and 3 for the CAM sensors :

- GND → Directly connected to the GND of the board
- OC → Connected to a pull-up and the jumper
- ACT → Connected only to the jumper

Because of the jumper only one of the two input signals is connected to the microcontroller. To choose which signal is connected you need to verify the position of the jumper in the box and therefore open it.

We will connect the OC input to the microcontroller because the pull up is needed for the signal of a real sensor and it doesn't hinder an active signal of a testbench



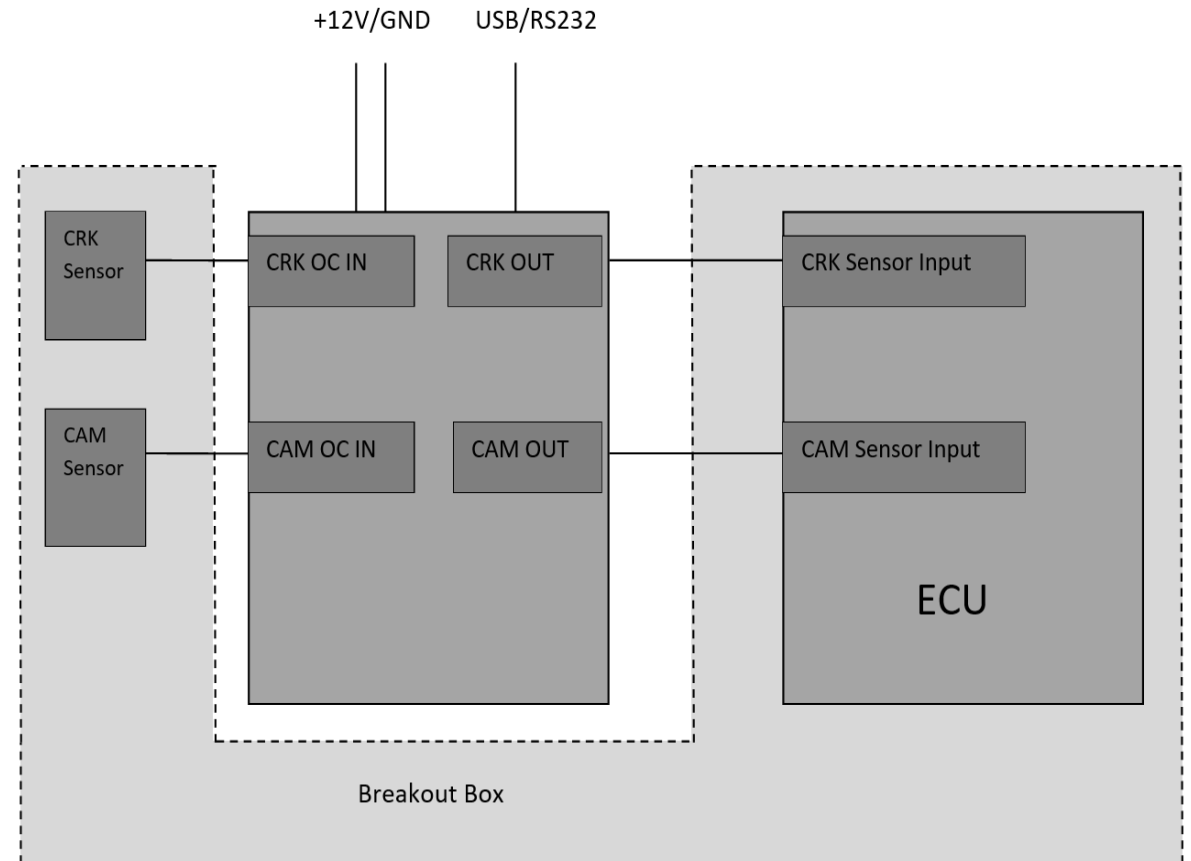
Correct jumper position

WIRING – BREAKOUT BOX / JAMMER BOX

Connect the sensor output to the OC input of the Jammer Box. Verify to have the jumper set correctly before.

To connect the jammer box to the ECU any output is useable. Nevertheless, the ACT is recommended because we have a real output and don't rely on the pull up of the ECU.

The Jammer box has multiple ground pins note that there are all connected to the same ground. Therefore, connect once the ground of the CAM sensor and the CRK sensor is enough.

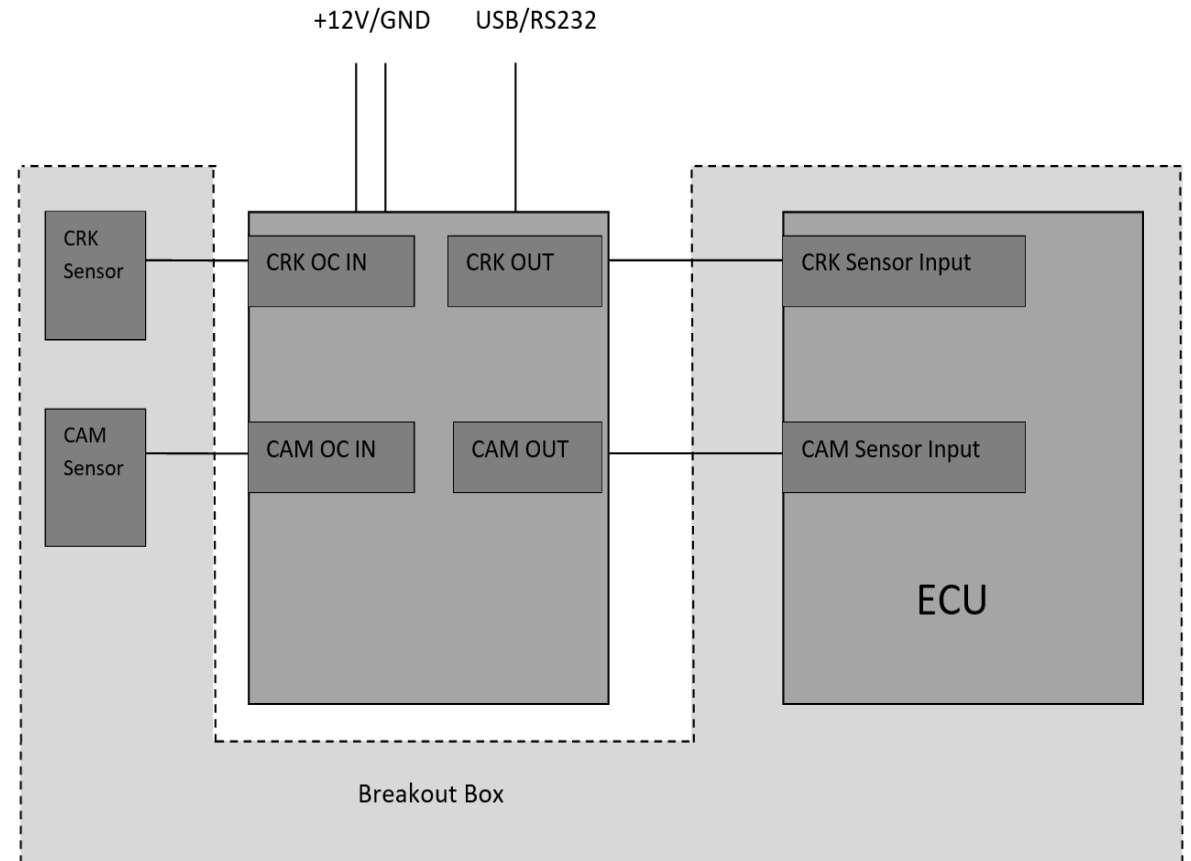


WIRING – POWER SUPPLY

The Jammer Box needs a 12 V DC power supply, it isn't recommended to use the battery of the car as the power supply. Because the voltage drop during the start of the engine leading to a shut down off the Jammer box and a stall of the car.

Use a convectional DC power supply or a battery to have a stable 12 V.

To connect the PC with the Jammer box we use an USB/RS232 cable.



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USER INTERFACE

To control the Jammer Box we will use a simple text interface. To use the Jammer box interface we will need:

- > The USB com port number
- > A Pattern file with the key information's to configure the Jammer box

The last step before using the Jammer box to generate failures, is to send the configuration of the CAM and CRK to the Jammer box.

To send an instructions to the Jammer box simply enter the corresponding number and press “enter” to validate. For more information read the [UserGuide.docx](#)

Note that all the configuration can be done while the engine is off or running. **Only the wiring need to be done before the engine start.**

```
Jammer Box interface
Enter the COM Port number used for the JammerBox
> COM: 6
usb vcp : Open
Enter the file path of the pattern file
> PatternTest.cnf

Enter the number corresponding to the Diag you want to generate



| CRK                     | CAM                  |
|-------------------------|----------------------|
| 1 - Config Crk          | 3 - Config Cam       |
| 2 - Reset Crk config    | 4 - Reset Cam config |
| 11- Crk Tooth Spk       | 21- CAM delay        |
| 12- Crk Run Out         | 22- CAM Spk          |
| 13- Crk Tooth Off       | 23- CAM Pat Error    |
| 14- Crk Gap Not Det     |                      |
| 15- Crk Seg Adp Err Lim |                      |
| 255 - Exit              |                      |



> 1
Set CRK config
!1/60/2/1/87.75/0.3/660/4/c%
Successful communication
> █
```

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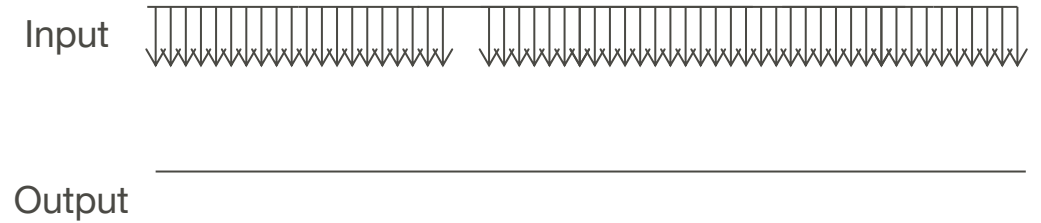
FAILURES

CRK / CAM SHORT CIRCUIT

CRK Short circuit

Set the CRK output signal to the ground or to the battery, the failure is determined by the user.

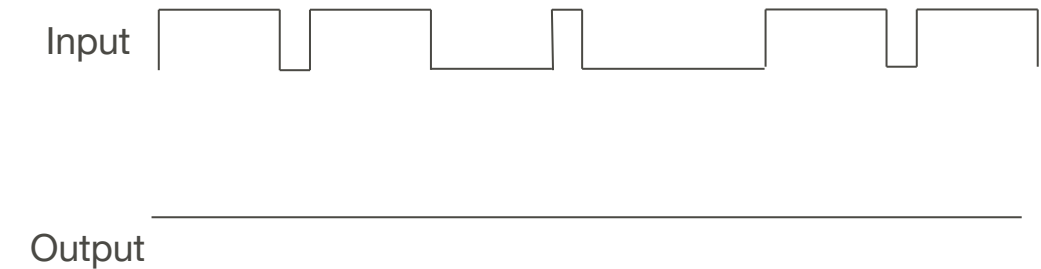
This failure generates the diagnosis **EveCrkScg** and **EveCrkScb**.



CAM Short circuit

Set the CAM output signal to the ground or to the battery, the failure is determined by the user.

This failure generates the diagnosis **EveCamScg** and **EveCamScb**.



FAILURES

CRK SPK AND RUN OUT

CRK Spk

Generate a 10µs pulse at the start of the falling edge of a CRK tooth.

This failure generates the diagnosis **EveCrkSpk**.

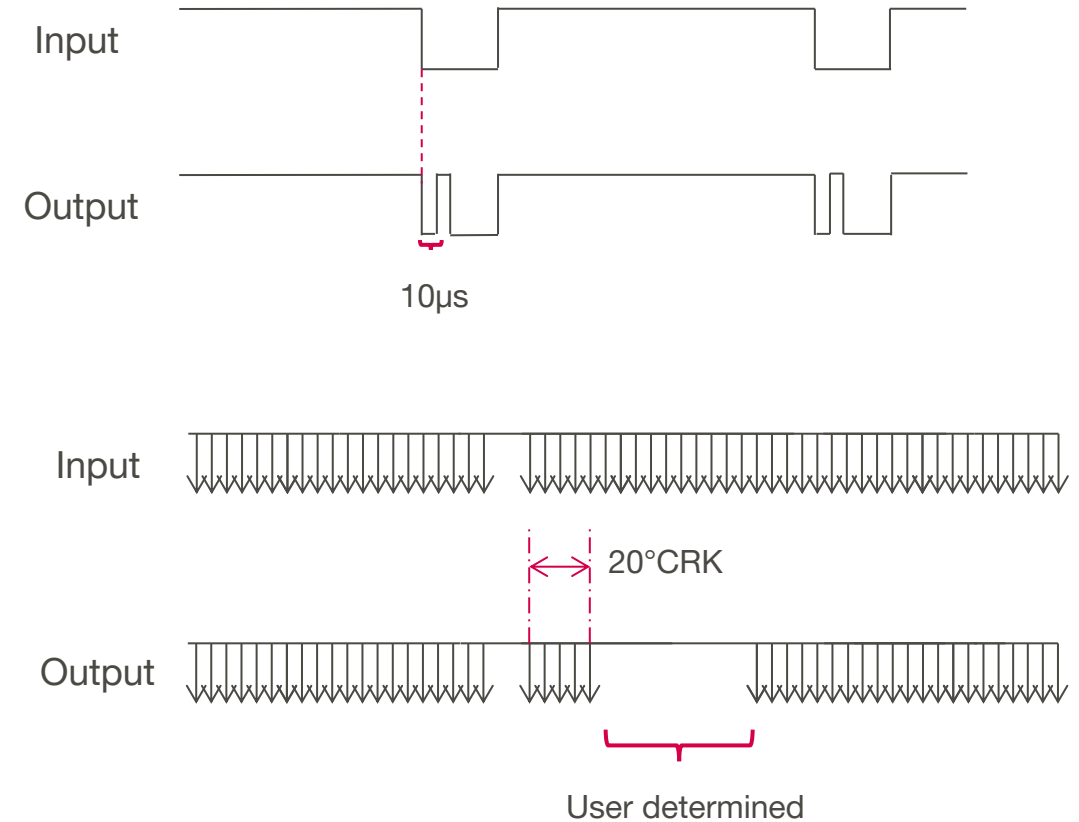
Results : Validated on HIL, not yet tested on car

CRK Run Out

Generate a short cut to battery or ground during a user given angle in °CRK after 20 °CRK after the gap.

This failure generates the diagnosis **EveCrkRunOut**, **EveCrkNoiseScb** and **EveCrkNoiseScg**.

Results : Validated on test bench and on car



FAILURES

CRK TOOTH OFF

CRK Tooth Off

Generate a short cut to battery during a tooth, for a user given number of teeth.

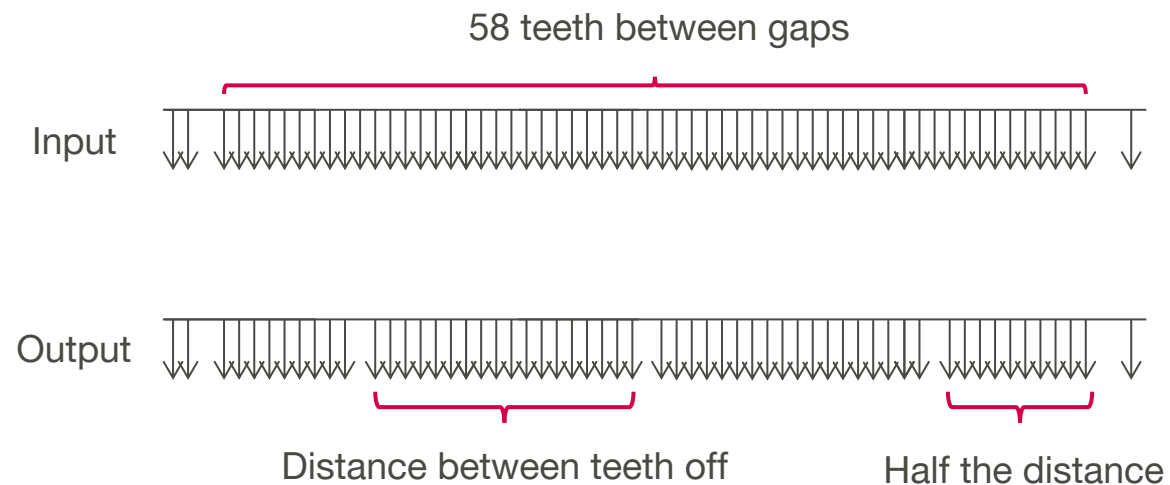
$$\text{Distance between teeth off} = \frac{\text{number of teeth between gap}}{\text{number of teeth off}}$$

This failure generates the diagnosis **EveCrkNrToothOrng** and **EveCrkSynLoss** depending on the number of teeth that are taken off, typically :

> 1 Tooth off → **EveCrkNrToothOrng**

> 3 Teeth off → **EveCrkSynLoss**

Results : Validated on test bench and on car



FAILURES

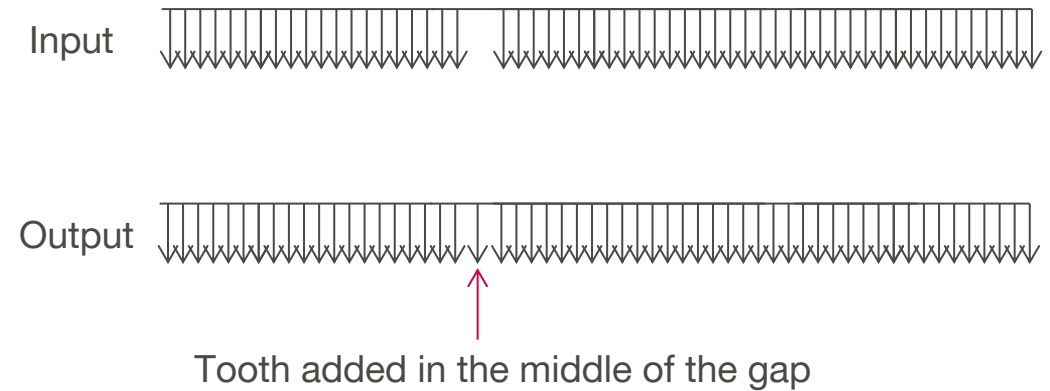
CRK GAP NOT DET

CRK Gap Not Det

Generate a tooth in the middle of the gap, the teeth length depends on the sensor type. If the sensor is a CPDD the added tooth is a 49μs pulse if not it is the size of half the last tooth.

This failure generates the diagnosis **EveCrkGapNotDet**. To generate diagnosis the failure must start at the engine start.

Results : Validated on HIL, need to be tested on car.



FAILURES

CRK SEG ADP ERR LIM

CRK Seg Adp Err Lim

This failure delays the last CRK tooth of the first ER segment by a user given angle. This is to make one segment bigger than another.

This failure generates the diagnosis **EveSegAdpErLim** may generate a backward diagnosis if the delay angle is too big or also **EveCrkNrToothOrng** if the delay is the length of a tooth.

Typically, we want one segment 0,7% bigger, for a 4-cylinder car a segment is 180 °CRK: $180 * 0,7\% = 1,26$, to have **EveSegAdpErLim** you will need to delay the tooth for at least 1,26 °CRK.

Mind that the backward triggers if the last tooth is 1,5 or 1,3 time bigger than the previous one. If a tooth is equivalent to 6 °CRK then with a delay of 1,8 °CRK you will generate at backward trigger.

Results : Validated on test bench that the signal is modified. Needs testing on HIL to see if the ER segments are different in length.

FAILURES

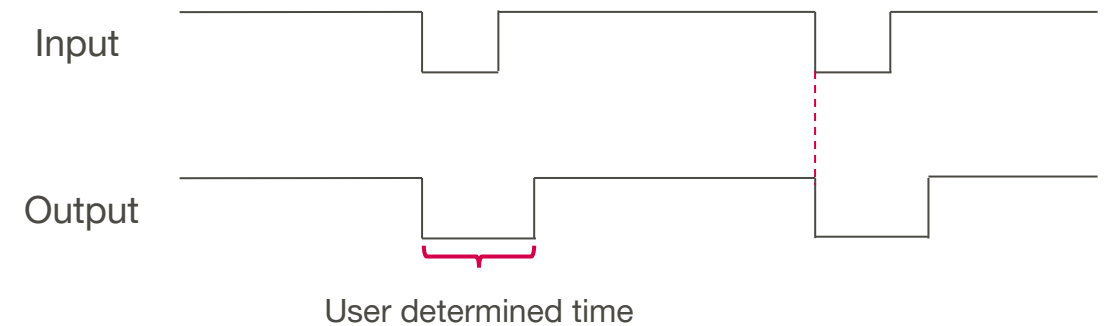
CRK PULSE DURATION AND CRK POSN ENG STST

CRK Pulse duration

This failure changes the pulse duration of the CRK sensor by a user given duration.

This failure generates the diagnosis **EveCrkPlsOrng** and may generate **EveCrkPlsBackPlaus**.

Results : not tested



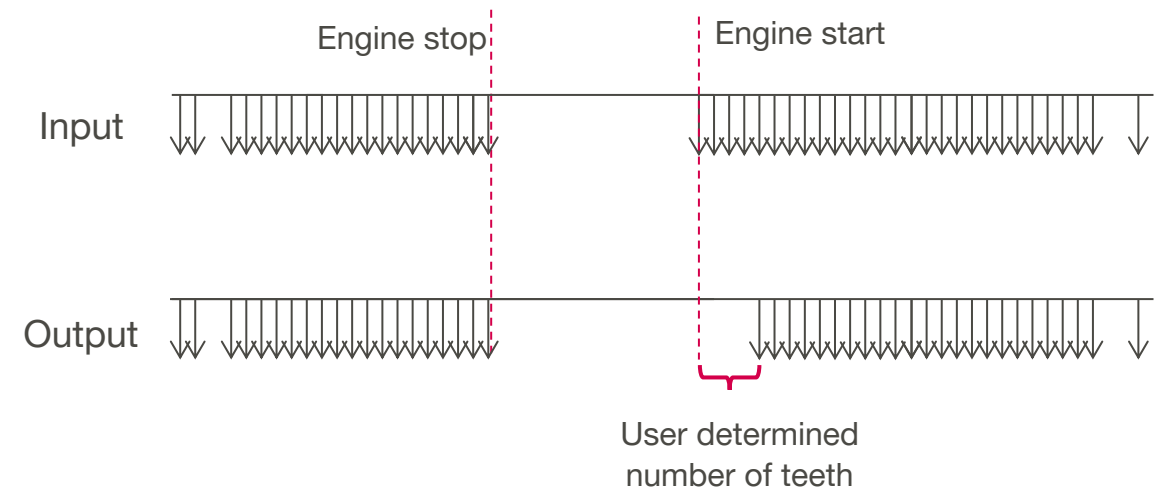
CRK Posn Eng Stst

This failure takes off a user determined number of teeth. It is done once to change the number of teeth seen by the ECU at a synchronised start.

This failure generates the diagnosis **EvePosnEngStstLoss** and **EvePosnEngStstOrng** depending on the number of teeth taken off.

- > 1 Tooth off → **EvePosnEngStstOrng**
- > 4 Teeth off → **EvePosnEngStstLoss**

Results : not tested



FAILURES

CAM DELAY

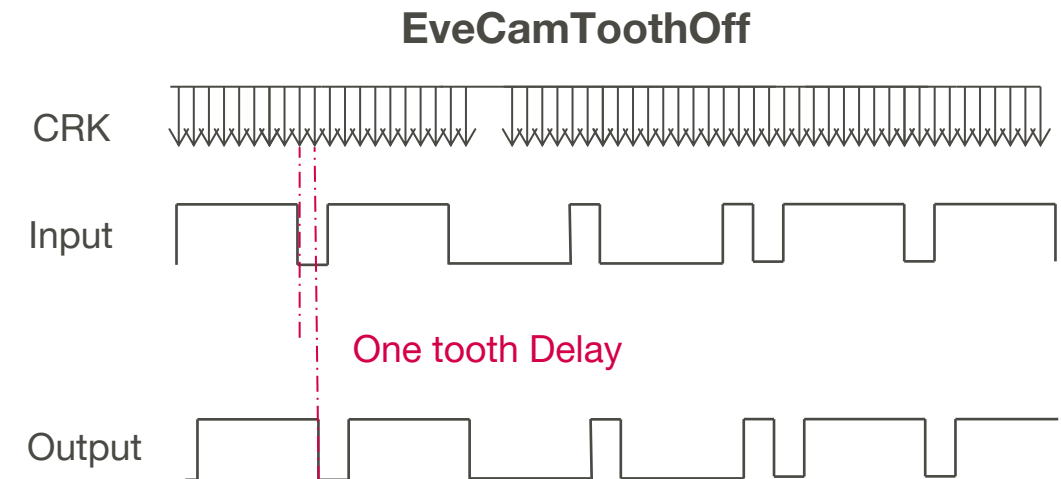
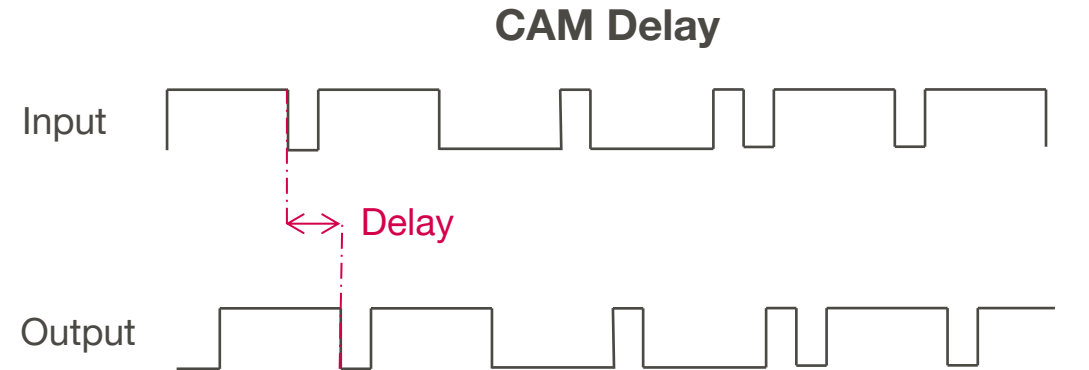
CAM delay

It delays the CAM signal by a user given value in °CRK .

This failure generates the diagnosis **EveCamPosnOrng**, **EveCamCrkSynErr** (for one CAM config only) and **EveCamToothOff**. Typically :

- > 20 °CRK before the sync → **EveCamCrkSynErr**
- > 20 °CRK after the sync → **EveCamPosnOrng**
- > One chain tooth delay → **EveCamToothOff**

Results : Validated on test bench and on car. Only CamToothOff is still to be tested.



FAILURES

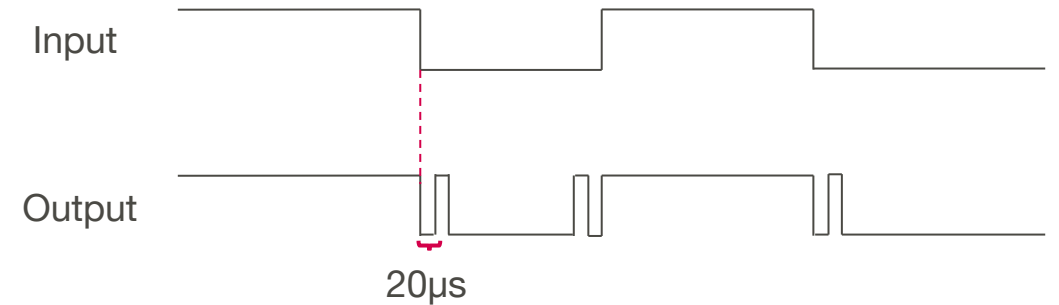
CAM SPK AND CAM PAT ERR

CAM Spk

It generates a pulse of 20μs on the CAM signal at every rising edge and falling edge of the CAM.

This failure generates the diagnosis **EveCamSpk**.

Results : Validated on test bench but not on car.

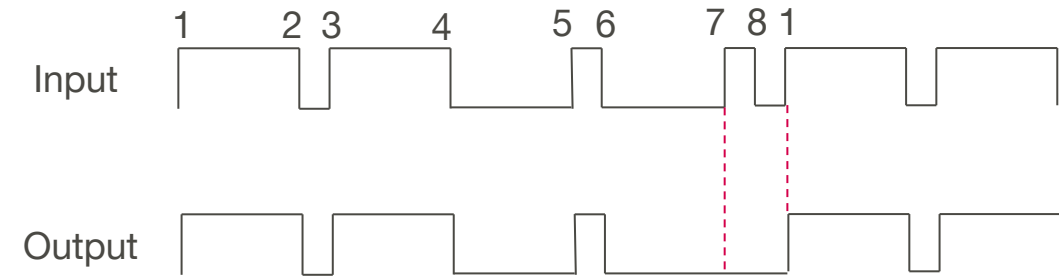


CAM Path Err

For every 7 active CAM edges the rising or falling edge will be ignored and not send to the output.

This failure generates the diagnosis **EveCamPatErr**.

Results : Not tested.



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WORK LEFT TO BE DONE

Hardware update:

- > Change the 12V power supply of the board by a 5V USB power supply
- > Change the RS232 port by a micro USB type b port
- > Add an input and output for a second CAM sensor
- > Remove the ACT input signal and have only one gnd pin per sensor

Software:

- > Clean the unused functions
- > Make all the functions compatible with a second CAM signal
- > Make the Jammer Box also signal generating box ?



OFF WE GO!