SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM :ACTIVE THERMAL CONTROL FMEA NO 06-3C -0103 -1, REV:08/23/

ASSEMBLY :FREON PUMP ASSEMBLY CRIT. FUNC:
P/N RI :MC250-0001-0436 CRIT. HDW:
P/N VENDOR:SV729716 VEHICLE EFFECTIVITY: 102 X, 103 X, 104 X
QUANTITY :2 PHASE(S): PL X LO X OO X DO X LS
:TWO,ONE PER LOOP
:

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

PREPARED BY:		APPROVED BY	APPROVED BY (NASA)
DES	O. TRAN	DES	SSM
REL	D. RISING	REL	REL
QE	W. SMITH	QE	QE

ITEM:
ACCUMULATOR, FREON COOLANT LOOP.

FUNCTION:
MAINTAINS LOOP PRESSURE ABOVE THE FREON VAPOR PRESSURE AND COMPENSATES FOR FREON THERMAL EXPANSION AND CONTRACTION.

FAILURE MODE:
INABILITY TO OPERATE, LOSS OF ABILITY TO ACCOMMODATE VOLUMETRIC CHANGE. EXTERNAL LEAKAGE (GN2), INTERNAL LEAKAGE ACROSS BELLOWS.

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

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

(A) UNABLE TO COMPENSATE FOR THERMAL EXPANSION AND CONTRACTION. MAY RESULT IN PUMP CAVITATION OR RUPTURE OF FREON LOOP.

(B) POSSIBLE LOSS OF ONE FREON LOOP FOR VEHICLE COOLING.

(C) POSSIBLE LOSS OF MISSION. EARLY MISSION TERMINATION FOR LOSS OF O FREON LOOP.

(D) SECOND ASSOCIATED FAILURE (LOSS OF REDUNDANT FREON COOLANT LOOP) W 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
DESIGN SAFETY FACTOR - PROOF PRESSURE OF 1.5 AND BURST PRESSURE OF 2.0 TIMES MAXIMUM OPERATING PRESSURE. TEFLON GUIDES FOR BELLOWS. EXTERNAL ALUMINUM SURFACE IS PROTECTED WITH ALODINE 1200 FOR CORROSION PROTECTION. ACCUMULATOR HOUSING IS FABRICATED FROM A SEAMLESS ALUMINU TUBE. PUMP INLET FILTER (25 MICRON ABSOLUTE) PROTECTS AGAINST CONTAMINATION. BELLOWS IS FABRICATED OF WELDED STAINLESS STEEL. ALL ACCUMULATOR MATERIAL IS COMPATIBLE WITH FREON AND NITROGEN.

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(B) TEST

QUALIFICATION TEST - PUMP PACKAGE IS QUALIFICATION TESTED FOR 100 MISSION LIFE. ACTUAL ACCUMULATOR RUPTURE PRESSURE OF 576 PSIG. PUMP PACKAGE VIBRATION TESTED AT 0.023 G^2/HZ FOR 84 MIN/AXIS, SHOCK TESTED AT +/- 20 G EACH AXIS.

ACCEPTANCE TEST - FUNCTIONAL PERFORMANCE AND PROOF AND LEAK CHECKS PERFORMED IN ATP.

OMRSD - PRE AND POST-FLIGHT CHECKOUT USING QUANTITY MEASUREMENT WILL DETECT OPERATIONAL STATUS. FREON CHEMICAL ANALYSIS PER SE-S-0073 DURING SERVICING. GSE FILTERS VEHICLE FREON THROUGH 10 MICRON (ABS) FILTER DURING SERVICING.

(C) INSPECTION

RECEIVING INSPECTION
RAW MATERIAL AND PURCHASED COMPONENTS REQUIREMENTS ARE VERIFIED BY RECEIVING INSPECTION. ID PERFORMED.

CONTAMINATION CONTROL
SYSTEM FLUID SAMPLES ARE PERIODICALLY ANALYZED FOR CONTAMINATION. 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.

ASSEMBLY/INSTALLATION
PARTS PROTECTION, MANUFACTURING PROCESSES, INSTALLATION AND ASSEMBLY OPERATIONS ARE VERIFIED BY INSPECTION ON SHOP TRAVELERS.

NONDESTRUCTIVE EVALUATION
RADIOGRAPHIC INSPECTION AT VENDORS TO DETERMINE THAT INTERNAL METAL BELLOWS ARE FREE FROM DAMAGE.

CRITICAL PROCESSES
WELDING AND ALODINING ARE VERIFIED BY INSPECTION.

TESTING
ALL TESTS ARE MONITORED TO VERIFY FUNCTIONAL OPERATION IS WITHIN SPECIFIED LIMITS.

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

(D) FAILURE HISTORY
NO FAILURE HISTORY.

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(E) OPERATIONAL USE

LOSS OF ACCUMULATOR N2 CHARGE, PUMP CAVITATION OR STUCK BELLOWS ARE INDICATED BY ON-BOARD FREON FLOW ALARM WHEN FREON PRESSURE AND TEMPERATURE AT PUMP INLET REACHES VAPORIZATION POINT. FREON PUMP WILL TURNED OFF AND LOSS OF ONE FREON LOOP POWERDOWN WILL BE PERFORMED. ENT AT NEXT PRIMARY LANDING SITE.

GROUND CONTROLLER WILL IDENTIFY HARDWARE FAILURE IN CASES WHERE PRESSUR INCREASES, SUCH AS STUCK BELLOWS AND INCREASING TEMPERATURE. IF PRESSU EXCEEDS MAXIMUM OPERATING PRESSURE OF THE FREON LOOP COMPONENTS, THE FREON PUMP WILL BE TURNED OFF AND LOSS OF ONE FREON LOOP POWERDOWN WILL BE PERFORMED. ENTRY AT NEXT PRIMARY LANDING SITE.