Science Instruments to



Facility Handling Equipment

Interface Control Document

ICD 1.9/2.7

|  |  |
| --- | --- |
| Approval required by: | |
| **Steve Hardash** | GN Head of Engineering Ops |
| **Michiel Van Der Hoeven** | GS Head of Engineering Ops |

Issued By: Systems Engineering Group

Version Control

| REVISION CHART | | | |
| --- | --- | --- | --- |
| Version | Author(s) | Description of Version | Date Completed |
| A | D. Montgomery | Initial Version | April 15, 1997 |
| B | D. Montgomery | Drawings and descriptions changed to reflect ‘as built’ handling equipment. Procedures updated to reflect experience with using the equipment on site circa. Sept-Dec. 1998. | November 5, 1998 |
| C | D. Montgomery | Operation and service manuals for handling equipment added to the ‘related documents’ list. Procedures updated to reflect experience with using the equipment on CP site. Installation procedures for wrap/rotator/ISS removed and referenced to  Manuals for same. | March 8, 2000 |
| D | Pablo Diaz | Updated formatting for a better handling of the texts | May 23, 2012 |
| E | M. Close | (1) Moved to new ICD template  (2) Removed non-interface details including procedures  (2) Added derived requirements, to be referenced by instrument builders | April 27, 2016  CR-16 2517 |

Table of Contents

Version Control 2

Table of Contents 3

Index of Figures 4

1 Description 5

1.1 Acronyms and Abbreviations 5

2 References 5

3 Summary of Equipment 6

4 Gantry Cranes 6

4.1 Mechanical Interface 6

4.1.1 Hoists 6

4.1.2 Rigging Equipment for Instruments 6

5 Air Bearing Pallet or Air Pallet 8

5.1 Mechanical Interface 8

6 Instrument Cart 9

6.1 Mechanical Interface 9

7 Cassegrain Instrument Platform Lift (IPL). 10

7.1 Mechanical Interface 10

Appendix A: Handling Equipment Interface Requirements 11

HEQ.1 Gantry Crane 11

HEQ.1.1 Unobstructed lifting points 11

HEQ.2 Air Bearing Pallet 11

HEQ.2.1 Compliance with air bearing pallet interface 11

HEQ.2.2 Instrument orientation for air bearing pallet interface 11

Index of Figures

Figure 1. Gantry cranes 7

Figure 2. Examples of rigging equipment for gantry crane 8

Figure 3. Instrument cart 9

Figure 4. IPL and auxiliary lift. 10

1. Description

This document defines the interfaces between science instruments and the facility handling equipment. Facility handling equipment is used in relation to science instruments for the following activities:

* Transporting instrument between locations within the summit facility
* Installation (mounting) of instrument on ISS
* Removal (dismounting) of instrument from ISS
* Servicing of dismounted instrument

Detailed handling procedures can be found in operations or service manuals for each instrument.

Note that this document is not intended to cover handling equipment interfaces with facility instruments (A&G, GCAL) or Cassegrain subsystems. Those interfaces are documented in G0015.

* 1. Acronyms and Abbreviations

AP Air Bearing Pallet or Air Pallet (refers to same thing)

GN Gemini North

GS Gemini South

IPL Instrument Platform Lift

ISS Instrument Support Structure

1. References

|  |  |  |
| --- | --- | --- |
| Drawing Number | Drawing Name | Description |
| [89-GP-1000-6001](http://dmt.gemini.edu/docushare/dsweb/View/Collection-69297)  2 sheets | Cassegrain handling layout | Layout of instrument platform lift and air pallet in relation to the Cassegrain when deployed for a side looking instrument. |
| [89-GP-1000-6003](http://dmt.gemini.edu/docushare/dsweb/View/Collection-69297)  2 sheets | Instrument handling on the observing floor | Deployment of the platform lift on the observing floor and telescope. |
| [89-GP-1000-6100](http://dmt.gemini.edu/docushare/dsweb/Get/Document-375037/89-GP-1000-6100%20Air%20Pallet%20Layout.pdf) | Air pallet layout | Conceptual layout for the air pallet. |
| [89-GP-1000-6106](http://dmt.gemini.edu/docushare/dsweb/Get/Document-389288/89-GP-1000-6106%20Instrument%20Interface%20Pad.pdf) | Instrument interface pad | Conceptual layout for the interface pad |
| [89-GP-1000-6122](http://dmt.gemini.edu/docushare/dsweb/Get/Document-375040/89-GP-1000-6122%20Instrument%20Pad%20Interface.pdf) | Instrument pad interface | Conceptual layout for the pad interface. |
| [89-GP-1000-6200](http://dmt.gemini.edu/docushare/dsweb/Get/Document-375036/89-GP-1000-6200%20Gantry%20Crane%20Layout.pdf) | Fixed gantry crane layout | Conceptual layout for the crane. |
| [89-GP-1000-6201](http://dmt.gemini.edu/docushare/dsweb/Get/Document-375035/89-GP-1000-6201%20Lifting%20Plate.pdf) | Lifting plate | One hook arrangement design. |
| [89-GP-1000-6250](http://dmt.gemini.edu/docushare/dsweb/Get/Document-375034/89-GP-1000-6250%20Mobile%20Gantry%20Crane%20Layout.pdf) | Mobile gantry crane layout | Conceptual layout for the crane. |
| [89-GP-1000-6300](http://dmt.gemini.edu/docushare/dsweb/Get/Document-375032/89-GP-1000-6300%20Instrument%20Platform%20Lift.pdf) | Instrument platform lift layout | Conceptual layout for the IPL. |
| [89-GP-1000-6310](http://dmt.gemini.edu/docushare/dsweb/Get/Document-375033/89-GP-1000-6310%20Instrument%20Platform%20Lift.pdf) | Instrument platform lift layout | Fabrication submittal layout for the IPL. |

1. Summary of Equipment

The following facility handling equipment is available in the summit facilities at both sites, except where stated otherwise.

**Gantry cranes**

* **Overhead gantry crane** is located in the Dome. It may be used to lift and move heavy subassemblies from the instrument; to lift and move instruments to/from the instrument platform lift (IPL), and to lift and move instruments to/from the air bearing pallet (AP).
* **Mobile or air bearing gantry crane** is located in the instrument lab. It may be used to lift and move heavy subassemblies from the instrument; and to lift and move instruments to/from the AP or instrument handling cart.
* **Hand-operated gantry crane** is located at Gemini South only and is used to handle various loads.

**Air bearing pallet or air pallet (AP)** may be used to hold dismounted instruments; to transport instrument around the facility; while mounting instruments to the bottom port; and while mounting instruments to a side port in conjunction with the IPL.

**Instrument carts** may also be used to hold dismounted instruments or to transport instrument around the facility.

**Instrument platform lift (IPL)** may be used while mounting instruments to a side port in conjunction with the AP.

**Pallet jacks** may be used with metal pallets to move subassemblies. There are both manual and motorized versions.

1. Gantry Cranes
   1. Mechanical Interface
      1. Hoists

* Overhead gantry crane has two cable hoists, one 5 tons and the other 50 tons.
* Mobile or air bearing gantry crane has two chain hoists with independent trolleys and a total lifting capacity of 5 tons.
* Hand-operated gantry crane has total lifting capacity of 2 tons.
  + 1. Rigging Equipment for Instruments

A variety of rigging equipment and approaches are in use. Early in the design phase, instrument builders should interact with Gemini mechanical engineers to agree on the approach.

* **Spreader bar**
* **Sling**
* **Custom lifting plate** (such as interfacing to instrument pintel)
* **Clevis** (such as interfacing to instrument A bracket)
* **Foundry hook** (such as interfacing to instrument pintel)

The area around the instrument lifting point shall be free of obstructions, to allow freedom of movement during lifting[[1]](#footnote-1).

|  |  |
| --- | --- |
| Macintosh HD:Users:mclose:Desktop:overhead crane.jpg | Macintosh HD:Users:mclose:Desktop:lab crane.jpg |
| Overhead gantry crane in dome | Mobile gantry crane in lab |

Figure . Gantry cranes

|  |  |
| --- | --- |
| Macintosh HD:Users:mclose:Desktop:spreader bar.jpg | |
| Spreader bar and other rigging equipment in cart | |
| **Macintosh HD:Users:mclose:Desktop:hook.jpg** | Macintosh HD:Users:mclose:Desktop:DESKTOP:instrument cart.jpg |
| Custom lifting plate | Pintel |

Figure . Examples of rigging equipment for gantry crane

1. Air Bearing Pallet or Air Pallet

These devices are mobile hand propelled air bearing platforms on which the instruments can be maneuvered within the observatory or positioned during assembly. The air pallets combine a fine motion hydraulic lift with manual XY motion and rotation in Z required to align the instrument interfaces during mounting. They consist of an extruded aluminum pallet that supports an air over hydraulic scissor lift platform. Four air bearing pads are used to provide manual mobility.

* 1. Mechanical Interface

The AP to instrument interface is a flat surface with four locating bosses 100mm diameter and 15mm high. The bosses have a central hole 70mm in diameter and are made from UHMWP (polyethylene). They are arranged in a square pattern 1200mm per side and the center of the pattern should lie on the design CofG of the instrument.[[2]](#footnote-2) The instrument side of the interface shall be provided in each orientation.[[3]](#footnote-3) The orientation of the instrument on the AP or cart depends on factors such as whether the instrument is being installed on, or removed from, a side or bottom port; and whether the instrument is being transported and what the dimensions are for the elevator or platform lift, corridors and doorways. If possible, the instrument mounting feet should be height adjustable to facilitate instrument installation and removal.

1. Instrument Cart

These devices are mobile hand propelled carts on which the instruments can be stored or maneuvered within the observatory.

* 1. Mechanical Interface

The cart to instrument interface is similar to the AP to instrument interface, with the same spacing and locating dimensions but lacking the padding around the locating bosses.

|  |  |
| --- | --- |
| Macintosh HD:Users:mclose:Desktop:handling cart 2.jpg | Macintosh HD:Users:mclose:Desktop:handling cart 3.jpg |
| Macintosh HD:Users:mclose:Desktop:handling cart.jpg | |

Figure . Instrument cart

1. Cassegrain Instrument Platform Lift (IPL).

The IPL provides a platform onto which the instrument and service personnel can be offered up to the side looking ports of the ISS. The instrument will be mounted on the AP during these operations. An auxiliary lift is provided for access of equipment and personnel to the raised platform.

* 1. Mechanical Interface

There is no direct instrument to IPL interface.



Figure . IPL and auxiliary lift.

Appendix A: Handling Equipment Interface Requirements

The Instrument as it is referred to below, shall include the set of components and ancillary equipment necessary to mount and operate the instrument on the ISS. This includes subsystems, enclosures, frames, weights, coolant, connectors, cabling, etc.

## Gantry Crane

### Unobstructed lifting points

The area around instrument lifting points shall be free of obstructions, to allow freedom of movement during lifting

## Air Bearing Pallet

### Compliance with air bearing pallet interface

The instrument shall comply with the air bearing pallet interface of four locating bosses.

### Instrument orientation for air bearing pallet interface

The instrument shall comply with the air bearing pallet interface in both orientations for mounting on side port and mounting on bottom port.

1. REQ HEQ.1.1 [↑](#footnote-ref-1)
2. REQ HEQ.2.1 [↑](#footnote-ref-2)
3. REQ HEQ.2.2 [↑](#footnote-ref-3)