SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM :ACTIVE THERMAL CONTROL FMEA NO 06-3D -0504 -3 REV:08/29/8

ASSEMBLY :RADIATOR & FLOW CONTROL CRIT. FUNC:
P/N RI :MC203-0002-0050 CRIT. HDW:
P/N VENDOR:224-00050 VEHICLE 102 103 104
QUANTITY :2 EFFECTIVITY: X X X
:TWO, ONE PER LOOP PHASE(S): PL LO OO X DO LS
:

REDUNDANCY SCREEN: A- B- C-

PREPARED BY:		APPROVED BY:	APPROVED BY (NASA):
DES	O. TRAN	DES	SSM
REL	D. RISING	REL	REL
QE	W. SMITH	QE	QE

ITEM:
VALVE, RADIATOR BYPASS.

FUNCTION:
PROVIDES COMPLETE BYPASS OF RADIATORS FOR UNDER TEMPERATURE PROTECTION THE FREON COOLANT LOOPS TO PREVENT THE FREEZING OF THE CABIN WATER COOLANT LOOPS.

FAILURE MODE:
FAILS IN THE BYPASS POSITION, MECHANICAL JAMMING.

CAUSE(S):
VIBRATION, MECHANICAL SHOCK, CORROSION, CONTAMINATION, PHYSICAL BINDING/JAMMING.

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

(A,B) POSSIBLE LOSS OF RADIATOR FLOW IN ONE FREON LOOP FOR VEHICLE COOLING THROUGH THE RADIATORS.

(C) POSSIBLE LOSS OF MISSION DUE TO THE LOSS RADIATOR COOLING TO SUPPO PAYLOAD OPERATIONS, A CRITICALITY 2/2 EFFECT.

(D) NO EFFECT.

(E) FUNCTIONAL CRITICALITY EFFECT - ANY TWO ADDITIONAL FAILURES (OTHER FREON COOLANT LOOP, HI-LOAD EVAPORATOR, AND AMMONIA BOILER SYSTEM) WIL CAUSE LOSS OF VEHICLE COOLING CAPABILITY AND MAY RESULT IN LOSS OF CREW/VEHICLE, A CRITICALITY 1R3 (PPP) EFFECT.

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

(A) DESIGN
WELDED CONSTRUCTION WITH BELLOWS FOR DYNAMIC SEALS. THE VALVE SHAFT, WHICH IS CONNECTED TO THE MOTOR BY A BALL SCREW, RIDES ON TEFLON BUSHINGS AT EACH END TO MINIMIZE FRICTION FORCES. THE BALL SCREW IS LUBRICATED WITH VACUUM COMPATIBLE MOLYBDENUM DISULFIDE LUBRICANT TO PRECLUDE BINDING/JAMMING. THE FLOW CONTROL ASSEMBLY IS MOUNTED ON VIBRATION ISOLATORS. VALVE HOUSING AND SEAT ARE MADE OF STAINLESS STEEL, WHICH IS COMPATIBLE WITH FREON 21. THERE IS A 65 MICRON FILTER IN THE FLOW CONTROL ASSEMBLY.

(B) TEST
QUALIFICATION TEST - QUALIFICATION TESTED FOR 100 MISSION LIFE. VIBRATION TESTED AT 0.1 G^2/HZ FOR 48 MIN/AXIS, SHOCK TESTED AT +/- 20 G EACH AXIS, AND 3500 CYCLE VALVE LIFE TEST.

ACCEPTANCE TEST - VALVE FUNCTIONAL TEST IS PERFORMED DURING ATP. ACCEPTANCE VIBRATION TEST IS DONE AT COMPONENT LEVEL AND AT A HIGHER ASSEMBLY (FLOW CONTROL ASSEMBLY).

OMRSD - FREON COOLANT LOOPS 1 AND 2 RADIATOR FLOW CONTROL CHECKOUT (MANUAL AND AUTO) DURING GROUND TURNAROUND. RADIATOR BYPASS VALVE OPERATION IS VERIFIED FREON CHEMICAL ANALYSIS PER SE-S-0073 DURING SERVICING. FREON IS SERVICED THROUGH A FINAL FILTER OF 25 MICRON SIZE.

(C) INSPECTION

RECEIVING INSPECTION
RAW MATERIAL CERTIFICATIONS ARE VERIFIED BY INSPECTION.

CONTAMINATION CONTROL
CONTAMINATION CONTROL PROCESSES, CONTAMINATION CONTROL PLAN AND CORROSION PROTECTION PROVISIONS ARE VERIFIED BY INSPECTION. FLUID SYSTEM IS VERIFIED BY INSPECTION TO BE FREE OF CONTAMINATION.

ASSEMBLY/INSTALLATION
MANUFACTURING, INSTALLATION AND ASSEMBLY ARE VERIFIED BY INSPECTION. DIMENSIONS AND SURFACE FINISHES VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION
X-RAY EXAMINATION OF FUSION WELDS IS VERIFIED BY INSPECTION. ULTRASONIC INSPECTION OF RAW MATERIAL VERIFIED. DYE PENETRANT EVALUATION OF MACHINED PARTS VERIFIED.

CRITICAL PROCESSES
PASSIVATION, HEAT TREATING, WELDING AND BRAZING ARE VERIFIED BY INSPECTION.

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TESTING
VIBRATION, FLOW RATE AND PRESSURE DROP REQUIREMENTS ARE VERIFIED BY INSPECTION DURING ATP. LEAKAGE DURING PROOF PRESSURE AND HELIUM LEAK CHECK TESTS IS VERIFIED BY INSPECTION. INSULATION RESISTANCE AND DIELECTRIC STRENGTH TEST ARE VERIFIED BY INSPECTION DURING ATP.

HANDLING/PACKAGING
HANDLING AND STORAGE ENVIRONMENTS ARE VERIFIED BY INSPECTION. PARTS PROTECTION VERIFIED BY INSPECTION.

(D) FAILURE HISTORY
NO FAILURE HISTORY.

(E) OPERATIONAL USE
ON-BOARD ALARM, EVAPORATOR OUT TEMPERATURES, WILL INDICATE HARDWARE FAILURE. FAILURE WILL CAUSE AN EARLY END OF MISSION. FREON PUMP WILL TURNED OFF AND A POWERDOWN PERFORMED. FREON PUMP WILL BE REACTIVATED ENTRY.