

Instructions for Changing Beam Cherenkov Gas Conditions

Introduction

There are two beam Cherenkov counters in the T9 beam. The upstream counter, Beam Cherenkov 1 or BCA, is 5 m long and is inside quadrupoles QFO07 and QDE06, while Beam Cherenkov 2 (BCB) is 2.5 m long and placed downstream of BCA. The control racks are against the shielding wall, close to the steps leading to the External Beam Control Room. The left rack is used to select the type of gas. (Nitrogen and carbon dioxide are available.) The right rack contains the valves, pressure gauges, pumps etc for adjusting and reading the gas pressures. The upper half of this rack is used to control Beam Cherenkov 1 and the lower half contains identical controls for Beam Cherenkov 2. The digital pressure meters are in the middle of the rack, between the two control sections. The pressure meters read **absolute** pressures in bars. The maximum safe operating pressure for the counters is 3.5 bar absolute. (Analogue gauges also display the pressure, but they show the over-pressure, i.e. the pressure above atmospheric pressure. They are not sufficiently accurate to be used for setting the Cherenkovs.)

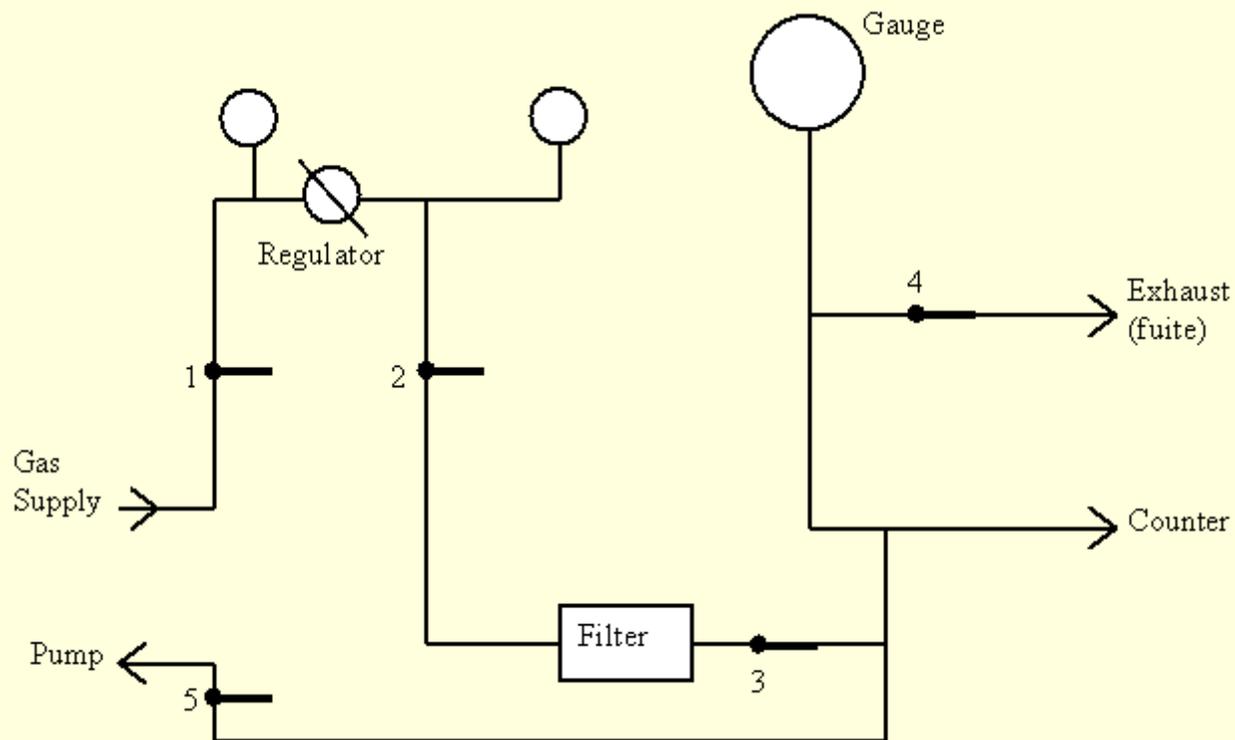


Diagram of the Gas Controls

Note that all the five valves, for each control circuit, are closed when the handles are horizontal and open when vertical (up). The pumps to evacuate the chambers are mounted on the floor behind the rack. They are switched on with circuit breakers on the rear wall, pump 1 for Beam Cherenkov 1 (BCA) and pump 2 for Beam Chamber 2 (BCB). **Note that the pumps must not be used when the pressure in the chamber is significantly greater than atmospheric!** When the pumps are used to evacuate a large volume they may emit some smoke. This is apparently normal, and not a cause for concern!

Instructions for increasing and decreasing the pressure in the Cherenkovs, or changing the type of gas, are given below, for various initial and final operating conditions.

A. Increasing Cherenkov Pressure

- o First check in the left-hand rack that the correct gas (nitrogen or CO₂) is turned on. If the wrong gas is currently in use, see the instructions for [changing the Cherenkov gas](#).

- Open valves 1, then 2 and then slowly open valve 3 on the appropriate gas control panel, and wait. It can take some time to fill the large volume of the chambers!
- Close valve 3, and after a few seconds read the pressure from the digital meter. This reads the **absolute** pressure, in bars.
- If the required pressure has not been reached, open valve 3 again. Repeat this step until the chamber has the correct pressure. If you exceed the desired pressure, see the instructions for [reducing Cherenkov pressure](#).
- Close valves 3, 2 and 1.
- Wait one minute for the pressure to stabilise before taking and recording the final pressure.
- **N.B. The maximum pressure allowed is 3.5 bar (absolute). However, the digital meters do not read above about 3.08 bar! If greater than this pressure is required, you must use the analogue gauge, which reads the approximate pressure above atmospheric (maximum allowed value 2.5 bar).**

B. Reducing Cherenkov Pressure

The procedure in this case depends on whether initial and final pressures are below or above atmospheric pressure.

1. Both initial and final pressures above atmospheric pressure

- Check that the initial pressure reading on the digital meter really is greater than 1 bar. If not, opening the exhaust valve will contaminate the chamber with air!
- Open valve 4 on the appropriate gas control panel, to vent the gas into the atmosphere. Wait! It can take some time to empty the large volume of the chambers!
- Close valve 4, and after a few seconds read the pressure from the digital meter. This reads the **absolute** pressure, in bars.
- If the required pressure has not been reached, open valve 4 again. Repeat this step until the chamber has the correct pressure. If you fall below the desired pressure, see the instructions for [increasing Cherenkov pressure](#).
- Close valve 4.
- Wait one minute for the pressure to stabilise before taking and recording the final pressure.

2. Both initial and final pressures below atmospheric pressure

- Check that the initial pressure reading on the digital meter is really at or below 1 bar! If not, see instructions below.
- Switch on the appropriate pump using the circuit breaker on the wall.
- Open the valve on the pump, by turning the spring-loaded red and black knob $\frac{1}{4}$ turn anticlockwise.
- Slowly open valve 5 and wait. It takes a long time to evacuate the large volume of the chambers!
- Close valve 5, and after a few seconds read the pressure from the digital meter. This reads the **absolute** pressure, in bars.
- If the required pressure has not been reached, open valve 5 again. Repeat this step until the chamber has the correct

pressure. If you fall below the desired pressure, see the instructions for [increasing Cherenkov pressure](#).

- Close valve 5. Close the valve on the pump, then turn off the mains circuit breaker.
- Wait one minute for the pressure to stabilise before taking and recording the final pressure.

3. Initial pressure above and final pressure below atmospheric pressure

- Open valve 4 on the appropriate gas control panel, to vent the gas into the atmosphere. Wait until gas can no longer be heard escaping from the back of the rack. This may take some time.
- Close valve 4, and check that the pressure on the digital meter has fallen to about 1.05 bar. (Do not go below this, or air may enter the chamber.)
- Switch on the appropriate pump using the circuit breaker on the wall.
- Open the valve on the pump, by turning the spring-loaded red and black knob $\frac{1}{4}$ turn anticlockwise.
- Slowly open valve 5 and wait. It takes a long time to evacuate the large volume of the chambers!
- Close valve 5, and after a few seconds read the pressure from the digital meter. This reads the **absolute** pressure, in bars.
- If the required pressure has not been reached, open valve 5 again. Repeat this step until the chamber has the correct pressure. If you fall below the desired pressure, see the instructions for [increasing Cherenkov pressure](#).
- Close valve 5. Close the valve on the pump, then turn off the mains circuit breaker.
- Wait one minute for the pressure to stabilise before taking and recording the final pressure.

C. Changing the Cherenkov Gas

When changing the gas, it is necessary to flush the chamber twice, in order to have a pure gas. This procedure will take about 30 minutes.

- If the current pressure is greater than 1 bar, open valve 4 on the appropriate gas panel to vent gas into the atmosphere. Wait until gas can no longer be heard escaping from the back of the rack. This may take some time. Close valve 4, and check that the pressure on the digital meter has fallen to about 1.05 bar.
- Switch on the appropriate pump using the circuit breaker on the wall.
- Open the valve on the pump, by turning the spring-loaded red and black knob $\frac{1}{4}$ turn anticlockwise.
- Slowly open valve 5 and wait for at least 10 minutes.
- Close valve 5, and check the pressure is no more than 0.02 bar on the meter.
- In the left-hand rack, ensure the previous gas is turned off and turn the correct gas on.
- Open valves 1, 2 and 3, and fill the chamber to 1 bar as described in [A.](#) above.
- Close valves 3, 2 and 1.
- Evacuate the chamber by repeating the above procedure.

- Close the valve on the pump, then turn off the mains circuit breaker.
- Fill the chamber to the required pressure as described in [A.](#) above.

Chris Booth 26th April 2001

If these instructions become out of date, or if you find them unclear or inadequate, please let me know (Chris.Booth@cern.ch) and I will try to modify them.