CIL
EMU CRITICAL ITEMS LIST

05/31/90 SUPERSEDES 01/02/90 ANALYST:

NAME P/N QTY	CRIT	FAILURE MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
PRESSURE TRANSDUCER, ITEM 215 SV778475-6 (1)	2/1RR	215FM02A: Output high. CAUSES: Failure of internal electrical wiring or strain gauge due to an open or short circuit.	END ITEM: Continuous indication of high SOP pressure. GFE INTERFACE: Loss of accurate SOP pressure reading. CWS will calculate too much time remaining for breathable O2. MISSION: None. False indication that a surplus of SOP oxygen exists. CREW/VEHICLE: None for single failure. Possible loss of crewman with loss of SOP.	A. Design - Shorting of the 215 wiring and strain gauge is prevented through the following design features. The transition between the gauges and the sensor header is accomplished through the use of an intermediate interconnect ring. The gauges are connected to the thick film ring pads through .001 inch diameter gold wire that is bonded at each end. The sensor header pins then pick up the ring pads when the header is assembled in place. The sensor header module connection is achieved through short lengths of teflon coated #32 gauge wire. The external connector/electronics interface is achieved through #26 gauge teflon insulated wire. All inter connecting wires are left as short as possible but with sufficient strain relief to prevent breakage. During assembly, all wiring can be visibly inspected once in place to insure they are not rubbing any edges. B. Test - Component Acceptance Test - The pressure transducer output is checked at the vendor (Kulite Semiconductor Inc.) per section 10.7 (Error Band Test) of Acceptance Test Procedure ATP 2161. This test consists of checking the transducer output at increments from 0 psig to 7400 psig and back to 0 psig at temperatures of 70 degrees F, 0 degrees F, and 100 degrees F. Component Functional Calibration Test per: AI-E-215 - The item is pressurized with a known pressure over the ranges of 0-7400 psig and 7400-0 psig. The output of the transducer when compared to the known pressure must be within 259 psig, except at 0 psig it shall be within 185 psig. An incorrect signal would be detected at this test. SEI PDA Testing per SEMU-60-007 - The item is checked for proper operation by pressurizing the end item (SOP) to a known pressure of 7200-7650 psig. The SOP is then allowed to blowdown at the rate of 5.26 - 3.46 lbs/hr GO2. The item pressure when compared to the known pressure shall be within 259 psig, except at 0. psig it shall be within 185 psig. Certification Test - The item completed the 15 year structural vibration and shock certification requirement during 10/83. Engineering changes 42806-141 (Preclude the possibility of a cable entry failure), 42806-301 (Eliminate a potential interference between transducer and SOP),

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	2/1RR	213TM02A1		42004-499 (Added weld inspection requirements and a more stringent leakage test) and 42004-500 (Added a voltage conditioning requirement and a more stringent screening procedure) have been incorporated and verified since this configuration was certified.

C. Inspection -
Units are subjected to the following test during assembly. The electronic components in the transducer network are screened to MIL-STD-883 and the hybrid assembly 4625-A-210 II receives burn-in and temperature cycle screen per Exide ATP 82341 to ensure their operation reliability and circuit integrity.
The -4 and -6 are the same except for minor wiring changes to comply with NHB5300.4 (3A-1), improved shield grounding to reduce EMI susceptibility, improved parts traceability, and increased electronics burn-in time. The sensor is visually inspected during assembly to insure proper wire strain relief and that soldering conforms to NHB 5300.4 (3A-1).
1. Vendor Document (ATP 2341) Component Acceptance test related electronic testing with specific sections (10.1) Burn-In Test done at ambient temperature and pressure for (48) hrs. min. (10.2) Insulation Resistance test done at (100) VDC. (10.4) Power Consumption test done at (13.9) VDC.
2. Vendor Document (ESP 2967) Burn-In of Hybrid Circuit temp increase to 257 degrees F for 100 hours at board level.
New Units P/N 0V770173-5 will be subjected to the following inspection tests during assembly.
1. Same as existing units.
2. Test performed on the amplifier level - Vendor document - (ESP 2004/3) Temp Cycle per MIL-STD-883 Method 1010 Condition C (ESP 2967) Burn-in per MIL-STD-883 Method 1015, Condition at 125 (ESP (2008/3) Stabilization per MIL-STD-883 Method 1008, Condition C.

D. Failure History -
J-EMU-213-001 (8-23-83) Transducer read full scale. The full scale reading was the result of an open circuit in the transducer electronics module. The open circuit was the result of a lifted gold lead wire ball from one of the integrated circuit aluminum pads. The lifting of the gold ball connection was attributed to random contamination of

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	2/1RB	[illegible]		the joint before joining. Kulite's MP sheets were changed to add a mandatory visual inspection of chips and bolts for cleanliness prior to joining field units N-EMU-295-0002 (10-7-83). Transducer read high during SOP PDA. High reading was caused by calibration at only one temperature by Kulite. The transducer was successfully recalibrated by Kulite. Kulite's calibration procedure was revised to make calibration at all three calibration temperatures (8-[illegible] 9).

J-EMU-215-002 (4-16-85) The transducer had a high, erratic, reading. This high reading was the result of using the unit in an electromagnetic field of greater magnitude than the transducer design or test limits. The present EMI requirement is being revised to a reduced EMI EMI requirement that accepts temporary EMU EMI induced outages.

B-EMU-215-002 (1-19-87) The transducer had damaged cable connector. This was the result of the use of Scotch weld which made the cable attachment too rigid. The Scotch weld will be deleted in all 4-44 configurations and subsequent.

Related failures:

B-EMU-151-001 (4-22-87) Shield circuit resistance too high. The high resistance was a result of the use of a lubricant on the interfacing connector shell surface. This prevented proper grounding of the mating connector. EC-42007-329-2 adds a grounding ring, provided by Bendix Corp, to all units. There is no impact on certification.

B-EMU-215-0004 (9-23-87) The electrical bonding between the sensor and oxygen manifold was out of specified limits. This was the result of Koropon being applied between the mating surfaces during assembly. Assembly Operation sheets were revised to clarify areas of application.

E. Ground Turnaround -
Tested per FEMU-R-001, Transducer and DCM Gauge Calibration Check, verifies the DCM SOP pressure readout is within 477 psi of the SOP gage (2132).

F. Operational Use -
Crew Response -
EVA : Since EVA termination is required as soon as SOP is flowing and this failure is not detectable, EVA termination would continue.

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	2/1RR	TRAINING:		Special training Standard training Standard EMU training covers this failure mode. Operational Considerations - EVA checklist procedures verify hardware integrity and systems operational status prior to EVA. Flight rules define EMU as lost any time SOP is [illegible]. Real Time Data System allows ground monitoring of EMU systems.

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