DCS User Requirements Document for My-Detector

Version x (dd month yyyy)

1. INTRODUCTION

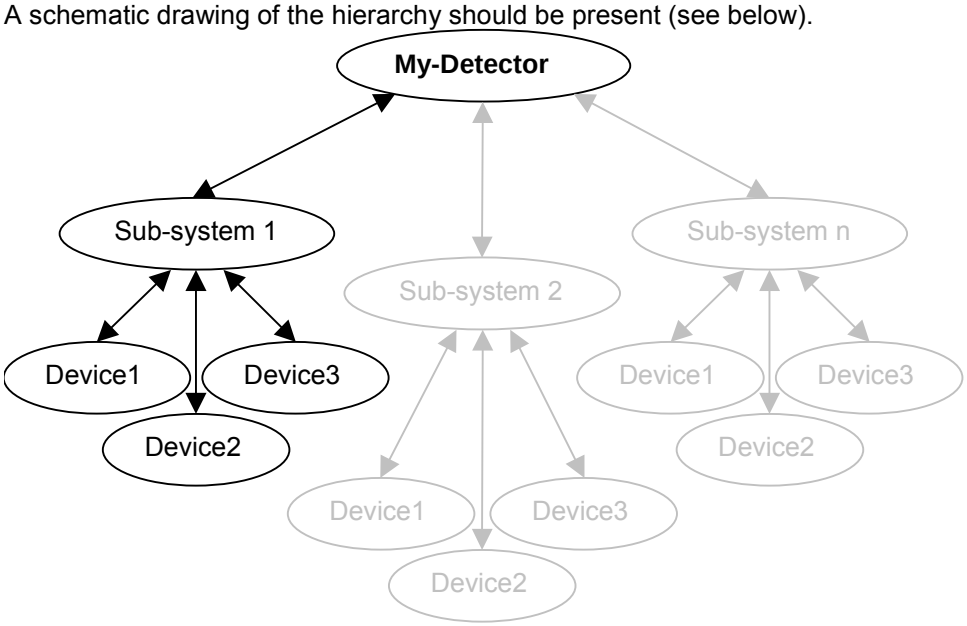
Here goes a short general introduction to My-Detector, maybe with a picture (< 1 page).

2. DESCRIPTION OF MY-DETECTOR

Here goes a more detailed description of My-Detector focussing of the equipment or elements to be controlled by the DCS, maybe with schematic drawings (< 2 pages).

3. THE CONTROL SYSTEM

Here goes a description of the control system clearly identifying the various sub-systems in the DCS of My-Detector (e.g. High Voltage, Low Voltage, Cooling System, etc.).
A schematic drawing of the hierarchy should be present (see below).



The first part (I) should hold all the information and requirements per sub-system.
The second part (II) should cover the information and requirements on the control system as a whole: interaction between the sub-systems, operational aspects of the control system.

I. DESCRIPTION AND REQUIREMENTS OF THE SUB-SYSTEMS

1) SUB-SYSTEM 1

Here goes a detailed description of Sub-system 1. It should at least cover the following items:

a) Functionality

Here goes a description of the functionality of the sub-system.

b) Device or Equipment

Here goes a description of the device(s) or equipment to be controlled that make up the sub-system. It should at least list the following items:

Location:

Define the final place where the device or equipment to be controlled will be physically installed.

Documentation:

List (links to) documentation of the device or equipment to be controlled.

c) Parameters

Here goes a description of all parameters to be controlled, with the type of parameter, ranges, precision, time resolution etc. If there is a group of parameters with all identical characteristics and requirements one description can do, clearly indicating the number of identical parameters (e.g. in the case of a set of identical HV channels). Also give any constraints that apply to these parameters (e.g. maximum cable lengths between device and ADC).

Refer to the appendix for help on filling this paragraph.

1. **Parameter 1**
2. **Parameter 2**

   …

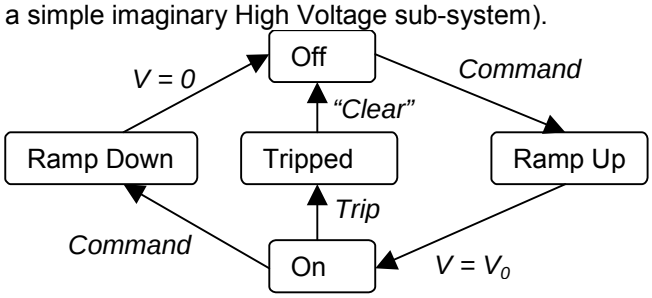
n. **Parameter n**

d) Interlocks and Safety aspects

Here goes a description of the interlocks that can be received or generated. Describe their nature (hardwired, software). Describe also interaction with other sub-systems or equipment outside of My-Detectors responsibility.

e) Operational and Supervisory aspects

Here goes a description of all aspects related to operation of the sub-system, its behaviour, constraints, etc. It should also describe the errors and alarms that can be generated in the sub-system. A state diagram would be helpful (see below an example for a simple imaginary High Voltage sub-system).



Here should also go the requirements of the supervisory layer of the sub-system. This could cover: a list of parameters to be archived (with archiving rate or deadband), ideas on user interfaces, ideas on what events should be logged (commands, errors etc.).

2) SUB-SYSTEM 2

a) Functionality

b) Device or Equipment

Location:

Documentation:

c) Parameters

1. **Parameter 1**
2. **Parameter 2**

   …

n. **Parameter n**

d) Interlocks and Safety aspects

e) Operational and Supervisory aspects

3) SUB-SYSTEM 3

…

n) SUB-SYSTEM N

II. REQUIREMENTS ON THE CONTROL SYSTEM

The following aspects should be covered, related to the control system as a whole.

a) Interlocks and Safety aspects

Here goes a description of the interlocks that can be received or generated. Describe their nature (hardwired, software). Describe also interaction with equipment outside of My-Detectors responsibility.

b) Operational and Supervisory aspects

Here goes a description of all aspects related to operation of (the control system of) My-Detector, its behaviour, constraints, etc. It should also describe the errors and alarms that can be generated in My-Detectors control system. A state diagram would be helpful. Here should also go the requirements of the supervisory layer of the control system as a whole. This could cover: ideas on user interfaces, ideas on what events should be logged (commands, errors etc.).

4. TIMESCALES AND PLANNING

Here goes the timescale of the project, including milestones (e.g. prototype tests, test beams etc.).

1) Design

Based on this URD a detailed solution should be projected for each sub-system and the prototyping can start. Once the prototype solution is working on the process and field level it will be linked up to PVSS and integrated into the supervisory layer environment. Indicate the latest date for these stages to be completed.

	HV [mm/yy]	LV [mm/yy]	Cooling [mm/yy]	Gas [mm/yy]	FEE [mm/yy]	[mm/yy]	[mm/yy]
Process control solution projected							
Process control solution prototyped							
Process control linked to PVSS							

2) Production and Purchasing

The controls components (PLC's I/O units, field buses and interfaces, etc) can only be purchased in quantities once the devices to be controlled (HV and LV power supplies, cooling and FE electronics equipment, etc.) have been fixed and a final prototype controls solution exists. Please indicate for each sub-system the latest date at which the purchasing and test of devices and controls components must be completed.

	HV [mm/yy]	LV [mm/yy]	Cooling [mm/yy]	Gas [mm/yy]	FEE [mm/yy]	[mm/yy]	[mm/yy]
P/P of devices to be controlled							
P/P of controls components							
P/P tests							

3) Installation

Some detectors will be pre-assembled and tested on the surface before they are installed in the pit. Indicate where this will take place (SXL2?). Give the pre-assembly and tests period and indicate if and which controls sub-system should be available. Indicate as well the period of the final installation of the detector in the pit. Preliminary dates for pre- and final installation as they appear in the overall ALICE planning, are given below:

	Pre-installation		Final installation	
Project	**Start**	**Finished**	**Start**	**Finish**
TPC	Dec-01	Oct-04	May-05	Nov-05
HMPID	Sep-03	Feb-05	May-05	Jul-05
MUON	Sep-03	Jan-05	Apr-04	Jul-05
ITS	Nov-03	Feb-05	Jun-05	Oct-05
ZDC	Apr-04	Jul-04	Oct-04	Mar-05
PMD	Apr-04	Sep-04	Sep-04	Mar-05
PHOS	Apr-04	Sep-04	Dec-04	Jun-05
CASTOR	Apr-04	Sep-04	May-05	Jun-05
FMD/T0/V0	Apr-04	Sep-04	Aug-05	Aug-05
TOF	May-04	Nov-04	Jan-05	Jun-05
TRD	May-04	Aug-04	Feb-05	Jun-05

Pre-assembly in: SLX2	HV [mm/yy]	LV [mm/yy]	Cooling [mm/yy]	Gas [mm/yy]	FEE [mm/yy]	[mm/yy]	[mm/yy]
Pre-assembly and test - start							
Pre-assembly and test - end							
Is a control system needed (yes/no)?							
Final installation in the pit - start							
Final installation in the pit - end							

4) Commissioning

Commissioning will normally start once the detectors are installed in the pit; individual sub-systems first, then full detector and finally full experiment.

	HV [mm/yy]	LV [mm/yy]	Cooling [mm/yy]	Gas [mm/yy]	FEE [mm/yy]	[mm/yy]	[mm/yy]
Individual sub-systems - start							
Individual sub-systems - end							

	start [mm/yy]	end [mm/yy]
Full detector		
Full experiment		31/12/2005

5) Operation with beam

For completeness, these are the LHC milestones.

1st test with beam	01 / 02 / 2006
Pilot run (1 month)	01 / 04 / 2006
PP physics run	01 / 08 / 2006
Pb-ion physics run	01 / 03 / 2007

6) Tests and Test beam

Please indicate if and when you plan to perform tests (with or without test-beam) and if you wish to test prototype control solutions at this occasion. In this case please indicate which sub-systems you wish to test.

	start [mm/yy]	end [mm/yy]	List of sub-system control prototypes to test
1st test period			
2nd test period			
3rd test period			

APPENDIX

---------- This is to help you to fill the description of the parameters ----------
Below are templates of various types of parameters that should be used in the list of parameters above.

The following applies to parameters that are controlled 'directly': via ADC or DAC and digital inputs or outputs.
For parameters that are acquired from or written to 'intelligent' devices or equipment via software (e.g. OPC), not all of the fields above are relevant since in most cases the physical value will be available directly. In that case describe the mechanism how to access the parameter.

Note that the entries in the tables are explained below.

- **An analog input parameter**

An analog input parameter is an input to the control system from the device or equipment to be controlled (e.g. a voltage from a device read by an ADC). Describe where the signal for this parameter is read.

Parameter type	AI
Parameter name	
Physical input range	
Control signal range	
Required physical resolution	
Corresp. control signal resol.	
Time resolution	

- **An analog output parameter**

An analog output parameter is an output from the control system to the device or equipment to be controlled (e.g. a voltage generated by a DAC to a device). Describe where the signal for this parameter is to be set.

Parameter type	AO
Parameter name	
Physical output range	
Control signal range	
Required physical resolution	
Corresp. control signal resol.	
Impedance	

- **A digital input parameter**

A digital input parameter is an input to the control system from the device or equipment to be controlled (e.g. a 24V signal or a closed contact). Describe where the signal for this parameter is read.

Parameter type	DI
Parameter name	
Physical input signal	
Logical 0 (signal definition)	
Logical 1 (signal definition)	
Logical 0 (meaning)	
Logical 1 (meaning)	
Time resolution	

- **A digital output parameter**

A digital output parameter is an output from the control system to the device or equipment to be controlled (e.g. a 24V signal or a closed contact). Describe where the signal for this parameter is to be set.

Parameter type	DO
Parameter name	
Physical output signal	
Logical 0 (signal definition)	
Logical 1 (signal definition)	
Logical 0 (meaning)	
Logical 1 (meaning)	
Impedance	

Explanation of the table entries:

Parameter type: AI (analog input), AO (analog output), DI (digital input), DO (digital output).
Parameter name: a symbolic name of this parameter that could be used e.g. as (part of) a variable name etc.
Physical input/output range: the range of the physical parameter to be controlled.
Control signal range: the range of the control signal corresponding to the physical range above. Give the conversion if not linear.
Required physical resolution: the resolution of the controlled physical parameter.
Corresp. control signal resol.: the resolution of the control signal corresponding to the given resolution of the physical signal (calculation).
Time resolution: the resolution in time of the input signal, defines the lowest sampling rate for that parameter.
Impedance: impedance as seen by the analog or digital output, defines the power/current to be delivered by a DAC or digital output.
Physical input/output signal: the type of digital input or output (e.g. voltage level, open or closed contact).
Logical 0/1 (signal definition): definition of the level logical 0 and 1 in terms of physical signal (e.g. 0 ≡ Voltage < 1.2V, or 1 ≡ closed contact).
Logical 0/1 (meaning): definition of the meaning of the logical 0 and 1 in terms of state of or action to the device or equipment (e.g. 0 ≡ valve is closed (for DI), 1 ≡ open a valve (for DO)).
---------- *End* ----------

- `This is an example on how to use a different typestyle for a comment or question.`