CSC – Safe Operation of the CSC Sub-System

This note outlines the Safe States for the operation of the CSC Sub-System during Beam Operations and Non-Beam Operations.

This note also outlines the implemented response of the DSS, Central DCS and CSC DCS concerning racks containing CSC equipment.

Prepared for CSC
by
Fred Borcherding FNAL

1 Notes / todo

What does cDCS do for CSC Equipment?
What does DSS do for CSC equipment? What does DSS do for CSC Racks?
What building alarms are routed to CSC equipment? Through DSS?
Automated Sequences do we have, implemented, planned, under consideration? What does CSC DCS do for CSC Equipment?
cDCS shift actions
What is Passed to CSC DCS? DIM?
Should CSC generate any alarms?
What are DSS States and Implemented Response
Do we want the DSS response to an alarm for a rack to be delayed? Especially in UXC, do we want a delay so the CSC-DCS can respond to the DSS trip?
Add information on automatic GSM calls
Define what ON / OFF means for all cases

2 Overview

CSC has developed Action Matrixes that enumerate the different SAFE states of the sub-system during ‘Global’ operation and ‘Maintenance’ periods

Three levels of Action Matrix

Top >> General overview of safe states used by the Operators and as a guide for DCS & DSS implemented action

Mature and **defined** here

DCS >> Action implemented within DCS using DCS monitoring inputs

cDCS based are implemented by cDCS

CSC specific are not implemented, all in planning stages

Need temperature sensors from cDCS implemented

DSS >> Action implemented within DSS using DSS inputs

‘Standard’ actions implemented within CMS DSS framework

Special CSC for LV implemented – but changed, need re-verification

What is an Action Matrix?

An Action Matrix has

a row for each of the possible states of the sub-detector

A column for each externally applied condition

And a column for the sub-state of

3 CSC – Safe Operation States

CSC has separate Action Matrixes for

3.1 Details on the above ground local DAQ farm

3.2 Details on the S1 service cavern

The CSC sub-system has equipment in several racks scattered in several places in S1.

3.2.1 S1A08-S1A10 > UF HV,

The UF, University of Florida, HV, High Voltage system supplies HV to all of the CSCs except those in the nose of YE1, namely the ME1/1 chambers. This is a custom HV system with a dedicated computer control, HV supplies, and distribution hardware located in S1. Further distribution hardware modules are located in racks in the YE towers. The S1 modules are connected to the tower modules through cables that carry the HV at about 3600V to each of the cavern distribution racks. These cables also carry the LV necessary to power the control and monitoring of the tower distribution racks. From the tower distribution racks a single cable carries HV only to each CSC mounted on the disk.

The UF HV system receives LV from its own power supplies, located in S1A12 and S1A13. it does not use any power distributed through the racks in UXC. Therefore the DSS and cDCS when they turn off a UXC rack do not effect the HV hardware. The HV and LV for this system remains present in the UXC rack and the HV remains on the CSCs. LV power supplies, located in S1A12 and S1A13, can be turned off using DCS, and doesn't use power from distribution boxes.

To turn off a CSC in the cavern the HV for this chamber must be turned off via CSC-DCS or at S1.

To turn off a Distribution rack in the cavern the HV primary supply and LV for this rack must be turned off from S1.

The distribution racks are;

X2jjj X2kkk …
X4jjj

To turn off a Master rack in S1 all Primary supplies and all LV for the entire endcap must be turned off.

The Master racks are;

S1jjj s1kkk …
S1jjj

To turn off a Control rack in S1 with computers and primaries everything must be turned off.

The Control racks are;

S1jjj s1kkk …
S1jjj

The HV system does not have temperature sensors in the boards. However, even if the turbine stops, the Distribution and Master racks will not overheat. The LV and HV current loads are very small and normal ambient air temperature keeps them in a safe temperature range. The exception would be if something else overheats the entire rack, like Maratons that are installed in some of the HV distribution racks, or if the temperature of UXC reached high levels.

3.2.2 S1D05 > TF – single crate in rack

The CSC TF system consists of a single VME crate within rack S1D05. The rack has DSS and cDCS connections and need no exceptional treatment. It should be monitored and controlled as a default CMS rack.

3.2.3 TTC??

3.2.4 S1D06 > FO patch panels, NO power used in rack

This rack has no active electronics; the fiber optic patch panels are completely passive. The rack has DSS and cDCS connections and need no exceptional treatment. It should be monitored and controlled as a default CMS rack.

3.2.5 S1G06&08 > FED

These two racks each contain 2 FED crates and fiber optic panels. The FED crates are standard CMS VME crates and requires no special treatment. The rack has DSS and cDCS connections and need no exceptional treatment. It should be monitored and controlled as a default CMS rack.

3.2.6 S1G07 > Net boxes

This rack contains a crate of network boxes. The network boxes are low power commercial equipment and require no special treatment. The rack has DSS and cDCS connections and need no exceptional treatment. It should be monitored and controlled as a default CMS rack.

3.2.7 S1G10 > ME1/1 HV

This rack contains the HV power supplies for the ME1/1 HV system. Otherwise known as the Dubna chambers. The two crates in this rack are commercial CAEN HV master crates and modules. The rack has DSS and cDCS connections and need no exceptional treatment. It should be monitored and controlled as a default CMS rack.

3.3 Details on the S2 service cavern

3.3.1 S2G19/20 computers

The CSC sub-system has two adjacent racks in S2, both of which house 1U and 2U standard CMS computers. Both of these racks are also shared by other sub-systems.

Some of these computers are under UPS and will be discussed separately in this document.

The remainder of the computers should be treated in the standard CMS way.

3.4 Details on the S4 service cavern

The CSC sub-system uses all of one rack and part of a second in the S4 area dedicated to CMS LV and the CMS LV UPS system.

3.4.1 S4F04 - CMS LV OPFCs

The CSC sub-system uses the Wiener Maraton LV system. This system has a module called the OPFC that transforms single phase AC power from the UPS system to 385VDC and does power conditioning. This voltage is then delivered through long cables to the UXC towers were it is distributed to the Maraton LV Power Modules.

Each pair of OPFC modules is supplied by a single AC breaker. And this AC breaker is tripped by the DSS system. In general the pair of OPFC-Maratons on the same breaker have the Maraton end located within the same UXC rack. The exceptions are the Maratons located on YE3.

This system concentrates 48 high current, 16A, OPFC modules within a single rack. In addition only a relatively small number of OPFC spares exist because only CSC and ECAL use them at CMS.

This rack, S4F04, is the most critical single rack for the CSC sub-system. A loss of function of this rack stops operations for all of CSC. Damage to a significant part of the contents of this rack would require a long recovery period. Therefore considerable effort must go into insuring the best possible safety measures for this rack.

3.4.2 S4F10 - DCS computers

The two computers that control the CSC LV hardware are located in S4F10 and have CANBus drivers that communicate with the Maratons and PCBs in the cavern. These field bus lines follow the same route as the 380VDC cables to minimize any noise and grounding issues.

3.5 Details on the UXC cavern

3.5.1.1 X2xxx/X4xxx > Maraton LV PS

The Maraton LVPS are located on all the endcap towers at the X2 and X4 levels.

3.5.1.2 X2xxx/X4xxx > HV Distribution

The UF HV distribution system is located in racks on each of the endcap towers at the X2 and X4 levels

3.5.1.3 X1xxx/X3xxx/X5xxx > pcrates

The pcrates for the CSC sub-system are located on each of the endcap disks at several levels. Those at the X1 and X5 levels are located in mini-racks which contain only CSC pcrates, most with 2 crates but on the YE3 disk with only 1 crate per rack. Those on the

X3 level are in normal tower racks and typically share that rack with other sub-detector equipment. Again most racks have 2 crates each except those on YE3 which have only one crate each. Also note that the pcrates on the YE3 disks are fully populated with boards.

3.5.1.4 Chambers with FE-Electronics

The first 3 – DAQ, S1 and S2 do not have any special conditions

They should follow and be included in all CMS wide action matrixes for Operators/cDCS/DSS

S4

S4 is 'mostly' standard and should be included in CMS Action matrix for S4

UXC has special needs

- Cooling is from separate systems
- LV and HV are not powered locally but from service caverns S4 & S1 respectively

3.6 CSC Safe Operation States – S1

Safe Operation States >> **USC55** (S1)

Smoke	Cooling	Power	➔	HV	FED	TF
Yes	x	x	➔	OFF	OFF	OFF
No	OFF	OFF	➔	OFF	OFF	OFF
No	OFF	ON	➔	OFF	OFF	OFF

HV racks must be off within 10 minutes
ME1/1 HV racks must be off within 10 minutes
FED racks must be off within 10 minutes
TF rack must be off within 10 minutes

Smoke	Cooling	Power	➔	HV	FED	TF
No	ON	OFF	➔	OFF	OFF	OFF
No	ON	ON	➔	ON	ON	ON

Smoke Yes /No ➔ smoke alarm present / not present in turbine or enclosure
Cooling ON / OFF ➔ Cooling water flow to racks in enclosure ON /OFF
Power ON / OFF ➔ AC power to distribution panels in racks ON /OFF
HV ON / OFF ➔ all HV primary supplies ON / OFF
FED / TF ON / OFF ➔ VME crate power ON / OFF

3.7 CSC Safe Operation States – S2

Safe Operation States >> **USC55** (S2)

Cooling	Power	➔	Computers
OFF	OFF	➔	OFF
OFF	ON	➔	OFF

The computers can be left ON when necessary if the room itself is cool

Cooling	Power	➔	Computers
ON	OFF	➔	OFF
ON	ON	➔	ON

Cooling ON / OFF ➔ Cooling water flow to racks in enclosure ON /OFF
Power ON / OFF ➔ AC power to distribution panels in racks ON /OFF
Computers ON / OFF ➔ Computer main power switch ON / OFF

3.8 CSC Safe Operation States – S4

Safe Operation States >> **USC55** (S4)

Cooling	Power	➔	OPFC	Computers
OFF	OFF	➔	OFF	OFF
OFF	ON	➔	OFF	OFF
	The computers can be left ON when necessary if the room itself is cool			
ON	OFF	➔	OFF	OFF
ON	ON	➔	ON	ON

Smoke Yes /No ➔ smoke alarm present / not present in turbine or enclosure
Cooling ON / OFF ➔ Cooling water flow to racks in enclosure ON /OFF
Power ON / OFF ➔ AC power from breakers to modules in rack ON /OFF
OPFC ON / OFF ➔ AC power from breakers to modules in rack ON /OFF
Computers ON / OFF ➔ Computer main power switch ON / OFF

3.9 CSC Safe Operation States - UXC

Safe Operation States >> UXC55 (cavern)

Water	Power	Gas	➔	HV	LV
Disk & tower	LV from S4				
OFF	x	x		OFF	OFF

Maratons must be off within 2 min
Pcrates within 5 min
Note LV to chambers is turned off by pcrate turn off
HV must be off within 60 min

ON	OFF	OFF	OFF	OFF
ON	OFF	ON	OFF	OFF
ON	ON	OFF	OFF	ON
ON	ON	ON	ON	ON

Computers ON / OFF ➔ Computer main power switch ON / OFF

4 Crash Buttons in the CMSCR

CSC has no CSC Emergency Stop in the CMSCR.

4.1 S1 and S2

4.2 S4 and UXC

5 DSS States and Implemented Response

CMS has two separate DSS systems. The first is called DSS and is the Detector Safety System for the Service enclosures underground and above ground. The second is called DSSX and is the Detector Safety System for the eXperimental cavern, UXC.

- The DSS is for detector protection only
- DSS can only do automatic actions based on hardware inputs, including manual triggers, e.g. water mist
- The alarm action matrix must be formally agreed on before LHC start up
- User notification will be improved via automatic GSM calls in addition to SMS
- OFF means no services to a device
  - Power (LV, HV, 48V), cooling, gas, etc
- OFF does NOT mean safe

The sensor input for each rack is:

Status breaker : ON/OFF
Electrical fault
Sum Alarm (XE Connecter)
  Thermostat cable
  Local Emergency Stop
  4 Spare not cabled

5.1 RSS OF CSC RACKS IN USC55

All the racks in S1, S2 have the same response to an alarm generated within the DSS system. The power is cut to that rack with 0 seconds delay. An example rack is given here.

5.1.1 ALARM AL_RACK_CSC_Alarm_USC55_S1A12

------- ALARM CONDITION --------
DI_Rack_Alarm_USC55_S1A12 TRUE (persistency = 0)

ACTION	DELAY
O_Rack_Cut_Power_USC55_S1A12	0

Send SMS to:	CSC (5509)
Published on DIP	

5.1.2 ALARM AL_RACK_CSC_Smoke_USC55_S1A12

------- ALARM CONDITION --------
DI_Rack_Smoke_USC55_S1A12 TRUE (persistency = 0)

ACTION	DELAY
O_Rack_Cut_Power_USC55_S1A12	0
Send SMS to:	CSC (5509)
Published on DIP	

5.2 *RSS OF CSC RACKS IN UXC55*

Within UXC there are two DSS alarms from each rack. One is called Smoke and is triggered when the smoke detector internal to the turbine exceeds threshold. The second is called simply Alarm and can be triggered by the turbine being switched off or the temperature sensor within the turbine detecting a temperature above 40C.

The response to both DSS alarms in a CSC equipment rack in UXC consists of two actions. One, the power (turbine) to that rack is cut. Two, an AC power breaker in S4 is cut. The breaker must be cut since a pcrate rack and a Maraton rack receive their power remotely from S4 and not locally. The mapping of alarms in UXC racks to which breaker is tripped is defined by us, CSC.

We divide our system in UXC into 12 parts for the DSS response. That is we group the racks into disk (6) times side (2, Near/Far). If any of the racks containing pcrates or Maratons within these racks alarms, we want DSS to turn off the power to all 4 (2 on YE3) Maratons and 6(3) pcrates in that 'disk x side' group of racks.

Which alarm in which rack initiated the trip will be published on DIP so that our DCS can display the information.

Presently we have requested that the trip be immediate. We can request that the trip be delayed for different times for each of the two alarms. We many want to do this if we want our DCS to execute a 'soft' turn off before DSS acts.

Directly below is a copy of the DSS alarm details. Following that is a list of all the racks involved and their grouping to breaker in S4

5.2.1 ALARM AL_RACK_CSC_Alarm_UXC55_YE_Plus_Far_X3A31

------- ALARM CONDITION --------
DI_Rack_Alarm_UXC55_YE_Plus_Far_X3A31 TRUE (persistency = 0)

ACTION	DELAY
O_Cut_Breaker_Low_voltage_EXD2009	0
O_Cut_Rack_Power_UXC55_YE_Plus_Far_X3A31	0
Send SMS to:	CSC (5509)
Published on DIP	

5.2.2 ALARM AL_RACK_CSC_Smoke_UXC55_YE_Plus_Far_X3A31

------- ALARM CONDITION --------
DI_Rack_Smoke_UXC55_YE_Plus_Far_X3A31 TRUE (persistency = 0)

ACTION	DELAY
O_Cut_Breaker_Low_voltage_EXD2009	0
O_Cut_Rack_Power_UXC55_YE_Plus_Far_X3A31	0
Send SMS to:	CSC (5509)
Published on DIP	

The possibility exists of adding additional temperature sensors, thermocouples, to the DSS inputs within a rack turbine. The addition of these temperature sensors in the air flow within a rack containing a pair of Maraton supplies could be warranted. There can be considerable air permeation within a rack and heat generated by power intensive devices can escape to the surrounding volume and not be recovered by the turbine. The result would be a much lower temperature reading from the thermocouple within the turbine and a failure to alarm in a timely manner. Four tower racks have the Maratons mounted midway up inside the rack and another twelve have the Maratons mounted at the bottom of the rack with other devices installed above.
These racks are:

Mounted mid rack	X4A31	X4J31	X4S31	X4V31
Mounted bottom	X2J31	X2J42	X2V31	X2V42
	X4A41	X4A51	X4S41	X4S51

In addition additional air temperature monitors within the air flow volume in the CSC OPFC rack X4F04 would be extremely important. In this rack we would like to add the maximum number of additional sensors, 4.

Our priorities are:
1 - 4 sensors in S4F04
2 - 1 sensor in each of the 4 racks in the mid mounted racks listed
3 - 1 sensor in each of the 8 racks in the bottom mounted racks listed

S1

Smoke	Standard CMS Smoke Response
Turbine Trip	Standard CMS Response
Over temperature in Turbine	Standard CMS Response

S2

Smoke	Standard CMS Smoke Response
Turbine Trip	Standard CMS Response
Over temperature in Turbine	Standard CMS Response

S4

Smoke	Standard CMS Smoke Response
Turbine Trip	Standard CMS Response
Over temperature in Turbine	Standard CMS Response

UXC

Smoke	Standard CMS Smoke Response

Turbine Trip	Standard CMS Response
Over temperature in Turbine	Standard CMS Response

Most CSC Racks in UXC require additional responses beyond the normal DSS responses

The LV power for the CSCs, chambers, and pcrates is not sourced at the UXC rack, thus cutting power at the UXC rack dose NOT turn off the LV

The LV power is routed through 2 racks in series, thus a trip in either rack requires the power be switched off at its source in S4F04

A special DSS Matrix for CSC LV power from S4 exists

5.3 DSS Action Matrix – CSC LV

Maraton	PCrate	PCrate	PCrate	Circuit Breaker	Contents
A DSS Trip in These Racks				*Trips This*	
X4A41	**X5R41**			**EXD 2004**	YE+2 - FAR
X2A41	**X1R41**	**X3A41**		**EXD 2005**	**4 Maratons + 6 pcrates**
A DSS Trip in These Racks				*Trips This*	
X2J42	**X1U41**			**EXD 2007**	YE+2 - NEAR
X4J41	**X3J41**	**X5U41**		**EXD 2008**	**4 Maratons + 6 pcrates**
A DSS Trip in These Racks				*Trips This*	
X4A31	**X5R31**			**EXD 2006**	YE+1 - FAR
X2A33	**X1R31**	**X3A31**		**EXD 2009**	**4 Maratons + 6 pcrates**
A DSS Trip in These Racks				*Trips This*	
X2J31	**X1U31**			**EXD 2010**	YE+1 - NEAR
X4J31	**X3J31**	**X5U31**		**EXD 2011**	**4 Maratons + 6 pcrates**
A DSS Trip in These Racks				*Trips This*	
X4S31	**X5L31**			**EXD 2012**	YE-1 - FAR
X2S33	**X1L31**	**X3S31**		**EXD 2015**	**4 Maratons + 6 pcrates**
A DSS Trip in These Racks				*Trips This*	
X2V31	**X1E31**			**EXD 2013**	YE-1 - NEAR
X4V31	**X3V31**	**X5E31**		**EXD 2014**	**4 Maratons + 6 pcrates**
A DSS Trip in These Racks				*Trips This*	
X2V42	**X1E41**			**EXD 2016**	YE-2 - NEAR
X4V41	**X3V41**	**X5E41**		**EXD 2017**	**4 Maratons + 6 pcrates**
A DSS Trip in These Racks				*Trips This*	
X4S41	**X5L41**			**EXD 2019**	YE-2 - FAR
X2S41	**X1L41**	**X3S41**		**EXD 2020**	**4 Maratons + 6 pcrates**
A DSS Trip in These Racks				*Trips This*	YE+3 - FAR
X4A51	**X5R51**	**X3A51**	**X1R51**	**EXD 2025**	**2 Maratons + 3 pcrates**
A DSS Trip in These Racks				*Trips This*	YE+3 - NEAR
X2J52	**X5U51**	**X3J51**	**X1U51**	**EXD 2026**	**2 Maratons + 3 pcrates**
A DSS Trip in These Racks				*Trips This*	YE-3 - NEAR

X2V52	**X5E51**	**X3V51**	**X1E51**	**EXD 2027**	**2 Maratons + 3 pcrates**
A DSS Trip in These Racks				*Trips This*	YE-3 - FAR
X4S51	**X5L51**	**X3S51**	**X1L51**	**EXD 2028**	**2 Maratons + 3 pcrates**

6 cDCS States and Implemented Response

What does cDCS do for CSC Racks

S1
Smoke Standard CMS Smoke Response (need this defined somewhere)
Turbine Trip Standard CMS Response
Over temperature in Turbine Standard CMS Response
S2
Smoke Standard CMS Smoke Response
Turbine Trip Standard CMS Response
Over temperature in Turbine Standard CMS Response
S4
Smoke Standard CMS Smoke Response
Turbine Trip Standard CMS Response
Over temperature in Turbine Standard CMS Response
UXC
Smoke Standard CMS Smoke Response
Turbine Trip Standard CMS Response
Over temperature in Turbine Standard CMS Response

Most CSC Racks in UXC require additional responses beyond the normal cDCS responses
The LV power for the CSCs, chambers, and pcrates is not sourced at the UXC rack, thus cutting power at the UXC rack dose NOT turn off the LV
The LV power is routed through 2 racks in series, thus a trip in either rack requires the power be switched off at its source in S4F04
A special cDCS Matrix for CSC LV power from S4 exists

7 CSC-DCS States and Implemented Response

What does CSC-DCS do for CSC Racks

Over temperature == calculated combined input from temperature sensors in rack. Note that cDCS only monitors the temperature sensor in the turbine. cDCS reads out the additional temperature sensors installed in most CSC racks by CSC and passes these values to CSC-DCS. CSC-DCS must implement the automatic action.

Standard CSC-DCS Response == Turn off crates in rack

S1

Over temperature Standard CSC-DCS Response

S2

Over temperature Standard CSC-DCS Response

S4

Over temperature special action for S4

UXC

Over temperature special action for UXC

Most CSC Racks in UXC require additional responses beyond the normal DCS responses

The LV power for the CSCs, chambers, and pcrates is not sourced at the UXC rack, thus cutting power at the UXC rack dose NOT turn off the LV

The LV power is routed through 2 racks in series, thus a trip in either rack requires the power be switched off at its source in S4F04

A special cDCS Matrix for CSC LV power from S4 exists

Special Action for S4

S4F04 is a critical rack for

Special Action for UXC

UXC Over Temperature from CSC installed sensors

Maraton Racks *X2/X4*	Immediately turn OFF Maraton (Later implement PCB turn off first)
HV Racks *X2/X4 not above*	Alert DCS shifter, After 5 min turn off HV equipment TBD
pcrate Racks *X1,X3,X5*	Turn off PCB for this pcrate

7.1 DIM / DIP signals from cDCS and DSS

What are the DIM and DIP signals used by CSC-DCS from cDCS and from DSS?

Presently the CSC-DCS receives signals through DIP for the Gas system. These signals are monitored and displayed on the shifter UI. An alarm window is also placed on the values, an alarm generated and displayed on the UI. They are not the primary source of alarm for the gas system. The primary route it via alerts and SMS to experts.

Presently the CSC-DCS receives signals through DIP for the Cooling Water system. . These signals are monitored and displayed on the shifter UI. An alarm window is also placed on the values, an alarm generated and displayed on the UI. They are not the primary source of alarm for the gas system. The primary route it via alerts and SMS to experts.

Future enhancements of the CSC-DCS system envision using more DIP information and using it for automatic action. For these cases the main safety action is taken via DSS. The implementation of the DCS action is meant to take more friendly action on the hardware and to take that action before the DSS action.

One such planned implementation is the “On Battery” signal from the CMS LV UPS system. CSC receives this signal through DIP and plans to take automatic action via CSC-DCS to implement a more controlled shut down of the CSC LV for the front end systems.

Another planned implementation is the utilization of the multiple temperature sensors that CSC has installed within the racks containing CSC hardware. These sensors are located on the supply and return of heat exchangers within the rack; in the cooling air flow with the rack; and on the supply and return for the water cooling of the PCBs. These racks are located in all the service caverns in which CSC hardware is located.

7.2 CSC-DCS Action Matrix – CSC LV

Maraton	**PCrate**	**Pcrate**
An Over Temperature Alarm in any of these Maraton racks		
	Must turn off the PCB to these pcrates	
X4A51	X5R51	X3A51
X2J52	X5U51	X3J51
X4A41	X5R41	
X2A41	X1R41	X3A41
X4A31	X5R31	
X2J42	X1U41	
X4J41	X3J41	X5U41
X2A33	X1R31	X3A31
X2J31	X1U31	
X4J31	X3J31	X5U31
X4S31	X5L31	
X2V31	X1E31	
X4V31	X3V31	X5E31
X2S33	X1L31	X3S31
X2V42	X1E41	
X4V41	X3V41	X5E41
X2V52	X5E51	X3V51
X4S51	X5L51	X3S51
X4S41	X5L41	
X2S41	X1L41	X3S41

For over temperature alarm for >3 on-chamber board within a single chamber > Turn off the pcrate associated with that chamber via the PCMB

For over temperature alarms for >3 pcrate boards within a single pcrate > turn off that pcrate via the PCMB

For a composite over temperature alarm in any of the Maraton racks given in the table > Turn off the multiple pcrates fed by those Maratons

8 UPS – CSC Racks/Crates/Computers on UPS

CSC equipment on UPS
CMS FE UPS System
S1Axx

9 Links to Relevant Documents

CSCOperations - **https://twiki.cern.ch/twiki/bin/view/CMS/CSCOperations** – The home page for CSC Shifter Procedures
CeoInformation - https://twiki.cern.ch/twiki/bin/view/CMS/CeoInformation - The page for CEO, CSC Expert Operator, Procedures
CSC Action Matrix 2008 version
Unattended Operation 2008 version
Shifter Training
CSC-DCS Training
DSS review of 14-Oct-2009 - http://indico.cern.ch/conferenceDisplay.py?confId=70772

10 Appendixes

10.1.1 CSC DIP Subscriptions – as of 14-Oct-09

10.1.2 Cooling (dip/CMSX/DSS)

cms_csc_dcs_05:CSC_WATER_COOLING.Flowmeter_EndCap_Cooling_YE_Minus_1
cms_csc_dcs_05:CSC_WATER_COOLING.Flowmeter_EndCap_Cooling_YE_Plus_1
cms_csc_dcs_05:CSC_WATER_COOLING.Flowmeter_Rack_EndCap_Cooling_Far_Side_YE_Minus_1
cms_csc_dcs_05:CSC_WATER_COOLING.Flowmeter_Rack_EndCap_Cooling_Near_Side_YE_Minus_1
cms_csc_dcs_05:CSC_WATER_COOLING.Flowmeter_Rack_EndCap_Cooling_Far_Side_YE_Plus_1
cms_csc_dcs_05:CSC_WATER_COOLING.Flowmeter_Rack_EndCap_Cooling_Near_Side_YE_Plus_1

10.1.3 Gas (dip/CMS/GCS/CMSCSC)

cms_csc_dcs_05:CSC_GAS_MONITOR.State
cms_csc_dcs_05:CSC_GAS_MONITOR.Status
cms_csc_dcs_05:GasMixer_o.State
cms_csc_dcs_05:GasMixer_o.OutPressure
cms_csc_dcs_05:GasMixer_o.TotalFlow
cms_csc_dcs_05:GasMixer_o.Line1Ratio
cms_csc_dcs_05:GasMixer_o.Line1InputPressure
cms_csc_dcs_05:GasMixer_o.Line2Ratio
cms_csc_dcs_05:GasMixer_o.Line2InputPressure
cms_csc_dcs_05:GasMixer_o.Line3Ratio

cms_csc_dcs_05:GasMixer_o.Line3InputPressure
cms_csc_dcs_05:GasDistribution_o.State
cms_csc_dcs_05:GasDistributionRack61_o.InPressure22
cms_csc_dcs_05:GasDistributionRack61_o.RegPressure
cms_csc_dcs_05:GasDistributionRack61_o.StateRack
cms_csc_dcs_05:GasDistributionRack61_o.InPressure24
cms_csc_dcs_05:GasDistributionRack62_o.InPressure22
cms_csc_dcs_05:GasDistributionRack62_o.RegPressure
cms_csc_dcs_05:GasDistributionRack62_o.StateRack
cms_csc_dcs_05:GasDistributionRack62_o.InPressure24
cms_csc_dcs_05:GasDistributionRack63_o.InPressure22
cms_csc_dcs_05:GasDistributionRack63_o.RegPressure
cms_csc_dcs_05:GasDistributionRack63_o.StateRack
cms_csc_dcs_05:GasDistributionRack63_o.InPressure24
cms_csc_dcs_05:GasDistributionRack64_o.InPressure22
cms_csc_dcs_05:GasDistributionRack64_o.RegPressure
cms_csc_dcs_05:GasDistributionRack64_o.StateRack
cms_csc_dcs_05:GasDistributionRack64_o.InPressure24
cms_csc_dcs_05:GasDistributionRack65_o.InPressure22
cms_csc_dcs_05:GasDistributionRack65_o.RegPressure
cms_csc_dcs_05:GasDistributionRack65_o.StateRack
cms_csc_dcs_05:GasDistributionRack65_o.InPressure24
cms_csc_dcs_05:GasDistributionRack66_o.InPressure22
cms_csc_dcs_05:GasDistributionRack66_o.RegPressure
cms_csc_dcs_05:GasDistributionRack66_o.StateRack
cms_csc_dcs_05:GasDistributionRack66_o.InPressure24
cms_csc_dcs_05:GasDistributionRack67_o.InPressure22
cms_csc_dcs_05:GasDistributionRack67_o.RegPressure
cms_csc_dcs_05:GasDistributionRack67_o.StateRack
cms_csc_dcs_05:GasDistributionRack67_o.InPressure24
cms_csc_dcs_05:GasDistributionRack68_o.InPressure22
cms_csc_dcs_05:GasDistributionRack68_o.RegPressure
cms_csc_dcs_05:GasDistributionRack68_o.StateRack
cms_csc_dcs_05:GasDistributionRack68_o.InPressure24
cms_csc_dcs_05:GasDistributionRack69_o.InPressure22
cms_csc_dcs_05:GasDistributionRack69_o.RegPressure
cms_csc_dcs_05:GasDistributionRack69_o.StateRack
cms_csc_dcs_05:GasDistributionRack69_o.InPressure24
cms_csc_dcs_05:GasDistributionRack70_o.InPressure22
cms_csc_dcs_05:GasDistributionRack70_o.RegPressure
cms_csc_dcs_05:GasDistributionRack70_o.StateRack
cms_csc_dcs_05:GasDistributionRack70_o.InPressure24
cms_csc_dcs_05:GasDistributionRack61Channel1_o.InFlow

cms_csc_dcs_05:GasDistributionRack61Channel1_o.OutFlow
cms_csc_dcs_05:GasDistributionRack61Channel2_o.InFlow
cms_csc_dcs_05:GasDistributionRack61Channel2_o.OutFlow
cms_csc_dcs_05:GasDistributionRack61Channel3_o.InFlow
cms_csc_dcs_05:GasDistributionRack61Channel3_o.OutFlow
cms_csc_dcs_05:GasDistributionRack61Channel4_o.InFlow
cms_csc_dcs_05:GasDistributionRack61Channel4_o.OutFlow
cms_csc_dcs_05:GasDistributionRack61Channel5_o.InFlow
cms_csc_dcs_05:GasDistributionRack61Channel5_o.OutFlow
cms_csc_dcs_05:GasDistributionRack61Channel6_o.InFlow
cms_csc_dcs_05:GasDistributionRack61Channel6_o.OutFlow
cms_csc_dcs_05:GasDistributionRack61Channel7_o.InFlow
cms_csc_dcs_05:GasDistributionRack61Channel7_o.OutFlow
cms_csc_dcs_05:GasDistributionRack61Channel8_o.InFlow
cms_csc_dcs_05:GasDistributionRack61Channel8_o.OutFlow
cms_csc_dcs_05:GasDistributionRack61Channel9_o.InFlow
cms_csc_dcs_05:GasDistributionRack61Channel9_o.OutFlow
cms_csc_dcs_05:GasDistributionRack62Channel1_o.InFlow
cms_csc_dcs_05:GasDistributionRack62Channel1_o.OutFlow
cms_csc_dcs_05:GasDistributionRack62Channel2_o.InFlow
cms_csc_dcs_05:GasDistributionRack62Channel2_o.OutFlow
cms_csc_dcs_05:GasDistributionRack62Channel3_o.InFlow
cms_csc_dcs_05:GasDistributionRack62Channel3_o.OutFlow
cms_csc_dcs_05:GasDistributionRack62Channel4_o.InFlow
cms_csc_dcs_05:GasDistributionRack62Channel4_o.OutFlow
cms_csc_dcs_05:GasDistributionRack62Channel5_o.InFlow
cms_csc_dcs_05:GasDistributionRack62Channel5_o.OutFlow
cms_csc_dcs_05:GasDistributionRack62Channel6_o.InFlow
cms_csc_dcs_05:GasDistributionRack62Channel6_o.OutFlow
cms_csc_dcs_05:GasDistributionRack62Channel7_o.InFlow
cms_csc_dcs_05:GasDistributionRack62Channel7_o.OutFlow
cms_csc_dcs_05:GasDistributionRack62Channel8_o.InFlow
cms_csc_dcs_05:GasDistributionRack62Channel8_o.OutFlow
cms_csc_dcs_05:GasDistributionRack62Channel9_o.InFlow
cms_csc_dcs_05:GasDistributionRack62Channel9_o.OutFlow
cms_csc_dcs_05:GasDistributionRack62Channel10_o.InFlow
cms_csc_dcs_05:GasDistributionRack62Channel10_o.OutFlow
cms_csc_dcs_05:GasDistributionRack62Channel11_o.InFlow
cms_csc_dcs_05:GasDistributionRack62Channel11_o.OutFlow
cms_csc_dcs_05:GasDistributionRack62Channel12_o.InFlow
cms_csc_dcs_05:GasDistributionRack62Channel12_o.OutFlow
cms_csc_dcs_05:GasDistributionRack62Channel13_o.InFlow
cms_csc_dcs_05:GasDistributionRack62Channel13_o.OutFlow

cms_csc_dcs_05:GasDistributionRack62Channel14_o.InFlow
cms_csc_dcs_05:GasDistributionRack62Channel14_o.OutFlow
cms_csc_dcs_05:GasDistributionRack62Channel15_o.InFlow
cms_csc_dcs_05:GasDistributionRack62Channel15_o.OutFlow
cms_csc_dcs_05:GasDistributionRack62Channel16_o.InFlow
cms_csc_dcs_05:GasDistributionRack62Channel16_o.OutFlow
cms_csc_dcs_05:GasDistributionRack62Channel17_o.InFlow
cms_csc_dcs_05:GasDistributionRack62Channel17_o.OutFlow
cms_csc_dcs_05:GasDistributionRack62Channel18_o.InFlow
cms_csc_dcs_05:GasDistributionRack62Channel18_o.OutFlow
cms_csc_dcs_05:GasDistributionRack63Channel1_o.InFlow
cms_csc_dcs_05:GasDistributionRack63Channel1_o.OutFlow
cms_csc_dcs_05:GasDistributionRack63Channel2_o.InFlow
cms_csc_dcs_05:GasDistributionRack63Channel2_o.OutFlow
cms_csc_dcs_05:GasDistributionRack63Channel3_o.InFlow
cms_csc_dcs_05:GasDistributionRack63Channel3_o.OutFlow
cms_csc_dcs_05:GasDistributionRack63Channel4_o.InFlow
cms_csc_dcs_05:GasDistributionRack63Channel4_o.OutFlow
cms_csc_dcs_05:GasDistributionRack63Channel5_o.InFlow
cms_csc_dcs_05:GasDistributionRack63Channel5_o.OutFlow
cms_csc_dcs_05:GasDistributionRack63Channel6_o.InFlow
cms_csc_dcs_05:GasDistributionRack63Channel6_o.OutFlow
cms_csc_dcs_05:GasDistributionRack63Channel7_o.InFlow
cms_csc_dcs_05:GasDistributionRack63Channel7_o.OutFlow
cms_csc_dcs_05:GasDistributionRack63Channel8_o.InFlow
cms_csc_dcs_05:GasDistributionRack63Channel8_o.OutFlow
cms_csc_dcs_05:GasDistributionRack63Channel9_o.InFlow
cms_csc_dcs_05:GasDistributionRack63Channel9_o.OutFlow
cms_csc_dcs_05:GasDistributionRack63Channel10_o.InFlow
cms_csc_dcs_05:GasDistributionRack63Channel10_o.OutFlow
cms_csc_dcs_05:GasDistributionRack63Channel11_o.InFlow
cms_csc_dcs_05:GasDistributionRack63Channel11_o.OutFlow
cms_csc_dcs_05:GasDistributionRack63Channel12_o.InFlow
cms_csc_dcs_05:GasDistributionRack63Channel12_o.OutFlow
cms_csc_dcs_05:GasDistributionRack63Channel13_o.InFlow
cms_csc_dcs_05:GasDistributionRack63Channel13_o.OutFlow
cms_csc_dcs_05:GasDistributionRack63Channel14_o.InFlow
cms_csc_dcs_05:GasDistributionRack63Channel14_o.OutFlow
cms_csc_dcs_05:GasDistributionRack63Channel15_o.InFlow
cms_csc_dcs_05:GasDistributionRack63Channel15_o.OutFlow
cms_csc_dcs_05:GasDistributionRack63Channel16_o.InFlow
cms_csc_dcs_05:GasDistributionRack63Channel16_o.OutFlow
cms_csc_dcs_05:GasDistributionRack63Channel17_o.InFlow

cms_csc_dcs_05:GasDistributionRack63Channel17_o.OutFlow
cms_csc_dcs_05:GasDistributionRack63Channel18_o.InFlow
cms_csc_dcs_05:GasDistributionRack63Channel18_o.OutFlow
cms_csc_dcs_05:GasDistributionRack64Channel1_o.InFlow
cms_csc_dcs_05:GasDistributionRack64Channel1_o.OutFlow
cms_csc_dcs_05:GasDistributionRack64Channel2_o.InFlow
cms_csc_dcs_05:GasDistributionRack64Channel2_o.OutFlow
cms_csc_dcs_05:GasDistributionRack64Channel3_o.InFlow
cms_csc_dcs_05:GasDistributionRack64Channel3_o.OutFlow
cms_csc_dcs_05:GasDistributionRack64Channel4_o.InFlow
cms_csc_dcs_05:GasDistributionRack64Channel4_o.OutFlow
cms_csc_dcs_05:GasDistributionRack64Channel5_o.InFlow
cms_csc_dcs_05:GasDistributionRack64Channel5_o.OutFlow
cms_csc_dcs_05:GasDistributionRack64Channel6_o.InFlow
cms_csc_dcs_05:GasDistributionRack64Channel6_o.OutFlow
cms_csc_dcs_05:GasDistributionRack64Channel7_o.InFlow
cms_csc_dcs_05:GasDistributionRack64Channel7_o.OutFlow
cms_csc_dcs_05:GasDistributionRack64Channel8_o.InFlow
cms_csc_dcs_05:GasDistributionRack64Channel8_o.OutFlow
cms_csc_dcs_05:GasDistributionRack64Channel9_o.InFlow
cms_csc_dcs_05:GasDistributionRack64Channel9_o.OutFlow
cms_csc_dcs_05:GasDistributionRack64Channel10_o.InFlow
cms_csc_dcs_05:GasDistributionRack64Channel10_o.OutFlow
cms_csc_dcs_05:GasDistributionRack64Channel11_o.InFlow
cms_csc_dcs_05:GasDistributionRack64Channel11_o.OutFlow
cms_csc_dcs_05:GasDistributionRack64Channel12_o.InFlow
cms_csc_dcs_05:GasDistributionRack64Channel12_o.OutFlow
cms_csc_dcs_05:GasDistributionRack64Channel13_o.InFlow
cms_csc_dcs_05:GasDistributionRack64Channel13_o.OutFlow
cms_csc_dcs_05:GasDistributionRack64Channel14_o.InFlow
cms_csc_dcs_05:GasDistributionRack64Channel14_o.OutFlow
cms_csc_dcs_05:GasDistributionRack64Channel15_o.InFlow
cms_csc_dcs_05:GasDistributionRack64Channel15_o.OutFlow
cms_csc_dcs_05:GasDistributionRack64Channel16_o.InFlow
cms_csc_dcs_05:GasDistributionRack64Channel16_o.OutFlow
cms_csc_dcs_05:GasDistributionRack64Channel17_o.InFlow
cms_csc_dcs_05:GasDistributionRack64Channel17_o.OutFlow
cms_csc_dcs_05:GasDistributionRack64Channel18_o.InFlow
cms_csc_dcs_05:GasDistributionRack64Channel18_o.OutFlow
cms_csc_dcs_05:GasDistributionRack65Channel1_o.InFlow
cms_csc_dcs_05:GasDistributionRack65Channel1_o.OutFlow
cms_csc_dcs_05:GasDistributionRack65Channel4_o.InFlow
cms_csc_dcs_05:GasDistributionRack65Channel4_o.OutFlow

cms_csc_dcs_05:GasDistributionRack65Channel7_o.InFlow
cms_csc_dcs_05:GasDistributionRack65Channel7_o.OutFlow
cms_csc_dcs_05:GasDistributionRack65Channel10_o.InFlow
cms_csc_dcs_05:GasDistributionRack65Channel10_o.OutFlow
cms_csc_dcs_05:GasDistributionRack65Channel13_o.InFlow
cms_csc_dcs_05:GasDistributionRack65Channel13_o.OutFlow
cms_csc_dcs_05:GasDistributionRack65Channel16_o.InFlow
cms_csc_dcs_05:GasDistributionRack65Channel16_o.OutFlow
cms_csc_dcs_05:GasDistributionRack66Channel1_o.InFlow
cms_csc_dcs_05:GasDistributionRack66Channel1_o.OutFlow
cms_csc_dcs_05:GasDistributionRack66Channel2_o.InFlow
cms_csc_dcs_05:GasDistributionRack66Channel2_o.OutFlow
cms_csc_dcs_05:GasDistributionRack66Channel3_o.InFlow
cms_csc_dcs_05:GasDistributionRack66Channel3_o.OutFlow
cms_csc_dcs_05:GasDistributionRack66Channel4_o.InFlow
cms_csc_dcs_05:GasDistributionRack66Channel4_o.OutFlow
cms_csc_dcs_05:GasDistributionRack66Channel5_o.InFlow
cms_csc_dcs_05:GasDistributionRack66Channel5_o.OutFlow
cms_csc_dcs_05:GasDistributionRack66Channel6_o.InFlow
cms_csc_dcs_05:GasDistributionRack66Channel6_o.OutFlow
cms_csc_dcs_05:GasDistributionRack66Channel7_o.InFlow
cms_csc_dcs_05:GasDistributionRack66Channel7_o.OutFlow
cms_csc_dcs_05:GasDistributionRack66Channel8_o.InFlow
cms_csc_dcs_05:GasDistributionRack66Channel8_o.OutFlow
cms_csc_dcs_05:GasDistributionRack66Channel9_o.InFlow
cms_csc_dcs_05:GasDistributionRack66Channel9_o.OutFlow
cms_csc_dcs_05:GasDistributionRack67Channel1_o.InFlow
cms_csc_dcs_05:GasDistributionRack67Channel1_o.OutFlow
cms_csc_dcs_05:GasDistributionRack67Channel2_o.InFlow
cms_csc_dcs_05:GasDistributionRack67Channel2_o.OutFlow
cms_csc_dcs_05:GasDistributionRack67Channel3_o.InFlow
cms_csc_dcs_05:GasDistributionRack67Channel3_o.OutFlow
cms_csc_dcs_05:GasDistributionRack67Channel4_o.InFlow
cms_csc_dcs_05:GasDistributionRack67Channel4_o.OutFlow
cms_csc_dcs_05:GasDistributionRack67Channel5_o.InFlow
cms_csc_dcs_05:GasDistributionRack67Channel5_o.OutFlow
cms_csc_dcs_05:GasDistributionRack67Channel6_o.InFlow
cms_csc_dcs_05:GasDistributionRack67Channel6_o.OutFlow
cms_csc_dcs_05:GasDistributionRack67Channel7_o.InFlow
cms_csc_dcs_05:GasDistributionRack67Channel7_o.OutFlow
cms_csc_dcs_05:GasDistributionRack67Channel8_o.InFlow
cms_csc_dcs_05:GasDistributionRack67Channel8_o.OutFlow
cms_csc_dcs_05:GasDistributionRack67Channel9_o.InFlow

cms_csc_dcs_05:GasDistributionRack67Channel9_o.OutFlow
cms_csc_dcs_05:GasDistributionRack67Channel10_o.InFlow
cms_csc_dcs_05:GasDistributionRack67Channel10_o.OutFlow
cms_csc_dcs_05:GasDistributionRack67Channel11_o.InFlow
cms_csc_dcs_05:GasDistributionRack67Channel11_o.OutFlow
cms_csc_dcs_05:GasDistributionRack67Channel12_o.InFlow
cms_csc_dcs_05:GasDistributionRack67Channel12_o.OutFlow
cms_csc_dcs_05:GasDistributionRack67Channel13_o.InFlow
cms_csc_dcs_05:GasDistributionRack67Channel13_o.OutFlow
cms_csc_dcs_05:GasDistributionRack67Channel14_o.InFlow
cms_csc_dcs_05:GasDistributionRack67Channel14_o.OutFlow
cms_csc_dcs_05:GasDistributionRack67Channel15_o.InFlow
cms_csc_dcs_05:GasDistributionRack67Channel15_o.OutFlow
cms_csc_dcs_05:GasDistributionRack67Channel16_o.InFlow
cms_csc_dcs_05:GasDistributionRack67Channel16_o.OutFlow
cms_csc_dcs_05:GasDistributionRack67Channel17_o.InFlow
cms_csc_dcs_05:GasDistributionRack67Channel17_o.OutFlow
cms_csc_dcs_05:GasDistributionRack67Channel18_o.InFlow
cms_csc_dcs_05:GasDistributionRack67Channel18_o.OutFlow
cms_csc_dcs_05:GasDistributionRack68Channel1_o.InFlow
cms_csc_dcs_05:GasDistributionRack68Channel1_o.OutFlow
cms_csc_dcs_05:GasDistributionRack68Channel2_o.InFlow
cms_csc_dcs_05:GasDistributionRack68Channel2_o.OutFlow
cms_csc_dcs_05:GasDistributionRack68Channel3_o.InFlow
cms_csc_dcs_05:GasDistributionRack68Channel3_o.OutFlow
cms_csc_dcs_05:GasDistributionRack68Channel4_o.InFlow
cms_csc_dcs_05:GasDistributionRack68Channel4_o.OutFlow
cms_csc_dcs_05:GasDistributionRack68Channel5_o.InFlow
cms_csc_dcs_05:GasDistributionRack68Channel5_o.OutFlow
cms_csc_dcs_05:GasDistributionRack68Channel6_o.InFlow
cms_csc_dcs_05:GasDistributionRack68Channel6_o.OutFlow
cms_csc_dcs_05:GasDistributionRack68Channel7_o.InFlow
cms_csc_dcs_05:GasDistributionRack68Channel7_o.OutFlow
cms_csc_dcs_05:GasDistributionRack68Channel8_o.InFlow
cms_csc_dcs_05:GasDistributionRack68Channel8_o.OutFlow
cms_csc_dcs_05:GasDistributionRack68Channel9_o.InFlow
cms_csc_dcs_05:GasDistributionRack68Channel9_o.OutFlow
cms_csc_dcs_05:GasDistributionRack68Channel10_o.InFlow
cms_csc_dcs_05:GasDistributionRack68Channel10_o.OutFlow
cms_csc_dcs_05:GasDistributionRack68Channel11_o.InFlow
cms_csc_dcs_05:GasDistributionRack68Channel11_o.OutFlow
cms_csc_dcs_05:GasDistributionRack68Channel12_o.InFlow
cms_csc_dcs_05:GasDistributionRack68Channel12_o.OutFlow

cms_csc_dcs_05:GasDistributionRack68Channel13_o.InFlow
cms_csc_dcs_05:GasDistributionRack68Channel13_o.OutFlow
cms_csc_dcs_05:GasDistributionRack68Channel14_o.InFlow
cms_csc_dcs_05:GasDistributionRack68Channel14_o.OutFlow
cms_csc_dcs_05:GasDistributionRack68Channel15_o.InFlow
cms_csc_dcs_05:GasDistributionRack68Channel15_o.OutFlow
cms_csc_dcs_05:GasDistributionRack68Channel16_o.InFlow
cms_csc_dcs_05:GasDistributionRack68Channel16_o.OutFlow
cms_csc_dcs_05:GasDistributionRack68Channel17_o.InFlow
cms_csc_dcs_05:GasDistributionRack68Channel17_o.OutFlow
cms_csc_dcs_05:GasDistributionRack68Channel18_o.InFlow
cms_csc_dcs_05:GasDistributionRack68Channel18_o.OutFlow
cms_csc_dcs_05:GasDistributionRack69Channel1_o.InFlow
cms_csc_dcs_05:GasDistributionRack69Channel1_o.OutFlow
cms_csc_dcs_05:GasDistributionRack69Channel2_o.InFlow
cms_csc_dcs_05:GasDistributionRack69Channel2_o.OutFlow
cms_csc_dcs_05:GasDistributionRack69Channel3_o.InFlow
cms_csc_dcs_05:GasDistributionRack69Channel3_o.OutFlow
cms_csc_dcs_05:GasDistributionRack69Channel4_o.InFlow
cms_csc_dcs_05:GasDistributionRack69Channel4_o.OutFlow
cms_csc_dcs_05:GasDistributionRack69Channel5_o.InFlow
cms_csc_dcs_05:GasDistributionRack69Channel5_o.OutFlow
cms_csc_dcs_05:GasDistributionRack69Channel6_o.InFlow
cms_csc_dcs_05:GasDistributionRack69Channel6_o.OutFlow
cms_csc_dcs_05:GasDistributionRack69Channel7_o.InFlow
cms_csc_dcs_05:GasDistributionRack69Channel7_o.OutFlow
cms_csc_dcs_05:GasDistributionRack69Channel8_o.InFlow
cms_csc_dcs_05:GasDistributionRack69Channel8_o.OutFlow
cms_csc_dcs_05:GasDistributionRack69Channel9_o.InFlow
cms_csc_dcs_05:GasDistributionRack69Channel9_o.OutFlow
cms_csc_dcs_05:GasDistributionRack69Channel10_o.InFlow
cms_csc_dcs_05:GasDistributionRack69Channel10_o.OutFlow
cms_csc_dcs_05:GasDistributionRack69Channel11_o.InFlow
cms_csc_dcs_05:GasDistributionRack69Channel11_o.OutFlow
cms_csc_dcs_05:GasDistributionRack69Channel12_o.InFlow
cms_csc_dcs_05:GasDistributionRack69Channel12_o.OutFlow
cms_csc_dcs_05:GasDistributionRack69Channel13_o.InFlow
cms_csc_dcs_05:GasDistributionRack69Channel13_o.OutFlow
cms_csc_dcs_05:GasDistributionRack69Channel14_o.InFlow
cms_csc_dcs_05:GasDistributionRack69Channel14_o.OutFlow
cms_csc_dcs_05:GasDistributionRack69Channel15_o.InFlow
cms_csc_dcs_05:GasDistributionRack69Channel15_o.OutFlow
cms_csc_dcs_05:GasDistributionRack69Channel16_o.InFlow

cms_csc_dcs_05:GasDistributionRack69Channel16_o.OutFlow
cms_csc_dcs_05:GasDistributionRack69Channel17_o.InFlow
cms_csc_dcs_05:GasDistributionRack69Channel17_o.OutFlow
cms_csc_dcs_05:GasDistributionRack69Channel18_o.InFlow
cms_csc_dcs_05:GasDistributionRack69Channel18_o.OutFlow
cms_csc_dcs_05:GasDistributionRack70Channel1_o.InFlow
cms_csc_dcs_05:GasDistributionRack70Channel1_o.OutFlow
cms_csc_dcs_05:GasDistributionRack70Channel4_o.InFlow
cms_csc_dcs_05:GasDistributionRack70Channel4_o.OutFlow
cms_csc_dcs_05:GasDistributionRack70Channel7_o.InFlow
cms_csc_dcs_05:GasDistributionRack70Channel7_o.OutFlow
cms_csc_dcs_05:GasDistributionRack70Channel10_o.InFlow
cms_csc_dcs_05:GasDistributionRack70Channel10_o.OutFlow
cms_csc_dcs_05:GasDistributionRack70Channel13_o.InFlow
cms_csc_dcs_05:GasDistributionRack70Channel13_o.OutFlow
cms_csc_dcs_05:GasDistributionRack70Channel16_o.InFlow
cms_csc_dcs_05:GasDistributionRack70Channel16_o.OutFlow
cms_csc_dcs_05:GasPreDistribution_o.State
cms_csc_dcs_05:GasPreDistribution_o.InPressure
cms_csc_dcs_05:GasPreDistribution_o.OutPressure
cms_csc_dcs_05:GasPump_o.State
cms_csc_dcs_05:GasPump_o.InPressure
cms_csc_dcs_05:GasPump_o.PressureSetpoint
cms_csc_dcs_05:GasPump_o.OutPressure
cms_csc_dcs_05:GasPump_o.Pump1UpperTemperature
cms_csc_dcs_05:GasPump_o.Pump1LowerTemperature
cms_csc_dcs_05:GasPump_o.Pump2UpperTemperature
cms_csc_dcs_05:GasPump_o.Pump2LowerTemperature
cms_csc_dcs_05:GasExhaust_o.State
cms_csc_dcs_05:GasExhaust_o.BufferPressure
cms_csc_dcs_05:GasExhaust_o.CirculationPressure
cms_csc_dcs_05:GasExhaust_o.CirculationFlow
cms_csc_dcs_05:GasPurifier_o.State
cms_csc_dcs_05:GasPurifier_o.ColAState
cms_csc_dcs_05:GasPurifier_o.ColARunVolume
cms_csc_dcs_05:GasPurifier_o.ColAInternal-TopTemp
cms_csc_dcs_05:GasPurifier_o.ColAInternalMiddle-Temp
cms_csc_dcs_05:GasPurifier_o.ColAExternalTemp
cms_csc_dcs_05:GasPurifier_o.ColAInFlow
cms_csc_dcs_05:GasPurifier_o.ColAOutPressure
cms_csc_dcs_05:GasPurifier_o.ColBState
cms_csc_dcs_05:GasPurifier_o.ColBRunVolume
cms_csc_dcs_05:GasPurifier_o.ColBInternal-TopTemp

cms_csc_dcs_05:GasPurifier_o.ColBInternalMiddle-Temp
cms_csc_dcs_05:GasPurifier_o.ColBExternalTemp
cms_csc_dcs_05:GasPurifier_o.ColBInFlow
cms_csc_dcs_05:GasPurifier_o.ColBOutPressure