

**SSME FMEA/CIL  
REDUNDANCY SCREEN**

Component Group: Igniters and Sensors  
 CIL Item: J306-02  
 Component: LPFTP Discharge Temperature Transducer (F2.3)  
 Part Number: RES7002  
 Failure Mode: Structural failure of probe.

Prepared: M. Oliver  
 Approved: T. Nguyen  
 Approval Date: 3/30/99  
 Change #: 1  
 Directive #: CCBD ME3-01-4894  
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Phase	Failure / Effect Description	Criticality Hazard Reference
SMC 4.1	Probe ingestion into HPFTP results in HPFTP hardware failure. Loss of vehicle.  Redundancy Screens: SINGLE POINT FAILURE N/A	1 ME-D1S,M,A,C

SSME EA/CIL  
DESIGN

Component Group: Igniters and Sensors  
CIL Item: J306-02  
Component: LPFTP Discharge Temperature Transducer (F2.3)  
Part Number: RES7002  
Failure Mode: Structural failure of probe.

Prepared: M. Oliver  
Approved: T. Nguyen  
Approval Date: 3/30/99  
Change #: 1  
Directive #: CCBD ME3-01-4954  
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Design / Document Reference

**FAILURE CAUSE: ALL CAUSES**

THE CRYOGENIC TEMPERATURE TRANSDUCER, FRONT HOUSING, SHIELD, AND END CAP ARE MADE FROM INCONEL 625 (1). TENSILE STRENGTH, RESISTANCE TO GENERAL CORROSION, WELDABILITY TO 300 SERIES CRFS, AND RESISTANCE TO STRESS CORROSION CRACKING ARE PRIMARY REASONS FOR SELECTING THIS MATERIAL (2). HYDROGEN ENVIRONMENT EMBRITTLEMENT IS NOT CONSIDERED A PROBLEM UNDER THIS CONDITION OF USE. THE SHIELD IS GAS TUNGSTEN ARC WELDED TO THE FRONT HOUSING WELDING IS CONTROLLED BY SPECIFICATION (1). THIS END ITEM UNIT IS A VENDOR SUPPLIED ITEM, DRAWING SPECIFICATIONS AND MANUFACTURING PROCESSES ARE CONTROLLED BY ROCKETDYNE (1). ALL SENSOR DESIGNS ARE SUBJECTED TO A CRITICAL DESIGN REVIEW. ANY DESIGN CHANGES ARE RE-REVIEWED (1). THE RES7002-231 TRANSDUCER DESIGN HAS PASSED DESIGN VERIFICATION TESTING (3), INCLUDING THERMAL CYCLING AND VIBRATION TESTING (4). THE -241 DESIGN IS IDENTICAL TO THE -231 DESIGN WITH THE ADDITION OF A WORKSHOP SCREENING REQUIREMENT. THE RES7002-241 DESIGN HAS BEEN QUALIFIED BY SIMILARITY (5). HIGH CYCLE AND LOW CYCLE FATIGUE LIFE, AS WELL AS THE MINIMUM FACTORS OF SAFETY FOR THE TEMPERATURE TRANSDUCER, MEET CEI REQUIREMENTS (6).

(1) RES7002; (2) RSS 8582-6 MSFC-SPEC-522; (3) DVS-SSME-203, RSS-8660; (4) RSS-203-11; (5) RSS-8560; (6) RL00532, CP320R0003B, RSS-8546

**SSME FMEA/CIL  
INSPECTION AND TEST**

Component Group: Igniters and Sensors  
 CIL Item: J306-02  
 Component: LPF1P Discharge Temperature Transducer (F2.3)  
 Part Number: RES7002  
 Failure Mode: Structural failure of probe.

Prepared: M. Olivar  
 Approved: T. Nguyen  
 Approval Date: 3/30/89  
 Change #: 1  
 Directive #: CCBD ME3-01-4994

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Failure Causes	Significant Characteristics	Inspection(s) / Test(s)	Document Reference
ALL CAUSES	TEMPERATURE TRANSDUCER		RES7002
	MATERIAL INTEGRITY	MATERIAL INTEGRITY IS VERIFIED PER SPECIFICATION REQUIREMENTS.	RC7002
	WELD INTEGRITY	WELDING IS INSPECTED PER SPECIFICATION REQUIREMENTS.	
	ASSEMBLY INTEGRITY	TRANSDUCERS ARE SUBJECTED TO A WORKMANSHIP SCREENING ACCEPTANCE TEST INCLUDING VIBRATION AND THERMAL CYCLING.	
	HOT FIRE ACCEPTANCE TESTING (GREEN RUN)	SENSOR OPERATION IS VERIFIED THROUGH HOT FIRE ACCEPTANCE TESTING.	RL00451
	PRE-FLIGHT CHECKOUT	SENSOR OPERATION IS VERIFIED EVERY MISSION FLOW BY SUCCESSFUL COMPLETION OF THE CONTROLLER SENSOR ELECTRICAL CHECKOUT. (LAST TEST)	OMRSD V41AQ0.010 OMRSD S00FA0.213

Failure History: Comprehensive failure history data is maintained in the Problem Reporting database (PRAMS/PRACA).  
 Reference: NASA letter SA21/88/308 and Rockwell letter B8RC09761.

Operational Use: Not Applicable.

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SSC  
WELDING

Component Group: Engines and Sensors  
 C. Item: J-152  
 Component: LP-10 Discharge Temperature Transducer (F23)  
 Part Number: RES7002

Program: 1000000  
 Revision: 1000000  
 Change #: 1  
 Direct: 1000000-01-0004  
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Component	Basic Part Number	Weld Number	Weld Type	Class	Part Side Not Applied	Critical Initial Low Size Not Detectable		Comments
						HCF	LCF	
TEMPERATURE TRANSDUCER	RES7002	R2	GTAW	II	X			
TEMPERATURE TRANSDUCER	RES7002	R2A	GTAW	II	X			

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