EMMI Calibration Unit Software Design Description

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## CHANGE RECORD

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<tr>
<td>1.2</td>
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1. INTRODUCTION

1.1 PURPOSE

This document describes the software design of the new EMMI Calibration Unit. It is intended to provide all the necessary information for the implementation of the software and for the preparation of test procedures.

1.2 SCOPE

The present document describes the design of the software for adapting the existing EMMI instrument software for the new EMMI Calibration Unit. A new software module emidig will be created, and several modules of the instrument control software (ICS) and the templates will be affected as well.

1.3 APPLICABLE DOCUMENTS

The following documents form a part of this document to the extent specified herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of this document shall be considered a superseding requirement.


1.4 REFERENCE DOCUMENTS

The following documents are referenced in this document.


1.5 ABBREVIATIONS AND ACRONYMS

The following abbreviations and acronyms are used in this document:

ICS   Instrument Control Software
OCS   Control Software
OLDB  Online Data Base
LSO   La Silla Observatory
N/A   Not Applicable
TBC   To Be Confirmed
TBD   To Be Defined

1.6 GLOSSARY

1.7 STYLISTIC CONVENTIONS

This subsection is optional. Use it if it makes sense. The following is just an example. Change it according to your needs.
The following styles are used:

**Bold**
In the text, for commands, filenames, pre-suffixes as they have to be typed.

*Italic*
In the text, for parts that have to be substituted with the real content before typing.

Teletype
For examples.

`<name>`
in the examples, for parts that have to be substituted with the real content before typing.

**Bold** and *italic* are also used to highlight words.
2. **OVERVIEW**

The following design considers that three new devices are added to the current EMMI instrument control system, as specified in [1]:

- Custom designed achromat on a removal unit
- Closing sphere disk on a removal unit
- Calibration lamp

In the following sections a proposal of a software design that incorporates the mentioned devices is presented.

2.1 **Architecture**

The design assumes that the EMMI instrument software has been successfully upgraded to BOSS and ICB (WS part only). Emphasis is given to get a standard implementation in order to minimize future maintenance work.

The following device names/keywords are proposed:

<table>
<thead>
<tr>
<th>Device Type</th>
<th>Device</th>
<th>FITS Prefix</th>
<th>ICB Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Achromat lens arm</td>
<td>lens</td>
<td>INS.LENS1</td>
<td>Special</td>
</tr>
<tr>
<td>Closing sphere disk</td>
<td>clsp</td>
<td>INS.CLSP1</td>
<td>Special</td>
</tr>
<tr>
<td>Calibration lamp</td>
<td>lamp5</td>
<td>INS.LAMP5</td>
<td>icbLAMP</td>
</tr>
</tbody>
</table>

As devices **lens** and **clsp** do not correspond to any already supported ICB standard device they have to be considered as special devices. However, as its functionality is similar to other already existing special devices (e.g. FEROS Mirror 3 and ADC arm) the respective software modules can be reused.

So the presented design only applies if the following conditions are met:

- EMMI instrument software is based on BOSS and ICB (WS part only)
- The hardware is compatible with the already existing special devices for digital control units
2.1.1 Impact

The main modifications will be:

- Incorporate the standard ICB server processes (LCU lemcal)
- Add a standard device (lamp5)
- Add two special devices (lens and clsp)
- Update templates
- Update ICS/OS panels
- Scanlinks
- OLDB
3. DESIGN DESCRIPTION

3.1 Standard Devices

To incorporate the standard device lamp5 it is first required to incorporate the corresponding standard ICB server processes at the LCU. As shown in fig.1, the original server process in charge of managing the EMMI calibration lamp unit is ntctlServer. For ICB the processes ic0lcuServer and ic0devServer (and the modules mcm and icb) must be added.

In order to incorporate these new control processes within the general ICS configuration, a configuration that considers a “virtual” LCU 3 is proposed:

```
INS.CON.WSENV        "wemmi"; # Workstation CCS environment
INS.CON.LCUNUM             3; # Number of instrument LCUs
INS.CON.LCUENV1      "lemmi"; # ICS LCU1
INS.CON.LCUENV2     "lemcal"; # Calibration lamps LCU2
INS.CON.LCUENV3     "lemcal"; # EMMI Calibration Unit (virtual for ICB)
```

Those devices assigned to LCU 2 (i.e., the existing calibration lamps) will still be handled by the server ntctlServer, and devices assigned to the new virtual LCU 3 will be handled by the ICB standard servers. So, standard and special devices can be added the usual way (see [4]) using the LCU ID 3.

3.1.1 Setup and Status Keywords

The standard device lamp5 inherits from class icbLAMP, meaning that the SETUP accepts the following FITS keywords [4]:

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>INS.LAMP5.ST</td>
<td>Turn the lamp on (T) or off (F)</td>
</tr>
<tr>
<td>INS.LAMP5.WAIT</td>
<td>Max. time to wait for lamp warm-up</td>
</tr>
</tbody>
</table>

The STATUS reports the following keywords [4]:

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>INS.LAMP5.ST</td>
<td>Lamp is on (T) or off (F)</td>
</tr>
<tr>
<td>INS.LAMP5.ID</td>
<td>Hardware identification of the lamp</td>
</tr>
<tr>
<td>INS.LAMP5.NAME</td>
<td>ESO name of the lamp</td>
</tr>
</tbody>
</table>

For detailed information please review section 8.11.1 of [4].

3.1.2 Configuration

The following lines show the configuration of the standard device lamp5 at the file emmcfgINS.cfg (module emmcfg):

```
# # Thorium Lamp
#
INS.LAMP5.DEVNAME     "lamp5"; # Name of the ICS device
INS.LAMP5.DEVDESC "Thorium lamp"; # Description of the ICS device
INS.LAMP5.LCUID             3; # Id. of the LCU managing the device
INS.LAMP5.SWSIM             F; # If T, function is software simulated
```

Note for implementation: use the following lines as reference only!
INS.LAMP5.ID      "THL";
INS.LAMP5.NAME    "Th_Lamp";
# Acromag digital I/O interface setup
INS.LAMP5.SIGDEV  "/acro0";  # TBD
INS.LAMP5.SIGBIT1 4;  # TBD
INS.LAMP5.IGFAULT T;  # TBD

3.1.3 Commands

As the device lamp5 is managed by the ICB servers, all standard commands (i.e., INIT, STANDBY, ONLINE, etc.) will be supported.

3.1.4 Database

The new device has to be incorporated into the OLDB as well (emi/dbl/emiEnv2.db):

POINT icbLAMP :Appl_data:EMMI:ICS:DEVICES:LAMP5
BEGIN
  ALIAS LAMP5
  ATTRIBUTE bytes20 device "lamp5"
  ATTRIBUTE bytes16 prefix "INS.LAMP5"
  ATTRIBUTE int32  lcuId  3
END

Note for implementation: so the DB branch for ICS devices at LCU lemcal will contain LAMP1 to LAMP5.
But in this case it seems that the ic0devServer fails when initializing the non-ICB device objects.
Consequently, it is necessary to enclose the DB point definitions of LAMP1 to LAMP4 within "#ifndef MAKE_VXWORKS" and "#endif".

Note for implementation: to compile lemcal's database the Makefile has to be modified (lemcal/dbl/Makefile):
DBL_FLAGS = -v0 `icbConfigGet EMMI DBL_FLAGS_LCU3`
3.2 Special Devices

Taking advantage of the available ICB standard servers the definition and incorporation of the special devices \texttt{Lens} and \texttt{Clsp} is straight forward. For this purpose a new software module \texttt{emidig} should be created.

Note for implementation: as the hardware is supposed to be compatible with the FEROS digital special devices, module \texttt{emidig} should re-use FEROS’ module \texttt{feidig} as much as possible.

3.2.1 Setup and Status Keywords

The SETUP shall accept the following FITS keywords:

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>INS.LENS1.NAME or INS.CLSP1.NAME</td>
<td>Position name (IN/OUT)</td>
</tr>
</tbody>
</table>

The STATUS shall report the following keywords:

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>INS.LENS1.NAME or INS.CLSP1.NAME</td>
<td>Position name (IN/OUT)</td>
</tr>
<tr>
<td>INS.LENS1.SWSIM or INS.CLSP1.SWSIM</td>
<td>Indicates if software is simulated (T) or not (F)</td>
</tr>
</tbody>
</table>

3.2.2 Commands

The following standard commands shall be supported:

<table>
<thead>
<tr>
<th>Command</th>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>INIT</td>
<td>-function</td>
<td>Load persistent attributes of the /acro board to the LCU’s OLDB</td>
</tr>
<tr>
<td>STANDBY</td>
<td>-function</td>
<td>Initialize and configure ports used by the special devices at the /acro board</td>
</tr>
<tr>
<td>ONLINE</td>
<td>-function</td>
<td>Bring device to ONLINE state and ready to receive SETUP command</td>
</tr>
<tr>
<td>SIMULAT</td>
<td>-function</td>
<td>Enabled device HW simulation on the LCU.</td>
</tr>
<tr>
<td>SETUP</td>
<td>-function</td>
<td>As mentioned before.</td>
</tr>
</tbody>
</table>

For example, to select the move the Achromat Lens Arm (\texttt{Lens}) to position \texttt{IN} the following command has to be sent to the WS ICS process \texttt{emicontrol}:

```
> SETUP -function INS.LENS1.NAME IN
```
3.2.3 Configuration

The following lines show the configuration of the special device lens at the file emmcfgINS.cfg (module emmcfg):

Note for implementation: reference taken from femcfgINS.cfg.

```
# Special devices (digital motorized functions)
# Achromat lens
INS.DIG1.DEVNAME      "lens"; # Name of the ICS device
INS.DIG1.DEVDESC "Achromat lens arm"; # Description of the ICS device
INS.DIG1.PREFIX  "INS.LENS1"; # FITS prefix
INS.DIG1.LCUID             3; # Id. of the LCU managing the device
INS.DIG1.SWSIM             F; # If T, function is software simulated
INS.DIG1.TIMEOUT          30; # Movement timeout [msec]
INS.DIG1.SIGDEV     "/acro0"; # TBD
INS.DIG1.OUTBIT          59; # TBD
INS.DIG1.OUTLOW1          F; # TBD
INS.DIG1.INBIT1          56; # TBD
INS.DIG1.INNAME1      "OUT"; # TBD
INS.DIG1.INLOW1           T; # TBD
INS.DIG1.INBIT2          57; # TBD
INS.DIG1.INNAME2     "IN"; # TBD
INS.DIG1.INLOW2           T; # TBD
INS.DIG1.INBIT3          58; # TBD
INS.DIG1.INNAME3    "LOCAL"; # TBD
INS.DIG1.INLOW3           F; # TBD
INS.DIG1.POSID1        "IN"; # TBD
INS.DIG1.POSNAME1      "IN"; # TBD
INS.DIG1.OUTVAL1          0; # TBD
INS.DIG1.INVAL11          0; # TBD
INS.DIG1.INVAL12          1; # TBD
INS.DIG1.POSID2        "OUT"; # TBD
INS.DIG1.POSNAME2     "OUT"; # TBD
INS.DIG1.OUTVAL2          1; # TBD
INS.DIG1.INVAL21          1; # TBD
INS.DIG1.INVAL22          0; # TBD

# Closing sphere disk
INS.DIG2.DEVNAME      "clsp"; # Name of the ICS device
INS.DIG2.DEVDESC "Closing sphere disk"; # Description of the ICS device
INS.DIG2.PREFIX  "INS.CLSPI1"; # FITS prefix
INS.DIG2.LCUID             3; # Id. of the LCU managing the device
INS.DIG2.SWSIM             F; # If T, function is software simulated
INS.DIG2.TIMEOUT          30; # Movement timeout [msec]
INS.DIG2.SIGDEV     "/acro0"; # TBD
INS.DIG2.OUTBIT          59; # TBD
INS.DIG2.OUTLOW1          F; # TBD
INS.DIG2.INBIT1          56; # TBD
INS.DIG2.INNAME1      "OUT"; # TBD
INS.DIG2.INLOW1           T; # TBD
INS.DIG2.INBIT2          57; # TBD
INS.DIG2.INNAME2     "IN"; # TBD
INS.DIG2.INLOW2           T; # TBD
```
3.2.4 Database

These new devices have to be incorporated into the OLDB as well (emidig/db/emidigEnv.db):

POINT emidigMOT :Appl_data:EMMI:ICS:DEVICES:LENS
BEGIN
   ALIAS LENS
      // name and desc. of the device,
      // prefix of the FITS keywords
      // and LCU managing the device
      //
      ATTRIBUTE bytes20 device "lens"
      ATTRIBUTE bytes20 description "Achromat lens arm"
      ATTRIBUTE bytes16 prefix "INS.LENS1"
   END

POINT emidigMOT :Appl_data:EMMI:ICS:DEVICES:CLSP
BEGIN
   ALIAS CLSP
      // name and desc. of the device,
      // prefix of the FITS keywords
      // and LCU managing the device
      //
      ATTRIBUTE bytes20 device "clsp"
      ATTRIBUTE bytes20 description "Closing sphere disk"
      ATTRIBUTE bytes16 prefix "INS.CLSP1"
   END

Note for implementation: code taken from module feidig, use as reference only.

3.3 Assemblies

Assemblies permit to group together several devices and their behavior into one single, virtual device. So, in order to show the new EMMI Calibration Unit as a single device to the user, the following ICS assembly could be used (see section 8.17 of [4] for detailed information):

INS.ASSEMBLY3 "INS.CLAMP"
INS.ASSEMBLY3.HEADER F
INS.ASSEMBLY3.KEY1 "ON"
INS.ASSEMBLY3.VAL1 "INS.LENS1.NAME IN INS.CLSP1.NAME IN, INS.LAMP5.ST T"  
INS.ASSEMBLY3.KEY2 "OFF"
This way whenever ICS receives the command:
SETUP -function INS.CLAMP ON

It is converted into:
SETUP -function INS.LENS1.NAME IN INS.CLSP1.NAME IN
SETUP -function INS.LAMP5.ST T

3.4 Templates

The technical and observation templates have to be modified in order to take advantage of the new EMMI Calibration Unit.

3.4.1 Template Signature Files (TSF)

The EMMI’s template signature files are located at modules emotsf and emmtsf.
TBD: new parameters required at TSF files?

3.4.2 Reference Setup Files (REF)

TBD: impact on the REF files?

3.4.3 Template Script Files (SEQ)

TBD: impact on the SEQ files?

3.5 Dictionary

The following entries have to be added at EMMI’s dictionary (module dicEMMI/src):

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>INS.DIGi</td>
<td>CFG</td>
</tr>
<tr>
<td>INS.LENSi</td>
<td>ICS</td>
</tr>
<tr>
<td>INS.CLSPi</td>
<td>ICS</td>
</tr>
</tbody>
</table>

3.6 Panels

The ICS and OS panels have to be modified in order to incorporate the new devices.
TBD: panel user requirements?

3.7 Scanlinks
The scanlinks for LCU \textit{lemcal} have to be updated accordingly.