

NAME P/N QTY	CRIT	FAILURE MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
WATER LINE & VENT TUBE ASSEMBLY, ITEM 102 ----- 0102-82437-27 (RUCOTHANE) (1) ----- 0102-82437-28 (HELASTIC) (1)	2/1R	102FM16 External leakage, water into SSA from tubing, or at interface with HTS or MWC. Defective Material: Hose clamp, or O-ring. Defective interface at HTS. Missing or loose clamp screw.	END ITEM: Leakage from water line into suit vent loop. GFE INTERFACE: Loss of cooling capability. Loss of water from water reservoir. Possible fogging of helmet. MISSION: Terminate EVA. Loss of use of one EMU. CREW/VEHICLE: None for first failure. Loss of crewman if SOP fails. TIME TO EFFECT /ACTIONS: Minutes. Activate the Purge Valve. Return to airlock. TIME AVAILABLE: Minutes. TIME REQUIRED: Seconds. REDUNDANCY SCREENS: A-PASS B-PASS C-PASS	A. Design - The EVA water tubing in the Water Line and Vent Tube Assembly is designed to an ultimate pressure of 50 psid, well above the normal operating pressure of 18-23.5 psid. This normal pressure is checked before each flight. Design also provides for a maximum water leakage of less than 2 cc/hr for the HUT portion of H2O cooling lines. Hose clamp screws are torqued to 9 in-lbs to prevent them from coming loose. A hose bead .040 inch larger than the I.D. of the EVA tubing is machined into the end of the MWC plug end to provide a positive sealing surface and a mechanical stop, which prevents the tube from being pulled off. A 63 surface finish is specified for the HTS fiberglass interface with the water line to provide a smooth surface for sealing with the Buna-N O-rings in hose connector flange. B. Test - Acceptance: Component - See Inspection. PDA: Water lines are leak tested at 23.5 psig for Pivoted HUT and 17.7 psig for Planar HUT and proof tested at 37.5 psig at the HUT assembly level during PDA. In accordance with ILC Documents 0111-70028J and 0111-710112. Certification: Bench testing to Pivoted HUT S/AD requirements was performed during "delta-cert" testing at ILC Dover (ref. Cert Test Report for the SSA, ILC Document 0111-70027). Ultimate pressure test of waterlines at 50 psig performed at ILC Dover (ref. 0111-70027). The Waterline Assembly on the cert HUT has been in use for approximately 2400 hours without a failure. Vibration testing at HSD has concluded that properly installed screws will not lose torque in the S/AD vibration environments. For the Planar HUT, certification testing was performed to the S/AD requirements including an ultimate pressure test of waterlines at 50 psig performed at ILC-Dover (ref. 0102-711982). In addition, vibration testing at HSD has concluded that properly installed screws will not lose torque in the S/AD vibration environments. (ref TER 3807). C. Inspection - Components and material manufactured to ILC requirements at an approved supplier are documented from procurement through shipping by the supplier. ILC incoming receiving inspection verifies that the hardware received are as identified in the procurement documents, that no damage has occurred during shipment and that supplier certifications have been received which provide traceability information. The following MIP's are performed during the HUT assembly manufacturing process to assure the failure causes are precluded from the fabricated item: Verification of screw torque and loctite application. Verification that tubes clamp is seated properly over the hoses and hose ends are butted against the flange. During PDA per ILC Document 0111-70028J for Pivoted HUT's and 0111-710112 for Planar HUT's a MIP is performed to verify successful completion of the water line leak test.

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D. Failure History -

J-EMU-102--002 (04/16/81). Leak of HUT/tube interface. Used Tygon tube procedure for EVA tube. Initiated new procedure for EVA tube.

B-EMU-102-A037 (11/9/99): Leak at interface of the water multiple connector. Most probable cause is thin EVA tube wall. ILC drawing revised to add wall thickness and ID/concentricity requirements to tubing used in future WLVTAs and Jumper Loops. ILC ECO# 002-0080 adds inspection to verify EVA wall thickness.

E. Ground Turnaround -

Tested for non-EET processing per FEMU-R-001, Water Servicing, Leakage and Gas Removal. FEMU-R-001 Para 8.2 EMU Preflight KSC Checkout for EET processing.

F. Operational Use -

Crew Response -

Pre/PostEVA: Trouble shoot problem if no success, consider third EMU if available. EMU no go for EVA.

EVA: Open helmet purge valve for CO2 control and anti-fog as required. Terminate EVA.

Training - No training specifically covers this failure mode.

Operational Considerations - EVA checklist verify hardware integrity and systems operational status prior to EVA. Flight rules define go/no go criteria related to EMU ventilation flow pressure integrity. Real Time Data System allows ground monitoring of EMU systems.

EXTRAVEHICULAR MOBILITY UNIT
SYSTEMS SAFETY REVIEW PANEL REVIEW
FOR THE
I-102 HARD UPPER TORSO (HUT)
CRITICAL ITEM LIST (CIL)
EMU CONTRACT NO. NAS 9-97150

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