Detector Control System for the 2018 Run

DCS phones: 164872 (+41754114872), 77076 (+41227677076)

Contents

1 WinCCOA DCS project

The DCS uses two main Linux PCs:

- **pccompass07**, main computer, located in the 888 control room.
- **pccompass04**, located in the 888 control room.

4 other Linux PCs are used for front-ends (CAEN control using SLiC/DIM):

- **pclip05** (BMS barrack),
- **pclip07** (DCS & Saclay barrack),
- **pclip09** (RICH barrack),
- **pclip010** (Trigger barrack).

3 other Windows PCs are used for front-ends (all controls from OPC servers):

- **pccompass03**,
- **pccompass06**,
- **pccompass08**,

The 3 Windows PCs are located in the DCS & Saclay barrack, in the left racks.

1.1 Starting the project

- Switch on all the DCS PCs.
- pccompass07
  - Login as compassdcs;
  - From terminal, start the DIM NAME SERVER (dns):

```
$ dns &
```

  - From the terminal, start the WinCC OA console:

```
$ startConsole
```

  - Start the project and check that all the important managers are started:

```
Process Monitor 1
Database Manager 0
RDB Archive Manager 99
Event Manager 0
Control Manager 1
Simulation Driver 1
Distribution Manager 1
Simulation Driver 13 (for DIP)
Control Manager 6 (Compass_Survey.ctl)
Control Manager 7 (smsTrigger.ctl)
Control Manager 3 (SetTime.ctl)
Control Manager 4 (hvChlsOnGuardian.ctl)
WCCOAnmr 1
Control Manager 12 (Power_Switches_Status.ctl)
Modbus Driver 3
Control Manager 14 (DIP_status.ctl)
Control Manager 13 (Cedar_Updates.ctl)
Control Manager 18 (Ecal2_position.ctl)
Control Manager 19 (Ecal1_position.ctl)
S7 Driver (For PTgt)
Control Manager 21 (RunInformation.ctl)
WCCOAdim 14
Control Manager 22 pccodb00_status.ctl
WCCOAdim 16
WCCOAdim 17
Control Manager 25 nmrNodeDuringSpill.ctl
Control Manager 26 DC0001Lv.ctl
Control Manager 27 Network_Power_Switches_Status.ctl
WCCOAdim 19
Control Manager 28 Hodo_Hv_Veto.ctl
WCCOAdim 20
```

  - Start the reading of SM2 magnetic field from NMR meter.
  - Start the PMM Lv control and monitoring.
  - Open a DCS UI and start the remaining managers when everything else has been started.

- pccompass04
  - From the terminal and as compassdcs, start the WinCC OA console.

```
$ startConsole
```

  - Start the project and check that all the important managers are started:

```
Process Monitor 1
Database Manager 0
RDB Archive Manager 99
Event Manager 0
Control Manager 1
Simulation Driver 1
Distribution Manager 1
Control Manager 3 (unDistributedControl.ctl)
Control Manager 20 (Beamdb2014.ctl)
Control Manager 28 (SetTime.ctl)
Control Manager 29 (SumAlertsToDCS1.ctl)
Control Manager 16 (Ecal1Script.ctl)
Control Manager 17 (Ecal2Script.ctl)
Control Manager 26 (Hcal1Script.ctl)
Control Manager 27 (Hcal2Script.ctl)
```

- pccompass03, pccompass06, pccompass08
  - From the terminal:

```
CC7
  $ xterm &
  $ xfreerdp -g "90%" -u compassdcs -d PCCOMPASS0X pccompass0X

SLC6
  $ rdesktop pccompass0X -g '90%'
```

  - Login as compassdcs and start the WinCC OA console.
- pclip05, pclip07, pclip09, pclip010
  - Login as root and start the SLiC(s).
  - Check on pccompass07 with did before starting the DIM managers:

```
  $ did &
```

1.2 Offline copy

pccompass04, pccompass07:

- Login in pccompass0X.
- Stop the WinCC OA project. Close the WinCC OA admin console.
- Kill the remaining WinCC OA processes:

```
  $ ps -ef | grep WinCC_OA - (only lm_ip -a lockmgr shall appear)
```

- Go to the /dcs/projects directory

- In the following directories remove the old versions of files:
  - /dcs/projects/compassdcs/panels
  - /dcs/projects/compassdcs/panels/objects
  - /dcs/projects/compassdcs/log
- As root, create the backup and move it to /dcs_Backup/offline_backups:

2 SLiC

4 SLiCs exist at the moment, and for each there is a corresponding DIM API manager in WinCC OA.

When the DIMs are stopped or started, from the DCS panel of the project, there is no effect on the SLiCs.

To start or stop SLiC one must login as root in the corresponding linux PCs, and do it manually.

If in pccompass07 CAEN HV tables show the purple color in all fields (v0, vMon, iMon) and if DIMs are running (check in the DCS panel of the project) and dns is running it probably means that SLiC is stopped.

To check if dns is running in pccompass07:

```
$ ps -ef | grep dns
```

2.1 Loading a1303 driver

Login as root in the SLiC PC:

```
$ cd /home/SLiC
$ source env.bash
$ cd /home/beharrel/projects/HSCAENETLib-1-7/driver/
$ ./a1303\_load.2.6
$ cat /proc/a1303
```

2.2 Generating SLiC configuration

Login as root in the SLiC PC:

```
  $ cd /home/SLiC
  $ ./generateConfigurations.pl configParams.txt configInit.txt \
  $ config.txt dimMap.txt

2nd SLiC:

  $ ./generateConfigurations.pl ./config2ndSLIC/configParams.txt \
  $ ./config2ndSLIC/configInit.txt ./config2ndSLIC/config.txt \
  $ ./config2ndSLIC/dimMap.txt
```

2.3 Starting SLiC

Login as root in the SLiC PC:

```
  $ cd /home/SLiC
  $ source env.bash
  $ ./SLiCapp ./config.txt ./ ./dimMap.txt >/dev/null &

2nd SLiC:

  $ ./SLiCApp config2ndSLIC/config.txt ./ config2ndSLIC/dimMap.txt > /dev/null &
```

2.4 Killing SLiC

Login as root in the SLiC PC:

```
  $ ps -ef | grep SLiC
  $ kill -9 pid
  $ cd /home/SLiC
  $ source env.bash
  $ ./semaphoreClear.pl
```

2.5 List of SLiCs

Next is a list of the current SLiC servers.

pclip05:

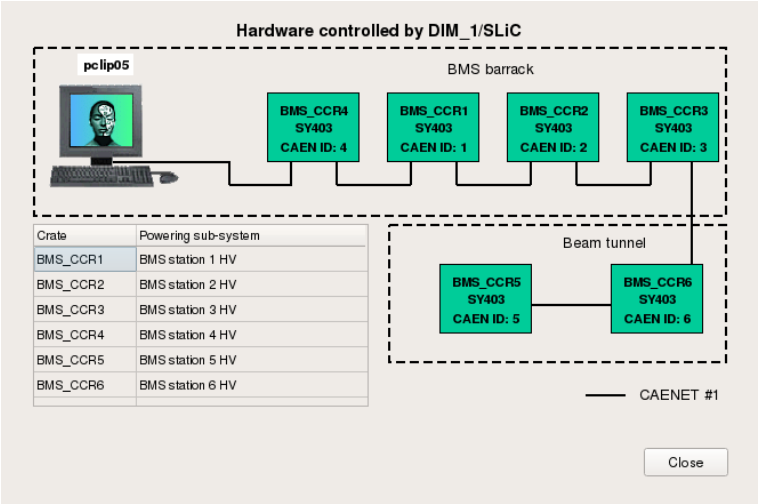


Figure 1: DIM_1.

pclip010:

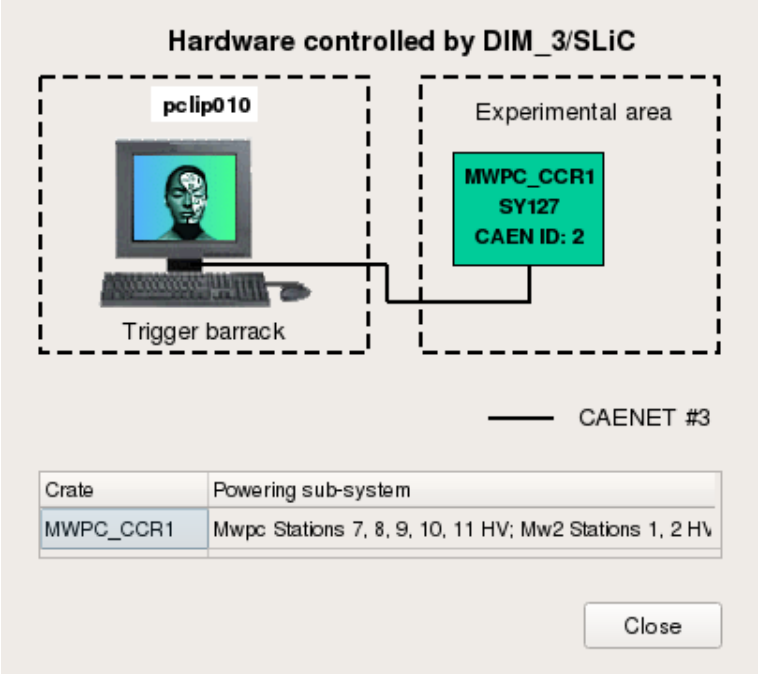


Figure 2: DIM_3.

pclip07:

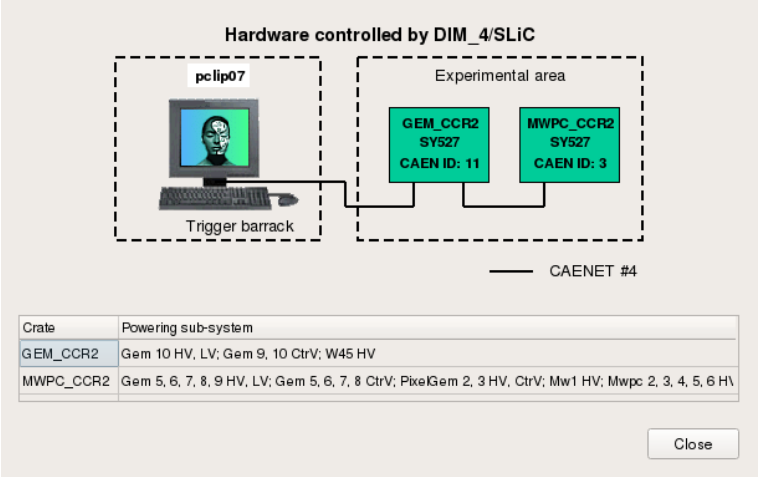


Figure 3: DIM_4.

pclip09:

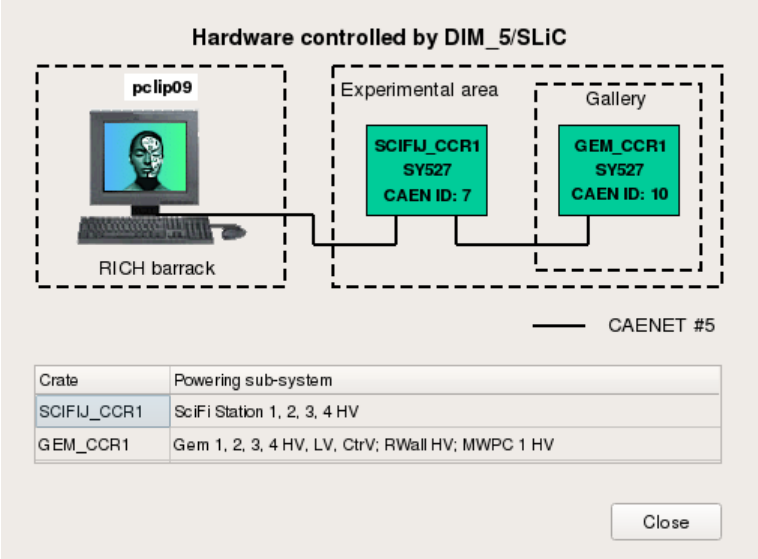


Figure 4: DIM_5.

3 OPC

3 Windows 7 PCs are used to run OPC servers and WinCC OA OPC clients.
pccompass03:

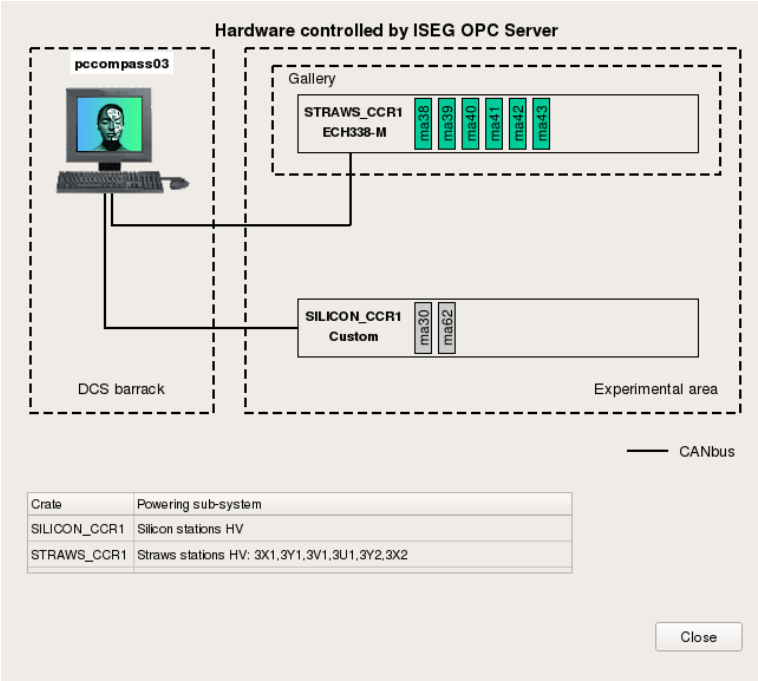


Figure 5: ISEG.

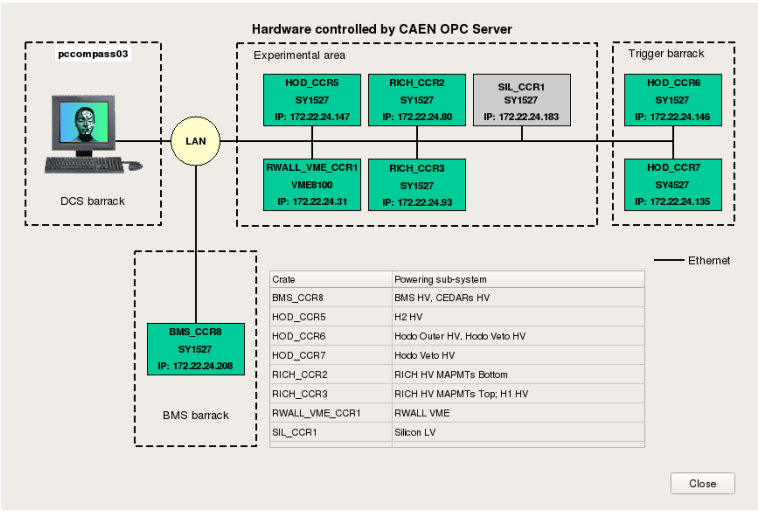


Figure 6: CAEN 1.

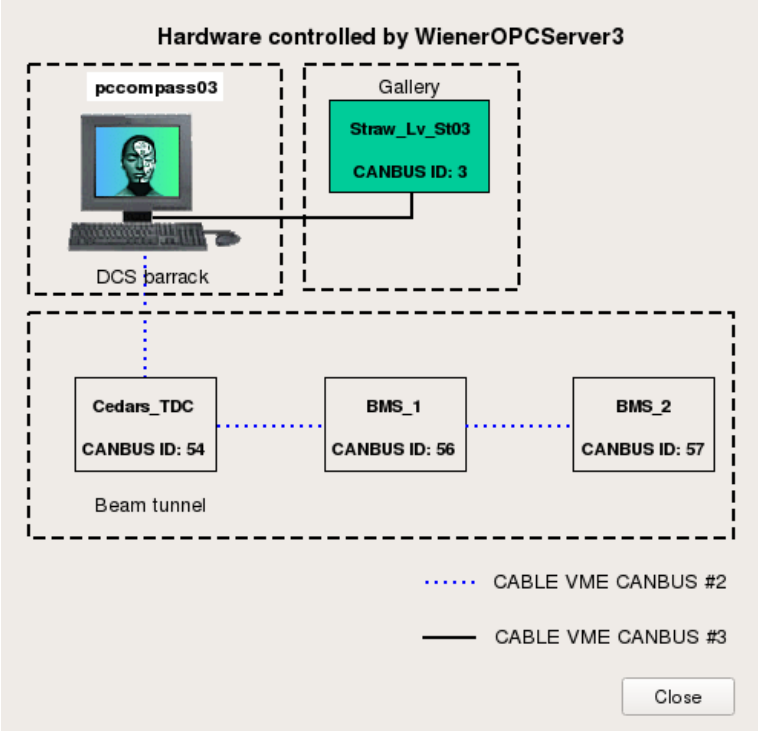


Figure 7: WIENER3.

pccompass06:

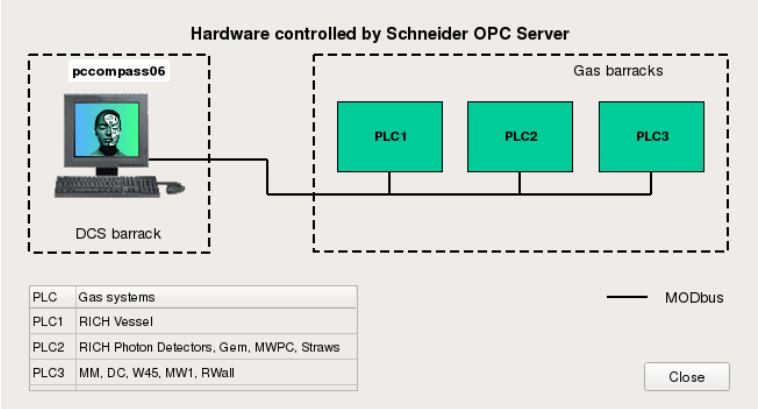


Figure 8: SCHNEIDER.

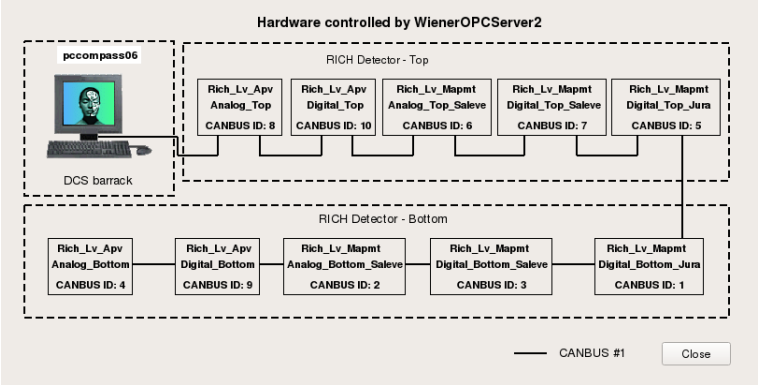


Figure 9: WIENER2.

pccompass08:

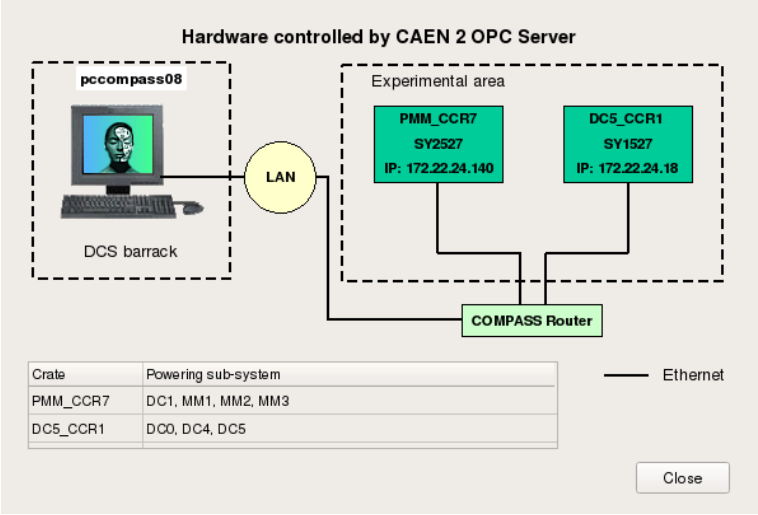


Figure 10: CAEN 2.

Figure 11: CANOPEN.

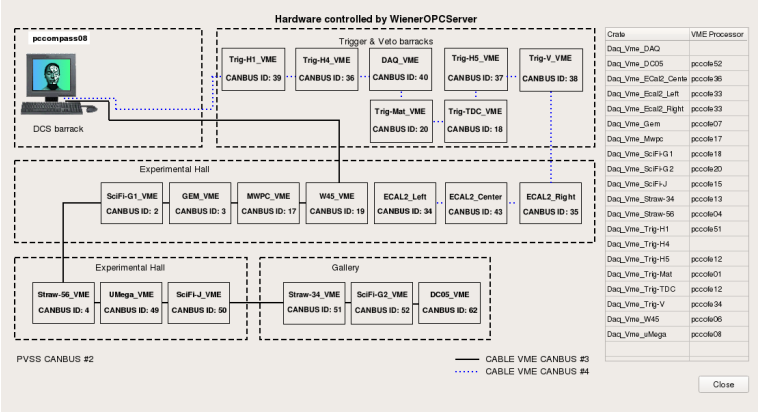


Figure 12: WIENER1.

4 Siemens S7

The Liquid Hydrogen Target is monitorized via WinCC OA Siemens S7 driver:

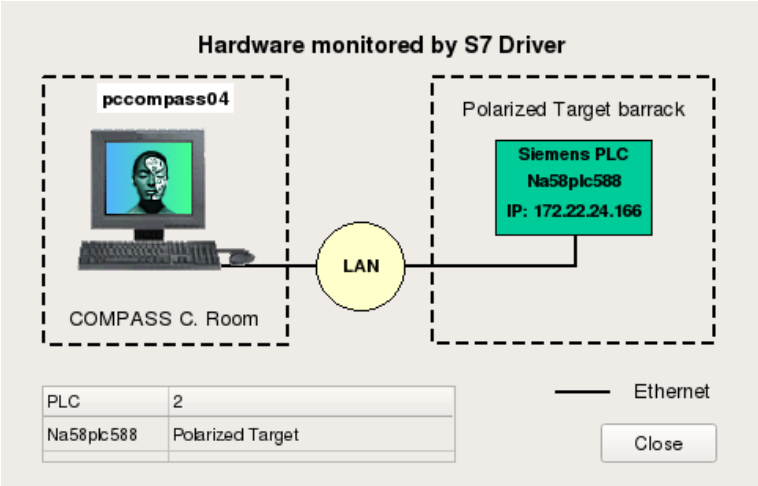


Figure 13: Siemens S7.

5 DIP

In the DCS, the monitoring of the beam line, radiation levels, CEDARs and some PTgt information is done via CERN DIP servers.

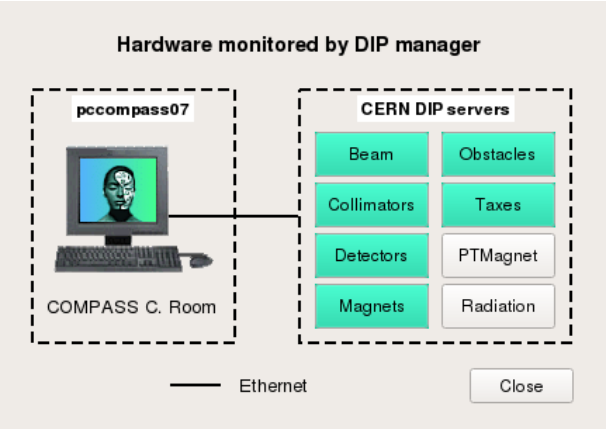


Figure 14: DIP_7.

6 DIM

In addition to the DIM clients and servers used for SLiC, other DIM clients and servers are used by the DCS:

- **DIM_11**
  - DAQ disks information.
  - xCals indirect monitoring via MySQL update time.
- **DIM_13**
  - DCs thresholds.
  - PMM Lv.
- **DIM_14**
  - spill structure

7 Databases

7.1 Oracle DB

The main DCS project connects to an Oracle DB named compr. This DB is managed by CERN Physics Databases Services. A replica and read-only copy is accessible at compr_adg.

In case the main DCS projects loses the connection to the DB, SMS and email notifications are sent and a "RDB_99: TimeAlarm" alarm is displayed in the DCS UI. If the alarm persists:

- Find if there is a network problem or a DB problem:
  - Try to connect via sqlplus:

    ```
    $ sqlplus comp_pvss@compr
    ```

  - Try ping to/from pccompass04 and pccompass07
  - Check the connections to oracle DB:

    ```
    $ netstat | grep itrac
    ```

- Check the WinCC OA logs:
  - Check /dcs/home/logs/PVSS_II.log
- Check the status of the RDB manager:
  - Open the WinCC OA console and check the color of the manager:

    ```
    $ startConsole
    ```

7.2 MySQL DB

The main DCS project connects to COMPASS MySQL DB pccodb00 to query xCals, triggers and vetos and run information.

DCS SM2 field from NMR information is copied to this database once per day.

8 CAEN

8.1 SY127, SY403 and SY527

If needed, first modify the SLiC config file to include the new channels.
In pccompass07, add the new channels to the DCS WinCC OA project:

- Identify which is the SLiC/DIM to which these channels belong:
  - For each SLiC/DIM there is an internal datapoint _fwDimDefaultConfig# where the mapping is stored (client services and client commands dp elements).
- Check which fwDimDefault is being used:

```
$ cd /dcs/packages/jcop_fw/scripts/libs/fwDevice
$ nano fwDevice.ctl -> search for fwDimDefault and change it if needed
```

- From startConsole, start the control manager fwScripts.lst
- Run fwCaenAddressDefaultSettings.pnl and set DIM as default address settings for CAEN hardware.
- From the fwDeviceEditorNavigator:
  - Go to the hardware view and add the crate, boards and channels if needed.
  - Set the default addresses and DP function. Do not set the default alarms.
  - Go to the logical view and add the channels.
- Go to the internal datapoint _fwDimDefaultConfig# and correct the client service and client commands dp elements:
  - Copy the content of these elements to kwrite/gedit (don't use nano).
  - Open did and check it the ending addresses are correct, there might be typos (ex: imon instead of IMon).
  - Copy and paste back the edited results.
- Edit panel DefCAENAlarmHandlingAndDescriptions.pnl and run it to add the alarm handling and descriptions.

- Edit the SumAlerts_on_nodes.ctl script and run it from terminal:

```
$ cd /dcs/home/scripts
$ ./runctl SumAlerts_on_nodes.ctl
```

- Check if the new channels are updating and the alarms are summed and propagating correctly.
- From the startConsole, restart the hvChlsOnGuardian.ctl manager.

8.2 SY1527, SY2527 and SY4527

If needed, first add the crate to the CAEN HV OPC Server Configurator on pccompass03 or pccompass08.

In pccompass07, add the new channels to the DCS WinCC OA project:

- Run fwCaenAddressDefaultSettings.pnl and set OPC as default address settings for CAEN hardware.
- From the fwDeviceEditorNavigator:
  - Go to the hardware view and add the crate, boards and channels if needed.
  - Set the default addresses[1] and DP function. Do not set the default alarms.
  - Go to the logical view and add the channels.
- Edit panel DefCAENAlarmHandlingAndDescriptions.pnl and run it to add the alarm handling and descriptions.
- Edit the SumAlerts_on_nodes.ctl script and run it from terminal:

```
$ cd /dcs/home/scripts
$ ./runctl SumAlerts_on_nodes.ctl
```

- Check if the new channels are updating and the alarms are summed and propagating correctly.
- From the startConsole, restart the hvChlsOnGuardian.ctl manager.

[1] You might need to change the default OPC driver number and groups. This can be done via Register device type→Edit device definitions functionality of fwDeviceEditorNavigator before setting the addresses or via export, edit and import of a dpl file via the WinCC OA ASCII Manager.

9 ISEG

ISEG setup is quite stable and it's unlikely to change soon. Still, if needed login on pccompass03 and first add the module(s) with the iseg OPC Config tool.

In pccompass07, add the new channels to the DCS WinCC OA project:

- From the fwDeviceEditorNavigator:
  - Go to the hardware view and add the boards and channels if needed.
  - Set the default addresses and DP function. Do not set the default alarms.
  - Go to the logical view and add the channels.
- Edit panel DefISEGAlarmHandlingAndDescriptions.pnl and run it to add the alarm handling and descriptions.
- Edit the SumAlerts_on_nodes.ctl script and run it from terminal:

```
$ cd /dcs/home/scripts
$ ./runctl SumAlerts_on_nodes.ctl
```

- Check if the new channels are updating and the alarms are summed and propagating correctly.
- From the startConsole, restart the hvChlsOnGuardian.ctl manager.

10 Wiener VME and LV

If needed, first add the crate(s) to Wiener configuration file on pccompass03, pccompass06 or pccompass08.

In pccompass07, add the new channels to the DCS WinCC OA project:

- From the fwDeviceEditorNavigator:
  - Go to the hardware view and add the crate and channels if needed.
  - Set the default addresses[2] and DP function. Do not set the default alarms.
  - Go to the logical view and add the crates.
- Edit panel DefWienerAlarmHandlingAndDescriptions.pnl and run it to add the alarm handling and descriptions.
- Edit the SumAlerts_on_nodes.ctl script and run it from terminal:

```
$ cd /dcs/home/scripts
$ ./runctl SumAlerts_on_nodes.ctl
```

- Check if the new channels are updating and the alarms are summed and propagating correctly.

[2]You might need to change the default OPC driver number and groups. This might be done via Register device type→Edit device definitions functionality of fwDeviceEditorNavigator before setting the addresses or via export, edit and import of a dpl file via the WinCC OA ASCII Manager.

11 ELMB

If needed, first edit the CANOpen config file on pccompass08. This can be done by adding the ELMB(s) and channel(s) from the fwDeviceEditorNavigator with the WinCC OA simulator ON instead of the driver and creating a new config file. Then just copy the modifications to the config file on pccompass08.

In pccompass07, add the new channels to the DCS WinCC OA project:

- From the fwDeviceEditorNavigator:
  - Go to the hardware view and add the ELMB and channels if needed.
  - Set the default addresses
  - Go to the logical view and add the channels.
- Add the alarm handling and descriptions if it applies.
- Edit the SumAlerts_on_nodes.ctl script and run it from terminal:

```
$ cd /dcs/home/scripts
$ ./runctl SumAlerts_on_nodes.ctl
```

- Check if the new channels are updating and the alarms are summed and propagating correctly.

12 Misc.

12.1 SM2 magnetic field from NMR meter

The NMR meter is in the control room, after the DAQ computers. It is connected via RS232 (serial) to pccompass07. The reading is currently done using the port /dev/ttyS2.

The program to read from the port called rs232.ncurses and it is in the directory /dcs/packages/compass/nmr/bpi

This program must be running at all times (during Run) in pccompass07.

Check if the program is running with the command:

```
$ ps -ef | grep rs232.ncurses
```

This program runs interactively, in a virtual scream. To enter the virtual screen (readout), do:

```
$ screen -r
```

By doing this, you regain the view of the virtual screen. You should see the program printing text to the screen, with a new value every few seconds.

To detach from the virtual screen, do: ctrl -a d

Do not logout before detaching from the virtual screen first. It would kill the program.

In case the program is stopped, as "compassdcs" do:

```
$ cd /dcs/packages/compass/nmr/bpi
$ screen -r
$ ./rs232.ncurses
```

After the program starts running, detach from the virtual screen with ctrl -a d

On the WinCC OA side, if needed, restart the WCCOAnmr manager from the console and check that the values in the DCS are updating.

12.2 SLC5 Custom kernel

For SLiC servers one needs to install a custom SLC5 kernel:

```
$ scp compassdcs@pccompass04:/dcs_Backup/SLiC_backups/kernel*rpm .
$ rpm -Uvh --oldpackage kernel*rpm
$ /sbin/service yum-autoupdate stop
$ /sbin/chkconfig --del yum-autoupdate
$ nano /etc/sysconfig/yum-autoupdate -> set update options = 0
$ /sbin/reboot
$ uname -a -> to check the kernel is correct
$ grep CONFIG_HZ /boot/config-2.6.x.x -> should be 100
```

12.3 DC00-04 and PMM Lv

This concerns the remote control of DC00-04 and PMM Lv via an Ethernet to Digital IO Relay and DIM.

The DIM server runs on a virtual screen in pccompass07.

In case the program is stopped, as "compassdcs" do:

```
$ cd /dcs/packages/compass/dimDCPMMLV
$ screen -r
$ ./dimDCPMM_LV
```

After the program starts running, detach from the virtual screen with ctrl -a d

On the WinCC OA side, if needed, restart the dim client from the dcs UI and check that the values in the DCS are updating.

12.4 Network ports

- Port Numbers used by WinCC OA:
  - Distribution Manager port is 4777.
  - Data Manager port is 4897.
  - Redundancy Manager port is 4899.
  - Event Manager port is 4998.
  - Pmon port is 4999.
  - Distribution Manager's alive port is 5777.
- Port Numbers used by DIM and DIP:
  - DNS default port is 2505.
  - DIM Servers will use ports in the range 5100 to 6000.

- Port Number used by Modbus is 502.

`https://wikis.web.cern.ch/wikis/display/EN/whatPortsAreUsed`
`https://dim.web.cern.ch/dim/dim_info.html`
`https://wikis.web.cern.ch/wikis/display/EN/DIP+FAQ`

12.5 Adding a comment to COMPASS logbook

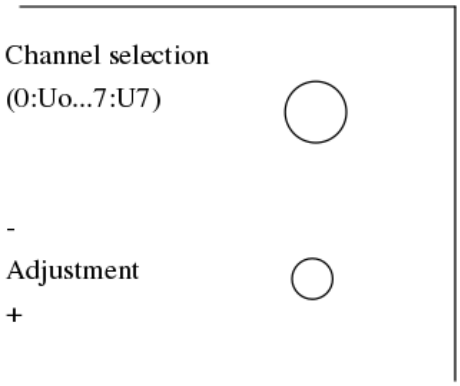
Login into COMPASS network with your personal account.
Then run:

```
$ add_comment
```

12.6 How to manage the rotary switches for Wiener LV PS

From Wiener Power supply PL508 manual:

All output voltages can be adjusted manually via the two rotary switches situated on the power supply top.



This procedure of voltage adjustment is not to recommend since the min. and max. limits of the Status window have to be readjusted accordingly. Otherweise the unit will trip

Mode Selection	Function
0-7	Adjust Voltage of U0-U7
A	CAN Address (low, Bit 0-3)
B	CAN Address (high, Bit 4-6)
C	CAN General Call Address (low, Bit 0-3)
D	CAN General Call Address (high, Bit 4-6)
E	CAN Transmission Speed Index

Figure 15: Rotary adjustments.

CAN Transmission Speed Index

Index	Max. Distance	Bit Rate	Type
0	10 m	1.6 Mbit/s	high- speed
1	40 m	1.0 Mbit/s	
2	130 m	500 kbit/s	(needs termination)
3	270 m	250 kbit/s	
4	530 m	125 kbit/s	
5	620 m	100 kbit/s	low-speed
6	1.300m	50 kbit/s	
7	3.300 m	20 kbit/s	
8	6.700 m	10 kbit/s	
9	10.000 m	5 kbit/s	

Figure 16: CAN speed index.

12.7 CAN bus interface

From Wiener RemoteControl manual:

CAN controller type:	P80C592 (CAN 2.0A protocol)
Physical Layer:	differential according to ISO 11898
Transceiver:	PCA82C250, opto-isolated, rise and fall slope control
CAN connector:	9-pin DSUB male according to CiA DS 102-1

Pin	Line	Comment
1	-	reserved by CiA
2 (10*)	CAN_L	CAN_L bus line (dominant low)
3 (9*)	GND	Ground
4	-	reserved by CiA
5	-	reserved by CiA
6	-	
7 (11*)	CAN_H	CAN_H bus line (dominant high)
8	-	reserved by CiA (failure signal)
9	-	

* optional connection to 15 pin DSUB female connector (UEV4020 VME Bins only)

Baudrates:

Max. Distance	Bit Rate	Type
10 m	1.6 Mbit/s	high-speed
40 m	1.0 Mbit/s	
130 m	500 kbit/s	
270 m	250 kit/s	
530 m	125 kbit/s	
620 m	100 kbit/s	low-speed
1300 m	50 kbit/s	
3300 m	20 kbit/s	
6700 m	10 kbit/s	
10.000 m	5kbit/s	

Figure 17: CAN bus interface.

12.8 Windows Updates

Windows updates are usually only applied between Runs to avoid undesired and unexpected side effects.

To apply new patches:

- Go to `https://cmf.web.cern.ch/cmf/`
- On the Named Set of Computers (NSC), click Edit Existing NSC.
- Select NSS and NSC (only one option available in both).
- Go to Package Collections.
- At the bottom of the page select NICE as the NSS Filter.
- Apply/Update the desired packages.
- Login in the Windows PCs and install the packages from the CMF icon that appears on the system tray.

12.9 DCS website update

To update DCS website, from CERN GPN, one needs to:

- Copy the website content to a local folder:

```
$ konqueror webdavs://dfs.cern.ch/dfs/Websites/c/compass-dcs
```

- Copy main folder
- Edit the website locally.
- Apply the changes to the online version.
- Change permissions if needed.

`https://compass-dcs.web.cern.ch`
`https://webservices.web.cern.ch/webservices/`