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GMA PREPARATION FOR SPACE VEHICLE THERMO-VAC TESTING

P0955 Rev –

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A SCOPE

This procedure defines how to connect the six outlets of the Gas Management Assembly (GMA) to Ground Support Equipment (GSE) in preparation for Space Vehicle thermo-vac chamber testing.

This GSE is installed in three phases. Phase 1(A&B) manifolds the GMA outlets on the Space Vehicle to a common access point on the Tilt Ring and should be performed before the Space Vehicle is positioned on the chamber loading rails (the dolly). Phase 2 plumbs lines from that point to a convenient spot on the chamber dolly and should be performed while the space vehicle is mounted on the rails, but before the dolly is rolled into the chamber. Phase 3 connects the lines through the chamber pass through and should be completed after the vehicle is inside the chamber.

Disconnection is also contained within this procedure. It is intended that additional operations will be performed on the GMA throughout this procedure (i.e. GMA functional testing. GMA thermo-vac testing, GMA transducer calibration, etc.). It is preferred that each section of this procedure be completed in its entirety and that all “inserted” operations be performed between the sections within this procedure. Additionally, inserted operations shall either restore the identical starting configuration or shall report its ending configuration in necessary detail. If the latter is the case, then the Test Director shall initiate a D-log (or “blue line”) to align this procedure with the change in configuration as required.

B SAFETY

B.1 Flight equipment:

The GMA is a self-contained gas delivery device and contains volumes under gas pressure. During this procedure, the configuration of the GMA will be such that the primary gas tanks are protected from impact by the GMA pallet and therefore do not present a realistic safety concern.

The GMA and the Space Vehicle are high value space flight hardware and should be handled with great care. The GMA tanks (mounted underneath the GMA pallet) are fracture critical items.

B.2 Ground Support Equipment (GSE)

The manifold lines connected to the GMA and Fill and Drain (F&D) Valves will not be exposed to high pressures and therefore do not present a realistic safety concern. Purge operations typically run at around 5-20 psig, regulator bleed down releases very small volumes of <300 psig gas into large vented volumes. All of the GSE used in this procedure has pressure ratings considerably higher than the maximum expected operating pressures.

During the operation, some lines connecting equipment together will represent minor trip/snag hazards – these hazards shall be minimized by careful routing, securing, and/or marking of such lines. Only qualified personnel under the supervision of the Test Director should work directly with this equipment.

Some of the GSE used in this procedure is large and mobile and normal efforts should be used to ensure that equipment does not roll or fall during an earthquake, especially when connected to flight equipment.

B.3 Heights:

Some functions of this procedure may be completed with the use of ladders, platforms, and/or personnel lifts. The potential for falls from such equipment represents a moderate safety concern. The use of these items shall be consistent with the normal practices of the Space Vehicle and the

facility within which it is located and shall be subject to the authority and policies of facility safety personnel.

B.4 Contamination:

Care should be exercised whenever venting any gas system to atmosphere to ensure that the internal volumes of the GMA and GSE plumbing lines are only exposed to appropriate environments. Improper venting of air into critical wetted areas can result in contamination requiring significant cleanup and verification.

These operations are expected to occur within the B156 highbay, a Class 100,000 clean room, but may occur in any similar environment. Care should be exercised during all connections to flight hardware to prevent contamination of wetted surfaces by particulates. Smocks, bonnets, and gloves (consistent with Class 10,000 practices) shall be worn whenever handling flight hardware. Full hoods, coveralls, bootcovers, and clean gloves (consistent with LMMS Class 1,000 practices) shall also be worn whenever working with flight wetted surfaces. All fluid connections shall be visually inspected by the operator making the connection.

B.5 Terms used:

In some cases, different equipment used in this procedure will have similar names. For clarity, the following are defined generally:

- Fill and Drain (or F&D) Valves – the five off pallet flight Fill and Drain valves mounted on the conical section of the Space Vehicle
- Fill and Drain (or F&D) Manifold – the GSE hardware connected to the F&D Valves
- Vent Manifold – the GSE hardware connected to the Vent port of the GMA
- Inside Valves – the two GSE valves installed inside the thermo-vac chamber.
- Outside Valves – the two GSE valves installed outside the thermo-vac chamber at the pass through port.
- Dolly – the rolling cart mechanism which supports the space vehicle and GSE inside the chamber, including the cages which support the thermal lamps.
- Long lines – the plumbing lines spanning the distances from the tilt ring supporting the Space Vehicle to the Inside Valves.
- Pass-through lines – the plumbing lines spanning the distance from the Inside Valves to the chamber pass through port.

Within this procedure, flight valves will generally be designated without hyphens (i.e. GMA V1, F&DS1) while GSE valves will be designated with hyphens (i.e. IV-1, OV-1).

B.6 Personnel Threatening Emergencies

In the event of an emergency threatening personnel health or safety, the area shall be evacuated without regard for equipment safety. Post-emergency steps shall be documented by D-log as required.

B.7 Non-Personnel Threatening Emergencies

In the event of an emergency requiring shutdown and/or evacuation which does allow time for steps to be taken without endangering personnel, the following general steps should be taken, in order of priority (operator to determine sequence):

- Isolate the flight hardware wetted surfaces (fluid flow paths) from the exterior environment by closing GSE valves (IV-1, IV-2, OV-1, OV-2 or similar, as applicable to the state of assembly.)
- Use ECU to close all GMA solenoid valves.

- Record state of GMA and related flight volumes as known (valves open/closed, current pressures, ECU status, etc.).
- Shut down GSE as desired (leak detectors, vacuum sources, ECU control systems, GDS, etc.).

In the event of a power failure, the Test Director shall implement similar steps as applicable (Use care to ensure that equipment remains safe when power is restored.

In the event that these steps have been taken (in part or whole), when it safe for personnel to return to the equipment:

- The Test Director shall perform an evaluation of the current state of the hardware.
- With concurrence of the GMA RE and QA, the Test Director shall issue a d-log detailing the steps required to return the flight equipment to its prior state and to establish from which step the procedure shall continue. The test director may issue partial instructions (i.e. start up GSE) for the purpose of better evaluation of the flight hardware status.
- If the Test Director, RE, or QA believe it necessary, a discrepancy report may be issued for MRB review.

C QUALITY ASSURANCE

C.1 QA Notification

This operation will be conducted on a formal basis to approved and released procedures. **The QA program office and ONR representative shall be notified 24 hours prior to the start of this procedure**. A Quality Assurance Representative, designated by D. Ross shall be present during the procedure and shall review any discrepancies noted and approve their disposition. Upon completion of this procedure, the QA Program Engineer, D. Ross or her designate, will certify her concurrence that the effort was performed and accomplished in accordance with the prescribed instructions by signing and dating in the designated place(s) in this document.

C.2 Red-line Authority

Authority to redline (make minor changes during execution) this procedure is given solely to the Test Director or his designate and shall be approved by the QA Representative.

C.3 Discrepancies

Discrepancies will be recorded in a D-log or as a DR per Quality Plan P0108.

D TEST PERSONNEL

The Test Director shall be Ken Bower or an alternate that he shall designate. The Test Director has overall responsibility for the implementation of this procedure and shall sign off the completed procedure and relevant sections within it. Additional personnel shall be assigned and supervised by the Test Director.

E REQUIREMENTS

E.1 Electrostatic Discharge Requirements

The Space Vehicle is defined as ESD sensitive. Appropriate ESD protection must be used when handling the space vehicle *or conductive equipment connected to it*.

E.2 Lifting Operation Requirements

N/A

E.3 Hardware/Software Requirements

- GMA on Space Vehicle
- HEPA downflow hood installed over critical work area when applicable to specific sections.
- ECU Flight Equivalent, Flight ECU, or Manual Latch Valve Control Box and related operational equipment (computers, cables, meters, etc.) when applicable to specific sections.
  (Note: The procedures will always call for an 'ECU command' to open GMA valves but it can be replaced by similar functions from any of the above equivalents.)
- "gma_null_setup.prc" script or similar
- Interface cables from ECU to GMA
- Research Grade (certified 99.9999%) Helium Supply: one (>1000psig) bottle for purge gas supply.
- F&D Manifold Hardware to connect to Space Vehicle Fill and Drain Valves.
- Vent Manifold to connect to GMA vent port.
- GSE valves prepared for use inside thermo-vac chamber.
- GSE mounting hardware for valves and manifolds as required.
- Leak detector, Alcatel (or alternate), internally calibrated
- Hand held particle counter (sensitive to 0.5 microns or better)
  Calibration Date: _____ S/N: _____ Model #: _____
- Various clean flex lines and fittings as required (Test Director to approve cleanliness of individual elements for specific uses)
- Alcatel Dry Pump / Turbo Pump Carts (or equivalent)
- Torque wrenches as required
  #2) Make/model _____ S/N _____ Certificate expiration _____
  #3) Make/model _____ S/N _____ Certificate expiration _____
  #4) Make/model _____ S/N _____ Certificate expiration _____
- Moog conical seal gaskets, for flight, as required
- Chamber pass-through port and associated hardware.

E.4 Instrument Pretest Requirements

All test equipment used to verify test data is required to be "in calibration."

E.5 Configuration Requirements

- The GMA is physically mounted, plumbed, and electrically grounded on the Space Vehicle (per LMMS INT-334 and SU P0945).
- The GMA Fill & Drain Valves are closed and capped.
- The GMA vent ports are capped.
- The Space Vehicle is oriented such that the GMA and Fill & Drain Valves are accessible by personnel and capable of being enclosed within a downflow hood.

E.6 Optional Non-flight Configurations

N/A

E.7 Verification/ Success Criteria

All connections shall be leak tight and properly torqued (when closed) as set out in individual procedure sections.

E.8 Constraints and Restrictions

N/A

F REFERENCE DOCUMENTS

F.1 Drawings

- GMA Schematic, GP-B Dwg. Number 26273

F.2 Supporting documentation

N/A

F.3 Additional Procedures

ECU operations as applicable.

G OPERATIONS

G.1 Verify Appropriate QA Notification

QA Notified_____ ONR Notified_____
(Date & Time) (Date & Time)

G.2 Verify Work Environment for Phase One

Started on: _____
Note: This section shall be completed prior to Space Vehicle installation onto the dolly.

G.2.1 Set up hand held particle counter near the caps of the Space Vehicle F&D Valves. Take five one-minute samples. Average number of 0.5 micron or greater particles should be less than 5 per cubic foot.

G.2.2 Samples @ F&D Valves : #1 ___ #2 ___ #3 ___ #4___ #5 ___.

G.2.3 Sample size: _____ Average particles per cubic foot: ____

G.2.4 Set up hand held particle counter near the GMA vent port. Take five one-minute samples. Average number of 0.5 micron or greater particles should be less than 5 per cubic foot.

G.2.5 Samples @ GMA vent port: #1 ___ #2 ___ #3 ___ #4___ #5 ___.

G.2.6 Sample size: _____ Average particles per cubic foot: ____

G.2.7 If any of the above particle count averages exceed 5, attempt to readjust the downflow hood arrangement and repeat the measurements as necessary. At the discretion of the Test Director with QA representative concurrence, the average count tolerance may be increased to a maximum of 100, provided that the counts of other measurable particle sizes do not exceed the standards of class 100 air (0.2 micron<750, 0.3 micron<300, 5.0 micron=0).

Section G.2 complete. QA _____
Customer _____

G.3 Setup of GMA and Space Vehicle

Started on: _____
Note: This section shall be completed prior to Space Vehicle installation onto the dolly.

G.3.1 Verify that all GMA F&D valves are closed (40+/-5 in.lbs.)

Wrench used_____
MV1 torque QA _____
MV2 torque QA _____
MV3 torque QA _____
MV4 torque QA _____

G.3.2 Verify that all off-pallet F&D valves are closed (40+/-5 in.lbs.)

Wrench used_____

F&DS2 torque QA _____

F&DS1 torque QA _____

F&DS3 torque QA _____

F&DS4 torque QA _____

F&DP1A torque QA _____

G.3.3 Verify that GMA V27, V28, V29, V30 are closed (use ECU to close them, or verify last state from prior operations).

method used/verification source_____

G.3.4 Install mounting clamps on tilt ring (adjust in future as desired).

Section G.3 complete. QA _____

Customer _____

G.4 Bleed Down GMA Regulator Lockup Pressure

Started on: _____
Note: Section G.4 may be completed at any time after section G.3 as desired or may be performed as part of another operation.

G.4.1 Verify that ECU controls and readouts are available.

G.4.2 Use the ECU to close all GMA valves.

G.4.3 Connect a vacuum source to GMA Vent Port (use care to not strain the GMA vent line) or Vent Manifold port as applicable.

G.4.4 If applicable, connect a vacuum source to the F&D Manifold port.

G.4.5 Evacuate the volume connected to the GMA Vent and outlets and use a valve(s) to meter flow from the GMA to the vacuum source.

G.4.6 Record state of all GMA pressure transducers on log in section H.

G.4.7 Use ECU to open V27 and V29.

G.4.8 Once GP6 registers a value less than its maximum, Use ECU to open V3 and V4.

G.4.9 Once GP2 and GP3 register sufficiently low values (<300 psia, exact value TBD by Test Director), Use ECU to open any of the following valves as desired (TBD by Test Director, mark off valves opened): V5, V6, V7, V8, V9, V10, V11, V12, V13, V14, V15, V16, V17, V18, V19, V20, V21, V22, V23, V24, V25, V26, V28, V30. Note: this sequence will depend upon when this function is performed. In general, zone I shall not be bled down; zones II-V shall be bled through the vent port into a vacuum source; and zones VI and VII shall, if required, be bled through the off pallet F&D valves into a vacuum source. Flows against the direction of normal GMA

operation shall be minimized in volume and rate to protect against reverse filter loading. Record sequence notes here:

_____

_____

_____

_____

If it is necessary to cycle the flight off-pallet F&D valves, record those cycles here and log as required. (Torque to 40+/-5 in.lbs.)

Wrench used_____
F&DS2 torque QA _____
F&DS1 torque QA _____
F&DS3 torque QA _____
F&DS4 torque QA _____
F&DP1A torque QA _____

G.4.10 Once desired pressures (<30 psia in zones III-VII, TBD by Test Director) have been achieved, use ECU to close all GMA valves.

G.4.11 Record state of all GMA pressure transducers on log in section H.

G.4.12 Shut down/disconnect vacuum source as desired and return vent connection port to starting state in G.4.3.

Section G.4 complete. QA _____
Customer _____

G.5 Connect GMA Vent Manifold (Phase 1A)

Started on: _____
Note: G.6 and may be performed before 0 if desired.
Note: This section shall be completed prior to Space Vehicle installation onto the dolly.

G.5.1 Prepare a vacuum source and lines and hardware as shown in Figure 1 (Vent Manifold) to provide vacuum to the GMA vent outlet.

G.5.2 Uncap one port on the GMA vent. Use care to not strain the GMA vent line.

G.5.3 Connect Vent Manifold to GMA vent port. Use care to not strain the GMA vent line.

G.5.4 Tighten all plumbing connections within the Vent Manifold.

G.5.5 Secure and strain relieve the Vent Manifold to the tilt ring (adjust in future as desired). Use care to route and secure plumbing lines to minimize hazard to personnel and equipment.

G.5.6 Use vacuum source to evacuate Vent Manifold and isolate (use temporary GSE valves as desired). If any gross leak is indicated, identify and repair it. Shut down and/or disconnect vacuum source if desired.

G.5.7 As possible, perform a fine leak check of the Vent Manifold. (This step may not be possible due to the internal leakage rates of the GMA.) Record best leakage rates here: _____. Shut down and/or disconnect leak detector as desired.

G.5.8 If desired, install (or leave installed) a temporary GSE valve to isolate the Vent Manifold from the environment and leave it under vacuum.

Section 0 complete. QA _____

Customer _____

G.6 Connect Fill and Drain (F&D) Valve Manifold (Phase 1B)

Started on: _____

Note: This section shall be completed prior to Space Vehicle installation onto the dolly.

G.6.1 Prepare an assembly as shown in Figure 1 (including vacuum and helium purge sources) for the F&D Manifold.

G.6.2 Secure and strain relieve the F&D Manifold to the tilt ring (adjust in future as desired). Use care to route and secure plumbing lines to minimize hazard to personnel and equipment.

G.6.3 Establish a light flow of helium through the F&D Manifold.

G.6.4 Uncap (log as required) F&DS2, F&DS1, F&DS3, F&DS4, F&DP1A. Bag, tag, and store removed caps for later use.

G.6.5 Connect F&D Manifold lines to F&DS2, F&DS1, F&DS3, F&DS4, and F&DP1A using new flight conical seals.

G.6.6 Tighten all plumbing connections within F&D Manifold.

G.6.7 Torque (log as required) F&D Manifold connections to F&D valves (120 +/-10 in.lbs.)

Wrench used_____

F&DS2 cap torque QA _____

F&DS1 cap torque QA _____

F&DS3 cap torque QA _____

F&DS4 cap torque QA _____

F&DP1A cap torque QA _____

G.6.8 Provide additional strain relief to the F&D Manifold lines as desired.

G.6.9 Use vacuum source to evacuate F&D Manifold and isolate (use temporary GSE valves as desired). If any gross leak is indicated, identify and repair it. Shut down and/or disconnect vacuum source if desired.

G.6.10 Perform a fine leak check of the F&D Manifold. Repair any leaks found (standard <2x10^7 sccs). Shut down and/or disconnect leak detector as desired. Initial here to verify test pass for the F&D Manifold hookup and leak check _____.

G.6.11 Cap/cover any exposed connections remaining. If desired, install (or leave installed) a temporary GSE valve to isolate the F&D Manifold from the environment and leave it under vacuum.

Section G.6 complete. QA _____

Customer _____

G.7 Connect F&D and Vent Manifold Long Lines on Dolly (Phase 2).

Started on: _____

Note: This section shall be completed after Space Vehicle installation onto the dolly and before dolly insertion into chamber.

G.7.1 Install GSE valve mounting hardware and IV-1 and IV-2 on dolly cage near where the chamber pass through port will be when the dolly is in the chamber. (Adjust in future as desired.)

G.7.2 Route two long plumbing lines from the Inside Valves to near the manifolds installed in sections 0 and G.6. (Adjust in future as desired.) Use care to route and secure plumbing lines to minimize hazard to personnel and equipment.

G.7.3 Uncap (and/or remove temporary GSE valve installed in G.6.11) F&D Manifold and connect one long line to F&D Manifold at one end and IV-1 at the other.

G.7.4 Uncap (and/or remove temporary GSE valve installed in G.5.8) Vent Manifold and connect one long line to Vent Manifold at one end and IV-2 at the other.

G.7.5 Inspect all manifolds to verify that they will not interfere with dolly to chamber insertion.

G.7.6 Tighten all plumbing connections and secure plumbing to GSE as desired.

G.7.7 Connect a vacuum source to IV-2.

G.7.8 Open IV-2. Use vacuum source to evacuate Vent Manifold and isolate (use temporary GSE valves as desired). If any gross leak is indicated, identify and repair it. Shut down and/or disconnect vacuum source if desired.

G.7.9 As possible, perform a fine leak check of the Vent Manifold. (This step may not be possible due to the internal leakage rates of the GMA.) Record best leakage rates here: _____. Close IV-2. Shut down and/or disconnect leak detector as desired.

G.7.10 Connect a vacuum source to IV-1.

G.7.11 Open IV-1. Use vacuum source to evacuate F&D Manifold and isolate (use temporary GSE valves as desired). If any gross leak is indicated, identify and repair it. Shut down and/or disconnect vacuum source if desired.

G.7.12 Perform a fine leak check of the F&D Manifold. Repair any leaks found (standard <2x10^7 sccs). Shut down and/or disconnect leak detector as desired. Initial here to verify test pass for the F&D Manifold hookup and leak check _____.

G.7.13 Leave F&D Manifold under vacuum and close IV-1. Shut down and/or disconnect leak detector as desired.

G.7.14 Open and log as required F&DS2, F&DS1, F&DS3, F&DS4, and F&DP1A. (If desired, a vacuum/helium supply system with pressure gauge may be connected to IV-1 to monitor pressure changes and pump out or backfill the spin-up lines during this step – close IV-1 at end of step.)

G.7.15 Cap/cover any exposed connections remaining.

G.7.16 Lock out IV-1 and IV-2.

G.7.17 If possible and desired, use ECU to put GMA into "sleep" mode.

Section G.7 complete. QA _____

Customer _____

G.8 Connect Manifolds to Chamber Pass-through (Phase 3)

Started on: _____

Note: This section shall be completed after dolly insertion into the chamber.

G.8.1 Verify that IV-1 and IV-2 are installed on the dolly such that connections from them to the chamber pass-through are feasible and adjust position if required.

G.8.2 Connect pass-through lines from IV-1 and IV-2 to the vacuum feedthroughs via the Pass through port. (Don't forget to install the Conflat gasket on the feedthroughs first!)

G.8.3 Connect OV-1 and OV-2 to the appropriate vacuum feedthroughs.

G.8.4 Tighten plumbing connections and secure plumbing to GSE as desired.

G.8.5 Use vacuum source to evacuate both pass-through lines. If any gross leak is indicated, identify and repair it. Shut down and/or disconnect vacuum source if desired.

G.8.6 Perform a fine leak check of both pass-through lines. Repair any leaks found (standard <2x10^7 sccs). Shut down and/or disconnect leak detector as desired. Initial here to verify test pass for the pass-through lines hookup and leak check _____.

G.8.7 Leave pass-through lines under vacuum and close OV-1 and OV-2.

G.8.8 Open IV-1 and IV-2.

G.8.9 Prepare IV-1 and IV-2 for thermo-vac testing (lock and remove outgassing components).

G.8.10 Secure vacuum feedthroughs (Conflats) to pass-through port. Note: The pass throughs shall be leak checked with the rest of the chamber under a separate operation after the chamber is sealed.

G.8.11 Install lock-out devices on Outside Valves and all fittings between them and the pass through port.

G.8.12 Cap/cover any exposed connections remaining.

Section G.8 complete. QA _____

Customer _____

Note: Thermo-vac testing occurs between these sections. During these operations, the Outside Valves may be connected to different GSE hardware. The Outside Valves should always be locked closed when not monitored by GMA competent personnel.

G.9 Remove Phase 3 GSE

Started on: _____
Note: This section shall be completed prior to dolly removal from the chamber.

G.9.1 Verify that Outside Valves are closed and remove any remaining outside GSE used in thermo-vac testing as desired.

G.9.2 Close and Lock Inside Valves.

G.9.3 Disconnect and remove Outside Valves, vacuum feedthroughs, and pass-through lines as desired.

Section G.9 complete. QA _____
Customer _____

G.10 Remove Phase 2 GSE

Started on: _____
Note: This section shall be completed after dolly removal from the chamber and before spacecraft removal from the dolly.

G.10.1 Verify that GMA V27, V28, V29, V30 are closed (use ECU to close them, or verify last state from prior operations).

method used/verification source_____

G.10.2 Close and torque (log as required) all off-pallet F&D Valves (40+/-5 in.lbs.)

Wrench used_____
F&DS2 torque QA _____
F&DS1 torque QA _____
F&DS3 torque QA _____
F&DS4 torque QA _____
F&DP1A torque QA _____

G.10.3 Disconnect and remove Inside Valves and long lines as desired.

G.10.4 Cap/cover any exposed connections remaining. If desired, install temporary GSE valves to isolate the F&D and Vent Manifolds from the environment and leave them under vacuum.

Section G.10 complete. QA _____
Customer _____

G.11 Verify Work Environment for Phase One GSE Removal

Started on: _____
Note: This section shall be completed after spacecraft removal from the dolly.

G.11.1 Set up hand held particle counter near the caps of the Space Vehicle F&D Valves. Take five one-minute samples. Average number of 0.5 micron or greater particles should be less than 5 per cubic foot.

G.11.2 Samples @ F&D Valves : #1 ___ #2 ___ #3 ___ #4___ #5 ___.

G.11.3 Sample size: _____ Average particles per cubic foot: ____

G.11.4 Set up hand held particle counter near the GMA vent port. Take five one-minute samples. Average number of 0.5 micron or greater particles should be less than 5 per cubic foot.

G.11.5 Samples @ GMA vent port: #1 ___ #2 ___ #3 ___ #4___ #5 ___.

G.11.6 Sample size: _____ Average particles per cubic foot: ____

G.11.7 If any of the above particle count averages exceed 5, attempt to readjust the downflow hood arrangement and repeat the measurements as necessary. At the discretion of the Test Director with QA representative concurrence, the average count tolerance may be increased to a maximum of 100, provided that the counts of other measurable particle sizes do not exceed the standards of class 100 air (0.2 micron<750, 0.3 micron<300, 5.0 micron=0).

Section G.11 complete. QA _____

Customer _____

G.12 Remove Phase 1 GSE

Started on: _____
Note: This section shall be completed after spacecraft removal from the dolly.

G.12.1 Option 1: leave Phase 1 GSE in place; proceed to next step. Option 2: remove all GSE, proceed to step G.12.6.

G.12.2 Install GSE valves on the outlets of the Vent and F&D Manifolds.

G.12.3 Hook up a vacuum source to the valves just installed and leak check connection.

G.12.4 Close valves and cap/cover valve outlets.

G.12.5 Proceed to step G.12.11.

G.12.6 Disconnect the Vent Manifold from the GMA Vent Port. Use care to not strain the GMA vent line.

G.12.7 Cap the GMA vent port. Use care to not strain the GMA vent line.

G.12.8 Disconnect the F&D Manifold from the five off-pallet F&D valves (log as required).

G.12.9 Install F&D Valve caps with new flight conical seals.

G.12.10 Torque (log as required) F&D Manifold connections to F&D valves (120 +/-10 in.lbs.)

Wrench used_____

F&DS2 cap torque QA _____

F&DS1 cap torque QA _____

F&DS3 cap torque QA _____

F&DS4 cap torque QA _____

F&DP1A cap torque QA _____

G.12.11 Disassemble/remove GSE manifolds and clamps as desired.

Section G.12 complete. QA _____

Customer _____

G.13 Completion

Started on: _____

G.13.1 If possible and desired, use ECU null script function to put GMA in “sleep” mode (all valves closed, zone I=II, zones III-VII ~20 psia).

G.13.2 If possible, use ECU to read all pressures/counts from GMA and log in pressure sensor log (at end of section H).

G.13.3 Shut down ECU if desired.

G.13.4 Disconnect remaining GSE as desired.

G.13.5 Visually inspect exterior surface of flight hardware and remove contamination if required.

Section G.13 complete. QA _____

Customer _____

G.14 Procedure Sign Off

The results obtained in the performance of this procedure are acceptable:

_____ date: _____
Test Director/GMA Engineer

Discrepancies if any:

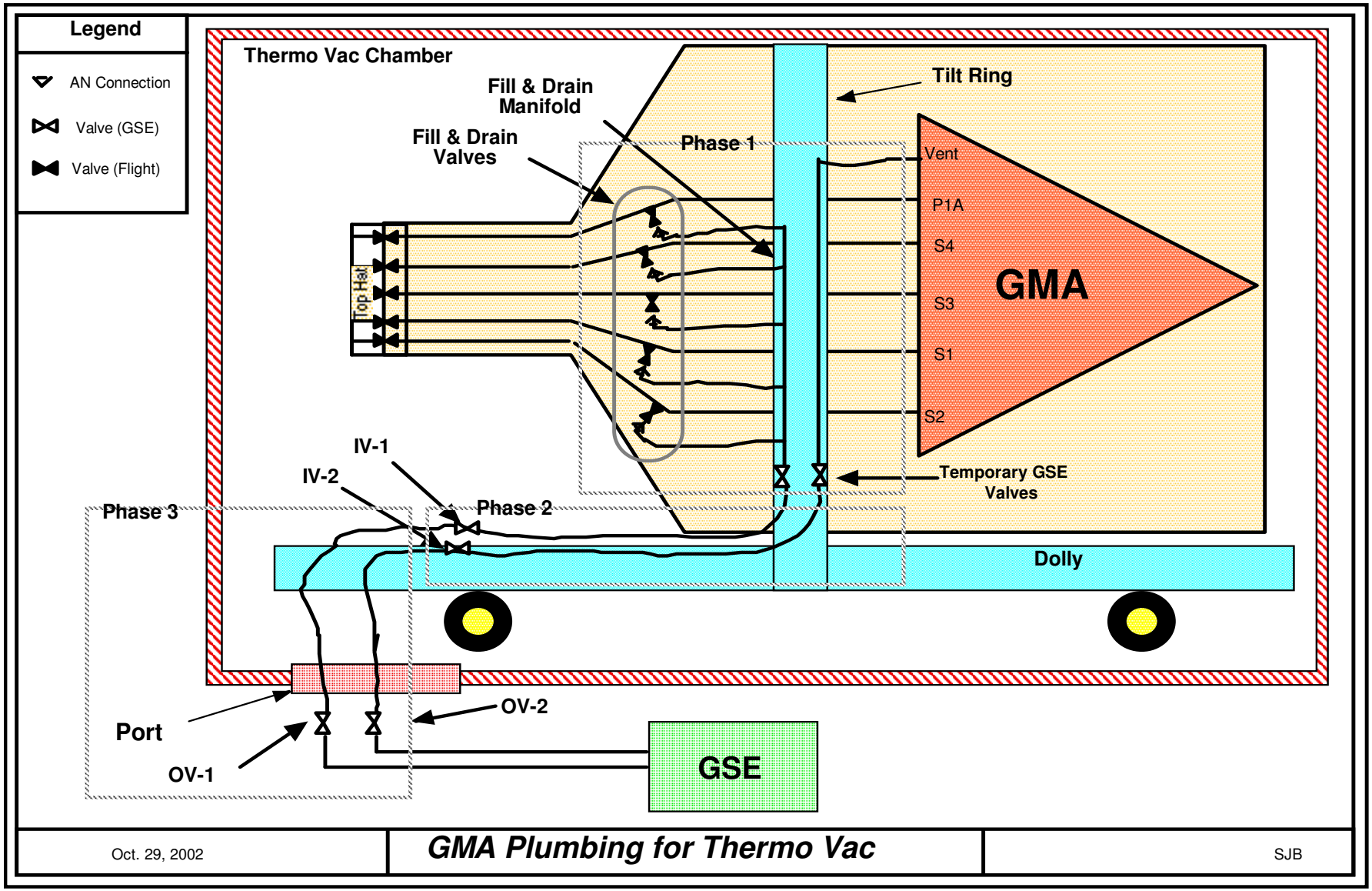
Approved: _____ date: _____
C. Gray, GMA REE

Approved: _____ date: _____
QA Representative

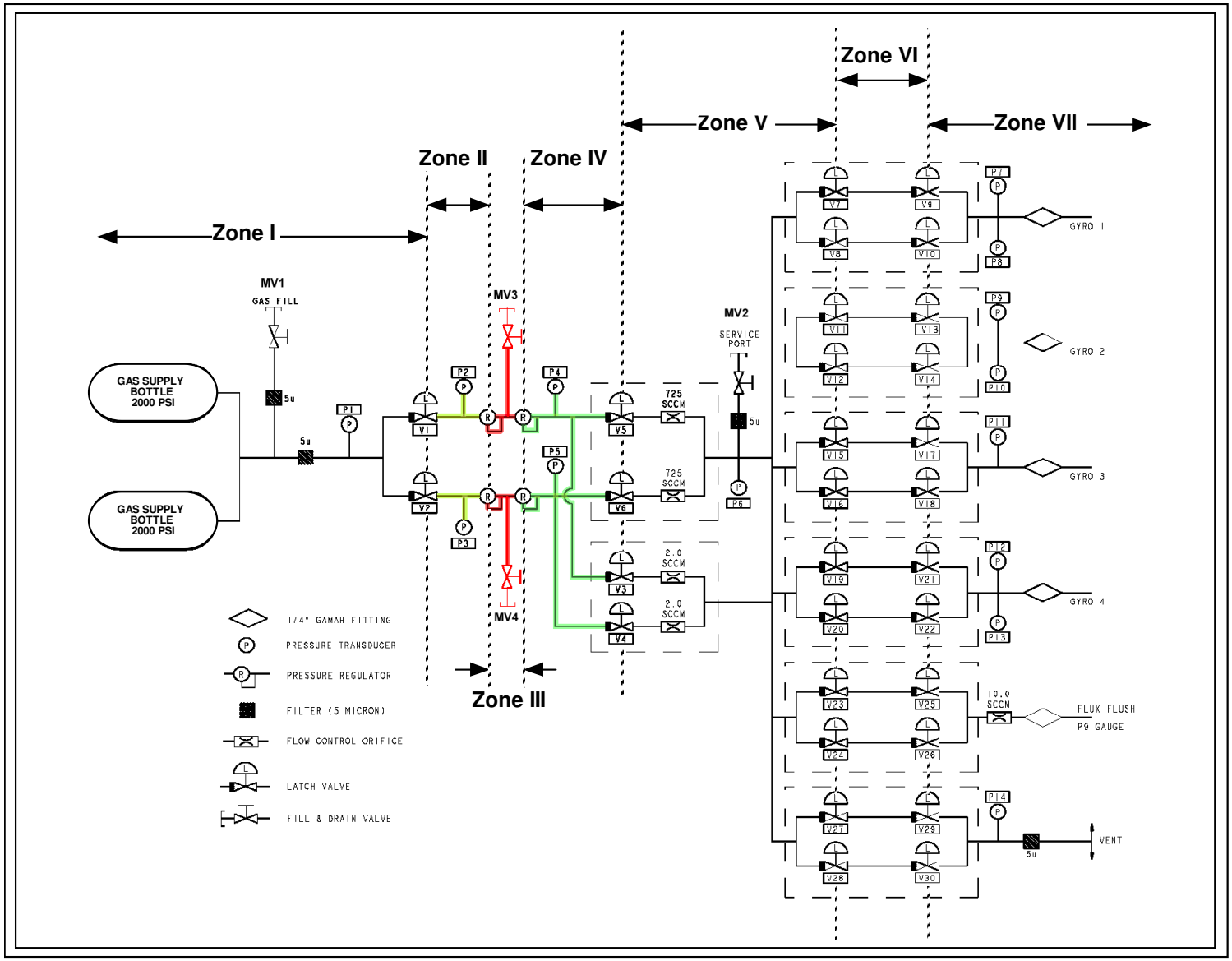
Approved: _____ date: _____
D. Ross, QA

H ILLUSTRATIONS AND TABLES

H.1 Figure 1 – GMA Thermo-Vac Schematic



H.2 Figure 2 – GMA Schematic



H.3 Table 1 – Pressure Sensor Log

	GMA Sensors Counts														
Sect: Step	**Time**	**P1**	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**	**P9**	**P10**	**P11**	**P12**	**P13**	**P14**