

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : ATMOSPHERIC REVIT. FMEA NO 06-1B -0548 -4 REV:09/07/8

ASSEMBLY : WATER PUMP CRIT. FUNC: 1F
 P/N RI : MC621-0008-0455/56 CRIT. HDW: 2
 P/N VENDOR: SV755547 HAM STD VEHICLE 102 103 104
 QUANTITY : 1 EFFECTIVITY: X X X
 : ONE IN LOOP 1 PHASE(S): FL LO X OO X DO X LS
 :

REDUNDANCY SCREEN: A-PASS B-PASS C-PAS
 PREPARED BY: APPROVED BY: APPROVED BY (NASA):
 DES N. K. DUONG W/DES *[Signature]* SSM *[Signature]*
 REL N. L. STEISSLINGER REL *[Signature]* REL *[Signature]*
 QE D. STOICA ASQE *[Signature]* QE *[Signature]*

ITEM:
 CHECK VALVE, LOOP 1 PUMP PACKAGE

FUNCTION:
 THIS SHUTTLE-BALL CHECK VALVE IS A THREE ORIFICE ASSEMBLY IN WHICH A BALL IS SHUTTLED IN POSITION OVER THE UNUSED ORIFICE BY THE FLOW PRESSURE OF THE OPERATING PUMP TO BLOCK BACK FLOW THROUGH THE NON-OPERATING PUMP AND PROVIDE A FLOW PATH FOR THE OPERATING PUMP.

FAILURE MODE:
 EXTERNAL LEAKAGE

CAUSE(S):
 MECHANICAL SHOCK, VIBRATION, CORROSION, MATERIAL DEFECT

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

(A) LOSS OF REDUNDANCY - LOSS OF ONE WATER COOLANT LOOP.
 (B) LOSS OF COOLING OF WATER COOLANT LOOP ONE. FREE WATER IN CABIN.
 (C) POSSIBLE EARLY MISSION TERMINATION FOR LOSS OF ONE WATER COOLANT LOOP.
 (D) POTENTIAL LOSS OF CREW/VEHICLE UPON SUBSEQUENT LOSS OF REDUNDANT WATER COOLANT LOOP.

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

(A) DESIGN
 THE CHECK VALVE IS MADE OF STAINLESS STEEL CRES AISI 347. IT IS BRAZED TO THE OUTLET MANIFOLD. A RUBBER VITON SEAL IS USED BETWEEN THE PUMP OUTLET AND THE CHECK VALVE. THE SHUTTLE BALL IS MADE OF TEFLON. SYSTEM CONTAINS HIGH PURITY AND LOW O2 CONTENT WATER.

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(B) TEST

ACCEPTANCE TEST - INTERNAL AND EXTERNAL LEAK, PROOF TEST, FLOW VS. DELTA P TESTS PERFORMED. OUTPUT PRESSURE RISE OF 46.5 +/- 1.2 PSID AT 97 LB/HR.

QUALIFICATION TEST - DIELECTRIC AND TWO AND THREE PHASE CHECKS DONE OUTPUT PRESSURE RISE OF 46.5 +/- 1.2 PSID AT 970 LB/HR. INSULATED RESISTANCE OF 100 MEGOHM MINIMUM. EMI/EMC OF 1 VOLT PER MOTOR SUBJECTED TO RANDOM VIBRATION SPECTRUM ENVELOPE OF 20 TO 150 HZ INCREASING AT 6 DB/OCTAVE TO 0.03 G**2/HZ, CONSTANT AT 0.03 G**2/HZ FRC 150 TO 1000 HZ, DECREASING AT 6 DB/OCTAVE FROM 1000 TO 2000 HZ FOR 4 MINUTES PER AXIS IN THREE ORTHOGONAL AXES. DESIGN SHOCK - THREE TERMINAL SAWTOOTH PULSES OF 20 G PEAK AMPLITUDE AND 11 MS DURATION APPLIED IN 300 DIRECTIONS ALONG EACH OF THREE ORTHOGONAL AXES.

IN-VEHICLE TESTING - SYSTEM DECAY TEST IS PERFORMED AT 85 - 95 PSIG. CC/MIN MAX LEAKAGE. PUMP OUT PRESSURE AND ACCUMULATOR QUANTITY ARE CONTINUOUSLY MONITORED WHEN THE VEHICLE IS POWERED UP AND SERVE AS AN INDICATION OF EXTERNAL LEAKAGE.

OMRSD - PUMP ACCUMULATOR QUANTITY AND OUTLET PRESSURE ARE CONTINUOUSLY MONITORED WHILE THE VEHICLE IS POWERED UP DURING EACH TURNAROUND, AND SERVE AS AN INDICATION OF EXTERNAL LEAKAGE. WATER IS SAMPLED PER SPE SE-S-0073 DURING SERVICING.

(C) INSPECTION

RECEIVING INSPECTION

INCOMING MATERIALS ARE VERIFIED FOR MATERIAL AND PROCESS CERTIFICATION.

CONTAMINATION CONTROL

CORROSION PROTECTION IS CHECKED AND VERIFIED. ASSEMBLY CLEANLINESS IS CHECKED AND MAINTAINED EXTERNALLY PER HS 1550 REQUIREMENT. INTERNAL CLEANLINESS IS MAINTAINED PER HS 3150 CE1.

ASSEMBLY/INSTALLATION

MACHINED PARTS ARE INSPECTED DIMENSIONALLY IN ACCORDANCE WITH REQUIREMENT. CRITICAL SEALING SURFACE IS VISUALLY INSPECTED UNDER 10 MAGNIFICATION TO PRECLUDE ANY IMPERFECTION OR FLAW. ADHESIVE BONDING OF COMPONENTS ARE VERIFIED PER DRAWING SPEC. WATER LEAK DETECTION (BUBBLE TEST) IS VERIFIED. END SURFACE FINISH OF VALVE SEAT IS VERIFIED PER DRAWING REQUIREMENT.

CRITICAL PROCESSES

HEAT TREATMENT IMPOSED ON COMPONENTS IS VERIFIED BY INSPECTION. BRAZING OF TUBE TO FLANGE IS VERIFIED PER REQUIREMENT.

NONDESTRUCTIVE EVALUATION

LEAK TEST IS VERIFIED BY INSPECTION.

TESTING

ATP IS VERIFIED BY INSPECTION.

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HANDLING/PACKAGING

PACKAGING FOR STORAGE AND SHIPMENT IS VERIFIED BY INSPECTION.

(D) FAILURE HISTORY

NO FAILURE HISTORY APPLICABLE TO EXTERNAL LEAKAGE FAILURE MODE. THE CHECK VALVE HAS SUCCESSFULLY PERFORMED WITHOUT FAILURE THROUGH THE DURATION OF THE SHUTTLE PROGRAM.

(E) OPERATIONAL USE

TBS.