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1   Acronyms and abbreviations

Abbreviation / Acronym:	Description:
AT	Acceptance Test
ECU	Electronic Control Unit
IUT	Implementation Under Test
LT	Lower Tester
PDU	Protocol Data Unit
TS	Test System
UT	Upper Tester
CAN	Controller Area Network
NM	Network Management
PCO	Point of Control and Observation
Tx	Transmission
Rx	Reception
SWC	Software Component
SUT	System Under Test
CANFD	CAN with Flexible Data Rate
DUT	Device Under Test
SUT	System Under Test

2 Scope

The following test cases are used to verify the correct behavior of all the communication features on CANFD.

Each test case documents for which releases of the AUTOSAR software specification it can be used:

- When test cases are known to be applicable for a release, this is mentioned in the "AUTOSAR Releases" field of the test case specifications.
  You can find a summary of the applicability of all test cases to the software specification releases in the "AUTOSAR_TR_ATSReleaseApplicability" document.
- When test cases are known to require adaptations (in their configuration requirements or test sequences), this is mentioned in the "Needed Adaptation to other Releases" field of the test case specifications.

3 RS_BRF_01592 – Data Transfer

3.1 General Test Objective and Approach

This Test Specification intends to cover the Data Transfer feature of the Com as described in the AUTOSAR Feature [RS_BRF_01592].
The tests use a test bench environment and Embedded Software Components that use the feature.
This test case document has been established to cover the following features:
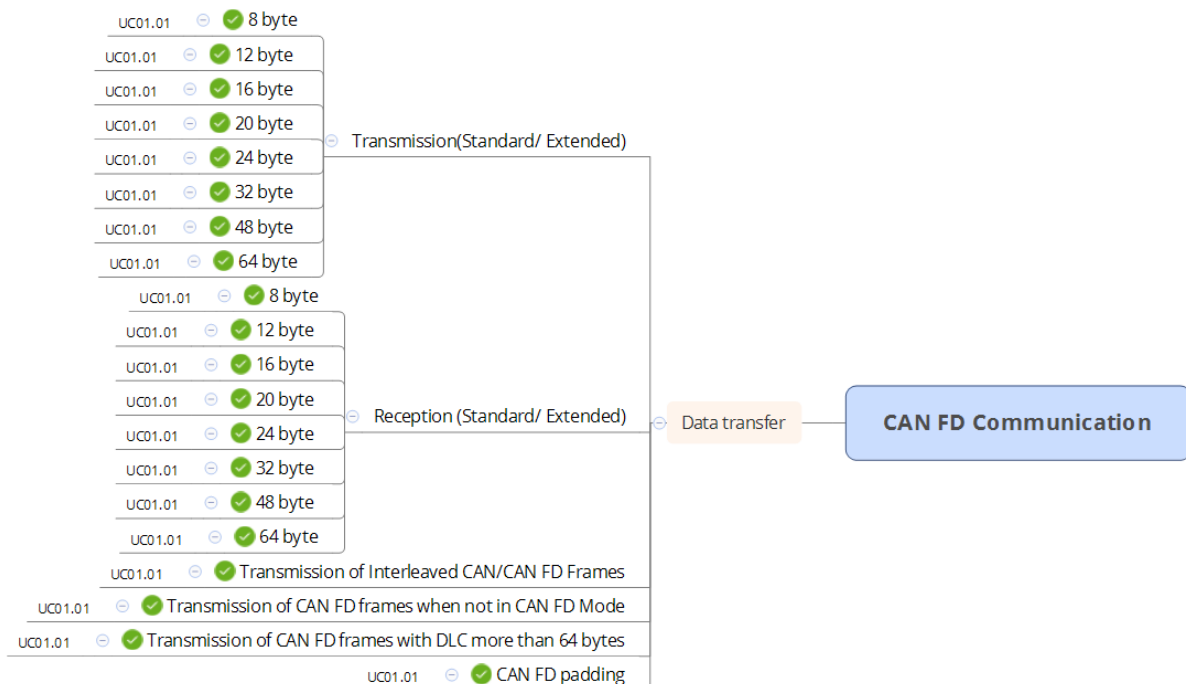
Fig A: Requirement on Data Transfer.

This specification gives the description of required tests environments (test bench, uses case, arxml files) and detailed tests cases for executing tests.

3.1.1 Test System

3.1.1.1 Overview on Architecture

In order to cover the required features / sub-features, the different uses cases are created.

3.1.1.1.1 Use case 01.01: CAN Bus

For this use case, the aim is to test the data transfer on CAN bus. In this architecture, COM focus will be on signals with 8 bytes, 12 bytes, 16 bytes, 20 bytes, 24 bytes, 32 bytes, 48 bytes and 64 bytes:
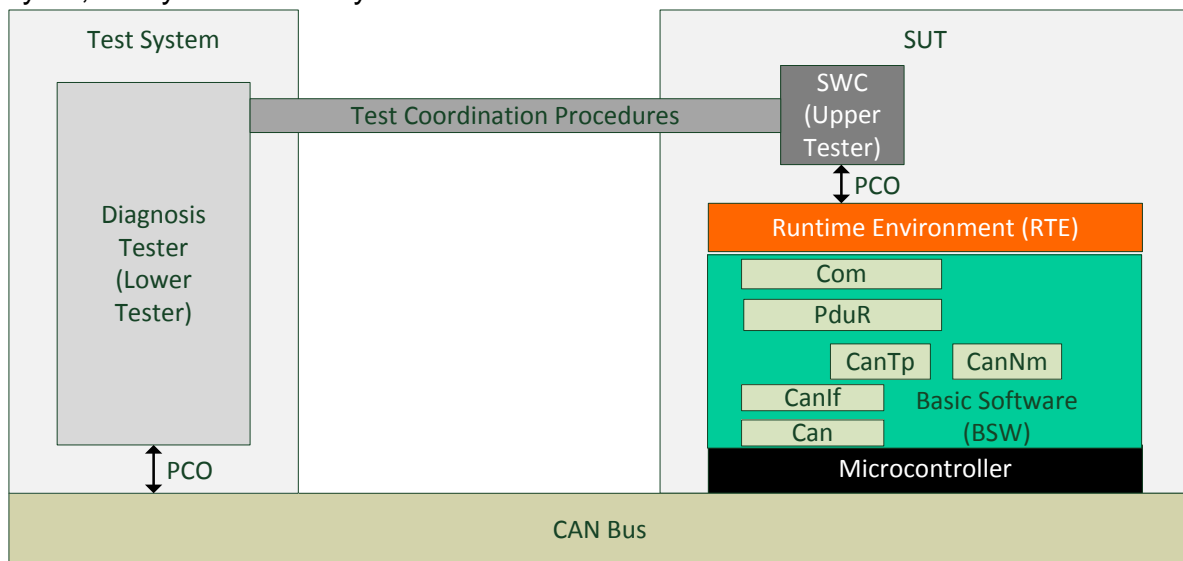
Fig B: Test System Architecture.

The test system architecture consists of Test Bench that executes only test sequencer and gives actions request through Test coordination Procedures to embedded SWC.

3.1.1.2 Specific Requirements

Not Applicable.

3.1.1.3 Test Coordination Requirements

Not Applicable.

3.1.2 Test Configuration

This section describes sets of requirements on configuration. These sets are later referenced by test cases. No configuration files are provided. They need to be developed when the test suite is implemented.

3.1.2.1 Generic Configuration Parameters for Can FD stack

CanControllerBaudRate = 500Kbps
CanControllerFdBaudRate = 5Mbps
CanControllerDefaultBaudRate = CanControllerBaudrateConfig
CanControllerTxBitRateSwitch = TRUE

3.1.2.2 Required ECU Extract of System Description Files

Fig C: SWC Overview.

A Mode-Switch Interface IF_AT_SwC_ActionsBswM must be created. The SWC Upper Tester should trigger BSW actions and BswM read the state through BswMMode Port. BswM shall launch actions according to following table:

ModeDeclaration	BswM Actions
IPDU_ACTIVATED	OnEntry: -StartIpduGroup

For the Software Component point of view, for each test case, the communication interfaces are defined as follow:

Port name	Data element type	Data element	Mapping	Type
<TestCaseName>_<SignalName>	uint8	<SignalName>	<SignalName>	Signal
<TestCaseName>_<SignalGroupName>	Struct { uint8: GroupSignal1; … uint8: GroupSignalx; }	GroupSignal	GroupSignal1-> <Signal1Name> GroupSignal2-> <Signal2Name> <PortName>-> <SignalGroupName>	Signal Group

Therefore ports and signals names change according to Test Case Name, but the building rule is the same.

3.1.2.2.1 Use Case 01.01: CAN Bus
The communication database is depicted below:

ComIPduGroup	I-Pdu	SignalGroup	Signal	Tx ECU	Rx ECU
AT_1011_IpduGroup	AT_1011_Ipdu		AT_1011_Sg1 to AT_1011_Sg8	SUT	TestBench
AT_1012_IpduGroup	AT_1012_Ipdu		AT_1012_Sg1 to AT_1012_Sg8	TestBench	SUT

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AT_1013_IpduGroup	AT_1013_Ipdu		AT_1013_Sg1 AT_1013_Sg2	SUT	TestBench
AT_1014_IpduGroup	AT_1014_Ipdu		AT_1014_Sg1 to AT_1014_Sg6	SUT	TestBench
AT_1015_IpduGroup	AT_1015_Ipdu		AT_1015_Sg1	SUT	TestBench
AT_1016_IpduGroup	AT_1016_Ipdu		AT_1016_Sg1	SUT	TestBench
AT_1017_IpduGroup	AT_1017_Ipdu		AT_1017_Sg1	SUT	TestBench
AT_1018_IpduGroup	AT_1018_Ipdu		AT_1018_Sg1	SUT	TestBench
AT_1019_IpduGroup	AT_1019_Ipdu		AT_1019_Sg1	SUT	TestBench
AT_1020_IpduGroup	AT_1020_Ipdu		AT_1020_Sg1 AT_1020_Sg2 AT_1020_Sg3	SUT	TestBench

3.1.2.3 Required ECU Configuration Description Files
The section describes the common EcuC parameters between test cases that are required by the implementer of the test cases.

No specific configuration requirements for ECU Configuration files as they can be derived from EcuExtract.

3.1.2.4 Required Software Component Description Files
The section describes the SWC-D that are required by the implementer of the test cases.

Refer to Fig C.

3.1.2.5 Mandatory vs. Customizable Parts
Mandatory parameters are listed in Tests Cases.

Customizable parameters are (these values are test case independent):
- ComSignalType (ISignal.networkRepresentationProps.swBaseType), ComSignalLength (baseTypeSize) and ComBitSize (ISignal.length) => must be consistent to associated dataElement
- ComSignalInitValue (ISignal.initValue)
- PduLength (Pdu.length)
- ComBitPosition (ISignalToIPduMapping.startPosition) and ComUpdateBitPosition (ISignalToIPduMapping.updateIndicationBitPosition) values => the location of these elements in the pdu
- CAN frames identifiers (Standard Id and Extended Id)

3.1.3 Test Case Design

Not Applicable.

3.2 Re-usable Test Steps

Not Applicable.

3.3 Test Cases

3.3.1 [ATS_COMCANFD_01011] Check the transmission of CAN FD frame for different payloads

Test Objective	Check the transmission of CAN FD frame for different payloads		
ID	ATS_COMCANFD_01011	**AUTOSAR Releases**	4.2.1|4.2.2
Affected Modules	CAN	**State**	reviewed
Trace to Requirement on Acceptance Test Document	ATR: ATR_ATR_00135		
Trace to SWS Item	CanDriver: SWS_Can_00416 CanDriver: SWS_CAN_00486		
Requirements / Reference to Test Environment	Use Case UC01.01		
Configuration Parameters	Sec 3.1.2.1 CanObjectType = TRANSMIT CanIfTxPduCanId = Standard CanId ComSignal = Sn1TC1-Sn8TC1		
Summary	Verify transmission of Standard CAN FD frame for different payloads (8, 12, 16, 20, 24, 32, 48 and 64 bytes)		
Needed Adaptation to other Releases			
Pre-conditions	DUT shall be initialized EcuM module shall be in RUN state ComM module shall be in FULL communication		
Main Test Execution			
Test Steps		**Pass Criteria**	
Step 1	[SWC] Trigger Explicit Inter RTE Write communication for a 8 byte CAN FD frame with signal AT_1011_Sg1	[SWC] The explicit inter RTE Write shall return successfully [LT] 8 byte CAN FD Frames shall be observed with the value on bus	
Step 2	[SWC] Trigger Explicit Inter RTE Write communication for a 12 byte CAN FD frame with signal AT_1011_Sg2	[SWC] The explicit inter RTE Write shall return successfully [LT] 12 byte CAN FD Frames shall be observed with the value on bus	

Step 3	[SWC] Trigger Explicit Inter RTE Write communication for a 16 byte CAN FD frame with signal AT_1011_Sg3	[SWC] The explicit inter RTE Write shall return successfully [LT] 16 byte CAN FD Frames shall be observed with the value on bus
Step 4	[SWC] Trigger Explicit Inter RTE Write communication for a 20 byte CAN FD frame with signal AT_1011_Sg4	[SWC] The explicit inter RTE Write shall return successfully [LT] 20 byte CAN FD Frames shall be observed with the value on bus
Step 5	[SWC] Trigger Explicit Inter RTE Write communication for a 24 byte CAN FD frame with signal AT_1011_Sg5	[SWC] The explicit inter RTE Write shall return successfully [LT] 24 byte CAN FD Frames shall be observed with the value on bus
Step 6	[SWC] Trigger Explicit Inter RTE Write communication for a 32 byte CAN FD frame with signal AT_1011_Sg6	[SWC] The explicit inter RTE Write shall return successfully [LT] 32 byte CAN FD Frames shall be observed with the value on bus
Step 7	[SWC] Trigger explicit inter RTE write communication for a 48 byte CAN FD frame with signal AT_1011_Sg7	[SWC] The explicit inter RTE write shall return successfully. [LT] 48 byte CAN FD frames shall be observed with value on the bus
Step 8	[SWC] Trigger Explicit Inter RTE Write communication for a 64 byte CAN FD frame with signal AT_1011_Sg8	[SWC] The explicit inter RTE Write shall return successfully [LT] 64 byte CAN FD Frames shall be observed with the value on bus
Post-	None	

conditions	

3.3.2 [ATS_COMCANFD_01012] Check the reception of CAN FD frame for different payloads

Test Objective	Check the reception of CAN FD frame for different payloads		
ID	ATS_COMCANFD_01012	**AUTOSAR Releases**	4.2.1|4.2.2
Affected Modules	CAN	**State**	reviewed
Trace to Requirement on Acceptance Test Document	ATR: ATR_ATR_00135		
Trace to SWS Item	CanDriver: SWS_Can_00416 CanDriver: SWS_CAN_00501		
Requirements / Reference to Test Environment	Use Case UC01.01		
Configuration Parameters	Sec 3.1.2.1 CanObjectType = RECEIVE CanIfRxPduCanId = Standard CanId ComSignal = Sn1TC2-Sn8TC2 ComNotification = Rte_COMCbk_ Sn1TC2-- Rte_COMCbk_ Sn8TC2		
Summary	To receive CAN FD frame with flexible data rate.		
Needed Adaptation to other Releases			
Pre-conditions	DUT shall be initialized EcuM module shall be in RUN state ComM module shall be in FULL communication		
Main Test Execution			
Test Steps		**Pass Criteria**	
Step 1	[LT] Transmit a frame with a payload 8 bytes and valid Standard Can-Id to the DUT from the Tester	[SWC] Com notification for the configured signal shall be invoked	
Step 2	[SWC] Application to request Explicit Inter RTE Read communication for a signal	[SWC] Data shall be updated in the buffer	
Step 3	[LT] Transmit a frame with a payload 12 bytes and valid Standard Can-Id to the DUT from the Tester	[SWC] Com notification for the configured signal shall be invoked	
Step 4	[SWC] Application to request Explicit Inter RTE	[SWC] Data shall be updated in the buffer	

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	Read communication for a signal	
Step 5	[LT] Transmit a frame with a payload 16 bytes and valid Standard Can-Id to the DUT from the Tester	[SWC] Com notification for the configured signal shall be invoked
Step 6	[SWC] Application to request Explicit Inter RTE Read communication for a signal	[SWC] Data shall be updated in the buffer
Step 7	[LT] Transmit a frame with a payload 20 bytes and valid Standard Can-Id to the DUT from the Tester	[SWC] Com notification for the configured signal shall be invoked
Step 8	[SWC] Application to request Explicit Inter RTE Read communication for a signal	[SWC] Data shall be updated in the buffer
Step 9	[LT] Transmit a frame with a payload 24 bytes and valid Standard Can-Id to the DUT from the Tester	[SWC] Com notification for the configured signal shall be invoked
Step 10	[SWC] Application to request Explicit Inter RTE Read communication for a signal	[SWC] Data shall be updated in the buffer
Step 11	[LT] Transmit a frame with a payload 32 bytes and valid Standard Can-Id to the DUT from the Tester	[SWC] Com notification for the configured signal shall be invoked
Step 12	[SWC] Application to request Explicit Inter RTE Read communication for a signal	[SWC] Data shall be updated in the buffer
Step 13	[LT] Transmit a frame with a payload 48 bytes and valid Standard Can-Id to the DUT from the Tester	[SWC] Com notification for the configured signal shall be invoked
Step 14	[SWC] Application to request Explicit Inter RTE Read communication for a signal	[SWC] Data shall be updated in the buffer
Step 15	[LT] Transmit a frame with a payload 64 bytes and valid Standard Can-Id to the DUT from the Tester	[SWC] Com notification for the configured signal shall be invoked
Step 16	[SWC] Application to request Explicit Inter RTE	[SWC] Data shall be updated in the buffer

	Read communication for a signal	
Post-conditions	None	

3.3.3 [ATS_COMCANFD_01013] Test the transmission of interleaved conventional CAN2.0 messages with CAN FD messages

Test Objective	Test the transmission of interleaved conventional CAN2.0 messages with CAN FD messages		
ID	ATS_COMCANFD_01013	**AUTOSAR Releases**	4.2.1|4.2.2
Affected Modules	CAN	**State**	reviewed
Trace to Requirement on Acceptance Test Document	ATR: ATR_ATR_00135		
Trace to SWS Item	CanDriver: SWS_Can_00416		
Requirements / Reference to Test Environment	Use Case UC01.01		
Configuration Parameters	Sec 3.1.2.1 CanObjectType = TRANSMIT CanIfTxPduCanId = Standard CanId1 CanIfTxPduCanId = Standard CanId2 ComSignal = Sn1TC3 ComSignal = Sn2TC3 CanIfTxPduCanIdType = STANDARD_CAN CanIfTxPduCanIdType = STANDARD_FD_CAN		
Summary	Transmitting Can FD message from application and then sending conventional CAN 2.0 message and again transmitting Can FD message.		
Needed Adaptation to other Releases			
Pre-conditions	DUT shall be initialized EcuM module shall be in RUN state ComM module shall be in FULL communication		
Main Test Execution			
Test Steps		**Pass Criteria**	
Step 1	[SWC] Trigger Explicit Inter RTE Write communication for a 8 byte CAN FD frame with signal AT_1013_Sg1	[SWC] The explicit inter RTE Write shall return successfully [LT] CAN FD frame shall be observed with the value on bus	

Step 2	[SWC] Trigger Explicit Inter RTE Write communication for a 8 byte conventional CAN 2.0 frame with signal AT_1013_Sg2	[SWC] The explicit inter RTE Write shall return successfully [LT] Conventional CAN 2.0 frame shall be observed with the value on bus
Step 3	[SWC] Trigger Explicit Inter RTE Write communication for a 8 byte CAN FD frame with signal AT_1013_Sg1	[SWC] The explicit inter RTE Write shall return successfully [LT] CAN FD frame shall be observed with the value on bus
Post-conditions	None	

3.3.4 [ATS_COMCANFD_01014] Validate transmission and reception of Extended CAN FD Id configuration

Test Objective	Validate transmission and reception of Extended CAN FD Id configuration		
ID	ATS_COMCANFD_01014	AUTOSAR Releases	4.2.1|4.2.2
Affected Modules	CAN	State	reviewed
Trace to Requirement on Acceptance Test Document	ATR: ATR_ATR_00135		
Trace to SWS Item	CanDriver: SWS_Can_00416 CanDriver: SWS_CAN_00486		
Requirements / Reference to Test Environment	Use Case UC01.01		
Configuration Parameters	Sec 3.1.2.1 CanObjectType = TRANSMIT CanObjectType = RECEIVE CanIfTxPduCanId = Extended CanId CanIfRxPduCanId = Extended CanId ComSignal = Sn1TC4-Sn6TC4 ComNotification = Rte_COMCbk_ Sn4TC4--Rte_COMCbk_ Sn6TC4		
Summary	Transmitting CAN FD frame which will switch to higher baud rate during payload or CRC and reception of CAN FD frame with extended CAN FD data identifier		
Needed Adaptation to other Releases			

Pre-conditions	DUT shall be initialized EcuM module shall be in RUN state ComM module shall be in FULL communication	
Main Test Execution		
Test Steps		**Pass Criteria**
Step 1	**Transmission**: [SWC] Trigger Explicit Inter RTE Write communication for a 8 byte CAN FD frame with signal AT_1014_Sg1	[SWC] The explicit inter RTE Write shall return successfully [LT] Extended CAN FD frames shall be observed with the value on bus
Step 2	[SWC] Trigger Explicit Inter RTE Write communication for a 32 byte CAN FD frame with signal AT_1014_Sg2	[SWC] The explicit inter RTE Write shall return successfully [LT] Extended CAN FD frames shall be observed with the value on bus
Step 3	[SWC] Trigger Explicit Inter RTE Write communication for a 64 byte CAN FD frame with signal AT_1014_Sg3	[SWC] The explicit inter RTE Write shall return successfully [LT] Extended CAN FD frames shall be observed with the value on bus
Step 4	**Reception**: [LT] Transmit a frame with a payload 8 bytes and valid Extended Can-Id to the DUT from the Tester	[SWC] Com notification for the configured signal shall be invoked
Step 5	[SWC] Application to request Explicit Inter RTE Read communication for a signal	[SWC] Data shall be updated
Step 6	[LT] Transmit a frame with a payload 32 bytes and valid Extended Can-Id to the DUT from the Tester	[SWC] Com notification for the configured signal shall be invoked
Step 7	[SWC] Application to request Explicit Inter RTE Read communication for a signal	[SWC] Data shall be updated
Step 8	[LT]	[SWC]

	Transmit a frame with a payload 64 bytes and valid Extended Can-Id to the DUT from the Tester	Com notification for the configured signal shall be invoked
Step 9	[SWC] Application to request Explicit Inter RTE Read communication for a signal	[SWC] Data shall be updated
Post-conditions	None	

3.3.5 [ATS_COMCANFD_01015] Transmission of CAN FD frames when CAN controller is not in CAN FD mode and PDU length less than or equal to 8 bytes

Test Objective	Transmission of CAN FD frames when CAN controller is not in CAN FD mode and PDU length less than or equal to 8 bytes		
ID	ATS_COMCANFD_01015	AUTOSAR Releases	4.2.1|4.2.2
Affected Modules	CAN	State	reviewed
Trace to Requirement on Acceptance Test Document	ATR: ATR_ATR_00135		
Trace to SWS Item	CanDriver: SWS_Can_00218		
Requirements / Reference to Test Environment	Use Case UC01.01		
Configuration Parameters	Sec 3.1.2.1 CanObjectType = TRANSMIT CanIfTxPduCanId = Standard CanId ComSignal = SnTC5 CanIfTxPduCanIdType = STANDARD_FD_CAN		
Summary	When Can Controller is not in CAN FD mode and If there is a request to transmit a CAN FD frame, the frame is sent as conventional CAN frame as long as the PDU length <= 8 bytes.		
Needed Adaptation to other Releases			
Pre-conditions	DUT shall be initialized EcuM module shall be in RUN state ComM module shall be in FULL communication		
Main Test Execution			
Test Steps		Pass Criteria	
Step 1	[SWC] Trigger Explicit Inter RTE Write communication for a signal AT_1015_Sg1, to transmit a CANFD frame with payload of 8	[SWC] The explicit inter RTE Write shall return successfully	

| | bytes | [LT]

Conventional CAN frame shall be observed with the value on bus |
|---|---|---|
| Post-conditions | None | |

3.3.6 [ATS_COMCANFD_01016] Transmission of CAN FD frames when CAN controller is not in CAN FD mode and PDU length is greater than 8 bytes

Test Objective	Transmission of CAN FD frames when CAN controller is not in CAN FD mode and PDU length is greater than 8 bytes		
ID	ATS_COMCANFD_01016	AUTOSAR Releases	4.2.1|4.2.2
Affected Modules	CAN	State	reviewed
Trace to Requirement on Acceptance Test Document	ATR: ATR_ATR_00135		
Trace to SWS Item	CanDriver: SWS_Can_00218		
Requirements / Reference to Test Environment	Use Case UC01.01		
Configuration Parameters	Sec 3.1.2.1 CanObjectType = TRANSMIT CanIfTxPduCanId = Standard CanId ComSignal = SnTC6 CanIfTxPduCanIdType = STANDARD_FD_CAN Do not configure CanControllerFdBaudrateConfig		
Summary	When there is a request to transmit a CAN FD frame with Pdu length more than 8 bytes and Can Controller is not in CAN FD mode, the frame shall not be transmitted.		
Needed Adaptation to other Releases			
Pre-conditions	DUT shall be initialized EcuM module shall be in RUN state ComM module shall be in FULL communication		
Main Test Execution			
Test Steps		Pass Criteria	
Step 1	[SWC]

Trigger Explicit Inter RTE Write communication for a 10 byte CAN FD frame with signal AT_1016_Sg1 | [SWC]

The explicit inter RTE Write shall return successfully

[LT]

No CAN FD frame shall be observed | |

		on bus
		[SWC]
		Transmission confirmation for the configured signal shall not be invoked
Post-conditions	None	

3.3.7 [ATS_COMCANFD_01017] Check the behavior of CAN controller when there is a request for the transmission and the DLC length is more than 64 bytes

Test Objective	Check the behavior of CAN controller when there is a request for the transmission and the DLC length is more than 64 bytes		
ID	ATS_COMCANFD_01017	**AUTOSAR Releases**	4.2.1|4.2.2
Affected Modules	CAN	**State**	reviewed
Trace to Requirement on Acceptance Test Document	ATR: ATR_ATR_00135		
Trace to SWS Item	CanDriver: SWS_Can_00218 CANInterface: SWS_CANIF_00893		
Requirements / Reference to Test Environment	Use Case UC01.01		
Configuration Parameters	Sec 3.1.2.1 CanObjectType = TRANSMIT CanIfTxPduCanId = Standard CanId ComSignal = SnTC7 CanIfTxPduCanIdType = STANDARD_FD_CAN		
Summary	When there is a request to transmit a CAN FD frame and payload of frame is greater than 64 bytes, the frame shall not be transmitted.		
Needed Adaptation to other Releases			
Pre-conditions	DUT shall be initialized EcuM module shall be in RUN state ComM module shall be in FULL communication		
Main Test Execution			
Test Steps		**Pass Criteria**	
Step 1	[SWC] Trigger Explicit Inter RTE Write communication for a 70 byte CAN FD frame with signal AT_1017_Sg1	[SWC] The explicit inter RTE Write shall return successfully	

		[LT] No CAN FD frame shall be observed on bus [SWC] Transmission confirmation for the configured signal shall not be invoked
Post-conditions	None	

3.3.8 [ATS_COMCANFD_01018] Verify CAN FD padding for unspecified data if data length > 8 bytes

Test Objective	Verify CAN FD padding for unspecified data if data length > 8 bytes		
ID	ATS_COMCANFD_01018	AUTOSAR Releases	4.2.1|4.2.2
Affected Modules	CAN	State	reviewed
Trace to Requirement on Acceptance Test Document	ATR: ATR_ATR_00135 ATR: ATR_ATR_00136		
Trace to SWS Item	CanDriver: SWS_CAN_00502		
Requirements / Reference to Test Environment	Use Case UC01.01		
Configuration Parameters	Sec 3.1.2.1 CanObjectType = TRANSMIT CanIfTxPduCanId = Standard CanId ComSignal = SnTC8 CanIfTxPduCanIdType = STANDARD_FD_CAN CanFdPaddingValue = AA		
Summary	When there is a request to transmit a CAN FD frame with Pdu length more than 8 bytes & If PduInfo->SduLength does not match possible DLC values then CanDrv shall use the next higher valid DLC for transmission with initialization of unused bytes to the value of the corresponding configured CanFdPaddingValue.		
Needed Adaptation to other Releases			
Pre-conditions	DUT shall be initialized EcuM module shall be in RUN state ComM module shall be in FULL communication		
Main Test Execution			
Test Steps		Pass Criteria	

| Step 1 | [SWC]

Trigger Explicit Inter RTE Write communication for a signal AT_1018_Sg1 to transmit a CAN FD frame with payload of 10 bytes | [SWC]

The explicit inter RTE Write shall return successfully

[LT]

CAN FD frame with padding bytes shall be observed on bus |
| Post-conditions | None | |

3.3.9 [ATS_COMCANFD_01019] Behaviour of CANIF when SDU length passed exceeds the maximum length of the PDU referenced by CANIFTXSDUID

Test Objective	Behaviour of CANIF when SDU length passed exceeds the maximum length of the PDU referenced by CANIFTXSDUID		
ID	ATS_COMCANFD_01019	AUTOSAR Releases	4.2.1|4.2.2
Affected Modules	CANIF	State	reviewed
Trace to Requirement on Acceptance Test Document	ATR: ATR_ATR_00135		
Trace to SWS Item	CANInterface: SWS_CANIF_00893 CANInterface: SWS_CANIF_00894		
Requirements / Reference to Test Environment	Use Case UC01.01		
Configuration Parameters	Sec 3.1.2.1 CanObjectType = TRANSMIT CanIfTxPduCanId = Standard CanId ComSignal = SnTC9 CanIfTxPduCanIdType = STANDARD_FD_CAN CanIfTxPduType = STATIC		
Summary	When there is a request to transmit a CAN FD frame with Pdu length more than 64 bytes, CanIf shall transmit as much data as possible and discard the rest .		
Needed Adaptation to other Releases			
Pre-conditions	DUT shall be initialized EcuM module shall be in RUN state ComM module shall be in FULL communication		
Main Test Execution			
Test Steps		Pass Criteria	
Step 1	[SWC] Trigger Explicit Inter RTE Write communication for a signal AT_1019_Sg1	[SWC] The explicit inter RTE Write shall	

	which supposed to transmit a CAN FD frame with payload of 70 bytes	return successfully [LT] CAN FD frame with 64 bytes shall be observed on bus. (Remaining 6 bytes discard by the CanIf module)
Post-conditions	None	

3.3.10 [ATS_COMCANFD_01020] Validate transmitting frame as CAN FD or conventional CAN 2.0 frame based on the configured CANIFTXPDUCANIDTYPE

Test Objective	Validate transmitting frame as CAN FD or conventional CAN 2.0 frame based on the configured CANIFTXPDUCANIDTYPE		
ID	ATS_COMCANFD_01020	AUTOSAR Releases	4.2.1|4.2.2
Affected Modules	CANIF	State	reviewed
Trace to Requirement on Acceptance Test Document	ATR: ATR_ATR_00135		
Trace to SWS Item			
Requirements / Reference to Test Environment	Use Case UC01.01		
Configuration Parameters	Sec 3.1.2.1 CanObjectType = TRANSMIT CanIfTxPduCanId = Standard CanId CanIfTxPduCanId = Extended CanId CanIfTxPduCanId = Standard CanId ComSignal = Sn1TC10 ComSignal = Sn2TC10 ComSignal = Sn3TC10 CanIfTxPduCanIdType = STANDARD_FD_CAN CanIfTxPduCanIdType = EXTENDED_FD_CAN CanIfTxPduCanIdType = STANDARD_CAN CanIfTxPduType = STATIC		
Summary	Whether to transmit a frame as CAN FD or conventional CAN 2.0 frame depends on the configuration parameter CanIfTxPduCanIdType.		
Needed Adaptation to other Releases			
Pre-conditions	DUT shall be initialized EcuM module shall be in RUN state ComM module shall be in FULL communication		

Main Test Execution		
Test Steps		**Pass Criteria**
Step 1	[SWC] Trigger Explicit Inter RTE Write communication for a signal AT_1020_Sg1 which transmit a standard CAN FD frame	[SWC] The explicit inter RTE Write shall return successfully [LT] Standard CAN FD frame shall be observed with the value on bus
Step 2	[SWC] Trigger Explicit Inter RTE Write communication for a signal AT_1020_Sg2 which transmit an extended CAN FD frame	[SWC] The explicit inter RTE Write shall return successfully [LT] Extended CAN FD frame shall be observed with the value on bus
Step 3	[SWC] Trigger Explicit Inter RTE Write communication for a signal AT_1020_Sg3 which transmit an standard CAN frame	[SWC] The explicit inter RTE Write shall return successfully [LT] Standard CAN frame shall be observed with the value on bus
Post-conditions	None	

4 RS_BRF_01648 – Large Data Type

4.1 General Test Objective and Approach

This Test Specification intends to cover the communication transfer of data sizes larger than the maximum transmission unit of the underlying bus as described in the AUTOSAR Feature [RS_BRF_01648].
The tests use a test bench environment and Embedded Software Components that use the feature.
This test case document has been established to cover the following features:
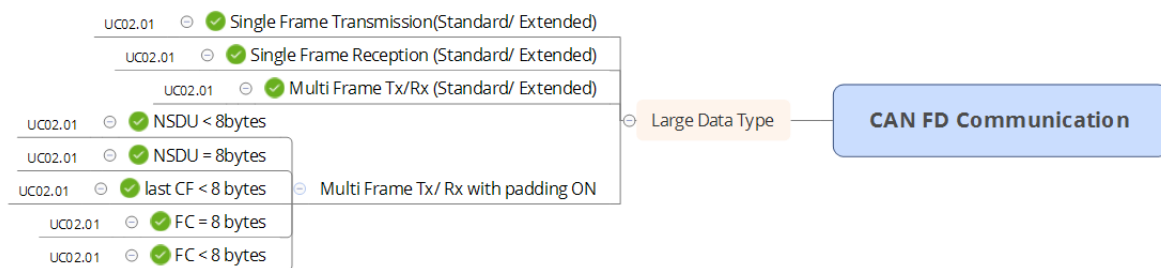
Fig D: Requirement on Large Data Type.

This specification gives the description of required tests environments (test bench, uses case, arxml files) and detailed tests cases for executing tests.

4.1.1 Test System

4.1.1.1 Overview on Architecture

In order to cover the required features / sub-features, the different uses cases are created.

4.1.1.1.1 Use case 02.01: CAN Bus

For this use case, the aim is to test the large data transfer on CAN bus. In this architecture, COM focus will be on signals with data larger than 64 bytes:
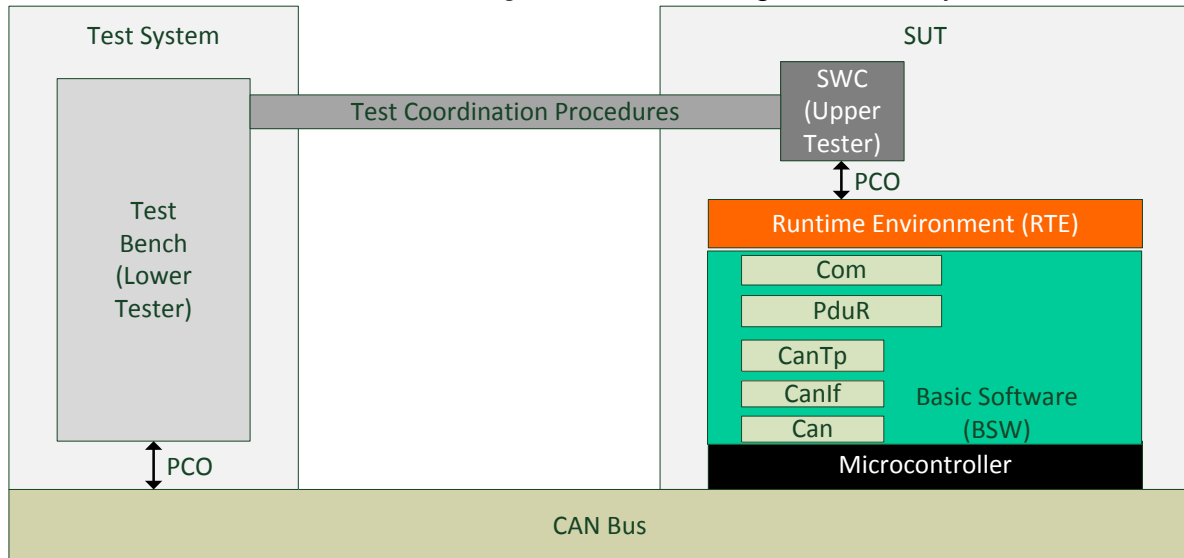
Fig E: Test System Architecture.

The test system architecture consists of Test Bench that executes only test sequencer and gives actions request through Test coordination Procedures to embedded SWC.

4.1.1.2 Specific Requirements
Not Applicable.

4.1.1.3 Test Coordination Requirements
Not Applicable.

4.1.2 Test Configuration

This section describes sets of requirements on configuration. These sets are later referenced by test cases. No configuration files are provided. They need to be developed when the test suite is implemented.

4.1.2.1 Generic Configuration Parameters for Can FD stack

CanControllerBaudRate = 500Kbps
CanControllerFdBaudRate = 5Mbps
CanControllerDefaultBaudRate = CanControllerBaudrateConfig
CanControllerTxBitRateSwitch = TRUE

4.1.2.2 Required ECU Extract of System Description Files

Fig F: SWC Overview.

A Mode-Switch Interface IF_AT_SwC_ActionsBswM must be created. The SWC Upper Tester should trigger BSW actions and BswM read the state through BswMMode Port. BswM shall launch actions according to following table:

ModeDeclaration	BswM Actions
IPDU_ACTIVATED	OnEntry: -StartIpduGroup

For the Software Component point of view, for each test case, the communication interfaces are defined as follow:

Port name	Data element type	Data element	Mapping	Type
<TestCaseName>_<SignalName>	uint8	<SignalName>	<SignalName>	Signal

<TestCaseName>_<SignalGroupName>	Struct
	{
	uint8:
	GroupSignal1;
	…
	uint8:
	GroupSignalx;
	}
		GroupSignal	GroupSignal1->
			<Signal1Name>
			GroupSignal2->
			<Signal2Name>
			<PortName>->
			<SignalGroupName>
				Signal
				Group

Therefore ports and signals names change according to Test Case Name, but the building rule is the same.

4.1.2.2.1 Use Case 01.01: CAN Bus

The communication database is depicted below:

ComIPduGroup	I-Pdu	SignalGroup	Signal	Tx ECU	Rx ECU
AT_1021_IpduGroup	AT_1021_Ipdu		AT_1021_Sg1 AT_1021_Sg2	SUT	TestBench
AT_1022_IpduGroup	AT_1022_Ipdu		AT_1022_Sg1 AT_1022_Sg2	SUT	TestBench

AT_1023_IpduGroup	AT_1023_Ipdu		AT_1023_Sg1	SUT	TestBench
AT_1024_IpduGroup	AT_1024_Ipdu		AT_1024_Sg1	SUT	TestBench
AT_1025_IpduGroup	AT_1025_Ipdu		AT_1025_Sg1	TestBench	SUT
AT_1026_IpduGroup	AT_1026_Ipdu		AT_1026_Sg1	TestBench	SUT
AT_1027_IpduGroup	AT_1027_Ipdu		AT_1027_Sg1	TestBench	SUT
AT_1028_IpduGroup	AT_1028_Ipdu		AT_1028_Sg1	TestBench	SUT
AT_1029_IpduGroup	AT_1029_Ipdu		AT_1029_Sg1	SUT	TestBench
AT_1030_IpduGroup	AT_1030_Ipdu		AT_1030_Sg1	SUT	TestBench
AT_1031_IpduGroup	AT_1031_Ipdu		AT_1031_Sg1	SUT	TestBench

4.1.2.3 Required ECU Configuration Description Files
The section describes the common EcuC parameters between test cases that are required by the implementer of the test cases.

No specific configuration requirements for ECU Configuration files as they can be derived from EcuExtract.

4.1.2.4 Required Software Component Description Files
The section describes the SWC-D that are required by the implementer of the test cases.

Refer to Fig F.

4.1.2.5 Mandatory vs. Customizable Parts
Mandatory parameters are listed in Tests Cases.

Customizable parameters are (these values are test case independent):
- ComSignalType (ISignal.networkRepresentationProps.swBaseType), ComSignalLength (baseTypeSize) and ComBitSize (ISignal.length) => must be consistent to associated dataElement
- ComSignalInitValue (ISignal.initValue)
- PduLength (Pdu.length)
- ComBitPosition (ISignalToIPduMapping.startPosition) and ComUpdateBitPosition (ISignalToIPduMapping.updateIndicationBitPosition) values => the location of these elements in the pdu
- CAN frames identifiers (Standard Id and Extended Id)

4.1.3 Test Case Design

Not Applicable.

4.2 Re-usable Test Steps

Not Applicable.

4.3 Test Cases

4.3.1 [ATS_COMCANFD_01021] Transmission of the single CAN FD frame and notification for PDU transfer using Standard Addressing Format

Test Objective	Transmission of the single CAN FD frame and notification for PDU transfer using Standard Addressing Format		
ID	ATS_COMCANFD_01021	**AUTOSAR Releases**	4.2.1|4.2.2
Affected Modules	CANTP	**State**	reviewed
Trace to Requirement on Acceptance Test Document	ATR: ATR_ATR_00135 ATR: ATR_ATR_00136		
Trace to SWS Item	CANTransportLayer: SWS_CanTp_00177 CANTransportLayer: SWS_CanTp_00231 CANTransportLayer: SWS_CanTp_00204 CANTransportLayer: SWS_CanTp_00348		
Requirements / Reference to Test Environment	Use Case UC02.01		
Configuration Parameters	Sec 4.1.2.1 CanTpFlexibleDataRateSupport = TRUE CanTpTxAddressingFormat = CANTP_STANDARD CanTpNas = 0.1 sec CanTpNcs = NA CanTpNbs = 0.1 sec CanTpTxPaddingActivation = CANTP_ON CanTpPaddingByte = 0xFF		
Summary	Transmit data having the data length less than 64 bytes from the application. This is an indirect testing for the transmission confirmation, the Com notification will be given to the application about the transmission of the signal.		
Needed Adaptation to other Releases			
Pre-conditions	DUT shall be initialized EcuM module shall be in RUN state ComM module shall be in FULL communication		
Main Test Execution			
Test Steps		**Pass Criteria**	
Step 1	[SWC] Trigger Explicit Inter RTE Write communication for a 4 byte CAN FD frame with signal AT_1021_Sg1 and Standard CanId	[SWC] Data passed to communication service successfully [LT] CAN FD frame shall be observed with the value on bus [SWC]	

		Transmission confirmation for the configured signal shall be invoked
Step 2	[SWC] Trigger Explicit Inter RTE Write communication for a 10 byte CAN FD frame with signal AT_1021_Sg2 and Standard CanId	[SWC] Data passed to communication service successfully [LT] CAN FD frame shall be observed with the value on bus [SWC] Transmission confirmation for the configured signal shall be invoked
Post-conditions	None	

4.3.2 [ATS_COMCANFD_01022] Transmission of the single CAN FD frame and notification for PDU transfer using Extended Addressing Format

Test Objective	Transmission of the single CAN FD frame and notification for PDU transfer using Extended Addressing Format		
ID	ATS_COMCANFD_01022	AUTOSAR Releases	4.2.1|4.2.2
Affected Modules	CANTP	State	reviewed
Trace to Requirement on Acceptance Test Document	ATR: ATR_ATR_00135		
Trace to SWS Item	CANTransportLayer: SWS_CanTp_00177 CANTransportLayer: SWS_CanTp_00231 CANTransportLayer: SWS_CanTp_00204		
Requirements / Reference to Test Environment	Use Case UC02.01		
Configuration Parameters	Sec 4.1.2.1 CanTpFlexibleDataRateSupport = TRUE CanTpTxAddressingFormat = CANTP_EXTENDED CanTpNTa = 0x34 CanTpNas = 0.1 sec CanTpNcs = NA CanTpNbs = 0.1 sec		
Summary	Transmit data having the data length less than 64 bytes from the application. This is an indirect testing for the transmission confirmation, the Com notification will be given to the application about the transmission of the signal.		
Needed Adaptation to other Releases			

Pre-conditions	DUT shall be initialized EcuM module shall be in RUN state ComM module shall be in FULL communication	
Main Test Execution		
Test Steps		**Pass Criteria**
Step 1	[SWC] Trigger Explicit Inter RTE Write communication for a 4 byte CAN FD frame with signal AT_1022_Sg1 and Extended CanId	[SWC] Data passed to communication Service successfully [LT] Extended CAN FD frame shall be observed with the value on bus [SWC] Transmission confirmation for the configured signal shall be invoked
Step 2	[SWC] Trigger Explicit Inter RTE Write communication for a 20 byte CAN FD frame with signal AT_1022_Sg2 and Extended CanId	[SWC] Data passed to communication Service successfully [LT] Extended CAN FD frame shall be observed with the value on bus [SWC] Transmission confirmation for the configured signal shall be invoked
Post-conditions	None	

4.3.3 [ATS_COMCANFD_01023] Transmission of the multiple CAN FD frames and notification for PDU transfer using Standard Addressing Format

Test Objective	Transmission of the multiple CAN FD frames and notification for PDU transfer using Standard Addressing Format		
ID	ATS_COMCANFD_01023	**AUTOSAR Releases**	4.2.1|4.2.2
Affected Modules	CANTP	**State**	reviewed
Trace to Requirement on Acceptance Test Document	ATR: ATR_ATR_00135		
Trace to SWS Item	CANTransportLayer: SWS_CanTp_00177 CANTransportLayer: SWS_CanTp_00232		

	CANTransportLayer: SWS_CanTp_00204	
Requirements / Reference to Test Environment	Use Case UC02.01	
Configuration Parameters	Sec 4.1.2.1 CanTpFlexibleDataRateSupport = TRUE CanTpTxAddressingFormat = CANTP_STANDARD CanTpNas = 0.1 sec CanTpNcs = NA CanTpNbs = 0.1 sec	
Summary	To transmit data having the data length more than 64 bytes from the application. This is an indirect testing for the transmission confirmation, the Com notification will be given to the application about the transmission of the signal.	
Needed Adaptation to other Releases		
Pre-conditions	DUT shall be initialized EcuM module shall be in RUN state ComM module shall be in FULL communication	
Main Test Execution		
Test Steps		**Pass Criteria**
Step 1	[SWC] Trigger Explicit Inter RTE Write communication for a 70 bytes CAN FD frame with signal AT_1023_Sg1 and Standard CanId	[SWC] Data passed to communication Service successfully [LT] First Frame shall be observed with the value on bus Flow Control frame with expected value to be received by the DUT
Step 2		[LT] Consecutive Frames shall be observed with the value on bus [SWC] Transmission confirmation for the configured signal shall be invoked
Post-conditions	None	

4.3.4 [ATS_COMCANFD_01024] Transmission of the multiple CAN FD frames and notification for PDU transfer using Extended Addressing Format

Test Objective	Transmission of the multiple CAN FD frames and notification for PDU transfer using Extended Addressing Format

ID	ATS_COMCANFD_01024	AUTOSAR Releases	4.2.1|4.2.2
Affected Modules	CANTP	State	reviewed
Trace to Requirement on Acceptance Test Document	ATR: ATR_ATR_00135		
Trace to SWS Item	CANTransportLayer: SWS_CanTp_00177 CANTransportLayer: SWS_CanTp_00232 CANTransportLayer: SWS_CanTp_00204		
Requirements / Reference to Test Environment	Use Case UC02.01		
Configuration Parameters	Sec 4.1.2.1 CanTpFlexibleDataRateSupport = TRUE CanTpTxAddressingFormat = CANTP_EXTENDED CanTpNTa = 0x36 CanTpNas = 0.1 sec CanTpNcs = NA CanTpNbs = 0.1 sec		
Summary	Transmit data having the data length more than 64 bytes from the application. This is an indirect testing for the transmission confirmation, the Com notification will be given to the application about the transmission of the signal.		
Needed Adaptation to other Releases			
Pre-conditions	DUT shall be initialized EcuM module shall be in RUN state ComM module shall be in FULL communication		
Main Test Execution			
Test Steps		Pass Criteria	
Step 1	[SWC] Trigger Explicit Inter RTE Write communication for a signal AT_1024_Sg1 with data of 70 bytes and Extended CanId	[SWC] Data passed to communication Service successfully [LT] First Frames shall be observed with the value on bus Flow Control frame with value is expected to be received in the DUT	
Step 2		[LT] Consecutive frames with Extended CAN Id shall be observed with the value on bus [SWC] Transmission confirmation for the configured signal shall be invoked	

Post-conditions	None

4.3.5 [ATS_COMCANFD_01025] Reception of the CAN FD frames with Rx SDU padding ON, if the length of N-SDU is of 8 bytes

Test Objective	Reception of the CAN FD frames with Rx SDU padding ON, if the length of N-SDU is of 8 bytes		
ID	ATS_COMCANFD_01025	AUTOSAR Releases	4.2.1|4.2.2
Affected Modules	CANTP	State	reviewed
Trace to Requirement on Acceptance Test Document	ATR: ATR_ATR_00135 ATR: ATR_ATR_00136		
Trace to SWS Item	CANTransportLayer: SWS_CanTp_00344		
Requirements / Reference to Test Environment	Use Case UC02.01		
Configuration Parameters	Sec 4.1.2.1 CanTpFlexibleDataRateSupport = TRUE CanTpRxAddressingFormat = CANTP_STANDARD CanTpNas = 0.1 sec CanTpNbr = 0.1 sec CanTpNcr = 1 sec CanTpRxDl = 8 CanTpRxPaddingActivation = CANTP_ON CanTpPaddingByte = 0xFF		
Summary	The data will be sent from the Tester to the DUT to check the reception process and will be notified to the upper layer (PduR). While receiving the frames from the Tester, if the CanTpRxPaddingActivation parameter is set to ON then CanTp shall only accept SF Rx N-PDUs or last CF Rx N-PDUs, belonging to that N-SDU, if the length is of eight bytes. The Com notification will be given to the application about the reception and the data will be read by the RTE.		
Needed Adaptation to other Releases			
Pre-conditions	DUT shall be initialized EcuM module shall be in RUN state ComM module shall be in FULL communication		
Main Test Execution			
Test Steps		Pass Criteria	
Step 1	[LT] Transmit a frame with a payload 8 bytes and valid Standard Can-Id to the DUT from	[SWC] Com notification for the configured signal shall be invoked	

Step 2	Tester	
	[SWC]	[SWC]
	Application to trigger Explicit Inter RTE Read communication for a signal	Data shall be updated
Post-conditions	None	

4.3.6 [ATS_COMCANFD_01026] Reception of the CAN FD frames with RX SDU padding ON, if N-PDU length is less than 8 bytes

Test Objective	Reception of the CAN FD frames with RX SDU padding ON, if N-PDU length is less than 8 bytes		
ID	ATS_COMCANFD_01026	AUTOSAR Releases	4.2.1|4.2.2
Affected Modules	CANTP	State	reviewed
Trace to Requirement on Acceptance Test Document	ATR: ATR_ATR_00135 ATR: ATR_ATR_00136		
Trace to SWS Item	CANTransportLayer: SWS_CanTp_00345		
Requirements / Reference to Test Environment	Use Case UC02.01		
Configuration Parameters	Sec 4.1.2.1 CanTpFlexibleDataRateSupport = TRUE CanTpRxAddressingFormat = CANTP_STANDARD CanTpNas = 0.1 sec CanTpNbr = 0.1 sec CanTpNcr = 1 sec CanTpRxDl = 8 CanTpRxPaddingActivation = CANTP_ON CanTpPaddingByte = 0xFF		
Summary	The data will be sent from the Tester to the DUT to check the reception process and will be notified to the upper layer (PduR). While receiving the frames from the Tester, if the CanTpRxPaddingActivation parameter is set to ON, then CanTp rejects the reception of SF Rx N-PDUs belonging to that N-SDU, if the NPDU length is less than eight bytes.		
Needed Adaptation to other Releases			
Pre-conditions	DUT shall be initialized EcuM module shall be in RUN state ComM module shall be in FULL communication		
Main Test Execution			
Test Steps		Pass Criteria	

Step 1	[LT] Transmit a frame with a payload 5 bytes and valid Standard Can-Id to the DUT from Tester	[SWC] Com notification for the configured signal shall not invoked
Step 2	[SWC] Application to trigger Explicit Inter RTE Read communication for a signal	[SWC] Data shall not be updated
Post-conditions	None	

4.3.7 [ATS_COMCANFD_01027] Reception of the CAN FD frames with RX SDU padding ON, if the length of last CF is less than 8 bytes

Test Objective	Reception of the CAN FD frames with RX SDU padding ON, if the length of last CF is less than 8 bytes		
ID	ATS_COMCANFD_01027	AUTOSAR Releases	4.2.1|4.2.2
Affected Modules	CANTP	State	reviewed
Trace to Requirement on Acceptance Test Document	ATR: ATR_ATR_00135 ATR: ATR_ATR_00136		
Trace to SWS Item	CANTransportLayer: SWS_CanTp_00346		
Requirements / Reference to Test Environment	Use Case UC02.01		
Configuration Parameters	Sec 4.1.2.1 CanTpFlexibleDataRateSupport = TRUE CanTpRxAddressingFormat = CANTP_STANDARD CanTpNas = 0.1 sec CanTpNbr = 0.1 sec CanTpNcr = 1 sec CanTpRxDl = 8 CanTpRxPaddingActivation = CANTP_ON CanTpPaddingByte = 0xFF		
Summary	The data will be sent from the Tester to the DUT to check the reception process and will be notified to the upper layer (PduR). While receiving the frames from the Tester, if the CanTpRxPaddingActivation parameter is set to ON, CanTp aborts the reception of CF Rx N-PDUs belonging to that N-SDU, if the NPDU length is less than eight bytes.		
Needed Adaptation to other Releases			
Pre-conditions	DUT shall be initialized EcuM module shall be in RUN state ComM module shall be in FULL communication		

Main Test Execution

Test Steps		Pass Criteria
Step 1	[LT] Transmit a first frame with a payload 66 bytes and valid Standard Can-Id to the DUT from Tester	[SWC] Com notification for the configured signal shall be invoked [LT] CanTp prepare FC frame & transmit FC frame to Tester
Step 2	[LT] After receiving the flow control frame the consecutive frame is send by the Tester with payload 6 bytes	[LT] CanTp abort the reception of the consecutive frame
Step 3	[SWC] Application to trigger Explicit Inter RTE Read communication for a signal	[SWC] Data shall be updated only for first 62 Bytes
Post-conditions	None	

4.3.8 [ATS_COMCANFD_01028] Reception of the CAN FD frames with RX SDU padding ON, if the length of FC PDU is 8 bytes

Test Objective	Reception of the CAN FD frames with RX SDU padding ON, if the length of FC PDU is 8 bytes		
ID	ATS_COMCANFD_01028	**AUTOSAR Releases**	4.2.1|4.2.2
Affected Modules	CANTP	**State**	reviewed
Trace to Requirement on Acceptance Test Document	ATR: ATR_ATR_00135 ATR: ATR_ATR_00136		
Trace to SWS Item	CANTransportLayer: SWS_CanTp_00347		
Requirements / Reference to Test Environment	Use Case UC02.01		
Configuration Parameters	Sec 4.1.2.1 CanTpFlexibleDataRateSupport = TRUE CanTpRxAddressingFormat = CANTP_STANDARD CanTpNas = 0.1 sec CanTpNbr = 0.1 sec CanTpNcr = 1 sec CanTpRxDl = 8 CanTpRxPaddingActivation = CANTP_ON CanTpPaddingByte = 0xFF		

Summary	The data will be sent from the Tester to the DUT to check the reception process and will be notified to the upper layer (PduR).
	While receiving the frames from the Tester, if the CanTpRxPaddingActivation parameter is set to ON then, CanTp transmits FC N-PDUs with a length of eight byte and unused bytes in N-PDU shall be updated with CANTP_PADDING_BYTE.
Needed Adaptation to other Releases	
Pre-conditions	DUT shall be initialized EcuM module shall be in RUN state ComM module shall be in FULL communication

Main Test Execution

Test Steps		Pass Criteria
Step 1	[LT] Transmit a first frame with a payload 70 bytes and valid Standard Can-Id to the DUT from Tester	[SWC] Com notification for the configured signal shall be invoked CanTp prepares Flow Control frame and transmit Flow Control frame with payload 8 bytes to the Tester
Post-conditions	None	

4.3.9 [ATS_COMCANFD_01029] Check the behaviour of CANTP, if the data length to be transmitted does not match possible DLC values

Test Objective	Check the behaviour of CANTP, if the data length to be transmitted does not match possible DLC values		
ID	ATS_COMCANFD_01029	**AUTOSAR Releases**	4.2.1|4.2.2
Affected Modules	CANTP	**State**	reviewed
Trace to Requirement on Acceptance Test Document	ATR: ATR_ATR_00135 ATR: ATR_ATR_00136		
Trace to SWS Item	CANTransportLayer: SWS_CanTp_00351		
Requirements / Reference to Test Environment	Use Case UC02.01		
Configuration Parameters	Sec 4.1.2.1 CanTpFlexibleDataRateSupport = TRUE CanTpTxAddressingFormat = CANTP_STANDARD CanTpNas = 0.1 sec CanTpNcs = NA CanTpNbs = 0.1 sec CanTpTxPaddingActivation = CANTP_ON CanTpPaddingByte = 0xFF		

Summary	Transmit data having the data length of 10 bytes from the application, if the CanTpTxPaddingActivation parameter is set to ON and If the data length which shall be transmitted does not match possible DLC values CanTp shall use the next higher valid DLC for transmission with initialization of unused bytes to the value of CANTP_PADDING_BYTE.
Needed Adaptation to other Releases	
Pre-conditions	DUT shall be initialized EcuM module shall be in RUN state ComM module shall be in FULL communication

Main Test Execution

Test Steps		Pass Criteria
Step 1	[SWC] Trigger Explicit Inter RTE Write communication for a 10 byte CAN FD frame with signal AT_1029_Sg1	[SWC] Data passed to communication Service successfully [LT] CAN FD frame shall be observed with the value on bus Hint: 12 bytes frame will be observed on the bus
Post-conditions	None	

4.3.10 [ATS_COMCANFD_01030] Transmission of the CAN FD frames with TX SDU padding ON, if the received FC N-PDU length is less than 8 bytes

Test Objective	Transmission of the CAN FD frames with TX SDU padding ON, if the received FC N-PDU length is less than 8 bytes		
ID	ATS_COMCANFD_01030	**AUTOSAR Releases**	4.2.1|4.2.2
Affected Modules	CANTP	**State**	reviewed
Trace to Requirement on Acceptance Test Document	ATR: ATR_ATR_00135 ATR: ATR_ATR_00136		
Trace to SWS Item	CANTransportLayer: SWS_CanTp_00349		
Requirements / Reference to Test Environment	Use Case UC02.01		
Configuration Parameters	Sec 4.1.2.1 CanTpFlexibleDataRateSupport = TRUE CanTpTxAddressingFormat = CANTP_STANDARD CanTpNas = 0.1 sec CanTpNcs = NA		

	CanTpNbs = 0.1 sec CanTpTxPaddingActivation = CANTP_ON CanTpPaddingByte = 0xFF
Summary	Transmit data having the data length more than 64 Bytes from the application, if the CanTpTxPaddingActivation parameter is set to ON then CanTp abort the transmission session if a FC N-PDU is received and the length of this FC is smaller than eight bytes.
Needed Adaptation to other Releases	
Pre-conditions	DUT shall be initialized EcuM module shall be in RUN state ComM module shall be in FULL communication
Main Test Execution	
Test Steps	**Pass Criteria**
Step 1	[SWC] Trigger Explicit Inter RTE Write communication for a signal AT_1030_Sg1	[SWC] Data passed to communication Service successfully [LT] CAN FD frame shall be observed with the value on bus
Step 2	[LT] Transmit a Flow Control frame Data less than 8 bytes to the DUT from Tester	[LT] No frame shall be observed on the bus (Flow control frame received with DLC less than 8 bytes. CanTp abort the transmission of consecutive frame)
Post-conditions	None

4.3.11 [ATS_COMCANFD_01031] Test the behaviour of CANTP when FC frames are not received after a certain amount of time during transmission of multiple

Test Objective	Test the behaviour of CANTP when FC frames are not received after a certain amount of time during transmission of multiple		
ID	ATS_COMCANFD_01031	**AUTOSAR Releases**	4.2.1|4.2.2
Affected Modules	CANTP	**State**	reviewed
Trace to Requirement on Acceptance Test Document	ATR: ATR_ATR_00135 ATR: ATR_ATR_00136		
Trace to SWS Item	CANTransportLayer: SWS_CanTp_00316		

Requirements / Reference to Test Environment	Use Case UC02.01
Configuration Parameters	Sec 4.1.2.1 CanTpFlexibleDataRateSupport = TRUE CanTpRxAddressingFormat = CANTP_STANDARD CanTpNas = 0.1 sec CanTpNbr = 0.1 sec CanTpNcr = 1 sec CanTpNbs = 1 sec CanTpRxPaddingActivation = CANTP_ON CanTpPaddingByte = 0xFF
Summary	Transmit data having the data length more than 64 bytes from the application to the Tester. After the first frame is transmitted, the wait for the flow control frame has to be deliberately extended beyond the timer N_Bs. When the timer expires CanTp will abort the current transmission.
Needed Adaptation to other Releases	
Pre-conditions	DUT shall be initialized EcuM module shall be in RUN state ComM module shall be in FULL communication

Main Test Execution

Test Steps		Pass Criteria
Step 1	[SWC] Trigger Explicit Inter RTE Write communication for a signal AT_1031_Sg1 with value and SduId	[SWC] Data passed to communication Service successfully [LT] First Frame shall be observed with the value on bus
Step 2	[LT] After the expiry of the Timer N_Bs, monitor and validate the frame on Tester	[LT] Consecutive Frames shall not be observed on bus
Post-conditions	None	

5 RS_BRF_01920 – AUTOSAR microcontroller abstraction shall provide access to communication bus controllers

5.1 General Test Objective and Approach

This Test Specification intends to cover the selective wake up functionality of CAN FD transceiver as described in the AUTOSAR Feature [RS_BRF_01920].
The tests use a test bench environment and Embedded Software Components that use the feature.
This test case document has been established to cover the following features:
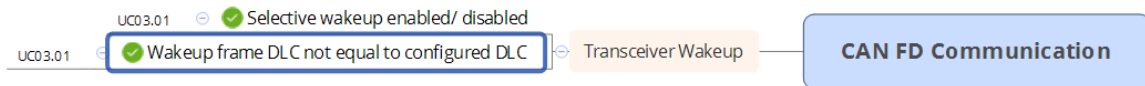

Fig G: Requirement on Data Transfer.

This specification gives the description of required tests environments (test bench, uses case, arxml files) and detailed tests cases for executing tests.

5.1.1 Test System

5.1.1.1 Overview on Architecture

In order to cover the required features / sub-features, the different uses cases are created.

5.1.1.1.1 Use case 03.01: CAN Bus

For this use case, the aim is to test the selective wakeup functionality of CanFd transceiver:
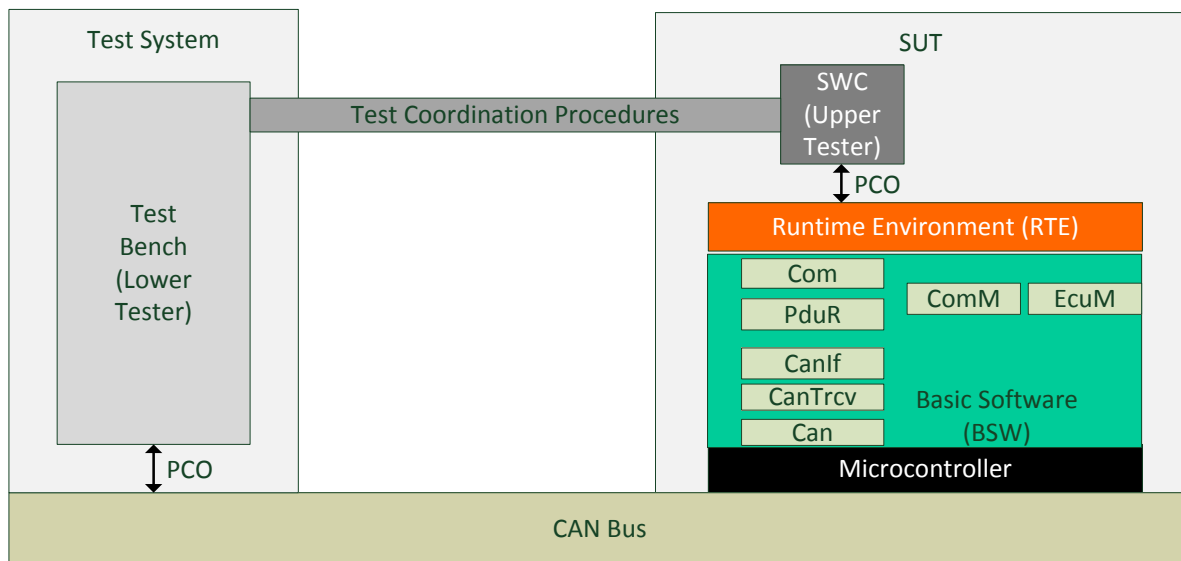

Fig H: Test System Architecture.

The test system architecture consists of Test Bench that executes only test sequencer and gives actions request through Test coordination Procedures to embedded SWC.

5.1.1.2 Specific Requirements

Not Applicable.

5.1.1.3 Test Coordination Requirements

Not Applicable.

5.1.2 Test Configuration

This section describes sets of requirements on configuration. These sets are later referenced by test cases. No configuration files are provided. They need to be developed when the test suite is implemented.

5.1.2.1 Generic Configuration Parameters for Can FD stack

CanControllerBaudRate = 500Kbps
CanControllerFdBaudRate = 5Mbps
CanControllerDefaultBaudRate = CanControllerBaudrateConfig
CanControllerTxBitRateSwitch = TRUE

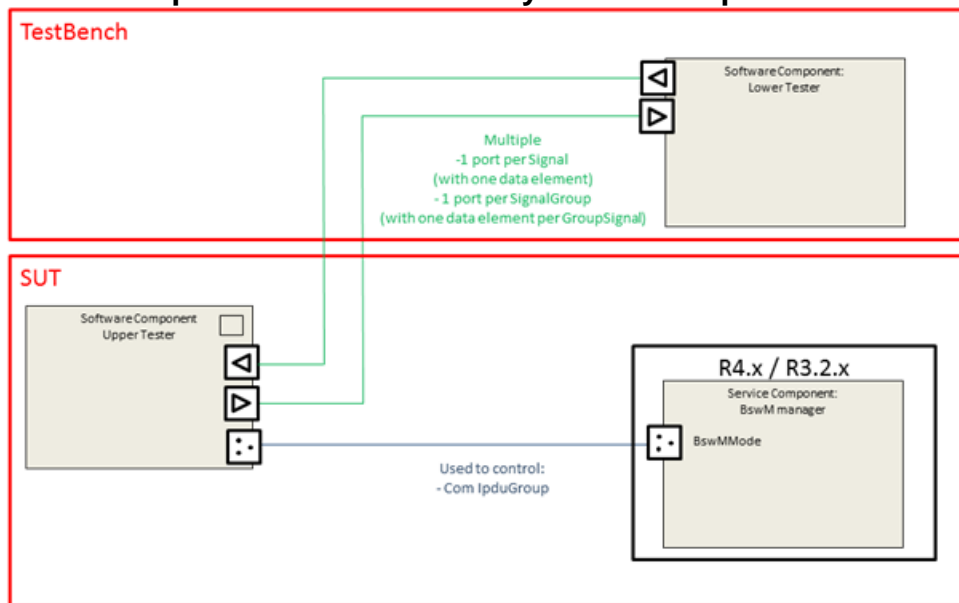### 5.1.2.2 Required ECU Extract of System Description Files

Fig I: SWC Overview.

A Mode-Switch Interface IF_AT_SwC_ActionsBswM must be created. The SWC Upper Tester should trigger BSW actions and BswM read the state through BswMMode Port. BswM shall launch actions according to following table:

ModeDeclaration	BswM Actions
IPDU_ACTIVATED	OnEntry: -StartIpduGroup

For the Software Component point of view, for each test case, the communication interfaces are defined as follow:

Port name	Data element type	Data element	Mapping	Type
<TestCaseName>_<SignalName>	uint8	<SignalName>	<SignalName>	Signal
<TestCaseName>_<SignalGroupName>	Struct { uint8: GroupSignal1; … uint8: GroupSignalx; }	GroupSignal	GroupSignal1-> <Signal1Name> GroupSignal2-> <Signal2Name> <PortName>-> <SignalGroupName>	Signal Group

Therefore ports and signals names change according to Test Case Name, but the building rule is the same.

5.1.2.2.1 Use Case 01.01: CAN Bus
The communication database is depicted below:

ComIPduGroup	I-Pdu	SignalGroup	Signal	Tx ECU	Rx ECU
AT_1032_IpduGroup	AT_1032_Ipdu		AT_1032_Sg1	TestBench	SUT
AT_1033_IpduGroup	AT_1033_Ipdu		AT_1033_Sg1	TestBench	SUT
AT_1034_IpduGroup	AT_1034_Ipdu		AT_1034_Sg1	TestBench	SUT

5.1.2.3 Required ECU Configuration Description Files

The section describes the common EcuC parameters between test cases that are required by the implementer of the test cases.

No specific configuration requirements for ECU Configuration files as they can be derived from EcuExtract.

5.1.2.4 Required Software Component Description Files

The section describes the SWC-D that are required by the implementer of the test cases.

Refer to Fig C.

5.1.2.5 Mandatory vs. Customizable Parts

Mandatory parameters are listed in Tests Cases.

Customizable parameters are (these values are test case independent):
- ComSignalType (ISignal.networkRepresentationProps.swBaseType), ComSignalLength (baseTypeSize) and ComBitSize (ISignal.length) => must be consistent to associated dataElement
- ComSignalInitValue (ISignal.initValue)
- PduLength (Pdu.length)
- ComBitPosition (ISignalToIPduMapping.startPosition) and ComUpdateBitPosition (ISignalToIPduMapping.updateIndicationBitPosition) values => the location of these elements in the pdu
- CAN frames identifiers (Standard Id and Extended Id)

5.1.3 Test Case Design

Not Applicable.

5.2 Re-usable Test Steps

Not Applicable.

5.3 Test Cases

5.3.1 [ATS_COMCANFD_01032] Test the selective wakeup functionality of Transceiver

Test Objective	Test the selective wakeup functionality of Transceiver		
ID	ATS_COMCANFD_01032	**AUTOSAR Releases**	4.2.1|4.2.2
Affected Modules	CANTRCV	**State**	reviewed
Trace to Requirement on Acceptance Test Document	ATR: ATR_ATR_00135		
Trace to SWS Item	CANTransceiverDriver: SWS_CanTrcv_00174 CANTransceiverDriver: SWS_CanTrcv_00175 CANTransceiverDriver: SWS_CanTrcv_00177		
Requirements / Reference to Test Environment	Use Case UC03.01		
Configuration Parameters	Sec 5.1.2.1 CanTrcvHwPnSupport = TRUE CanTrcvPnEnabled = TRUE CanTrcvPnFrameCanId = 0x148 CanTrcvPnFrameCanIdMask = 0x0F CanTrcvPnFrameDlc = 0x03 CanTrcvPnFrameDataMask = 0x01 CanTrcvPnFrameDataMaskIndex = 0x00		
Summary	The Tester will send WUFs (Wake Up Frames) with the selective Can-Ids which is configured for the DUT and which is not configured for the DUT.		
Needed Adaptation to other Releases			
Pre-conditions	DUT shall be initialized EcuM module shall be in RUN state ComM module shall be in FULL communication		
Main Test Execution			
Test Steps		**Pass Criteria**	
Step 1	[LT] Transmit a valid CAN FD frame with Standard Can-Id and Data from the Tester to the DUT	[LT] Passive wakeup shall be occurred on the DUT	
Step 2	[SWC] Application to request to ComM to be in Full Communication	[SWC] Successfully changed to the Full Communication mode	
Step 3	[LT] Transmit an invalid CAN FD frame with different Standard Can-Id which is not configured for this ECU and data from the Tester to the DUT	[LT] Passive wakeup shall not occur on the DUT	

Post-conditions	None

5.3.2 [ATS_COMCANFD_01033] Behavioural check of CANTRCV when a WUF with a DLC which is not equal to the configured value tries to wakeup the SUT

Test Objective	Behavioural check of CANTRCV when a WUF with a DLC which is not equal to the configured value tries to wakeup the SUT		
ID	ATS_COMCANFD_01033	**AUTOSAR Releases**	4.2.1|4.2.2
Affected Modules	CANTRCV	**State**	reviewed
Trace to Requirement on Acceptance Test Document	ATR: ATR_ATR_00135		
Trace to SWS Item	CANTransceiverDriver: SWS_CanTrcv_00174 CANTransceiverDriver: SWS_CanTrcv_00175 CANTransceiverDriver: SWS_CanTrcv_00177		
Requirements / Reference to Test Environment	Use Case UC03.01		
Configuration Parameters	Sec 5.1.2.1 CanTrcvHwPnSupport = TRUE CanTrcvPnEnabled = TRUE CanTrcvPnFrameCanId = 0x150 CanTrcvPnFrameCanIdMask = 0x0F CanTrcvPnFrameDlc = 0x03 CanTrcvPnFrameDataMask = 0x01 CanTrcvPnFrameDataMaskIndex = 0x00		
Summary	The Tester will send a WUF (Wake Up Frame) with the varying DLC having Can-Id which is configured to wake up the DUT.		
Needed Adaptation to other Releases			
Pre-conditions	DUT shall be initialized EcuM module shall be in RUN state ComM module shall be in FULL communication		
Main Test Execution			
Test Steps		**Pass Criteria**	
Step 1	[LT] Transmit a valid CAN FD frame with Standard Can-Id and Data from the Tester to the DUT	[LT] Passive wakeup shall be occurred on the DUT	
Step 2	[SWC] Application to request to ComM to be in Full Communication	[SWC] Successfully changed to the Full Communication mode	

Step 3	[LT] Transmit a valid CAN FD frame with same Standard Can-Id but different DLC and data from the Tester to the DUT	[LT] Passive wakeup shall not occur on the DUT
Post-conditions	None	

5.3.3 [ATS_COMCANFD_01034] Transceiver with CAN standard wakeup when selective wakeup is Disabled / Partial networking not enabled

Test Objective	Transceiver with CAN standard wakeup when selective wakeup is Disabled / Partial networking not enabled		
ID	ATS_COMCANFD_01034	AUTOSAR Releases	4.2.1|4.2.2
Affected Modules	CANTRCV	State	reviewed
Trace to Requirement on Acceptance Test Document	ATR: ATR_ATR_00135		
Trace to SWS Item	CANTransceiverDriver: SWS_CanTrcv_00174 CANTransceiverDriver: SWS_CanTrcv_00175 CANTransceiverDriver: SWS_CanTrcv_00177		
Requirements / Reference to Test Environment	Use Case UC03.01		
Configuration Parameters	Sec 5.1.2.1 CanTrcvHwPnSupport = FALSE CanTrcvPartialNetwork = Do not configure this container		
Summary	The Tester sends invalid WUFs (Wake Up Frames) with the selective Can-Ids which is not configured for the DUT, the wakeup will not occur. Then send WUP(Wake up pattern) offered by normal transceiver, wake up occurs.		
Needed Adaptation to other Releases			
Pre-conditions	DUT shall be initialized EcuM module shall be in RUN state ComM module shall be in FULL communication		
Main Test Execution			
Test Steps		Pass Criteria	
Step 1	[LT] Transmit an invalid CAN FD frame with different Can-Id which is not configured for this ECU from the Tester to the DUT	[LT] Passive wakeup shall not occur on the DUT	
Step 2	[SWC] Application to request Full Communication mode for COMM	[SWC] Will not change to the Full Communication mode and no Can	

		frames shall be observed on the bus
Step 3	[LT] Transmit an Wake Up Pattern (WUP) offered by normal transceivers	[LT] Passive wakeup shall occur on the DUT
Step 4	[SWC] Application to request ComM Full Communication	[SWC] Successfully changed to the Full Communication mode [LT] Can Frames shall be observed on the bus
Post-conditions	None	