SR1 building – DCS workpackage 1 implementation

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Introduction

This document specifies the tasks and equipment needed for the implementation of work package WP1 in the ATLAS inner detector SR building DCS system. An overview of the whole system is given in [1]. WP1 consists of the LCS to monitor the infrastructure (the 'CIC' in DCS terminology), together with appropriate hardware and software to monitor the following components:

- Racks
- Environmental monitoring
- Ventilation system
- Safety system
- Gas systems
- UPS system
- Network

Additionally, a second PC (as well as the infrastructure LCS/CIC) for global control will be setup at this stage, to allow tests of the DCS system in a master/slave relationship. This is the 'low level' part of WP2 in [1]. Monitoring of the evaporative cooling system is covered in a separate work package (WP3).

A plan view of the SR building is given in Figure 1. Initially, both the CIC PC and the control PC will be set up in the control room area, but later the CIC should be transferred to DCS space in the rack area. Appropriate CANbus and Ethernet connections will be needed to allow this.

The following sections discuss each of the monitored items in more detail, and a list of parts to be provided by the ID and DCS groups is given at the end.

Rack monitoring

A total of 55 racks are installed in the SR building rack area. Each will be equipped with a simple thermostat, whose contacts close when the temperature reaches 50ºC, and a NTC 10k temperature sensor. The thermostat is intended for local use by equipment on the rack, to act as a last-ditch hardware power cutoff. It will not be connected to DCS. The temperature sensor will be used to monitor the rack temperature via DCS, and initiate software-based power cutoffs of components in the rack by the subsystems using the racks (the power to the whole rack can only be cutoff through the main electricity distribution). We currently assume one temperature readout per rack.

The temperature sensors will be read out be ELMBs. There are five rows of racks (see Figure 1), three rows with 10 racks, one with 15 and one with 10 or 11 (the other racks in this row are reserved for safety systems and will not be monitored). The temperature sensors in each row will be connected to one 16-channel connector in the ELMB via a single cable with 16 twisted pair connections. One ELMB will then serve four racks, with a second ELMB for the fifth row, having 3 16 channel input connectors free for other tasks.

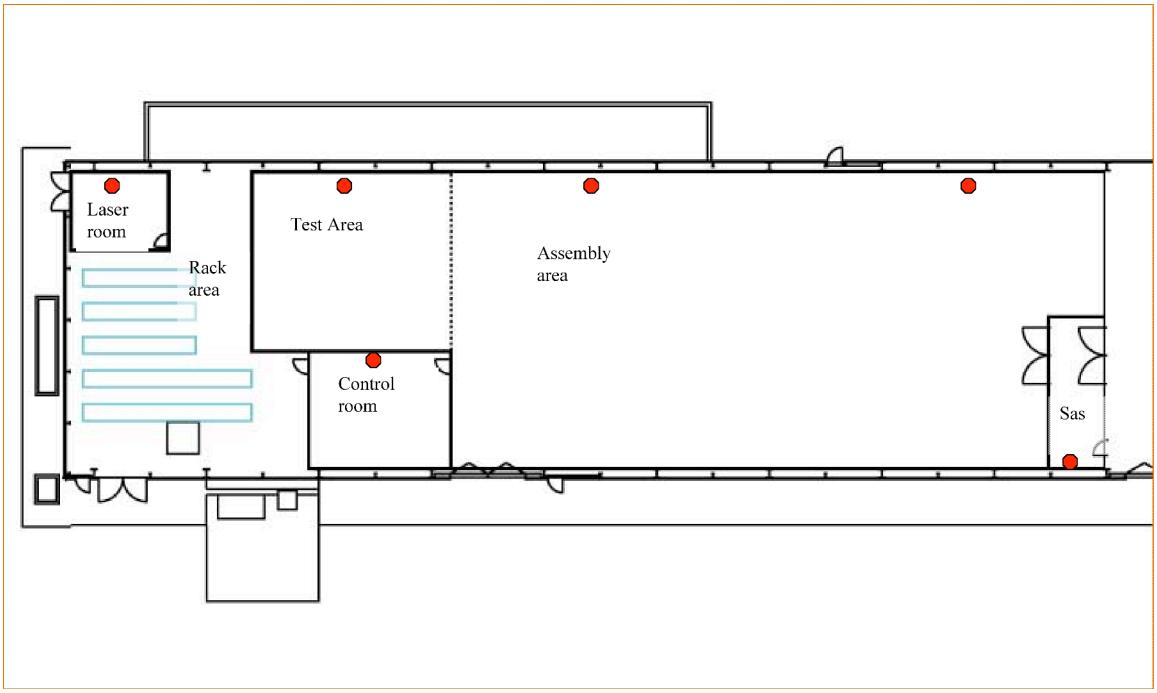

Figure 1: Layout of the SR building, showing the position of the various rooms and areas. The proposed location of the temperature/humidty sensors are shown by the red circles..

Environment monitoring

The environment (temperature and humidity) should be monitored at six locations in the SR building:

- Control room
- Laser room
- Entry room at far end of building ('sas')
- Clean room – 3 locations: one in the test area and two in different parts of the assembly area.

Temperature and humidity monitoring is required at each location. The clean room is expected to be kept at 22±2ºC and at less than 50% relative humidity; the other locations could vary over a larger range.

One proposal is to use the sensor probe of an Omega RH-20 humidity meter, which requires two channels (temperature and humidity) to be read out by ELMB. More information can be found at http://www.omega.com. Another proposal is to use the same sensors used by Marek et al in the cooling lab, as these will also be used later in the SR building for monitoring the cooling system. Whichever sensor is chosen, it should be readout in a standard way via ELMBs.

Ventilation system

The ventilation/air conditioning in SR1 is a standalone unit with its own temperature and air quality monitoring. It will be equipped with an Ethernet interface that sends information to the CERN TCR, who will monitor it for alarms/faults and take appropriate action. A mechanism exists for us to query the TCR servers for the available status/monitoring information over TCP/IP. This information needs to be read by the CIC PC and made available for our own monitoring. The contact in ST-CV is Francois Levrier (francois.levrier@cern.ch). Although this is a specific ID SR requirement, it is likely that more similar systems will be used in ATLAS (with standard PLCs), so it would be useful to develop a standard interface to the DCS CIC.

Safety system

A standard gas monitoring box is mounted in the SR building for fire detection, and connected to the central fire brigade server. As for the ventilation system, we may be able to query this information over the network and monitor it ourselves. The contact for these CERN safety systems is Floris Bonthond (floris.bonthond@cern.ch).

Environmental gas systems

We will have a system for providing dry air and nitrogen in the SR building, for which a minimum of monitoring will be necessary – e.g. the gas bottle levels and some basic flowrates. This system is expected to arrive in summer 2003, and DCS planning should take place after we have made progress with the racks. Fred Hartjes may be able to help with this.

UPS systems

We have some UPS systems recuperated from ALEPH and IP6 (LEP), giving a total power of 100 kW. These need to be monitored (*need details – Heinz is checking with ST-EL).*

Network

How do we monitor the network – what exactly is meant by this (connection from SR1 to rest of CERN? internal functioning of the network in SR1). Details of the network are sketchy at this point.

Components to be provided by ID

All components to be provided by the ID are listed here.

- Second PC to act as global control/monitoring station. Standard CERN PC with Windows (NICE 2000 or standalone ?) 256 or preferably 512 MB.
- Cabling for rack temperature sensors.
- Interface cards for rack temperature sensors.
- 6 environment temperature/humidity sensors.
- Components for monitoring gas and UPS systems.

Components to be provided by DCS

All components to be provided by the DCS group are listed here. In some cases, ID will pay for parts procured by the DCS group.

- PC to act as CIC + CANbus interface (ID to pay for rental of interface from electronics pool).
- CANbus cabling to connect ELMBs to CIC PC.
- 64 NTC 10k temperature sensors for rack monitoring (including calibration).
- ELMBs for environment monitoring (1 ELMB sufficient for 6 temperature + 6 humidity channels).
- All software, including integration and low-level drivers.

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[1] R. Hawkings, S. Stapnes, SR building DCS, ATL-IC-EN-0011.