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Rolls-Royce Motor Cars Limited

# Integration Manual Vin

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|---|---|
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## Revision History

| Version | Date | Changed by | Description |
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| 3.5.0 | 2017-02-23 | Björn Sachsenberg | No changes - only version update |
| 3.4.2 | 2016-10-27 | Björn Sachsenberg | Add a note on NVM block length |
| 3.4.1 | 2016-08-25 | Björn Sachsenberg | Fix NVM configuration |
| 3.4.0 | 2016-03-17 | Björn Sachsenberg | Specify write frequency of NVM blocks, updated section Data Mapping |
| 3.3.0 | 2015-12-11 | Björn Sachsenberg | Clarified data mapping |
| 3.2.0 | 2015-07-10 | Björn Sachsenberg | Added SI adapter |
| 3.1.0 | 2015-03-13 | Björn Sachsenberg | Added SSV functionality |
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# 1 Introduction

## 1.1 General

For a general introduction to the BAC4 Platform Modules please refer to [1].

This document only describes topics related to the SWT BAC4 Module.

This Integration Manual describes the basis functionality, API and the configuration of the BMW system function VIN.

## 1.2 Functional overview

The Vin module is used to request the VIN over the bus, set the qualifier and hand it over to application software components.

# 2 Acronyms and Abbreviations

| | |
|---|---|
| A&S | Authentication and Signature (Grundschutzmechanismen) |
| AllgGB | Allgemeine Gültigkeitsbedingung |
| AN | Applikationsnummer |
| API | Application Programming Interface |
| AppGB | Applikationsspezifische Gültigkeitsbedingung |
| AUTOSAR | Automotive Open System Architecture |
| CA | Certification Authority |
| CAL | Cryptographic Abstraction Layer |
| CAS | Car Access System (Steuergerät) |
| CCC | Car Communication Computer |
| CKD | Completely Knocked Down. A BMW plant that is not connected to the central BMW IT. |
| CSM | Client Security Module |
| CRL | Certificate Revocation List |
| DEK | Data Encryption Key |
| DER | Distinguished Encoding Rules (As described by ASN.1) |
| DES | Data Encryption Standard |
| DN | Distinguished Name |
| DTC | Diagnostic Trouble Code -> Fehlercode des Fehlerspeichereintrages |
| ECU | Electronic Control Unit |
| FAT | Flash-Absicherungs-Tool |
| FSC | Freischaltcode |
| FSCS | Freischaltcode-Stelle |
| FZG | Fahrzeug |
| FZG-R | BMW Fahrzeug-Root-CA |
| GB | Gültigkeitsbedingung |

| | |
|---|---|
| GG | Gültigkeitsgruppe |
| GMT | Greenwich Mean Time |
| HO | Handelsorganisation (BMW) |
| HW | Hardware |
| M-FSCS | Master-Freischaltcodestelle |
| OS | Operating System |
| PKI | Public Key Infrastrucutre |
| RCn | Routine Control Option n / Exit Result n |
| RI | Routine Identifier |
| RSA | Asymmetric Cryptoalgorithm by Rivest, Shamir und Adleman |
| RTE | Runtime Environment |
| SG | Steuergerät |
| SGID | Steuergeräte-ID, Diagnoseadresse, Steuergeräte-Adresse |
| SID | Service Identifier |
| SigS | SW-Signatur-Stelle |
| SW | Software |
| SW-C | Software Component |
| SWID | Software-ID consisting of application number and upgrade index |
| SWT | SWEEPING Technologies (SoftWare Enabled Electronic Platform for Innovative Next Generation Technologies) |
| UDS | Universal Diagnostic Services |
| UI | Upgrade Index |
| UTC | Coordinated Universal Time |
| VCM | Vehicle Configuration Management |
| VIN | Vehicle Identification Number |
| VIN7 | The last 7 digits of the 17-digit VIN |

All abbreviations used throughout this document -- except the ones listed here -- can be found in the official AUTOSAR glossary [6].

# 3 Related documentation

## 3.1 BMW Specifications

[1] BAC4 General Concept for the Module Integration
BAC4_General_Concepts_for_the_Module_Integration.pdf

[2] Specification of Module DataLogistic
ModuleSpecification_Dlog.pdf

[3] Specification of Module FSCSM
ModuleSpecification_Fscsm.pdf

[4] Integration Manual FSCSM
IntegrationManual_Fscsm.pdf

[5] Specification of Module Vin
ModuleSpecification_Vin.pdf

## 3.2 AUTOSAR Specifications

[6] Glossary
AUTOSAR_TR_Glossary

[7] Specification of RTE Software
AUTOSAR_SWS_RTE

[8] Specification of NVRAM Manager
AUTOSAR_SWS_NVRAMManager

# 4 Limitations

Autosar 4.2.1 or later is required.

# 5 Software Architecture

## 5.1 Dependencies on AUTOSAR modules

### 5.1.1 RTE

The module Vin is realized as a software component and is using RTE services [7] for client/server as well as sender/receiver communication to communicate with other SWCs.

### 5.1.2 NvM

The NVRAM Manager [8] is used to store the last VIN and the SSV state.

## 5.2 Dependencies on BMW modules

### 5.2.1 Dlog

The Dlog module [2] is used to get the internal VIN.

### 5.2.2 Fscsm

The Fscsm module [3] is needed for receiving the secure VIN.

# 6 Integration

## 6.1 Configuration of other Modules

The following modules shall be configured, before the module Vin is compiled and linked.

### 6.1.1 Communication Stack

The communication stack shall be configured to provide the Vehicle Identification Number (VIN) message from the corresponding bus.

For $i \in \{1, \ldots, 7\}$ configure the signals

| | |
|---|---|
| Shortname (according to BMW BNE): | NO_VECH_<$i$> |
| ComBitPosition: | $8(i-1)$ |
| ComBitSize: | $8$ |
| ComSignalEndianness: | OPAQUE |
| ComSignalLength: | $1$ |
| ComSignalType: | UINT8_N |
| ComTransferProperty: | TRIGGERED |

**Note:** The Signals "NO_VECH_<$i$>" ($1 \leq i \leq 7$) have to be configured as a Signalgroup!

**Note:** In Ethernet, these signals are modeled as structure in the field `ChassisNumber` of the Service Interface `VehicleInformation`.

### 6.1.2 Nvm

Following NvM blocks shall be configured:

| **NVM_BLOCK_Vin** | |
|---|---|
| NvMBlockCrcType | NVM_CRC16 |
| NvMBlockHeaderInclude | Vin_NvM.h |
| NvMBlockManagementType | NVM_BLOCK_NATIVE |
| NvMBlockUseCrc | true |
| NvMBlockWriteProt | false |
| NvMExtraBlockChecks | true |
| NvMNvBlockLength | 8[1] |
| NvMNvBlockNum | 1 |
| NvMProvideRteServicePort | true |
| NvMRamBlockDataAddress | - |
| NvMResistantToChangedSw | true, if NvMDynamicConfiguration = true |
| NvMRomBlockDataAddress | &Vin_NVStateDefault |
| NvMRomBlockNum | 0 |

[1] block length might differ depending on the used compiler and compiler settings

| | |
|---|---|
| NvMSelectBlockForReadAll | false |
| NvMSelectBlockForWriteAll | false |
| NvMWriteBlockOnce | False |

**Write Frequency:** The block will be written every time a different VIN than the last VIN is received on the bus and once on switch to safe environment. In practice this means, it is written once in the plant and every time, the ECU is transferred into a different vehicle.

#### 6.1.3 Fscsm

For the secure VIN, FscsmActivateVerifyMessage shall be enabled in Fscsm, see [3, 4] for details.

### 6.2 Configuration

For a detailed description of the configuration parameters, please consult the Vin Software Specification [5].

### 6.3 Configuration of the RTE

#### 6.3.1 Assembly connectors

##### 6.3.1.1 Always

- <BSW-Servicename>* shall be connected with its corresponding BSW port.
- <Modulename><Portname> shall be connected with its corresponding <Portname> of the module <Modulename>.

##### 6.3.1.2 If SecureVin is configured

- SSVErrorCode shall be connected to the DEM Environment Data for the FscsmError, see [3, 4] for details.
- RandomNumberGenerator shall be connected to the corresponding Port of the Fscsm module.

#### 6.3.2 Event Mapping

All events must be mapped to the same or to non-preemptive tasks.

### 6.3.3 Data Mapping

#### 6.3.3.1 If EnableSIAdapter=false

For the R-Port ComVin, the data elements Vin_ComVinType/Vin<$i$> shall be mapped to the signals NO_VECH_<$i$> for $i \in \{1, \ldots, 7\}$.

For the P-Port VinRequest, the data element RequestMessageIdentifier shall be mapped to the signal ID_FN_INQY.

#### 6.3.3.2 If SecureVin is configured with EnableSIAdapter=false

For the P-Port SSVChallengeToSSS, the data element Challenge shall be mapped to the PDU SECU_CHAL as follows:

| | |
|---|---|
| SsvId | → SSV_IDENT_CHAL |
| SSssId | → SSS_IDENT_CHAL |
| Challenge | → SECU_CHAL |

For the R-Port SSVResponseFromSSS, the data element Response shall be mapped to the PDU SECU_RESP as follows:

| | |
|---|---|
| SsvId | → SSV_IDENT_RESP |
| CounterBase | → COU_BS_RESP |
| Signature | → STU_RESP |

For the R-Port SSVVinMacFromSSS, the data element Mac shall be mapped to the signal STU_8_BYTE.

#### 6.3.3.3 If EnableSIAdapter=true

The R-Port ComVin shall be connected to the corresponding P-Port of the VinSIAdapter SWC.

The P-Port VinRequest shall be connected to the corresponding R-Port of the VinSIAdapter SWC.

The R-Port ChassisNumberNotifier of the VinSIAdapter SWC shall be connected with the notifier of the Field ChassisNumber of the Service Interface VehicleInformation.

The R-Port ChassisNumber of the VinSIAdapter SWC shall be connected with the getter of the Field ChassisNumber of the Service Interface VehicleInformation.

#### 6.3.3.4 If SecureVin is configured with EnableSIAdapter=true

The P-Port SSVChallengeToSSS and the R-Ports SSVResponseFromSSS, SSVVinMacFromSSS shall be connected to the corresponding ports of the VinSIAdapter SWC.

The R-Port ChassisNumberAuthentication of the VinSIAdapter SWC shall be connected with the Service Interface ChassisNumberAuthentication.

### 6.3.4 Exclusive Areas

The exclusive area VinState shall be configured.

## 6.4 Software Integration

### 6.4.1 Startup/Initialisation

The INITIALIZED mode shall be requested.

### 6.4.2 Normal Operation

When the LifeCycle mode is in INITIALIZED, the RUNNING mode shall be requested.

### 6.4.3 Shutdown/Deactivation

The STOPPED mode shall be requested.