INTERFACE CONTROL DOCUMENT (ICD)	Doc. No. SP-391-001-22 R0	LUSI SUB-SYSTEM XPP

XES PCDS to LUSI XPP Instrument ICD

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Revision	Date	Description of Changes	Approved
R0	24Jul08	Initial release	

DCR

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1. Applicable Documents

PRD# SP-391-000-33	Physics Requirements for the XPP Instrument
PRD# SP-391-000-03	LUSI Controls and Data System
PRD# SP-391-000-13	XPP Diffractometer System
PRD# SP-391-000-18	XPP Laser System
SOW# PS-391-000-86	XPP Robot Characterization
PRD# SP-391-000-97	XPP 2-D Detector
ESD# SP-391-001-19	LUSI Common Instruments Controls
ESD# SP-391-001-21	XPP Controls ESD
ESD# SP-391-001-23	XPP DAQ ESD

2. Introduction

This document defines the interface between the XPP Experiment instrument and the XES Photon Controls and Data Systems. Input for this document comes from the XPP Controls Engineering Specification Document (Controls ESD) and the XPP Data Acquisition Engineering Specification Document (DAQ ESD).

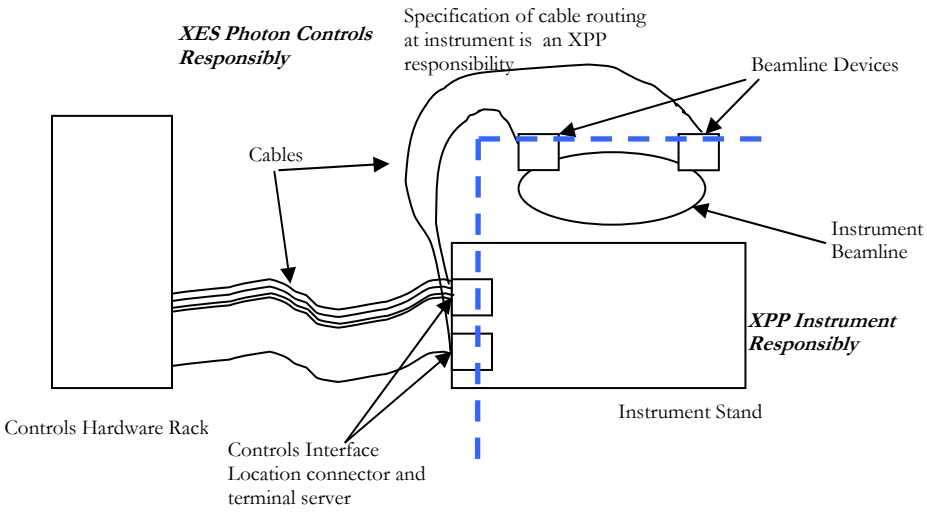
2.1. *Scope*

This document establishes the areas of responsibility for XPP Instrument and XES Photon Controls and defines the interface components. This includes all components for Vacuum, Motion, Vision, DAQ, and Power as well as interfaces to other services including MPS, networking, and timing systems.

2.2. *Areas of responsibility*

In general, the XPP Instrument is responsible for the acquisition and installation of all beam line devices for vacuum, pressure monitoring, motion, vision, specifying the cable routing from the Controls Interface Location connector to the beam line devices. The Controls/Data Acquisition Group is responsible for the Controls Interface Location connector, all cabling from the Controls Interface Location connector to the controlling hardware (rack based), and is responsible for the acquisition and installation of all controls hardware. Controls is also responsible for the procurement and installation of cables from the Interface connector to the beamline devices. For certain components, due to their complexity, the XPP instrument will be responsible for the cabling to the fixed Controls Interface Location connector – eg. the Diffractometer.

Figure 2.2.1 Conceptual layout showing areas of responsibility and interface points



2.3. *Controls Interface Location Connector*

The Controls Interface Location connector is a connection point between the Controls/Data Acquisition cabling and the device. This multipurpose connection point (e.g. DIN-rail) is generally located on the experiment stand containing the devices being controlled and read out. In special situations, the Controls Interface Location may be at the particular device itself (e.g. HV power for Ion pumps). For serial controls, the Controls Interface Location connector is an Ethernet connected terminal server located on the instrument stand.

3. XPP Instrument packages

3.1. *Optics Table in Hutch 2*

This instrument package contains the following items from upstream to downstream on the instrument stand (vacuum components discussed in Vacuum Section):

LUSI Coarse Guard Slit System
LUSI In-Situ Intensity-Position Monitor
LUSI Pop-in Profile Monitor with high resolution option.

Summary of EPICS control elements:

EPICS Control Group	Device	Model Number	Quantity	Interface Type
Motion	Stepper Motor	Mdrive Plus (smart motor)	9	Serial/ combined with power supply in custom chassis
Power	Power supply for Intensity-Position Monitor Front End Electronics	12 Volt supply	1	NA
Power	Power supply for the stepper motors	SLAC custom built	1	Combined with Serial control interface in custom chassis
Power	Camera	12 Volt supply	1	NA
Vision	Camera	Pulnix TM-6710CL or Imperx IPX-VGA210	1	CameraLink
DAQ	Camera	CameraLink	1	120Hz DAQ Readout
DAQ	Intensity-Position Monitor	SLAC built	1	Serial

3.2. *Optics & Diagnostics Table in Hutch 3*

This instrument package contains the following items from upstream to downstream on the instrument stand (vacuum components discussed in Vacuum Section):

LUSI In-Situ Intensity Postion Monitor
LUSI Precise Primary Slit System
LUSI X-Ray Focusing Lens System with Z motion
LUSI Attenuator System
LUSI Pop-in Intensity Monitor
LUSI Pulse Picker
LUSI Harmonic Rejection Mirrors
LUSI Precise Mono Slit System
LUSI In-Situ Intensity-Position Monitor
LUSI Pop-in Profile Monitor with high resolution option
XPP Diffractometer and Wide Angle Detector Mover

Summary of EPICS control elements:

EPICS Control Group	Device	Model Number	Quantity	Interface Type
Motion	Stepper Motor	Mdrive Plus (smart motor)	28+16 active motors on Diffractometer	Serial/ combined with power supply in custom chassis
Motion	Pneumatic positioners	SLAC Solenoid Controller SD-385-001	2	Digital IO to IP digital IO boards on VME cpu
Motion	Detector Mover	Robotic controller	1	Enet
Power	Power supply for the stepper motors	SLAC custom built	3	Combined with Serial control interface in custom chassis
Power	Power supply for Intensity-Position Monitor Front End Electronics	12 Volt supply	3	NA
Power	Camera	12 Volt supply	1	NA
Vision	Camera	Pulnix TM-6710CL or Imperx IPX-VGA210	1	CameraLink
DAQ	Camera	CameraLink	1	30 Hz DAQ Readout
DAQ	Intensity Monitor	SLAC built	1	Serial

DAQ	Intensity-Position Monitor	SLAC built	2	Serial
DAQ	2-D Detector readout	SLAC Built	1	Enet/Timing Fiber

3.3. *Diagnostics Table in Hutch 3*

This instrument package contains the following items from upstream to downstream on the instrument stand (vacuum components discussed in Vacuum Section):

LUSI Pop-in Intensity Monitor
LUSI Pop-in Profile Monitor with high resolution option

Summary of EPICS control elements:

EPICS Control Group	Device	Model Number	Quantity	Interface Type
Motion	Stepper Motor	Mdrive Plus (smart motor)	3	Serial/ combined with power supply in custom chassis
Power	Power supply for Intensity Monitor Front End Electronics	12 Volt supply	1	NA
Power	Power supply for the stepper motors	SLAC custom built	1	Combined with Serial control interface in custom chassis
Power	Camera	12 Volt supply	1	NA
Vision	Camera	Pulnix TM-6710CL or Imperx IPX-VGA210	1	CameraLink
DAQ	Camera	CameraLink	1	30Hz DAQ Readout
DAQ	Intensity Monitor	SLAC built	1	Serial

3.4. *XPP Vacuum System*

The XPP instrument will have its own vacuum system controlled by a PLC based system located in Hutch 3. This system will control all valves, pumps, and gauges associated with the XPP

instrument components located in Hutch 2 and Hutch3. This system interfaces to the XTOD Vacuum System to coordinate control with installed XTOD components.

EPICS control system will allow the user to select system to view summary status of components and to select individual components for detailed control.

Component	Device	Model Number	Quantity	Interface Type
NEH Hutch 2 Vacuum	Gate Valve	VAT Series 108 (pneumatic controller)	2	PLC controlled
	Ion Pumps	Gamma Vacuum TiTan100L with Digitel MPS Controller	1 pumps, 1 controllers	Serial
	Cold Cathode Gauges and TBD Pirani Gauges	MKS with MKS 937A Gauge Controller	1	Serial
NEH Hutch 3	Gate Valve	VAT Series 108 (pneumatic controller)	6	PLC controlled
	Ion Pumps	Gamma Vacuum TiTan100L with Digitel MPS Controller	3 pumps, 2 controllers	Serial
	Cold Cathode Gauges and TBD Pirani Gauges	MKS with MKS 937A Gauge Controller	3	Serial

4. Other Systems

4.1. XTOD Vacuum System

An interface exists between the XPP Instrument vacuum system and the XTOD vacuum system in NEH Hutch 3 and the XRT. The XTOD vacuum system controller needs a VAC OK/VAC NOT OK signal from the XPP Instrument Vacuum system. This will be provided by using the vacuum trip output from the appropriate pressure gauges on various XPP instrument stands. Controls will implement a repeater relay on the Controls Interface Location connector at these stands to route this signal to the XTOD vacuum system controller.

4.2. Machine Protection System

A VALVE NOT OUT signal will be provided to the Machine Protection System for each gate valve on the XPP beam line. This signal, taken from the Valve Out position indicator on the gate valve will be routed to the MPS system via the Controls Interface Location connector on the instrument stand, Controls to implement. Controls will implement this signal.

4.3. AC Power

AC Power will be proved at each instrument stand location. Two 30 Amp circuits with Quad distribution boxes will be provided at the location of each instrument stand as listed in section 3 above. Each PCDS rack will be equipment with two separate 3 phase, 208VAC, 30 Amp circuits.

4.4. Machine Timing

Several devices require precise triggering with respect to the FEL pulse. As noted in the tables above, this timing comes from the Controls system via equipment (EVRs) in the support racks.