



# CCDB Conventions





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|  EUROPEAN<br>SPALLATION<br>SOURCE | <h1>CCDB Conventions</h1>                       |  EUROPEAN<br>SPALLATION<br>SOURCE |
| <b>Program:</b> Construction   | <b>Work Package:</b> 3 Core Software Components | <b>Work Unit:</b> 3.1 Controls<br>Configuration Data Management  |
| <b>Author:</b> R. Fernandes  | <b>Version:</b> 1.3                             | <b>Date:</b> 2016-07-19  |



## Approval Matrix



| Role     | Name              | Affiliation | Date       |
|----------|-------------------|-------------|------------|
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| Reviewer | Miha Vitorovic    | Cosylab     | 2015-08-06 |

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## Version Summary



| Version | Date       | Description   |
|---------|------------|---|
| 0.9     | 2015-07-30 | Draft document  |
| 0.91    | 2015-08-05 | Minor updates/corrections   |
| 1.0     | 2015-08-06 | Initial document  |
| 1.1     | 2015-10-01 | <ul style="list-style-type: none"> <li>Reorder data entries conventions in <a href="#">Section 2</a>.</li> <li>Updated IOC convention with the latest specifications in <a href="#">Section 3</a>.</li> <li>Minor updates/corrections.</li> </ul>             |
| 1.2     | 2015-10-15 | <ul style="list-style-type: none"> <li>Added short description about units, enumerations, properties, device types, devices, containers and slots.</li> <li>Added mandatory convention in the units concerning base-unit, super-unit and sub-unit.</li> </ul> |
| 1.3     | 2016-07-19 | <ul style="list-style-type: none"> <li>Added PLC convention.</li> <li>Minor updates/corrections.</li> </ul>   |

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## 1. SUMMARY

This document enumerates and describes a set of conventions that shall be followed by different actors when managing data in the Controls Configuration Database (CCDB). More specifically, it is a guideline for both administrators and end-users to correctly insert, update, delete and organize data stored in this application. This will increase data integrity/consistency – avoiding data chaos that can emerge otherwise – for external applications (e.g. Cable Database, IOC Factory, PLC Factory) to consume this data properly and enable these to successfully perform their domain specific businesses. This guideline will be actively updated by the administrators of the CCDB whenever a new convention is defined.

The conventions presented in this document can roughly be organized in “Data Entries” and “Data Patterns”. The “Data Entries” describes conventions to follow when defining units, enumerations, properties, devices types, devices, containers and slots in the CCDB. The “Data Patterns” describes how to deal with data that repeat itself. Typical examples of such repetition (or pattern) are signals list, racks, IOCs and PLCs.

## 2. DATA ENTRIES



### 2.1. Units

A unit is a quantity chosen as a standard in terms of which other quantities may be expressed. It can also be seen as a definite magnitude of a physical quantity, defined and adopted by convention or by law. Examples of a unit are meter, liter and celsius.

| Field       | Mandatory   | Recommendation   |
|-------------|---|--|
| Name        | <ul style="list-style-type: none"> <li>Shall be upper camel-case. Example: MyUnit</li> <li>Shall be expressed in the base-unit (and not in a super-unit or in a sub-unit). Example: length is expressed in meter (and not in kilometre or centimetre).</li> </ul> | <ul style="list-style-type: none"> <li>Should be less or equal than 20 chars long</li> <li>Should use a dot (.) – and not a comma (,) – to represent fractional numbers</li> </ul> |
| Description | None  | None   |
| Symbol      | None  | <ul style="list-style-type: none"> <li>Should follow ISO standards when applicable</li> </ul>  |

Table 1: Data entry convention for the Units



|   |   |   |
|---|---|---|
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## 2.2. Enumerations

An enumeration groups values according to a certain interest/context. For example, the ESS lifecycle can be enumerated with the “construction”, “commission”, “operation” and “decommission” values.

| Field       | Mandatory  | Recommendation   |
|-------------|--|--|
| Name        | <ul style="list-style-type: none"> <li>Shall be upper camel-case. Example: MyEnumeration</li> </ul>  | <ul style="list-style-type: none"> <li>Should be less or equal than 20 chars long</li> </ul> |
| Description | None   | None   |
| Definition  | <ul style="list-style-type: none"> <li>Shall be upper-case. Example: WINDOWS</li> <li>Shall have multiple words separated by an underscore (_). Example: WINDOWS_XP</li> </ul> | <ul style="list-style-type: none"> <li>Should be less or equal than 20 chars long</li> </ul> |

Table 2: Data entry convention for the Enumerations

## 2.3. Properties

A property describes a certain device in terms of its characteristics/attributes/features. Examples of a property are manufacturer, model, price and serial number.



| Field       | Mandatory  | Recommendation   |
|-------------|--|--|
| Name        | <ul style="list-style-type: none"> <li>Shall be upper camel-case. Example: MyProperty</li> </ul> | <ul style="list-style-type: none"> <li>Should be less or equal than 20 chars long</li> </ul> |
| Description | None   | None   |

Table 3: Data entry convention for the Properties

## 2.4. Device Types

A device type describes a certain device in an abstract way by associating one or more properties to it. Examples of a device type are pump, valve, motor and PLC.

| Field | Mandatory  | Recommendation   |
|-------|--|--|
| Name  | <ul style="list-style-type: none"> <li>Shall be upper-case. Example: CAMERA</li> <li>Shall have multiple words separated by an underscore (_). Example: MY_CAMERA_XYZ</li> </ul> | <ul style="list-style-type: none"> <li>Should be less or equal than 20 chars long</li> <li>Should use a dot (.) – and not a comma (,) – to represent fractional numbers</li> </ul> |

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|             |      |  |
|-------------|------|--|
|             |      | <ul style="list-style-type: none"> <li>Should start with the name of the manufacturer. Example: SIEMENS_DI_CARD</li> </ul> |
| Description | None | None   |

Table 4: Data entry convention for the Device Types

## 2.5. Devices

A device is an instance of a certain device type. Examples of a device are pump\_0001, valve\_1234, motor\_9998 and PLC\_7575.

| Field        | Mandatory  | Recommendation   |
|--------------|--|--|
| Inventory ID | <ul style="list-style-type: none"> <li>Shall be exactly the same as the device type name followed by a suffix composed of 4 digits when the device is not registered in an inventory system. Example: CAMERA_0001</li> <li>Shall be exactly the same as the ID of the device registered in an inventory system when in such system.</li> </ul> | <ul style="list-style-type: none"> <li>Should be less or equal than 20 chars long</li> </ul> |



Table 5: Data entry convention for the Devices

## 2.6. Containers

A container is basically a folder that may have other containers and/or slots. Examples of a container are ICS, TARGET and ACCELERATOR\_DIVISION.

| Field       | Mandatory  | Recommendation   |
|-------------|--|--|
| Name        | <ul style="list-style-type: none"> <li>Shall be upper-case. Example: CONTAINER</li> <li>Shall have multiple words separated by an underscore (_). Example: MY_CONTAINER</li> </ul> | <ul style="list-style-type: none"> <li>Should be less or equal than 20 chars long</li> </ul> |
| Description | None   | None   |

Table 6: Data entry convention for the Containers



|  |   |  |
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## 2.7. Slots

A slot is a placeholder for a certain device to be installed in. Examples of a slot are LEBT-00:Ctrl-Crate-1, Tgt-PCool:Equ-Flow-01 and Tgt-PCool:Equ-Val-01.

| Field       | Mandatory  | Recommendation |
|-------------|--|----------------|
| Name        | <ul style="list-style-type: none"> <li>Shall follow ESS naming convention. Example:<br/>LEBT-00:Ctrl-Rack-1</li> </ul> | None           |
| Description | None   | None           |

Table 7: Data entry convention for the Slots

|  |   |  |
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## 3. DATA PATTERNS

### 3.1. Signals List

A signals list refers to the information that enumerates and describes signals that a certain device has. This information is composed mandatorily by a name and a description and, optionally, a type (e.g. digital input, analog output) and a voltage value for each signal. For the signals list of a device to be correctly stored/represented in the CCDB, the following conditions must be respected:

- The device type shall have the following installation slot properties (these properties are already defined in the CCDB):
  - SignalName<0...X> (mandatory)
  - SignalDescription<0...X> (mandatory)
  - SignalType<0...X> (optional)
  - SignalVoltage<0...X> (optional)
- The device shall be installed in an appropriate slot.
- An EXCEL template file named “ccdb\_signals\_list.xlsx” can be downloaded from the CCDB and used to describe the signals of the device.
- The EXCEL template file “ccdb\_signals\_list.xlsx” can be uploaded in the CCDB to effectively store the signals list in the installed slot device.



### 3.2. Racks

To be defined in due time.

### 3.3. IOCs

An Input/Output Controller (IOC) is an application providing an executable that utilizes resources from EPICS modules. Typical usage of an IOC is to interface and control devices. For an IOC (stored/represented in the CCDB) to be properly consumed by the IOC Factory, the following conditions must be respected:

- The device type that runs an IOC (e.g. CPU, IPC) shall have an installation slot property named “OperatingSystem”. This property, which is already defined in the CCDB, is of type enumeration and specifies the operating system platform/architecture (e.g. SL6-x86\_64, centos7-x86\_64) that the device type uses.

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- The device that runs an IOC (e.g. CPU, IPC) shall be installed in an appropriate slot and has its installation slot property “OperatingSystem” specified with the correct platform/architecture (e.g. SL6-x86\_64, centos7-x86\_64).
- The installed slot device that runs an IOC (e.g. CPU, IPC) shall have a relationship of type “Contains” with the IOC.
- The IOC shall be installed in an appropriate slot and has a relationship of type “Controls” with each device that it interfaces.
- Each device that the IOC interfaces shall have a property named “EPICSModule” and “EPICSSnippet” – these properties are already defined in the CCDB. The property “EPICSModule” is of type strings list and shall be used to enumerate all EPICS modules (e.g. SIS8300BCM, streamdevice) needed to interface the device; the property “EPICSSnippet” is of type strings list and shall enumerate all EPICS snippets (e.g. sis8300bcmChannel, sis8300bcmChannelCommon) also needed to interface the device.

### 3.4. PLCs

A programmable logic controller (PLC) is a digital computer used for automation of typically industrial electromechanical processes, such as control of machinery on factory assembly lines, amusement rides, or light fixtures. For a PLC (stored/represented in the CCDB) to be properly consumed by the PLC Factory, the following conditions must be respected:

- The device type of the PLC may have attachments that contain the header/footer information to include when generating PLC code. When present, these attachments shall respect the following naming convention:
  - `<device_type>_<type>_TEMPLATE_<N>.txt` (where `<device_type>` is the device type of the PLC; `<type>` is either “HEADER” or “FOOTER”; and `<N>` is the template number). Example: “PLC\_DEVICE\_HEADER\_TEMPLATE\_1.txt” or “PLC\_DEVICE\_FOOTER\_TEMPLATE\_3.txt”.
- The device type that the PLC controls shall have attachments that contain the template to use when generating PLC code. These attachments shall respect the following naming convention:
  - `<device_type>_TEMPLATE_<N>.txt` (where `<device_type>` is the type of the device controlled by the PLC; and `<N>` is the template number). Example: “VALVE\_TEMPLATE\_1.txt” or “LEYBOLD\_TURBOPUMP\_CONTROLLER\_TEMPLATE\_2.txt”.
- The PLC shall be installed in an appropriate slot and has a relationship of type “Controls” with each device that it interfaces.