

**GRAVITY PROBE B
PROCEDURE FOR
PAYLOAD VERIFICATION
P0628**

**LOW TEMPERATURE UN-CAGING OF
GYROS IN PROBE C**

November 3, 1999

Prepared by: Chris Gray

Program Responsibility	Signature	Date
Chris Gray Operation Engineer		
Robert Brumley Gyroscope R. E.		
John Mester Caging System R. E.		
M. Taber Payload Test Director		
Dorrene Ross GP-B Quality Assurance		
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NOTES:

Level of QA required during performance of this procedure:

- Stanford QA Representative
- Government QA Representative

All redlines must be approved by QA

Revision Record:

Rev	Rev Date	ECO #	Summary Description

Acronyms and Abbreviations:

Acronym / Abbreviation	Meaning
GSE	Ground Support Equipment
QA	Quality Assurance Personnel
SMD	Science Mission Dewar

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A Scope

This procedure is intended to be used to uncage gyros in Probe C at Low Temperature.

B Requirements Verification
N/A

C Configuration Requirements

Probe C is integrated into the SMD per dwg 65113-1C34292 and oriented horizontal for phase C testing. Probe C should be in the following orientation before uncaging Gyro1 and/or Gyro 2: -X . Probe C should be in the following orientation before uncaging Gyro3 and Gyro 4: -Y .

D Hardware Required

D.1 Flight hardware required

Description	No. Req'd
65113-1C34292 Probe C / SMD Assy.	1

D.2 Commercial test equipment

Manufacturer	Model	Serial Number	Calibr. Exp. Date
Alcatel Helium Leak Detector	180t		N/A
Met One particle detector	100L		
RGA			

D.3 Mechanical/Electrical Special test equipment

Description	Part No.	Rev. no.	Serial No.	Certification Date
DDC Suspension System				
Absolute Pressure Transducer				
Keithly Electrometer	617		400929	11/01/99
Caging Control Unit				

D.4 Tools

Description	No. Req'd
Wrenches as required	

D.5 Expendables

Description	Quantity
Ni VCR gaskets	As required
High Pressure He Gas 6.0 Grade	1

E Procedures Required

Procedure Name	Procedure No.
Levitation of Gyroscopes in Probe C	P0481
GSE Caging Ballast System Installation	P0621
GSE Caging Commissioning	P0625

F Equipment Pretest Requirements: N/A

G Personnel Requirements

Qualified personnel are: Robert Brumley, Ken Bower, Bruce Clarke, David Hipkins, John Mester, and Chris Gray.

H Safety Requirements

H.1 High Pressure Gas

H.1.1 Care should be taken when working with high pressure gas. Slowly increase pressure at the regulator and vent gas in high pressure lines before disassembly.

I General Instructions

I.1 Redlines can be initiated by Chris Gray and Robert Brumley and must be approved by QA.

I.2 Any nonconformance or test anomaly should be reported by a Discrepancy Report. Refer to the Quality Plan, P0108, for guidance. Do not alter or break test configuration if a test failure occurs; notify quality assurance.

I.3 Only the following persons have the authority to exit/terminate this test or perform a retest: Chris Gray, Robert Brumley, Mike Taber, and Russ Leese.

J References and Applicable Documents: N/A

Op. Order No. _____
Date Initiated _____
Time Initiated _____

K Operations

K.1 Connect DDC System to appropriate suspension lines for the corresponding Gyro or Gyros (Gyro circuit 3 & 4) which will be uncaged. Use Procedure P0481.

K.1.1 Ensure that the bridge on the DDC or DDC's are functioning properly . Another person should gently tap on the SMD support ring while someone is monitor the bridge on the DDC. It should be obvious that the gyroscope rotor is free.

K.2 Connect the Keithly Electrometer (or Electrometers if verifying Gyro's 3 & 4) to the appropriate gyroscope ground plane connector on the top hat of Probe C.

- Gyroscope #1: CG18
- Gyroscope #2: CG28
- Gyroscope #3: CG38
- Gyroscope #4: CG48

Check the functionality of the Electrometer or Electrometers with a 100 MOHM resistor before connecting to the ground plane.

The Electrometer is connected to the "Ground Plane" per Figure 1. One end of the connection is connected to the "Ground Plane" and the other end of the circuit is connected to the Probe C Ground. ESD Wrist straps should be used during this operation.

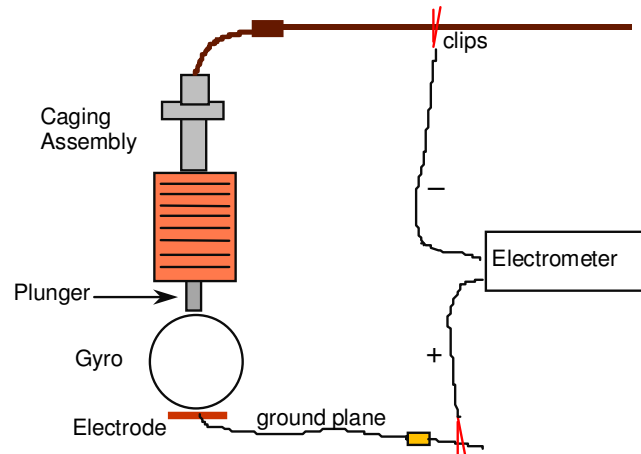


Figure 1

K.3 Confirm the Helium bottle connected to the GSE Caging Unit is certified as 6.0 He.

K.4 Confirm that the RGA connected to the top hat of Probe C (@P9), is functioning properly. Record the partial pressure and time of Helium (mass 4): _____

- K.5 Start up the Alcatel 180t (or equivalent) leak detector and calibrate for He. Connect the leak detector to V7 on the GSE Caging manifold. V7 should be closed.
- K.6 A certified clean high pressure hose should be connected from V6 on the Caging GSE manifold to the Caging Ballast manifold. If a hose is not connected, use P0520 Section K K.8 to K.11.
- K.7 Close V2 on the Caging GSE unit, V3 should be open. Open V7 and V6. Start pumping on the manifold through the leak detector. The manifold should be pumped to a hard vacuum ($< 1 \times 10^{-3}$).
- K.8 Put the leak detector in "HOLD". This is to ensure the leak detector is not going to be dumped when opening the Caging Ballast valve. The Alcatel 180t leak detector will say "Cycle Waiting" in its display.
- K.9 One person should be monitoring the DDC bridge and record the bridge position. Record the initial (caged) position of the DDC bridge. The position is in microinches.

X=_____ Y=_____ Z=_____ Gyro #_____

X=_____ Y=_____ Z=_____ Gyro #_____

Note: The second line is only to be used if caging two gyroscopes simultaneously (i.e. Gyros 3 and 4)

Record the Electrometer resistance(s): _____ , _____
Gyro # _____

- K.10 Another person should operate the Caging GSE manifold. Note the pressure on the analog pressure gage mounted on the Caging Ballast tank to be pumped on.
Caged Gyro Pressure: _____

- K.11 Open valve on the ballast tank for the appropriate gyro to be uncaged.
Caging Gyro 1 → Ballast Tank valve VG1
Caging Gyro 2 → Ballast Tank valve VG2
Caging Gyros 3 and 4 → Ballast Tank valve VG3/4

- K.12 Monitor the pressure on the Absolute pressure transducer on the Caging GSE unit and the pressure on the leak detector display.

- K.13 Pump on the Caging manifold circuit until a pressure $< 2 \times 10^{-2}$ has been achieved.

- K.14 Record the final uncaged position of the DDC bridge. The position is in microinches.

X=_____ Y=_____ Z=_____ Gyro #_____

X=_____ Y=_____ Z=_____ Gyro #_____

Note: The second line is only to be used if caging two gyroscopes simultaneously (i.e. Gyros 3 and 4)

Record the Electrometer resistance(s): _____ , _____

Gyro # _____

Gyro # _____

K.15 Record the following pressures:

Leak detector: _____

Absolute pressure Transducer: _____

Analog Pressure gage _____

(Ballast): _____

K.16 Record the RGA data for Helium:

Partial Pressure: _____

Time: _____

K.17 Close the appropriate valve on Probe C top hat for the Gyro that was uncaged.
Probe C Top Hat Caging valve legend:

Gyro 1	→	CG5 and CG6
Gyro 2	→	CG3 and CG4
Gyro 3 and 4	→	CG1 and CG2

K.18 Close valve on the ballast tank for the appropriate gyro that was uncaged.

Caging Gyro 1 → Ballast Tank valve VG1

Caging Gyro 2 → Ballast Tank valve VG2

Caging Gyros 3 and 4 → Ballast Tank valve VG3/4

K.19 Close V7 to isolate the leak detector from the Caging GSE manifold. Vent the Caging GSE manifold and the high pressure hose going from V6 to Ballast tank valve by opening V4.

K.20 Disconnect the high pressure hose from the Ballast tank valve manifold.

RECORD OF UNCAGING

Gyroscope(s) # _____

Caging Valve(s) CG _____

Pressure (psid)	Resistance	Gyroscope Position [X Y Z] microinches	Notes

Pressure (psid)	Resistance	Gyroscope Position [X Y Z] microinches	Notes

Test completed.

Completed by: _____

Witnessed by: _____

Date: _____

Time: _____