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**Milestone 2- Coding with NCS Expert**

**Idea #2**: Recode BMW car data to enable/disable different features. It can also expand further to create an environment for engine tuning.

**Milestone #2:** Enable/Disable factory Options as needed for educational/recreational purposes.

**Summary of Activities:**

In our previous milestone, we created an environment for tuning and diagnostics by installing essential tools such as INPA, NCSExpert, Ms4xFlasher, and TunerPro. Now, we will delve into BMW coding using NCSExpert, a straightforward program that enables reading, writing, and modifying configuration files in the vehicle’s electronic control unit (ECU) and its various modules. When you read an ECU using NCSExpert, it extracts a configuration file called FSW\_PSW.TRC, a trace file that contains the current coding settings for each scanned module. Examples of these modules include KOMBI (Instrument Cluster), CAS (Car Access System), and MRS (Multiple Restraint System), among others.

These modules can be accessed through NCSExpert, which outputs the trace file used to modify vehicle functions. For instance, you can add a digital speedometer to your instrument cluster, enable an upgraded comfort access system on a base model, or remove airbag settings in a racecar that no longer requires specific airbags. All these modifications are legitimate uses of NCSExpert. The only drawback is that the information read from a BMW’s ECU is written in German. Thus, prior knowledge of the specific parameters or the use of another tool, such as NCS Dummy, is helpful.

Once the preferred settings have been changed in the module's code, you will save the file and overwrite the .trc file into an FSW\_PSW.MAN file, which will then be exported back to NCSExpert for coding the vehicle. While these programs are normally used for recreational purposes, such as enabling features in your vehicle, there are concerns related to criminals using these modules to steal cars from dealerships. Once a criminal has access to a vehicle they are targeting, all they need to do is get a complete scan of the vehicles ECU, then come back with a coded key specific to the vehicle’s vin-number and steal the vehicle. This is becoming a serious concern in the car industry with new software being released completely streamlining this process using tools that can be purchased on amazon to efficiently clone keys to specific vin-numbers. This issue highlights the growing cybersecurity risks in modern vehicles, particularly as more software-based systems are implemented. It underscores the importance of securing access to diagnostic ports and ensuring that the software tools used for vehicle maintenance and coding are properly safeguarded while still allowing public use.

**Description of Learning Completed:**

* Open NCS Expert tool located in the BMW standard tools suite.

A screenshot of a computer

Description automatically generated

* Load the preconfigured profile to make coding easier by simplifying the coding process.
  + File > load profile > Revtor’s NCS Expert Profile

A screenshot of a computer

Description automatically generated

* Start (F1)
* Chassis > Select vehicle.

A screenshot of a computer

Description automatically generated

* Select ECU
* Back (F6)
* Process ECU > Select ECU Module

By default, it will read all the ECU modules, which is not ideal. We will select the correct module housing the code we wish to manipulate.

* Change the job to Reading coding data (CODIERDATEN\_LESEN) in german, this process extracts the current coding data associated with the selected ECU and stores the information in the trace file for editing.

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* Select Execute job.

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**Directory Search**

* Navigate to WORK folder in C: drive, C:\NCSEXPER\WORK to locate the trace file which we will be editing its code.

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Description automatically generated

* Open FSW\_PSW.TRC and locate the lines of code you wish to manipulate. (open trace file to edit and man file to write to ecu)

A screenshot of a computer program

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A screen shot of a computer

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* Use CTRL+F to find option to code.
* Change option from enabled (aktiv) to not enabled (nicht\_aktiv) or vice-versa as needed.
* File > Save as >Save as type: All files > Overwrite .MAN file.

A screenshot of a computer

Description automatically generated

**NCSDummy option**

* This same process can be enumerated in English using NCSDummy.

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Description automatically generated

* Similarly Select Chassis
* Select Module
* Browse> Select FSW\_FSW.TRC Trace File located at C:\NCSEXPER\WORK
* Locate coding options wanting to edit.

A close-up of a computer screen

Description automatically generated

* Simply enable options wanted.
* Export FSW/PSW > Export FSW\_PSW.MAN

**Back to NCS Expert.**

* Change Job to coding in NCS. (SG\_CODIEREN).
* Execute job.
* Once “coding ended” is shown job is complete and the vehicles settings have been updated via coding.

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