

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : ACTIVE THERMAL CONTROL FMEA NO 06-3C -0201 -7 REV:08/23/  
ASSEMBLY : FREON THERMAL LOOP CRIT. FUNC: 1  
P/N RI : MC250-0001-0040/0540 CRIT. HDW:  
P/N VENDOR: SV755517 VEHICLE 102 103 104  
QUANTITY : 1 EFFECTIVITY: X X X  
: ONE PER VEHICLE PHASE(S): PL LO X OO X DO X LS  
:

REDUNDANCY SCREEN: A-PASS B-PASS C-PAS  
PREPARED BY: DES O. TRAN *O.T.* DES *[Signature]* APPROVED BY (NASA): SSM *[Signature]*  
REL D. RISING *D.R.* REL *[Signature]* REL *[Signature]*  
QE W. SMITH *W.S.* QE *[Signature]* QE *[Signature]*

ITEM:  
INTERCHANGER, WATER/FREON INTERFACE.

FUNCTION:  
THE INTERCHANGER TRANSFERS CABIN WASTE HEAT FROM EITHER THE PRIMARY OR SECONDARY WATER COOLANT LOOPS TO THE FREON COOLANT LOOPS.

FAILURE MODE:  
EXTERNAL LEAKAGE, WATER.

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

EFFECT(S) ON:  
(A) SUBSYSTEM (B) INTERFACES (C) MISSION (D) CREW/VEHICLE  
(A, B) POSSIBLE LOSS OF ONE WATER COOLANT LOOP FOR CABIN COOLING. LOSS COOLING UNTIL IMPLEMENTATION OF CORRECTING ACTION.  
(C) POSSIBLE LOSS OF MISSION. EARLY MISSION TERMINATION FOR LOSS OF ONE WATER COOLANT LOOP.  
(D) SECOND ASSOCIATED FAILURE (LOSS OF REDUNDANT WATER COOLANT LOOP) WILL CAUSE LOSS OF ALL CABIN 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 INTERCHANGER IS MADE FROM STAINLESS STEEL AND NICKEL BRONZE ALLOYS, WHICH ARE CORROSION RESISTANT AND COMPATIBLE WITH FREON 21 AND WATER. A 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 STACKED PLATE-FIN STAINLESS STEEL PARTING SHEETS DESIGN PROOF PRESSURE IS 1.5 AND BURST PRESSURE IS 2.0 TIMES MAXIMUM OPERATING PRESSURE.

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(B) TEST

QUALIFICATION TEST - QUALIFICATION TESTED FOR 100 MISSION LIFE. INTERCHANGER WAS SUBJECTED TO A PROOF/RUPTURE TEST FOR QUALIFICATION. DESIGN PROOF IS 760 PSIG AND UNIT DID NOT RUPTURE UNTIL 2440 PSIG (NOMINAL FREON OPERATING PRESSURE IS 110 PSIG). VIBRATION TESTED AT 0.07 G<sup>2</sup>/HZ FOR 52 MIN/AXIS, SHOCK TESTED AT +/- 20 G EACH AXIS.

ACCEPTANCE TEST - CORE IS LEAK TESTED PRIOR TO INSTALLING HEADERS.

OMRSD - WATER COOLANT LOOPS ARE LEAK CHECKED PRIOR TO EACH FLIGHT. MONITORING OF WATER ACCUMULATOR QUANTITY WILL DETECT ANY EXTERNAL LEAKAGE. WATER IS SERVICED AS PER SZ-S-0073.

(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 PROOF AND LEAK TESTS.

TESTING

INSPECTION VERIFIES THAT RESULTS OF ACCEPTANCE TESTING AND FLOWRATES ARE 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 ALARMS, PUMP INLET PRESSURE AND ACCUMULATOR QUANTITY, WILL PROVIDE INDICATION OF HARDWARE FAILURE. ACTIVATE REDUNDANT WCL PUMP. ENTRY AT NEXT PLS.