

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : ACTIVE THERMAL CONTROL FMEA NO 06-3C -0220 -4 REV:08/26/83
ASSEMBLY : FREON THERMAL LOOP CRIT. FUNC: 1R
P/N RI : MC250-0001-0270 CRIT. HDW: 2
P/N VENDOR: SV729792-2 VEHICLE 102 103 104
QUANTITY : 2 EFFECTIVITY: X X X
: TWO, ONE PER LOOP PHASE(S): PL X LO X CO DO X LS X
:

REDUNDANCY SCREEN: A-PASS B-PASS C-PASS
PREPARED BY: DES O. TRAN DES APPROVED BY: APPROVED BY (NASA):
REL D. RISING REL SSM
QE W. SMITH QE

ITEM:
VALVE MODULE, FLOW PROPORTIONAL.

FUNCTION:
THE VALVE MODULE PROPORTIONS THE FLOW OF FREON BETWEEN THE PAYLOAD HEAT EXCHANGER AND THE WATER/FREON INTERCHANGER.

FAILURE MODE:
FAILS TO OPERATE, FAILS IN THE PAYLOAD POSITION.

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

EFFECT(S) ON:
(A) SUBSYSTEM (B) INTERFACES (C) MISSION (D) CREW/VEHICLE
(A) LOSS OF ONE HALF OF THE FLOW OF ONE FREON COOLANT LOOP TO CABIN INTERCHANGER.
(B,C) NO EFFECT.
(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 VALVE CONSISTS OF A STAINLESS STEEL HOUSING, SPOOL AND TWO POSITION ELECTRIC ACTUATOR. THE CLEARANCE BETWEEN THE SPOOL AND HOUSING IS 0.001 INCH. THE SPOOL IS CONNECTED TO THE ACTUATOR WITH A SPLINED SHAFT TO AVOID ANY PHYSICAL JAMMING/BINDING. THERE ARE 8 DIFFERENT SIZED ORIFICES ON THE SPOOL WALL. THE SMALLEST IS 0.062 INCH. 25 MICRON ABSOLUTE FILTERS AT THE INLET AND OUTLET OF THE VALVE PROTECT AGAINST CONTAMINATION. MATERIALS USED ARE CORROSION RESISTANT AND COMPATIBLE WITH FREON 21. ACTUATOR GEAR TEETH ARE LUBRICATED WITH GREASE PER MIL-G-21164.

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(B) TEST

QUALIFICATION TEST - QUALIFICATION TESTED FOR 100 MISSION LIFE.
VIBRATION TESTED AT 2.0 G²/HZ FOR 84 MIN/AXIS, SHOCK TESTED AT +/- 20 G
EACH AXIS. THE VALVE WAS CYCLED 1000 TIMES WITH NO FAILURES OF THIS
TYPE.

ACCEPTANCE TEST - ATP VERIFIES PERFORMANCE, CLEANLINES LEVEL AND PROPE
FLOW.

OMRSD - VALVE OPERATION IS VERIFIED PRIOR TO EACH FLIGHT. VEHICLE FREQ
IS SERVICED THROUGH A 10 MICRON (ABS) GSE FILTER.

(C) INSPECTION

RECEIVING INSPECTION

RAW MATERIAL AND PURCHASED COMPONENTS REQUIREMENTS ARE VERIFIED BY
RECEIVING INSPECTION. COATING AND PLATING MATERIALS AND PROCESSES ARE
VERIFIED BY INSPECTION.

CONTAMINATION CONTROL

FORMAL CONTAMINATION CONTROL PLAN IS VERIFIED BY INSPECTION.
CONTAMINATION CONTROL PROCESSES AND CLEAN AREAS ARE VERIFIED BY
INSPECTION. CORROSION PROTECTION PROVISIONS ARE VERIFIED BY INSPECTION
SYSTEM FLUID SAMPLES ARE PERIODICALLY ANALYZED FOR CONTAMINATION AND
VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

PARTS PROTECTION, MANUFACTURING PROCESSES, INSTALLATION AND ASSEMBLY
OPERATIONS ARE VERIFIED BY INSPECTION ON SHOP TRAVELERS. MEASUREMENT
STANDARDS AND TEST EQUIPMENT IMPLEMENTATION PER REQUIREMENTS OF MIL
SPECIFICATIONS ARE VERIFIED BY INSPECTION. TORQUE CERTIFICATION IS
VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION

LEAK TEST IS VERIFIED BY INSPECTION.

TESTING

FUNCTIONAL TEST IS MONITORED BY INSPECTION TO VERIFY FLOWRATE IS WITHIN
SPECIFIED LIMITS.

HANDLING/PACKAGING

HANDLING, PACKAGING, AND STORAGE REQUIREMENTS ARE VERIFIED BY
INSPECTION.

(D) FAILURE HISTORY

NO APPLICABLE FAILURE HISTORY.

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(E) OPERATIONAL USE

FAILURE IS INDICATED BY TALKBACK AND ON-BOARD FLOW INSTRUMENTATION.
INTERCHANGER FLOW OF THE AFFECTED LOOP WILL BE BELOW THE REQUIRED FLOW
RATE TO MAINTAIN LRU'S FROM OVERHEATING IN AVIONICS BAYS 1 AND 2 IN THE
EVENT OF LOSS OF THE OTHER LOOP; LOSS OF FREON LOOP DEFINITION. ENTRY A
NEXT PRIMARY LANDING SITE.

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