

**INTERFACE CONTROL DOCUMENT TITLE AND APPROVAL PAGE**

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**ICD Number:** ICD-123-310-0000

**Primary Author:** B. Stratton

**Impacted WBS Elements:** WBS-31 to WBS-123

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

**Description of Interface:**

The equilibrium magnetics diagnostics will include a set of saddle loops mounted on the external surface of the NCSX vacuum vessel. These will be single-turn, rectangular loops (linear dimensions on the order of 6-12 inches) fabricated from small-diameter (40-61 mil) mineral-insulated cable. The required number of such loops and their locations will be determined by modeling; a preliminary estimate is that as many as 132 loops per vacuum vessel period may be required, for a total of approximately 396 loops if all three vessel periods are instrumented. Because these loops will be mounted on the external surface of the vacuum vessel, they will need to cross the cooling tubes that will also be mounted on the external surface of the vacuum vessel. This will be accomplished by mounting each cooling tube so that there is a minimum 1/16 inch gap between the tube and the external surface of the vessel. The saddle loops will pass through this gap to cross the cooling tubes. A heat-conducting epoxy will fill the gap between the cooling tubes and the vessel surface to insure good heat transfer.

**Record of Revisions**

<b>Revision Number</b>	<b>Description</b>	<b>Date</b>
0	Initial Issue	June 16, 2003

**Approvals**

<b>WBS Manager:</b>	<b>WBS Manager:</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 vacuum vessel cooling tubes (WBS123) and the magnetics diagnostics (WBS310). It also impacts the field period assembly (WBS18).

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

Vacuum vessel cooling tubes (WBS 123): Goranson  
Magnetics Diagnostics (WBS 310): Johnson  
Field Period Assembly (WBS 18): Chrzanowski

### **Related ICDs:**

### **Notes and Abbreviations:**

### **Interface Block Diagrams:**

### **Installation Information:**

The equilibrium magnetics saddle loops will be installed on each vacuum vessel segment prior to installation of the cooling tubes. The installation technique will require fabrication of a set of fiberglass templates covering the surface of one section of the vessel (one-sixth of the entire vessel). These templates will have holes indicating the corners of each of the saddle loops. The templates will be laid on the vacuum vessel surface and the holes marked. The templates will be removed and studs attached to the vessel surface at each of the marked locations. The loops will be formed by passing the mineral-insulated cable around the studs and then affixing the portions of the cable between the studs to the vessel by spot welding thin stainless steel tabs over the cable at several points. This work will be the responsibility of WBS3. The cooling tubes will be installed on a given vacuum vessel section after the saddle loops for one vacuum vessel section have been installed on that vessel section. This will be done as described above, with a minimum 1/16 inch gap between the cooling tubes and the vessel surface and heat-conductive epoxy used to fill this gap. WBS1 will be responsible for this work.

The leads from the sensors will be routed in groups to covered terminal blocks mounted on the vessel exterior at locations outside the cryostat, e. g., on the sides of the top and bottom ports 12a/12b. The terminal blocks will be sufficiently sturdy to protect the terminated cable ends from damage during machine assembly. Leads from the sensors in one field period will be split top/bottom and routed systematically from the sensors to the terminal blocks. The leads will be terminated in a way that protects the MI cable MgO insulator from moisture absorption and provides a robust connection to the terminal blocks. The work described in this paragraph will be the responsibility of WBS3.

### **Other Pertinent Information:**

Because the saddle loops will be inaccessible after completion of NCSX assembly, the reliability of the saddle loops shall be at the same level as the NCSX modular and conventional coils.