

ESS Naming Convention

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 File: ESS Naming Convention
 Owner: K. Rathsman
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Sec-Sub:Dis-Dev-Idx:Property.FIELD

Area name

Device name

Record name

Process Variable name

Name	Mnemonic	Definition	Page
Section	Sec	Functional area of the facility restricted to a particular system	4
Subsection	Sub	Functional area of the facility restricted to a particular subsystem	4
Discipline	Dis	Branch of knowledge indicating the context in which a device is used	5
Device type	Dev	Generic type, i.e. two devices of the same type provide the same function	5
Instance Index	Idx	Alphanumeric index to distinguish instances of devices of the same type in the same subsection and discipline.	6
Property	Property	Observable property of a device. E.g. Current, time or temperature.	8
Field	FIELD	Predefined for each record type. Example: value (VAL), units (EGU), alarmlimits (HIGH, LOW etc).	8

Naming Service: <https://naming.ess.lu.se>

Naming Coordinator: Karin Rathsman

Document History

Revision	Date	Changed/ reviewed	Modification
1	2010/10/26	G. Trahern	Initial version
1.1	2010/11/16	G. Trahern	Clarify syntax for system/subsystem instantiation TOC formatting
1.2	2011/03/21	G. Trahern	Updated examples, moved reference tables to separate document
1.3	2012/09/26	K. Rathsmann	Replaced examples with Implementation-How to name devices
1.4	2013/01/11	K. Rathsmann	Updated Implementation and removed references.
2	2013/12/09	K. Rathsmann	Update based on naming committee meetings. Conceptually the content is the same, but more explanations and updated examples are given.
2.1	2014/01/17	K.Rathsmann	Minor corrections.
3	2014/05/20	K.Rathsmann	1) Inserted discipline into all device names to reduce bureaucracy and increase flexibility. This unifies the syntax for accelerator and target. 2) Signal part of names have been simplified based on input from PSI. 3) Updated the naming rules accordingly. 4) Rewritten the document with references to the Naming Service. 5) Updated examples with focus on first users (CF and Cryogenics)
3.1	2014/06/11	K. Rathsmann	Included the process variable name to be explicit about definitions.

The ESS Naming Convention was agreed upon and approved at an early stage of the ESS project to ensure meaningful, short and structured names of signals and devices. Given the millions of signals to control and thousands of devices to operate, clear communication is essential among operators, physicists and engineers. Considerable efforts have been invested to make the ESS Naming Convention useful in a wider context to help enforce system integration activities across all divisions.

The ESS Naming Convention is based on a standard originally developed for the Super Superconducting Collider (SSC) and later adopted by other large research facilities, for example the Spallation Neutron Source (SNS), Facility for Rare Isotope Beams (FRIB), International Thermonuclear Experimental Reactor (ITER), the Continuous Electron Beam Accelerator Facility (CEBAF), Paul Scherrer Institute (PSI). We gratefully acknowledge the use of ideas, nomenclature, and software as well as conversations with personnel from these institutions.

1. Scope

The ESS Naming convention applies to devices and signals controlled and monitored by the Integrated Controls System (ICS). ICS reserves the right to enforce the naming convention by limiting the functionality of hardware in case

- the signal names, referred to as process variable names in EPICS based Control System, do not follow the naming convention format and rules given in section 6.
- the associated device name of the process variable name is not registered in the web-based Naming Service¹ provided by ICS.

Equipment outside of the ICS scope will be named if requested. For example, safety valves like pressure relieve valves and manual valves are not controlled but could nevertheless be named and also displayed on control screens.

The ESS Naming Convention names shall be used on operator screens, drawings, design schematics, computer software, project databases, equipment name tags, test procedures, and other sources of technical information at ESS.

The device names shall not be confused with inventory identification since the naming convention names reflect where equipment are installed and in which context these are used. In addition, when a device is replaced, the new device inherits the name.

In general, equipment at ESS will be assigned identification codes. Several identification codes will be associated with the same equipment, in for example project break down structure (PBS) or other project management systems. To avoid confusion identification codes of devices have to be clearly distinguished from the ESS Naming Convention names:

- Identification codes must not be mnemonic, i.e. it shall not contain abbreviations or acronyms. Having parallel conventions for mnemonic names will inevitably cause confusion.
- Identification codes must not simulate the ESS Naming Convention syntax.

¹ Naming Service is available at <https://naming.ess.lu.se>. The Naming Service is a further development of the Proteus Naming System by the DISCS collaboration between Brookhaven National Laboratory (BNL), Facility for Rare Isotope Beams (FRIB), Cosylab, Institute of High Energy Physics (IHEP), and European Spallation Source (ESS).

The ESS naming convention names are composed by acronyms and abbreviations referred to as name elements. These elements are sorted under area, device and configuration structures described below. The naming structures are intended for management and administration of name elements only. However, the name elements as well as composed names should be used in other structures and systems. Given the name it should be possible to look up equipment in for example the inventory. Since names are still subject to changes it is recommended to use the name IDs as references in other systems. These are for software applications accessible via the RESTful API of the Naming Service. It is also possible to download a complete list of names and name IDs in excel file format from the web interface of the Naming Service.

2. Area Structure

From the operational point of view it is beneficial to have names mentally linked to functional area. This would help physicists, operators, technicians and engineers to orient themselves on the site relative to named technical systems. Devices and signals are therefore sorted under a functional area structure in three levels:

Level 1. **Super Section (Sup)**: High level area of the facility restricted to a particular use such as the Neutron Instruments (NI), Target Station (TS), Accelerator (Acc) and Central Services (CS). The super section is not part of the device and signal names but it is used for sorting and filtering purposes in the Naming Service as well as in other systems where the names are used.

Level 2. **Section (Sec)**: Accelerator sections correspond to the accelerating structure used along the linac, for example the High Beta Linac (HBL). Sections under Central Services are the Water Cooling Plant (WCP), Cryogenic System (CrS) etc. Devices related to buildings will be sorted under corresponding building, for example the Gallery (G02).

Level 3. **Subsection (Sub)**: Examples: The Target Moderator Cryoplat (TMCp) is a subsection under Cryogenic System (CrS). Air Handling Unit number 2 (AHU02) is a subsection under the Gallery (G02).

Items in the area structure are managed by subgroups of the ESS Naming Committee, one for each super section including at least the naming coordinator and a systems engineer.

To help personnel orient themselves relative to the technical systems the functional area name, defined as

Sec-Sub

shall be displayed on building structures wherever required.

3. Device Structure

Any equipment that serves a particular function and is connected to the Integrated Control System is modelled as a device. A Device name can represent

- Single piece of equipment, e.g. a temperature transmitter with only one signal.
- Complex module of components, named devices and a local control system. Examples: Klystron modulators and neutron beam choppers.
- Indirectly controlled equipment, e.g., a quadrupole magnet with the gradient field calculated from the settings and readouts from the connected power supply.
- Equipment outside the scope of ICS. Equipment will be given a device name if requested.

Devices can reside inside other devices, however the parent child relation cannot be resolved from the names. The hierarchy can instead be found in the configuration database or in other systems where the names are used.

Throughout the facility we can expect to have thousands of different kind of devices. Devices are therefore categorised on three levels in the device structure:

Level 1. **Discipline (Dis)**: Branch of knowledge indicating the context in which a device is used. Examples: Cryogenics (Cryo), vacuum (Vac), water cooling (WtrC), proton beam instrumentation (PBI). Conventional facilities will use the Swedish BSAB96 codes as mnemonic name elements for disciplines. Personnel not familiar with this nomenclature can still understand the context from the subsection name. Example: Air Handling (57B) in the Air Handling Unit number 2 (AHU02).

Level 2. **Category (Cat)**: This level has been introduced to allow certain devices, for example sensors (Sn) and Indicators (In) to be grouped together in lists and is not part of names. Default category is miscellaneous (Misc).

Level 3. **Device Type (Dev)**: Two devices of the same generic type provide the same function. Examples: temperature transmitter (TT), temperature sensor (TSn), exhaust fan (EF).

Items in the device structure are managed by subgroups of the ESS Naming Committee, one for each discipline including at least the naming coordinator and a device editor using the naming service.

To reduce bureaucracy and increase flexibility the discipline **Dis** has become part of all device names. Therefore, the device type **Dev** needs to be unique only within the parent discipline, which allows shorter name elements for device types. Non-experts can still understand the context from the discipline.

Some device types, such as pumps, sensors and indicators are used in several disciplines. The device types for these should be named the same but sorted under the different disciplines. For example, a temperature sensor (TSn) is a generic device type in both cryogenics and water cooling disciplines.

4. Device Registration

A name format in combination with a set of syntax rules do not necessarily ensure a meaningful and consistent naming. A web-based naming service is therefore provided by ICS to assist users of the naming convention to register instances of devices and to administer the mnemonic name elements.

Instances of device names in the registry are displayed in a tree view under super section, section and subsection. Filtering capabilities are provided for any of the items in area and device structures to help users to browse limited sets of registered device names.

Naming convention users, referred to as device editors in the naming service, will be guided by the following two questions when registering a device:

- Which part of the facility does the device provide service to?
- What kind of device is it?

The answers, which are selected from the area and device structures are used to generate the device names. Only the instance index **Idx**, and an optional comment needs to be entered to create a unique device name on the format

Sec-Sub:Dis-Dev-Idx

On layouts only device type and instance index (**Dev-Idx**) should be displayed at the individual components, provided that the area name (**Sec-Sub**) and discipline (**Dis**) are printed somewhere on the same layout.

4.1. Batch Naming

Experienced device editors can register a batch of devices in three steps:

1. Download a template file in excel format from the Naming service.
2. Fill in existing name elements for section, subsection, discipline, device type and instance index as well as a comment (optional) for each device.
3. Upload the file.

4.2. Naming Rules

The Naming Service validates device names against the following set of rules:

1. Instance index (**Idx**) shall be alphanumeric. I.e., only upper and lower case alphanumeric characters (a-z, A-Z, 0-9) are allowed.
2. The device names **Sec-Sub:Dis-Dev-Idx** shall be distinguishable, which means that names shall be unique irrespective of
 - (a) Letter case
 - (b) Letters I, l and number 1
 - (c) Letter O and number 0
 - (d) Letters V and W
 - (e) Leading zeros, i.e., number 0 immediately following a non-numerical character
3. The maximum length of instance index (**Idx**) is 6 characters.

5. Administration of mnemonic name elements

Items in the area and device structures are administered in the Naming Service. Device editors can propose to add, delete and modify mnemonic name elements.

5.1. Validation

The proposed name elements are validated against the following set of rules:

1. Names elements for any of the items in the area structure (Sup, Sec, Sub) and device structure (Dis, Cat, Dev) shall be alphanumeric. I.e., only upper and lower case alphanumeric characters (a-z, A-Z, 0-9) are allowed.
2. Name elements for super section (Sup), section (Sec) and discipline (Dis) shall be distinguishable according to definition in section 4.2
3. Name elements for subsection Sub shall be distinguishable under the same parent section, according to the definition in section 4.2.
4. Name elements for device category (Cat) and type (Dev) shall be distinguishable under the same discipline according to definition in section 4.2.
5. Names elements for any of the items in the area structure (Sup, Sec, Sub) and device structure (Dis, Cat, Dev) shall be at least one character long.
6. The maximum length of name elements for items in the area structure (Sup, Sec, Sub) is 6 characters.
7. The maximum length of name elements for items in the device structure (Dis, Cat, Dev) is 4 characters.

5.2. Guidelines

The naming coordinator, who acts on behalf of the naming committee, approves or reject proposals according to the general guidelines for mnemonic name elements:

1. Name elements shall be mnemonic, so that operators, technicians, engineers and physicist, who are not necessarily expert in the particular field, do not have to look up names more than occasionally.
2. Names should be short and easy to read. Abbreviate words and use camel case, i.e., skip blanks and begin words with capital letters. Example: Spk for spoke cavities and HBL for High Beta Linac.
3. Aspects of long term operation (>20 years) are prioritised over straightforward solutions.
4. Use standard nomenclature. Users should for example refer to existing names in the Naming Service before proposing new names, especially for device types used in several disciplines.

6. Configuration Structure and Signal Name

Naming convention users prefer to use generic device type as device identifier in names. Essential for configuration of the control system is however the specific device type, which in principle could be viewed as the fourth level in the device structure. In difference to items in the device structure, which are managed by the naming committee, the specific device types and signal part of names are owned and managed by the developers. The specific device types and the signal part are therefore sorted under a separate configuration structure:

Level 1 **Specific Device Type** (SDev): Two devices of the same specific device type are identical from a controls perspective and among others have the same set of control signals. Although the specific device type is not displayed in names the users are still responsible for selecting the correct specific device type.

Level 2 **Property** (Property): Observable property. Example: Current (Current), Flow (Flow), Temperature (Temp), etc.

Level 3 **Field** (FIELD): The field names are predefined for a given record type. Examples are value (VAL), unit (EGU) and alarm limits (LOLO, LOW, HIGH, HIHI). Please refer to the EPICS record manual for further examples²

Configuration of a device from the bottom-up approach is initiated by creating a specific device type and assigning it a generic device type from the device structure. Developers are allowed to select any suitable and relevant device type from level 3 in the device structure as parent.

The name elements shall be validated according to the following rules:

1. Name element for specific device type and property (SDev & Property) shall be alphanumeric. I.e., only upper and lower case alphanumeric characters (a-z, A-Z, 0-9) are allowed.
2. Name element for specific device type (SDev) shall be distinguishable according to the definition in section 4.2
3. Name element for property (Property) shall be distinguishable according to the definition in section 4.2, however only under the same specific device type.
4. The maximum length of name element for specific device type and property (SDev & Property) is 9 characters.

Developers are responsible for creating suitable names for items in the configuration structure according to the guidelines in section 5.2. Since properties like temperature, current, voltage etc., will be used for many different device types, the naming coordinator will collect proposals for a standard for the properties names³.

Configuration from a top-down approach is initiated by selecting registered device names and assigning these to a specific device type. The process variable names are composed by appending the property and field elements to the selected device name as:

Sec-Sub:Dis-Dev-Idx:Property.FIELD

² EPICS 3-14 Record Reference Manual https://wiki-ext.aps.anl.gov/epics/index.php/RRM_3-14

³ For example the NSLS-II signal list https://wiki.bnl.gov/nsls2controls/index.php/Standards-Naming_-_Convention_Signal_Names#Signal_Names