

Revisions to the ISAC Target Vacuum System

020506
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Introduction

The purpose of this note is to inform ISAC Operations of recent changes to the targets vacuum system and to provide an updated operating procedure to be incorporated in the ISAC instruction manual.

In order to de-couple as much as possible the operation of the East and West targets it was decided to make major revisions to the vacuum pumping system. The purpose is to allow a target to be changed in one station without affecting operations on the other. This is accomplished by revising the piping to separate the roughing and backing functions. Either target, the pre separator box and DB0 will normally be roughed by pump ITH:MP1, located in the Module Service Area. This pump was originally installed to transfer gas from the Operating Storage tanks to the Decay Storage tank and to evacuate the Decay Storage tank to atmosphere. It continues to have these functions as well as now being the roughing pump of choice. There will still be some interaction between the systems, and some care will be required to make the transition from roughing to high vacuum on one station while the other is operating.

The pumps ITH:MP1 and 1S now are normally used only to back the turbo pumps on the target stations and on DB0.

There are a number of hardware changes associated with this revision.

- 1) A new roughing line is installed from the ITE, ITW, pre separator and DB0 roughing valves to the pre-existing line from the ITH pump area to ITH:MP1.
- 2) The connection of the target primary and secondary roughing valves to this line is arranged such that the pressure will always be lower on the primary side. This is accomplished by a flow restriction in the secondary pumping line and an interlock against the secondary roughing valve being open unless the primary is open.
- 3) The check valves between the primary and secondary backing lines have been removed. They were deemed unnecessary as the operation of the intermodular connectors is such that it is not possible to develop a pressure across the containment box walls.
- 4) ITH:MP1 and 1S are new pumps. They are slightly smaller than the previous pumps at these locations and are designed to operate with exhaust pressure below atmospheric if desired.
- 5) The absolute pressure relief valves that were on the exhausts of the old pumps are removed. These were passive devices and ISAC ops may not have been aware of them.

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6) The Penning gauges are now operated by a Varian "Mutigauge" controller and no longer go on and off with the turbo pumps. The gauges are turned on and off from the control screen, just as any other gauges. The gauges are operated by individual cards in the same case. They are fully independent as far as remote operation is concerned, but only one gauge at a time can be displayed locally. The readings may be different from before for the same pressure as the controller is calibrated for a different head than the type used.

7) ITW:PNG2 is renamed by Controls to ITW:PNG4 (for consistency?) . The location has not changed.

8) The hot cathode gauges ITW:IG1 and ITW:IG1S have been removed from the control system as redundant. They are physically still in place and could be used for diagnostics.

General

Many modes of operation are possible and acceptable. In general any sequence of operations that does not result in unacceptable discharges to the atmosphere and does not result in damage to the target/ion source is permissible. Interlocks in the control system will normally ensure that these criteria are met.

In the instructions that follow a device may already be in the required state. "Open X", for instance, may be read as "check that X is open". They also refer to the targets, but are essentially the same for the pre separator and DB0.

Pumping from atmosphere to high vacuum

ITH:SV3 and ITH:XOV1 must be closed for target, pre separator or DB0 roughing.
If there is no requirement by Safety to obtain a gas sample for analysis, skip to C)

A) Empty the decay storage tank.

- 1) Open ITM:SV4 Provides exit for pump exhaust
- 2) Start ITM:MP1
- 3) Open ITM:SV1 Inlet to pump.
- 4) Open ITM:SV2 Connect to manifold.
- 5) Open ITM:SV5 Connect to tank.
- 6) Pump until ITM:CG3 < 1 Torr
- 7) Close ITM:SV1 Isolate pump.
- 8) Continue to B) OR 9)

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- 9) Turn off ITM:MP1
- 10) Close ITM:SV4

The decay storage tank is now ready to receive gas from a target, the pre separator or DB0

B) Transfer gas from the target to the decay storage by pressure difference.

- 1) Open ITH:RV1 Connect to roughing line.
- 2) Open the appropriate RV. For a target use the "Open Rvs" button on the target page so that both Rvs (4 and 4S) open.
- 3) Wait for the pressure in the decay storage tank to equal the pressure in the volume being pumped. When the pressure change is less than 10 Torr/min you may consider the pressures equal. The Convectron gauges may not read identically.
- 4) Close ITM:SV5 Isolate decay storage tank.

C). Pump the balance of the gas to atmosphere.

NOTE: If the target is at atmosphere when starting this procedure ITM:MP1 will be tripped by ITM:PS1. This is a pressure switch to prevent over pressure on the exhaust port of the pump. The trip is momentary and will clear it's self. You may be able to avoid the trip by opening and closing ITM:SV1. This is a bit of a nuisance, but I don't see a way around it at the moment.

- 1) Close ITM:SV2
- 2) Open ITM:SV4 Provides exit for pump exhaust
- 3) Start ITM:MP1
- 4) Open ITM:SV1 Pump inlet valve.
- 5) Open ITH:RV1 Connect to roughing line.
- 6) Open ITW(E):RV4 and RV4S using the "Open Rvs" button.
- 7) Pump until the target pressure falls below 0.400 Torr.

Open ITH 3 PVI / PVI 2

This is the end of the roughing phase. To continue to high vacuum

- 8) Close the Rvs
- 9) Note the pressures on ITH:CG2 and ITH:CG2S
- 10) Open the BV s.
- 11) Start the turbos.
- 12) Close ITH:RV1

Switch from (roughing to nuclear exhaust) to (backing to nuclear exhaust)

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- 13) Close ITM:SV1
- 14) Turn off ITM:MP1
- 15) Close ITM:SV4
- 16) When the pressures on ITH:CG2 and ITH:CG2S have fallen to 150% of the values at 9) turn on ITx:PNG1 and ITx:PNG4

To Transfer Contents of Operating Storage Tanks to Decay Storage

I expect this to be an infrequent occurrence and would best be done with no target heaters on and no target gas flow.

The general procedure is to isolate the all turbo pumps and to transfer the gas first by pressure difference and then with ITM:MP1.

Transfer Primary Operating Storage to Decay Storage.

- 1) Obtain Permission from Safety to proceed.
- 2) Empty decay storage as per instructions A)
- 3) Close ITM:SV4 Isolate transfer pump exhaust
- 4) Close ITH:PV1 Isolate all primary turbo exhausts
- 5) Open ITH:SV3 Connect to primary operating manifold
- 6) Open ITH:SV4 Operating storage tank valve.
- 7) Wait for ITM:CG3 and ITH:CG6 to come to equilibrium.
- 8) Close ITM:SV2 Isolate decay storage manifold.
- 9) Open ITM:SV3 Connect pump exhaust to decay storage
- 10) Turn on ITM:MP1
- 11) Open ITM:SV1 Pump balance of gas to decay storage.
- 12) Close ITH:SV3 Isolate primary backing line
- 13) Turn off ITM:MP1
- 14) Close ITM:SV3
- 15) Close ITM:SV5

Transfer Secondary Operating Storage to Decay Storage.

- 1) Obtain Permission from Safety to proceed.
- 2) Empty decay storage as per instructions A)
- 3) Close ITM:SV4 Isolate transfer pump exhaust
- 4) Close ITH:PV1 Isolate all primary turbo exhausts
- 5) Close ITH:SV5S Isolate open exhaust line
- 6) Open ITH:XOV1

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- 7) Open ITH:SV3S Connect to secondary operating manifold
- 6) Open ITH:SV4S Operating storage tank valve.
- 7) Wait for ITM:CG3 and ITH:CG6S to come to equilibrium.
- 8) Close ITM:SV2 Isolate decay storage manifold.
- 9) Open ITM:SV3S Connect pump exhaust to decay storage
- 10) Turn on ITM:MP1
- 11) Open ITM:SV1 Pump balance of gas to decay storage.
- 12) Close ITH:SV3S Isolate primary backing line
- 13) Turn off ITM:MP1
- 14) Close ITM:SV3
- 15) Close ITM:SV5