

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : ATMOSPHERIC REVIT. FMEA NO 06-1B -0547 -4 REV: 09/07/

ASSEMBLY : WATER PUMP CRIT. FUNC: 1  
P/N RI : MC621-0008-0455/56 CRIT. HDW: 1  
F/N VENDOR: SV729708 HAM STD VEHICLE 102 103 104  
QUANTITY : 3 EFFECTIVITY: X X X  
: LOOP 1 - 2 PUMPS PHASE(S): PL LO X OO X DO X LS  
: LOOP 2 - 1 PUMP

PREPARED BY: DES N. K. DUONG  
REL N. L. STEISSLINGER  
QE D. STOICA

REDUNDANCY SCREEN: A-PASS B-N/A C-PA  
APPROVED BY: (NASA):  
SSM  
REL  
QE

*U-DES*  
*REL*  
*QE*

*Approved for LASCOE*  
*Approved for I COVERED*

ITEM:

PUMP, WATER COOLANT

FUNCTION:

PROVIDES THE MOVING FORCE FOR WATER CIRCULATION IN THE WATER COOLANT LOOPS. LOOP ONE CONTAINS TWO PUMPS AND LOOP 2 CONTAINS ONE PUMP.

FAILURE MODE:

LOSS OF OUTPUT - LOOP 2 PUMP

CAUSE(S):

MECHANICAL SHOCK, VIBRATION, CONTAMINATION, CORROSION, ELECTRICAL FAIL

EFFECT(S) ON:

(A) SUBSYSTEM (B) INTERFACES (C) MISSION (D) CREW/VEHICLE

(A) LOSS OF REDUNDANCY - LOSS OF ONE WATER COOLANT LOOP.

(B) NO EFFECT - REDUNDANT LOOP PROVIDES COOLING.

(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. 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

THE PUMP IS A CENTRIFUGAL 2 STAGE TYPE DRIVEN BY A CANNED TYPE INDUCTIVE MOTOR OPERATING ON 115 VAC, 400HZ, 3 PHASE POWER SUPPLY. THE PUMP PACKAGE HAS AN INLET FILTER (10/25 MICRON) AND THE PUMP HAS 51 MICRON INLET AND OUTLET FILTERS TO CONTROL CONTAMINATION. THE ARMATURE AND PUMP IMPELLERS ARE SUPPORTED BY TWO CARBON SLEEVED BEARINGS WHICH ARE LUBRICATED BY A HYDRODYNAMIC LAYER OF WATER FLOWING THROUGH THE PUMP. FLUID ENTERS THE PUMP INLET VIA TWO STAGE IMPELLERS AND FLOWS BETWEEN MOTOR AND PUMP HOUSING CAVITY TO EXIT TUBE. PUMP IS MADE OF STAINLESS STEEL EXCEPT FOR BEARINGS AND WEAR FITTINGS WHICH ARE CARBON. ALL S.

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ARE TEFLON. ALL MATERIALS ARE CORROSION RESISTANT AND COMPATIBLE WITH WATER.

(B) TEST

ACCEPTANCE TEST - INTERNAL AND EXTERNAL LEAK, PROOF TEST, FLOW VS. DEPTH TESTS PERFORMED. OUTPUT PRESSURE RISE OF 46.5 +/- 1.2 PSID AT 970 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. INSULATION RESISTANCE OF 100 MEGOHM MINIMUM. EMI/EMC OF 1 VOLT PER METER. 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 FROM 150 TO 1000 HZ, DECREASING AT 5 DB/OCTAVE FROM 1000 TO 2000 HZ FOR 15 MINUTES PER AXIS IN THREE ORTHOGONAL 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 - THREE-PHASE OPERATION IS VERIFIED IN PUMP CHECKS. PUMP PRESSURES ARE CONTINUOUSLY MONITORED WHILE THE VEHICLE IS POWERED UP.

OMRSD - THREE-PHASE OPERATION IS VERIFIED IN PUMP CHECKS BEFORE THE FIRST FLIGHT OF EACH ORBITER AND AS A CONTINGENCY FOR LRU RETEST. PUMP PRESSURES ARE CONTINUOUSLY MONITORED WHILE THE VEHICLE IS POWERED UP DURING EACH TURNAROUND. WATER IS SAMPLED PER SPEC SE-S-0073 DURING SERVICING.

(C) INSPECTION

RECEIVING INSPECTION

INCOMING PARTS ARE VERIFIED FOR MATERIAL, PHYSICAL PROPERTIES AND PROCESS CERTIFICATION.

CONTAMINATION CONTROL

CLEANLINESS IS MAINTAINED AND VERIFIED TO REQUIRED LEVEL. INSPECTION VERIFIES CORROSION PROTECTION PROVISIONS.

ASSEMBLY/INSTALLATION

DIMENSIONS AND SURFACE FINISHES VERIFIED BY INSPECTION. ORIENTATION OF CONNECTOR MASTER KEYWAY IS DETERMINED AND VERIFIED BY INSPECTION. MOUNTING FEET COATED FOR ELECTRICAL BONDING PURPOSE IS VERIFIED.

NONDESTRUCTIVE EVALUATION

LEAK CHECK IS VERIFIED BY INSPECTION.

CRITICAL PROCESSES

WELD OF THE FILTER HOUSING TO PUMP INLET FLANGES IS VERIFIED. TUBE WELDS ARE VERIFIED BY INSPECTION. ADHESIVE BONDING OF FILTER IS CHECKED.

TESTING

ATP IS VERIFIED BY INSPECTION.

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HANDLING/PACKAGING  
ALL PACKAGING FOR SHIPMENT IS VERIFIED BY INSPECTION.

(D) FAILURE HISTORY  
NO FAILURE HISTORY APPLICABLE TO LOSS OF OUTPUT FAILURE MODE. THE PTP  
HAS SUCCESSFULLY PERFORMED WITHOUT FAILURE THROUGH THE DURATION OF THE  
SHUTTLE PROGRAM.

(E) OPERATIONAL USE  
TBS.