

<i>Safety Systems Section</i>	Hutch Protection System (HPS) Stopper Acceptance				
	DCO No. 0042	Released By: Reference Only	Effective Date 07 Apr 09	Document No. CD-SS-PPS-06-12-03	Rev. 02

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Hutch Protection System (HPS) Stopper Acceptance

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1.0 Introduction

1.1 Purpose

To verify the correct operation of the PPS interface to the LCLS Hutch Protection System (HPS) Stoppers depicted in SLAC drawing ID-380-765-01. Proper operation is to be confirmed prior to installation in the beamline.

1.2 Scope

This procedure verifies proper implementation of stopper control and in/out position readback for both chains. In addition, Burn-Through Monitor (BTM) pressure switches are adjusted, and proper operation of the BTM system is verified.

2.0 Applicability

- 2.1.1 The Controls Department, Personnel Protection Systems (PPS) Group is responsible for the completion of the certification. Only qualified personnel trained by this Group are permitted to perform these tests.

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Initial Items Verified

<p>3.0 Prerequisite Actions</p> <p>3.1 One person is required to execute this procedure:</p> <ul style="list-style-type: none"> • One at the HPS Stopper Assembly <p>3.2 Necessary equipment:</p> <p>3.3 PPS Stopper Test Box</p> <p>3.4 Flat head screwdriver</p> <p>3.5 DC voltmeter</p> <p>3.6 Stopper/BTM adaptor (12 pin male trim trio chassis connector with an 8 pin female trim trio connector).</p>	
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4.0 LCLS Hutch Protection System Stopper Acceptance Test

4.1 Initial Set-up

4.1.1 Connect house air to the stopper assembly.

Note: All connections should be leak tight. All pressure measurements should be steady with the valves closed indicating no air leaks.

4.1.2 Set the input pressure regulator so that its output is 30 psi.

4.1.3 Note the Stopper ID for the stopper assembly to be tested in Column [A] of Table 1 and Table 2.

4.2 Upstream Stopper Control and Status Checks

4.2.1 Connect the Stopper Test Box to the electrical connector of the stopper assembly for the upstream stopper (J5). Both OUT COMMAND toggle switches should be in the IN position.

4.2.2 Confirm upstream stopper 'in' status and complete the following steps, initialing to indicate successful completion in Table 1 in the specified column:

- a. Both Chain A and Chain B OUT COMMAND LEDs are not lit on the test box.
- b. The upstream stopper is physically fully inserted.
- c. Both Chain A and Chain B IN LEDs are lit on the test box.
- d. Both Chain A and Chain B OUT LEDs are not lit on the test box.
- e. Initial in Column [B] in the UPSTREAM row of Table 1.

4.2.3 Switch both Chain A and Chain B OUT COMMAND toggle switches on the test box. Confirm upstream stopper 'out' status with the following:

- a. Both Chain A and Chain B OUT COMMAND LEDs are lit on the test box.

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- b. The upstream stopper is physically fully extracted.
- c. Both Chain A and Chain B IN LEDs are not lit on the test box.
- d. Both Chain A and Chain B OUT LEDs are lit on the test box.
- e. Initial in Column [C] in the UPSTREAM row of Table 1.

4.2.4 Remove the Chain A OUT COMMAND with the toggle switch on the test box. Confirm upstream stopper 'in' status with the following:

- a. The Chain A OUT COMMAND LED is not lit on the test box.
- b. The Chain B OUT COMMAND LED is lit on the test box.
- c. The upstream stopper is physically fully inserted.
- d. Both Chain A and Chain B IN LEDs are lit on the test box.
- e. Both Chain A and Chain B OUT LEDs are not lit on the test box.
- f. Initial in Column [D] in the UPSTREAM row of Table 1.

4.2.5 Switch both Chain A and Chain B OUT COMMAND toggle switches on the test box. Confirm upstream stopper 'out' status with the following:

- a. Both Chain A and Chain B OUT COMMAND LEDs are lit on the test box.
- b. The upstream stopper is physically fully extracted.
- c. Both Chain A and Chain B IN LEDs are not lit on the test box.
- d. Both Chain A and Chain B OUT LEDs are lit on the test box.
- e. Initial in Column [E] in the UPSTREAM row of Table 1.

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4.2.6 Remove the Chain B OUT COMMAND with the toggle switch on the test box. Confirm upstream stopper 'in' status with the following:

- a. The Chain A OUT COMMAND LED is lit on the test box.
- b. The Chain B OUT COMMAND LED is not lit on the test box.
- c. The upstream stopper is physically fully inserted.
- d. Both Chain A and Chain B IN LEDs are lit on the test box.
- e. Both Chain A and Chain B OUT LEDs are not lit on the test box.
- f. Initial in Column [F] in the UPSTREAM row of Table 1.

4.2.7 Remove both OUT COMMANDs with the toggle switches on the test box and disconnect the Stopper Test Box from the stopper assembly.

4.3 Downstream Stopper Control and Status Checks

4.3.1 Connect the Stopper Test Box to the electrical connector of the stopper assembly for the downstream stopper (J11). Both OUT COMMAND toggle switches should be in the IN position.

4.3.2 Confirm downstream stopper 'in' status and complete the following steps, initialing to indicate successful completion in Table 1 in the specified column:

- a. Both Chain A and Chain B OUT COMMAND LEDs are not lit on the test box.
- b. The downstream stopper is physically fully inserted.
- c. Both Chain A and Chain B IN LEDs are lit on the test box.
- d. Both Chain A and Chain B OUT LEDs are not lit on the test box.
- e. Initial in Column [B] in the DOWNSTREAM row of Table 1.

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4.3.3 Switch both Chain A and Chain B OUT COMMAND toggle switches on the test box. Confirm upstream stopper 'out' status with the following:

- a. Both Chain A and Chain B OUT COMMAND LEDs are lit on the test box.
- b. The downstream stopper is physically fully extracted.
- c. Both Chain A and Chain B IN LEDs are not lit on the test box.
- d. Both Chain A and Chain B OUT LEDs are lit on the test box.
- e. Initial in Column [C] in the DOWNSTREAM row of Table 1.

4.3.4 Switch the Chain A OUT COMMAND toggle switch on the test box. Confirm downstream stopper 'in' status with the following:

- a. The Chain A OUT COMMAND LED is not lit on the test box.
- b. The Chain B OUT COMMAND LED is lit on the test box.
- c. The downstream stopper is physically fully inserted.
- d. Both Chain A and Chain B IN LEDs are lit on the test box.
- e. Both Chain A and Chain B OUT LEDs are not lit on the test box.
- f. Initial in Column [D] in the DOWNSTREAM row of Table 1.

4.3.5 Switch both Chain A and Chain B OUT COMMAND toggle switches on the test box. Confirm upstream stopper 'out' status with the following:

- a. Both Chain A and Chain B OUT COMMAND LEDs are lit on the test box.
- b. The downstream stopper is physically fully extracted.
- c. Both Chain A and Chain B IN LEDs are not lit on the test box.
- d. Both Chain A and Chain B OUT LEDs are lit on the test box.

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- e. Initial in Column [E] in the DOWNSTREAM row of Table 1.
- 4.3.6 Remove the Chain B OUT COMMAND with the toggle switch on the test box. Confirm upstream stopper 'in' status with the following:
- a. The Chain A OUT COMMAND LED is lit on the test box.
 - b. The Chain B OUT COMMAND LED is not lit on the test box.
 - c. The downstream stopper is physically fully inserted.
 - d. Both Chain A and Chain B IN LEDs are lit on the test box.
 - e. Both Chain A and Chain B OUT LEDs are not lit on the test box.
 - f. Initial in Column [F] in the DOWNSTREAM row of Table 1.
- 4.3.7 Remove both OUT COMMANDs with the toggle switches on the test box and disconnect the Stopper Test Box from the stopper assembly.
- 4.4 Upstream Stopper BTM Adjustments and Checks
- 4.4.1 Connect the Stopper Test Box to the electrical connector of the stopper assembly for the upstream stopper (J4) utilizing the Stopper/BTM Adaptor. Both OUT COMMAND toggle switches should be in the IN position.
- 4.4.2 Confirm and perform the following steps, initialing to indicate successful completion in Table 2 in the specified column:
- a. Both Chain A and Chain B OUT COMMAND LEDs are not lit on the test box.
 - b. The transducer reads ~0.0 Volts.
 - c. Adjust the flow of the fill and vent valves to fully closed (CW) and then back them off by a quarter turn so they have a very low flow rate when opened.
 - d. Initial in Column [B] in the UPSTREAM row of Table 2.

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- 4.4.3 Fill the BTM by switching the Chain A OUT COMMAND toggle switch on the test box to OUT and verify the following:
- a. The Chain A OUT COMMAND LED is lit on the test box,
 - b. Measure the voltage across the pressure transducer outputs, which should measure 3.0 Volts \pm 10%. Record the voltages in Column [C] in the UPSTEAM row of Table 2.
- 4.4.4 Remove the Chain A OUT COMMAND with the toggle switch on the test box. Pressure should remain steady with the transducer measuring 3.0 Volts \pm 10%.
- 4.4.5 Partially vent the BTM by switching the Chain B OUT COMMAND toggle switch on the test box to OUT until a pressure of 10 psi is indicated by a measurement of 2Volts \pm 10% across the pressure transducer output. Toggle the Chain B OUT COMMAND back to the IN position and perform the following:
- a. Adjust the two pressure switch trip points so that the normally open contacts are just barely tripped, as indicated by the Chain A and Chain B OUT LEDs.
 - b. Record the trip point voltage in Column [D] in the UPSTEAM row of Table 2.
- 4.4.6 Fill the BTM again by switching the Chain A OUT COMMAND toggle switch on the test box to OUT and verify the following:
- a. Both Chain A and Chain B OUT LEDs are lit on the test box,
 - b. Confirm that the pressure transducer outputs again measure 3.0 Volts \pm 10%.
 - c. Initial in Column [E] in the UPSTEAM row of Table 1.
- 4.4.7 Fully vent the BTM by by switching the Chain B OUT COMMAND toggle switch on the test box to OUT and verify the following:
- a. Both the Chain A and Chain B OUT LEDs on the test box become not lit at about 10 psi, indicated by a measurement of 2.0 Volts \pm 10%.
 - b. The BTM fully vents to 0 psi, indicated by a measurement of ~0.0 Volts.

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<p>c. Initial in Column [F] in the UPSTREAM row of Table 2.</p> <p>4.4.8 Disconnect the Stopper Test Box from the stopper assembly.</p> <p>4.5 Downstream Stopper BTM Adjustments and Checks</p> <p>4.5.1 Connect the Stopper Test Box to the electrical connector of the stopper assembly for the upstream stopper (J12) utilizing the Stopper/BTM Adaptor. Both OUT COMMAND toggle switches should be in the IN position.</p> <p>4.5.2 Confirm and perform the following steps, initialing to indicate successful completion in Table 2 in the specified column:</p> <p style="padding-left: 20px;">a. Both Chain A and Chain B OUT COMMAND LEDs are not lit on the test box.</p> <p style="padding-left: 20px;">b. The transducer reads ~0.0 Volts.</p> <p style="padding-left: 20px;">c. Adjust the flow of the fill and vent valves to fully closed (CW) and then back them off by a quarter turn so they have a very low flow rate when opened.</p> <p style="padding-left: 20px;">d. Initial in Column [B] in the DOWNSTREAM row of Table 2.</p> <p>4.5.3 Fill the BTM by switching the Chain A OUT COMMAND toggle switch on the test box to OUT and verify the following:</p> <p style="padding-left: 20px;">a. The Chain A OUT COMMAND LED is lit on the test box.</p> <p style="padding-left: 20px;">b. Measure the voltage across the pressure transducer outputs, which should measure 3.0 Volts \pm 10%. Record the voltages in Column [C] in the DOWNSTREAM row of Table 2.</p> <p>4.5.4 Remove the Chain A OUT COMMAND with the toggle switch on the test box. Pressure should remain steady with the transducer measuring 3.0 Volts \pm 10%.</p> <p>4.5.5 Partially vent the BTM by switching the Chain B OUT COMMAND toggle switch on the test box to OUT until a pressure of 10 psi is indicated by a measurement of 2Volts \pm 10% across the pressure transducer output. Toggle the Chain B OUT COMMAND back to the IN position and perform the following:</p>

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<p>a. Adjust the two pressure switch trip points so that the normally open contacts are just barely tripped.</p> <p>b. Record the trip point voltage in Column [D] in the DOWNSTREAM row of Table 2.</p> <p>4.5.6 Fill the BTM again by switching the Chain A OUT COMMAND toggle switch on the test box to OUT and verify the following:</p> <p>a. Both Chain A and Chain B OUT LEDs are lit on the test box,</p> <p>b. Confirm that the pressure transducer outputs again measure 3.0 Volts \pm 10%.</p> <p>c. Initial in Column [E] in the DOWNSTREAM row of Table 1.</p> <p>4.5.7 Fully vent the BTM by switching the Chain B OUT COMMAND toggle switch on the test box to OUT and verify the following:</p> <p>a. Both the Chain A and Chain B OUT LEDs on the test box become not lit at about 10 psi, indicated by a measurement of 2.0 Volts \pm 10%.</p> <p>b. The BTM fully vents to 0 psi, indicated by a measurement of ~0.0 Volts.</p> <p>c. Initial in Column [F] in the DOWNSTREAM row of Table 2.</p> <p>4.5.8 Disconnect the Stopper Test Box from the stopper assembly.</p> <p>4.5.9 Disconnect house air from the stopper assembly.</p> <p>4.6 Repeat this procedure (Section 4) as necessary to test multiple stopper assemblies.</p>
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Table 1						
[A] Stopper Assembly Tracking ID	Stopper Under Test	[B] Confirm stopper IN status with neither OUT Command.	[C] Remove stopper, verify OUT status.	[D] Release Chain A OUT Command, verify the stoppers goes IN.	[E] Remove stopper, verify OUT status.	[F] Release Chain B OUT Command, verify the stoppers goes IN.
	UPSTREAM J5 Connector					
	DOWNSTREAM J11 Connector					
	UPSTREAM J5 Connector					
	DOWNSTREAM J11 Connector					
	UPSTREAM J5 Connector					
	DOWNSTREAM J11 Connector					
	UPSTREAM J5 Connector					
	DOWNSTREAM J11 Connector					

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Table 2						
[A] Stopper Assembly Tracking ID	BTM Under Test	[B] Valve vent/fill adjustment	[C] BTM full fill pressure voltage analog	[D] BTM trip pressure adjustment: voltage analog	[E] BTH full pressurization closes trip sensor contacts.	[F] BTM successfully vents fully and trip sensors register a fault
	UPSTREAM J4 Connector					
	DOWNSTREAM J12 Connector					
	UPSTREAM J4 Connector					
	DOWNSTREAM J12 Connector					
	UPSTREAM J4 Connector					
	DOWNSTREAM J12 Connector					
	UPSTREAM J4 Connector					
	DOWNSTREAM J12 Connector					

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5.0 Records and Reports

5.1.1 Test Performed By

Signature

Name and Title (Print)

Date/Time

5.1.2 Comments

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5.2	Test Review and Close-Out. Signature of this section indicates that this procedure has been reviewed for completeness and accuracy. Any outstanding hardware issues or procedural deviations should be noted in Tables 3 and 4, respectively. Minor typographical corrections do not constitute a procedural deviation.	
5.2.1	Lead PPS Engineer Test Approval	
Signature		
Name and Title (Print)		
Date		
5.2.2	Accelerator Division Safety Officer Test Approval	
Signature		
Name and Title (Print)		
Date		
5.2.3	Are there any Outstanding Issues required before final signoff? If Yes, enter items below in Table 3 or Table 4, as appropriate.	<input type="checkbox"/> Yes <input type="checkbox"/> No

Table 3: Outstanding Hardware Issues				
Line Item No.	ARTEMIS No.	RSWCF No.	Reconciled by	Date

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Table 4: Procedural Deviations	
Procedure Section or Step No.	Description of Deviation

5.3	Test Review and Close-Out of Outstanding Hardware Issues and Procedural Deviations: Signature of this section indicates that a) unresolved hardware issues pose no additional risk to personnel during operation of the facility, and b) procedural deviations are evaluated as appropriate, or amended and re-executed such that safe operation of the facility has been assured by the test.
5.3.1	Lead PPS Engineer Test Approval
Signature	<input type="text"/>
Name and Title (Print)	<input type="text"/>
Date	<input type="text"/>
5.3.2	Accelerator Division Safety Officer Test Approval
Signature	<input type="text"/>
Name and Title (Print)	<input type="text"/>
Date	<input type="text"/>
5.3.3	Safety Systems QC Manager Approval
Signature	<input type="text"/>
Name and Title (Print)	<input type="text"/>
Date	<input type="text"/>

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6.0 Revision History

Rev No.	Date	DCO No.
01	24 Feb 09	0028
02	07 Apr 09	0042