dSPACE Calibration and Bypassing Service

Feature Reference

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dSPACE

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You can also use the support request form: http://www.dspace.com/go/supportrequest. If you are logged on to mydSPACE, you are automatically identified and do not need to add your contact details manually.

If possible, always provide the relevant dSPACE License ID or the serial number of the CmContainer in your support request.

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About This Reference

Contents

This document provides feature-oriented access to the information you need to work with the dSPACE Calibration and Bypassing Service.

Note

The *dSPACE Calibration and Bypassing Service* is part of the installation of ECU Interface Software.
After you install and decrypt ECU Interface Software, you will find the `dSPACECalibrationAndBypassingService_<version>.exe` file in the `%ProgramData%\dSPACE\<InstallationGUID>\dsECU\Services` folder. Run it to install the service and its documentation in a folder of your choice.
You can access the `%ProgramData%\dSPACE\<InstallationGUID>` folder via a shortcut in the Windows Start menu below dSPACE RCP and HIL <version>.

Symbols

dSPACE user documentation uses the following symbols:

Symbol	Description
⚠ DANGER	Indicates a hazardous situation that, if not avoided, will result in death or serious injury.
⚠ WARNING	Indicates a hazardous situation that, if not avoided, could result in death or serious injury.
⚠ CAUTION	Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.
NOTICE	Indicates a hazard that, if not avoided, could result in property damage.
Note	Indicates important information that you should take into account to avoid malfunctions.
Tip	Indicates tips that can make your work easier.

Symbol	Description
	Indicates a link that refers to a definition in the glossary, which you can find at the end of the document unless stated otherwise.
	Precedes the document title in a link that refers to another document.

Naming conventions

dSPACE user documentation uses the following naming conventions:

%name% Names enclosed in percent signs refer to environment variables for file and path names.

< > Angle brackets contain wildcard characters or placeholders for variable file and path names, etc.

Special folders

Some software products use the following special folders:

Common Program Data folder A standard folder for application-specific configuration data that is used by all users.

```
%PROGRAMDATA%\dSPACE\<InstallationGUID>\<ProductName>
```

or

```
%PROGRAMDATA%\dSPACE\<ProductName>\<VersionNumber>
```

Documents folder A standard folder for user-specific documents.

```
%USERPROFILE%\Documents\dSPACE\<ProductName>\
<VersionNumber>
```

Local Program Data folder A standard folder for application-specific configuration data that is used by the current, non-roaming user.

```
%USERPROFILE%\AppData\Local\dSPACE\<InstallationGUID>\
<ProductName>
```

Accessing dSPACE Help and PDF Files

After you install and decrypt dSPACE software, the documentation for the installed products is available in dSPACE Help and as PDF files.

dSPACE Help (local) You can open your local installation of dSPACE Help:

- On its home page via Windows Start Menu
- On specific content using context-sensitive help via **F1**

dSPACE Help (Web) You can access the Web version of dSPACE Help at www.dspace.com.

To access the Web version, you must have a *mydSPACE* account.

PDF files You can access PDF files via the  icon in dSPACE Help. The PDF opens on the first page.

License Agreement for the dSPACE Calibration and Bypassing Service

Introduction

If you want to work with the dSPACE Calibration and Bypassing Service, you have to accept the License Agreement first.

License Agreement

License agreement

Note

IMPORTANT – USE OF THIS SERVICE IS SUBJECT TO LICENSE RESTRICTIONS READ THIS LICENSE AGREEMENT CAREFULLY BEFORE USING THE SERVICE

This license is a legal Agreement between you, the end user, either individually or as an authorized representative of the company acquiring the license, and dSPACE GmbH acting directly or through its local dSPACE companies or authorized distributors (collectively "dSPACE"), concerning the use of the C code containing the dSPACE Calibration and Bypassing Service (hereinafter referred to as "the Service") together with any other materials which are provided for use in connection with the Service, including without limitation the executable for installation of the Service, any associated user manual and internal documentation (hereinafter collectively referred to as "the Program").

BY IMPLEMENTING THE EXECUTABLE AND INSTALLING THE PROGRAM, YOU AGREE TO COMPLY WITH THE FOLLOWING TERMS AND RESTRICTIONS. IF YOU DO NOT AGREE TO THE TERMS OF THIS AGREEMENT, DO NOT INSTALL OR USE THE PROGRAM AND PROMPTLY RETURN IT TO THE PLACE WHERE YOU OBTAINED IT, OR DELETE THE PROGRAM IF YOU RECEIVED IT ELECTRONICALLY.

1. Grant of License

Unless explicitly agreed otherwise, dSPACE grants you a nonexclusive license to use the Program and execute the Service as described in the respective product description or documentation for the sole purpose of product development involving dSPACE tools.

2. Restrictions of Use

You may not market, distribute or transfer copies of the Program, in whole or in part, to third parties (including any subsidiary, affiliate or company under common control with you) or transfer the Program (directly or indirectly) via Internet or network applications (such as Citrix, Microsoft Remote Desktop or other terminal servers) or grant third parties any access to the Program by any means. You may not rent, lease or loan the Program.

These restrictions do not prevent you from providing compiled object code versions of the Service as part of your own ECU code to third parties, subject to the condition that:

- This takes place in the course of a project where (amongst others) dSPACE tools are used, *and*
- The code is used for the sole purpose of product development and not for use in any end product or production.

The recipient of your respective ECU code needs to be instructed accordingly and shall undertake to comply with these restrictions and to agree to the Limitation of Liability according to Clause 4 hereunder. dSPACE reserves the right to ask for written confirmation that appropriate instructions have been issued.

Upon request and at the sole discretion of dSPACE, you may be granted permission to provide the Service itself, in whole or in part, to third parties as part of your own ECU source code, subject to the conditions stated above. To be valid, such permission needs to be granted in writing by dSPACE.

For the avoidance of doubt, in any case any transfer of or granting of access to parts of the Program other than the Service itself is explicitly prohibited.

3. Confidentiality

dSPACE considers the Program to contain valuable intellectual property of dSPACE, the unauthorized disclosure of which could cause irreparable harm to dSPACE. You agree to use reasonable efforts not to disclose the Program to any third parties (including any subsidiary, affiliate or company under common control with you) and not to use the Program other than for the purposes authorized by dSPACE.

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The Program was designed and tested solely for use in research and product development and is supplied to you by dSPACE exclusively for this purpose. It must be put into operation exclusively by suitably trained and expert operating personnel under strict compliance with the safety measures described in the software documentation. Any use of the Program or compiled object code versions of the Service for purposes and under conditions other than the above, including but not only any use in end products, constitutes inappropriate use.

Any liability by dSPACE under mandatory law, including but not restricted to product liability law, for damages of any kind that may be caused by using the Program or compiled object code versions of the Service in areas other than product development shall be limited, even to the point of total exclusion, as the case may be. In the event of claims by third parties against dSPACE that are due to such inappropriate use of the Program or of compiled object code versions of the Service by you or with your permission, you agree to indemnify dSPACE against all such claims.

In addition, the regulations on liability according to the General Terms and Conditions of dSPACE as attached to any dSPACE offer apply accordingly. A copy of the General Terms and Conditions can also be obtained at info@dspace.de.

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Any amendments or additions to this Agreement must be made in writing and must be expressly marked as such. This also applies to this written form requirement.

In the event that any of the above terms is or becomes invalid, the remaining terms shall continue in full force and effect.

Any failure to enforce, or any waiver of, any right under this Agreement by dSPACE shall not be construed as a waiver of future rights.

The legal regulations shall apply in addition to the terms of this Agreement, except in cases where they conflict with said terms. This Agreement shall be governed by the laws of the Federal Republic of Germany, excluding the UN Convention on Contracts for the International Sale of Goods (CISG).

Paderborn, Germany, is agreed as the exclusive place of jurisdiction for all disputes arising from or in connection with this Agreement, unless a different place of jurisdiction is mandatory on the basis of legal requirements.

Introduction

Introduction to the dSPACE Calibration and Bypassing Service

Introduction

The dSPACE Calibration and Bypassing Service can be used for calibration, bypassing, measurement (data acquisition [DAQ]), and ECU flash programming purposes.

Access to ECU application and resources

During the development of ECUs, it is often necessary to access the ECU resources such as the ECU memory. This can be the case if you want to measure values calculated by the ECU or calibrate parameters to change values of the ECU control algorithm.

The dSPACE Calibration and Bypassing Service provides access to the ECU application and the ECU resources. This access can be used for calibration, measurement, bypassing, and ECU flash programming purposes.

Further requirements

The dSPACE Calibration and Bypassing Service is used to control communication between an ECU and a calibration and/or bypassing tool. To perform calibration, data acquisition, bypassing, or ECU flash programming using the dSPACE Calibration and Bypassing Service, different components are required:

Calibration and DAQ For calibration and DAQ, you need the following items:

- PC with ControlDesk
- ECU with DCI-GSI2

  or

  RapidPro system used as a stand-alone prototyping ECU
- USB connection between the RapidPro system and the host PC with ControlDesk

  or

  Ethernet connection between the ECU with DCI-GSI2 and the host PC with ControlDesk

Implementing the dSPACE Calibration and Bypassing Service is necessary in the following cases:

Interface	Calibration	Data Acquisition
DCI-GSI2	✓ / – [1]	✓ / – [2]
RapidPro	✓	✓

[1] Depending on the ECU microcontroller and the configured calibration method, calibration might be performed using the dSPACE Calibration and Bypassing Service. In other cases, however, other mechanisms are used on the DCI-GSI2.

[2] The integration of the dSPACE Calibration and Bypassing Service is optional. If the ECU has a data trace interface, measurement data can be acquired synchronously and consistently without an ECU service.

Bypassing For bypassing, you need the following items:

- PC with RTI Bypass Blockset
- dSPACE prototyping system:
  - Modular system based on DS1006 with DS4121 ECU Interface Board, *or*
  - MicroAutoBox II with ECU Type 1 board
- ECU with POD
- LVDS connection between the POD and the dSPACE prototyping system

ECU flash programming For ECU flash programming, you need the following items:

- dSPACE ECU Flash Programming Tool
- DCI-GSI2
- Ethernet connection between the host PC with dSPACE ECU Flash Programming Tool and the DCI-GSI2

dSPACE Calibration and Bypassing Service features

The dSPACE Calibration and Bypassing Service provides basic features such as:

- Alive mechanism

  The alive mechanism checks whether the ECU interface is alive and running.
- Measuring ECU variables and parameters

  It is possible to measure ECU variables and parameters during the application development (data acquisition).
- Bypassing of ECU functions

  For function development, you can bypass ECU functions by using external rapid control prototyping (RCP) hardware. With the dSPACE Calibration and Bypassing Service, you can bypass ECU functions using dSPACE prototyping hardware, such as MicroAutoBox II with DS1401 Base Board or a modular system based on DS1006 with DS4121 ECU Interface Board.
- API programming

  An API is provided to adapt the dSPACE Calibration and Bypassing Service to the requirements of a specific ECU.

- Programming the ECU flash memory

  The entire ECU flash memory can be programmed to access the code, parameters and even shadow configuration words (as used on the Freescale MPC56x).
- Calibration and page switching

  A set of commands to perform page switching and calibration is provided.
- Integrating user commands

  Arbitrary user commands can be integrated into the dSPACE Calibration and Bypassing Service. This feature is available only as part of a dSPACE engineering service, because it requires modifications to the firmware of the ECU interfaces used.

For details on the dSPACE Calibration and Bypassing Service features, refer to Features of the dSPACE Calibration and Bypassing Service on page 15.

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Features of the dSPACE Calibration and Bypassing Service

Introduction

The dSPACE Calibration and Bypassing Service can be used for different purposes.

Where to go from here

Information in this section

Calibration Features

Introduction

ECUs are calibrated by tuning the ECU parameters. These are located in the read-only ECU's flash memory and are accessed and calibrated via a host interface.

Online calibration

The dSPACE Calibration and Bypassing Service supports online calibration. Online calibration means the synchronous handling of parameter values.

ECU memory access

Some host interfaces provide high-speed access to the ECU variables for calibration and measurement via their parallel data connection. They emulate the flash memory of the ECU where the parameters of the ECU application are located. The ECU flash memory is mapped to the host interface's memory for this.

Other host interfaces do not have an emulation memory and provide serial access to the ECU variables for calibration and measurement. ECU-internal flash memory is overlaid with elements of microcontroller-internal RAM (overlay RAM).

In some special cases, the relevant ECU registers for configuring the overlay units are not accessible via the serial interface of the DCI-GSI2. Then the dSPACE Calibration and Bypassing Service is used to perform the read and write accesses to these registers.

The dSPACE Calibration and Bypassing Service addresses the ECU memory either in paged address mode or absolute address mode (see below).

Address modes

Each parameter (except for adaptive parameters) that is used by the ECU application is located in every data set. The dSPACE Calibration and Bypassing Service supports two address modes for addressing the ECU memory:

- Paged address mode

  In paged address mode, the address depends not only on the address of the parameter but also on the page number. The address must be mapped to the correct physical memory space. This is done by customer-specific functions.
- Absolute address mode

  In absolute address mode, the parameter is written directly to the specified address. This addressing mode must be used if data (such as adaptive parameters) has to be written to a memory region that is not paged.

Switching memory pages

The dSPACE Calibration and Bypassing Service and ControlDesk support memory page switching.

Some parameter values on the two pages are usually different. You can switch from one page to the other. It is possible to make the changes of parameters available to the ECU via a single page switch.

Note

Since the paging mechanism is highly ECU-specific, the dSPACE Calibration and Bypassing Service provides no service to switch memory pages. You must implement the actual page switch mechanism yourself. The dSPACE Calibration and Bypassing Service Custom API provides functions that allow adaptation to your specific needs when you implement memory page switching.

For the ECU these pages appear at the same addresses, that is, only one page is visible to the ECU at a time. So when you change parameters on one page, you can make these changes available to the ECU via a single page switch. If you request a page switch, it is executed regardless of the ECU's status.

Checksum calculation

Every page can consist of one or more memory segments. Both ControlDesk and the dSPACE Calibration and Bypassing Service calculate checksums for every single memory segment. If you switch from offline to online, the memory segments are compared on the basis of these checksums. If one or more memory segments differ, you have to equalize the pages. The memory segments which differ are transmitted during this offline-to-online transition.

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dSPACE Calibration and Bypassing Service Configuration Options (dSPACE Calibration and Bypassing Service Implementation 🕮)

Measurement Features

Introduction

Data acquisition (DAQ) is the capturing of variables. The ECU application contains variables and parameters. Using the dSPACE Calibration and Bypassing Service, you can measure ECU variables to evaluate the effects of parameter calibration. You can also measure the ECU parameters.

Defining event channels

To measure data, you have to define event channels. An event channel is a fixed raster that is defined in the ECU code.

Block copy mechanism

The block copy mechanism allows you to transfer data blocks. An entry in the service configuration tables consists of an address and the number of accesses.

- The block copy mechanism allows efficient copying of large, coherent data blocks.
- If the size of data blocks are smaller, the efficiency of the block copy mechanism is reduced. In this case, disabling the block copy mode may lead to a better performance of the dSPACE Calibration and Bypassing Service.

Note

If the block copy mechanism is disabled, only the address given in the service configuration tables will be used and the number of accesses will be ignored.

Alive and version information mechanism

For information, refer to Alive and version information mechanism on page 24.

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Bypassing Features

Introduction

If you want to optimize the ECU code or add new functions, you can use the bypass method. Specific software functions are transferred from the production ECU to the bypassing system that is connected to the ECU, for example, by a dual-port memory (DPMEM) interface, a debug interface or CAN. At the same time, your ECU still runs the existing code.

You can access the ECU via the ECU interface unit of MicroAutoBox II or a DS1006 in connection with a DS4121 (ECU Interface Board). With the dSPACE Calibration and Bypassing Service, bypassing can be performed with a DPMEM-based POD.

Extended bypassing mechanisms

The dSPACE Calibration and Bypassing Service provides extended bypassing mechanisms:

- Double buffer mechanism
- Wait mechanism
- Buffer synchronization mechanism
- Failure checking mechanism
- Fail-safe mechanism

These mechanisms are interdependent. The dSPACE Calibration and Bypassing Service provides specific commands for configuring them.

Double buffer mechanism

The double buffer mechanism is used to ensure that only consistent data blocks are transmitted. If the mechanism is enabled, two buffers are used for data exchange between the ECU and the RCP (rapid control prototyping) system. For example, when reading data from the RCP system, the ECU continues reading old data (= data already read before) as long as no new data is available from the RCP system. This ensures data consistency. If you disable the double buffer mechanism, only one buffer is used for data exchange.

The dSPACE Calibration and Bypassing Service supports the double buffer mechanism. You can use the configuration file to specify whether the mechanism is to be supported. Then you must enable or disable the double buffer mechanism explicitly in every Read and Write block of the RTI Bypass Blockset.

If the double buffer mechanism is disabled, the wait, failure checking, and fail-safe mechanisms are not available.

Wait mechanism

You can use the wait mechanism to enable the ECU to wait for a valid response from the RCP (Rapid Control Prototyping) system. If the mechanism is enabled, the ECU waits until new data is available from the RCP system. If the ECU receives no new data until a predefined timeout, the ECU continues working in a defined way. The wait mechanism ensures that the ECU uses only data calculated by the RCP system.

The dSPACE Calibration and Bypassing Service supports the wait mechanism. You can use the configuration file to specify whether the mechanism is to be supported. Then you must enable or disable the wait mechanism explicitly for every event channel (service instance) in the Write blocks of the RTI Bypass Blockset.

Note

- You can enable the consistency wait mechanism only if you also enable the double buffer mechanism.
- Using the wait mechanism may increase the ECU's task execution time.
- You must configure a timeout scaling factor in the service configuration or alternatively realize a custom time stamp functionality within the service customization layer to ensure that the effective waiting time and the wait time configuration match. For further information on the functionality and configuration of the different timeout detection methods, refer to Configuration of DAQ and Bypassing Features (dSPACE Calibration and Bypassing Service Implementation 🕮).

Buffer synchronization mechanism

The buffer synchronization mechanism is used to enable the ECU to recognize whether data that is written back from the RCP system to the ECU belongs to the current sampling step, or whether it is delayed data from the previous sampling step. Data that is written back from the RCP system to the ECU after the ECU waiting time (specified in the wait mechanism) has expired is marked as old data. This prevents old results from being erroneously interpreted as current results.

Delayed data is identified by comparing identifier values of read and write service calls. When sending data to the RCP system, the ECU also transmits a unique identifier to the RCP system. (Each time a write service is called, the identifier value is incremented.) When the RCP system writes the calculated data back to the ECU, it also returns the identifier it received from the ECU. When new data is available from the RCP system, the ECU compares its current local identifier with the identifier received from the RCP system. Matching identifiers indicate results of the current sampling step. If the identifiers differ, the received data is immediately marked as old data (by setting old buffer equal to current buffer), and the ECU continues waiting for new data.

The dSPACE Calibration and Bypassing Service supports the buffer synchronization mechanism. You can use the dSPACE Calibration and Bypassing Service API function to activate the mechanism.

Note

- As of RTI Bypass Blockset 2.1, the buffer synchronization settings can be set conveniently in the blockset. The `dsecu_service_buffer_sync` function is no longer required.
- The buffer synchronization mechanism is active only if the wait mechanism is enabled.
- The buffer synchronization mechanism applies to data transmission only from the RCP system to the ECU.

Failure checking and fail-safe mechanisms

The dSPACE Calibration and Bypassing Service lets you enable the failure checking and the fail-safe mechanisms.

Failure checking mechanism The failure checking mechanism is used by the read service call for counting the number of failed data exchanges. A data exchange failure occurs when the ECU has not received new data from the rapid control prototyping (RCP) system. The failure checking mechanism must be enabled or disabled globally via the configuration file.

Fail-safe mechanism The fail-safe mechanism provides valid data (fail-safe data) if the RCP system has failed to provide new data to the ECU more often than indicated in the failure limit value.

Whenever the ECU receives no new data from the RCP system, the failure number is incremented. When the failure number reaches the predefined failure limit, the following happens (depending on the configuration settings made in the RTI Bypass Blockset and on the `DSECU_FAILSAFE_PAGE` define):

- If the fail-safe mechanism is enabled and if a fail-safe page (memory area containing data to be used by the ECU) exists, the ECU uses the data from the fail-safe page for further calculation.
- If the fail-safe mechanism is not enabled, the service returns `no data copied`, and the ECU uses the data calculated by its own control algorithm.

If the RCP system sends new data to the ECU, the failure count is reset to 0. The fail-safe mechanism ensures that the ECU continues working with "safe" data even if, for example, the connection between the ECU and the RCP system is interrupted.

The dSPACE Calibration and Bypassing Service supports the fail-safe mechanism. You can use the configuration file to specify whether the mechanism is to be supported. Then you must enable or disable the fail-safe mechanism explicitly for every event channel (service instance) in the Write blocks of the RTI Bypass Blockset.

Note

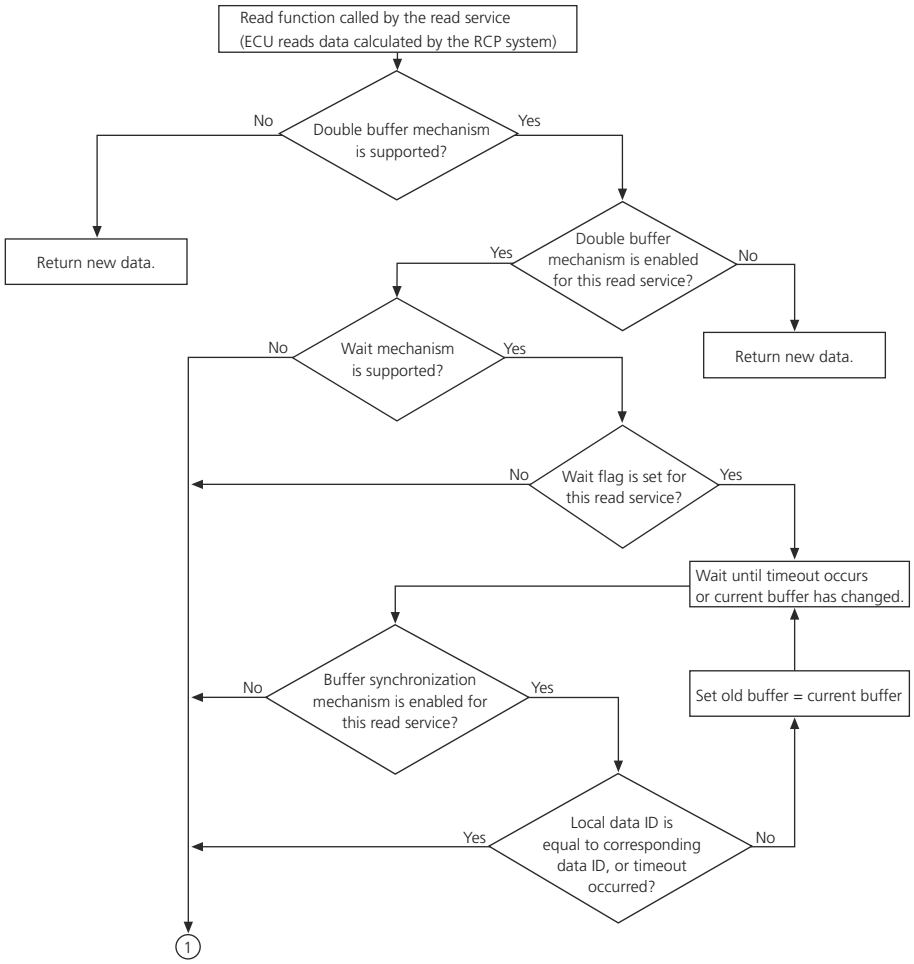
The fail-safe mechanism is currently not supported by the RTI Bypass Blockset.

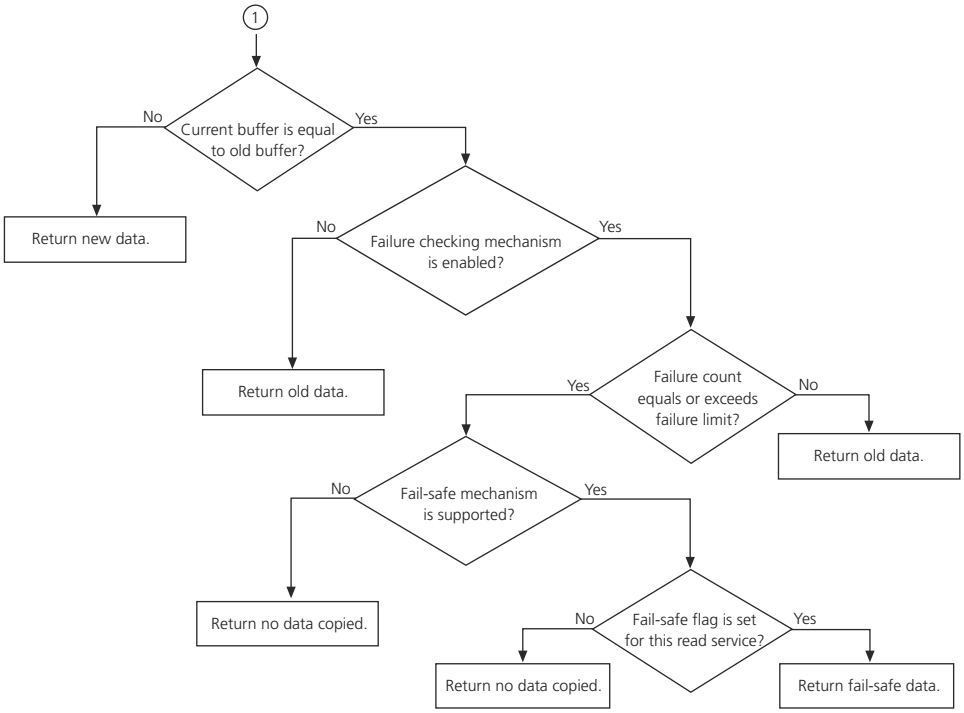
Note

- You can enable the failure checking and fail-safe mechanisms only if you also enable the double buffer mechanism.
- To make the fail-safe mechanism available, the failure checking mechanism must be enabled.

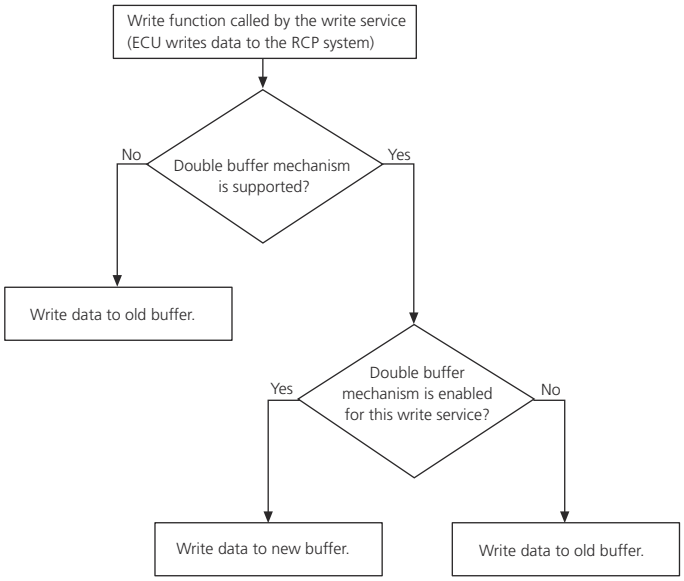
Flowcharts of extended bypassing mechanisms

Read service call The following illustrations show the extended bypassing mechanisms integrated for the read service call:





Write service call The following illustration shows the extended bypassing mechanisms integrated for the write service call:



Note

Some of the decisions shown in the illustrations above must be made in the configuration file (for example, whether the double buffer mechanism is supported). Other settings must be made on the dialog pages of the RTI Bypass Blockset.

Alive and version information mechanism

The alive and version information mechanism is provided by the dSPACE Calibration and Bypassing Service to detect if a calibration tool (ControlDesk) or bypassing system (for example, DS1006 or MicroAutoBox II) is connected to the ECU and is running.

Mechanism details Because measurement and bypassing is supported in parallel, the alive and version information mechanism addresses two different memory ranges. The alive and version information function provides four different mechanisms.

- Version control

  This submechanism provides information on the version of the dSPACE Calibration and Bypassing Service code.
- Compile information

  The compile information submechanism provides a flag that indicates the bypassing system that the service code was compiled for.
- Write submechanism (ECU and device)

  The write submechanism is used between the ECU and bypassing system to determine whether the other side is alive. Two submechanisms (words) are provided, that are read and written by the ECU and the corresponding device.
- Still alive submechanism (ECU and bypassing system)

  The still alive submechanism is used to indicate that the ECU or bypassing system is switched off. If you perform a controlled shutdown, the still alive submechanism writes a value to the appropriate memory location to inform the other side. If you switch off the power supply suddenly, the value is written the next time the system is started.

For further information, refer to Alive and Version Information Mechanism (dSPACE Calibration and Bypassing Service Implementation 🕮).

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Subinterrupt Handling

Introduction

The dSPACE Calibration and Bypassing Service provides a mechanism to generate and handle multiple subinterrupts using a single hardware interrupt line.

Subinterrupt handling methods

Three different methods of subinterrupt handling are supported:

Bit-based subinterrupt handling One bit is used per subinterrupt.

Byte-based subinterrupt handling One byte is used per subinterrupt. The bytes are read with every service call.

Word-based subinterrupt handling Two bytes are used per subinterrupt.

The mechanisms for byte- and word-based subinterrupt generation are very similar. The difference is that in the one case only one byte is written to/read from the RAM of the device instead of two bytes. For details on the subinterrupt handling methods, refer to Subinterrupt Handling Mechanism (dSPACE Calibration and Bypassing Service Implementation 🕮).

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Subinterrupt Handling Mechanism (dSPACE Calibration and Bypassing Service Implementation 🕮)

Programming the ECU Flash Memory

Introduction

The dSPACE Calibration and Bypassing Service can be used for ECU flash programming with the DCI-GSI2. You can use the dSPACE ECU Flash Programming Tool to supply the ECU's flash memory with new ECU application code, ECU boot code, and/or calibration data.

The DCI-GSI2 provides a high data throughput from the host PC to the ECU. Therefore the time for flashing an ECU with the dSPACE Calibration and Bypassing Service is very short.

ECU flash programming is supported by the dSPACE Calibration and Bypassing Service via a protocol for fast data transportation, including a common host tool applicable to any flash memory configuration.

Note

The actual flash driver is not part of the dSPACE Calibration and Bypassing Service. It must be provided by the customer since it depends on the type of flash device(s) to be programmed. Many flash device suppliers freely distribute standard flash drivers for their devices – e.g. this is almost always the case for processor internal flash devices. Inquire at your flash supplier to obtain a driver for your flash devices.

General ECU flash programming concept

- A memory segment is defined as an area in the flash memory. You can divide the flash memory into logical memory segments which can be programmed and erased independently. This allows you to program specific parts of the flash memory selectively.
- For each individual memory segment priorities for erasing and writing can be defined. Therefore you can control the exact sequence in which the segments are programmed to the ECU.

Activating flash service in ECU boot code

- The required flash functions are not integrated into the standard ECU application itself but into a small separate application, called the *dSPACE flash kernel*. The dSPACE flash kernel consists of the dSPACE Calibration and Bypassing Service and the custom flash functions. It also contains the appropriate driver(s) for the flash memory used.

  Note

  A flash kernel has to be adapted to the specific requirements of an ECU and its software. Contact dSPACE to discuss the next steps for creating a flash kernel for your ECU.

- Whenever a flashing operation is requested, the dSPACE flash kernel is loaded by the flash tool (for example, the dSPACE ECU Flash Programming Tool) to the ECU's RAM, where it is activated.
- Integrating the flash functionality into a separate flash kernel keeps the standard ECU application small.
- No risk of corrupting the flash memory, even if the ECU application crashes as the flash functions are not part of the ECU application.
- A single boot check function of the dSPACE Calibration and Bypassing Service must be integrated to your ECU application to allow flashing. This function checks if a flash operation is requested whenever the ECU is booted. When flashing is requested the downloaded dSPACE flash kernel is started.
- The boot check function can also be integrated into the ECU's boot code. This allows you to flash an ECU, even if the current ECU application is erroneous.

Related topics

Basics

Introduction to the dSPACE Calibration and Bypassing Service..... 11

References

dSPACE Calibration and Bypassing Service Configuration Options (dSPACE Calibration and Bypassing Service Implementation 🕮)

Adaptation of ECUs

ECU Adaptation

Introduction

ASAM MCD-2 MC (A2L) files contain a variable description of an ECU or RapidPro system used as a stand-alone prototyping ECU. To access an ECU or RapidPro system via ControlDesk for calibration and measurement, or to bypass an ECU via DPMEM using the RTI Bypass Blockset, there are some requirements the A2L file must meet.

Required interface-specific information

The A2L file must include an `IF_DATA` element specific to the calibration or bypass interface used. The `IF_DATA` element contains interface-specific information. This information must comply with a special format, which is described in ASAP2 Meta Language (AML) files. The AML specification of the interface must also be contained in the A2L file.

For information on the interface-specific `IF_DATA` elements and details on their data format, refer to the Interface Description Data Reference 🕮.

Related topics

Basics

Interface Description (dSPACE Calibration and Bypassing Service Implementation 🕮)