



INCA V7.3

Serial Calibration with InCircuit2

User's Guide - Supplement

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Serial Calibration with InCircuit2 R01 EN - 03.2020

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1 Introduction

This section contains information on the use of the InCircuit2 function in INCA. The first part is a brief overview of the principles of the InCircuit2 serial calibration method and the special features during the INCA installation. The next part is the description of the operational procedures in INCA. The final part explains the additional entries that need to be added to the A2L description file for the support of InCircuit2.

For general information on INCA operation please see the INCA Getting Started manual and the INCA online help.

1.1 Safety Information



WARNING

Calibration activities influence the behavior of the ECU and the systems controlled by the ECU. This may result in unexpected behavior of the vehicle and thus can lead to safety critical situations.

Only well trained personnel should be allowed to perform calibration activities.

1.2 The InCircuit2 Calibration Method

A calibration RAM ("working page"), common to all serial calibration methods, exists in the control unit. This is in addition to the flash page ("reference page") that is used to run the control unit in "normal mode". If this RAM is at least the same size as the flash, the entire data area can be copied into the working page allowing calibration of all parameters online.

The InCircuit2 method is used if this RAM ("ARAM") is considerably smaller than the flash ("DROM"), [Fig. 1-1](#). As a result, not all parameters that should be calibrated will fit into the calibration RAM.

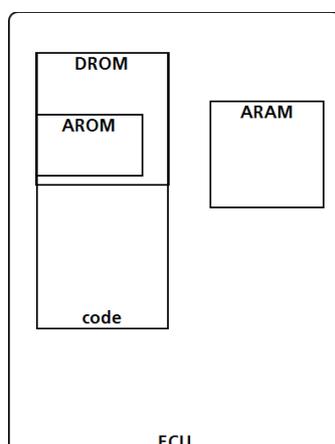


Fig. 1-1: Memory Distribution for the InCircuit2 Calibration Method

Instead, prior to the calibration, the user needs to select the desired parameters to copy into the calibration RAM where they can be calibrated. After finishing the calibration of these parameters, the user must transfer the entire dataset, including the changes, to the reference page.

The parameters in the ARAM are addressed using one or more pointer tables. Normally, each pointer refers to the parameter in the flash. However, if the parameter has been copied to the ARAM for online calibration, INCA modifies the pointer to refer to the copy of the parameter in the calibration RAM.

The control unit itself can be toggled between direct access to the flash ("control unit access to reference page") and access to the application RAM via the pointer table ("control unit access to working page") (Fig. 1-2).

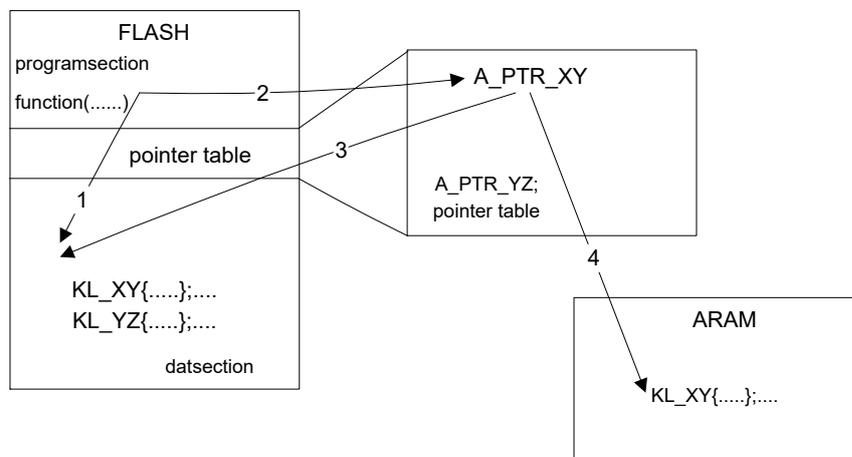


Fig. 1-2: InCircuit2 Method in the Control Unit

The InCircuit2 function extension in INCA is responsible for the ARAM management, which includes allowing the user to select the variables to calibrate, copying them into the ARAM, and redirecting the pointers in the pointer table to the ARAM.

Fig. 1-3: on the next page illustrates an overview of this process.

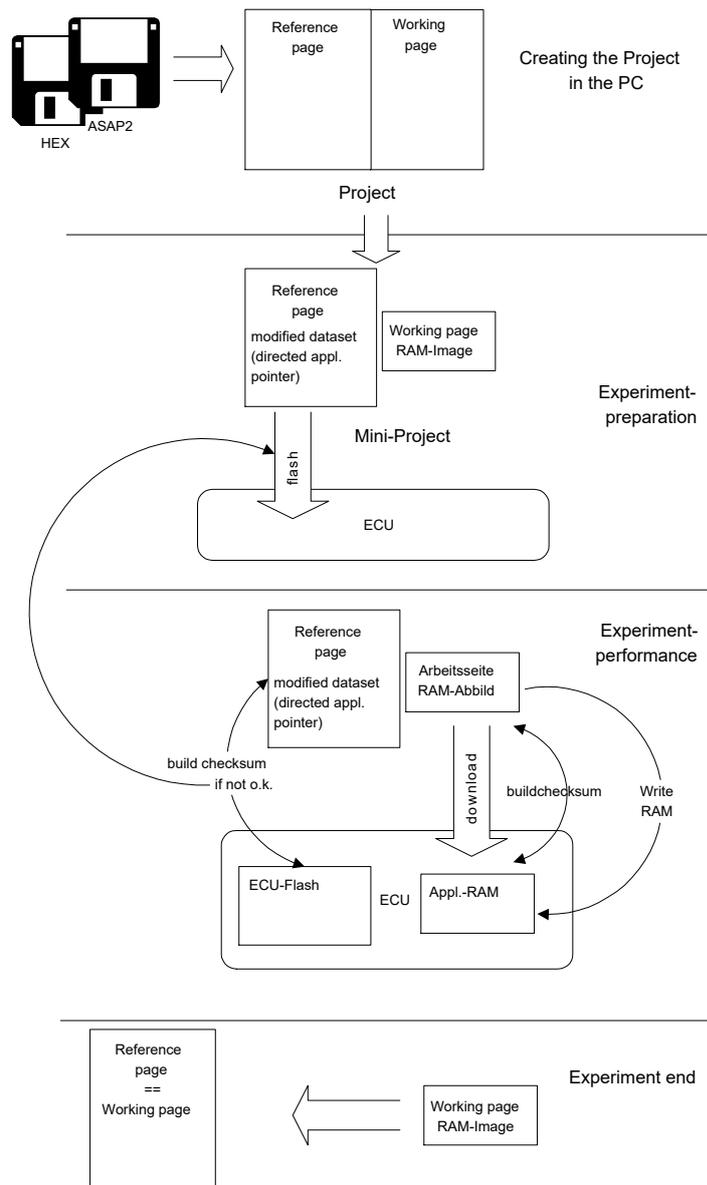


Fig. 1-3: Schematic process flow of InCircuit2 in INCA

2 Working with InCircuit2

2.1 Installation

The InCircuit2 function is automatically installed together with INCA.

For transferring the pointer tables, you will also need at least a ProF flow control sequence for flashing the complete control unit contents or, preferably, for flashing only the address range where the pointer tables are located. This flow control also needs to be installed in INCA. For more information, please consult the INCA manual. The flow control is specific to the control unit and can be obtained from the manufacturer of the control unit.

After the installation is complete, the **Variables** → **InCircuit2** main menu in the experiment environment will contain the following options for InCircuit2:

- **Experiment preparation**

Opens a window with this title from which you can select your desired parameters that can be calibrated.

- **Show ARAM contents**

Displays in the monitor window the parameters selected for online calibration and the calibration RAM addresses at which they have been stored by INCA.

2.2 Workspace and Hardware Configuration

Create a workspace and as described in the INCA manual, i.e., add a new hardware configuration, insert a CCP and assign a project. It is important, however, that your A2L file that will be read as your project description file includes the information required for InCircuit2 (see "[Additional Entries in the A2L File](#)" on [page 18](#)). Otherwise, INCA will not be able to recognize that your control unit uses the InCircuit2 method and will try to access the calibration RAM directly using the flash addresses.

 **Note**

For further information on setting up a hardware configuration, see the INCA Getting Started manual or the INCA online help ("Serial Calibration Using CCP").

If your A2L file includes the InCircuit2-specific additional information items, you specified a serial control unit interface (CAN) in the hardware configuration, and you installed the InCircuit2 function extension, INCA will automatically use the InCircuit2 method without requiring further actions from the user.

When using the InCircuit2 calibration method, the checksum is calculated during the hardware initialization only across the code page (if specified in A2L) and the reference page. The checksum is not calculated across the working page, because the contents of the calibration RAM for InCircuit2 is managed by INCA. In contrast to the "normal" calibration, for security reasons, the InCircuit2 calibration method does not allow you to switch to the working page to perform the calibration if the checksum of the reference page in the control unit does not match the checksum of the reference page in INCA. In this case, you first have to flash the contents of the reference page to the control unit from the memory page management dialog that opens automatically in this situation, or perform an upload from the control unit.



Fig. 2-1: Error message in case of a reference page mismatch

2.3 Experiment Preparation

When you change from the Hardware Configuration Editor to the experiment environment for the first time while a control unit is connected, you must first specify which parameters you want to copy into the calibration RAM so that they can later be calibrated online.

For this purpose, a dialog box is opened that is very similar to the variable selection dialog and which is also operated identically. In contrast to the variable selection, however, this dialog box only displays parameters.

To select parameters

1. In the **Sources** field, select the desired control unit interface.
In the tabular area of the window a list of the parameters made available by the selected component appears. Press the <TAB> key until the first parameter is highlighted in the tabular area.
2. Use the arrow keys to move the highlight to the variable to be selected.
3. Confirm by pressing the <SPACE> key.
The intended variable is now marked by a square in front of the variable name.
4. Select here all the parameters that you intend to calibrate later online.
To facilitate the selection, you can also apply a filter to certain parameter types as in the variable selection dialog.

- When you are done with the selection, exit the dialog box by clicking **OK**.

The pointer tables are now modified so that the address pointers of the selected parameters refer to the application RAM instead of to the flash. Use the **Variables → InCircuit2 → Show ARAM contents** command to view in the monitor window which parameters have been currently selected for online calibration and at which calibration RAM addresses they have been stored by INCA.

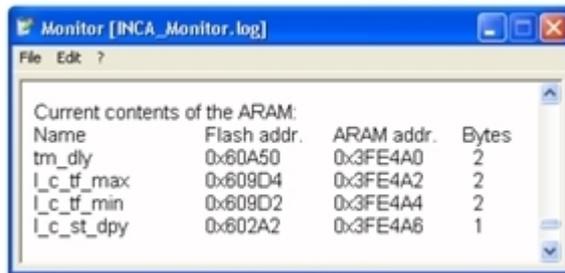


Fig. 2-2: Currently selected parameters with memory addresses

If you selected more parameters than fit into the calibration RAM, an error message (see [Fig. 2-3](#)) appears allowing you to repeat your selection if desired.

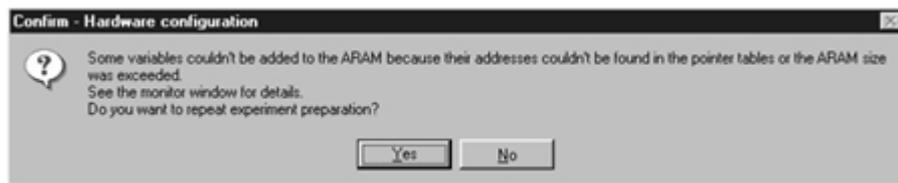


Fig. 2-3: Error message if the selected parameters exceed the capacity of the calibration RAM

In parallel, the monitor window indicates the current allocation of the calibration RAM and identifies the parameters that could not be inserted.

The modified pointer tables will be transferred to the control unit "[Flashing the Pointer Tables](#)" on the next page. If the transfer was successful, the values of the selected parameters will be copied from the working page of INCA into the calibration RAM. If this operation completes successfully, you can switch to the working page in INCA to perform online calibrations in the calibration RAM. If, however, an error occurred when flashing or writing into the calibration RAM, the working page is locked for security reasons because the control unit may work on invalid data on the working page in this case.

Exit the experiment preparation dialog box by clicking **Cancel** if you do not want to pre-select the parameters for online calibration. In this case, the pointer tables will not be modified and no parameters will be copied into the calibration RAM. This also means that you will not be able to switch to the working page.

Your pre-selection of parameters for online calibration is saved in the experiment. When opening an experiment that already contains a pre-selection of variables for online calibration, the checksum of the pointer tables in the control unit is first compared with the expected checksum of the pointer tables modified according to this pre-selection. If the checksum is correct, it is an indication for INCA that this control unit was last used with this particular experiment. Then also the expected checksum of the calibration RAM modified by INCA is compared with the checksum of the actual calibration RAM contents in the control unit. If there is a mismatch, the calibration RAM contents composed by INCA will be downloaded to the control unit.

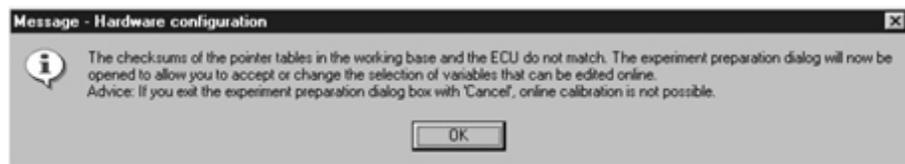


Fig. 2-4: Message in case of a mismatch between the pointer table checksums

If the checksums of the pointer tables do not match, you will receive a message (see Fig. 2-4), and then the dialog box for variable selection will open. It already contains a pre-selection of the parameters that have been saved in the experiment. You can accept them by clicking **OK** or you can edit them. When you exit the dialog box by clicking **OK**, the pointer tables are transferred into the control unit and the values of the selected parameters are copied into the calibration RAM, as already described above.

However, if you exit the dialog box by clicking **Cancel**, the existing contents of the pointer tables and the calibration RAM in the control unit are retained. This also means that you will not be able to switch to the working page.

You can also modify the pre-selection of parameters for online calibration at any other time by choosing the **Variables** → **InCircuit2** → **Experiment preparation** menu option from the experiment environment. The current pre-selection is saved together with the experiment.

The parameter selection dialog is not automatically opened if no control unit is connected when switching to the experiment environment or when loading an experiment. However, you can also open the variable selection dialog box without a control unit connected by choosing the **Experiment preparation** menu option. The parameters you select in this dialog box will then also be saved in the experiment.

2.4 Flashing the Pointer Tables

To write the modified pointer tables whose address pointers of the pre-selected parameters for online editing refer to the calibration RAM instead of the flash into the control unit, they have to be "flashed". Flashing is done using the **ProF** tool

version integrated into INCA.

To flash the entire control unit contents, you need at least one ProF flow control sequence, preferably one that only flashes the address range of the pointer tables, as appropriate for the control unit (which is also faster).

Once you have completed the experiment preparation as described above, the system will automatically invoke the **ProF** tool that is integrated in INCA. When calling it for the first time, you have to first install your ProF flow control sequence.

Note

For detailed information on ProF, please consult the manual or the documentation for the corresponding process control flow.

Configure the baud rate and additional adjustable parameters of the ProF control flow as necessary, and confirm your input with **OK**. Now begins first the deletion which is then followed by the rewriting of the control unit Flash. The specific procedure and messages that may be displayed depend on the particular flow control sequence. If you have questions regarding ProF or encounter difficulties, please contact the INCA hotline.

If the flashing process finishes successfully, this is indicated by a success message. Most control units require that you perform a reset (switching the ignition off and back on) before you can continue.

If an error occurred during the flashing process, the system offers you the option to repeat the process. You can switch the control unit to the working page for online calibration only if the transfer finishes successfully. In case of failure, INCA inhibits switching to the working page.

2.5 (Online) Measurements and Calibrations in the Control Unit

After you have completed the experiment preparation and transfer of the pointer tables successfully, you can start performing measurements and calibrations with INCA (almost) as usual and as described in the manual. The difference between the InCircuit2 calibration method and other methods lies in the fact that you can only calibrate online in the control unit parameters that you pre-selected during the experiment preparation. These parameters exist only in the calibration RAM. All other parameters are still located in the flash and cannot, therefore, be calibrated directly in the control unit.

INCA displays both types of parameters (calibratable *online* and calibratable *offline*, displayable *online*) in the variable selection dialog and allows you to invoke editors for these variables. However, the behavior of the editors depends

on the fact whether INCA is in online mode (with HW calibration access; **Hardware** → **ECU calibration access** menu option is checked) or in offline mode (without HW calibration access;)

In online mode, it is possible to calibrate parameters only that are available for online calibration, provided INCA and the control unit are on the working page. The calibration operations are written directly into the calibration RAM of the control unit. The parameters that are available only for offline calibration are write-protected (see Fig. 2-5). On the reference page, of course, all parameters are write-protected.

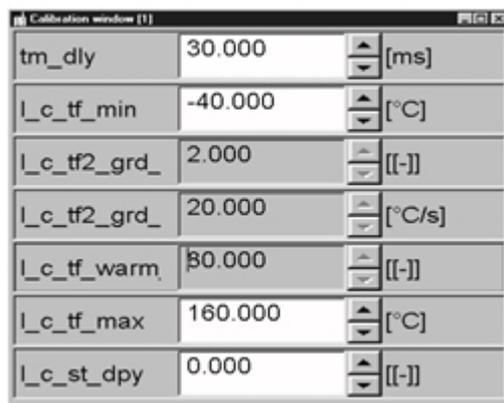


Fig. 2-5: Parameter editors in online mode

In offline mode, all parameters on the working page can be edited (see Fig. 2-6). However, if you perform a calibration operation, it is not written to the control unit! All parameters on the reference page are of course write-protected.

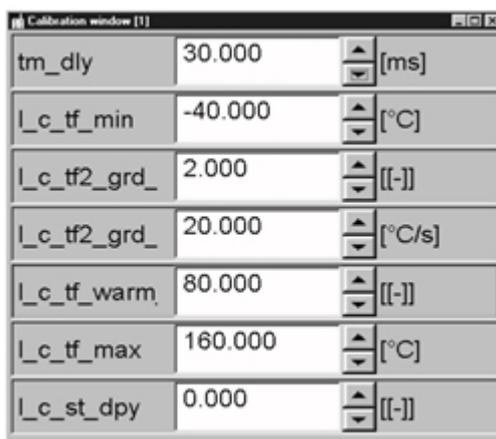


Fig. 2-6: Parameter editors in offline mode

When switching from offline into online mode, all calibrations that you performed before in offline mode for the parameters that are available for online calibration

will be written collectively into the calibration RAM of the control unit. The calibrations for variables that can be calibrated in offline mode only will not be written (see Fig. 2-7).



Fig. 2-7: Message when switching from off-line into online mode

To write the offline changes to the parameters available for online calibration into the control unit, the control unit must be on the reference page. If it is currently on the working page, it will be switched temporarily to the reference page during the download. Be sure to confirm the switch-over (see Fig. 2-8), otherwise, the download cannot be executed and you will not be able to perform online calibrations.

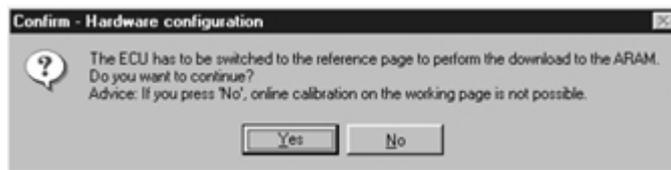


Fig. 2-8: Confirmation of temporarily switching to the reference page during the download

To write the changes to the parameters available for offline calibration into the control unit, the memory page manager needs to transfer the working page of INCA into the control unit.

During the measurement the InCircuit2 calibration method does not differ from other calibration methods. For more information, consult the description in the INCA Getting Started manual.

2.6 Memory Page Management

Similar to other calibration methods, the Memory Page Manager provides functions to write the contents of the working page and reference page to a file, to read other data versions, to compare the checksum of the control unit's working page and reference page with INCA's working page and reference page, and to transfer data.

The difference between the online mode and offline mode is even more noticeable for the InCircuit2 calibration method than for other methods:

- In offline mode (no HW calibration access; "HW access" checkbox *not* enabled in the Memory Page Manager dialog), all functions refer to INCA's working page and reference page only. Thus the same functions are offered here as for all other calibration methods.

- In online mode (with HW calibration access; "HW access" checkbox enabled in the Memory Page Manager dialog), functions are provided that really access the control unit, and some additional functions that, although accessing INCA's working page and reference page only, are also useful in online mode. The functions provided exhibit some differences between the InCircuit2 calibration method and "normal" calibration methods.

To demonstrate that the calibration RAM of the control unit is smaller than the flash and that it contains only the data of the parameters which were selected during the experiment preparation for online calibration, the memory page manager distinguishes for the sources and targets of the functions clearly between the working page and the calibration RAM (or "ARAM").

- The "working page" always refers to the working page in INCA containing both the data of the parameters that can be calibrated online and offline only.
- "ARAM", however, actually refers to the calibration RAM in the control unit or its PC image containing only the data of the parameters that can be calibrated online.

Since the same functions are provided in offline mode regardless of the calibration method used, please consult the INCA Getting Started manual for more information.

The following describes all functions of the memory page manager that are available in online mode.

"Flash Programming" Operation

Working page (+ Program page) → ECU flash

Programs the contents of the working and program page of INCA into the flash memory of the control unit. You can decide whether to include in the transfer to the control unit the pointer tables that you modified during the experiment preparation and in which some pointers refer to the ARAM, or to transfer the original pointer tables in which all pointers refer to the flash (see [Fig. 2-9](#)).



Fig. 2-9: User prompt to specify whether to flash original or modified pointer tables

This prompt does not appear if there are no modified pointers.

The integrated ProF is invoked for the flashing operation. If required, install and configure the ProF flow control sequence appropriate for your control unit as described in "[Flashing the Pointer Tables](#)" on page 10, select the desired operation in the ProF dialog, and start the programming process.

Upon successful completion of the programming process, the contents of the working page in INCA are copied to the reference page. If you selected "flashing the original pointer tables", the selection of parameters available for online calibration is reset; to re-enable online calibrations, you have to select new parameters in the variable selection. If you selected "flashing the modified pointer tables", the flashing process is followed by a download into the calibration RAM, while the parameters selected for online calibration are retained.

If an error occurs during the flashing process, INCA locks the switch-over to the working page for security reasons (it switches automatically to the reference page for the programming process).

Reference page (+ Program page) → ECU flash

Programs the contents of the reference and program page of INCA into the flash memory of the control unit. You can also decide whether to include the modified or the original pointer tables in the programming process.

The procedure is the same as for programming the contents of the working page (see above), with the exception, of course, that the contents of the working page are not copied when the transfer finishes successfully.

Pointer tables → ECU flash

Programs the modified pointer tables (and the contents of the reference and program page of INCA, if required) into the flash memory of the control unit. The function is identical to the usually automatic programming process of the pointer tables following the experiment preparation (see also "Flashing the Pointer Tables" above).

File → ECU flash (only on the "Enhanced" tab)

Programs the contents of the selected file into the flash memory of the control unit. You, as the user, are responsible that the file contains a valid program version.

The contents of the data versions in INCA are not updated automatically!

"Upload" Operation ("2 Enhanced" tab)

ECU → Reference page (+ Program page)

Uploads the data from the reference page (flash) of the control unit into the reference page of INCA. You can select whether to upload into the existing dataset or to create new datasets (reference and working page datasets). If you create new datasets, the new working page dataset is filled with the data from the reference page.

You should perform an upload of the pointer tables (as part of the program page) only if the pointer tables are in their original state.

Otherwise, INCA will detect that the pointers are not reasonable. There is no automatic detection which parameters have been selected for online calibration.

"Checksum" Operation ("2 Enhanced" tab)

ARAM → Reference page → Program page → Pointer table

Verifies the checksums in INCA and in the control unit for the selected memory pages. These are compared with the checksum of the PC image of the calibration RAM during the checksum verification of the application RAM.

"Hexadec. Representation" Operation ("2 Enhanced" tab)

ARAM → Reference page → Program page → Pointer tables

Opens a hex viewer/editor for the selected memory page which displays a comparison between the contents of the memory page in INCA and in the control unit. Again, you can edit the contents of the calibration RAM, but you, as the user, are responsible for the correctness of the edited data!

"Write dataset to file" Menu Option

Dataset → Write dataset to file... → Working page only or ... → Working page and code page

Writes the contents of the working page and, if required, also the contents of the program page of INCA into a file. The working page contains the current contents of both the parameters that can be calibrated online and offline only.

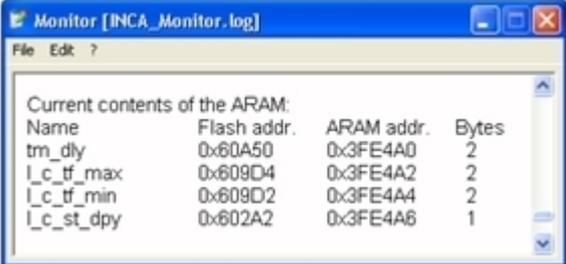
Dataset → Write dataset to file... → Reference page only or ... → Reference page and code page

Writes the contents of the reference page and, if required, also the contents of the program page of INCA into a file.

3 Tips and Tricks

For security reasons, INCA locks the possibility to switch to the working page if an error occurred (e.g., if transferring the pointer tables failed) and, in case of severe errors, it also inhibits the possibility to perform the experiment preparation. Fix the problem and then execute the "Initialize HW" function (function key <F3> or **Hardware** → **Initialize HW** menu option). If the error does not reoccur, the access to the working page is unlocked.

The **Variables** → **InCircuit2** → **Show ARAM contents** menu option in the experiment environment provides an overview of the parameters currently selected for online calibration and their calibration RAM addresses assigned by INCA. The parameters are then listed in the monitor window (see [Fig. 3-1](#)).



Current contents of the ARAM:			
Name	Flash addr.	ARAM addr.	Bytes
tm_dly	0x60A50	0x3FE4A0	2
l_c_tf_max	0x609D4	0x3FE4A2	2
l_c_tf_min	0x609D2	0x3FE4A4	2
l_c_st_dpy	0x602A2	0x3FE4A8	1

Fig. 3-1: Monitor window listing the parameters available for on-line calibration

4 Additional Entries in the A2L File

Some additional entries are required in the A2L description file to ensure that INCA can apply the InCircuit2 calibration method correctly. In particular, the size and location of the pointer tables and calibration RAM need to be described separately. To describe the calibration method and the location of the pointer tables, ASAM-MCD-MC2 Version 1.3 provides the new `CALIBRATION_METHOD` keyword. For example:

```

/begin MOD_PAR
...
/begin CALIBRATION_METHOD
  "InCircuit"          /* method name */
  2                    /* method version */
  /begin CALIBRATION_HANDLE
                        /* description of pointer table 1 */
                        0x2B000 /* start address of pointer table 1 */
                        0x200  /* length of pointer table 1 */
                        0x4    /* size of one pointer table entry */
                        0x2A000 /* begin of the flash section */
                        0x2000  /* length of the flash section */
  /end CALIBRATION_HANDLE
  /begin CALIBRATION_HANDLE
                        /* description of pointer table 2 */
                        0x2B200 /* start address of pointer table 2 */
                        0x100  /* length of pointer table 2 */
                        0x4    /* size of one pointer table entry */
                        0x2A000 /* begin of the flash section */
                        0x2000  /* length of the flash section */
  /end CALIBRATION_HANDLE
/end CALIBRATION_METHOD
...
/end MOD_PAR

```

Each pointer table has to be described by a `CALIBRATION_HANDLE` section in the `CALIBRATION_METHOD`. This has to describe the start address and length of the pointer table, the length of the address entry in the pointer table, and the

start and length of the flash segment that contains the pointer table. You can combine the pointer tables in the description, if they follow each other contiguously and reside in the same flash segment.

The size of the flash and calibration RAM is described by `MEMORY_SEGMENT`. For example:

```
/begin MEMORY_SEGMENT
  Data "" DATA FLASH INTERN 0x28000 0x2000 -1 -1 -1 -1 -1
/end MEMORY_SEGMENT

/begin MEMORY_SEGMENT
  ARAM "" SERAM RAM EXTERN 0x30000 0x400 -1 -1 -1 -1 -1
/end MEMORY_SEGMENT
```

It is important to also describe the range of the pointer tables. For example:

```
/begin MEMORY_SEGMENT
  Pointer "" CODE FLASH INTERN 0x2B000 0x500 -1 -1 -1 -1 -1
/end MEMORY_SEGMENT
```

This ensures that the pointer tables are stored in datasets in INCA from where they can be included in the transfer. If the pointer tables are already included in a CODE segment described in A2L, they need not be described again separately.

4.1 Additional Entries in the A2L File for InCircuit2 with CCP

To be able to use the calibration concept of InCircuit2 in combination with the calibration protocol CCP the implementation must follow some rules to ensure a consistent behavior.

CCP Page Definition

The description of the memory position of the working page, which is located within the `IF_DATA ASAP1B_CCP` block below `DEFINED_PAGES`, has to be consistent with the corresponding description in the block `MEMORY_SEGMENT` which is describing the ARAM.

CCP Checksum Method

CCP provides two modes of checksum calculation:

- Checksum calculation only on active page (i.e. the page the ECU is running on)
- Checksum calculation on both active and non-active side

Due to the fact that it is not safe to switch an InCircuit2 ECU to a page which was not initialized to perform a checksum calculation, the parametrization must enable the tool to perform the checksum calculation on the non-active side.

The CCP IF_DATA section option **CHECKSUM_CALCULATION_BIT_OR_WITH_OPT_PAGE** provides this possibility. If this mode is available the tool can perform a checksum calculation without a page switch to that page.

It is also required to set the option **RAM_INIT_BY_ECU**; this prevents the tool from trying to initialize the working page by using the MOVE command or by means of a regular download, which both do not work with the InCircuit2 calibration concept.

A2L Example

```

/begin IF_DATA ASAP1B_CCP
  [...]
/begin TP_BLOB
  [...]
/begin CHECKSUM_PARAM
  0x8006 0xFFFFFFFF
  CHECKSUM_CALCULATION_BIT_OR_WITH_OPT_PAGE
/end CHECKSUM_PARAM
/begin DEFINED_PAGES
  0x1 "reference page" 0x0 0x28000 0x2000
  FLASH
/end DEFINED_PAGES
/begin DEFINED_PAGES
  0x2 "working page" 0x0 0x30000 0x400
  RAM
  RAM_INIT_BY_ECU
  FLASH_BACK
/end DEFINED_PAGES
OPTIONAL_CMD 0x9 /*GET_ACTIVE_CAL_PAGE*/
OPTIONAL_CMD 0xE /*BUILD_CHKSUM*/
OPTIONAL_CMD 0x11 /*SELECT_CAL_PAGE*/
OPTIONAL_CMD 0xD /*GET_SESSION_STATUS*/
OPTIONAL_CMD 0xF /*SHORT_UP*/
OPTIONAL_CMD 0x18 /*PROGRAM*/
OPTIONAL_CMD 0x10 /*CLEAR_MEMORY*/
OPTIONAL_CMD 0x22 /*PROGRAM_6*/

```

```

/end TP_BLOB
/end IF_DATA

```

Summary

The CCP description has to meet the following requirements:

- The description of the block `DEFINED_PAGES` has to be consistent with the description in the block `MEMORY_SEGMENT`.
- The parameter `CHECKSUM_CALCULATION_BIT_OR_WITH_OPT_PAGE` has to be set.
- The parameter `RAM_INIT_BY_ECU` has to be set.

Note

ETAS strongly recommends to implement a CRC checksum algorithm to enable tools to determine differences in the pages and pointer tables reliable.

4.2 Additional Entries in the A2L File for InCircuit2 with XCP

To be able to use the calibration concept of InCircuit2 in combination with the Universal Measurement and Calibration Protocol (XCP) the A2L file should provide standard information for write and read access of the memory pages correctly.

ECU Access

There are four different settings for the ECU Access in the `PAGE` section of `IF_DATA XCP` with the following meaning:

Flag in the A2L	Meaning	
<code>ECU_ACCESS_NOT_ALLOWED</code>	ECU access not allowed for the PAGE.	
<code>ECU_ACCESS_WITHOUT_XCP_ONLY</code>	ECU access allowed only if the XCP master does NOT access this PAGE at the same time.	
<code>ECU_ACCESS_WITH_XCP_ONLY</code>	ECU access allowed only if the XCP master accesses this PAGE at the same time.	
<code>ECU_ACCESS_DONT_CARE</code>	ECU access allowed and the ECU does NOT care whether the XCP master accesses at the same time or not.	

The `ECU_ACCESS_x` flags indicate whether and how the ECU can access this page.

According to InCircuit2 architecture, the correct setting of the flag for ECU Access is `ECU_ACCESS_DONT_CARE`.

Read Access

There are four different settings for the Read Access in the `PAGE` section of `IF_DATA_XCP` with the following meaning:

Flag in the A2L	Meaning	
<code>XCP_READ_ACCESS_NOT_ALLOWED</code>	Read access not allowed for the PAGE.	
<code>XCP_READ_ACCESS_WITHOUT_ECU_ONLY</code>	Read allowed only if the ECU does NOT access this PAGE at the same time.	
<code>XCP_READ_ACCESS_WITH_ECU_ONLY</code>	Read access allowed only if the ECU accesses this PAGE at the same time.	
<code>XCP_READ_ACCESS_DONT_CARE</code>	Read access allowed and the XCP master does NOT need to care whether the ECU accesses at the same time or not.	

According to InCircuit2 architecture, the correct setting of the flag for ECU Read Access is `XCP_READ_ACCESS_DONT_CARE`.

Write Access

There are four different settings for the Write Access in the `PAGE` section of `IF_DATA_XCP` with the following meaning:

Flag in the A2L	Meaning	
<code>XCP_WRITE_ACCESS_NOT_ALLOWED</code>	Write access not allowed for the PAGE.	
<code>XCP_WRITE_ACCESS_WITHOUT_ECU_ONLY</code>	Write allowed only if the ECU does NOT access this PAGE at the same time.	
<code>XCP_WRITE_ACCESS_WITH_ECU_ONLY</code>	Write access allowed only if the ECU accesses this PAGE at the same time.	
<code>XCP_WRITE_ACCESS_DONT_CARE</code>	Write access allowed and the XCP master does NOT need to care whether the ECU accesses at the same time or not.	

According to InCircuit2 architecture, the correct setting of the flag for ECU Write Access is `XCP_WRITE_ACCESS_DONT_CARE` for pages which can be written by the XCP master.

Note

A wrong configuration of the pages for InCircuit2, could cause that INCA tries to switch the pages in an invalid state. Example: if in an A2L file the flag `XCP_WRITE_ACCESS_WITH_ECU_ONLY` is defined for the PAGE, during the initialization INCA will try to switch the ECU and the XCP master synchronously to the working page before the ARAM is initialized.

Note

ETAS strongly recommends to implement a CRC checksum algorithm to enable tools to determine differences in the pages and pointer tables reliable.

A2L Example for InCircuit2 with XCP

```

/begin IF_DATA XCP
  /begin SEGMENT
    2 2 0 0 0
    /begin CHECKSUM
      XCP_CRC_16
      MAX_BLOCK_SIZE 4096
    /end CHECKSUM
    /begin PAGE
      0
      ECU_ACCESS_DONT_CARE
      XCP_READ_ACCESS_DONT_CARE
      XCP_WRITE_ACCESS_NOT_ALLOWED
      INIT_SEGMENT 0
    /end PAGE
    /begin PAGE
      1
      ECU_ACCESS_DONT_CARE
      XCP_READ_ACCESS_DONT_CARE
      XCP_WRITE_ACCESS_DONT_CARE
      INIT_SEGMENT 0
    /end PAGE
  /end SEGMENT

```

```
/end IF_DATA
```

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