

CRITICAL ITEMS LIST

REFERENCE DESIGNATOR: HPA-3
 NAME / QUANTITY: PFR Extender
 DRAWING REFERENCE: 417500

PROJECT: HST
 LRU NAME / QUANTITY: HST PFR/APC Assembly
 LRU PART NUMBER: SED 3811925-501,501

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 SUBSYSTEM: N/A
 EFFECTIVITY: ALL ORBITERS

FAILURE MODE NUMBER HST-3-3	CRITICALITY 1R/2	FAILURE EFFECT	RETENTION RATIONALE			
FUNCTION PFR extender is used to change the location of a PFR socket required for attaching a HST or STS PFR.		END ITEM Cannot remove the PFR Extender from a PFR socket for landing.	DESIGN I. Design Feature to Minimize the Chance of the Failure Mode A. Design The PFR Extender was designed to an ultimate structural safety factor of 1.4 B. Tolerances Sufficient tolerances were used in the PFR Extender design to prevent jamming by expansion and contraction of material due to temperature extremes or on-orbit use. C. Materials - Major Components Probe - 15-5PH, Condition H1025. Pip pin - Modified MS stainless steel pin (P/N 4173211) II. Testing and Analysis A. Acceptance Testing 1. PIA A full pre-installation acceptance (PIA) test was performed on the Jetison Handle assembly before it was delivered to KSC to support flight. The PIA verified that the Jetison Handle is functioning within tolerances and that the assembly is clean (ref. 189320299). 2. Pip Pin Acceptance The Pip pin was used in the STS-31 manned thermal vacuum test to demonstrate its operation under thermal conditions. The operation was successful at -90°F.			
FAILURE MODE AND CAUSE MODE PFR Extender is jammed in a PFR Socket within the Payload bay envelope. CAUSE(S) 1). Pip pin is jammed or will not operate. 2). Binding or galling of probe in socket.		MISSION None if on last EVA.				
REDUNDANCY SCREENS A - Pass B - Pass C - Pass	REMAINING PATHS 1.) 7/16" EVA Release Bolt.	CREW / VEHICLE Damage to orbiter if PFR Extender comes loose in payload bay during landing.				
MISSION PHASE EVA	CORRECTIVE ACTION TIMES <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 50%;">TIME TO EFFECT</th> <th style="width: 50%;">TIME TO CORRECT</th> </tr> <tr> <td>Minutes</td> <td>Seconds</td> </tr> </table> Standard PFR socket in payload bay.			TIME TO EFFECT	TIME TO CORRECT	Minutes
TIME TO EFFECT	TIME TO CORRECT					
Minutes	Seconds					
INTERFACE Standard PFR socket in payload bay.						

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CRITICAL ITEMS LIST

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SUBSYSTEM: N/A
EFFECTIVITY: ALL ORBITERS

REFERENCE DESIGNATOR: HPA-3
NAME / QUANTITY: PFR Extender
DRAWING REFERENCE: 417602

PROJECT: HST
LRU NAME / QUANTITY: HST PFR/APC Assembly
LRU PART NUMBER: SED 39119295-591,303

FAILURE MODE NUMBER	CRITICALITY	FAILURE EFFECT	RETENTION RATIONALE
HST-3-3	1R/2		
FUNCTION PFR extender is used to change the location of a PFR socket required for attaching a HST or STS PFR.		END ITEM Cannot remove the PFR Extender from a PFR socket for landing.	DESIGN 8. Certification Testing 1. Thermal Vacuum The PFR Extender was exposed to a cold temperature (-132°F) vacuum (1x10 ⁻⁵ torr) environment. This test was used to check the tolerances of the hex probe to the PFR socket and the operation of the pip pin. The operational requirement was -90°F (Ref. JSC-23550) 2. Functionals The PFR Extender pip pin was functionally operated prior to and immediately after all acceptance/certification tests to verify that the test environment did not degrade the hardware performance.
FAILURE MODE AND CAUSE MODE PFR Extender is jammed in a PFR Socket within the Payload bay envelope. CAUSE(S) 1). Pip pin is jammed or will not operate. 2). Binding or galling of probe in socket.		MISSION None if on last EVA.	
REDUNDANCY SCREENS A - Pass B - Pass C - Pass		CREW / VEHICLE Damage to Orbiter if PFR Extender comes loose in Payload bay during landing.	
REMAINING PATHS 1.) 7/16" EVA Release Bolt.		INTERFACE Standard PFR Socket in Payload bay.	
MISSION PHASE		CORRECTIVE ACTION TIMES	
		TIME TO EFFECT	TIME TO CORRECT
EVA	Minutes	Seconds	

CRITICAL ITEMS LIST

REFERENCE DESIGNATOR: HPA-3
 NAME / QUANTITY: PFR Extender
 DRAWING REFERENCE: 4172802

PROJECT: HST
 LRU NAME / QUANTITY: HST PFR/APC Assembly
 LRU PART NUMBER: BED 201 10295-901,600

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 SUBSYSTEM: N/A
 EFFECTIVITY: ALL ORBITERS

FAILURE MODE NUMBER HST-3-3	CRITICALITY 1R/2	FAILURE EFFECT	RETENTION RATIONALE																														
FUNCTION PFR extender is used to change the location of a PFR socket required for attaching a HST or STS PFR.		END ITEM Cannot remove the PFR Extender from a PFR socket for landing.	DESIGN C. <u>Certification Analysis</u> All PFR Extender components were analyzed to the following induced environments to verify that the assembly can withstand the environment levels: 1. Requirements Source Data A. <u>Structures</u> - Fracture JSC-25836 Ok per Mail-93-079 - UR. (Is = 2.0) Interim Loads from ES4 See Below <table style="margin-left: 40px; border-collapse: collapse;"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> <th>Mx</th> <th>My</th> <th>Mz</th> </tr> </thead> <tbody> <tr> <td>75</td> <td>19</td> <td>70</td> <td>1215</td> <td>4800</td> <td>450</td> </tr> <tr> <td>19</td> <td>75</td> <td>70</td> <td>4800</td> <td>1215</td> <td>450</td> </tr> <tr> <td>19</td> <td>19</td> <td>260</td> <td>1215</td> <td>1215</td> <td>450</td> </tr> <tr> <td>19</td> <td>19</td> <td>70</td> <td>1215</td> <td>1215</td> <td>1800</td> </tr> </tbody> </table> B. <u>Temperature</u> - Hot LESC-30943 +250°F - Cold JSC-23550 -90°F	X	Y	Z	Mx	My	Mz	75	19	70	1215	4800	450	19	75	70	4800	1215	450	19	19	260	1215	1215	450	19	19	70	1215	1215	1800
X	Y	Z		Mx	My	Mz																											
75	19	70		1215	4800	450																											
19	75	70		4800	1215	450																											
19	19	260		1215	1215	450																											
19	19	70	1215	1215	1800																												
FAILURE MODE AND CAUSE MODE PFR Extender is jammed in a PFR Socket within the Payload bay envelope. CAUSE(S) 1). Pip pin is jammed or will not operate. 2). Binding or galling of probe in socket.		MISSION None if on last EVA.																															
REUNDANCY SCREENS A - Pass B - Pass C - Pass		CREW / VEHICLE Damage to Orbiter if PFR Extender comes loose in Payload bay during landing.																															
REMAINING PATHS 1.) 7/16" EVA Release Bolt.		INTERFACE Standard PFR Socket in Payload bay.																															
MISSION PHASE	CORRECTIVE ACTION TIMES																																
	TIME TO EFFECT	TIME TO CORRECT																															
EVA	Minutes	Seconds																															

PREPARED BY: J. F. PARK

REVISION: BASIC

SUPERSEDING DATE: NONE

DATE: 10/2/80

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CRITICAL ITEMS LIST

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SUBSYSTEM: N/A
EFFECTIVITY: ALL ORBITERS

REFERENCE DESIGNATOR: HPA-3
NAME / QUANTITY: PFR Extender
DRAWING REFERENCE: 417702

PROJECT: HST
LRU NAME / QUANTITY: HST PFR/APC Assembly
LRU PART NUMBER: 620 39110295-001/003

FAILURE MODE NUMBER HST-3-3	CRITICALITY 1R/2	FAILURE EFFECT	RETENTION RATIONALE
FUNCTION PFR extender is used to change the location of a PFR socket required for attaching a HST or STS PFR.		END ITEM Cannot remove the PFR Extender from a PFR socket for landing.	DESIGN III. Inspection A. Manufacturing 1. The PFR Extender components were inspected prior to build-up for conformance to their applicable drawings. B. Assembly 1. PFR Extender and pip pin are cleaned and inspected to the levels described in JSC 5322B. Once cleaned, the PFR Extender was bagged to prevent anything from contaminating the unit. C. Testing 1. The hardware was fully inspected for any signs of galling as a part of the pre/post functional tests performed prior to and immediately after all certification and acceptance tests.
FAILURE MODE AND CAUSE MODE PFR Extender is jammed in a PFR Socket within the Payload bay envelope. CAUSE(S) 1). Pip pin is jammed or will not operate. 2). Binding or galling of probe in socket.		MISSION None II on last EVA.	
REDUNDANCY SCREENS A - Pass B - Pass C - Pass		CREW / VEHICLE Damage to Orbiter if PFR Extender comes loose in Payload bay during landing.	
REMAINING PATHS 1.) 7/16" EVA Release Bolt.		INTERFACE Standard PFR Socket in Payload bay.	
MISSION PHASE	CORRECTIVE ACTION TIMES		
	TIME TO EFFECT	TIME TO CORRECT	
EVA	Minutes	Seconds	

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CRITICAL ITEMS LIST

REFERENCE DESIGNATOR: HPA-3
 NAME / QUANTITY: PFR Extender
 DRAWING REFERENCE: 417202

PROJECT: HST
 LRU NAME / QUANTITY: HST PFR/APC Assembly
 LRU PART NUMBER: SED 381 19285-504,505

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 SUBSYSTEM: N/A
 EFFECTIVITY: ALL ORBITERS

FAILURE MODE NUMBER HST-HPA-3-3	CRITICALITY 1R/2	FAILURE EFFECT	RETENTION RATIONALE
FUNCTION PFR extender is used to change the location of a PFR socket required for attaching a HST or STS PFR.		END ITEM Cannot remove the PFR Extender from a PFR socket for landing.	IV. Failure History A. None, HST PFR/APC flew on STS-31, but was not used V. Operations A. <u>Effects of Failure</u> PFR Extender loses connection to the APC and is free to move within the payload bay. B. <u>Crew Actions</u> None. C. <u>Training</u> None. D. <u>Mission Constraints</u> Possible damage to cargo within payload bay if the PFR Extender does come loose. E. <u>In Flight Check-Outs</u> None
FAILURE MODE AND CAUSE MODE PFR Extender is jammed in a PFR Socket within the Payload bay envelope. CAUSE(S) 1). Pip pin is jammed or will not operate. 2). Binding or galling of probe in socket.		MISSION None if on last EVA.	
REUNDANCY SCREENS A - Pass B - Pass C - Pass		CREW / VEHICLE Damage to Orbiter if PFR Extender comes loose in Payload bay during landing.	
REMAINING PATHS 1.) 7/16" EVA Release Bolt.		INTERFACE Standard PFR Socket in Payload bay.	
MISSION PHASE Launch/Landing		CORRECTIVE ACTION TIMES TIME TO EFFECT TIME TO CORRECT Minutes Seconds	

PREPARED BY: J. F. PARK

REVISION: BASIC

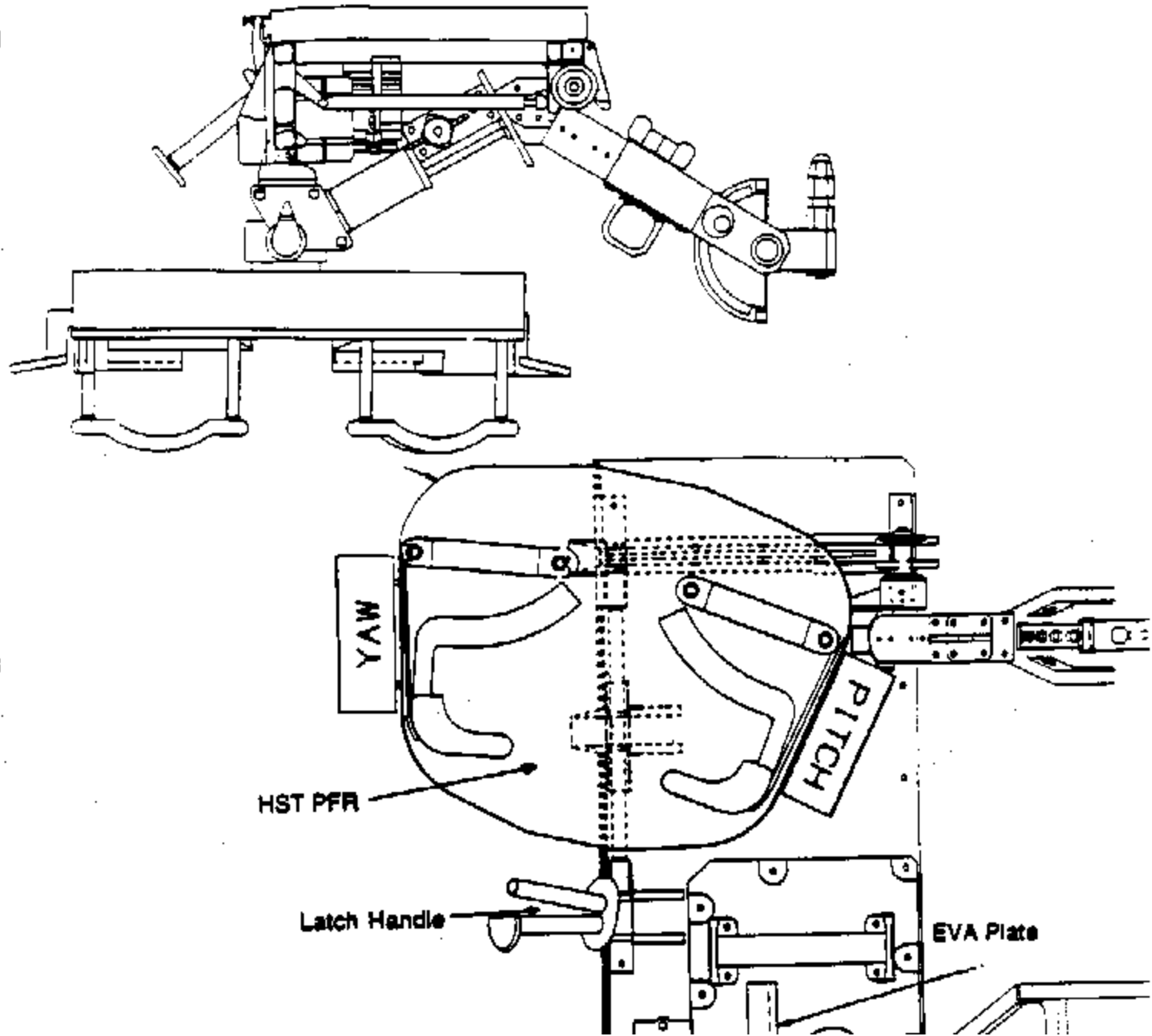
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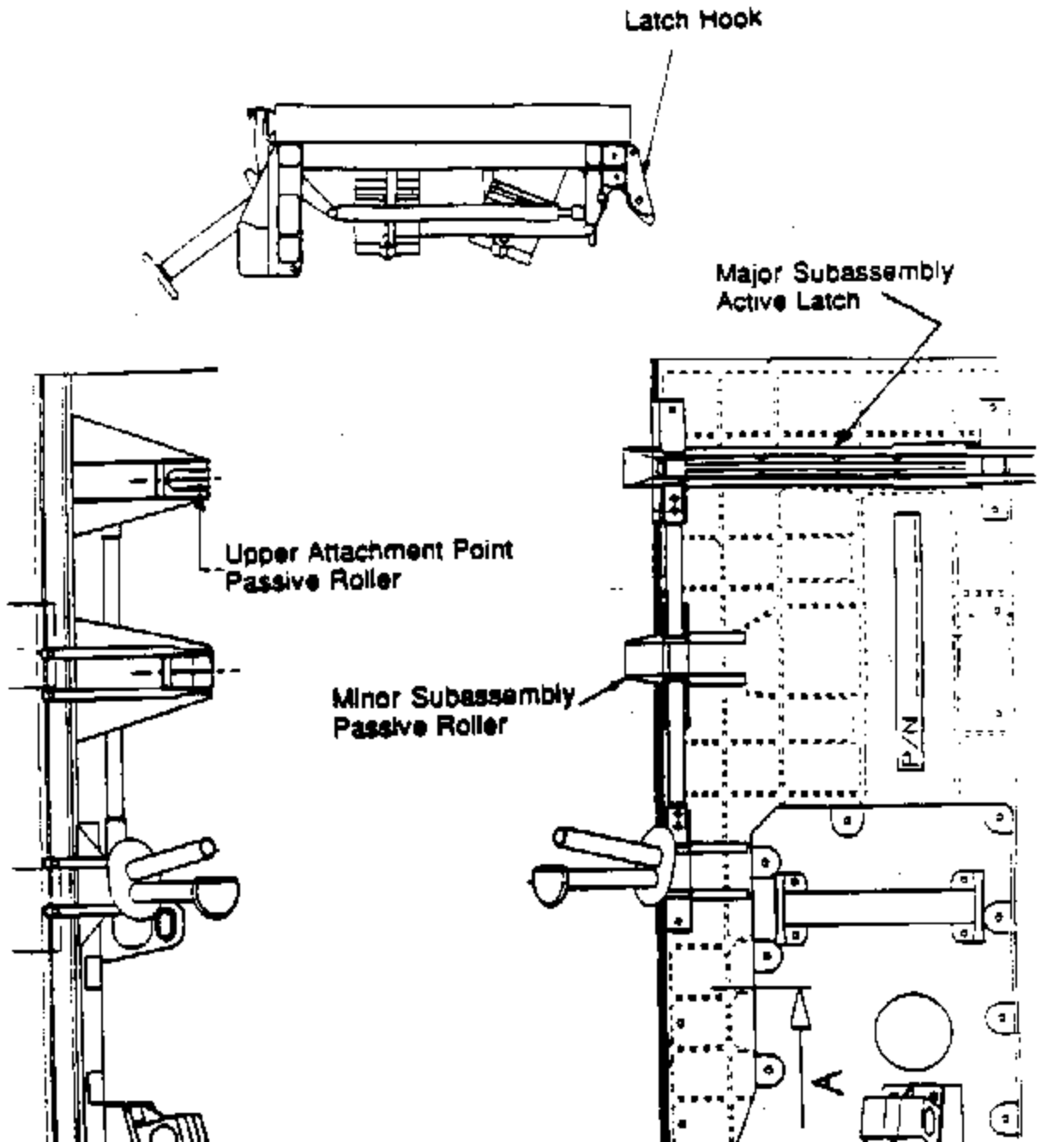
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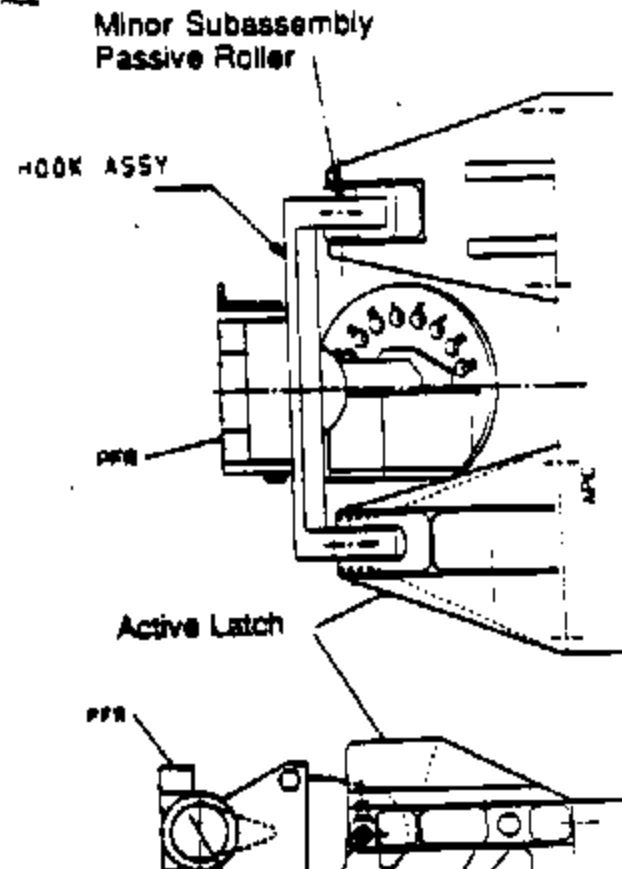
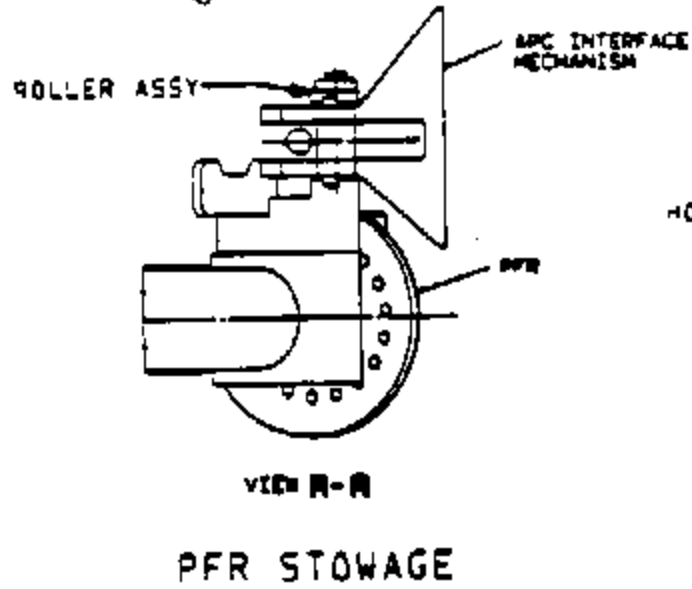
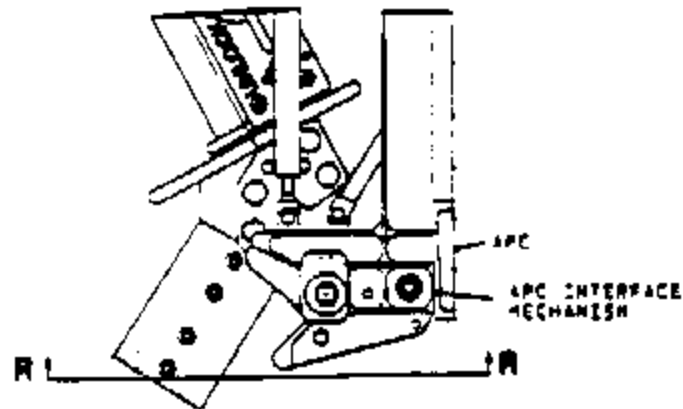
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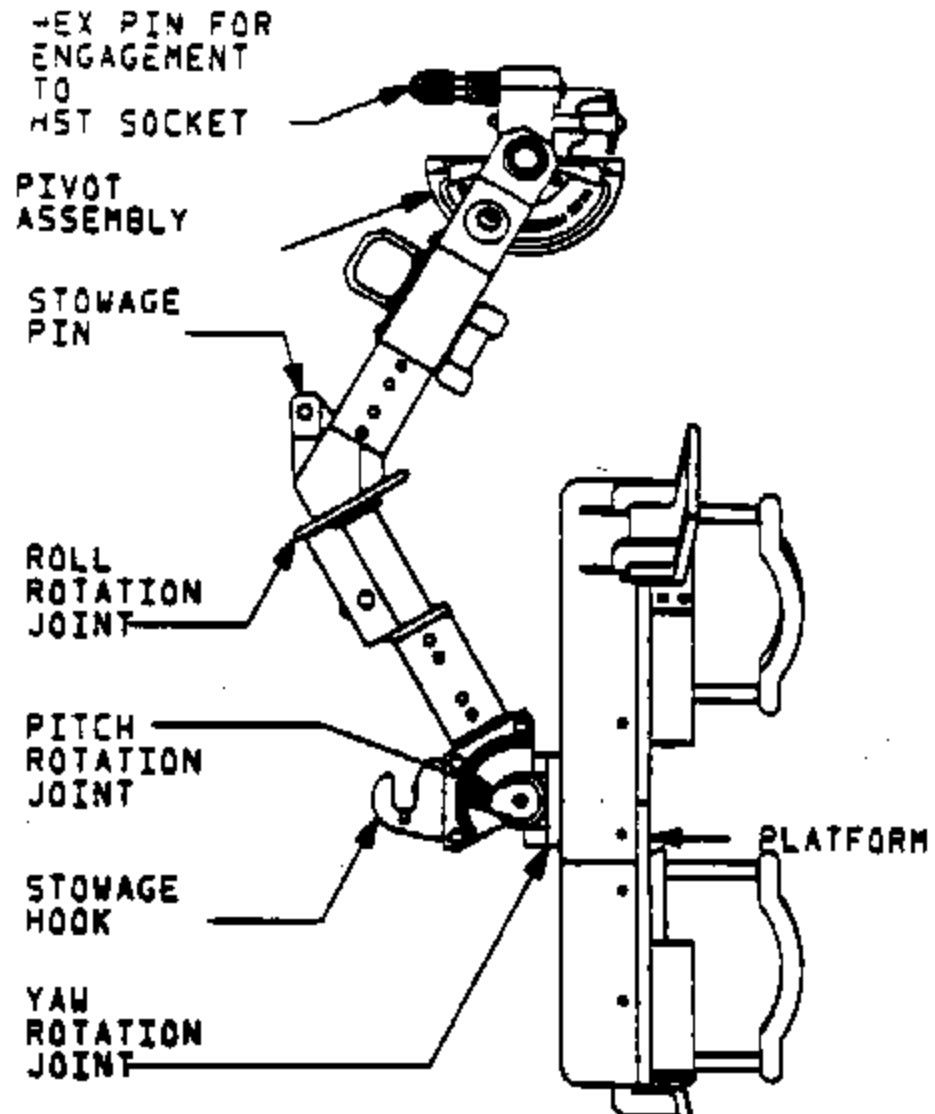


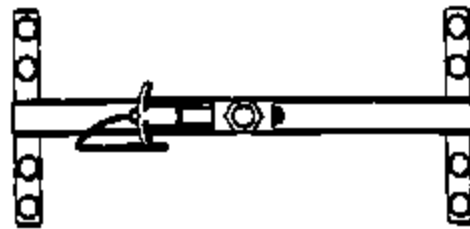
FMEA /CIL for the HST PFR/APC Assy., JSC-24293 Rev. A



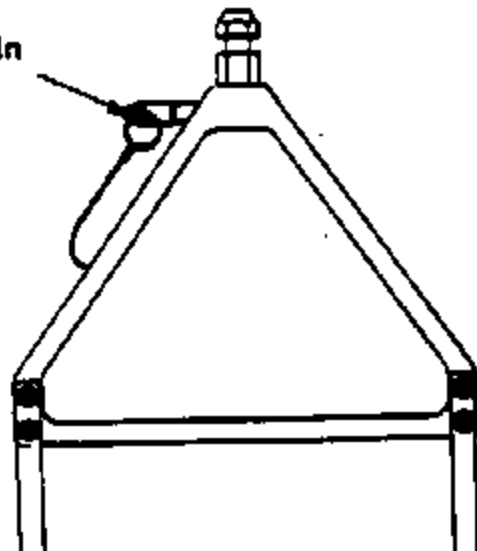
FMEA/CIL for the HST PFR/APC Assy. JSC-24293 Rev. A







Pip Pln



Probe

