

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : ACTIVE THERMAL CONTROL FMEA NO 06-3D -0504 -2 REV:06/03/82

|                                    |                              |
|------------------------------------|------------------------------|
| 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 X LS |

|              |                          |                     |                       |      |
|--------------|--------------------------|---------------------|-----------------------|------|
| PREPARED BY: | REDUNDANCY SCREEN:       | A-PASS              | B-FAIL                | C-PA |
| DES          | APPROVED BY:             | APPROVED BY (NASA): |                       |      |
| REL          | O. TRAN <i>ENT</i> DES   | SSM                 | <i>H. K. ... 4/18</i> |      |
| QE           | D. RISING <i>DES</i> REL | REL                 | <i>...</i>            |      |
|              | W. SMITH QE              | QE                  | <i>...</i>            |      |

ITEM:  
 VALVE, BYPASS, RADIATOR.

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

FAILURE MODE:  
 OPEN (ELECTRICAL), FAILS IN THE RADIATOR FLOW POSITION.

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

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

(A) LOSS OF ONE REDUNDANT ELECTRICAL DRIVE FOR ONE BYPASS VALVE.

(B,C,D) NO EFFECT. REDUNDANT ELECTRICAL DRIVE SYSTEM WILL PROVIDE BYE OPERATION.

(E) FUNCTIONAL CRITICALITY EFFECT - LOSS OF ALL RADIATOR UNDER TEMPERATURE CONTROL/PROTECTION (REDUNDANT MOTOR CONTROL AND ACTUATOR OF THE BYPASS VALVE, AND THE FLOW CONTROL VALVE) CAN FREEZE THE INTERCHANGER AND RESULT IN RUPTURE OF WATER AND FREON COOLANT LOOPS. LOSS OF ALL VEHICLE COOLING WILL CAUSE LOSS OF CREW/VEHICLE. REDUNDANCY SCREEN 'E' FAILS BECAUSE VALVE IS OPERATED BY SIMULTANEOUS DUAL MOTOR DRIVES AND FAILURE OF ONE MOTOR DRIVE DOES NOT AFFECT VALVE OPERATION.

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

(A) DESIGN  
 WELDED CONSTRUCTION WITH BELLOWS FOR DYNAMIC SEALS. DUAL ELECTRICAL CONTROL CIRCUITS. THE FLOW CONTROL ASSEMBLY IS MOUNTED ON VIBRATION ISOLATORS. VALVE HOUSING AND SEAT ARE MADE OF STAINLESS STEEL, WHICH IS COMPATIBLE WITH FREON 21. ELECTRICAL COMPONENTS ARE CONFORMAL COAT AND CORROSION RESISTANT.

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(B) TEST

QUALIFICATION TEST - QUALIFICATION TESTED FOR 100 MISSION LIFE.  
VIBRATION TESTED AT 0.1 G<sup>2</sup>/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. AVT IS  
DONE AT COMPONENT LEVEL AND AT A HIGHER ASSEMBLY (FLOW CONTROL ASSEMBLY).  
DIELECTRIC STRENGTH TEST WAS PERFORMED AT 1250 VOLTS WITH A LEAKAGE RATE  
OF LESS THAN 2 MA/SEC.

OMRSD - RADIATOR BYPASS VALVE MANUAL AND AUTO CHECKOUT DURING GROUND  
TURNAROUND.

(C) INSPECTION

RECEIVING INSPECTION

RAW MATERIAL CERTIFICATIONS ARE VERIFIED BY INSPECTION. PARTS PROTECTION  
VERIFIED BY INSPECTION.

CONTAMINATION CONTROL

CONTAMINATION CONTROL PROCESSES, CONTAMINATION CONTROL PLAN AND CORROSION  
PROTECTION PROVISIONS ARE VERIFIED BY INSPECTION. FLUID SYSTEM SAMPLES  
FOR CONTAMINATION ARE VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

MANUFACTURING, INSTALLATION, AND ASSEMBLY OPERATIONS ARE VERIFIED BY  
INSPECTION.

NONDESTRUCTIVE EVALUATION

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

CRITICAL PROCESSES

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

TESTING

VIBRATION REQUIREMENT IS VERIFIED BY INSPECTION DURING ATP. LEAKAGE  
DURING PROOF PRESSURE AND HELIUM LEAK CHECK TESTS IS VERIFIED BY  
INSPECTION. INSULATION RESISTANCE AND DIELECTRIC STRENGTH REQUIREMENTS  
ARE VERIFIED BY INSPECTION DURING ATP.

HANDLING/PACKAGING

HANDLING AND STORAGE ENVIRONMENTS ARE VERIFIED BY INSPECTION.

(D) FAILURE HISTORY

NO APPLICABLE FAILURE HISTORY.

(E) OPERATIONAL USE

FIRST FAILURE IS NOT DETECTABLE, REDUNDANT ELECTRICAL CIRCUIT AND MOTOR  
WILL CONTROL THE BYPASS VALVE FOR NORMAL OPERATION. NO CREW ACTION  
REQUIRED.