

**INTERFACE CONTROL DOCUMENT TITLE AND APPROVAL PAGE**

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**ICD Number:** ICD-123-4-5 -0001 Vacuum Vessel  
Port Resistance Heaters

**Primary Author:** P. Goranson

**Impacted WBS Elements:** WBS 121, WBS 4, WBS 5

**Type of Interface:** Mechanical/Envelope  
Interface

**Description of Interface:**

The Vacuum Vessel (VV) utilizes inner and outer port extensions which project through the Modular Coil (MC) shell structure and the Cryostat wall. The port extension walls within the cryostat are electrically heated by resistance heaters which are attached to the port walls and are covered by the port insulation wrap. This ICD defines the requirements for the heaters and defines the WBS interfaces. The outer port extensions are not within the scope of this document.

For purpose of assigning interface responsibility, the WBS 4 responsibility shall end at the power panel. The leads from the power panel to the heaters shall be the responsibility of WBS 12. WBS 5 shall receive and archive temperature signals from WBS 12.

**Record of Revisions**

Revision Number	Description	Date
0	Initial Issue	12/21/2004
1	Update port 12 and port 4 requirements	5/24/06

**Approvals**

<b>WBS Manager:</b>	<b>WBS Manager:</b>
<b>WBS Manager:</b>	<b>Project Engineer:</b>
<b>Project Engineer:</b>	<b>Project Engineer:</b>
<b>Systems Engineering Support Manager:</b>	

## ICD DETAIL SHEET

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(Use Continuation Sheets as Necessary to Include the Following Applicable Information)

### **Scope of Interface:**

This interface impacts the design and fabrication of the inner VV port extensions, and power input to the Core system.

### **Equipment and Responsibility List:**

Vacuum Vessel Systems (WBS 121): Goranson  
Electrical Power Systems (WBS 4): Ramakrishnan  
Central I&C Systems (WBS 5): Oliaro

**Related ICDs: None**

**Notes and Abbreviations: None**

**Interface Block Diagrams: None**

### **Installation Information:**

Each of the inner port extensions is provided with a minimum of one primary and one redundant (backup) electrical resistance heater tape mounted to their surface. The vertical ports (port 12) and large non-circular ports (port 4) will each be provided with four sets of heaters (plus backups). The port extension heater tape hookup interfaces shall be located outside the MC structure, at the inner port flanges. The port 12 heater tape hookup interface shall be at the port 12 diagnostic interface flange.

The interfacing electrical system must be capable of upgrade to provide power to a similar system of heaters on the outer extensions, even though they are not utilized in initial operation. For purpose of assigning interface responsibility, the WBS 4 responsibility shall end at the power panel.

The heaters must be electrically isolated from the VV and its structure. WBS 121 is responsible for the design of the inner port extension heaters, their mounting provisions, the power controllers, temperature sensors, and signal conditioning. The leads from the power panel to the heaters shall be the responsibility of WBS 12.

WBS 5 shall receive and archive thermocouple signals from WBS 12.

Each heater must be capable of continuous variable operation from zero output to a maximum of 200 watts. The expected nominal operating level is 50-100 watts. The heaters must be capable of continuous operation at 350 C.

### **Other Pertinent Information:**

Reference Documents

NCSX Vacuum Vessel Heat Balance Analysis    NCSX-CALC-123-03.