SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM :ATMOSPHERIC REVIT. FMEA NO 06-1B -0501 •4 REV:05/02/88

ASSEMBLY :WATER COOLANT LOOP
P/N RI :MC276-0020-1371/1373
P/N VENDOR:502060-1371/1373 SYMETRICS
QUANTITY :4
:2 FILL
:2 DRAIN

CRIT. FUNC: 2P
CRIT. HDW: 3

VEHICLE	102	103	104
EFFECTIVITY:	X	X	X

PHASE(S): PL LO X OC X DO X LS

REDUNDANCY SCREEN: A-FAIL B-FAIL C-PASS

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ITEM:
DISCONNECT WITH CAPS - FILL AND DRAIN, AIRBORNE HALF

FUNCTION:
PROVIDE THE ATTACHMENT POINTS FOR SERVICING THE WATER COOLANT LOOPS AND ADJUSTING ACCUMULATOR QUANTITY.

FAILURE MODE:
INTERNAL LEAKAGE

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

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

(A,B,C,D) NO EFFECT.

(E) FUNCTIONAL CRITICALITY EFFECT - FIRST FAILURE, OF QD, IS UNDETECTED. SECOND FAILURE, CAP LEAKAGE, RESULTS IN LOSS OF A COOLANT LOOP. THIRD FAILURE, IN REMAINING COOLANT LOOP, MAY RESULT IN LOSS OF CREW/VEHICLE. SCREEN A FAILS BECAUSE THE CAP CANNOT BE LEAK TESTED. SCREEN B FAILS BECAUSE LEAKAGE OF QD OR CAP IS NOT DETECTABLE UNLESS THE REDUNDANT SEAL FAILS.

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

(A) DESIGN
MALE AIRBORNE QD IS A 3/8 INCH PUSH-PULL QUICK DISCONNECT COUPLING, OF STAINLESS STEEL CONSTRUCTION (CRES 15-5 PH AND 17-7 PH), AND HAS A SCREW-ON PRESSURE CAP ATTACHED WITH LANYARD. PRESSURE CAP SEAL IS ETHYLENE PROPYLENE RUBBER (EPR). SPRING LOADED STAINLESS STEEL POPPET. WHEN DISCONNECTED, THE POPPET CLOSES. EPR O-RING AND TEFLON BACK-UP RING FORM A DOUBLE SEAL BETWEEN THE POPPET AND THE HOUSING.

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(B) TEST

ACCEPTANCE TEST - PROOF PRESSURE 90 PSIG WITH DEIONIZED WATER. LEAK TEST WITH GHE (1 X 10 EXP -4 SCCS MAX) FOR UNCOUPLED CONFIGURATION AND COUPLED CONFIGURATION (WITH THE USE OF A GSE TOOL). CAP IS ALSO LEAK TESTED USING A HOLLOWED MALE HALF. FLUID LOSS TEST - 0.22 CC MAX PER CYCLE.

QUALIFICATION TEST - TEMP: CYCLED THREE TIMES BETWEEN -65 AND -160 F. HUMIDITY: 8-100%. SALINITY: 1% BY WEIGHT. ACCELERATION 5 G IN ALL AXES CRASH LOADS: 20 G IN ALL AXES. SIDE LOADS: 200 INCH-LB. TRANSIENT VIBRATION TEST: ONE SWEEP OF SINUSOIDAL VIBRATION FROM 5-35 HZ AT AN ACCELERATION AMPLITUDE OF PLUS AND MINUS 0.25 G, ONE OCTAVE/MINUTE SWEEP RATE. RANDOM VIBRATION TEST: ACCELERATION SPECTRAL DENSITY INCREASING AT 6 DB/OCTAVE FROM 20 TO 70 HZ, CONSTANT AT 0.1 G**2/HZ FROM 70 TO A POINT WHERE INCREASING AT 6 DB/OCTAVE WILL ACHIEVE 0.2 G**2/HZ AT 150 HZ, CONSTANT AT 0.2 G**2/HZ FROM 150 TO 300 HZ, DECREASING AT 6 DB/OCTAVE TO 0.12 G**2/HZ AND THEN CONSTANT TO 1000 HZ, DECREASING AT 9 DB/OCTAVE FROM 1000-2000 HZ. THE UNITS ARE PRESSURIZED TO 10 AND 90 PSIG WHILE VIBRATED FOR 48 MINUTES IN EACH AXIS; NO VISIBLE LIQUID LEAKAGE ALLOWED. BURST PRESSURE: 180 PSIG.

IN-VEHICLE TESTING - SYSTEM DECAY TEST IS PERFORMED AT 85 - 95 PSIG, WHICH WOULD REVEAL QD INTERNAL LEAKAGE.

OMRSD - CAP SEAL AND MATING SURFACES ARE VISUALLY INSPECTED WHENEVER CAP IS REMOVED. DURING TURNAROUND THE WATER COOLANT LOOPS ARE USED TO SUPPORT VEHICLE COOLING AND THE LOOP PRESSURES AND QUANTITIES ARE VERIFIED.

(C) INSPECTION

RECEIVING INSPECTION
RAW MATERIALS ARE SENT TO A TEST LAB FOR MATERIAL/CHEMICAL ANALYSIS CERTIFICATION.

CONTAMINATION CONTROL
CLEANLINESS TO LEVEL 100A OF MA0110-301 PER SPECIFICATION IS VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION
RAW MATERIAL INSPECTED PRIOR TO MACHINING. DIMENSIONS AND SURFACE FINISHES VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION
PENETRANT INSPECTION IS VERIFIED BY INSPECTION.

CRITICAL PROCESSES
HEAT TREAT IS VERIFIED BY INSPECTION.

TESTING
ACCEPTANCE TEST VERIFIED BY INSPECTION.

HANDLING/PACKAGING
HANDLING AND PACKAGING REQUIREMENTS ARE VERIFIED BY INSPECTION;

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(D) FAILURE HISTORY
NO FAILURE HISTORY APPLICABLE TO INTERNAL LEAKAGE FAILURE MODE. THE DISCONNECTS HAVE SUCCESSFULLY PERFORMED WITHOUT FAILURE THROUGH THE DURATION OF THE SHUTTLE PROGRAM.

(E) OPERATIONAL USE
1. CREW ACTION
ACTIVATE STAND-BY H2O COOLANT LOOP OR PERFORM POWERDOWN FOR LOSS OF ALL H2O COOLING.

2. TRAINING
CURRENT ECLSS TRAINING COVERS THE EFFECT OF THIS FAILURE.

3. OPERATIONAL CONSIDERATIONS
A. FIRST FAILURE IS UNDETECTABLE.
B. REAL TIME DATA SYSTEM ALLOWS FOR GROUND MONITORING.
C. MISSION TERMINATION TO NEXT PLS AFTER FIRST FAILURE OF COOLANT LOOP.