

APPENDIX VI

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### PIA TEST DEFINITION (LSS SEMU)

PIA tests are performed after each SEMU build-up. This test series includes twenty-nine individual tests which are briefly described below:

1. CWS Logic Flow Test - all logic flow paths are verified functional in the Caution and Warning System.
2. Tones Test - the tones test verifies a status tone of  $5 \pm 1$  second once the bubble test fails. Upon passing a bubble test a  $1.2 \pm 0.5$  second alert one is verified. A warning tone ( $5 \pm 1$  second) is verified for high suit pressure.
3. DCM Display Test, EVC and FW Current Limiter Test - all DCM displays are verified correct. The EVC and feedwater valve current limiter are verified electrically.
4. High Pressure O<sub>2</sub> Leakage - with PLSS O<sub>2</sub> bottles fully charged, the PLSS O<sub>2</sub> regulators are cycled on and back to off. Bottle pressure decay is then monitored for a 12 hour period. Maximum allowable pressure decay is 22 psig in 12 hours.
5. 113A Leakage - the O<sub>2</sub> fill check valve is verified to a maximum leakage spec of 15.0 scc/hr O<sub>2</sub>.
6. Gas Structural and Leakage - the suit is pressurized to  $6.6 \pm 0.1$  psig for 5 minutes and "no structural deformation" is verified. The positive pressure relief valve (Item 146) function is verified at  $4.7 \pm 5.3$  psid. Suit leakage is verified less than 129 sccm O<sub>2</sub> at EMU level testing or 85.7 sccm O<sub>2</sub> at SEMU level.

7. H<sub>2</sub>O Servicing Leakage and Gas Removal - the water bladders are dumped and then recharged fully. The SEMU is powered up and the H<sub>2</sub>O loops are degassed using the fan/pump/separator and gas trap. Water leakage is then measured using a portable volumetric panel. Maximum leakage allowed is 6 cc/hr. After SCU/DCM adapter is removed, the DCM multiple connector ports are visibly verified not to leak.
8. Comm and Bio-Med validation - SEMU communications are verified using a flight CCA. All bioned system functions are verified.
9. O<sub>2</sub> Actuator Force Measurement - actuator slide and detent force measurements are taken and verified within specifications.
10. 136 Regulation - the feedwater pressure regulator (item 136) is confirmed to supply water to the feedwater shut off valve (item 137) at  $2.9 \pm 0.25$  psi above ambient with a flow rate of 0.1 - 0.2 pph, and at  $2.8 \pm 0.25$  psi at a flow of  $4.9 \pm 0.1$  pph. The feedwater supply pressure is at  $10.0 \pm 0.2$  psig and  $15.0 \pm .2$  for the above requirements.
11. 113D Leakage - suit pressure regulator leakage is verified less than 15 sccm with a suit pressure of  $4.6 \pm .1$  psig over a 10 minute period.
12. 113C Leakage - gas feedwater pressure regulator leakage is verified less than 25 sccm during a 5 minute interval.
13. 113F Orifice Flow Test - flow is verified to be 169 - 281 sccm N<sub>2</sub>.
14. 113G Crack (Gas Feedwater Relief Valve) - relief pressure is verified  $18 \pm$  psig.
15. 113D and 113E Regulation - the performance of the regulators is verified at all combinations of the following:
  - full O<sub>2</sub> bottle pressure
  - low O<sub>2</sub> bottle pressure
  - IV and press setting
  - low suit bleed flow ( $280 \pm 50$  sccm)
  - high suit bleed flow ( $1870 \pm 50$  sccm)
16. 145 Flow - flow of 1.84 scfm O<sub>2</sub> minimum is verified out the vent loop relief valve at 5.3 psig maximum into suit volume at ambient.
17. 121 Leakage, SOP Checkout Circuit Leakage - verifies back leakage through the vent flow sensor (item 121) less than 569 sccm O<sub>2</sub>, and verifies leakage in PLSS/SOP interface loop to be between 1505 to 6815 sccm O<sub>2</sub> at operating pressure.

18. 146 Flow - verifies the positive pressure relief valve (item 146) cracking pressure to be within 4.7 - 5.3 psid. At a pressure of  $5.3 \pm 0.05$  psid the flow out the 146 is confirmed to be 22.8 - 25.8 pph  $O_2$ .
19. DCM Purge Valve Actuation and Flow Test - at a suit pressure of 3.4 - 3.5 psig the purge valve flow is verified to be 3.54 - 4.34 scfm  $O_2$ . The function of the purge valve detent grips and locking function are verified.
20. 147 Flow - the negative pressure relief valve (item 147) flow is verified to be 57.8 pph  $N_2$  minimum into the suit volume at less than 0.8 psid.
21. 128 Leakage - water pressure of 0.9 - 1.1 psig is applied in the reverse flow direction on the pump inlet check valve (item 128). Leakage is measured over a 15 minute period and verified to be less than 56.5 cc.
22. DCM Cooling Control Valve and Common Connector Flow/Delta Test - water transport loop and  $O_2$  vent flow loops are verified for flow conditions at operating  $\Delta P$ 's with and without the SCU connected. The cooling control valve is verified operational.
23. Fan/Pump/Separator/Vent Flow Sensor Performance, Reserve to Primary  $H_2O$  Tank Leakage, 135 Relief and Reseat Check - full charge volume of primary and secondary water bladders is verified, item 142 and 143 valves are verified, 135 relief valve cracking and reseat pressure is verified. Fan/Pump performance is verified by measuring  $O_2$  and  $H_2O$  flows at specific  $\Delta P$ 's. Electrical consumption is verified at performance level; vent flow sensor performance is verified by DCM display indicators as vent flow is reduced and increased.
24. PLSS and DCM Electrical Checkout, 137 Actuation Check,  $O_2$  Actuator Position Switch Check - performance of the bite light and PGA gage light is verified. Status/proceed switch function, power mode switch and fan switch are verified operational.  $O_2$  actuator position signals and CCA warning tone are verified. All pressures, temperature,  $CO_2$  level, voltage and current sensors are verified. The feedwater shut off valve (item 137) is verified functionally.
25. SOP Functional Check - SOP activation pressure is verified at 3.25 psid minimum and then regulation pressure is confirmed at 3.33 - 3.55 psid at a suit bleed flow of 1.05 - 1.12 scfm and 3.4 - 3.7 psid at a flow of 330 - 341 sccm  $O_2$ .

26. DCM Gage Calibration Check, PLSS Transducer Check - performance of PLSS pressure transducers and calibrations are verified. DCM gage calibration is verified, CO<sub>2</sub> sensor activation is verified.
27. Water Leakage - leakage is verified less than 6cc/hr during a 15 minute time interval. The leakage test may be run three times. The DCM multiple connectors ports T5, T6 and T8 are also verified for no leakage.
28. Gas Structural and Leakage - (see test 6).
29. SEMU Level CO<sub>2</sub> Sensor Calibration Check - check points are measured during 30 minutes at actual CO<sub>2</sub> levels of 4.0, 8.0 and 15.0 mmHg.