

NAME P/N QTY	FAILURE MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
54W/SEPARATOR/PUMP/M OILR ASSEMBLY ITEM 123 5478/904-0 119	1234M12c Ignition.  CAUSE: Heat source or spark in the motor electronics cavity.	EMI SWING: Loss of Fan/Pump/Separator assembly with Ignition.  GFE INTERFACE: Loss of RPM verification loop pressure integrity due to fire.  MISSION: Abort EVA. Loss of use of one EMU.  CREW/VEHICLE: Possible loss of crewman with Ignition.	A. Design - The design of the motor portion is a brushless DC, using Hall sensors (magnetic) as position sensors. There are no mechanical commutators or sliprings in the design to generate sparks. The Hall sensors, transistors, diodes, and relays are hermetically sealed to prevent damage due to contamination, humidity, and pressure fluctuations. Semiconductor failure is minimized through the use of high reliability components. Established reliability capabilities (Level B) and radiators (Level B) are used and are qualified to the requirements of their respective MIL specs and thermal shocked per condition B of MIL-STD-202 Method 967. Microcircuits are qualified to the requirements of MIL-H-10510 and receive burn-in per MIL-STD-883. The transistors and diodes are qualified to the requirements of MIL-B-79100 and receive the burn-in of JANNEY level parts per the applicable methods, 1030, 1032, and 1040, of MIL-STD-750. The electronic components are operating within the power derating requirements of ENV2706. The printed circuit boards are fiberglass/epoxy per MIL-P-15949 type G1 or polyimide per MIL-P-15949 type G1 and manufactured per NSFC-STD-134. Parts cleaning and soldering per NSFC-STD-136 and WWS300.4 (3A-1). The board assemblies are hand mounted to the motor case to provide a thermal transfer path between the board heatinks and the motor case to direct heat away from the electronic components. The board assemblies are conformal coated per MIL-A-46156 (How Curing ENV3160) for environmental protection and to minimize arcing potential. All wiring used in the motor is M22759/11 (cotton insulated). Soldering is per WWS300.4 (3A-1) and wire crimping is per ENV6700 (based on NSC-SPEC-0-2A). All wires are strain relieved. There are two series seals between the vent loop and the PC board which consists of two O-rings made from silicone rubber, EE-N-765 C1, 2a or C1, 2b or, 50. Silicone was used because it has the best thermal vacuum stability and the material (silicone) is not affected by aging and has an expected life of over 20 years. The motor has an automatic shut off if the RPM falls below 13,000 (after startup).  B. Test - Component Acceptance Test - The item is performance tested in the EVA n-10A mode. For the various set conditions in the EVA mode, the motor

NAME P/N QTY	CRIT	FAILURE MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
	R/1	1231M12:		<p>current shall be 2.6 amps max. for the various set conditions in the IVA mode, the motor current shall be 4.7 amps max. The item is tested for max current draw during start-up. The max start-up current shall be 8 amps within the first five seconds of start-up. The item is then subjected to a burn-in cycle test where it must operate for 24 hours. It is cycled 3 times at 3 hours IVA and 3 hours EVA conditions. The item is performance tested again in the EVA conditions, as per above.</p> <p>IVA test per SEMI-60-010 -          The item is performance tested in the IVA mode and the PRESS mode. For the various set conditions in the EVA mode, the motor current shall be 2.6 amps max, and 4.7 amps max in the PRESS mode set conditions.</p> <p>Certification test -          The item completed 10,000 hours of operation and 8400 on/off cycles exceeding the 15 year certification requirement by more than a factor of three. The 15 year structural vibration and design shock were completed 88/84. The following engineering changes have been incorporated and certified since this same certification: 42806-343-35 (change power consumption requirements - more amps), 42806-606 (incorporate Nitronic 60 retaining nuts), 42806-426 (test cup change to assure a good weld), 42806-618 (water pump change to 10-x inspection in areas susceptible to contamination and remove break edges and deburring operations to class MSL 2-MS-123-078 42806-814 (change bearing limited life requirements).</p> <p>C. Inspection -          All wires used in the assembly are 100% inspected for proper assembly and for nicks, cuts and other faults which might cause a short to ground. The motor current is checked at initial build-up then after boards have been wired, after stacking the PC boards, after assembly of cover, and after all assembly and testing is completed. Both MSD and government WPI exist on the final current check. All soldering is inspected by MS QA and OCAS QA per MMS300.4 (1A-1). After assembly of all electronics, the motor is subjected to a powered vibration test to verify all connections and components are sound. Performance is verified after vibration testing.</p>

267

SEMU-44-001F  
 Page 761  
 Change 3

CDL  
EMU CRITICAL ITEMS LIST

Page: 3  
Date: 01/06/90

07/01/89 SUPERSEDED / /

AMLYE1

NAME P/N REV	CRIT	FAILURE MODE & CAUSES	FAILURE EFFECT	REASONABLE FOR ACCEPTANCE
	1/1	WZJFNIZ:		

D. Failure History -  
Failure History None.

E. Ground Turnaround -  
No specific test will detect test source or operator.

F. Operational Use -  
Crew Response -  
Preventive/Recovery/EAs: No response possible.  
Training - No training specifically covers this failure mode.  
Operational Considerations - Not applicable.

SEMUL44-001F  
Page 762  
Change 3

268

EMU - 851