
**GRAVITY PROBE-B
TEST PROCEDURE
AIRLOCK/DEWAR INTEGRATION**

March 30, 1995

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A	620	8/15/97	Changes to Update for GTU1 redlines and modify for use of Science Mission Dewar (SMD) and SMD Ground Support Equipment	August 6, 1997
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C	995	4/13/99	Changes to update for Probe-C Fitcheck Insertion.	

ABBREVIATIONS

xxP	Kit number xx of P type kits (ref. SU GP-B P0141)
ALSP	Airlock Support Plate
ALSPV	Airlock Support Plate Valve
ATC	Advanced Technology Center (at LMSS)
AVxx	Gas Module valve number xx
BPS	Bellville Pre-load System
CNT	Composite Neck Tube of Probe
ESD	Electrostatic Discharge
EVxx	Gas Module Valve number xx
AWG	American Wire Gauge
Cryoperm	Trade name for cryogenic magnetic shielding
CT	Cooling Tube
CTE	Cryogenic Test Engineer
DAS	Data Acquisition System
DEV-xx	Dewar Exhaust Valve number xx
DVM	Digital Volt Meter
EEBA	Emergency Evacuation Breathing Apparatus
EG-xx	Gas Module Exhaust Gauge number xx
ESD	Electrostatic Discharge
EVRx	Gas Module Relief Valve number x
FIST	Final Integrated System Test
GHe	Gaseous Helium
GP-B	Gravity Probe-B program (also, Relativity Mission)
GRT	Germanium Resistance Thermometer
GSE	Ground Support Equipment
GTU-2	Ground Test Unit number 2
HEPA	High Efficiency Particulate Air
ISO	International Standards Organization
L.D.	Leak Detector
LGS	Leakage Gas System
LLS	Liquid Level Sensor
LMSS	Lockheed Martin Space Systems
LN ₂	Liquid Nitrogen
mG	milli Gauss
MHz	Megahertz
NPB	Normal Boiling Point
Ozsi	Ounces per square inch
PPS	Programable Power Supply
PWx	Well Pressure gauge x
QD	Quick Disconnect - O-ring seal under screw down cap
RCM	Rotating Coil Magnetometer
RGA	Residual Gas Analyzer
RSE	Responsible Safety Engineer
RQE	Responsible Quality Engineer
sccs	Standard cubic centimeters per second
SMD	Science Mission Dewar (of GP-B , Relativity Mission program)
SU	Stanford University
TAO	Thermal Acoustic Oscillation
TGxx	UTS Gauge xx
TM xx	Task Module number xx.
TVxx	UTS Valve xx
VMA	Valve of Mini-Airlock
UTS	Utility Turbo pumping Station
VFV	Vatterfly Valve
VSx	Valve number x on Shutter
VW-1	Valve on Dewar Adapter connecting Well to outside

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1 SCOPE

This procedure describes the steps necessary to prepare the instrument Probe for the Gravity Probe-B (Relativity Mission) Program for insertion into the SMD (Science Mission Dewar). The principal task accomplished herein is the integration of the Airlock/Probe assembly with the SMD.

2 REFERENCE DOCUMENTS

2.1 Procedures:

The procedures listed are those required to prepare and insert a Probe into the SMD. S0317 presents an overview of the process and is for information only. The material of S0318 is used as a reference document with all the other procedures to identify the various attachment, lifting, etc. hardware that have been assembled into kits.

	<u>Procedure No.</u>	<u>Title</u>
P0210	SMD Tank to Well Helium Transfer	
P0207	SMD Main Tank Normal Boiling Point Fill	
P0133	Preparation for Probe/Airlock Integration	
P0134	Airlock/Dewar Integration	
P0135	Probe Insertion into Dewar	
P0141	FIST Emergency Procedures	
S0317	Probe/SMD Insertion Overview	
S0318	Probe/SMD Hardware Kit List	

2.2 Drawings:

	<u>Lockheed Dwg. No.</u>	<u>Title</u>
5833519 Rev C	Helium Airlock Assembly	
5823341 Rev D	Helium Airlock Installation	
5813359	Axial-lock Assembly	
5813395	SMD External plumbing	

2.3 Figures:

Fig. 1	Test Flow for Airlock/Dewar Integration
Fig. 2	Gas Module Plumbing Configuration

- 2.4 Supporting documentation
 - 2.4.1 Ignition Control Plan, LMMS-5835031
 - 2.4.2 Safety Compliance Assessment, LMMS GPB-100153C 100153C
 - 2.4.4 Hazard FMECA, LMMS GPB-100333
 - 2.4.5 Emergency Procedures SU/GP-B P0141
 - 2.4.6 Dewar Hardware Kit List, SU/GP-B P0144
 - 2.4.7 Final Assembly, LMMS 5833500
 - 2.4.8 Contamination Control Plan SU/GP-B P059

Fig. 1 TEST FLOW CHART

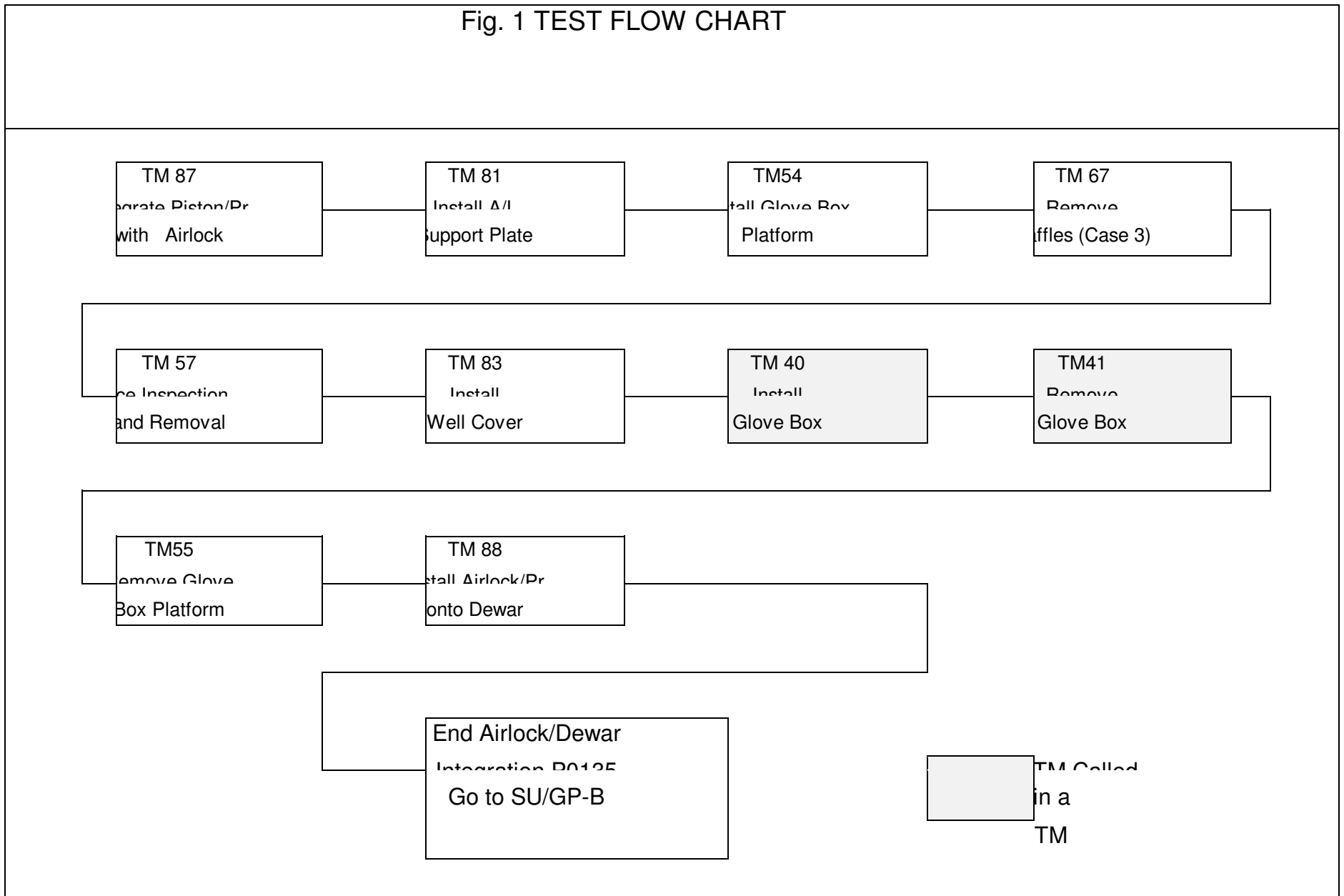


Figure 2 Gas Module Plumbing Configuration

1 SAFETY

1.1 General

Personal injury and hardware damage can result during normal positioning, assembly and disassembly of hardware (e.g. positioning of Dewar in tilt stand; integration of probe into airlock; integration of airlock/probe onto Dewar; removal of airlock from Dewar; removal of probe from Dewar); and during positioning of support equipment (e.g. pressurized gas cylinders; supply dewars).

Undesired events associated with these operations include: (1) Personnel or other objects are struck (e.g. by forklift or crane load) when hardware is being moved . (2) Personnel who are positioning hardware get their hands or feet caught between objects as hardware is moved into place. (3) Suspended hardware is dropped. (4) Personnel who are present during hardware movements (e.g. by forklift; crane) are caught between objects (e.g. forklifts and walls; loads and building support columns).

1.2 Lifting operations

The following Paras. apply to lifting operations.

- 1.2.1 Hard hats shall be available and used by personnel working around elevated working platforms.
- 1.2.2 Hoisting equipment operators shall be trained and qualified in the safe operation of all lifting equipment employed. They shall be competent in rigging lifting hardware. It is the responsibility of these individuals to ensure proper lifting configuration, based upon a review of procedures, drawings, training and experience.
- 1.2.3 Movements shall be verbally rehearsed before performing them.
- 1.2.4 All personnel in the area of hoisting operations shall wear hard hats.
- 1.2.5 Spotters shall be used as required. The crane operator and spotters shall agree upon and use a standard safety signal system prior to the start of any lifting operation.
- 1.2.6 Personnel who are positioning hardware shall use extreme caution so that they don't get their fingers pinched between the load and other objects.
- 1.2.7 Standard rigging fittings and lifting devices specially designed for the specific task shall be used at all times for hoisting material and equipment. The use of C-

clamps, mild steel bolts and non-shouldered eye bolts are prohibited for use as rigging fittings.

- 1.2.8 Safety hoist ring bolts shall be tightened to the torque value indicated on the safety hoist rings. Safety hoist rings shall not be modified in any manner. The use of substitute parts is expressly prohibited. Only those replacement or exchange parts recommended by the manufacturer are authorized.
 - 1.2.9 The hoist operator shall visually inspect accessory hoisting equipment for damage or defects prior to each use. Particular attention shall be paid to the condition of slings (e.g. broken wires, fraying, excessive wear, abrasions, kinks, deformation, cracks, etc.). Equipment found to be defective shall be immediately removed from service and reported to the supervisor.
 - 1.2.10 The hoist operator shall inspect cranes, hoists and all other primary lifting equipment each day before the initial use and before any critical lifting operation as specified by procedure. He shall perform a hoist checkout, or verify one has been performed that day.
 - 1.2.11 The hoist operator shall be responsible for the rigging of each lifting operation called out in each procedure. The lifting sling, attachment, etc., shall be selected from P0144, Probe-B/SMD Hardware Kit List.
 - 1.2.12 The hoist operator shall be responsible for the safety of all lifting operations.
- 1.3 Injuries
- In case of any injuries adhere to the following:
- 1.3.1 Obtain medical treatment. **Call 9-911**
 - 1.3.2 Notify Test Director, Mike Taber, telephone 54136 or beeper (9) 599-8033
- 1.4 Liquid Helium Dump
- Certain failure modes of the SMD can lead to a rapid dump of liquid/gaseous helium into the room. The following precautions will minimize possibly injury to personnel.
- 1.4.1 Non-flight diverters (90-deg elbows) are to be attached to the outboard flange of the two Main Tank and two Vacuum Enclosure burst disk assemblies. These diverters shall be positioned to direct the potential helium flow to the floor (or

other designated safe dump area).

- 1.4.2 When the diverters are directed to the floor, drip pans shall be placed under them to prevent liquid oxygen collection on the floor.
- 1.4.3 In the case of a fast helium dump the oxygen concentration may be lowered below a safe level (19.5%). In this case an oxygen concentration sensor mounted on the west wall will sound an alarm. All personnel shall immediately exit the FIST Operations room.

1.5 Genie Operations

Work at the top of the Airlock after it has been integrated with the SMD requires the use of Genie personnel lifts. The following steps shall be used whenever the Genie lifts are employed.

- 1.5.1 Before raising the Genie ensure the four outriggers (or floor anchors) have been installed and locked and the leveling jacks have been adjusted to firmly touch the floor and the base is level.
- 1.5.2 Do not adjust outriggers or reposition the machine while the platform is raised.
- 1.5.3 No work should be performed by leaning out over the rails.
- 1.5.4 Those working at the top of the Airlock shall each have easy access to an EEBA (Emergency Exit Breathing Apparatus) to be used for evacuating the room in case of a sudden dump of the helium cryogen and resultant depletion in oxygen concentration in the room.

1.6 Safety

The SMD Safety Compliance Assessment, LMMS GP-B 1000153C, discusses the safety design, operating and maintenance requirements of the SMD. This document should be reviewed for applicability at any facility where the hardware is operated.

1.7 Hazards Analysis

The GP-B SM Dewar FMECA, LMMS GP-B 100333, discusses hazards inherent in ATC-developed SMD hardware in detail.

1.8 Emergency Procedures

The FIST Emergency Procedures, SU/GP-B P0141, sets forth the procedures to be taken in case of facility power loss, arming and disarming the FIST alarm system and safeing of equipment in case of a sudden loss of liquid helium from the Dewar.

2 CONTAMINATION CONTROL

2.1 Particulate Contamination:

The control of particulate contamination of the probe is described in AGP-B Contamination Control Plan, SU/GP-B P059. Specific cases that require special methods are treated individual in this procedure. In general the when the Probe is in the FIST Lab it should be covered in clean room plastic and handled with gloves.

2.2 Magnetic Contamination:

The control of magnetic cleanliness of the probe and/or dewar is described in GP-B Magnetic Control Plan, LMMS-5835031. Specific cases that require special tools and handling are treated individually in this procedure.

3 TEST PERSONNEL

3.1 Personnel Qualifications:

The performance of the two Probe insertion procedures, P0134, Airlock/Dewar Integration and P0135, Probe Insertion into Dewar, require a Test Director and crew of from 1 to 3 Cryogenic Test Engineer (CTE) and one Responsible Safety Engineer (RSE). The minimum number of personnel to accomplish most of the Task Modules of these procedures is: Test Director and one CTE. However, a crew of Test Director and two CTE would be more efficient for several of the Task Modules. The one exception to this manning scheme is the Task Module 92, Lower Probe into Dewar, for which the required manning is Test Director and three CTE and the RSE. The RSE attendance for Test Modules 87 and 88 is required; his attendance at other portions of the procedures is at his discretion.

The test director is the designated signer for the Awitnessed by signoffs located at the end of each procedure/task module. .

3.2 Qualification of Personnel:

The Test Director must have a detailed understanding of all procedures and facility operations and experience in all of the Probe insertion operations.

The Cryogenic Test Engineers must have Probe/FIST operations experience and an understanding of the operations and procedures used for the cryogenic servicing/maintenance of the Dewar.

At present (May, 1998) the personnel who qualify for the above categories are:

Test Director:	Mike Taber	Stanford University
	Dave Murray	Lockheed
Cryogenic Test Engineer:	Tom Welsh	Lockheed
	Dave Frank	Lockheed
	Dean Read	Lockheed
	Dave Donegan	Lockheed
	Chuck Warren	Stanford University
	Mike Taber	Stanford University
	Dave Murray	Lockheed
Quality Engineer	Ben Taller	Stanford University
	Phil Unterriener	Lockheed
Safety Engineer	John Janicki	Lockheed
	A. Rodriguez	Lockheed

3.3 Redline Authority

The persons authorized to create and sign-off on redline modifications of the procedure as it is performed are the test directors, M. Taber and D. Murray. The redlines will be reviewed and approved by the RSE during or after the performance of the redline.

3.4 Critical Operations Review

At the start of this procedure and before any test procedures have been initiated an operations review meeting will be held with all personnel in attendance who have been assigned or who could be assigned (on a replacement basis) responsibilities. This meeting will cover the following all safety precautions described above and in particular instructions on the location and operation of the **Crane Disconnect** Switch. Emergency egress from scaffolding, room and building will be discussed.

All operations which are deemed critical by the test director(s), e.g., any moving or lifting of the Probe, shall have one Test Director in attendance.

3.5 Quality Assurance

Quality Assurance engineering shall be notified at least 48 hours prior to the start of this procedure. In the event of a failure during the execution of testing, Quality Assurance shall be contacted. Any redlines made to this procedure shall be initiated by a program RQE prior to his/her final sign off.

4 OPERATIONS

- 4.1 Verify that the Critical Operations Review meeting of Para. 5.4 has been completed and that all applicable personnel have attended or been briefed of the results.
- 4.2 Test Director for this Procedure is: _____ .
Starting Date & Time: _____ .
- 4.3 Verify responsible safety and quality engineers have been notified at: _____
Time/Date
- 4.4 Verify Completion of procedure SU/GPB P0133 Preparation for Airlock/Dewar Integration.
- 4.5 Verify the SMD Falling Object and Debris (FOD) shield is installed.
- 4.6 Perform in sequence the following Task Modules, except Task Module 87 can be anytime before Task Module 88. Also, Task Modules 81 and 54 may be omitted if already performed as parts of previous procedures.

Airlock/Dewar Integration						
Para No	TASK MODULE Airlock/Dewar Integration	Op No.	START		FINISH	
			TIME	DATE	TIME	DATE
4.6.1	Task Module 87: Integrate Piston/Probe with Airlock					
4.6.2	Task Module 81: Install Airlock Support Plate					
4.6.3	Task Module 54: Install Glove Box Platform					
4.6.4	Task Module 67: Remove Baffles (Case 3)					
4.6.5	Task Module 57: Ice Inspection and Removal					
4.6.6	Task Module 83: Install Well Cover					
4.6.7	Task Module 40: Install Glove Box (Used in TM 83)					
4.6.8	Task Module 41: Remove Glove Box (Used in TM 83)					
4.6.9	Task Module 55: Remove Glove Box Platform					
4.6.10	Task Module 88: Install Airlock/Probe onto Dewar					

4.7 Airlock/Dewar Integration complete.

Completed by:

Witnessed by:

Date:

AIRLOCK/DEWAR INTEGRATION

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Time:

RQE Sign off: _____

APPENDIX A

TASK MODULES

FOR

PROCEDURE

P0134

AIRLOCK/SMD INTEGRATION
Task Module 87: Integrate Piston/Probe with Airlock

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Task Module 87: Integrate Piston/Probe with Airlock

Operations Number
Date Initiated
Time Initiated

A SCOPE

- A.1 This module effects the integration of the Piston/Probe hardware to the Airlock prior to probe insertion.

B GENERAL REQUIREMENTS

- B.1 Magnetic screened tools, obtained from non-magnetic tool box are used for all open-well operations. Magnetic Zone SP, black marking (shrink tubing), is to be assumed unless Zone 2, yellow marking, is specifically called out.
- B.2 All O-rings installed shall be visually inspected, cleaned with isopropyl/ethyl alcohol as required and installed dry, unless otherwise noted.

C CONFIGURATION REQUIREMENTS

- C.1 Completed procedure P0133, Preparations for Probe/Airlock Integration.

D HARDWARE REQUIRED

- D.1 Hardware installed/used:
- a) Kit Installed: 12G, Bridge to Airlock Cylinder;
17Gb, Bridge to Piston
 - b) Guide Rod Spacer Blocks (2)
- D.2 Tools required
- a) Miscellaneous hand tools
 - b) Overhead Crane
 - c) Load Cell Assembly (Lockheed P/N 5833512-101)
 - d) Compliance Device (Lockheed P/N 5829166-106)

AIRLOCK/SMD INTEGRATION
Task Module 87: Integrate Piston/Probe with Airlock

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E OPERATIONS

1 Preparing to integrate to Airlock:

- 1.1 Verify RSE has been notified of moving of flight hardware. Date/Time: _____ .
- 1.2 Remove pumpout port dust cover and lanyard from the Probe.
- 1.3 Install Cryolab valve operator, VTH, and open the valve. (See Fig. 87-2)
- 1.4 Install double relief valves RVW-2a, -2b and VW-3 per Fig. 87-2.
- 1.5 Open/verify open valves VTH and VW-3
- 1.6 Inspect and alcohol (ethyl or isopropyl) wipe bottom surface of Probe Top Hat Flange.

2 Verifying Thermal Shoe Settings:

CAUTION

In the following steps care must be taken to not damage the electrical leads of the GRTs located on the bottom side of the Thermal Shoe Rings in the vicinity of the -X axis.

- 2.1 Check the position of all thermal shoes using a cleaned thermal shoe gauge tool.
- 2.2 Verify that all thermal shoes have been checked and noted in Table 87-1.

:

Time/Date

Sign-off

3 Lifting Probe/Piston Assembly from Assembly Stand:

CAUTION

For ESD prevention wear a wrist grounding strap connected to the Probe structure when connecting/disconnecting cables from flight equipment or irreversible damage to equipment may occur. Also, a ground wire must be connected from Probe ground point on Top Hat to facility ground.

- 3.1 If demating/mating of flight connectors is required, record in the Probe-C Usage Log Book.
- 3.2 Shut off power supply to all equipment and disconnect all external cables.
- 3.3 Verify balance weights determined in TM 86 are in place.
- 3.4 Install/verify installed two Guide Rod Spacer Blocks on top of Guide rods with T-pins in place.
- 3.5 Verify Airlock upper door gasket is trimmed to ID of Airlock.
- 3.6 Remove Airlock Upper Door.
- 3.7 Verify installation of the 4 screws (3/8x3-in)and washers (Kit No. 17Gb) that fasten the Bridge to the Piston Assembly. Verify equal lengths of the bolts protrude above the Bridge.

CAUTION

All personnel in or around crane handling operations must be wearing hardhats at all times.

CAUTION

In all of the following operations care must be taken to not apply side or bending loads to the Probe as these may damage the neck tube.

- 3.8 Verify Crane functional check-out has been performed within the last week:
Confirmed by Crane operator: _____ .
- 3.9 Attach the overhead crane with Load Cell Assembly (Lockheed P/N 5833512-101) to Compliance Device (Lockheed P/N 5829166-106), but do not completely remove slack.
- 3.10 Remove Probe restraining hardware from Probe Vacuum Shell and Assembly Stand.

CAUTION

In all Probe handling use gloves to prevent contamination of the Probe.

- 3.11 Remove all protective coverings from Probe using clean room gloves for handling.

- 3.12 Remove/verify removed, -X (open side of Stand) work platform and scaffolding from Assembly Stand.
- 3.13 Remove/verify removed, upper and lower locking pins that hold Guide Rods in Assembly Stand.

CAUTION

Physically restrain the hardware held by the Overhead Crane at all times, as practical, to prevent excessive swaying and possible damage to the Probe.

- 3.14 Remove/verify removed, all loose hardware from Bridge and Piston except for balance weights, if any.
- 3.15 Set tare weight on load cell.
- 3.16 Lift Piston/Probe sufficient to verify weight balance.
- 3.17 Adjust balance weight locations as required and note location on Fig. 87-1.
- 3.18 Verify balance weights are secured with tape to Piston.
- 3.19 Replace upper Guide Rod lock pins.
- 3.20 Lift the Piston/Probe hardware high enough to clear Assembly Stand.

3.21

Record weight: _____

3.22 Verify equipment listed, Includes: Balance weights, Guide Rods and Spacers, Piston Assembly (w/ Bridge), P

4 Installing Probe/Piston into Airlock:

- 4.1 Move the Assembly Stand away.
- 4.2 Raise Piston/Probe hardware high enough so that Guide Rods and Probe will pass through Airlock Upper Door.
- 4.3 Roll Airlock into position under the Piston/Probe and verify correct X/Y orientation of the two assemblies..

- 4.4 Lower the Piston/Probe hardware into the Airlock until the Bridge is positioned approximately 1/4" above the Airlock.
- 4.5 Align the Bridge to the Airlock using 2 dowel pins.
- 4.6 Lower the Piston/Probe hardware until the Bridge rests on the Airlock.
Note: Ensure Bridge and Airlock +/-Y axes line up.
- 4.7 Fasten the Bridge to the Airlock using the screws, washers, lock washers, and nuts from Kit No. 12G.
- 4.8 Torque the screws and nuts to 70-90 in-lbs.
- 4.9 Remove all equipment from Probe/Piston area.

5 Reconnecting Cables:

- 5.1 Install instrumentation cables to Piston.
- 5.2 Install top Airlock door.
- 5.3 Using DAS verify that the instrumentation is OK.

6 Task Module 87 complete.

Completed by:
Witnessed by:
RSE Sign offs:
Date:
Time:
RQE Sign off: _____

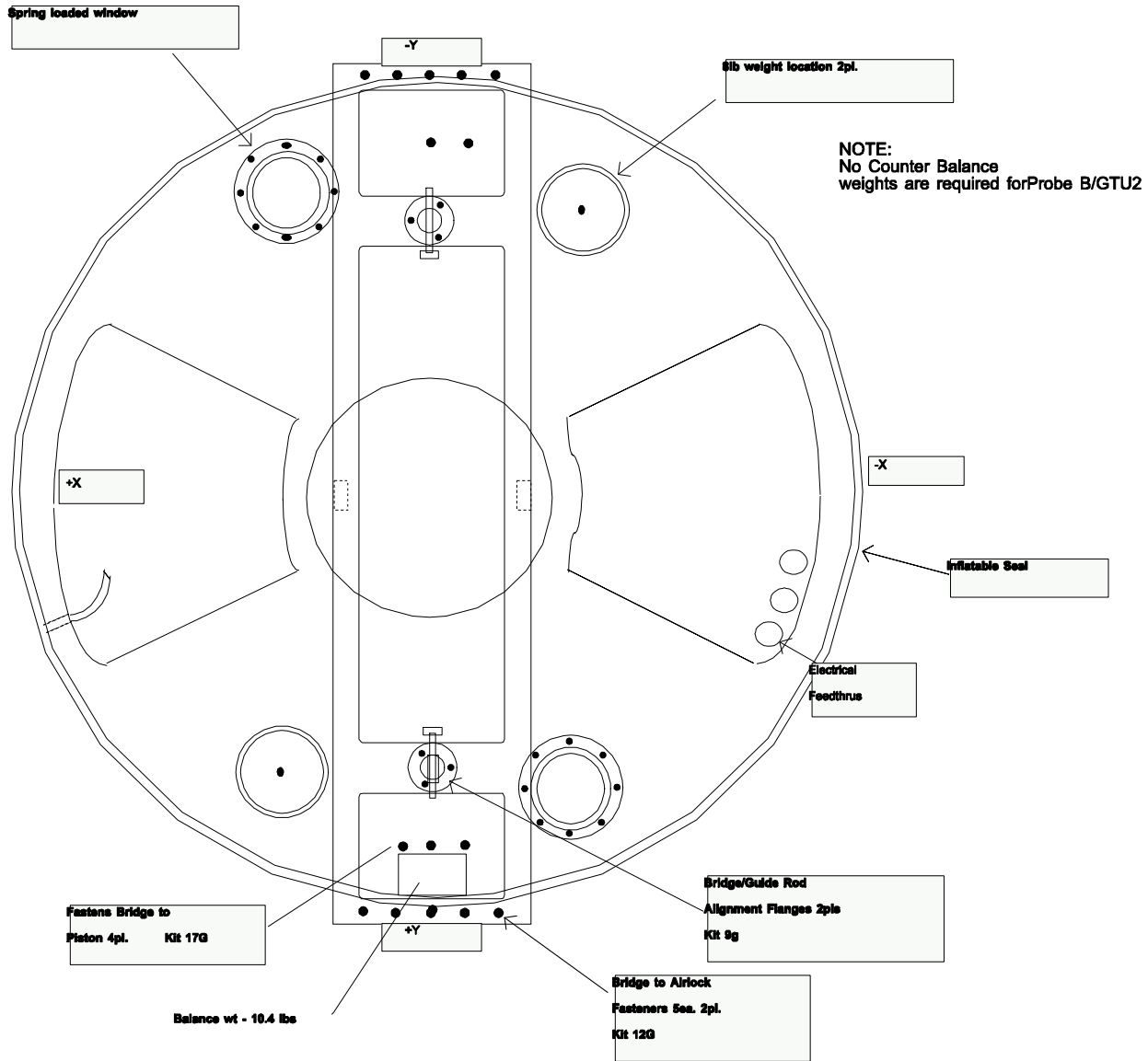
Table TM87-1 Thermal Shoe Adjustment

Position	Flex Pivot Check	Thermal Shoe Gauge	Comments
HEX-1	1		
	2		
	3		
	4		
	5		
	6		
HEX-2	1		
	2		
	3		
	4		
	5		
	6		
HEX-3	1		
	2		
	3		
	4		
	5		
	6		
HEX-4	1		
	2		
	3		
	4		
	5		
	6		

1) NOTE: Position 1 has temperature sensor wires on the underside of the HEX copper ring: take care to not crush with tool.

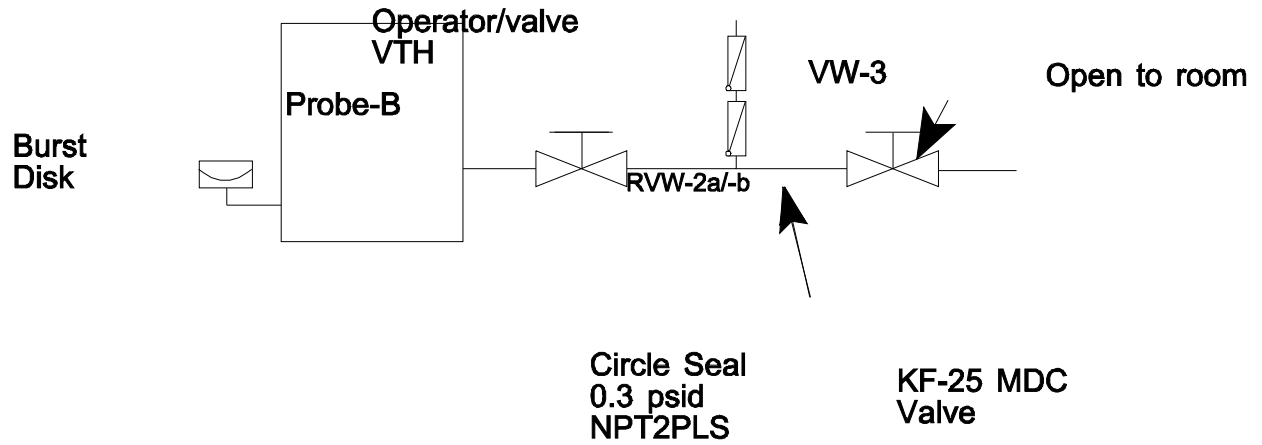
AIRLOCK/SMD INTEGRATION
Task Module 87: Integrate Piston/Probe with Airlock

Figure 87-1 Piston Plate Configuration



AIRLOCK/SMD INTEGRATION
Task Module 87: Integrate Piston/Probe with Airlock

Figure 87-2 Probe Exhaust Valving.



0

Task Module 81: Install Airlock Support Plate

Operations Number
Date Initiated
Time Initiated

A SCOPE

- A.1 This module effects the installation of the Airlock Support Plate onto the SMD when no Probe is installed in the Dewar.

B GENERAL REQUIREMENTS

- B.1 Magnetic screened tools, obtained from non-magnetic tool box are used for all open-well operations. Magnetic Zone SP, black marking (shrink tubing), is to be assumed unless Zone 2, yellow marking, is specifically called out.
- B.2 All O-rings installed shall be visually inspected, cleaned with isopropyl /ethyl alcohol as required and installed dry unless otherwise specified.

C CONFIGURATION REQUIREMENTS

- C.1 The starting configuration is with the Dewar Adapter and Shutter with Cover Plate installed on the SMD.

D HARDWARE REQUIRED

- D.1 Hardware installed/used:
- a) Airlock Support Plate.
 - b) Mounting Hardware: Kits 28P, 29P, 30G, 31G.
 - c) Seals from Kits 6 and 17
 - d) O-ring No. 5a. (37.3-in OD).
- D.2 Hardware removed:
- a) None.

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Task Module 81: Install Airlock Support Plate

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- D.3 Tools, non-magnetic required except where noted
- a) 7/16 open/box ended wrench.
 - b) 7/16 socket and wrench.
 - c) 1/4-in Allen wrench (for attaching lifting hardware).
 - d) 9/16 open/box end wrench.

E OPERATIONS

1 Preparing Equipment:

- 1.1 If O-rings for sealing between SMD top plate and Airlock Support Plate and between Airlock Support Plate and Airlock Cylinder are not in place or are to be changed out, perform this section.

Yes, do this section; No, skip this section

- 1.1.1 Perform procedure P0301 to remove the Guard and Main Tank vent lines and replace with appropriate vent relief valving.
 - 1.1.2 Verify both tanks are venting from the relief valving as appropriate.
 - 1.1.3 Clean O-ring groove and O-ring, Kit 16, with ethyl/isopropyl alcohol and lint free wipes alcohol and install in SMD top plate O-ring groove.
 - 1.1.4 Clean O-ring, Kit 6, which seals Airlock Support Plate to Airlock Cylinder, with alcohol.
 - 1.1.5 Wrap and secure this O-ring around SMD neck area above Airlock Support Plate flange.
- 1.2 Position two halves of Support Plate on floor near SMD.
- 1.3 Verify attachment hardware of Kits of para. D.1.c are available.
- 1.4 Clean seal areas with alcohol and wipe down.

CAUTION

For ESD prevention wear a wrist grounding strap connected to the Probe structure when connecting/disconnecting cables from flight equipment or irreversible damage to equipment may occur.

- 1.5 Remove five cables from the connector saver on top plate of SMD.

2 Installing First Half (smaller) of Support Plate:

- 2.1 At least three persons are require in the following steps.

CAUTION

Take extreme care to not bump the SMD with the Support Plate as permanent damage to vacuum shell may result.

- 2.2 Position the south-most (-X) Support Plate half on the scaffold.
- 2.3 Verify the SMD/Support Plate flange seal is in place.
- 2.4 Three persons lift the plate into position while the fourth person secures the plate with two bolts from Kit 28P, lightly snugging the bolts. **Do not grease this seal.**
- 2.5 Install all remaining bolts and hand tighten.

3 Installing Second Half (larger) of Support Plate:

- 3.1 Verify the split plate seal, Kit 17, is in place.
- 3.2 Position the north-most (+X) Support Plate half on the scaffold.
- 3.3 Two persons lift the plate into position while the third person:
 - a) secures the plate with at two bolts, Kit 28P, locations, hand tightening the bolts.
 - b) secures two bolts, Kit 29P, fastening the two support plate halves together
- 3.4 Position the Support Plate Assembly so that the two 1/4-in dowel pins can be installed between the Support Plate and Dewar.
- 3.5 Torque 5/16-24 flange bolts, Kit 28P, between Airlock Support Plate and Dewar to 130 +/- 13 in-lb.
- 3.6 Install all remaining flange bolts and torque as above.
- 3.7 Install all remaining support plate bolts, Kit 29P, and torque to 70 ft-lb.
- 3.8 Remove clam shell boots from the cable access holes, dress the five cables through the holes, reinstall the clam shell boots and tighten for air-tight seal.

NOTE:

The short second cable of cable WD-01 should be left above the plate and not dressed through the cable access hole.

- 3.9 Verify cables are correctly connected by checking the matching color coding at the interface connectors and/or the labeling.

4 Installing the Support Plate cylinder:

- 4.1 Three persons are required for the following steps.
- 4.2 If Main and Guard Tank vent lines have been removed in the above then perform this section.
- Yes, do this section; No, skip this section
- 4.2.1 Verify O-ring for Airlock Support Plate to Airlock Cylinder seal, Kit 6, has been cleaned and installed in the cleaned Airlock Support Plate O-ring groove.
- 4.2.2 Attach the Main Tank and Guard Tank vent lines to their respective bayonets, laying them in the Support Plate saddles and install the vent line cantilever supports.
- 4.3 Lift the Support Plate Cylinder onto the Support Plate; installing two 1/4-in dowel pins for alignment.
- 4.4 Fasten the hardware with the 1/4-28 screws from Kits 30G and 31G, torque to 70 in-lb.

5 Module 81 completed.

: _____
Witnessed by:
Date:
Time:
RQE Sign off: _____

AIRLOCK/SMD INTEGRATION
TASK MODULE 54: Install Glove Box Platform

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Task Module 54: Install Glove Box Platform

Operations Number
Date Initiated
Time Initiated

A SCOPE

This module effects the installation of the Glove Box Platform (GBP) onto the Airlock Support Plate.

B GENERAL REQUIREMENTS

- B.1 Magnetic screened tools, obtained from non-magnetic tool box are used for all open-well operations. Magnetic Zone SP, black marking (shrink tubing), is to be assumed unless Zone 2, yellow marking, is specifically called out.
- B.2 All O-rings installed shall be visually inspected, cleaned with isopropyl /ethyl alcohol as required and installed dry unless otherwise specified.

C CONFIGURATION:

- C.1 Hardware configuration is with Airlock Support Plate and Support Plate Cylinder installed on SMD.

D Hardware Required

- D.1 Hardware installed/used:
 - a) Overhead Crane (used)
 - b) Six foot , 2-leg lifting Sling (Caldwell, Lockheed P/N 5834820-105), 2 used
 - c) Glove Box Platform (installed)
 - d) Kit 18G (installed)
 - e) O-ring Kit No. 6 (installed)
 - f) Hand Tools as required

**AIRLOCK/SMD INTEGRATION
TASK MODULE 54: Install Glove Box Platform**

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E OPERATIONS

1 Preparing GBP:

WARNING

All personnel in or around crane lifting operations must be wearing hardhats at all times.

- 1.1 Verify Crane functional check-out has been performed within the last week:
Confirmed by Crane operator: _____ .
- 1.2 Attach two six foot , 2-leg lifting slings to Crane.
- 1.3 Move GBP storage rack into crane area.
- 1.4 Attach one leg of six foot , 2-leg lifting sling to top two shackle swivels of GBP.
- 1.5 Using Crane, lift GBP up and off of storage rack.
- 1.6 Remove GBP storage rack from Crane area.
- 1.7 Using Crane, slowly lower GBP flat on floor, ensuring that there is adequate room to do so.
- 1.8 Attach the two six foot , 2-leg lifting slings to all four shackle swivels.

2 Installing GBP:

- 2.1 Installing O-ring:
 - 2.1.1 Remove 56.36-in diameter O-ring, No. 6, from Support Plate Cylinder and inspect for signs of cracking and replace if required.
 - 2.1.2 Clean O-ring and groove as required with isopropyl/ethyl alcohol.
 - 2.1.3 Install O-ring No. 6 into Support Plate Cylinder O-ring groove; leave dry, do not grease.
- 2.2 Using Crane, lift the GBP to a position directly over the Airlock Support Plate.

NOTE

The clocking of the GBP to the Airlock Support Plate is for the beveled-out side of the GBP opening to align parallel to and lie next to the mean location of the SMD connectors.

- 2.3 Position GBP to correct clocking for mating to Airlock Support Plate.
- 2.4 Using Crane, lower the GBP onto Airlock Support plate.
- 2.5 Fasten GBP to Airlock Support Plate with 36 screws, lock washers and 72 flat washers from Kit 18G.
- 2.6 Torque all bolts to 70-90 in-lb.
- 2.7 Remove the two six foot , 2-leg lifting slings (Caldwell, Lockheed P/N 5834820-105) from GBP shackle Swivels and stow.
- 2.8 Install GBP safety rails and gates.

AIRLOCK/SMD INTEGRATION
Task Module 67: Remove baffles (Four Cases)

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3 Module 54 completed.

Completed by:

Witnessed by:

Date:

Time:

RQE Sign off:

Task Module 67: Remove baffles (Four Cases)

Operations Number
Case Number
Date Initiated
Time Initiated

A SCOPE

This task module effects the removal of Dewar neck tube Baffles. The starting configuration can be any one of four different configurations and the ending configuration can be any one of four. The four cases differ slightly and are the following:

Case 1: Removal of the Baffle Plug Assembly

Case 2: Removal of the 6-in Aperture Annular Baffle Assembly along with the Plug Baffle Assembly.

Case 3: Removal of the complete Baffle Assembly.

Case 4: Removal of the complete Baffle Assembly with the Cryoperm Shield/Baffle Assembly substituted in place of the 6-in aperture baffles.

A.1 Wherever in the procedure the procedure an individual case requires separate treatment, horizontal lines are used to separate the text.

A.2 Before executing the procedure the sections that deal with the multiple cases shall be highlighted for the particular case under consideration and the Cases which do not apply shall be crossed out.sdffg

B CONFIGURATION REQUIREMENTS

B.1 The Shutter and a Cover Plate are installed on the Dewar Adapter:

Case 1 All Baffles are installed in the Dewar.

Case 2 All Baffles are installed in the Dewar.

Case 3 All Baffles are installed in the Dewar.

Case 4 All Baffles (with the 6-in aperture baffle replaced with the Cryoperm 6-in aperture baffle element) are installed in the Dewar.

B.2 General requirements:

a) Magnetic screened tools, obtained from non-magnetic tool box are used for all operations. Magnetic Zone SP, black marking (shrink tubing), is to be assumed unless Zone 2, yellow marking, is specifically called out.

b) Hardware for installation shall be taken from plastic bag with magnetic screening ID.

AIRLOCK/SMD INTEGRATION
Task Module 67: Remove baffles (Four Cases)

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- c) Hardware removed shall be removed to the original plastic bag with magnetic screening ID.
- d) Clean room gloves shall be worn by all persons working on hardware to be inserted into the well. For any work performed at the level of the dewar opening clean room shoes shall be worn in addition.
- e) All operations with the Well the pressure shall be maintained above atmospheric.
- f) All O-rings installed shall be visually inspected, cleaned with isopropyl /ethyl alcohol as required and installed dry, unless otherwise noted.

C HARDWARE REQUIRED

C.1 Hardware installed:

Case 1	Kits 1P and 2P
---------------	----------------

Case 2	Kits 1P and 3P.
---------------	-----------------

Case 3	Kits 1P and 4P
---------------	----------------

Case 4	Kits 1P and 4P
---------------	----------------

C.2 Hardware Used

- a) Baffle Assembly
- b) Short Airlock Cylinder (For Cases 1, 2 and 3)
- c) Long Airlock Cylinder (1 for Cases 1,2,3 and 2 each for Case 4)
- d) Baffle Installation Tool (BIT) LMMS 5823243
- e) Cover Plate LMMS 5823256
- f) Pole Clamp Lock
- g) Clamp Ring
- h) Overhead Crane
- i) One large Lifting Pear ring (rated 1500 Kg)
- j) Two 5/16-in S.S. Long Shackles
- k) One 3-Ft , 2-leg lifting sling (load capacity >1000 lbs each leg)

C.3 Hardware removed:

- a) Kit 1P
- b) And:

Case 1	Baffle Plug Assembly
---------------	----------------------

Case 2	Baffle Plug Assembly 6-in Dia Cloth Sleeve Attachment Ring 6-in Aperture Baffle Assembly
---------------	--

Case 3	Baffle Plug Assembly 6-in Dia Cloth Sleeve Attachment Ring 6-in Aperture Baffle Assembly 10-in Dia Cloth Sleeve Attachment Ring 10-in Aperture Baffle Assembly
---------------	--

Case 4	Baffle Plug Assembly 6-in Dia Cloth Sleeve Attachment Ring 6-in Aperture Cryoperm Shield Baffle Assembly 10-in Dia Cloth Sleeve Attachment Ring 10-in Aperture Baffle Assembly
---------------	--

C.4 Tools, non-magnetic required

- a) Phillips No. 3 screwdriver
- b) Long nose pliers, ground down
- c) Large pear ring

F OPERATIONS

1 Verifying liquid helium levels in the Dewar and Prep Crane:

CAUTION

Liquid helium levels, specified herein shall be maintained at all times, using the appropriate cryogen procedures as required.

1.1 Verify and record liquid helium levels:

Location	10-in
Tank	30
Guard	N/A
Well	>97
Axial Lock	N/A

Date: _____
Time: _____

WARNING

All personnel in or around crane lifting operations must be wearing hardhats at all times.

1.2 Verify Crane functional check-out has been performed within the last week:
Confirmed by Crane operator: _____ .

2 Assembling Airlock Hardware:

2.1 Verify Shutter is installed on Dewar Adapter.

Note:

Steps annotated with a Γ are steps which are skipped when removing baffles from a partial "Install Baffles", Task Module 75.

2.2 Γ Assemble on the floor the Short Airlock and Long Airlock cylinder(s) with the Short Airlock on the bottom and baffle installation pole.

2.3 Γ Attach the Crane to the Airlock lifting lugs with a double sling and position it near the Dewar work area.

3 Attaching the Baffle Installation Tool:

3.1 Γ Open/verify opened Shutter.

3.2 Γ Remove Cover Plate from the Shutter.

3.3 CASE 1

3.3.1 Remove the three 1/4-20 x 2-in. screws (Kit 2P) that hold the Baffle Plug to the 6-in Aperture Baffles.

3.3.2 Mate the Baffle Installation Tool to the Baffle Plug using the three 1/4-20 x 2-in. screws (Kit 1P) previously removed.

3.4 CASE 2

3.4.1 Remove the six 1/4-20 x 2-in. screws (Kit 3P) that hold the 6-in Aperture Baffle Assembly to the 10-in Aperture Baffle.

3.4.2 Mate the Baffle Installation Tool to the 6-in Aperture Baffle at the 9.5-in diameter B.C. using three 1/4-20 x 2-in.(Kit 1P) screws.

3.5 CASE 3 and CASE 4

3.5.1 Verify all the Baffles are fastened together.

3.5.2 Remove the six 1/4-20 x 1-1/4-in screws (Kit 4P) from the 14-in. diameter B.C. holding down the 10-in Aperture Baffles.

3.5.3 Mate the Baffle Installation Tool to the 10-in Aperture Baffle Plate using three 1/4-20 x 2-in. screws (Kit 1P).

4 Attaching Airlock Hardware:

4.1 Use Crane to position Airlock Assembly onto the Shutter.

4.2 Mate Airlock Assembly to Shutter with Marmon Clamp.

4.3 Install Cover Plate onto Installation Pole and fasten to Airlock Assembly with Marmon Clamp.

4.4 Tighten Cover Plate 1-1/4-in. QD.

4.5 Remove Lifting Sling from the Airlock Assembly.

5 Purging Airlock:

5.1 Attach helium purge gas line from Support Plate to VW-1. a) Yes b) No

5.2 Attach O₂ Sensor line with tee to tee at VMA.

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Task Module 67: Remove baffles (Four Cases)

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- 5.3 Close/verify closed EV-11 and EV-19 open.
- 5.4 Power-on O₂ Sensor.
- 5.5 Open VS-1, VS-2 and VMA to aid in purging.
- 5.6 Purge the airlock with helium gas until the O₂ monitor is < 0.2 %.
- 5.7 Power off O₂ Sensor.
- 5.8 Verify VS-1, VS-2, VW-1 and VMA are closed.
- 5.9 Select the Continue or Pause option in the following steps.

-
- 5.10 Option: **Continue** with procedure
 - 5.10.1 Adjust VS-1 to keep pressure at PW-1 <5-ozsi.
 - 5.10.2 Go to step 6.0.

-
- 5.11 Option: **Pause** the procedure
 - 5.11.1 Verify PW-1 reads between 3 and 7-in ozsi.
 - 5.11.2 When ready to proceed:
 - a) Verify closed EV-11; verify EV-19 open.
 - b) Proceed to step 6.0.

6 Retracting Baffle(s):

- 6.1 Loosen Cover Plate 1-1/4-in. QD.
- 6.2 Lift Baffle Pole by hand about 2-in to verify no binding.
- 6.3 Mate the crane to the Baffle Installation Tool.
- 6.4 Using Crane, slowly retract the Baffle Assembly into the Airlock stopping about 1-in from Airlock Cover Plate.

Note: Observe baffles carefully to verify no interference between fixed and moving baffle sets.
- 6.5 Hand tighten Cover Plate 1-1/4-in QD and install a Pole Clamp Lock.
- 6.6 **Close Shutter.**

7 Install the Cover Plate on Shutter.

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- 7.1 **Verify Shutter is closed.**
- 7.2 Unfasten Airlock Assembly from Shutter and lift Airlock/Baffles away with Crane.
- 7.3 Stow Airlock Assembly to floor and secure Crane.
- 7.4 Immediately install a Cover Plate onto the Shutter and secure with clamp.
- 7.5 Attach O₂ Sensor line with tee to 2-in QD on Cover Plate.
- 7.6 Power on O₂ Sensor.
- 7.7 Purge the Shutter with helium gas until the O₂ monitor is < 0.2 %.
- 7.8 Power off O₂ Sensor.

- 7.9 Remove O₂ Sensor and install 2-in QD Plug.
- 7.10 Verify EV-11 closed, EV-19 open.

8 Task Module 67 completed.

Completed by:
Witnessed by:
Date:
Time:
RQE Sign off: _____

Task Module 57: Ice Inspection/Removal

Operation Number
Date Initiated
Time Initiated

A SCOPE

This task module effects the inspection and/or removal of ice from the thermal stop rings and station 200 of the Dewar.

B GENERAL REQUIREMENTS

- B.1 Magnetic screened tools, obtained from non-magnetic tool box are used for all open-well operations. Magnetic Zone SP, black marking (shrink tubing), is to be assumed unless Zone 2, yellow marking, is specifically called out.
- B.2 All O-rings installed shall be visually inspected, cleaned with isopropyl /ethyl alcohol as required and installed dry unless otherwise specified.

C CONFIGURATION REQUIREMENTS

- C.1 The Shutter is installed with a Cover Plate.
- C.2 The baffles have been removed per Task Module 67, Case 3 or 4 (all baffles removed).

D HARDWARE REQUIRED

- D.1 Hardware installed:
 - a) Cover Plate
- D.2 Hardware removed: None
- D.3 Hardware Used
 - a) Ice Removal Cover Plate
 - b) Ice Removal Tool
- D.4 Tools, non-magnetic required
 - a) Slothead No. 2 screwdriver

E OPERATIONS

1 Verifying Liquid Helium Levels:

1.1 The liquid helium level in the Well should be just below Station 200 for optimal visibility in the ice inspection and removal. However the level must be maintained above the top of the lead bag. This is satisfied for a Well LLS reading of >20.

1.2 Record liquid helium levels.

Well (>20%) _____ %
Axial Lock _____ %
Tank _____ %

Date _____
Time _____

1.3 Record internal transfer Procedure P0210 if used:

Operations Number _____ .

2 Inspecting for Ice:

2.1 Verify Baffles have been removed per TM 67, Case 3 or 4.

2.2 Inspect the thermal stop ring and station 200 areas for ice and record.

2.3 Verify visually that the Axial Lock Dogs are retracted into their pockets and do not protrude into the ID of Station 200.

3 Removing Ice:

NOTE

Clean all of the Ice Removal Tools with isopropyl/ethyl alcohol as assembled.

3.1 Install the Ice Brush tool into the Ice Removal Cover Plate.

3.2 **Verify Shutter is closed.**

3.3 Remove Shutter Cover Plate, lower Ice Removal Assembly and attach to Shutter with Marmon clamp.

Note: Do not allow Brush to contact mylar film of Shutter.

AIRLOCK/SMD INTEGRATION
Task Module 57: Ice Inspection/Removal

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- 3.4 Attach the O₂ Sensor line to Shutter at VS-1.
- 3.5 Power-on Sensor.
- 3.6 Purge Shutter with Well boil-off.
- 3.7 Purge with helium gas until the O₂ monitor is < 0.2 %.
- 3.8 **Open Shutter.**
- 3.9 Lower Tool and remove ice:

CAUTION

Do not use the Ice Brush on the titanium foil covered portions of the neck tube as damage to this foil can produce leaks into the Dewar vacuum.

- a) Thermal stop rings
- b) Station 200

3.10

Record results: _____

- 3.11 Power off O₂ Sensor.
- 3.12 Remove O₂ Sensor.

4 Remove Ice Brush Tool:

- 4.1 Raise tool into top of Shutter.
- 4.2 Close Shutter.
- 4.3 Remove Cover Plate with attached Ice Brush tool assembly and reinstall a Cover Plate on the Shutter.
- 4.4 Purge Shutter until O₂< 1%.

5 Task Module 57 complete.

Completed by: _____
Witnessed by: _____
Date: _____
Time: _____
RQE Sign off: _____

Task Module 83: Install Well Cover

Operations Number
Date Initiated
Time Initiated

A SCOPE

This module effects removal of the Dewar Adapter and the installation of the Well Cover Assembly for preparation of Probe insertion.

B GENERAL REQUIREMENTS

- B.1 Magnetic screened tools, obtained from non-magnetic tool box are used for all open-well operations. Magnetic Zone SP, black marking (shrink tubing), is to be assumed, unless Zone 2, yellow marking, is specifically called out.
- B.2 All O-rings installed shall be visually inspected, cleaned with isopropyl /ethyl alcohol as required and installed dry unless otherwise specified.

C CONFIGURATION REQUIREMENTS

- C.1 All Baffles have been removed per Task Module 67(Case 3 or 4)
- C.2 The Lead Bag Retainer is installed.

D HARDWARE REQUIRED

- D.1 Hardware installed/used:
 - a) Well Cover Assembly (aka Pancake Cover)
 - b) Collapsible Baffle Assembly
 - c) Kits installed: 14P
 - d) Fluorosilicone O-ring No. 2c, new, cleaned with ethyl/isopropyl alcohol, greased with Braycote 600 and bagged
 - e) KF-25 O-ring, centering ring and clamp
- D.2 Hardware removed:
 - a) Kits Removed: 10P
 - b) SMD Dewar Adapter
 - c) Well Cover Plate with deployable baffles
 - d) Shutter
 - e) Vent Plumbing

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Task Module 83: Install Well Cover

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D.3 Tools required

- a) 2 each 7/16 open end wrench (non-magnetic)
- b) plastic tray
- c) needle nose pliers (non-magnetic)

D.4 Materials required

- a) Non-lint wipes
- b) Isopropyl/Ethyl alcohol
- c) Braycote 600 perfluoropolyether vacuum grease

E OPERATIONS

1 Preparing for Well Cover installation:

- 1.1 Verify SMD cable pass-throughs in Airlock Support Plate have been adequately sealed with Dux-Seal putty.
- 1.2 Remove oxygen sampling line from above the Airlock Support Plate.
- 1.3 Remove/verify removed the external helium purge line from VW-1 and the Support Plate QD nipple.
- 1.4 Loosen and remove 11 of the 15 screws and washers (leaving four easily accessible screws in place) that hold the Dewar Adapter Assembly to the SMD and stow in Kit 10P.
- 1.5 Remove any cap on valve VW-1.
- 1.6 Install the Glove Box per Task Module 40.
- 1.7 Start internal Tank to Well transfer:

Operations order No.

Date and Time

b) ____ No.

a) ____

NOTE:

The Axial Lock LLS will probably not register due to the high boil off.

- 1.8 Record liquid helium levels.

Tank (∓30%) _____ %

Axial Lock (∓25%) _____ %

Time

Date

- 1.9 Verify collapsible Baffle Assemble is installed on Well Cover.
- 1.10 Configure the Well exhaust plumbing per Fig. 83-1.
- 1.11 Install into glove box the items listed in D.1 and D.3.
- 1.12 Verify O-ring 2c, cleaned, lightly greased with Bracote 600, bagged and installed in Glove Box.
- 1.13 Install Cover Plate on top of Glove Box with a Marmon clamp.

1.14

Purge Glove Box until O₂ monitor reads # 0.2%.

Record

2 Installing Well Cover:

CAUTION

O-ring between Dewar Adapter and Shutter may lift off when removing Shutter and abort the operation.

- 2.1 Remove Cover Plate from Shutter.
- 2.2 Remove the Marmon clamp holding the Shutter to the Dewar Adapter and remove the Shutter and stow in the Glove Box.
- 2.3 Install Cover Plate on Dewar Adapter and close DEV-15.
- 2.4 Close EV-19, verify EV-11 is closed and disconnect the Dewar Adapter vent line.
- 2.5 Remove the remaining four screws and washers that are holding the Dewar Adapter to the SMD and stow in Kit 10P.

CAUTION

Take EXTREME CARE when removing Adapter to prevent the O-ring between Dewar Adapter and Top Plate from lifting off and falling into The Well.

- 2.6 Remove the Dewar Adapter and stow in the Glove Box.
- 2.7 Replacing Dewar Adapter O-ring:
 - 2.7.1 Remove O-ring, No. 2, from SMD Top Plate.
 - 2.7.2 Clean O-ring groove with isopropyl /ethyl alcohol using lint free Q-tips or wipes.
 - 2.7.3 Install new, clean, O-ring No. 2c, flight O-ring, lightly greased with Braycote 600, into SMD Top Plate O-ring groove.
- 2.8 Install the Well Cover Assembly/Collapsible Baffles.
- 2.9 Fasten the Well Cover Assembly to the SMD Adapter Plate using the three Well Cover Assembly Fasteners from Kit 14P.

2.10

Record liquid levels:

Tank: __

Well: _____ %

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Task Module 83: Install Well Cover

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Time and date:

2.11

Remove Glove Box per Task Module 41.

Operatio

2.12 Tether the Well Cover Assembly fasteners to the Guide Rod Cups.

3 Deploy well Cover Baffles:

3.1 Connect three Baffle string supports to the lifting ring.

3.2 Tauten the support strings by raising the lifting ring.

3.3 Release the locking strings.

3.4 Lower the lifting ring, deploying the baffles into the SMD CNT.

4 Module 83 completed.

Completed by:

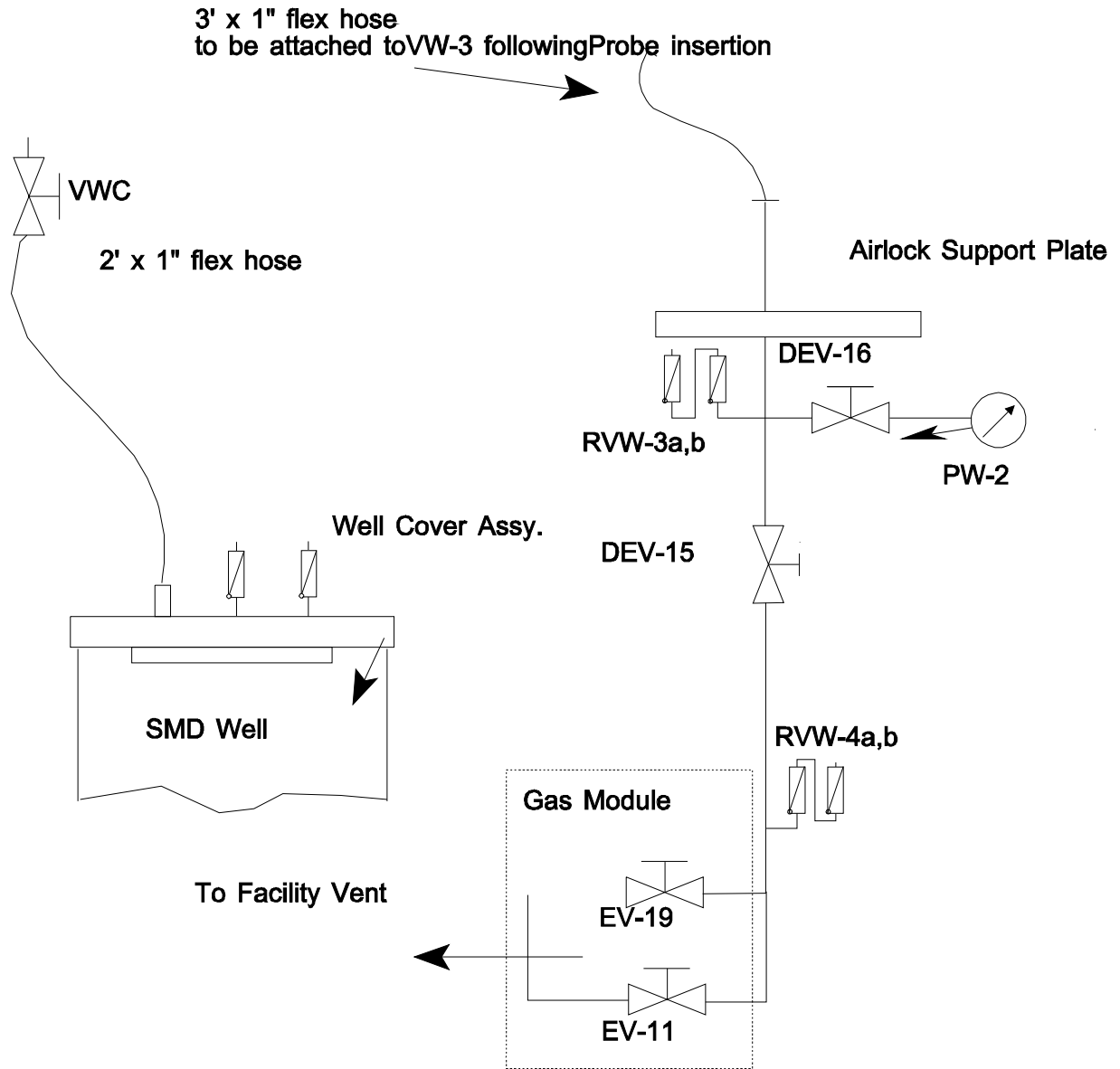
Witnessed by:

Date:

Time:

RQE Sign off: _____

Fig. 83-1 Well Vent Configuration prior to Probe Insertion



Task Module 40: Install Glove Box

Operations Number
Date Initiated
Time Initiated

A SCOPE

This module effects the installation of the Glove Box onto the Glove Box Platform (Glove Box Adapter Plate).

B GENERAL REQUIREMENTS

- B.1 Magnetic screened tools, obtained from non-magnetic tool box are used for all open-well operations. Magnetic Zone SP, black marking (shrink tubing), is to be assumed unless Zone 2, yellow marking, is specifically called out.
- B.2 All O-rings installed shall be visually inspected, cleaned with isopropyl /ethyl alcohol as required and installed dry unless otherwise specified.

C CONFIGURATION REQUIREMENTS

- C.1 Dewar has the Airlock Support Plate installed together with the Glove Box Adapter Plate.

D HARDWARE REQUIRED

- 0.1 Hardware installed/used:
 - 0.1.1 Overhead Crane
 - 0.1.2 Glove Box
 - 0.1.3 Glove Box Spreader Bar
 - 0.1.4 Two 3-Ft , 2-leg Lifting Slings (Caldwell, P/N 47176)
- 0.2 Hardware removed:
 - 0.2.1 None
- 0.3 Tools, non-magnetic required
 - 0.3.1 None

1 OPERATIONS

Time:

F Preparing Crane and Glove Box:

WARNING

All personnel in or around crane lifting operations must be wearing hardhats at all times to guard against head injury

1. Verify Crane functional check-out has been performed within the last week:
Confirmed by Crane operator: _____ .
- 1.1 Vacuum and wipe down Airlock Support Plate and Glove Box Platform.
- 1.2 Attach the Spreader Bar to the Crane and install two 3-ft double slings on the Spreader Bar lifting hooks.
- 1.3 Position Glove Box under the crane with Spreader Bar over the Glove Box lifting clevises.
- 1.4 Attach slings to Glove Box lifting clevises.
- 1.5 Lift the Glove Box high enough to remove the four casters.
- 1.6 Remove the four casters and insert the two guide pins.
- 1.7 Ethyl alcohol wipe Glove Box seal.

F Installing Glove Box:

1. Use Crane to raise and center Glove Box over the Glove Box Support Plate with the side marked #2 to the west or +X, +Y Dewar quadrant.
2. Verify all 16 latches are in the straight up position.
3. Use Crane to slowly lower the Glove Box, engaging the two guide pins, and finally resting on the Glove Box Support Plate.
4. Latch 16 latches.

F Removing Crane:

1. De-mate the slings from the Glove Box lifting clevises.
2. Use Crane to remove spreader Bar away from the working area.
3. Secure Crane.

F Task Module 83 complete.

Approved by:
Witnessed by:
Date :

AIRLOCK/SMD INTEGRATION
Task Module 40: Install Glove Box

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Time :

Task Module 41: Remove Glove Box

Operations Number
Date Initiated
Time Initiated

A SCOPE

This module effects the removal of the Glove Box from the Glove Box Adapter Plate.

B GENERAL REQUIREMENTS

- B.1 Magnetic screened tools, obtained from non-magnetic tool box are used for all open-well operations. Magnetic Zone SP, black marking (shrink tubing), is to be assumed unless Zone 2, yellow marking, is specifically called out.
- B.2 All O-rings installed shall be visually inspected, cleaned with isopropyl /ethyl alcohol as required and installed dry unless otherwise specified.

C CONFIGURATION REQUIREMENTS

- C.1 The Glove Box is installed on the Glove Box Adapter Plate on the Dewar.

D HARDWARE REQUIRED

- D.1 Hardware installed/used:
 - a) Overhead Crane
 - b) Glove Box Spreader Bar (Lockheed P/N 5834820-105)
 - c) Two 3-Ft , 2-leg Lifting Slings (Caldwell P/N 47176)
- D.2 Hardware removed:
 - a) Glove Box Lockheed Dwg 5834850
- D.3 Tools, required
 - a) None

E OPERATIONS

WARNING

All personnel in or around crane lifting operations must be wearing hardhats at all times to guard against head injury

1 Preparing Crane

- 1.1 Verify Crane functional check-out has been performed within the last week
Confirmed by Crane operator: _____ .
- 1.2 Use Crane to lift the Glove Box Spreader Bar to a position above the Glove Box.
- 1.3 Use the two 3-Ft , 2-leg Lifting Slings to attach the Glove Box Spreader Bar to the Glove Box.
- 1.4 Retract 16 latches of Glove Box.
- 1.5 Remove the two Guide Pins.
- 1.6 Use Crane to remove slack from lifting slings.
- 1.7 **Verify** all 16 latches are retracted.

2 Removing Glove Box

- 2.1 Use hand pressure on lifting slings to verify Glove Box is free to lift.
- 2.2 Use Crane to raise the Glove Box and move to floor area.
- 2.3 Stop Crane – 2 ft above floor and install four casters.
- 2.4 Lower Glove Box to floor and stow.

3 Remove Crane

- 3.1 Remove the two 3-Ft , 2-leg Lifting Slings.
- 3.2 Remove the Glove Box Spreader Bar.
- 3.3 Secure Crane.

4 Task Module 41 complete.

Completed by:

Witnessed by:

Date:

Time:

RQE Sign off: _____

Task Module 55 Remove Glove Box Platform

Operations Number
Date Initiated
Time Initiated

A SCOPE

This module effects the removal of the Glove Box Platform (GBP) from the Airlock Support Plate.

B REQUIREMENTS

None

C HARDWARE REQUIRED

C.1 Hardware used/removed/installed

- a) Glove Box Platform (removed)
- b) Overhead Crane (used)
- c) Two 6-Ft , 2-leg Lifting Slings (Caldwell, P/N 5834820-105) (used)
- d) Tools used: Miscellaneous hand tools (used)
- e) Kit 18G, Airlock Cylinder to GBP (removed)

D CONFIGURATION REQUIRED

D.1 Hardware configuration is with Airlock Support Plate and Airlock Short Cylinder mounted to the SMD and with the Glove Box removed.

E OPERATIONS

1 Removing the Glove Box Platform:

WARNING

All personnel in or around crane lifting operations must be wearing hardhats at all times.

- 1.1 Verify Crane functional check-out has been performed within the last week:
Confirmed by Crane operator: _____ .
- 1.2 Remove Safety Rails from GBP (Glove Box Platform).
- 1.3 Attach the two 6-Ft , 2-leg Lifting Slings to the Crane.
- 1.4 With slack , attach the two 6-Ft , 2-leg Lifting Slings to the 4 shackle swivels on the GBP.
- 1.5 Remove the 36 screws, 36 washers and bag in Kit 18G.
- 1.6 Use Crane to very **slowly** raise GBP about 0.1-in and verify GBP free.
- 1.7 Continue raising at slow speed about 1-in.
- 1.8 Remove GBP to floor area and set down.
- 1.9 Remove one 2-leg sling from #2 side of the GBP.
- 1.10 Using the Crane, slowly raise GBP off of floor; traverse crane to keep GBP under center of lift (keep lifting sling vertical).

Note:

Take care that GBP does not slip on floor surface.

- 1.11 Move GBP storage rack into crane area
- 1.12 Lower GBP into Storage Rack.
- 1.13 Disconnect and secure Crane.

2 Task Module 55 complete.

Completed by:
Witnessed by:
Date:
Time:
RQE Sign off: _____

Task Module 88: Install Airlock/Probe onto Dewar

Task Module 88: Install Airlock/Probe onto Dewar

Operations Number
Date Initiated
Time Initiated

A SCOPE

- A.1 This module effects the lowering and the fastening of the Airlock/Probe Assembly onto the SMD Dewar.

B GENERAL REQUIREMENTS

- B.1 Magnetic screened tools, obtained from non-magnetic tool box are used for all open-well operations. Magnetic Zone SP, black marking (shrink tubing), is to be assumed unless Zone 2, yellow marking, is specifically called out.
- B.2 All O-rings installed shall be visually inspected, cleaned with isopropyl /ethyl alcohol as required and installed dry unless otherwise specified.

C CONFIGURATION REQUIREMENTS

- C.1 The successful completion of procedure P0133 and all preceding Task Modules of this procedure.

D HARDWARE REQUIRED

- D.1 Hardware installed/used:
 - a) Overhead Crane
 - b) Kit Installed: 13G, 14G, 24P, 13P
 - c) Compliance Device (Lockheed P/N 5829166-106)
 - d) Load Cell (Lockheed P/N 5833512-101)
 - e) Guide Rod Lifter (Lockheed P/N 5833518-101)
- D.2 Tools required
 - a) Electronic Clinometer
 - b) Miscellaneous hand tools
 - c) Isopropyl or ethyl alcohol

Task Module 88: Install Airlock/Probe onto Dewar**E OPERATIONS****1 Preparing to install the Airlock onto the SMD Dewar:**

1.1 Verify RSE has been notified of moving of flight hardware. Date/Time: _____ .

1.2 Clean the upper surface of the SMD and Airlock Support Plate with isopropyl/ethyl alcohol and lint free wipes.

1.3 Verify Airlock Support Plate vent plumbing is operable and configured per Fig. 83-1 of Task Module 83.

1.4 Level/verify level the SMD, using a clinometer, to within 1 arc minute in X and Y axis using any of the following surfaces; indicate which surface used in final leveling. Record trails on Fig. 88-1.

Note: The Airlock Support Plate has, in the past, given the best, least inconsistent, results.

1.5 Record final results: X axis _____ , Y axis _____ .

1.6 Installing O-ring:

1.6.1 Remove O-ring, No. 6, from SMD Top Plate Cylinder and inspect for cracking and replace if required.

1.6.2 Clean O-ring and groove with isopropyl /ethyl alcohol.

1.6.3 Install O-ring No. 6 into SMD Top Plate Cylinder O-ring groove; leave dry, do not grease.

1.7 Install the 2 Guide Rod Clamps onto the SMD using Kit No. 13P.

Note:

Do not tighten screws at this time.

2 Conditioning Well Exhaust Manifold Using Tank Vent Gas to Purge Well Vent Line:**Note:**

Refer to Gas Module Plumbing Configuration of P0134, Fig. 88-2 for valve location and function.

2.1 Verify EV-9 open and EV-18 and EV-6 closed, Record EG-3 _____ torr.

2.2 Close/verify closed EV-11 and EV-19.

2.3 If Guard Tank has no liquid helium, then close EV-13.

2.4 Verify DEV-15 open, DEV-16 closed and no cap on end of 3-ft flex line.

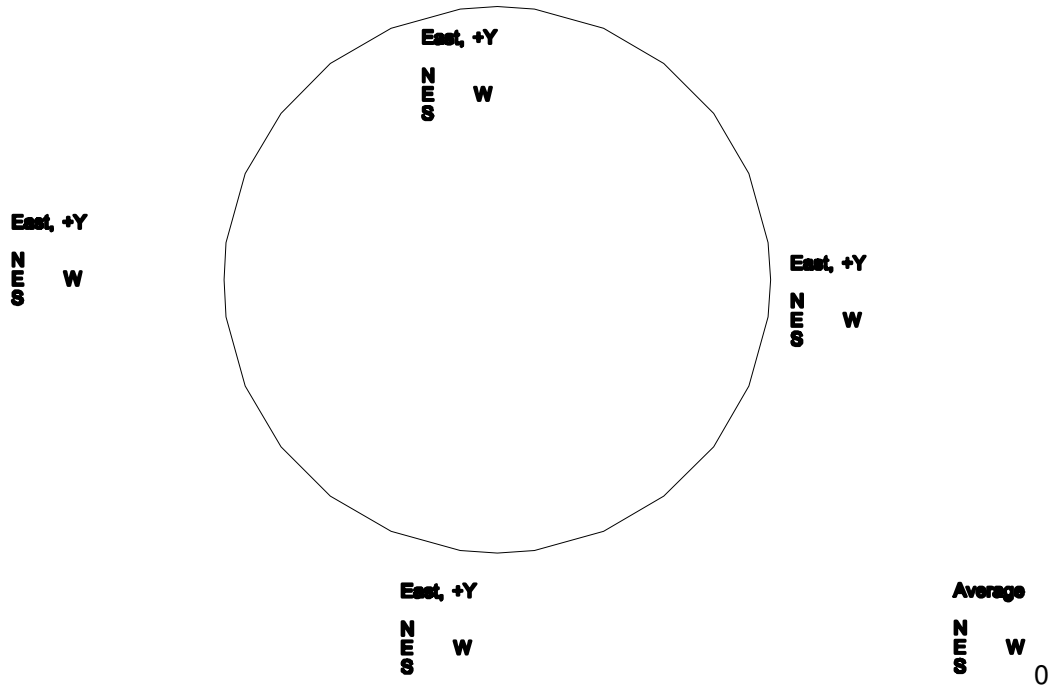
2.5 Open EV-11 letting Main Tank blow down via EV-9, EV-11, DEV-15 to room.

2.6 Close EV-11.

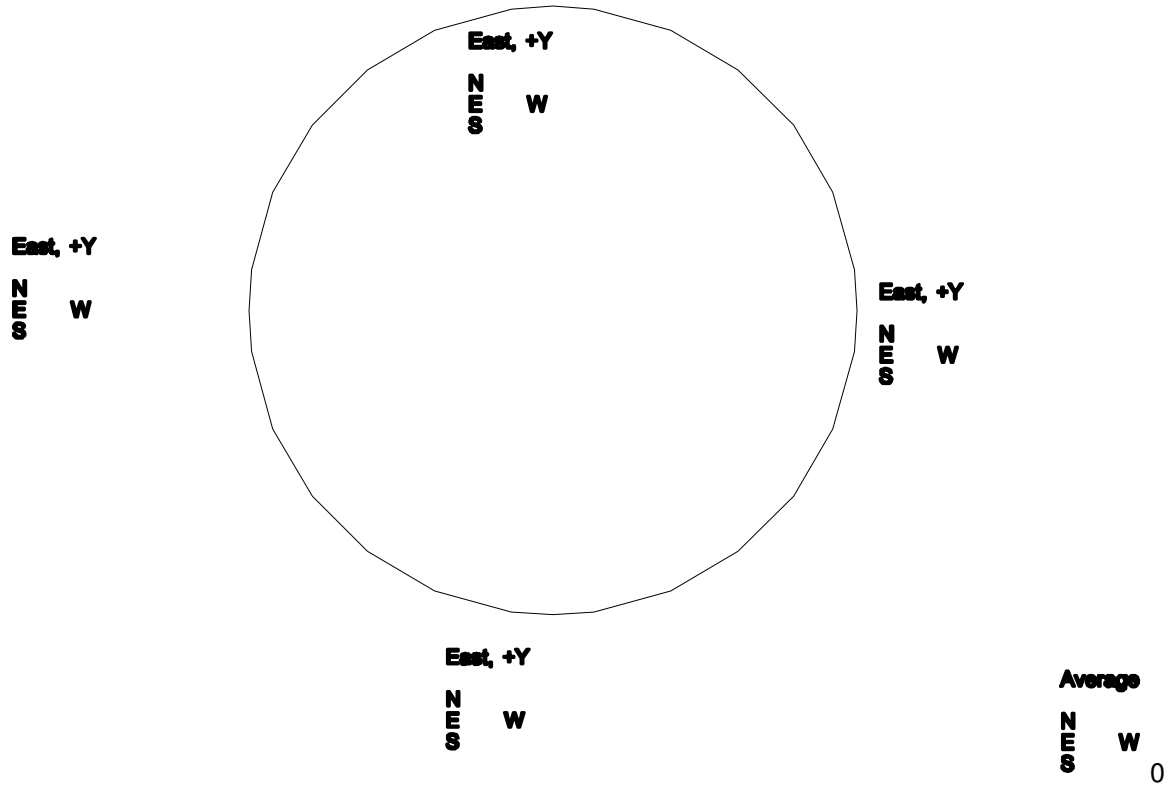
Task Module 88: Install Airlock/Probe onto Dewar

Figure 88-1 Leveling Results.

Surface used



Surface used



Task Module 88: Install Airlock/Probe onto Dewar

- 2.7 Open/verify open EV-9, -13, -16.
- 2.8 Continue venting for 2 minutes and then cap off end of 3-ft flex line with KF-25 hardware (see Fig. 88-2).

Sign-off:
Date/Time

3 Installing Airlock Assembly onto the SMD Dewar:

CAUTION

In all of the following operations care must be taken to not apply side or bending loads to the Probe as these may damage the neck tube.

WARNING

All personnel in or around crane lifting operations must be wearing hardhats at all times.

- 3.1 Verify Crane functional check-out has been performed within the last week:
Confirmed by Crane operator: _____ .
- 3.2 Attach Crane to Compliance Device **with** Load Cell Assembly.
- 3.3 Using Crane, lift Airlock/Probe off the Assembly Stand and clean bottom Airlock flange with ethyl/isopropyl alcohol and lint free wipes.
- 3.4 Using the crane, lift Airlock Assembly over the Dewar.
- 3.5 Verify that the proper X and Y Axes are lined up.
- 3.6 Slowly lower Airlock Assembly onto Support Plate Cylinder stopping ~1-in above mating surface.
- 3.7 Orient the Airlock above the SMD so that the Airlock bottom flange mates with the dowel pins in the Support Plate cylinder. Use 1/4" diameter rods to help guide Airlock onto Airlock Support Plate Cylinder.
- 3.8 Continue to lower Airlock until it rests on the Support Plate Cylinder.

Task Module 88: Install Airlock/Probe onto Dewar

NOTE:

In the following step exclude the 9 screws below the Airlock bottom door as it is to be opened soon.

3.9 Fasten the Airlock to the Support Plate using the 72 washers and 36 screws, lock washers, and nuts from Kit No. 13G.

3.10 Torque all bolts to 70-90 in-lb.

4 Erecting Scaffolding:

4.1 Erect upper portion of scaffolding per engineering instructions.

5 Installing Guide Rods:

5.1 Remove Crane from Compliance Device.

5.2 Fasten Guide Rod Lifter U-side up, to Guide Rods with two 2-13 X1-3/16 -in bolts (Kit No. 20G).

5.3 Verify loose/loosen the 2 Guide Rod Clamps.

5.4 Mate Crane to Guide Rod Lifter (without Load Cell) and lift Guide Rods to remove load from Guide Rod Spacer Blocks.

5.5 Remove Guide Rod Spacer Blocks.

5.6 Stow Guide Rod Pins in Guide Rod Spacer Blocks.

5.7 Using Crane, lower Guide Rods until ends of Guide Rods enter and seat into the Dewar Guide Rod Holes.

5.8 Remove Guide Rod Lifter from crane and stow in Genie lift along with Spacer Blocks.

5.9 Mate Crane to Compliance Device with Load Cell Assembly and remove slack.

5.10 Shut off Crane.

6 Completing Airlock installation:

6.1 Remove the Airlock bottom door.

6.2 Tighten all fasteners associated with the 2 Guide Rod Clamps.

AIRLOCK/SMD INTEGRATION

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Task Module 88: Install Airlock/Probe onto Dewar

6.3 Install GHe hoses for the airlock purge and inflatable seal

7 Task Module 88 complete.

Completed by:

Witnessed by:

RSE Sign off: _____

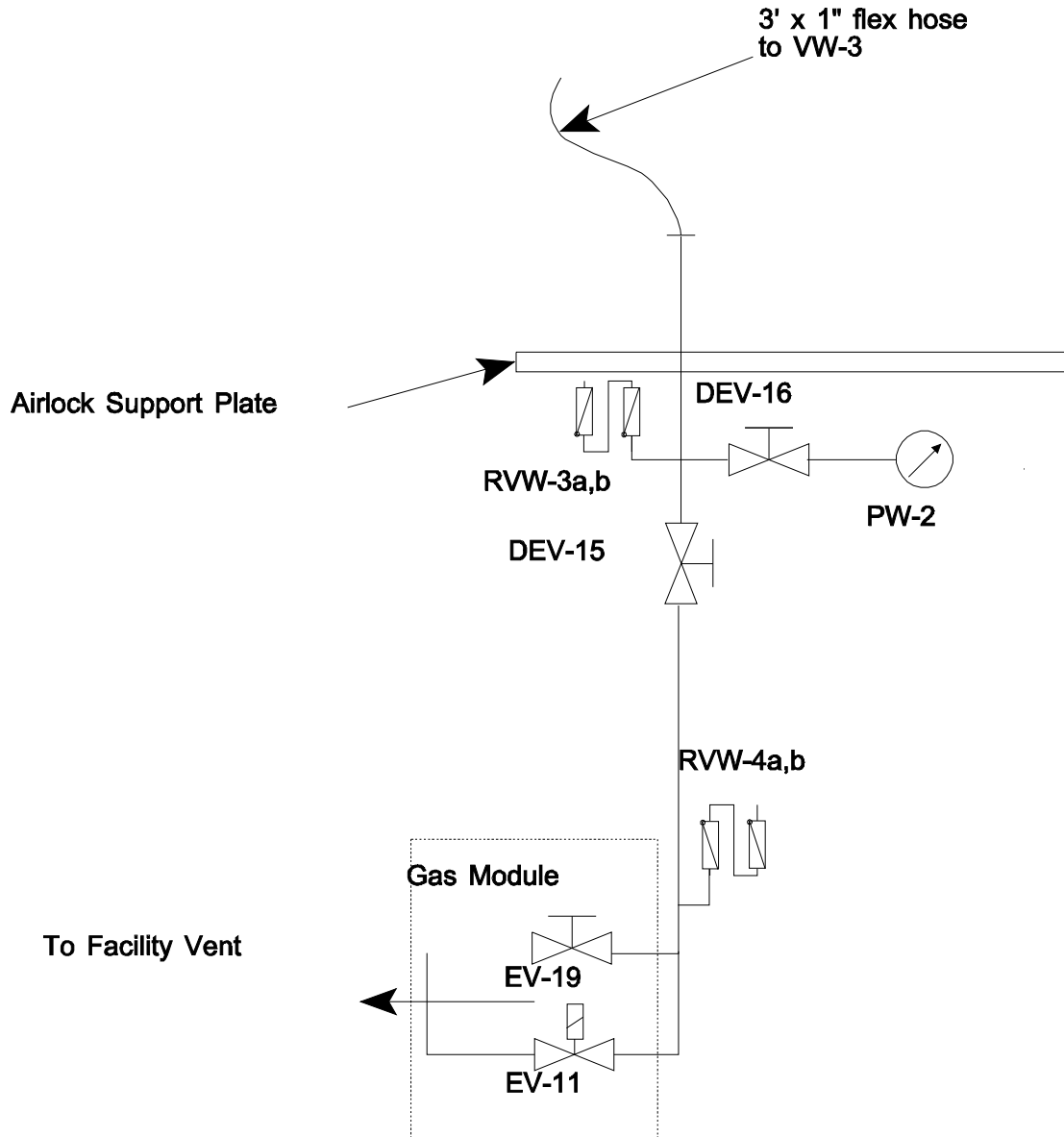
Date:

Time:

RQE Sign off: _____

Task Module 88: Install Airlock/Probe onto Dewar

Fig. 88-2 Well Vent Plumbing Configuration for Helium Conditioning



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