PIP-II AccU-BSTR -Dampers-CHG0

Interface Specification Document (ISD)

Document number: ED00xxxxx

Document Approval

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| Signatures Required | Date Approved |
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|  |  |
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| Approver: L2 Manager is typically the approver | Approved in TC |

Revision History

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| --- | --- | --- |
| Revision | Date of Release | Description of Change |
| - | 1-20-2021 | Initial Release. |
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# Purpose

Interface Specification Documents (ISDs) contain the information necessary to define all of the external interfaces for the given system. Interfaces are defined globally in the PIP-II Master Interface Control Document (MICD) which then reference the pertinent ISDs which contain the particular interface details. The ISD contains all the information or references to the information that is necessary to fully define and complete the given interface.

# Scope

This document describes the details of the interfaces for the **CHG0 Detector** of the **AccU – Booster-Damper Task**, 121.05.04.04.03 PIP-II Project. This activity, formerly an Accelerator Division AIP project to be completed prior to PIP-II, is managed coordinated, and implemented by AD Instrumentation Department personnel in conjunction with other AD personnel. All interfaces for this activity are external to the PIP-II project except for the L2 Accelerator Upgrade Project and the L3 manager for Booster Upgrades. This document will focus on the interfaces within Accelerator Division and between any other Fermi Divisions. Since the interfaces for this activity are external to the PIP-II project L3 Tasks, they aren’t included in the PIP-II MICD.

# Acronyms

|  |  |
| --- | --- |
|  |  |
| ISD | Interface Specification Document |
| MICD | Master Interface Control Document |
| L2M |  Level 2 Manager |
| L3M | Level 3 Manager |
| L5AM | Level 5 Activity Manager |
| PIP-II | Proton Improvement Plan II Project |
| PS | Proton Source |
| TRS | Technical Requirements Specification |
|  |  |

# CHG0 Roles and Responsibilities

The following is a description of the AD Department personnel and the required roles / personnel involved int eh Activity. Also includes are responsibilities and interface of those involved in the design, development, installation, and implementation of the Booster CHG0 detector system. This will be listed by Accelerator Division Department.

PIP-II L3 Manage

 David Johnson:

* interface between PIP-II L2 AccU Manager and the L5 Activity manager
* Provide monthly status reports to L2M/CAM
* support the L5AM
* Convene any reviews, provide any requested support

AD Instrumentation

 L5 Activity Manager (L5AM) - Electrical Engineer: Michelle Aisha Ibrahim

* Interface with L3M for support and activity status for monthly reports
* Main Point of Contact for Activity
* Interfaces with all personnel involved in activity
* Responsible for QC of detector/electronics

 Electrical Engineer 2: TBA

* Primary interface – L5AM
* Perform any electrical engineering tasks as directed by the L5 Activity manager

 Applications Development & Systems Analysist John Diamond

* Primary interface – L5 Activity manager
* Specify Electronics hardware as directed by L5AM
* etc

 Electrical Assembly Tech: : TBA

* Perform electronics assembly ad directed by L5AM od designee

AD Proton Source (PS)

 PS Department Head: C.Y. Tan

* Primary interface to L3M
* Specifies detector requirements and specifications in consultation of all stake holders
* Interfaces with PS Department personnel regarding questions on implementation

Deputy Dept. Head: Salah Chaurize

* Interface with L5AM and PS Dept. Head
* Provide gallery rack information for detector electronics
* Specify tunnel location for detector

Engineering Physicist: Kent Triplet

* Interface with L5AM regarding ultimate signal distribution requirements

AD EE Support

 Electrical Drafting: TBA

* Interface with L5AM
* Provide electrical/electronic drafting as requested by L5AM or designee

AD Mechanical Support

 Mechanical Engineer Proton Source: Rob Ridgeway

* Interface with L5AM and PS Department
* Primary interface with Mechanical Engineer doing Stand Design
* Interface with PS Deputy Head or designee on detector installation questions

 Mechanical Engineer: Beth Klein

* Interface with L5AM
* Interface with Proton Source Mechanical Engineer
* Design installation stand for detector
* Design vacuum connections for detector to Booster vacuum system
* Provide QC on stand/mounting components for detector as requested by L5AM or designee

 Mechanical Assembly Technician: TBA

* Interface with L5AM
* Interface with Mechanical Engineer
* Assembly of detector stand/mounting hardware
* Installation of mounting stand/mounting hardware/detector
* Etc.

 Vacuum Technician: Jason Kuklinski

* Interface with L5AM
* Interface with PS Deputy Head
* Responsible for letting up accelerator beam tube vacuum, leak checking the detector after installation
* Responsible for re-establishing accelerator beam tube vacuum

AD Controls

 Information Technology: TBA

* Interface with L5AM
* Interface with PS Deputy Head
* Write and test interrupt handler
* etc

AD Headquarters

 Installation Coordinator: Cons Gattuso – Interface with L5 manager

* Interface with L5AM
* Interface with PS Deputy Head
* Coordinate the installation of the detector during the 2022 Summer shutdown

 T&M Coordinator: Jim Ranson – Interface with L5 Manager

* Interface with L5AM
* Interface with PS Deputy Head
* Provide and support for T&M electricians to install cables specified by L5AM

PPD Metrology Department

 Proton Source Alignment Coordinator: O’Sheg Babatunde

* Interface with L5AM
* Interface with PS Deputy Head for tunnel scheduling
* Provide and support, and supervise alignment crews for component fiducialization and tunnel alignment

AD Controls

 Information Technology: TBA

* Interface with L5 Manager
* Review digitizer specifications
* Write timing and clock/gate specifications for interrupts

# CHG0 Detector Interfaces

##  Most of the effort will be implemented by Instrumentation Group however, any task or activity that requires interface with another Group any specifications, requirements, wiring diagrams, circuit diagrams, or necessary procedures will transmitted from the L5AM to the appropriate groups. See the following for interface examples.

## Mechanical Support Stand

The CHG0 will be supported by a mechanical support stand designed by AD Mech Support. A specification and interface drawing (provided from the CHG0 vendor) will be provided to Mechanical Support to drive their design, which aims to improve noise immunity and accuracy. The fixture mechanically supports, electrically isolates, provides a robust connection for the calibration windings and output signals, and protects the sensor.

## Beamline Connection

Flange connection and CHG0 flange to flange length will be provided to the Booster Group via drawings.

Coordination with vacuum and alignment crews will further ensure proper installation and beamline readiness. If the vacuum chamber requires a bake-out, the sensor must not be heated beyond 80degC.

## Signal Interfaces

The drive, sense, calibration, and output signals for the Bergoz NPCT unit are all bundled within a pre-terminated cable, which is provided by the manufacturer. This cable will be the main connection between the pickup in the tunnel and the electronics in the gallery.

The electronics in the gallery require the typical building infrastructure such as AC power, grounding, and dressing of the racks. The electronics will include the manufacturer-provided electronics chassis, in-house transition board, and a front end. The front end to the Booster NPCT system will require

* control signal infrastructure such as encoded clock signal (TCLK) and/or event-based TTL signals (e.g. CAMAC timing cards) to be directed by L5AM and implemented by Instrumentation Group, probably John Diamond.
* network infrastructure to provide Ethernet connections to the control system. This is typically a simple request to Controls (Steve Colon and crew)
* reference to the Booster LLRF Sweep to be coordinated between PS LLRF Group and L5AM

## Controls Interfaces

The Booster NPCT system will provide current measurement readouts, with functionalities similar to B:CHG0, in order to ensure efficient operation of the Booster. In addition, the system will provide analog monitor points, which are can be further distributed to secondary systems as needed. Specifications and requirements will be transmitted to personnel in Instrumentation Group or Controls.

## Detector Alignment

Component Fiducialization and alignment specifications will be documented and transmitted from the L4AM to Proton Source Alignment Interface.

# Reference Documents

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| --- | --- | --- |
| **#** | **Reference** | **Document #** |
| 1 | PIP-II Master Interface Control Document | ED0010433 |
| 2 |  | ED00xxxxx |
| 3 |  | ED00xxxxx |
| 4 |  | ED00xxxxx |
| 5 |  | ED00xxxxx |