


SCOPE OF APPLICATION All Project/Engineering		SHT/SHTS 1 / 23
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<b>AUTOSAR FiM User Manual</b>		

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일반(Anyuser)/김수연 책임 클래식오토사 1팀 본 문서는 HyundaiAutoever 의 정보자산이므로 무단으로 전제 및 복제할 수 없으며, 이를 위반할 시에는 당사 사규 및 관련 법규에 의해 제재를 받을 수 있습니다.

# User Manual

DOCUMENT NUMBER  
(1)

SHT/SHTS  
2 / 23

## Table of Contents

<b>1 Overview</b>	4
<b>2 Reference</b>	4
<b>Acronyms and abbreviations</b>	5
<b>3 AUTOSAR System</b>	6
<b>3.1 Overview of Software Layers</b>	6
3.2 AUTOSAR Diagnostic Stack	7
3.2.1 Function Inhibition Manager	7
3.2.2 Diagnostic Event Manager	7
3.2.3 Diagnostic Communication Manager	7
3.2.4 Development Error Tracer	7
<b>4 Product Release Notes</b>	8
<b>4.1 Overview</b>	8
<b>4.2 Scope of the Release</b>	8
<b>4.3 Change Log</b>	8
4.3.1. Version 1.0.0.0 (2021-02-25)	8
4.3.2. Version 1.0.1.0 (2022-03-18)	8
4.3.3. Version 1.0.2.0 (2022-06-30)	9
4.3.4. Version 1.0.2.1 (2022-08-17)	9
4.3.5. Version 1.0.3.0 (2022-10-25)	10
4.3.6. Version 1.0.3.1 (2022-05-23)	10
<b>4.4 Module Release Notes</b>	10
4.4.1 Limitations	10
4.4.2 Deviations	11
<b>5 Configuration Guide</b>	12
<b>5.1 FiMGeneral</b>	12
<b>5.2 FiMConfigSet</b>	12
<b>5.3 FiMFID</b>	13
5.4 FiMIInhibitionConfiguration	13
5.5 FiMSummaryEvent	15

# User Manual

DOCUMENT NUMBER  
(1)

SHT/SHTS  
3 / 23

<b>5.9 System Configuration</b>	15
<b>5.9.1 ApplicationSwComponentType</b>	15
<b>5.9.2 CompositionSwComponentType</b>	15
<b>6 Application Programming Interface (API)</b>	16
<b>6.1 Type Definitions</b>	16
<b>6.1.1 FiM_ConfigType</b>	16
<b>6.2 Macro Constants</b>	16
<b>6.3 Functions</b>	16
<b>6.3.1 FiM_Init</b>	16
<b>6.3.2 FiM_GetFunctionPermission</b>	16
<b>6.3.3 FiM_SetFunctionAvailable</b>	17
<b>6.3.4 FiM_DemTriggerOnMonitorStatus</b>	18
<b>6.3.5 FiM_DemTriggerOnComponentStatus</b>	18
<b>6.3.6 FiM_DemInit</b>	19
<b>6.3.7 FiM_GetVersionInfo</b>	19
<b>6.3.8 FiM_MainFunction</b>	20
<b>6.4 Service Interfaces</b>	20
<b>6.4.1 Client-Server-Interfaces</b>	20
<b>6.5 Notes</b>	21
<b>6.5.1 In Communication with application SW-C</b>	21
<b>7 Generator</b>	21
<b>7.1 Generator Option</b>	21
<b>7.2 Generator Error Message</b>	22
<b>7.3 Warning Messages</b>	23
<b>7.4 Information Messages</b>	23
<b>8 Appendix</b>	23

# User Manual

DOCUMENT NUMBER  
(1)SHT/SHTS  
4 / 23

## 1 Overview

It is written based on AUTOSAR standard SRS / SWS. If more detailed functional explanation is needed when using the module, see the Reference Manual. The interpretation of setting related category is as follows:

- Changeable (C): Items that can be set by the user
- Fixed (F): Items that cannot be changed by the user.
- Not Supported (N): Deprecated item

## 2 Reference

Sl. No.	Title	Version
1	AUTOSAR_SWS_FunctionInhibitionManager.pdf	4.4.0

# User Manual

DOCUMENT NUMBER  
(1)

SHT/SHTS  
5 / 23

## Acronyms and abbreviations

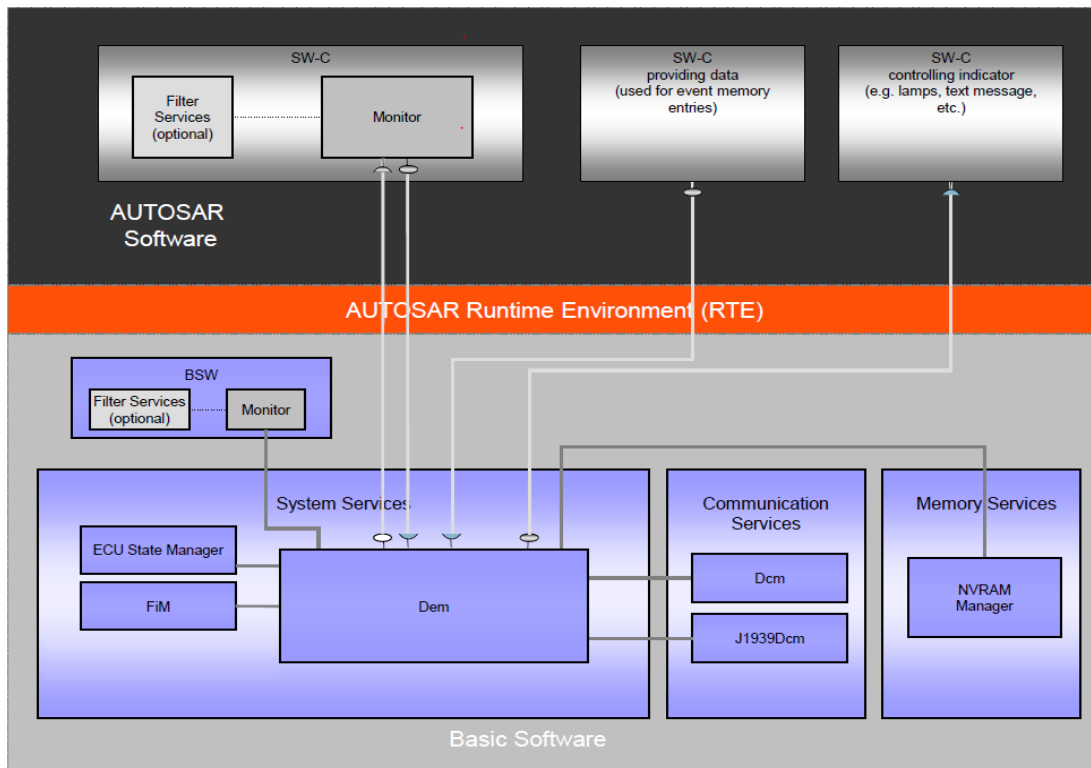
Abbreviation/ Acronym:	Description:
Activity	The activity state is the status of a software component being executed. The activity state results from the permission state as a precondition and physical enable condition, too. It is not calculated by the FiM and not available as a status variable. It can only be derived from local information within a software component.
API	Application Programming Interface
BSW	Basic Software
Dem	Diagnostic Event Manager
ECU	Electronic Control Unit
FID	Function Identifier
FiM	Function Inhibition Manager
Functionality	Functionality comprises User-visible and User-non-visible functional aspects of a system (AUTOSAR_Glossary.pdf) . In addition to that - in the FiM context - a functionality can be built up of the contents of one, several or parts of runnable entities with the same set of permission / inhibit conditions. By means of the FiM, the inhibition of these functionalities can be configured and even modified by calibration. Each functionality is represented by a unique FunctionId. A functionality is characterized by a specific set of inhibit condition in contrast to runnable entities having specific scheduling conditions.
HW	Hardware
ID	Identification/Identifier
Inhibition Condition	The relation between one FID, an inhibition mask and the status of a Dem event/component. (see FiMinhibitionConfiguration).
ISO	International Standardization Organization
MIL	Malfunction Indication Light
Monitoring function	<ul style="list-style-type: none"> <li>• Part of the Software Component.</li> <li>• Mechanism to monitor and finally to detect a fault of a certain sensor, actuator or could be a plausibility check</li> <li>• Reports states about events from internal processing of a SW-C or from further processing of return values of other basic software modules.</li> <li>• See also AUTOSAR_SWS_DiagnosticEventManager</li> </ul>
NVRAM	Non volatile Memory
OBD	On-board Diagnostics
OBDII	Emission-related On-board Diagnostics

OEM	Original Equipment Manufacturer
OS	Operating System
Permission state	The permission state contains the information whether a functionality, represented by its FID, can be executed or whether it shall not run. The state is controlled by the FiM based on reported events. For further details, see chapter 7.2.1.6.
RAM	Random Access Memory
ROM	Read-only Memory
RTE	Runtime Environment
Runnable entity	A Runnable Entity is a part of an Atomic Software-Component, which can be executed and scheduled independently from the other Runnable Entities of this Atomic Software-Component. It is described by a sequence of instructions that can be started by the RTE. Each runnable entity is associated with exactly one EntryPoint.
SW-C	Software Component
UDS	Unified Diagnostic Services
WP	Autosar Work Package
Xxx_	Placeholder for an API provider

## 3 AUTOSAR System

### 3.1 Overview of Software Layers

The Layered Architecture of the AUTOSAR platform is as follows. The AUTOSAR platform can be divided into Service Layer, ECU Abstraction Layer, Complex Device Drivers, and Microcontroller Abstraction Layer.



## 3.2 AUTOSAR Diagnostic Stack

### 3.2.1 Function Inhibition Manager

The permission status of SW-C functionality is changed according to Event Status (TestFailed, etc.). In SW-C, it monitors the status of the permission of the functionality to determine whether the functionality is operating.

### 3.2.2 Diagnostic Event Manager

Handles events that occurred in SW-C and BSW modules.

### 3.2.3 Diagnostic Communication Manager

It manages the diagnostic data flow and diagnostic state, and performs diagnostic requests from the diagnostic device.

### 3.2.4 Development Error Tracer

Manage errors that occur during development. (Remove module during mass production)

## 4 Product Release Notes

### 4.1 Overview

This chapter aims to provide the release information for the HYUNDAI AUTOEVER FiM module. Describes the limitations and specifics about the software product release version.

### 4.2 Scope of the Release

All information in this document is limited to the following HYUNDAI AUTOEVER FiM modules.

Module Name	AUTOSAR Version	Module Version
FiM	4.4.0	1.0.3.1

Module version means Sw version of each module's BswModule Description (Bswmd) file.

### 4.3 Change Log

#### 4.3.1. Version 1.0.0.0 (2021-02-25)

##### ➤ Improvement

###### ■ Initial Version

원인	Initial Version
동작 영향	없음
설정 영향	없음
ASW 조치 사항	없음

#### 4.3.2. Version 1.0.1.0 (2022-03-18)

##### ➤ Feature

###### ■ ASPICE Compliance update

원인	ASPICE Compliance update
동작 영향	없음
설정 영향	없음
ASW 조치 사항	없음

##### ➤ Bug

###### ■ Correct memory section of the FiM\_Ram code

원인	Inconsistency memmap of variable FiM_GucInitStatus in FiM_Ram.c
----	---



## User Manual

DOCUMENT NUMBER  
(1)SHT/SHTS  
9 / 23

	and FiM_Ram.h
동작 영향	없음
설정 영향	없음
ASW 조치 사항	없음

## ➤ Bug

## ■ Fixing compile warning

원인	When the S32G RTU using the GHS Compiler, there are some warning messages of FiM, because missing end of line in generated files (FiM_Cfg.c and FiM_Cfg.h)
동작 영향	없음
설정 영향	없음
ASW 조치 사항	없음

## 4.3.3. Version 1.0.2.0 (2022-06-30)

## ➤ Bug

## ■ Recover to execute UT/IT of Det Module in the x86

원인	For Jenkins, recover to execute UT/IT of Det Module in the x86
동작 영향	없음
설정 영향	없음
ASW 조치 사항	없음

## ➤ Improvement

## ■ Fix TCG Validation Error

원인	Update parameter value to fix TCG validation error
동작 영향	없음
설정 영향	없음
ASW 조치 사항	없음

## 4.3.4. Version 1.0.2.1 (2022-08-17)

➤ **Improvement**

## ■ Fix UNECE violations

원인	UNECE violations should be fixed.
동작 영향	없음
설정 영향	없음
ASW 조치 사항	없음

## 4.3.5. Version 1.0.3.0 (2022-10-25)

➤ **BUG**

## ■ Add missing logic on API FiM\_DemTriggerOnMonitorStatus

원인	The API FiM_DemTriggerOnMonitorStatus() is missing logic validate EventId existing in the Dem module configuration
동작 영향	없음
설정 영향	없음
ASW 조치 사항	없음

## 4.3.6. Version 1.0.3.1 (2022-05-23)

➤ **Task**

## ■ R44 UM Template Update

원인	UM Template need to update because of incorrect information.
동작 영향	없음
설정 영향	없음
ASW 조치 사항	없음

## 4.4 Module Release Notes

### 4.4.1 Limitations

- 1) Only Pre-Compile is supported.
- 2) Since communication between software components and basic software is limited to one ECU, the FiM can only control FIDs being located on the same ECU.
- 3) Timing constrains have to be considered for the whole system. Note that the process and response times strongly depend on the implementation of the FiM module. Hence, if there are explicit needs for faster

# User Manual

DOCUMENT NUMBER  
(1)SHT/SHTS  
11 / 23

responses of the FiM than the cycle (time slice of the task) these needs have to be considered by the FiM implementation specifically by the affected application.

4) Interdependencies between FIDs are not supported by the FiM.

5) Generation tool for FiM module only supports decimal configuration.

## 4.4.2 Deviations

None

## 5 Configuration Guide

The FiM setting of the AUTOSAR platform distributed by Hyundai Auto is a setting reflecting Hyundai Auto Policy's policy. Therefore, you should consult with Hyundai Auto.

### 5.1 FiMGeneral

Parameter Name	Value	Category
FiMAvailabilitySupport	FALSE	C
FiMDevErrorDetect	TRUE	F
FiMEventUpdateTriggeredByDem	From SRS	C
FiMMainFunctionPeriod	From SRS	C
FiMMaxEventsPerFidInhibitionConfiguration <sup>(1)</sup>		C
FiMMaxFiMinhibitionConfigurations <sup>(2)</sup>		C
FiMMaxInputEventsPerSummaryEvents <sup>(3)</sup>		C
FiMMaxSumEventsPerFidInhibitionConfiguration <sup>(4)</sup>		C
FiMMaxSummaryEvents <sup>(5)</sup>		C
FiMVersionInfoApi	FALSE	F

(1) FiMMaxEventsPerFidInhibitionConfiguration:

This configuration parameter specifies the total maximum number of inhibiting events in a FiMinhibitionConfiguration.

(2) FiMMaxFiMinhibitionConfigurations:

This configuration parameter specifies the total maximum number of FiMinhibitionConfigurations.

(3) FiMMaxInputEventsPerSummaryEvents:

This configuration parameter specifies the total maximum number of input events per summary event.

(4) FiMMaxSumEventsPerFidInhibitionConfiguration:

This configuration parameter specifies the total maximum number of inhibiting summary events in a FiMinhibitionConfiguration.

(5) FiMMaxSummaryEvents:

This configuration parameter specifies the maximum number of summarized events that can be configured.

### 5.2 FiMConfigSet

See settings.

## User Manual

DOCUMENT NUMBER  
(1)SHT/SHTS  
13 / 23

Parameter Name	Value	Category
FiMFID <sup>(1)</sup>		C
FiMInhibitionConfiguration <sup>(2)</sup>		C
FiMSummaryEvent <sup>(3)</sup>		C

## (1) FiMFID:

This container includes symbolic names of all FIDs.

## (2) FiMInhibitionConfiguration:

This container includes all configuration parameters concerning the relationship between event and FID.

## (3) FiMSummaryEvent

The summarized EventId definition record consists of a summarized event ID and specific Dem Events.

This record means that a particular FID that has to be disabled in case of summarized event (defined above) is to be disabled in any of the specific events. A possible solution could be assigning events as summarized events along with a list of specific events. During the configuration process the summarized event substitutes the referenced.

**5.3 FiMFID**

See settings.

Parameter Name	Value	Category
FiMFunctionId		C

## (1) FiMFunctionId:

The configuration parameter is used as an ID which represents a functionality. FiMFunctionId is the unique identifier assigned during FIM configuration.

**5.4 FiMInhibitionConfiguration**

See settings.

## User Manual

DOCUMENT NUMBER  
(1)SHT/SHTS  
14 / 23

Parameter Name	Value	Category
FiMInhInhibitionMask <sup>(1)</sup>		C
FiMInhComponentRef <sup>(2)</sup>		C
FiMInhEventRef <sup>(3)</sup>		C
FiMInhFunctionIdRef <sup>(4)</sup>		C
FiMInhSumRef <sup>(5)</sup>		C

## (1) FiMInhInhibitionMask:

The configuration parameter is used to specify the inhibition mask for an event - FID relation.

FIM_LAST_FAILED	Last Failed - DEM_UDS_STATUS_TF flag of Dem Eventstatus is set Use case: Re-configuration, avoiding follow-up errors
FIM_NOT_TESTED	Not Tested this cycle - DEM_UDS_STATUS_TNCTOC flag of Dem Eventstatus is set. Use case: Scheduling of monitors.
FIM_TESTED	Tested - DEM_UDS_STATUS_TNCTOC flag of Dem Eventstatus is not set. Use case: Self deactivation, check during driving cycle.
FIM_TESTED_AND_FAILED	Tested and Failed - DEM_UDS_STATUS_TF flag of Dem Eventstatus is set and DEM_UDS_STATUS_TNCTOC flag is not set Use case: Avoiding deadlocks, repeated monitoring.

## (2) FiMInhComponentRef:

Reference to a DemComponent which is necessary for function permission.

## (3) FiMInhEventRef:

Selection of a single DEM Event (Symbolic name reference to DemEventParameter).

## (4) FiMInhFunctionIdRef:

Reference to [ FiMFID ]

## (5) FiMInhSumRef:

Selection of a summarized Event.( Reference to FiMSummaryEvent).

## 5.5 FiMSummaryEvent

See settings.

Parameter Name	Value	Category
FiMInputEventRef <sup>(1)</sup>		C

(1) FiMInputEventRef :

Reference to DemEventParameters combined to this summarized event.( Symbolic name reference to DemEventParameter)

## 5.9 System Configuration

### 5.9.1 ApplicationSwComponentType

Refer to AUTOSAR BSW Service API Guide.doc document.

### 5.9.2 CompositionSwComponentType

Refer to AUTOSAR BSW Service API Guide.doc document.

## 6 Application Programming Interface (API)

### 6.1 Type Definitions

#### 6.1.1 FiM\_ConfigType

Configuration data structure of the FiM module.

### 6.2 Macro Constants

None

### 6.3 Functions

#### 6.3.1 FiM\_Init

Function Name	FiM_Init	
Syntax	void FiM_Init( const FiM_ConfigType* FiMConfigPtr )	
Service ID [Hex]	0x00	
Sync/Async	Synchronous	
Reentrancy	Non-Reentrant	
Parameters (In)	FiMConfigPtr	Pointer to the selected configuration set.
Parameters (Inout)	None	
Parameters (Out)	None	
Return Value	None	
Description	This service initializes the FiM.	
Available via	FiM.h	

#### 6.3.2 FiM\_GetFunctionPermission

Function Name:	FiM_GetFunctionPermission
Syntax:	Std_ReturnType FiM_GetFunctionPermission( FiM_FunctionIdType FID, boolean* Permission)
Service ID[hex]:	0x01
Sync/Async:	Synchronous
Reentrancy:	Reentrant



# User Manual

DOCUMENT NUMBER  
(1)

SHT/SHTS  
17 / 23

Parameters (In)	FID	Identification of a functionality by assigned FID. The FunctionId is configured in the FIM. Min.: 1 (0: Indication of no functionality) Max.: Result of configuration of FIDs in FIM (Max is either 255 or 65535)
Parameters (Inout)	None	
Parameters (Out)	Permission	Current time stamp that is valid at this time
Return Value	Std_ReturnType	E_OK: The request is accepted E_NOT_OK: The request is not accepted, ie. Initialization of FIM not completed
Description	This service reports the permission state to the functionality.	
Available via	FiM.h	

## 6.3.3 FiM\_SetFunctionAvailable

Function Name:	FiM_SetFunctionAvailable	
Syntax:	Std_ReturnType FiM_SetFunctionAvailable( FiM_FunctionIdType FID, boolean Availability )	
Service ID[hex]:	0x07	
Sync/Async:	Synchronous	
Reentrancy:	Reentrant	
Parameters (In)	FID	Identification of a functionality by assigned FID.
	Availability	The permission of the requested FID: TRUE: Function is available. FALSE: Function is not available.
Parameters (Inout)	None	
Parameters (Out)	None	
Return Value	Std_ReturnType	E_OK: The request is accepted E_NOT_OK: Request is not accepted (e.g. invalid FID is given)
Description	This service sets the availability of a function. The function is only available if FiMAvailabilitySupport is configured as True.	
Available via	FiM.h	

# User Manual

DOCUMENT NUMBER  
(1)

SHT/SHTS  
18 / 23

## 6.3.4 FiM\_DemTriggerOnMonitorStatus

Function Name:	FiM_DemTriggerOnMonitorStatus	
Syntax:	void FiM_DemTriggerOnMonitorStatus( Dem_EventIdType EventId )	
Service ID[hex]:	0x02	
Sync/Async:	Synchronous	
Reentrancy:	Reentrant	
Parameters (In)	EventId	Identification of an Event by assigned event number. The Event Number is configured in the DEM. Min.: 1 (0: Indication of no Event or Failure) Max.: Result of configuration of Event Numbers in DEM (Max is either 255 or 65535)
Parameters (Inout)	None	
Parameters (Out)	None	
Return Value	None	
Description	This service is provided to be called by the Dem in order to inform the Fim about monitor status changes.	
Available via	FiM_Dem.h	

## 6.3.5 FiM\_DemTriggerOnComponentStatus

Function Name:	FiM_DemTriggerOnComponentStatus	
Syntax:	void FiM_DemTriggerOnComponentStatus( Dem_ComponentIdType ComponentId, boolean ComponentFailedStatus )	
Service ID[hex]:	0x06	
Sync/Async:	Synchronous	
Reentrancy:	Non Reentrant	
Parameters (In)	ComponentId	Identification of a DemComponent.
	ComponentFailedStatus	New FAILED status of the component.
Parameters (Inout)	None	
Parameters (Out)	None	
Return Value	None	

## User Manual

DOCUMENT NUMBER  
(1)SHT/SHTS  
19 / 23

Description	Triggers on changes of the component failed status.
Available via	FiM_Dem.h

**6.3.6 FiM\_DemInit**

Function Name:	FiM_DemInit
Syntax:	void FiM_DemInit(void)
Service ID[hex]:	0x03
Sync/Async:	Synchronous
Reentrancy:	Non Reentrant
Parameters (In)	None
Parameters (Inout)	None
Parameters (Out)	None
Return Value	None
Description	This service re-initializes the FIM.
Available via	FiM_Dem.h

**6.3.7 FiM\_GetVersionInfo**

Function Name:	FiM_GetVersionInfo
Syntax:	void FiM_GetVersionInfo( Std_VersionInfoType* versioninfo )
Service ID[hex]:	0x04
Sync/Async:	Synchronous
Reentrancy:	Reentrant
Parameters (In)	None
Parameters (Inout)	None
Parameters (Out)	versioninfo Pointer to where to store the version information of this module.
Return Value	None
Description	Allows the Customers to set the new User Data that has to be valid for the system, which will be sent to the busses.

## User Manual

DOCUMENT NUMBER  
(1)SHT/SHTS  
20 / 23

Available via FiM.h

**6.3.8 FiM\_MainFunction**

Function Name:	FiM_MainFunction
Syntax:	void FiM_MainFunction( void )
Service ID[hex]:	0x05
Description	--
Available via	SchM_FiM.h

**6.4 Service Interfaces****6.4.1 Client-Server-Interfaces****6.4.1.1 FunctionInhibition**

Name	FunctionInhibition	
Comment	The SW Components can use this service to query for the permission to execute a certain functionality represented by a FID.	
IsService	True	
Variation	--	
Possible Errors	0	E_OK
	1	E_NOT_OK

**Operations**

Name	GetFunctionPermission		
Comments	Get the permission state of the respective FID.		
Variation	--		
Parameters	Permission	Comment	The permission of the requested FID. TRUE: FID has permission to run FALSE: FID has no permission to run, i.e. shall not be executed
		Type	boolean
		Variation	--
		Direction	OUT

# User Manual

DOCUMENT NUMBER  
(1)

SHT/SHTS  
21 / 23

Possible Errors	E_OK	Operation successful
	E_NOT_OK	The request is not accepted, i.e. initialization of FIM not completed

## 6.4.1.2 ControlFunctionAvailable

Name	ControlFunctionAvailable	
Comment	SW Components can use this service to set the availability of a function.	
IsService	True	
Variation	{({ecuc(FiM/FiMGeneral/FiMAvailabilitySupport)} == True) }	
Possible Errors	0	E_OK
	1	E_NOT_OK

### Operations

Name	SetFunctionAvailable		
Comments	Sets the availability of a function.		
Variation	-		
Parameters	Availability	Comment	The permission of the requested FID: TRUE: Function is available. FALSE: Function is not available.
		Type	boolean
		Variation	--
		Direction	IN
Possible Errors	E_OK	Operation successful	
	E_NOT_OK	Operation failed	

## 6.5 Notes

### 6.5.1 In Communication with application SW-C

For the prototype of the RTE-based generated function, see the AUTOSAR BSW Service API Guide.doc document.

## 7 Generator

### 7.1 Generator Option

Options	Description
-G,--Generation	Symbolic parameters to be used for fore generation (skip validation).
-H,--Help	Display this help message.

## User Manual

DOCUMENT NUMBER  
(1)SHT/SHTS  
22 / 23

-I,--Input <I>	ECU description file path of the module for which generation tool need to run.
-L,--Log	Symbolic parameters to be used for generation error log.
-M,--Module <M>	Specify module name and version to be generated code for.
-O,--Output <O>	Project-relative path to location where the generated code is to be placed.
-T,--Top_path <T>	Symbolic parameters to be used for set path of module.
-V,--Validate	Symbolic parameters to be used for invoking validation checks.

## 7.2 Generator Error Message

**ERR0110051: Value of the parameter <parameter name> should be unique in the container <short name of FiMFID container>**

Container Name	Parameter Name
FiMFID	FiMFunctionId

-This error occurs when ID parameter in FiMFID containers isn't unique.

**ERR0110052: Number of <container name> containers configured should be less than or equal to the value configured for the parameter <maximum number parameter name> in the container 'FiMGeneral'.**

Name of Container contain Maximum Number Parameter	Name of Maximum Number Parameter	Container Name
FiMGeneral	FiMMaxFiMinhibitionConfigurations	FiMinhibitionConfigurat ion
	FiMMaxSummaryEvents	FiMSummaryEvent

- This error occurs when total containers is more than the maximum number parameter

**ERR0110053: Total number of events configured per FID in the container <short name of container> should be less than or equal to <maximum number parameter name> in the container 'FiMGeneral'.**

Name of Container contain Maximum Number Parameter	Name of Maximum Number Parameter	Parameter Name
FiMGeneral	FiMMaxEventsPerFidInhibitionConfiguration	FimInhEventRef
	FiMMaxSumEventsPerFidInhibitionConfiguration	FimInhSumRef

- This error occurs when total number of events in FiMInhibitionConfiguration container is more than maximum number parameter.

**ERR0110054: All the configured summary event Ids in container 'FiMSummaryEvent' should be referred by the parameter 'FiMInhSumRef' in the container 'FiMInhibitionConfiguration'.**

- This error occurs when any 'FiMSummaryEvent' container isn't referred by the parameter 'FiMInhSumRef' in the container 'FiMInhibitionConfiguration'.

**ERR0110055: All the configured Function Ids in the container 'FiMFID' should be referred by the parameter 'FiMInhFunctionIdRef' in the container 'FiMInhibitionConfiguration'.**

- This error occurs when any 'FiMFID' container isn't referred by the parameter 'FiMInhFunctionIdRef' in the container 'FiMInhibitionConfiguration'.

**ERR0110056: Value of the pair for parameter 'FiMFunctionId' in the container 'FiMFID' and Dem event parameters configured in the container <short name of container> should be unique.**

This error occurs when:

- 'FiMInhFunctionIdRef' parameter in 'FiMInhibitionConfiguration' isn't unique.
- 'FiMInhEventRef' parameter in 'FiMInhibitionConfiguration' isn't unique.

**ERR0110057: The number of DemEventIds referred by the parameter 'FiMInputEventRef' in the container <short name of container> should be less than or equal to the value configured for the parameter 'FiMMaxInputEventsPerSummaryEvents' in the container 'FiMGeneral'.**

- This error occurs when total DemEventIds referred by the parameter 'FiMInputEventRef' in the container 'FiMSummaryEvent' is more than the maximum number parameter.

**ERR0110058: For each configured 'FiMInhibitionConfiguration', at least one of 'FiMInhSumRef' or 'FiMInhEventRef' or 'FiMInhComponentRef' shall be configured.**

## 7.3 Warning Messages

None

## 7.4 Information Messages

None

## 8 Appendix

None