S-AA-M-31

Cryogenic Target Handling System Operations Manual Volume IV–CTHS Description

Chapter 11: Cart Maintenance Room (CMR)

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Chapter 11
Cart Maintenance Room (CMR)

11.1 INTRODUCTION

The cart maintenance room (CMR) provides a work area for performing maintenance on the MCTC's. The room is equipped to handle DT-contaminated carts and the associated parts; this chapter introduces the CMR.

11.1.1 Floor Plan

The cart maintenance room is located at the south end of the OMEGA passageway. The floor plan in Fig. 11.1-1 shows the CMR layout. The room is approximately 21 ft wide by 31 ft long. The contaminated work area is located in the back of the room; appropriate anticontamniation clothing must be worn in accordance with **LLEINST 6610B, Section 3006**.

11.1.2 Special Considerations for Tritium

Maintenance of contaminated MCTC's is performed in the CMR. The room has been constructed to ensure that tritium is vented to the stack in the event of a tritium release. The ceiling panels are made of nonporous metal and the walls are painted with a nonporous paint. The floor is coated with a tough epoxy that forms a skirt around the wall to inhibit the spread of contamination and facilitate decontamination.

Normal entry into the room is through a keycard-automated door (Fig. 11.1-2); only authorized personnel can enter this area. This maintains the negative pressure that is set up for the room by the HVAC system and prevents tritium gas from escaping in the event of a release. The door can be "popped open" in the event of a power loss or emergency.

11.1.3 Major Equipment

The following summarizes the different work areas and equipment:

- Overhead crane to transport heavy equipment between work areas,
- Roughing and turbo backing system specifically for this room; pumps located in OMEGA pump room,
- Parking slots for two carts; each parking slot has valves to the roughing and turbo backing line, control power, and utility connections,
- MC vacuum test stand,
- Contaminated gate-valves and spooler storage,
- Two workbenches for maintenance and assembly of parts,
- Storage cabinet for parts,
- Test stand for vibration and window offset testing,
- Room air exhaust trunks distributed around perimeter, and
- Tritium monitor for sampling activity within the MCTC.

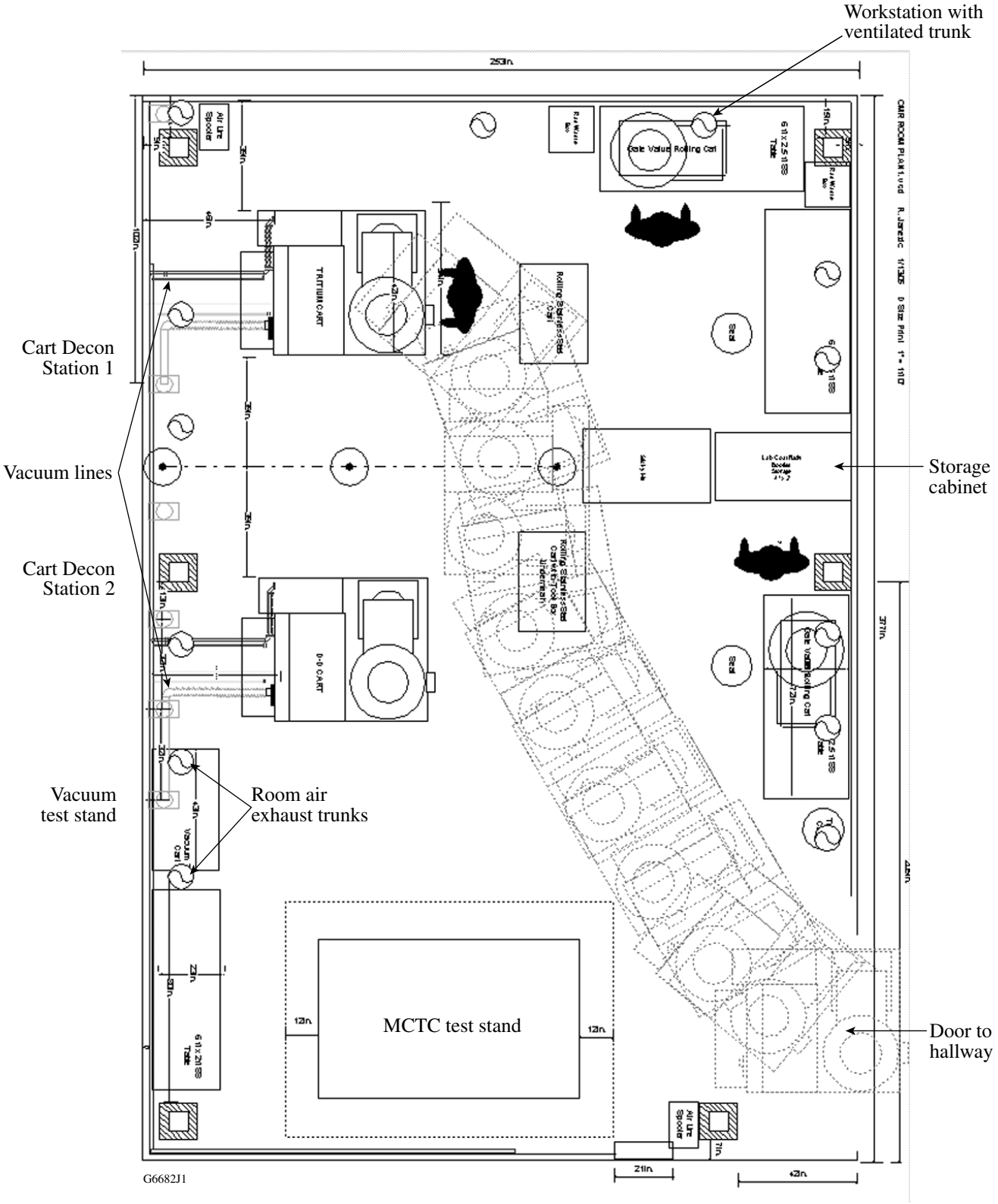

Figure 11.1-1
CMR floor plan.

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Figure 11.1-2
CMR keycard-automated door.

11.2 EQUIPMENT OVERVIEW

11.2.1 Room Ventilation

Stack exhaust plenums have been placed around the circumference of the room to provide ventilation as needed. Each plenum has a flow meter (1000-cfm maximum range) that measures flows from 15 to 100 cfm. The readings from the flow sensors can be seen in the operator's GUI (Fig. 11.2-1); if a minimum flow is not reached the plenum is displayed in red. The total flow to the stack is ~1,500 cfm.

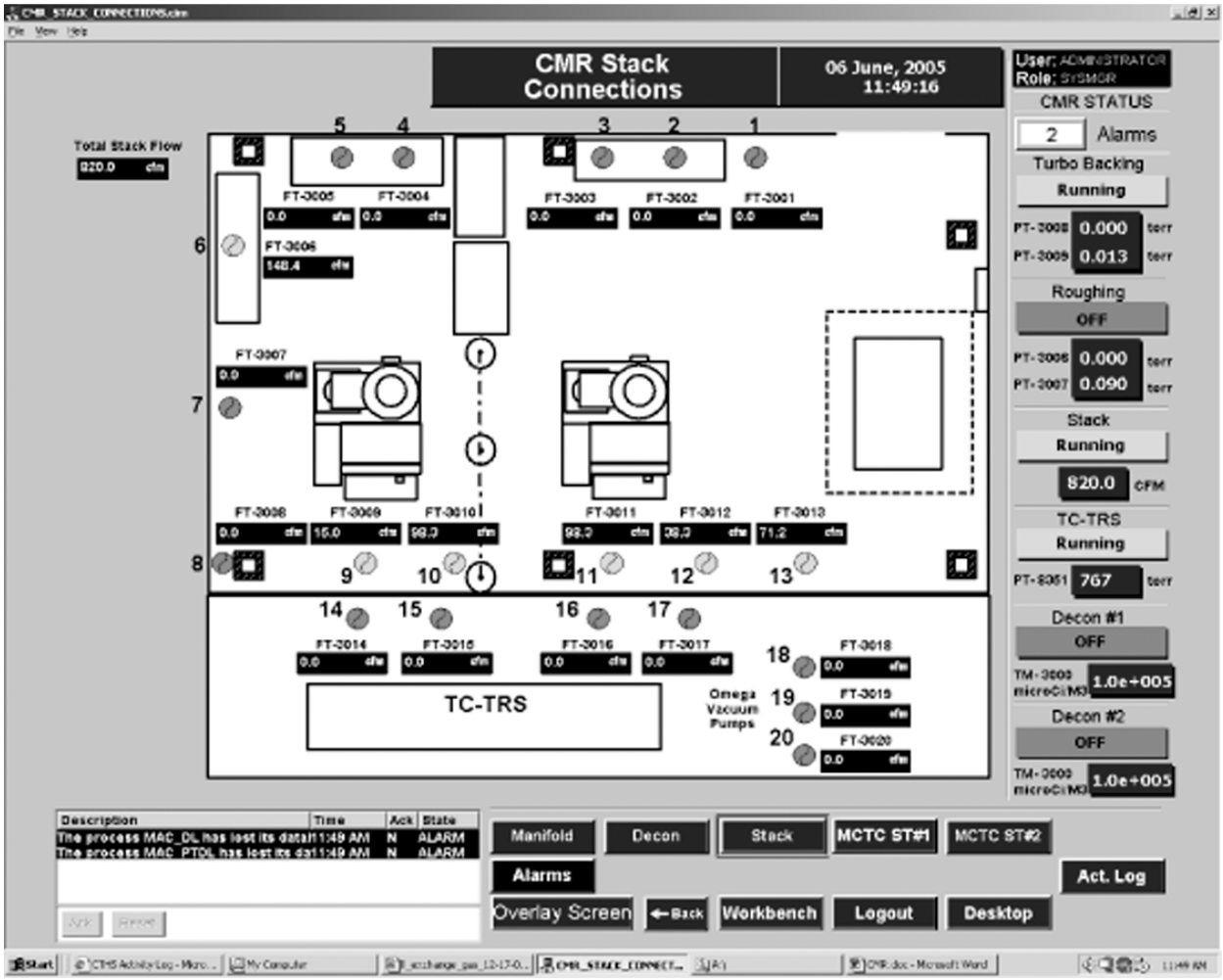

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Figure 11.2-1
CMR stack connections GUI.

11.2.2 Maintenance Work Station

A workstation is provided for maintenance work on contaminated parts. An exhaust trunk (Fig. 11.2-2) is provided to direct airflow around the contaminated part and directly to the stack.

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Figure 11.2-2
Workstation with ventilated trunk.

11.2.3 Overhead Crane

An overhead crane is provided for removal of the scissor lift cover and 16-in. gate-valve assembly. The crane is rated for 4000 lbs and the hoist is rated for 1000 lbs (Fig. 11.2-3).

11.2.4 Operator Station

An operator station (Fig. 11.2-4) provides a graphical user interface for the vacuum manifold, room ventilation, decon stations, vacuum test station, and MCTC test stand. A local PLC touch panel display is also provided.

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Figure 11.2-3
CMR crane.

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Figure 11.2-4
CMR operator station.

11.2.5 CMR Vacuum System

The CMR vacuum system is serviced by three XDS-10 Edwards scroll vacuum pumps located in the pump house behind the TC-TRS (Fig. 11.2-5). The vacuum system configuration consists of vacuum stations, a backing manifold, and a roughing manifold (Fig. 11.2-6). Each of the pumps can be used for roughing or backing, in parallel or individually. The vacuum pump discharge can be sent directly to the stack or to the TC-TRS.

The vacuum manifold runs along the back wall of the CMR. There are two cart vacuum stations used for cart decontamination and evacuation. One station is used for vacuum testing. Each station has two manifold valves for connecting to the roughing or backing manifolds. There are two pressure sensors at each vacuum station; the gauge ranges are 0–1000 torr and 0–1 torr (Fig. 11.2-7).

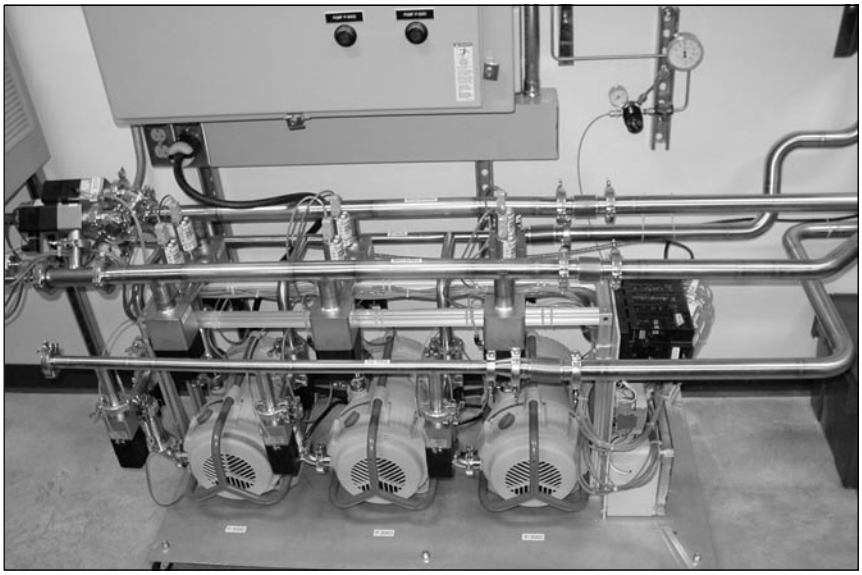

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Figure 11.2-5
CMR vacuum pumps (in pump room).

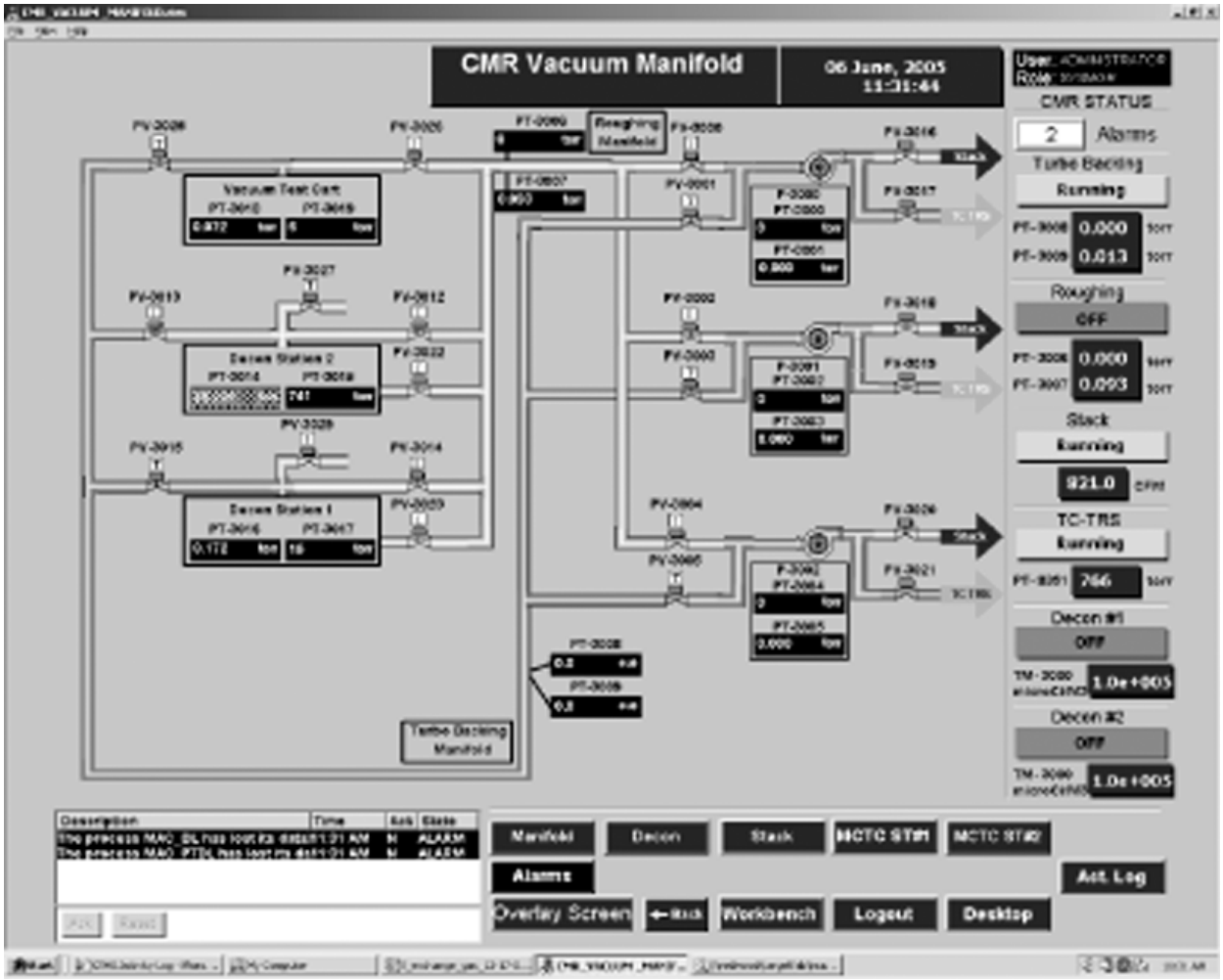

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Figure 11.2-6
CMR vacuum system.

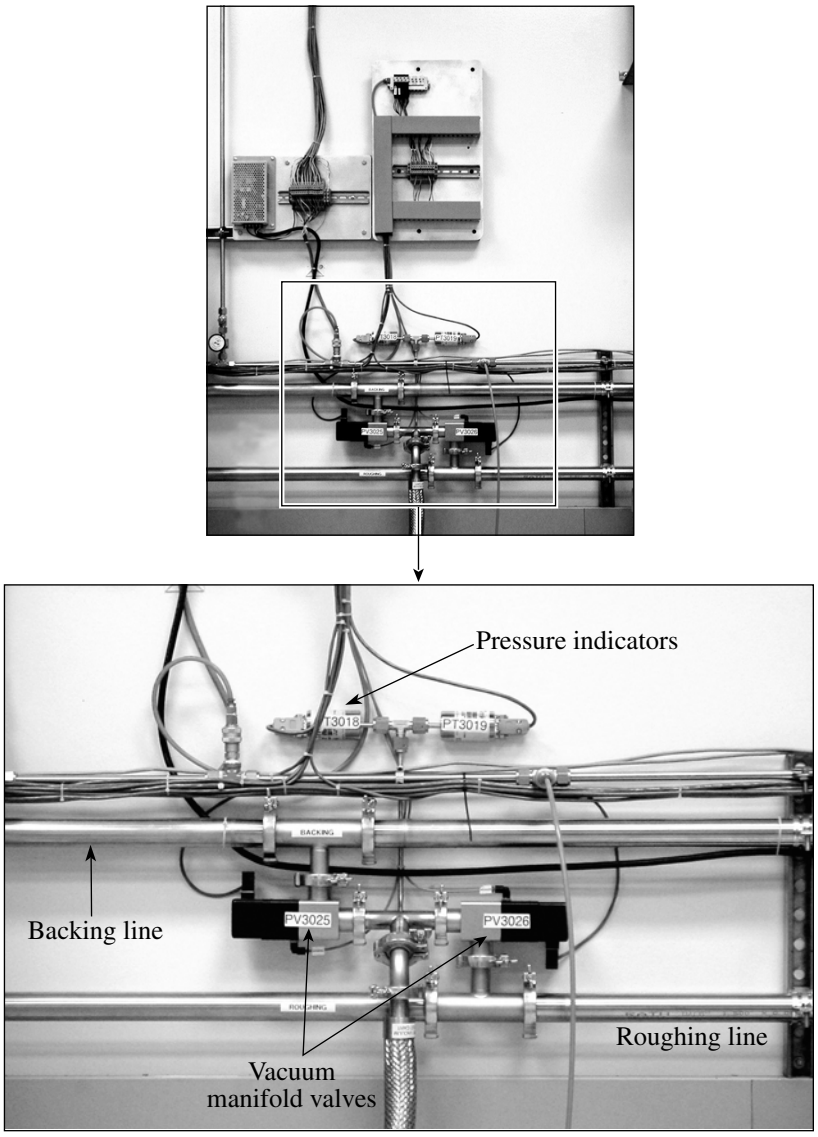

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Figure 11.2-7
CMR vacuum station.

11.2.6 MCTC Decon Station

There are two MCTC vacuum manifold decon stations, one station can be seen in Fig. 11.2-8. The stations provide the following functions for MCTC maintenance operations:

- **Decon cycle:** This is a decontamination process where the cart is vented, soaked for a specified time, and then roughed. The pump effluent is discharged to the TC-TRS and the activity per unit volume is periodically measured. This decon cycle is automatically repeated until the activity level is acceptable.

- **Purge cycle:** The purge provides a continuous flow of room air within the cart and sends the effluent directly to stack. The purge flow is generated by connecting the MCTC to the 3-in. stack exhaust plenum and opening vent ports on the cart. The activity per unit volume is sampled periodically.

- **Roughing:** The cart can be roughed to ~10^{-3} torr.

- **Turbo backing:** After the carts are roughed to the backing level, the carts can be switched to the backing manifold (from the roughing manifold). The MCTC turbopumps can then be turned on.

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Figure 11.2-8
MCTC decon station.

11.2.7 Tritium Monitor Sample System

The CMR tritium monitor sample system (Fig. 11.2-9) is used to sample the MCTC's activity per unit volume. The system has a small pump that pumps effluent from the MCTC, through the ion chamber, and then to the stack. A flow indicator is also installed in the sample line.

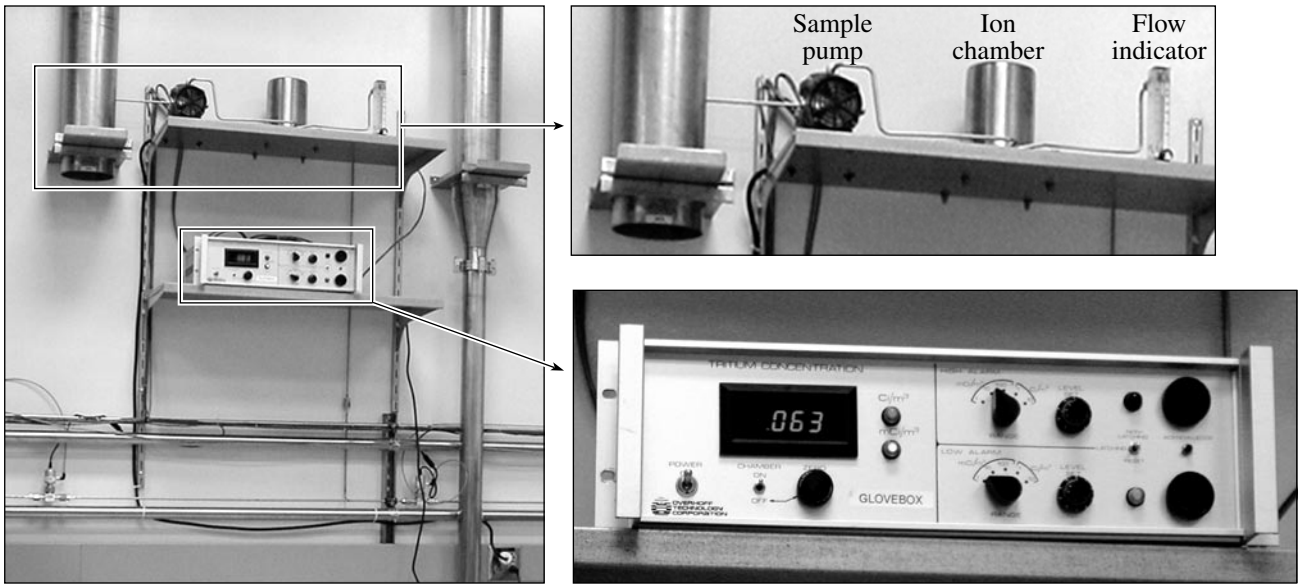

Figure 11.2-9
The tritium monitor sample system.

11.2.8 Vacuum Test Station

The vacuum test station is used to perform vacuum leak checks on the MC exchange gas prior to installation into a MCTC. This station has a vacuum vessel that is connected to the CMR vacuum manifold. The vessel is sized to contain an MC and can be evacuated to provide a vacuum jacket for the MC (see Fig. 11.2-10). Instrumentation is provided for exchange gas leak checking on the MC's upper shroud.

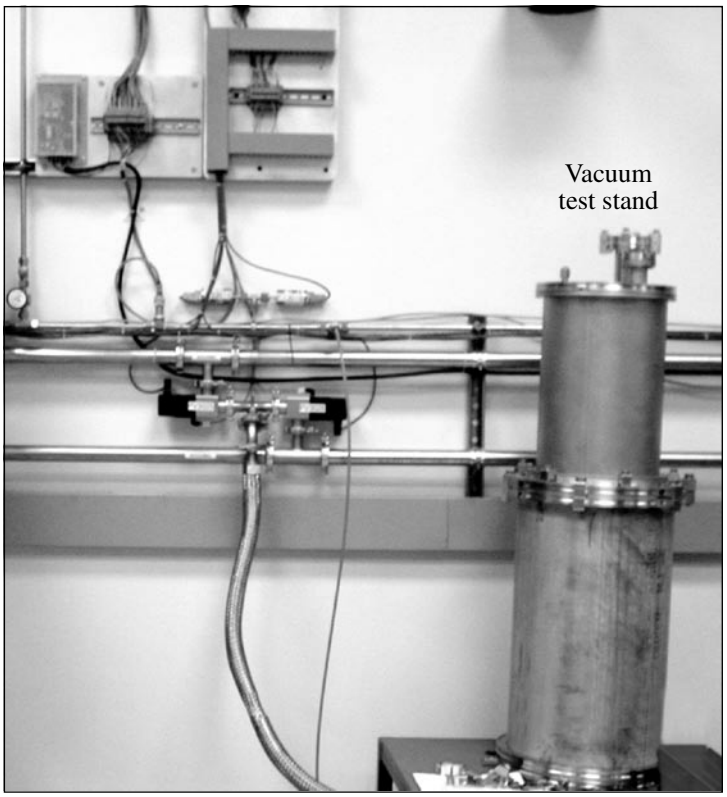

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Figure 11.2-10
Vacuum test station.

11.2.9 MCTC Test Station

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Figure 11.2-11
MCTC test station.

11.3 PROCESS OVERVIEW

This section describes operations for connecting the cart to a decon station, decontaminating a cart, and purging a cart.

11.3.1 Cart Connections

The following MCTC connections are made during the decon station docking operations (Fig. 11.3-1):

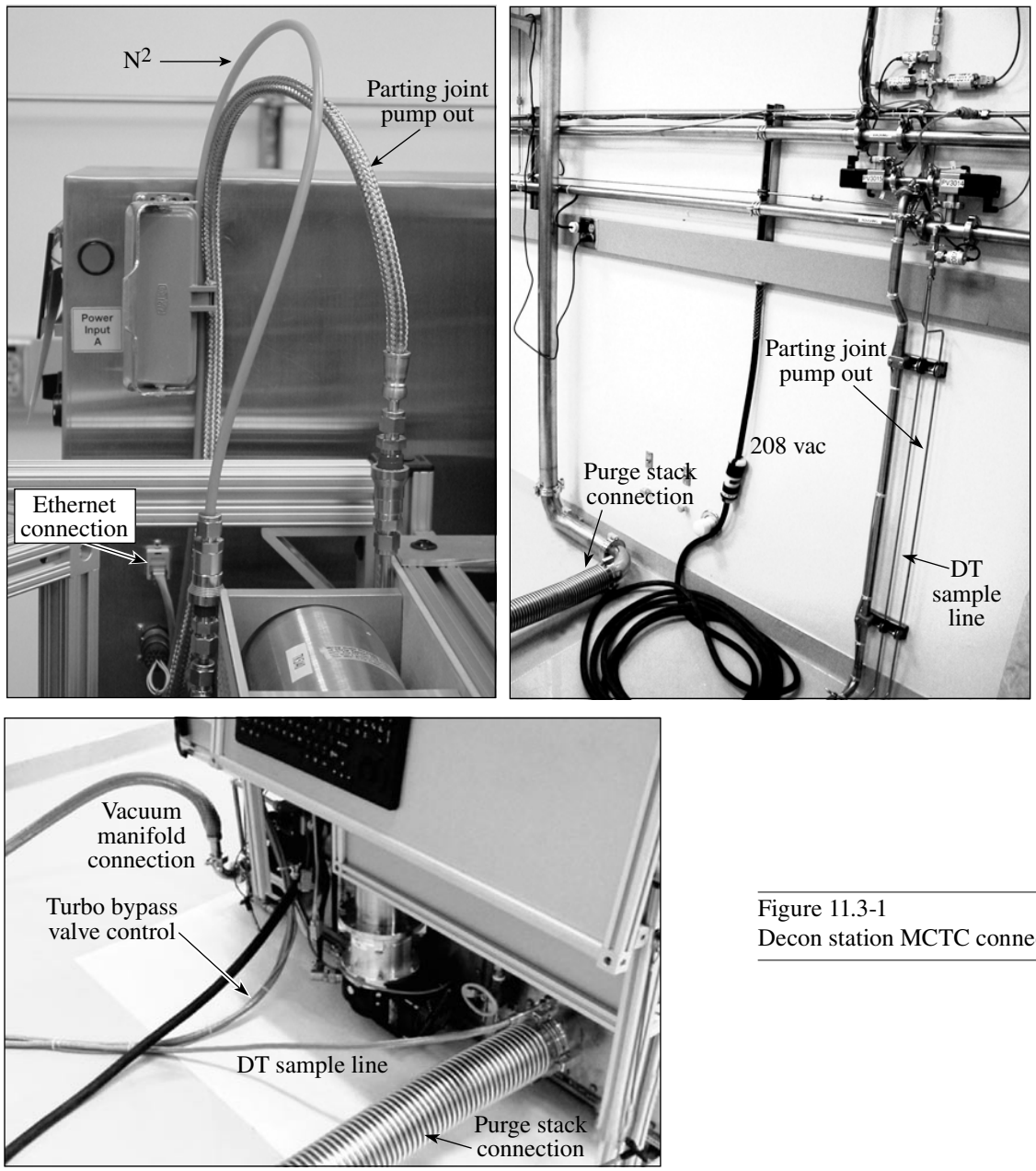

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Figure 11.3-1
Decon station MCTC connections.

- 208-Vac power connection
- nitrogen supply
- Ethernet communications cable
- turbo bypass valve (MV-5183) solenoid control cable (this valve will not OPEN without this connection)
- MCTC vacuum connection to the CMR vacuum manifold
- parting joint pump out to CMR roughing manifold
- CMR tritium sample line
- purge connection to stack

11.3.2 Purge and Decon Operations

The purge and decon operations are partially automated and are operated from the GUI shown in Fig. 11.3-2.

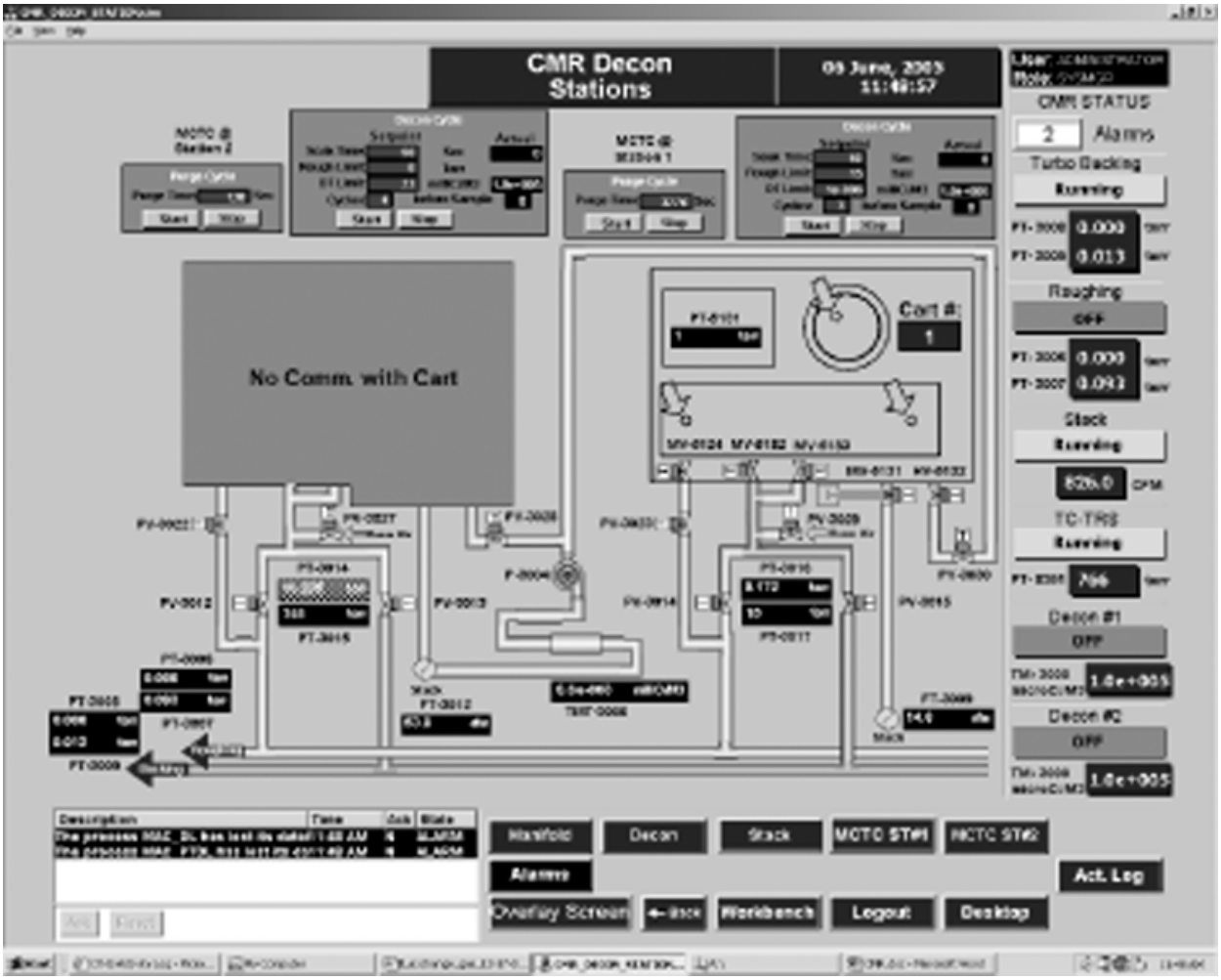

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Figure 11.3-2
Cart decontamination operations GUI.

11.3.3 Decon Cycle

The decon cycle is an automated sequence that can be executed at either decon station. The following steps are performed in the decon cycle:

1. Vent the MCTC
2. Soak for a specified time
3. Sample the activity level
4. Evacuate the cart to a specified level
5. Repeat if the activity level is above the specified limit

The CMR PLC and the MCTC PLC work together to perform the decon cycle. The decon cycle setup parameters are summarized below (see Fig. 11.3-3).

- **Soak time:** Amount of time the cart soaks with room air
- **Rough limit:** After soaking, the cart is roughed to the rough limit
- **DT limit:** Soak and evacuation cycle repeats until the DT limit has been reached
- **Cycles:** Enter the number of soak and evacuation cycles that will run before the DT activity is measured. The control system will turn on the DT monitor pump (**P-3004**) and open **PV-3028/3030** at the end of "X" cycles.

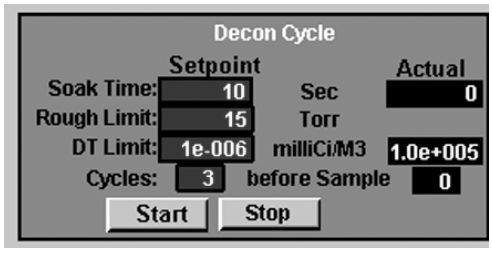

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Figure 11.3-3
Decontamination operations setup area on the decon operations GUI.

11.3.4 Purge Cycle

The purge sequence can only be operated if the current tritium contamination level is below the decon limit. This operation is used to provide a steady flow of room air through the cart and into the stack. The purge flow inhibits the contamination from spreading into the CMR. Periodically during the purge, the CMR tritium monitor samples the air; the purge timer is configured via the GUI (see Fig. 11.3-4).

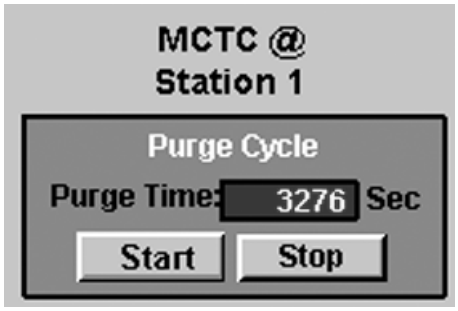

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Figure 11.3-4
Purge operations setup are on the decon operations GUI.