SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM :ATMOSPHERIC REVIT. FMEA NO 06-1B -0530 -1 REV:09/07/8

ASSEMBLY :HEAT EXCHANGER, WATER CHILLER
P/N RI :MC621-0008-0020
P/N VENDOR:SV729791 HAM STD
QUANTITY :1
:ONE PER SUBSYSTEM
:

CRIT. FUNC: 1R
CRIT. HDW: 2

VEHICLE EFFECTIVITY:	102	103	104
	X	X	X

PHASE(S): PL LO X GO X DO X LS

REDUNDANCY SCREEN: A-PASS B-N/A C-PAS

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5/23/3

ITEM:
HEAT EXCHANGER, WATER CHILLER

FUNCTION:
PROVIDES COOLING FOR FOOD MANAGEMENT (POTABLE) WATER.

FAILURE MODE:
RESTRICTED FLOW, WCL

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

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

(A) ~~FUNCTIONAL DEGRADATION~~ - REDUCED OR LOST COOLING CAPABILITY OF ONE WATER COOLANT LOOP.

(B) NO EFFECT. REDUNDANT LOOP PROVIDES COOLING.

(C) POSSIBLE EARLY MISSION TERMINATION FOR LOSS OF ONE WATER COOLANT LOO FOR CABIN AVIONICS COOLING.

(D) POTENTIAL LOSS OF CREW/VEHICLE UPON SUBSEQUENT LOSS OF REDUNDANT WATER COOLANT LOOP. SCREEN B IS N/A BECAUSE REDUNDANT LOOP IS INOPERATIVE UNTIL REQUIRED.

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

(A) DESIGN
HEAT EXCHANGER IS A CRES BRAZED/WELDED PLATE-FIN ASSEMBLY. THE HEAT TRANSFER FLUID IS A HIGH PURITY/LOW OXYGEN CONTENT WATER AND THE SYSTEM CONTAINS A 10/25 MICRON FILTER. SYSTEM COMPONENTS AND SEALS ARE SELECTE TO BE COMPATIBLE WITH WATER AND ALCOHOL. THE FIN GEOMETRY IS 0.020 INCHES IN HEIGHT AND 0.002 INCHES THICK WITH 32 FINS PER INCH.

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(B) TEST

ACCEPTANCE TEST - PROOF PRESSURE TESTED AT 136-139 PSIG FOR 5 MINUTES. ALLOWABLE INTERNAL AND EXTERNAL GHE LEAKAGE RATE OF 3.2 X 10 EXP -5 SCCS MAXIMUM AT 90 PSIG. ALLOWABLE PRESSURE DROP OF 2.1 PSI MAXIMUM AT 950 PPH FLOW. VISUAL INSPECTION OF TUBES.

QUALIFICATION TEST - QUALIFIED FOR STRESS AND LIFE BY ANALYSIS AND ALSO BY SIMILARITY TO THE GSE HEAT EXCHANGER. QUALIFIED FOR VIBRATION AND SHOCK BY SIMILARITY TO GSE HEAT EXCHANGER. SUBJECTED TO RANDOM VIBRATI SPECTRUM ENVELOPE OF 20 TO 80 HZ INCREASING AT 6 DB/OCTAVE TO 0.075 G**2/HZ, CONSTANT AT 0.075 G**2/HZ FROM 80 TO 700 HZ, DECREASING AT 6 DB/OCTAVE FROM 700 TO 2000 HZ FOR 48 MINUTES PER AXIS IN THREE ORTHOGON AXES. DESIGN SHOCK - THREE TERMINAL SAWTOOTH PULSES OF 20 G PEAK AMPLITUDE AND 11 MS DURATION APPLIED IN BOTH DIRECTIONS ALONG EACH OF THREE ORTHOGONAL AXES.

IN-VEHICLE TESTING - PUMP CHECKS ARE PERFORMED AND PUMP OUT PRESSURE IS CONTINUOUSLY MONITORED WHEN THE VEHICLE IS POWERED UP; SERVES AS AN INDICATION OF BLOCKAGE IN THE LOOP.

OMRSD - PUMP OUTLET PRESSURE IS CONTINUOUSLY MONITORED WHEN THE VEHICLE IS POWERED UP DURING EACH TURNAROUND AND SERVES AS AN INDICATION OF BLOCKAGE IN THE LOOP. WATER IS SAMPLED PER SPEC SE-S-0073 DURING SERVICING.

(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.

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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 APPLICABLE TO RESTRICTED FLOW, WCL FAILURE MODE. THE WATER CHILLER HAS SUCCESSFULLY PERFORMED WITHOUT FAILURE THROUGH THE DURATION OF THE SHUTTLE PROGRAM.

(E) OPERATIONAL USE
TBS.