

Main Ring Pumping System

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The number of pumps required is tabulated below. The numbers in parenthesis are from the "Blue Book" Table VII-I.

Number of sputter-ion pumps

a. Vacuum envelope (50 liter/sec)	378 (250)
b. Radio-frequency cavities (200 liter/sec)	21 (15)
c. Collins straight sections (100 liter/sec)	15 (10)
d. Special tanks (2000 liter/sec)	3 (8)

Number of forevacuum stations **30 (36)**

Each station: Turbomolecular pump 260 liter/sec
 Mechanical pump 15 cfm

These numbers are obtained as follows. The spacing between high vacuum pumps is ~ 15 m as in the "Blue Book." Thus, there are 63 50 l/s pumps/superperiod placed as shown in Fig. 1. In addition, a 200 l/s pump is associated with each RF cavity. If the RF cavities occupy 3 medium straight sections, then a 100 l/sec pump is allotted to each of the remaining 3 medium straight sections and 2 100 l/sec pumps to each of the 6 long straight sections. The 3 special tanks are for injection, internal target, and EPB.

The 378 small high vacuum pumps all attach to the ring in the one-foot spaces between magnets. This will pose a tricky engineering problem because of limited space, but a possible solution is shown in Fig. 2. The pump is placed on the floor to remove it from the main ring magnetic field and to remove its magnetic field from the beam. Because of the shortened pump manifold, the effective pumping speed is 40 l/sec compared to 35 l/sec in the "Blue Book" design (Fig. VII - 5 and F. S. Reinath UCID 2517). Assuming an out-gassing rate of $10^{-10} \text{ torr l/sec} - \text{cm}^2$, the average pressure in the B_1 magnets will be $2.2 \times 10^{-7} \text{ torr}$ and 3.0×10^{-7} in the B_2 magnets.

The number of forevacuum stations is determined by the number of major and minor utility buildings: 5/superperiod. The roughing line should be at least 8" pipe and run straight from the utility building, through the utility tunnel, under the train tracks, and to the ring. There will be less bends if the fore-pumps are below the ring tunnel floor level.

The forevacuum pump spacing is ~200 m. This adds about ~1 hour to the pumpdown time shown in Fig. VII-4 of the "Blue Book" (F. Reinath, UCID-2517). However, portable forepumps can speed this up considerably.

The increased cost of the pumping system is itemized below assuming the pump "mix" of the various size high vacuum pumps to be the same as in the "Blue Book" and using an average cost per pump. In addition, 5% spare pumps are needed. These figures do not include price increases since the "Blue Book" was written.

	<u>"Blue Book"</u>	<u>Current</u>
	(in thousands of dollars)	
I. A. 5. b High Vacuum Pumping System	430	630
c High Vacuum Pumping System Power Supply	170	250
d Forevacuum System	380	320
e Monitor and leak-hunt instruments	200	200
f Spare pumps	-	50
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Total	1180	1450

Increase - 270

FIG. 2 POSITION OF 50 liter/sec PUMP

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