STANFORD UNIVERSITY
W.W. HANSEN EXPERIMENTAL PHYSICS LABORATORY
GRAVITY PROBE B, RELATIVITY GYROSCOPE EXPERIMENT
STANFORD, CALIFORNIA 94305-4085

HOOK-UP & POST INTEGRATION INSTRUMENTATION CHECKOUT

GPB SCIENCE MISSION PROCEDURE

27 April, 1999

PREPARED _____ _____
D. Bardas, Integration Manager Date

APPROVED _____ _____
C. Gray, Integration Engineer Date

APPROVED _____ _____
D. Bardas, Integration Manager Date

APPROVED _____ _____
B. Taller, Quality Assurance Date

APPROVED _____ _____

S. Buchman, Hardware Manager Date

TABLE OF CONTENTS

1 SCOPE

This document provides the procedure for checking the Probe-C instrumentation wiring, after installation of the QB/T. This procedure checks for resistances (including shorts) between individual wires, from wires to ground, from wires to instrumentation shields, and from shields to ground associated with QB/T Instrumentation. The corresponding connectors at the Top Hat are I-1, I-3, and I-4 and those inside the probe are TB-1, TB-3, and TB4. Top Hat Connectors I-8 and I-9, which are connected to telescope instrumentation, are covered in another procedure (P0439). For those wires not already connected to instrumentation in the probe, resistance values of the device will be checked for device integrity and comparison to previously measured results (P0390) prior to and after hookup to the QB/T devices. Finally, those items which are not connected until the SQUID brackets are installed i.e. the GRTs and Heaters on those brackets, will be measured at a later time, and will be added to a complete summary table. This shall include a recheck of the heaters sharing a LEMO with the Gyro heaters. The complete set of tables after probe integration is completed will be used when the probe is at cryogenic temperatures for a final check of instrument performance.

1.1 Acronyms

The following acronyms are used in this document

PM	Precision Manipulator
T-_Q	SIA Temperature Sensor
T-_P	Probe Temperature Sensor
H-_P	Probe Heater
H-_Q	Probe Heater
GRT	Germanium Resistance Thermometer
SD	Silicon Diode
TB_	Terminal Block X
DMM	Digital Multimeter
BPS_	Belleville Preload System
SIA	Science Instrument Assembly
HEPL	Hansen Experimental Physics Lab
GPB	Gravity Probe B
QA	Quality Assurance
ITD	Integration and Test Director
NA or N/A	Not Applicable
SM	Science Mission
Mohm or MΩ	Meg Ohm
mohm or mΩ	milli-ohm
V	Volt
I	Current
I-_	Top Hat Connector
HEX_	Heat Exchanger

2 APPLICABLE DOCUMENTS

2.1 Plans and Procedures

- P0059 GPB Contamination Control Plan
- P0057 Stanford Magnetic Control Plan
- P0390 Probe Instrumentation Pre-Integration Wiring Check-Out

2.2 Drawings

- 23170 Science Instrument Assembly Kit
- 23171 Science Instrument Assembly
- 1C34103 Probe / SIA Interface

3. GENERAL REQUIREMENTS

ONR representative, QA and Safety to be notified prior to beginning this procedure

3.1 Environmental Requirements

This procedure will be conducted in the Stanford Class 10 Cleanroom in the HEPL facility.

3.1.1. Cleanliness

The Class 10 clean room where this integration takes place shall be maintained at the cleanliness levels per GPB Contamination Control Plan P0059. Certified Class 10 cloth garments shall be worn in the Class 10 clean room.

3.1.2 Particulate Contamination

All parts and tools shall be cleaned at least to the cleanliness levels of the rooms where they are used for assembly or testing. In addition, all flight parts shall be maintained at level 100 cleanliness per GP-B Contamination Control Plan (P0059). Take all necessary precautions to keep tools and handling equipment free of particulate contamination.

To the maximum extent possible, personnel shall keep their bodies and garments downstream of the SIA, relative to the HEPA wall.

3.1.3. Magnetic Contamination

All parts and tools shall be screened per Procedure P0057. All parts and tools shall be cleaned using methods consistent with achieving Mil Spec Level 100 cleanliness. In addition, all parts shall be maintained at level 100 cleanliness per GP-B Magnetic Control Plan, P0057. Take all necessary precautions to keep tools and handling equipment free of particulate contamination. Tools to be cleaned with Ethyl Alcohol prior to use, or when contaminated.

3.1.4. Electrostatic Discharge Control

To prevent electrostatic charge buildup on the QB/T the particle ionizer shall always be upstream of the QB/T relative to the fan wall and the PM and the QB/PM shall be grounded.
Also, precautions, such as use of the appropriate meter and Grounding Straps shall be used where needed, such as when measuring SD's

3.2 Integration and Test Personnel

3.2.1 Integration and Test Director

The Integration and Test Director (ITD) shall be Dr. Doron Bardas or an alternate that he shall designate. The ITD has overall responsibility for the implementation of this procedure and shall sign off the completed procedure and relevant sections within it.

3.2.2 Integration Engineers and other personnel

All engineers and technicians participating in this procedure shall work under the direction of the ITD who shall determine personnel that are qualified to participate in this procedure. Participants in this procedure are expected to be D. Bardas, G. Asher, C. Gray, with assistance from LMMS (particularly G. Reynolds, and T. Carson) at certain times.

3.3 Safety

3.3.1 General

Personnel working in the Class 10 Cleanroom must be cognizant of the base of the Precision Manipulator, and take special care to avoid tripping or bumping into it.

3.3.2 Hardware Safety

Extreme care must be taken to avoid accidentally bumping or scratching the QB/Telescope.

3.3.3 Maximum Number of People in Cleanroom

Under normal operating conditions, there shall be no more than 5 people in the Class 10 Cleanroom. This is to avoid violating legal make up air requirements, and to provide an efficient workspace. Exceptions must be for short periods only, and approved by the ITD.

3.4 Quality Assurance

Integration shall be conducted on a formal basis to approved and released procedures. The QA program office shall be notified of the start of this procedure. A Quality Assurance Representative, designated by B. Taller shall be present during the procedure and shall review any discrepancies noted and approve their disposition. Upon completion of this procedure, the QA Program Engineer, B. Taller or his designate, nominally R. Leese, will certify his concurrence that the effort was performed and accomplished in accordance with the prescribed instructions by signing and dating in the designated place(s) in this document. Discrepancies will be recorded in a D-log or as a DR per Quality Plan P0108.

3.5 Red-line Authority

3.5.1 Authority to red-line (make minor changes during execution) this procedure is given solely to the ITD or his designate and shall be approved by the QA Representative. Additionally, approval by the Hardware Manager shall be required, if in the judgment of the ITD or QA Representative, experiment functionality may be affected.

3.5.2 Procedure Computerization Special Requirements

Because of cleanliness requirements in the Class 10 room, and to conveniently record data directly into the procedure thus generating the “as-built” document, the procedure will be handled in a paperless fashion until completed. A Laptop computer containing an electronic version of this

procedure will be operated by the ITD or QA Representative and data shall be recorded by typing directly into the electronic file.

3.5.3 Following completion of the procedure, a hard copy of the "as-built" procedure shall be printed ***and signed off by all the designated parties***. It shall then be filed, including an electronic copy into the data base.

The electronic editing of this document shall be as follows:

- Data will be inserted into the document using normal font, i.e. non-bold, non-italic
- "Signatures" shall be designated by **BLACK CAPITAL BOLD LETTERS**.
- "Redlines" shall be in ***RED BOLD ITALICS*** to make them distinguishable both on the Laptop screen and on the hard copy printout.
- If available, digital pictures shall be inserted into the document where appropriate.

4 REQUIRED EQUIPMENT

Flight Hardware

Hardware	**Part Number**
Probe-C Assembly, without sunshade	1C34115-102

Ground Support Equipment Calibration Date

- Digital Multimeter: Fluke Model 45 or equivalent
- Fluke 75 multimeter 1/22/98
- (tro 005161 used for I-1 and I-2)
- Fluke 87 multimeter due 3/16/01
- (msl 100792 used for I-3 through I-7)
- Probe breakout box
- Diode checker, lakeshore cryotronics (when used with multimeter, calibration is that of the multimeter)
- Ensure meter used cannot damage testing of silicon diodes or other items.
- Note: to eliminate any risk of damage to the silicon diodes, pin to pin checks of silicon diodes were skipped when using the fluke multimeter only. They were instead checked out with a diode checker, which is used in conjunction with the fluke 87.
- Miscellaneous wiring and clip leads n/a
- Lemo adapters for cold end connectors n/a
- Top hat instrumentation connector breakout box n/a

- Grounded cuff straps for esd protection n/a
- Connector saver for 4 pin lemo connector, m-1
- Ion sprayers not required, since the sia is during this procedure.

5 INSTRUMENTATION RESISTANCE CHECKS

Record Start Date and Time

5.1 Initial Preparations

5.1.1 The Probe should be horizontal on the Precision Manipulator at a height of approximately 4 feet, with the cold end toward the observation window.

5.1.2 Clear off an appropriate cleanroom table and position it under the Top Hat, and another under the QBS

5.1.3 Set up the Digital Multimeter to read resistance on the self-ranging scale. Short the test leads together to verify a reading close to zero ohms (typically < 0.2 ohms)

5.1.4 Rotate the probe so that the instrumentation connector to be worked on is in a position convenient for mating the connector at the TOP HAT ans well as at the TB connector on the QBS.

5.1.5 Fill out the Tables below after installing the sensor or heater device in the probe.

5.2 Verify that the wire bundle shield is grounded

This is accomplished by demonstrating a resistance of < 1 ohm between shield and ground. Shield can be accessed at the cold end of the probe, while ground is the TOP HAT.

5.3 End to End resistance for each instrumentation wire

Using the breakout box at the Top Hat connector and an appropriate connector at the cold end (i.e. Lemo connector or pin), measure the "end-to-end" resistance of each of the wires in I-1 through I-7 (no I-5). For those wires already connected to a device this measurement cannot be done, however wire integrity is determined from the data in Section 5.2.

Note: Lead resistance from multimeter to lemo connector is 0.65 ohm (includes breakout box, jumper leads, connector saver lead)

5.4 Resistance between cable wires

Using the breakout box test points, each of which corresponds to a pin on a Top Hat connector, check the resistance between each pin and all the other pins in that connector. To accomplish this, connect one probe of the DMM to each pin in turn, and then connect the other probe to each of the other pins in turn. Begin with pin 1 and measure resistance between it and pins 2, 3,..., 55. Record the data in the relevant column in the appropriate table below for that Top Hat Connector. Next, connect the meter to pin 2, and measure resistance between it and pins 3, ..., 55, in turn, and so on.

Note that some wires are already connected to devices as marked in the Table. Record these resistance values. In particular, note that SD measurements are polarity dependent. Confirm diode property and installation and record the resistance. Connect the positive wire of the diode checker to the positive port of the multimeter and the positve lead of the breakout box. Similarly for the negative wire. Apply 10 microamp current from the checker. If the output light on the checker is on steadily, and the voltage is approximately 0.5 V, the connection is continuous. If

there is no connection, the output light will flash, and the multimeter will read approximately 19 V.

TABLE 1. I-1 CONNECTOR CHECKOUT

I-1 pin #	Res to Gnd (Ohms) =>10 MΩ	Res Pin to Pin (Ohms) =>10 MΩ	Connector #	Lemo pin#	Res End-to-End (Ohms)	Device ID	Device Type and Polarity	Resistance to other I-1 pins of same device (Ohms).						Comments about Measurements or Wiring Work-arounds
								V+ to V-	I+ to I-	V+ to I+	V- to I-	V+ to I-	V- to I+	
1			I1J2	1		T-5Q	GRT (V+)							
2			I1J2	2		T-5Q	GRT (V-)							
3	*No connection*													
4			I1J6	1		T-6Q	GRT (V+)							
5			I1J6	2		T-6Q	GRT (V-)							
6			I1J9	1		T-17Q	GRT (V+)							
7			I1J9	2		T-17Q	GRT (V-)							
8			I1J10	1		T-1Q	GRT (V+)							
9			I1J10	2		T-1Q	GRT (V-)							
10			I1J3	1		T-2Q	GRT (V+)							
11			I1J3	2		T-2Q	GRT (V-)							

I-1 pin #	Res to Gnd (Ohms) =>10 MΩ	Res Pin to Pin (Ohms) =>10 MΩ	Connector #	Lemo pin#	Res End-to-End (Ohms)	Device ID	Device Type and Polarity	Resistance to other I-1 pins of same device (Ohms).						Comments about Measurements or Wiring Work-arounds
								V+ to V-	I+ to I-	V+ to I+	V- to I-	V+ to I-	V- to I+	
12			I1J4	1		T-3Q	GRT (V+)							
13			I1J4	2		T-3Q	GRT (V-)							
14			I1J11	1		T-4Q	GRT (V+)							
15			I1J11	2		T-4Q	GRT (V-)							
16-22	*No connection*													
23			I1J5	1		X-1	Spare							
24			I1J5	2		X-1	Spare							
26			I1J5	3		X-2	Spare							
27			I1J5	4		X-2	Spare							
28			I1J7	1		X-3	Spare							
29			I1J7	2		X-3	Spare							
30			I1J7	3		X-4	Spare							
31			I1J7	4		X-4	Spare							

I-1 pin #	Res to Gnd (Ohms) =>10 MΩ	Res Pin to Pin (Ohms) =>10 MΩ	Connector #	Lemo pin#	Res End-to-End (Ohms)	Device ID	Device Type and Polarity	Resistance to other I-1 pins of same device (Ohms).						Comments about Measurements or Wiring Work-arounds
								V+ to V-	I+ to I-	V+ to I+	V- to I-	V+ to I-	V- to I+	
32			I1J10	3		T-1Q	GRT (I+)							
33			I1J10	4		T-1Q	GRT (I-)							
34			I1J3	3		T-2Q	GRT (I+)							
35			I1J3	4		T-2Q	GRT (I-)							
36			I1J4	3		T-3Q	GRT (I+)							
37			I1J4	4		T-3Q	GRT (I-)							
38			I1J11	3		T-4Q	GRT (I+)							
39			I1J11	4		T-4Q	GRT (I-)							
40			I1J9	3		T-17Q	GRT (I+)							
41			I1J9	4		T-17Q	GRT (I-)							
42			I1J2	3		T-5Q	GRT (I+)							
43			I1J2	4		T-5Q	GRT (I-)							

I-1 pin #	Res to Gnd (Ohms) =>10 MΩ	Res Pin to Pin (Ohms) =>10 MΩ	Connector #	Lemo pin#	Res End-to-End (Ohms)	Device ID	Device Type and Polarity	Resistance to other I-1 pins of same device (Ohms).						Comments about Measurements or Wiring Work-arounds
								V+ to V-	I+ to I-	V+ to I+	V- to I-	V+ to I-	V- to I+	
44			I1J6	3		T-6Q	GRT (I+)							
45			I1J6	4		T-6Q	GRT (I-)							
46	*No connection*													
47			I1J8	1		X-1A	spare							
48			I1J8	2		X-2A	spare							
49			I1J8	3		X-3A	spare							
50			I1J8	4		X-4A	spare							
51			I1J1	1		X-5A	spare							
52			I1J1	2		X-6A	spare							
53			I1J1	3		X-7A	spare							
54			I1J1	4		X-8A	spare							
55	*No connection*													

TABLE 2. I-3 CONNECTOR CHECKOUT

I-1 pin #	Res to Gnd (Ohms) =>10 MΩ	Res Pin to Pin (Ohms) =>10 MΩ	Connector #	Lemo pin#	Res End-to-End (Ohms)	Device ID	Device Type and Polarity	Resistance to other I-1 pins of same device (Ohms).						Comments about Measurements or Wiring Work-arounds
								V+ to V-	I+ to I-	V+ to I+	V- to I-	V+ to I-	V- to I+	
1			I3J6	1		H-1Q	Heater (V+)		NA	NA	NA	NA	NA	
2			I3J6	2		H-1Q	Heater (V-)		NA	NA	NA	NA	NA	
3	*No connection*													
4			I3J6	3		H-2Q	Heater (V+		NA	NA	NA	NA	NA	
5			I3J6	4		H-2Q	Heater (V-)		NA	NA	NA	NA	NA	
6			I3J9	1		H-3Q	Heater (V+)		NA	NA	NA	NA	NA	
7			I3J9	2		H-3Q	Heater (V-)		NA	NA	NA	NA	NA	
8			I3J9	3		H-4Q	Heater (V+		NA	NA	NA	NA	NA	
9			I3J9	4		H-4Q	Heater (V-)		NA	NA	NA	NA	NA	
10			I3J2	1		H-5Q	Heater (V+)		NA	NA	NA	NA	NA	
11			I3J2	2		H-5Q	Heater (V-)		NA	NA	NA	NA	NA	
12			I3J2	3		H-6Q	Heater (V+)		NA	NA	NA	NA	NA	

I-1 pin #	Res to Gnd (Ohms) =>10 MΩ	Res Pin to Pin (Ohms) =>10 MΩ	Connector #	Lemo pin#	Res End-to-End (Ohms)	Device ID	Device Type and Polarity	Resistance to other I-1 pins of same device (Ohms).						Comments about Measurements or Wiring Work-arounds
								V+ to V-	I+ to I-	V+ to I+	V- to I-	V+ to I-	V- to I+	
13			I3J2	4		H-6Q	Heater (V-)		NA	NA	NA	NA	NA	
14			I3J1	1		H-7Q	Heater (V+)		NA	NA	NA	NA	NA	
15			I3J1	2		H-7Q	Heater (V-)		NA	NA	NA	NA	NA	
16	*No connection*													
17			I3J1	3		H-8Q	Heater (V+)		NA	NA	NA	NA	NA	
18			I3J1	4		H-8Q	Heater (V-)		NA	NA	NA	NA	NA	
19			I3J10	1		H-9Q s/n O	Heater (V+)		NA	NA	NA	NA	NA	
20			I3J10	2		H-9Q s/n O	Heater (V-)		NA	NA	NA	NA	NA	
21			I3J10	3		H-10Q s/n P	Heater (V+)		NA	NA	NA	NA	NA	
22			I3J10	4		H-10Q s/n P	Heater (V-)		NA	NA	NA	NA	NA	
23			I3J3	1		H-11Q s/n L	Heater (V+)		NA	NA	NA	NA	NA	

I-1 pin #	Res to Gnd (Ohms) =>10 MΩ	Res Pin to Pin (Ohms) =>10 MΩ	Connector #	Lemo pin#	Res End-to-End (Ohms)	Device ID	Device Type and Polarity	Resistance to other I-1 pins of same device (Ohms).						Comments about Measurements or Wiring Work-arounds		
								V+ to V-	I+ to I-	V+ to I+	V- to I-	V+ to I-	V- to I+			
24			I3J3	2		H-11Q s/n L	Heater (V-)		NA	NA	NA	NA	NA			
25	*No Connection*															
26			I3J3	3		H-12Q	Heater (V+)		NA	NA	NA	NA	NA			
27			I3J3	4		H-12Q	Heater (V-)		NA	NA	NA	NA	NA			
28			I3J7	1		X-7	spare									
29			I3J7	2		X-7	spare									
30			I3J7	3		X-8	spare									
31			I3J7	4		X-8	spare									
32			I3J5	1		X-9	spare									
33			I3J5	2		X-9	spare									
34			I3J5	3		X-10	spare									
35			I3J5	4		X-10	spare									
36,37	*No Connection*															
38			I3J8	1		T-18Q	SD (I+)									

I-1 pin #	Res to Gnd (Ohms) =>10 MΩ	Res Pin to Pin (Ohms) =>10 MΩ	Connector #	Lemo pin#	Res End-to-End (Ohms)	Device ID	Device Type and Polarity	Resistance to other I-1 pins of same device (Ohms).						Comments about Measurements or Wiring Work-arounds		
								V+ to V-	I+ to I-	V+ to I+	V- to I-	V+ to I-	V- to I+			
39			I3J8	2		T-18Q	SD (I-)									
40			I3J8	3		T-7Q	SD (I+)									
41			I3J8	4		T-7Q	SD (I-)									
42			I3J11	1		T-8Q (alt)	GRT (V+)									
43			I3J11	2		T-8Q (alt)	GRT (V-)									
44			I3J11	3		T-8Q (alt)	GRT (I+)									
45			I3J11	4		T-8Q (alt)	GRT (I-)									
46	*No Connection*															
47			I3J4	1		T-10Q (alt)	GRT (V+)									
48			I3J4	2		T-10Q (alt)	GRT (V-)									
49			I3J4	3		T-10Q (alt)	GRT (I+)									
50			I3J4	4		T-10Q (alt)	GRT (I-)									

I-1 pin #	Res to Gnd (Ohms) =>10 MΩ	Res Pin to Pin (Ohms) =>10 MΩ	Connector #	Lemo pin#	Res End-to-End (Ohms)	Device ID	Device Type and Polarity	Resistance to other I-1 pins of same device (Ohms).						Comments about Measurements or Wiring Work-arounds
								V+ to V-	I+ to I-	V+ to I+	V- to I-	V+ to I-	V- to I+	
51-55	*No Connection*													

TABLE 3. I-5 CONNECTOR CHECKOUT

I-1 pin #	Res to Gnd (Ohms) =>10 MΩ	Res Pin to Pin (Ohms) =>10 MΩ	Connector #	Lemo pin#	Res End-to-End (Ohms)	Device ID	Device Type and Polarity	Resistance to other I-1 pins of same device (Ohms).						Comments about Measurements or Wiring Work-arounds
								V+ to V-	I+ to I-	V+ to I+	V- to I-	V+ to I-	V- to I+	
1			TB5	17		T-12Q	GRT (V+)							
2			TB5	24		T-12Q	GRT (V-)							
3	*No connection*													
4			TB5	31		T-13Q	GRT (V+)							
5			TB5	38		T-13Q	GRT (V-)							
6			TB5	2		T-14Q	GRT (V+)							
7			TB5	9		T-14Q	GRT (V-)							
8			TB5	16		T-15Q	GRT (V+)							
9			TB5	23		T-15Q	GRT (V-)							
10			TB5	7		T-10P	GRT (V+)							
11			TB5	14		T-10P	GRT (V-)							
12			TB5	21		T-11P	GRT (V+)							
13			TB5	28		T-11P	GRT (V-)							

I-1 pin #	Res to Gnd (Ohms) =>10 MΩ	Res Pin to Pin (Ohms) =>10 MΩ	Connector #	Lemo pin#	Res End-to-End (Ohms)	Device ID	Device Type and Polarity	Resistance to other I-1 pins of same device (Ohms).						Comments about Measurements or Wiring Work-arounds
								V+ to V-	I+ to I-	V+ to I+	V- to I-	V+ to I-	V- to I+	
14			TB5	3		T-16Q	SD (V+)							
15			TB5	10		T-16Q	SD (V-)							
16	*No connection*													
17			TB5	20		T-19P	SD (V+)		NA	NA	NA	NA	NA	
18			TB5	27		T-19P	SD (V-)		NA	NA	NA	NA	NA	
19			TB5	34		T-20P	SD (V+)		NA	NA	NA	NA	NA	
20			TB5	41		T-20P	SD (V-)		NA	NA	NA	NA	NA	
21			TB5	18		T-21Q	GRT (V+)							
22			TB5	25		T-21Q	GRT (V-)							
23 – 26	*No Connection*													
27			TB5	32		T-21Q	GRT (I+) *see P0151*							
28			TB5	39		T-21Q	GRT (I-) *see P0151*							
29 – 31	*No Connection*													

I-1 pin #	Res to Gnd (Ohms) =>10 MΩ	Res Pin to Pin (Ohms) =>10 MΩ	Connector #	Lemo pin#	Res End-to-End (Ohms)	Device ID	Device Type and Polarity	Resistance to other I-1 pins of same device (Ohms).						Comments about Measurements or Wiring Work-arounds
								V+ to V-	I+ to I-	V+ to I+	V- to I-	V+ to I-	V- to I+	
32			TB5	30		T-12Q	GRT (I+) s/n 27500							
33			TB5	37		T-12Q	GRT (I-)							
34			TB5	1		T-13Q	GRT (I+)							
35			TB5	8		T-13Q	GRT (I-)							
36			TB5	15		T-14Q	GRT (I+)							
37			TB5	22		T-14Q	GRT (I-)							
38			TB5	29		T-15Q	GRT (I+)							
39			TB5	36		T-15Q	GRT (I-)							
40			TB5	35	NA	T-10P	GRT (I+)							
41			TB5	42	NA	T-10P	GRT (I-)							
42			TB5	6	NA	T-11P	GRT (I+)							
43			TB5	13	NA	T-11P	GRT (I-)							
44 – 46	*No Connection*													
47			TB5	33	NA	H-14P	Heater (V+)		NA	NA	NA	NA	NA	

I-1 pin #	Res to Gnd (Ohms) =>10 MΩ	Res Pin to Pin (Ohms) =>10 MΩ	Connector #	Lemo pin#	Res End-to-End (Ohms)	Device ID	Device Type and Polarity	Resistance to other I-1 pins of same device (Ohms).						Comments about Measurements or Wiring Work-arounds
								V+ to V-	I+ to I-	V+ to I+	V- to I-	V+ to I-	V- to I+	
48			TB5	40	NA	H-14P	Heater (V-)		NA	NA	NA	NA	NA	
49			TB5	4	NA	H-15P	Heater (V+)		NA	NA	NA	NA	NA	
50			TB5	11	NA	H-15P	Heater (V-)		NA	NA	NA	NA	NA	
51			TB5	5	NA	H-5P	Heater (V+)		NA	NA	NA	NA	NA	
52			TB5	12	NA	H-5P	Heater (V-)		NA	NA	NA	NA	NA	
53			TB5	19	NA	H-6P	Heater (V+)		NA	NA	NA	NA	NA	
54			TB5	26	NA	H-6P	Heater (V-)		NA	NA	NA	NA	NA	
55	*No Connection*													

6 PROCEDURE COMPLETION

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

Integration Engineer (S)

Discrepancies if any:

ITD designate Date

ITD Date

The information obtained under this assembly and test procedure is as represented and the documentation is complete and correct:

QA Representative Date

Quality Assurance Date

7 DATA BASE ENTRY

The following data shall be entered into the GP-B Data Base:

- Name, number and revision of this procedure
- A hard copy of the signed off

- An electronic copy of this “as-built” procedure