

## MV POWER HOUSING ASSEMBLY PROCEDURE– MARS

| PROGRAM |
|---------|
| MARS    |

| ASSEMBLY NAME AND NUMBER         |
|----------------------------------|
| MV POWER HOUSING ASSEMBLY 110418 |

| REFERENCE |
|-----------|
|           |

| SERIAL #/LOT # |
|----------------|
|                |

| NEXT HIGHER ASSEMBLY        |
|-----------------------------|
| NODE MODULE ASSEMBLY 110505 |

| REVISION |
|----------|
| DRAFT    |

| Operation # | Operation Description                                                                                                                                                                                                                                                                                                                                                       | Initial / Date |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| <b>100</b>  | <b>CHASSIS INSTALLATION SETUP</b>                                                                                                                                                                                                                                                                                                                                           |                |
| 110         | Clean and prepare penetrator endcap for assembly. Clean, inspect and install large o-rings and backup rings as required.<br><br>Prepare connector, penetrator and plug for installation into penetrator endcap. Clean, inspect and replace o-rings as required. Torque fasteners per 110418.                                                                                |                |
| 120         | Pass wires through cutouts in the G10 chassis support disc. Bolt penetrator endcap to the G10 disc. Torque fasteners per 110418. Connect wires as required per electronics assembly.                                                                                                                                                                                        |                |
| 130         | Hoist completed electronics chassis assembly onto lift table. Move into position in front of chassis support stand.                                                                                                                                                                                                                                                         |                |
| 140         | Bolt chassis to stand using spacers as required. Use lift table and hoist as required.                                                                                                                                                                                                                                                                                      |                |
| 150         | Replace lift table with jack stand positioned on small rolling table and support chassis mid-span. Remove hoist.                                                                                                                                                                                                                                                            |                |
| 160         | Clean and re-inspect the large o-rings on the penetrator endcap, as required.                                                                                                                                                                                                                                                                                               |                |
| 170         | Lift pressure housing out of its shipping crate and onto lift table outfitted with UHMW saddles. Housing should be positioned slightly off center on the table to allow load transfer from the small rolling table. Allow for room to insert the chassis support disk (G10) into the end of the housing past the sealing surface (1.5" both ends). Secure housing to table. |                |
| <b>200</b>  | <b>CHASSIS INSTALLATION</b>                                                                                                                                                                                                                                                                                                                                                 |                |
| 210         | Align housing with chassis. Clock housing such that the tapped holes line up with the thru holes on the bulkhead.                                                                                                                                                                                                                                                           |                |
| 220         | Adjust lift table as required while installing electronics chassis. Watch for component interference. Lightly lubricate o-rings with castor oil and install the penetrator endcap into the housing. Torque fasteners per 110418.                                                                                                                                            |                |
| <b>300</b>  | <b>BELLOWS PRESET AND INSTALLATION</b>                                                                                                                                                                                                                                                                                                                                      |                |
| 310         | Clean and prepare bellows endcap for assembly. Clean, inspect and install large o-rings and backup rings as required.                                                                                                                                                                                                                                                       |                |
| 320         | Preset bellows expansion per 110418. Install plug with desiccant as required.                                                                                                                                                                                                                                                                                               |                |
| 330         | Assemble bellows, mounting flange and bellows endcap per 110418. Slide guide sleeve into housing as shown on 110418.                                                                                                                                                                                                                                                        |                |
| 340         | Lightly lubricate o-rings with castor oil and with the support of an engine hoist, install the bellows endcap into the housing. Torque fasteners per 110418.                                                                                                                                                                                                                |                |

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| <b>PROGRAM</b>        | <b>ASSEMBLY NAME AND NUMBER</b>  | <b>REFERENCE</b> |
| MARS                  | MV POWER HOUSING ASSEMBLY 110418 |                  |
| <b>SERIAL #/LOT #</b> | <b>NEXT HIGHER ASSEMBLY</b>      | <b>REVISION</b>  |
|                       | NODE MODULE ASSEMBLY 110505      | DRAFT            |

| Operation #                              | Operation Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Initial / Date |    |    |    |    |    |    |    |    |    |                            |   |   |   |   |   |   |   |   |   |                             |   |   |   |   |   |   |   |   |   |        |   |   |   |   |   |   |   |   |   |         |   |   |   |   |   |   |   |   |   |                     |   |   |   |   |   |   |   |   |   |                                     |   |   |   |   |   |   |   |   |   |                                          |   |   |   |   |   |   |   |   |   |  |
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| 350                                      | Record the weight of the dry MV Housing Assembly: _____<br>This may be performed anytime prior to filling with FC-77.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                |    |    |    |    |    |    |    |    |    |                            |   |   |   |   |   |   |   |   |   |                             |   |   |   |   |   |   |   |   |   |        |   |   |   |   |   |   |   |   |   |         |   |   |   |   |   |   |   |   |   |                     |   |   |   |   |   |   |   |   |   |                                     |   |   |   |   |   |   |   |   |   |                                          |   |   |   |   |   |   |   |   |   |  |
|                                          | <p>For the following operations, reference SCHEMATIC, FC-77 FILL SYSTEM MV POWER HOUSING ASSEMBLY TF110418 and Table 1.</p> <p><b>REVIEW AND UNDERSTAND EACH OF THE FOLLOWING OPERATIONS THOROUGHLY BEFORE PROCEEDING.</b></p> <table><tr><th></th><th>R1</th><th>R2</th><th>Y1</th><th>Y2</th><th>G1</th><th>G2</th><th>B1</th><th>B2</th><th>B3</th></tr><tr><td>PURGE AIR FROM INLET LINES</td><td>O</td><td>O</td><td>X</td><td>X</td><td>X</td><td>O</td><td>O</td><td>X</td><td>X</td></tr><tr><td>PURGE AIR FROM OUTLET LINES</td><td>X</td><td>O</td><td>X</td><td>X</td><td>X</td><td>O</td><td>O</td><td>X</td><td>X</td></tr><tr><td>VACUUM</td><td>X</td><td>O</td><td>X</td><td>X</td><td>X</td><td>O</td><td>O</td><td>X</td><td>X</td></tr><tr><td>He LEAK</td><td>X</td><td>O</td><td>X</td><td>X</td><td>O</td><td>X</td><td>X</td><td>X</td><td>X</td></tr><tr><td>FC-77 FILL (vacuum)</td><td>O</td><td>O</td><td>X</td><td>X</td><td>X</td><td>O</td><td>O</td><td>X</td><td>X</td></tr><tr><td>STOP FILL &amp; INSTALL LOWER FILL PLUG</td><td>X</td><td>X</td><td>O</td><td>O</td><td>X</td><td>O</td><td>X</td><td>X</td><td>X</td></tr><tr><td>RELEASE VACUUM &amp; INSTALL UPPER FILL PLUG</td><td>X</td><td>X</td><td>O</td><td>O</td><td>X</td><td>O</td><td>X</td><td>O</td><td>X</td></tr></table> <p>Table 1 - Valve Positions</p> <p>X = VALVE CLOSED</p> <p>O = VALVE OPEN</p> |                | R1 | R2 | Y1 | Y2 | G1 | G2 | B1 | B2 | B3 | PURGE AIR FROM INLET LINES | O | O | X | X | X | O | O | X | X | PURGE AIR FROM OUTLET LINES | X | O | X | X | X | O | O | X | X | VACUUM | X | O | X | X | X | O | O | X | X | He LEAK | X | O | X | X | O | X | X | X | X | FC-77 FILL (vacuum) | O | O | X | X | X | O | O | X | X | STOP FILL & INSTALL LOWER FILL PLUG | X | X | O | O | X | O | X | X | X | RELEASE VACUUM & INSTALL UPPER FILL PLUG | X | X | O | O | X | O | X | O | X |  |
|                                          | R1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | R2             | Y1 | Y2 | G1 | G2 | B1 | B2 | B3 |    |    |                            |   |   |   |   |   |   |   |   |   |                             |   |   |   |   |   |   |   |   |   |        |   |   |   |   |   |   |   |   |   |         |   |   |   |   |   |   |   |   |   |                     |   |   |   |   |   |   |   |   |   |                                     |   |   |   |   |   |   |   |   |   |                                          |   |   |   |   |   |   |   |   |   |  |
| PURGE AIR FROM INLET LINES               | O                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | O              | X  | X  | X  | O  | O  | X  | X  |    |    |                            |   |   |   |   |   |   |   |   |   |                             |   |   |   |   |   |   |   |   |   |        |   |   |   |   |   |   |   |   |   |         |   |   |   |   |   |   |   |   |   |                     |   |   |   |   |   |   |   |   |   |                                     |   |   |   |   |   |   |   |   |   |                                          |   |   |   |   |   |   |   |   |   |  |
| PURGE AIR FROM OUTLET LINES              | X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | O              | X  | X  | X  | O  | O  | X  | X  |    |    |                            |   |   |   |   |   |   |   |   |   |                             |   |   |   |   |   |   |   |   |   |        |   |   |   |   |   |   |   |   |   |         |   |   |   |   |   |   |   |   |   |                     |   |   |   |   |   |   |   |   |   |                                     |   |   |   |   |   |   |   |   |   |                                          |   |   |   |   |   |   |   |   |   |  |
| VACUUM                                   | X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | O              | X  | X  | X  | O  | O  | X  | X  |    |    |                            |   |   |   |   |   |   |   |   |   |                             |   |   |   |   |   |   |   |   |   |        |   |   |   |   |   |   |   |   |   |         |   |   |   |   |   |   |   |   |   |                     |   |   |   |   |   |   |   |   |   |                                     |   |   |   |   |   |   |   |   |   |                                          |   |   |   |   |   |   |   |   |   |  |
| He LEAK                                  | X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | O              | X  | X  | O  | X  | X  | X  | X  |    |    |                            |   |   |   |   |   |   |   |   |   |                             |   |   |   |   |   |   |   |   |   |        |   |   |   |   |   |   |   |   |   |         |   |   |   |   |   |   |   |   |   |                     |   |   |   |   |   |   |   |   |   |                                     |   |   |   |   |   |   |   |   |   |                                          |   |   |   |   |   |   |   |   |   |  |
| FC-77 FILL (vacuum)                      | O                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | O              | X  | X  | X  | O  | O  | X  | X  |    |    |                            |   |   |   |   |   |   |   |   |   |                             |   |   |   |   |   |   |   |   |   |        |   |   |   |   |   |   |   |   |   |         |   |   |   |   |   |   |   |   |   |                     |   |   |   |   |   |   |   |   |   |                                     |   |   |   |   |   |   |   |   |   |                                          |   |   |   |   |   |   |   |   |   |  |
| STOP FILL & INSTALL LOWER FILL PLUG      | X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | X              | O  | O  | X  | O  | X  | X  | X  |    |    |                            |   |   |   |   |   |   |   |   |   |                             |   |   |   |   |   |   |   |   |   |        |   |   |   |   |   |   |   |   |   |         |   |   |   |   |   |   |   |   |   |                     |   |   |   |   |   |   |   |   |   |                                     |   |   |   |   |   |   |   |   |   |                                          |   |   |   |   |   |   |   |   |   |  |
| RELEASE VACUUM & INSTALL UPPER FILL PLUG | X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | X              | O  | O  | X  | O  | X  | O  | X  |    |    |                            |   |   |   |   |   |   |   |   |   |                             |   |   |   |   |   |   |   |   |   |        |   |   |   |   |   |   |   |   |   |         |   |   |   |   |   |   |   |   |   |                     |   |   |   |   |   |   |   |   |   |                                     |   |   |   |   |   |   |   |   |   |                                          |   |   |   |   |   |   |   |   |   |  |
| 400                                      | PURGE SYSTEM OF AIR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                |    |    |    |    |    |    |    |    |    |                            |   |   |   |   |   |   |   |   |   |                             |   |   |   |   |   |   |   |   |   |        |   |   |   |   |   |   |   |   |   |         |   |   |   |   |   |   |   |   |   |                     |   |   |   |   |   |   |   |   |   |                                     |   |   |   |   |   |   |   |   |   |                                          |   |   |   |   |   |   |   |   |   |  |
| 410                                      | Purge air from the inlet lines by introducing FC-77 until it just reaches the housing. A small amount of FC-77 is expected to enter the housing. Close R1 to allow the air to complete its purge through the system.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |    |    |    |    |    |    |    |    |    |                            |   |   |   |   |   |   |   |   |   |                             |   |   |   |   |   |   |   |   |   |        |   |   |   |   |   |   |   |   |   |         |   |   |   |   |   |   |   |   |   |                     |   |   |   |   |   |   |   |   |   |                                     |   |   |   |   |   |   |   |   |   |                                          |   |   |   |   |   |   |   |   |   |  |
| 500                                      | VACUUM BAKE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |    |    |    |    |    |    |    |    |    |                            |   |   |   |   |   |   |   |   |   |                             |   |   |   |   |   |   |   |   |   |        |   |   |   |   |   |   |   |   |   |         |   |   |   |   |   |   |   |   |   |                     |   |   |   |   |   |   |   |   |   |                                     |   |   |   |   |   |   |   |   |   |                                          |   |   |   |   |   |   |   |   |   |  |
| 510                                      | Vacuum bake as required per customer procedure.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                |    |    |    |    |    |    |    |    |    |                            |   |   |   |   |   |   |   |   |   |                             |   |   |   |   |   |   |   |   |   |        |   |   |   |   |   |   |   |   |   |         |   |   |   |   |   |   |   |   |   |                     |   |   |   |   |   |   |   |   |   |                                     |   |   |   |   |   |   |   |   |   |                                          |   |   |   |   |   |   |   |   |   |  |
| 600                                      | HELIUM LEAK TEST                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                |    |    |    |    |    |    |    |    |    |                            |   |   |   |   |   |   |   |   |   |                             |   |   |   |   |   |   |   |   |   |        |   |   |   |   |   |   |   |   |   |         |   |   |   |   |   |   |   |   |   |                     |   |   |   |   |   |   |   |   |   |                                     |   |   |   |   |   |   |   |   |   |                                          |   |   |   |   |   |   |   |   |   |  |
| 610                                      | Helium leak test assembly per MP105382.<br>Record He leak reading _____                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                |    |    |    |    |    |    |    |    |    |                            |   |   |   |   |   |   |   |   |   |                             |   |   |   |   |   |   |   |   |   |        |   |   |   |   |   |   |   |   |   |         |   |   |   |   |   |   |   |   |   |                     |   |   |   |   |   |   |   |   |   |                                     |   |   |   |   |   |   |   |   |   |                                          |   |   |   |   |   |   |   |   |   |  |

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| <b>PROGRAM</b>        | <b>ASSEMBLY NAME AND NUMBER</b>  | <b>REFERENCE</b> |
| MARS                  | MV POWER HOUSING ASSEMBLY 110418 |                  |
| <b>SERIAL #/LOT #</b> | <b>NEXT HIGHER ASSEMBLY</b>      | <b>REVISION</b>  |
|                       | NODE MODULE ASSEMBLY 110505      | DRAFT            |

| Operation # | Operation Description                                                                                                                                                                                                                                                       | Initial / Date |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| <b>700</b>  | <b>FLUORINERT (FC-77) FILL AND SEAL</b>                                                                                                                                                                                                                                     |                |
| 710         | Verify that the housing is level. Mark the housing assembly 0.68" from the top. This will be the height of the fluid when the housing is completely full. Adjust the height of the lift table such that this mark is level with the highest mark on the overflow reservoir. |                |
| 720         | Ensure the valve to the He leak tester is closed prior to introducing FC-77 into the system.                                                                                                                                                                                |                |
| 730         | Open R1 to allow FC-77 to fill the housing. Monitor the outlet lines and overflow reservoir to verify the fill process is progressing as planned.                                                                                                                           |                |
| 740         | Stop the fill process when the overflow reservoir is nearly full. Install the lower fill plug.                                                                                                                                                                              |                |
| 750         | Open valve B2 to release the system vacuum. Fluid level in the overflow chamber will drop as the system pressure equalizes to ambient and the bellows retracts to its preset state.                                                                                         |                |
| 760         | Adjust the height of the lift table such that the fill mark on the housing is at the same height as the fluid level in the overflow chamber. Install the upper fill plug.                                                                                                   |                |
| 770         | Record the weight of the filled MV Housing Assembly: _____<br>Weight of FC-77 in MV Housing = Dry weight – Filled weight = _____                                                                                                                                            |                |
| <b>800</b>  | <b>PRESSURE vs. TEMPERATURE TEST</b>                                                                                                                                                                                                                                        |                |
| 810         | Test as required per customer procedure.                                                                                                                                                                                                                                    |                |
| <b>900</b>  | <b>DISASSEMBLY &amp; RECOVERY OF FC-77</b>                                                                                                                                                                                                                                  |                |
| 910         | Lift assembly onto lift table outfitted with UHMW saddles. Orient as shown on 110418, zone C-4.                                                                                                                                                                             |                |
| 920         | Install fill adapters and external plumbing used for the fill procedure, above. Drain, filter and recover FC-77.                                                                                                                                                            |                |
| 930         | Mount the penetrator endcap onto the chassis support stand.                                                                                                                                                                                                                 |                |
| 940         | Remove bellows endcap with bellows attached. Remove guide sleeve.. Set aside.                                                                                                                                                                                               |                |
| 950         | Remove the penetrator endcap out of housing until o-rings have cleared. Continue moving housing away until it is clear of the electronics chassis. Support mid-span as required.                                                                                            |                |
| 960         | Transfer chassis from support stand to workbench for troubleshooting.                                                                                                                                                                                                       |                |