

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : ACTIVE THERMAL CONTROL FMEA NO 06-3C -0304 -2 REV:08/29/8

ASSEMBLY : FREON THERMAL LOOP CRIT. FUNC: 10  
 P/N RI : MC250-0001-0025 CRIT. HDW: 1  
 P/N VENDOR: SV755511 VEHICLE: 102 103 104  
 QUANTITY : 1 EFFECTIVITY: X X X  
 : ONE/VEHICLE PHASE(S): PL LG X OO X DO X LS  
 :

		REDUNDANCY SCREEN	A-PASS	B-PASS	C-PASS
PREPARED BY:		APPROVED BY:	APPROVED BY (NASA):		
DES	O. TRAN <i>Out</i>	DES <i>[Signature]</i>	SSM <i>[Signature]</i>		
REL	D. RISING <i>REL</i>	REL <i>[Signature]</i>	REL <i>[Signature]</i>		
QE	W. SMITH <i>W QE</i>	QE <i>[Signature]</i>	QE <i>[Signature]</i>		

ITEM:  
 HEAT EXCHANGER, GSE.

FUNCTION:  
 THE GSE HEAT EXCHANGER TRANSFERS ORBITER WASTE HEAT VIA FREON COOLANT LOOPS TO GROUND SUPPORT EQUIPMENT DURING GROUND TURNAROUND. THE HEAT EXCHANGER WAS DESIGNED WITH REDUNDANT GSE LOOPS. THE REDUNDANT GSE LOOP IS CAPPED AND NOT IN USE.

FAILURE MODE:  
 RESTRICTED FLOW, FREON 21 LOOP.

CAUSE(S):  
 CONTAMINATION, CORROSION, MECHANICAL SHOCK.

EFFECT(S) ON:  
 (A) SUBSYSTEM (B) INTERFACES (C) MISSION (D) CREW/VEHICLE

(A, B) POSSIBLE LOSS OF FLOW IN ONE FREON COOLANT LOOP FOR VEHICLE COOLING.

(C) POSSIBLE LOSS OF MISSION. EARLY MISSION TERMINATION FOR LOSS OF ONE COOLANT LOOP.

(D) SECOND ASSOCIATED FAILURE (LOSS OF REDUNDANT FREON COOLANT LOOP) WILL CAUSE LOSS OF ALL VEHICLE COOLING AND MAY RESULT IN LOSS OF CREW/VEHICLE

DISPOSITION & RATIONALE:  
 (A) DESIGN (B) TEST (C) INSPECTION (D) FAILURE HISTORY (E) OPERATIONAL USE

(A) DESIGN  
 THE HEAT EXCHANGER IS MADE FROM STAINLESS STEEL AND NICKEL BRONZE ALLOYS, WHICH ARE CORROSION RESISTANT AND COMPATIBLE WITH FREON 21 AND FREON 114, AND CONTAINS NO MOVING PARTS SUBJECT TO WEAR. THE FLOW HEADERS ARE MACHINED FROM A SINGLE PIECE STAINLESS STEEL BAR. THE HEADERS ARE WELDED TO THE CORE, WHICH IS MADE OF 136 STACKED PLATE-FIN STAINLESS STEEL PARTING SHEETS. ALL FINS ARE 0.020 INCHES HIGH AND ARE MADE OF 0.002 INCH THICK STAINLESS STEEL SHEET STOCK. THE FINS ARE RUFFLED AND HAVE A DENSITY OF 32 FLOW PATHS PER INCH. PUMP INLET FILTERS (25 MICRON) PROTECT AGAINST CONTAMINATION.

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(B) TEST

QUALIFICATION TEST - QUALIFICATION TESTED FOR 100 MISSION LIFE.  
VIBRATION TESTED AT 0.075 G<sup>2</sup>/HZ FOR 52 MIN/AXIS, SHOCK TESTED AT -/- .  
EACH AXIS.

ACCEPTANCE TEST - PERFORMANCE PRESSURE DROP TEST IN ATP WILL VERIFY THE  
PASSAGES ARE NOT OBSTRUCTED.

OMRSD - FCL FLOWRATES ARE VERIFIED PRIOR TO EACH FLIGHT. FREON CHEMICAL  
ANALYSIS PER SE-S-0073 DURING SERVICING. FREON IS SERVICED THROUGH A  
MICRON FILTER.

(C) INSPECTION

RECEIVING INSPECTION

RAW MATERIAL AND PURCHASED COMPONENTS REQUIREMENTS ARE VERIFIED BY  
INSPECTION. PARTS PROTECTION IS VERIFIED BY INSPECTION.

CONTAMINATION CONTROL

SYSTEMS FLUID ANALYSES FOR CONTAMINATION ARE VERIFIED BY INSPECTION.  
CONTAMINATION CONTROL PLAN IS VERIFIED BY INSPECTION. CONTAMINATION  
CONTROL PROCESSES AND CLEAN AREAS ARE VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

MANUFACTURING, INSTALLATION, AND ASSEMBLY OPERATIONS ARE VERIFIED BY  
INSPECTION. SHEET METAL PARTS ARE INSPECTED AND VERIFIED BY INSPECTION  
SURFACE FINISHES VERIFIED BY INSPECTION. DIMENSIONS VERIFIED BY  
INSPECTION.

CRITICAL PROCESSES

WELDING IS VERIFIED BY INSPECTION. ALL WELDS ARE STRESS RELIEVED AFTER  
WELDING, VERIFIED BY INSPECTION. BRAZING IS VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION

HEADER WELDS TO THE TUBES ARE PENETRANT AND X-RAY INSPECTED. OTHER  
WELDS (MOUNTING PADS AND HEADER WELDS TO THE CORES) ARE PENETRANT AND  
10X MAGNIFICATION VISUALLY INSPECTED. BRAZES ARE VERIFIED BY PROCF AND  
LEAK TESTS.

TESTING

INSPECTION VERIFIES THAT RESULTS OF ACCEPTANCE TESTING AND FLOWRATES AR  
WITHIN SPECIFIED LIMITS.

HANDLING/PACKAGING

HANDLING AND PACKAGING REQUIREMENTS VERIFIED BY INSPECTION.

(D) FAILURE HISTORY

NO FAILURE HISTORY.

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(E) OPERATIONAL USE

ON-BOARD ALARM, FREON FLOW, WILL INDICATE HARDWARE FAILURE. FREON PUMPS WILL BE TURNED OFF AND LOSS OF ONE FREON COOLANT LOOP POWERDOWN WILL BE PERFORMED. ENTRY AT NEXT PRIMARY LANDING SITE.

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