

**DØ CRYO  
INSTRUMENT AIR  
BACKUP SYSTEM**

**DØ ENGINEERING NOTE  
3740.214-EN-268  
JOHN URBIN  
20 NOV 90**

REVIEWED: \_\_\_\_\_

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DATE: \_\_\_\_\_

*11/20/90*

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# DØ CRYO SYSTEM INSTRUMENT AIR BACKUP

## SYSTEM DESCRIPTION

The DØ instrument air system for cryo controls has an emergency backup supply of nitrogen gas. The backup system consists of a high pressure tube trailer (38 tubes - 2400 psig MAWP), piping, valves, regulators and pressure monitoring instrumentation. The trailer is located south of DAB alongside the LN<sub>2</sub> Dewar. Fixed piping ties to the trailer with a flex-hose. The piping follows the cryo piping bridge entering the south wall of DAB, where it passes through the pipe chase and into the cryo pump room (Rm # 315). The high pressure gas is regulated down to 90 psig before tying into the compressor supplied instrument air system. Check valves are installed at the tee for the primary air and the backup N<sub>2</sub>. Normal operating pressure for instrument air is 100-120 psig. With the backup supply pressure set to 90 psig, "emergency air" is supplied whenever primary air pressure falls below 90 psig. There are two additional, outside connections to the system: one is a connection for repumping the trailer after a minimum backup volume is reached and the other is an auxiliary flex-hose connection for another trailer. All manual valves at system connections will be locked closed when not in use.

The system's maximum allowable working pressure (MAWP) is 2400 psi, which is the trailer MAWP. All piping and components have a minimum 2400 psi working pressure. Actual component working pressures are included in the component list.

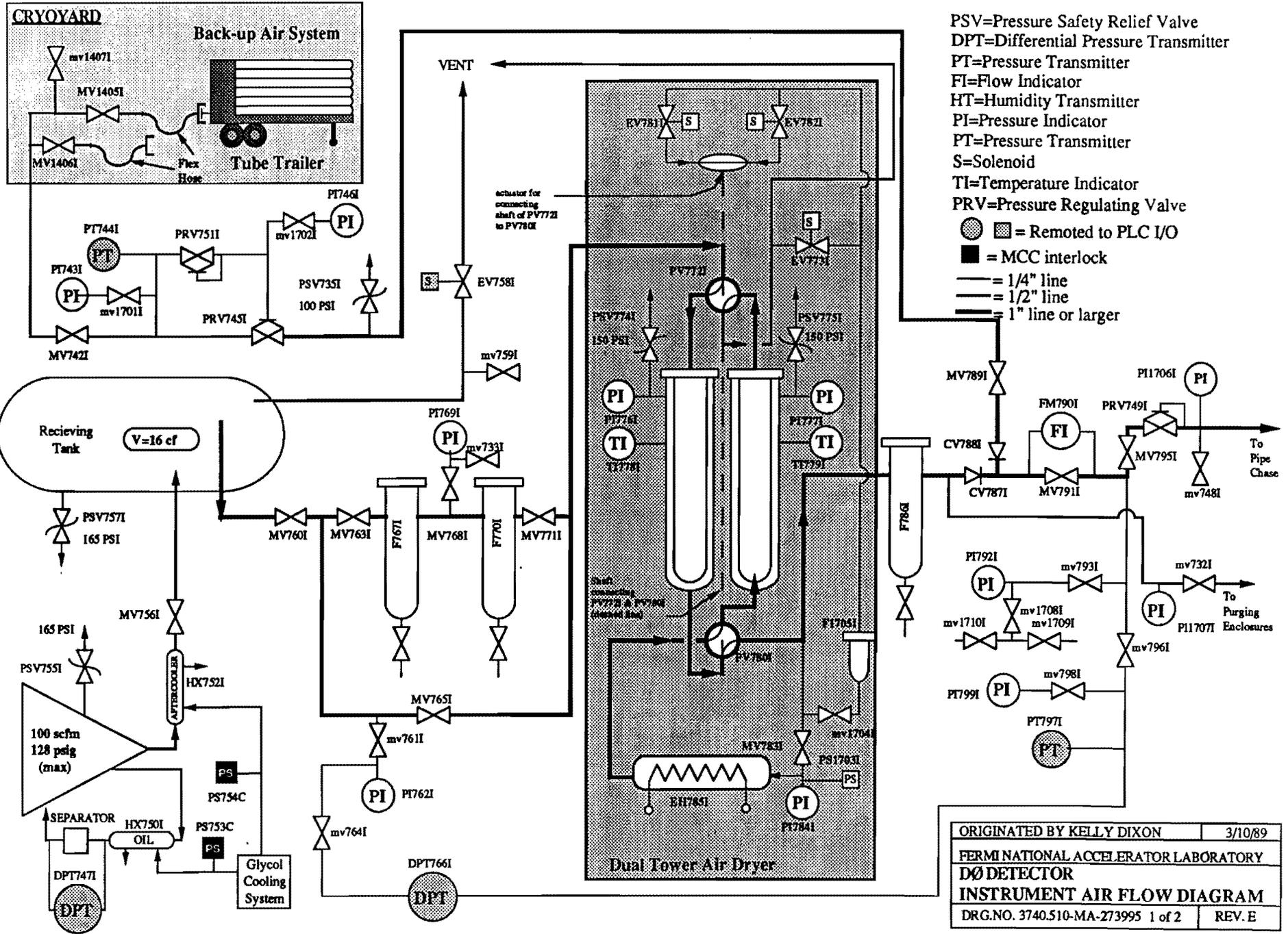
SEE DRAWING NO. 3740.510-MA-273995 (REV. D) FOR FLOW DIAGRAM

## INSTRUMENT AIR BACKUP SYSTEM COMPONENTS

<u>DEVICE</u>	<u>DESCRIPTION</u>	<u>MAWP</u>
MV 742 I	SHUTOFF VALVE AT PUMP ROOM SUPPLY PANEL	2500 PSI
PI 743 I	BACKUP AIR SUPPLY PRESSURE INDICATOR (PUMP ROOM)	3000 PSI
PT 744 I	BACKUP AIR SUPPLY PRESSURE TRANSMITTER	3000 PSI
PRV 745 I	REGULATOR WHICH SETS BACKUP AIR PRESSURE (LOADS DOME ON PRV 751)	3000 PSI
PI 746 I	BACKUP AIR PRESSURE (PRESSURE IN DOME OF PRV751 I)	150 PSI
PRV 751 I	BACKUP AIR SUPPLY REGULATOR	3500 PSI
PSV 774 I	100 PSIG RELIEF VALVE DOWNSTREAM OF SUPPLY REGULATOR	2500 PSI
CV 788 I	CHECK VALVE AT BACKUP AIR TIE-IN TO INSTRUMENT AIR	3000 PSI
MV 789 I	BACKUP AIR SHUTOFF VALVE TO INSTRUMENT AIR SYSTEM	2500 PSI
MV 1405 I	SHUTOFF VALVE AT PRIMARY TRAILER CONNECTION	2500 PSI
MV 1406 I	SHUTOFF VALVE AT AUXILIARY TRAILER CONNECTION	2500 PSI
MV 1407 I	SHUTOFF VALVE AT TRAILER REFILL CONNECTION	2500 PSI
MV 1701 I	PI 743 I ISOLATION VALVE	3000 PSI
MV 1702 I	PI 746 I ISOLATION VALVE	3000 PSI
PIPING	1/2 IN., SCH 40, 304L, SS PIPE AND FITTINGS	3850 PSI
TUBING	1/4 IN. 0.065 WALL, SS TUBE AND FITTINGS	10,200 PSI

# DØ Instrument Air System

REV	DR	DATE
E	DOUGLAS CLARK	11/09/90



# DØ INSTRUMENT AIR BACKUP SYSTEM PRESSURE TEST PROCEDURE

## OVERVIEW:

This procedure covers the pressure testing of the emergency N<sub>2</sub> backup system for the DØ Cryo instrument air system. The maximum allowable working pressure (MAWP) of the high pressure backup piping and components is 2400 psi, which is the supply trailer MAWP. The system will be tested to 3000 psi (1.25 x MAWP). The procedure follows the requirements for pressure testing set out in the Fermilab Safety Manual Chapter 5034.

## PREPARATIONS:

- \* Rope off the piping bridge area and the dewar / trailer area (southwest corner outside DAB).
- \* Post the pressure test signs at the roped areas and at the door to the pump room (room # 315).
- \* Restrict access to pipe chase during test. Close, lock and alarm all doors.
- \* Set up the LN<sub>2</sub> pump cart and make the connections to the suction line from the LN<sub>2</sub> dewar and to the discharge line from the backup system refill connection at MV 1407 I.
- \* Check that the system is configured per DØ Dwg. No.3740-MA-273995 Rev E.
- \* The supply trailer flexhose must be connected to the trailer and secured with chain at both ends. The auxiliary flexhose connection must be capped off and secured by chain to the bridge column.

## PROCEDURE:

1. Line up the system valves in the following manner:

CLOSED	OPEN
TRAILER VALVE	MV 1405I
MV 789I	MV 1406I
	MV 1407I
	MV 742I
	mv 1701I
	mv 1702I

- 2..Back out PRV 751I completely (turn knob counter clockwise). This closes PRV 745I. The limits of the test are now the trailer valve and the high pressure regulator

3. Announce over the PA that a pressure test is being conducted in the outdoor cryo area and the cryo pump room, and all non-test personnel must stay clear of the areas. Post test personnel at the outside cryo area and at the door to the pumphouse.
4. Using the LN<sub>2</sub> pump cart or a cylinder, pressurize the system to 100 psi and snoop for leaks. If any leaks are found, depressurize the system and make repairs.
5. Once the system is tight, the pump cart will be used to pressurize the system. Keep a log of the test including all pressures and hold times.
6. Slowly increase the system pressure to 1500 psi. and hold for 10 minutes. Isolate the pump cart from the system during the hold periods and watch for any pressure drop. Immediately reduce the pressure to 750 psi while locating a leak. Depressurize and make repairs if necessary.
7. The test will continue in 300 psi increments with 10 min holding periods. After the hold period at 3000 psi, reduce the pressure to 2400 psi and hold for a final 10 minutes.

**REMAIN CLEAR OF THE SYSTEM AFTER REACHING  
THE SYSTEM MAWP OF 2400 PSI.**

PSI	TIME
1500	14:26
1800	15:21
2100	15:32
2400	15:42
2700	15:54
3000	16:10
2400	16:20

8. Depressurize the system and disconnect the pump cart.
9. Close and lock MV 1406I and MV1407I.
10. Record test results in the DØ Cryo logbook and the system EN. Forward a copy of the backup system EN to the DØ Cryo Safety Review Panel.
11. Assuming a full trailer, safety panel approval and operational correctness the backup system is now ready to be placed online.



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EXHIBIT B

Date: 14 NOV 90

Pressure Testing Permit\*

Type of Test:  Hydrostatic  Pneumatic

Test Pressure: 3000 psig Maximum Allowable Working Pressure: 2400 psig

Items to be Tested: PIPING SYSTEM WHICH SUPPLIES GN<sub>2</sub> TO BACKUP THE  
DΦ CRYO INSTRUMENT AIR SYSTEM

Location of Test: DΦ / SOUTHWEST CRYO AREA  
PUMP ROOM Date and Time: \_\_\_\_\_

Hazards Involved: HAZARDS ASSOCIATED WITH HIGH PRESSURE PIPING

Safety Precautions Taken: TEST AREA WILL BE CLEARED OF PERSONNEL. TEST AREA WILL  
BE MOVED OFF WITH <sup>WARNING</sup> SIGNS POSTED. ALL APPROXIES OF ENTRANCE TO THE TEST AREA WILL BE

MONITORED BY TEST PERSONNEL. ANNOUNCEMENT OF THIS TEST WILL BE MADE ON THE P.A. SYSTEM.  
ANOTHER ANNOUNCEMENT WILL BE MADE WHEN THE TEST IS COMPLETED.

Special Conditions or Requirements: NONE

Forward a copy of the test procedures to RD Safety for review prior to  
beginning the pressure test.

Test Coordinator: John B. Urban / John B. Urban Dept/Date: 19 Nov 90

Division/Section Safety Officer: J. S. ... Dept/Date: 16 Nov 90

Division/Section Head: Peter ... Dept/Date: 18 Nov 90

Results: TEST WAS SUCCESSFULLY COMPLETED WITHOUT INCIDENT  
SEVERAL SMALL LEAKS WERE REPAIRED ALONG THE WAY.

Witness: John B. Urban / Kelly ... Dept/Date: RD/Cryo 19 NOV 90  
(Safety Officer or Designee)

\*Must be signed by division/section safety officer and division head prior to conducting test. It is the responsibility of the test coordinator to obtain signatures.