W. W. Hansen Experimental Physics Laboratory
STANFORD UNIVERSITY
STANFORD, CALIFORNIA 94305 - 4085

Gravity Probe B Relativity Mission

GSS BOARD TEST SYSTEM (GOLD SYSTEM) GSE CERTIFICATION PROCEDURE

System SN:	
System Configuration:	**Full Partial**
Date:	

GP-B Procedure
P0663 Rev -

Approved by: William J. Bencze Date
RE, Gyroscope Suspension System (GSS) Group

Approved by: Dorrene Ross Date
GP-B Quality Assurance

Table of Contents:

1.0 Revision History

Rev Level	Comments/notes	Date	Revised By
	Initial procedure complete; circulated for internal reviw.	14-Mar-00	WJ Bencze
-0	Replace ADDA procedure by Flt Cmd 16,1,0x20E Add pre-insertion checks prior to integration	3-Mar-00	S Smader
-1	Clarify software commands.	4-Apr-00	S Smader
-	First release of this procedure	4-Apr-00	S Smader

2.0 Scope:

This procedure details the tests required to certify a GSS flight equivalent unit, or "Gold System" for use as GSE for flight unit board level testing.

This procedure is to be performed whenever the configuration or contents of the gold system changes.

3.0 Definition of Gold System Components

3.1. Gold system components (PWAs, cables) are flight equivalent electronics assemblies that have been built with 100% flight-compatible interfaces and functionality so that they may come into contact and be operated with flight components under test without risk of contamination or other types of damage. In most all cases, this has been ensured by building brassboard units from the flight designs, substituting easily available commercial-equivalent electrical components for flight devices in internal circuitry. All interfaces (connectors) are flight quality parts.

3.2. Gold system components are identified by a "GS" marking in their respective serial numbers.

4.0 Reference Documents

4.1.	Board level test procedure for GSS ABP card, PWA 8A01901	P0596
4.2.	Board level test procedure for GSS AMT card, PWA 8A01899	P0597
4.3.	Board level test procedure for GSS ACS card, PWA 8A01898	P0598
4.4.	Board level test procedure for GSS ACL card, PWA 8A01897	P0599
4.5.	Board level test procedure for GSS ATC card, PWA 8A01900	P0600
4.6.	Board level test procedure for GSS FBP card, PWA 8A01893	P0601
4.7.	Board level test procedure for GSS FMR card, PWA 8A01892	P0602
4.8.	Board level test procedure for GSS FCL card, PWA 8A01891	P0603
4.9.	Board level test procedure for GSS ADDA card, PWA 8A01886	P0604
4.10.	Board level test procedure for GSS ABU card, PWA 8A01884	P0605
4.11.	Board level test procedure for GSS ARB card, PWA 8A01885	P0606
4.12.	Board level test procedure for GSS MUX card, PWA 8A01883	P0607
4.13.	Board level test procedure for GSS LVA card, PWA 8A01882	P0608
4.14.	Board-level test software operational procedure	P0670

4.15. Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies, and Equipment, MIL-STD-1686

5.0 Test Facilities

HEPL Room 127, Stanford University

6.0 QA Provisions:

6.1. This procedure shall be conducted on a formal basis to its latest approved and released version. The QA Program Engineer (D. Ross) and the ONR representative (E. Ingraham) shall be notified 24 hours prior to he start of this procedure. QA may monitor the execution of all or part of this procedure should they elect to do so.

Date/time:_____ Date/time:_____

GP-B QA (D. Ross) ONR (E. Ingraham)

6.2. Upon completion of this procedure, the GSS manager and the GP-B QA manager shall certify her/his concurrence that the procedure was performed and accomplished in accordance with the prescribed instructions by signing and dating his approval at the end of this procedure.

7.0 Test Personnel

This test procedure is to be conducted only by the following personnel:

7.1. William Bencze

7.2. Scott Smader

7.3. Joe Kilner

7.4. Lo Van Ho

8.0 General Instructions

8.1. Redlines can be initiated by the test personnel listed in Section 7.0 and must be approved by QA.

8.2. Test operators shall read this procedure in its entirety and resolve any apparent ambiguities prior to beginning this test.

8.3. 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.

8.4. Only the following persons have the authority to exit/terminate this test or perform a retest: Test operators listed in Section 7.0 and GP-B QA.

8.5. In this document, "Perform Flight S/W system test commands:" means to prepare the test system software as described in P0670 Board-Level Test Software Operational Procedure, and then issue the listed commands according to the procedure described in P0670.

9.0 Hardware Safety Requirements:

9.1. This assembly is ESD sensitive; special care shall be exercised per the "Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies, and Equipment", MIL-STD-1686

9.2. Ensure that power is removed from cable assemblies before connecting or disconnecting cable connectors.

9.3. Examine all mating connectors before attempting to mate them. Remove any foreign particles. Look for any damaged pins or sockets. Do not force the coupling action if excessive resistance is encountered. Ensure that key-ways are aligned when mating connectors.

10.0 External Test Equipment

All external test equipment that will be required is called out in the individual board test procedures that make up this qualification document.

11.0 Gold System Software Configuration:

The software routines run on the PC-EBI computer and the RAD6000 are configuration controlled.

The codes used for these tests run on two platforms

11.1. PC, for the PC-EBI tests (Configuration A)

11.2. Sun workstation/RAD6000 for the flight-like tests (Configuration B)

These codes are archived on a CD-ROM attached to this procedure. It is marked as "P0663 Rev – Test Codes" These codes are to loaded on their respective computers before hardware qualification begins.

	P/F	Notes:
11.2.1. Load codes in PC directory to PC-EBI computer. (record directory at right)		
11.2.2. Load codes in SUN directory to Sun workstation. (record directory at right)		

Should a change be necessary in the code, this procedure shall be updated with the latest software version information. Then, this procedure shall be re-run in order to re-qualify the system to the new version of the code.

12.0 Qualification Procedure:

Note: All handling of this PWA shall be performed using ESD control methods, as outlined in MIL-STD-1686. Unit shall be inspected at an ESD certified station. Wrist straps and/or heel grounding straps shall be used. An ESD approved laboratory coat shall be worn when in close proximity to this PWA.

12.1. Partial and Complete Gold System configurations.

- A "Partial" gold system (for Aft PWA testing only) is built by running the tests in sections 12.2 through 12.3
- A "Complete" gold system (for Aft and forward PWA testing) is built by running the tests in sections through 12.4 through 12.5

- Record Serial Numbers of all gold system cards and gold system components in provided locations in Table 1 (pg 18)

12.2. Partial Gold System Assembly:

- Install and remove cards in the system per the procedure given in Section 15.0.
- Interconnect the enclosures after the covers have been installed as given in Section 14.0.

	P/F	Notes:
12.2.1. Install gold system aft backplane per the procedure in Section 15.0.		
12.2.2. Install AMT gold system card into aft enclosure		
12.2.3. Install ACL gold system card into aft enclosure		
12.2.4. Install ACS gold system card into aft enclosure		
12.2.5. Install ATC gold system card into aft enclosure		
12.2.6. Install forward backplane per the procedure in Section 15.0.		
12.2.7. Install ADDA gold system card into fwd enclosure		
12.2.8. Install FMR gold system card into fwd enclosure		
12.2.9. Install FCL gold system card into fwd enclosure		
12.2.10. Install PC630 FRM emulator into fwd enclosure.		

12.3. Partial Gold System Tests

- The body of each test procedure below indicates which test configuration (A or B or both) to use for its individual board level tests. Each test procedure may require the configuration to be changed from A to B during the test.
- Install and remove cards in the system per the procedure given in Section 15.0.
- Interconnect the enclosures after the covers have been installed as given in Section 14.0.
- Perform Pre-Insertion checks on all cards (through section 13 of that card's Board-Level Test Procedure) prior to integration.

		P/F	Notes:
12.3.1.	Perform test procedure P0597 for the AMT card. (attach completed copy of procedure to this document)		
12.3.2.	Perform test procedure P0598 for the ACS card. (attach completed copy of procedure to this document)		
12.3.3.	Perform test procedure P0600 for the ATC card. (attach completed copy of procedure to this document)		
12.3.4.	Perform test procedure P0596 for the ABP card. (attach completed copy of procedure to this document)		
12.3.5.	Perform Flight S/W system test commands: 16, 100 16, 2, 0x0101, 20 1, 1 16, 2, 0x0100, 7 16, 1, 0x020E If the value of "PIT 3-diag. Monitors", "Monitor 3:" is 0x0003, record 'Pass' for this test. Otherwise record 'Fail'.		
12.3.6.	Perform Flight S/W system test commands: 14, 1 14, 38 If this completes successfully, record Pass for this test. Otherwise record 'Fail'.		
12.3.7.	Perform test procedure P0599 for the ACL card. (attach completed copy of procedure to this document)		
12.3.8.	Perform test procedure P0603 for the FCL card. (attach completed copy of procedure to this document)		
12.3.9.	Perform test procedure P0602 for the FMR card. (attach completed copy of procedure to this document)		

This partial gold system is certified good if all of the above tests are "pass".

Proceed to Section 13.0

12.4. Complete Gold System Assembly:

- Install and remove cards in the system per the procedure given in Section 15.0.
- Interconnect the enclosures after the covers have been installed as given in Section 14.0.

	P/F	Notes:
12.4.1. Install gold system aft backplane per the procedure in Section 15.0.		
12.4.2. Install AMT gold system card into aft enclosure		
12.4.3. Install ACL gold system card into aft enclosure		
12.4.4. Install ACS gold system card into aft enclosure		
12.4.5. Install ATC gold system card into aft enclosure		
12.4.6. Install forward backplane per the procedure in Section 15.0.		
12.4.7. Install ADDA gold system card into fwd enclosure		
12.4.8. Install FMR gold system card into fwd enclosure		
12.4.9. Install ABU gold system card into fwd enclosure		
12.4.10. Install ARB gold system card into fwd enclosure		
12.4.11. Install MUX gold system card into fwd enclosure		
12.4.12. Install LVA gold system card into fwd enclosure		
12.4.13. Install PC630 FRM emulator into fwd enclosure.		
12.4.14. Install FCL gold system card into fwd enclosure		

12.5. Complete Gold System Tests

- The body of each test procedure below indicates which test configuration (A or B or both) to use for its individual board level tests. Each test procedure may require the configuration to be change from A to B during the test.
- Install and remove cards in the system per the procedure given in Section 15.0.
- Interconnect the enclosures after the covers have been installed as given in Section 14.0
- Perform Pre-Insertion checks on all cards (through section 13) prior to integration.

	P/F	Notes:
12.5.1. Perform test procedure P0597 for the AMT card. (attach completed copy of procedure to this document)		
12.5.2. Perform test procedure P0598 for the ACS card. (attach completed copy of procedure to this document)		
12.5.3. Perform test procedure P0600 for the ATC card. (attach completed copy of procedure to this document)		
12.5.4. Perform test procedure P0596 for the ABP card. (attach completed copy of procedure to this document)		
12.5.5. Perform Flight S/W system test commands: 16, 100 16, 2, 0x0101, 20 1, 1 16, 2, 0x0100, 7 16, 1, 0x020E If the value of "PIT 3-diag. Monitors", "Monitor 3:" is 0x0003, record 'Pass' for this test. Otherwise record 'Fail'.		
12.5.6. Perform Flight S/W system test commands: 14, 1 14, 38 If this completes successfully, record Pass for this test. Otherwise record 'Fail'.		
12.5.7. Perform test procedure P0599 for the ACL card. (attach completed copy of procedure to this document)		
12.5.8. Perform test procedure P0603 for the FCL card. (attach completed copy of procedure to this document)		
12.5.9. Perform test procedure P0602 for the FMR card. (attach completed copy of procedure to this document)		
12.5.10. Perform test procedure P0606 for the ARB card. (attach completed copy of procedure to this document)		

	P/F	Notes:
12.5.11. Perform test procedure P0607 for the MUX card. (attach completed copy of procedure to this document)		
12.5.12. Perform test procedure P0608 for the LVA card. (attach completed copy of procedure to this document)		
12.5.13. Perform test procedure P0605 for the ABU card. (attach completed copy of procedure to this document)		
12.5.14. Perform test procedure P0601 for the FBP card. (attach completed copy of procedure to this document)		

This complete gold system is certified good if all of the above tests are "pass".

13.0 Completion of Procedure:

I certify that this procedure was performed in whole and that the data recorded above is complete and accurate.

Test Engineer		Date	

This is to certify that the information obtained under this test procedure is as represented and the documentation is completed and correct.

GSS Representative		Date	
Quality Assurance		Date	

14.0 Gold System Hardware Configurations:

The GSS gold systems may be configured in one of two ways, depending on the hardware under test. Thus, this procedure has separate qualification sections for each configuration. In brief, these configurations are:

14.1. Configuration A: Gold System PWAs plus PC-EBI GSE computer. (See Figure 1.)

14.2. Configuration B: Gold System PWAs plus EU RAD6000 computer. (See Figure 2.)

Complete parts lists for these configurations are given in the following table. (See Table 1.)

Numbers on the figures in square brackets [xxx] correspond to item numbers in the parts list.

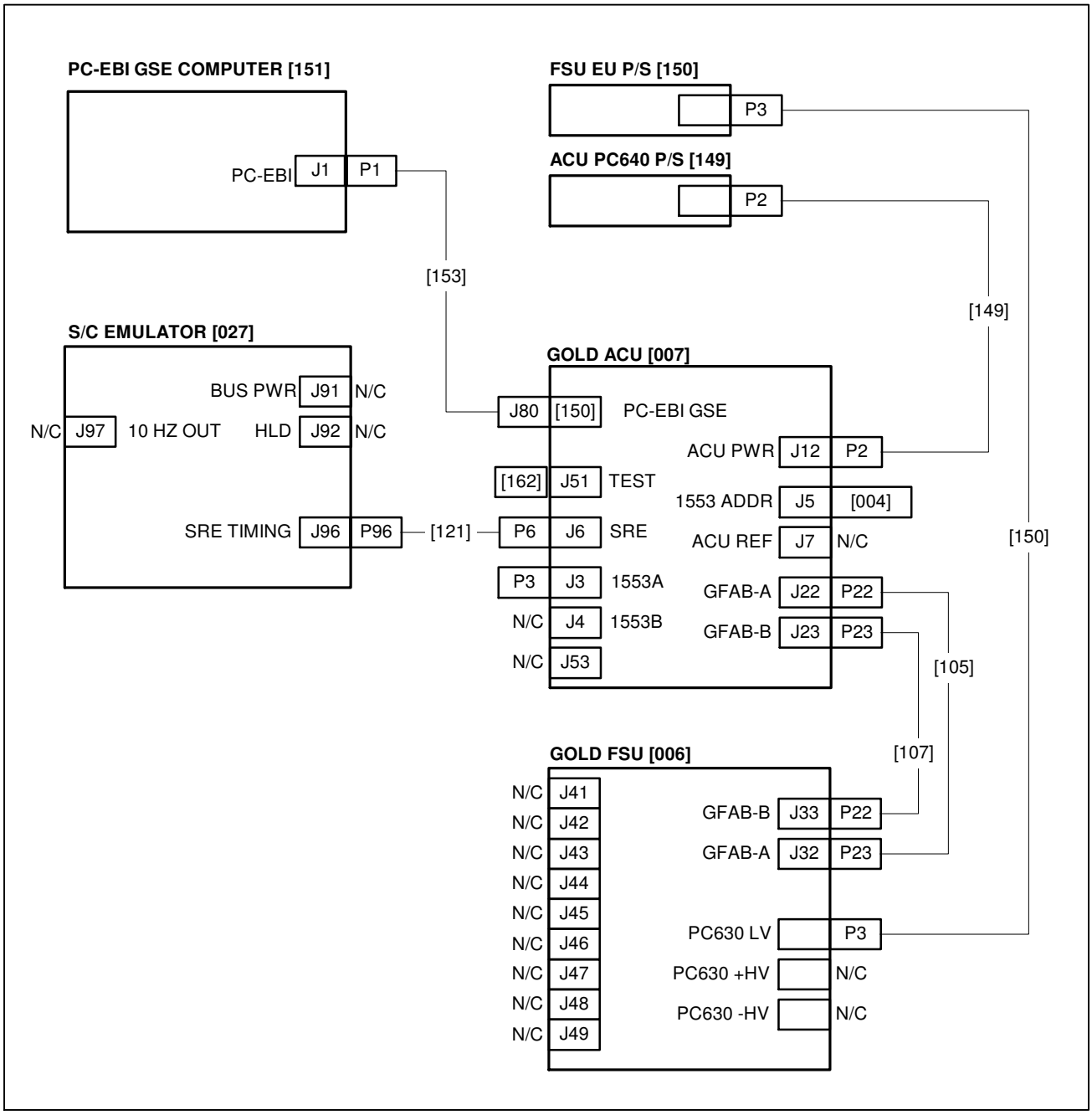

Figure 1: Connection diagram for Gold System configuration A

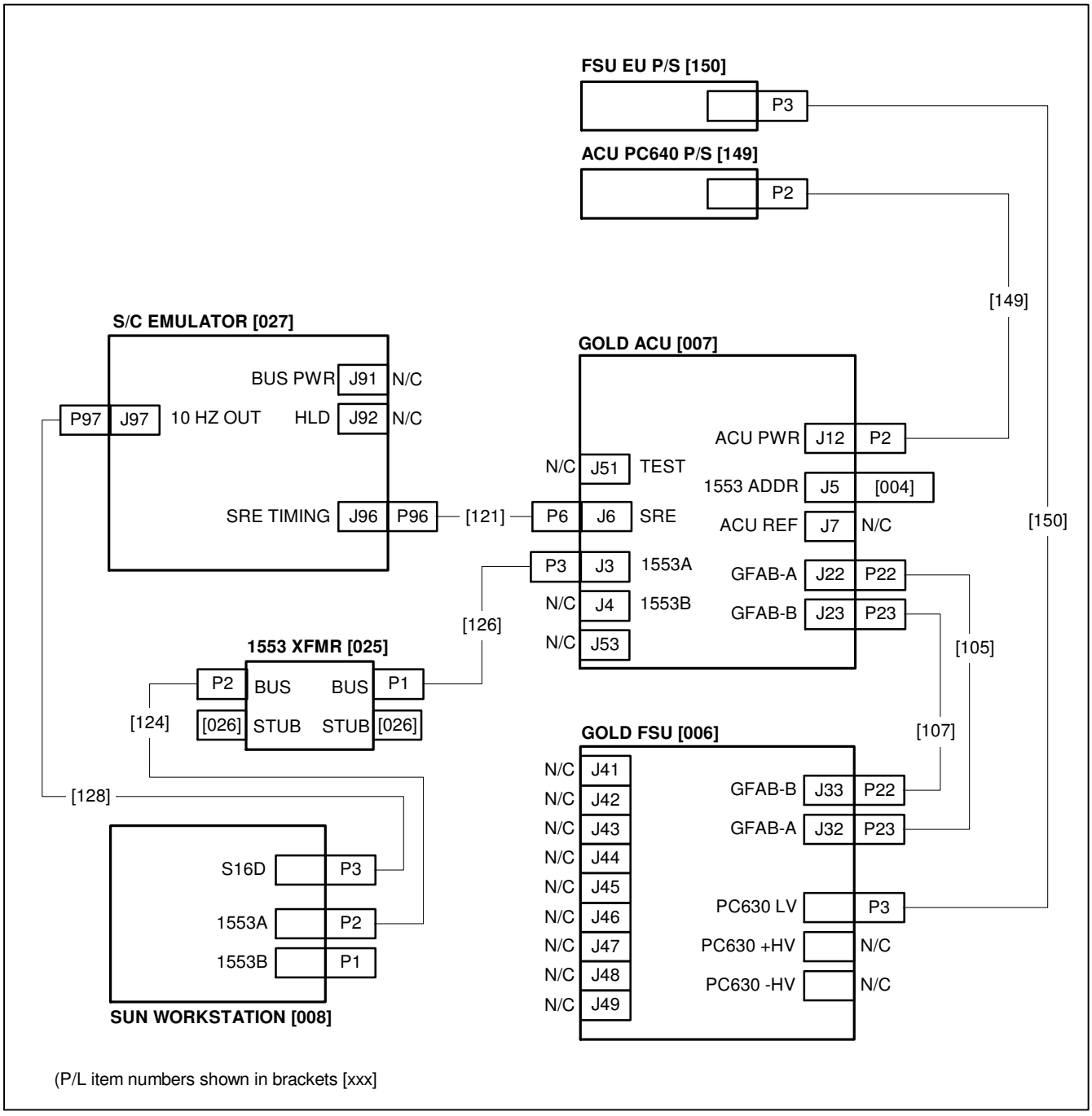

Figure 2 : Connection diagram for Gold System configuration B

The Test Operator is to record the serial number of the listed items in the space provided. Quantities of item are noted for both the A and B configurations.

Table 1: Parts List for Gold System configurations A and B

ITEM	QTY		PART NO.	PART DESCRIPTION	SERIAL NUMBER
	A	B			
004		1	8A01481	Address Plug, Address 12	NA
006	1	1	8A01424GSE	FSU GSE enclosure	
007	1	1	8A01425GSE	ACU GSE enclosure	
008		1	NA	Sun Workstation	
025		2	90-50202	Bus Coupler, Two Port	NA
026		4	10-06403-025	Terminator	NA
027	1	1	NA	Spacecraft Simulator	
105	1		8A01473-101	Cable Assembly, GFAB-A	
107	1		8A01474-101	Cable Assembly, GFAB-B	
115	1		8A02097GSE-101	Cable Assembly, HV	
121	1	1	8A02084GSE-101	Cable Assembly	
124		1	CA-2014-72	Cable Assembly, 1553	
126		1	8A00673GSE-503	Cable Assembly	
128		1	NA	Cable Assembly, S16D	NA
135	1	1	8A10899-GS	Gold AMT card	
136	1	1	8A10898-GS	Gold ACS card	
137	1	1	8A10900-GS	Gold ATC card	
138	1	1	8A01901-GS	Gold ABP card	
139	1	1	8A01871-GS	Gold ACL card	
140	1	1	8A01870-GS	Gold ADDA card	
141	1	1	8A01891-GS	Gold FCL card	
142	1	1	8A01892-GS	Gold FMR card	
143	1	1	8A01893-GS	Gold Fwd backplane	
145	1	1	8A01885-GS	Gold Arbiter card	
146	1	1	8A10884-GS	Gold ABU card	
147	1	1	8A01883-GS	Gold MUX card	
148	1	1	8A10882-GS	Gold LVA card	
149	1	1	PC640-ASSY	Aft FEU power supply	
150	1		PC650-ASSY	PC-EBI extension card	

(continued)

ITEM	QTY		PART NO.	PART DESCRIPTION	SERIAL NUMBER
	A	B			
151	1		NA	PC-EBI computer	
152	1		NA	PC-EBI cable	NA
153		1	199A962-1	RAD6000 EU card	
154	1	1	8A02429GSE	FSU GSE Cover	NA
155	1	1	8A02430GSE	ACU GSE Cover	NA
156	1	1	PC610	FSU test card 1	
157	1	1	PC620	FSU test card 2	
158	1	1	E3630A	FSU PS 1	
159		1	E3620A	FSU PS 2	
160		2	E3617A	FSU PS 3,4	
161	1	1	PC630-ASSY	FRM emulator	
162	1		PC355-Assy	ATC daughter card	

Table 1: Parts List for Gold System configurations A and B (continued)

15.0 PWB Insertion/Removal Procedures:

15.1. The location and orientation of the cards in the aft Gold System enclosure (Figure 3)

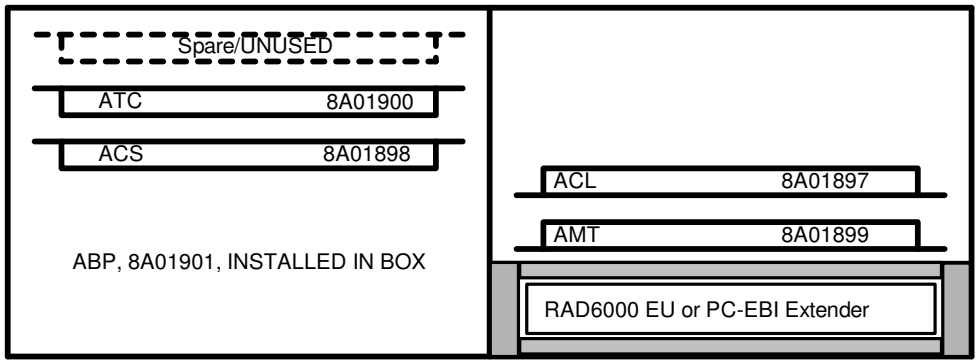

Figure 3: Location of cards in aft enclosure (view looking at the top of the backplane)

15.2. Installation of the Aft Backplane:

Note 1: Boards are ESD sensitive; use anti-static protection while handling these assemblies.

Note 2: Handle PWAs with ESD control-compatible rubberized gloves to minimize contamination of flight hardware.

A. Remove any bracket holding the 25-pin D-connector J12.

B. Place backplane into empty aft GSE enclosure. Orient the PWB such that the 122-pin connector rests in the RAD6000 slot.

C. Install 16 4-40 x 0.375 screws and 32 NAS620C4L washers to attach the backplane to the box. Place a washer between the screw head and the PWB and one washer between the PWB and enclosure for each of the screws. Snug-tighten screws.

D. Gently move the J12 D-connector such that it is centered in J12 cutout in the box wall near the backplane.

E. Install jackpost hardware to attach the connector to the enclosure wall.

15.3. Removal of Aft Backplane

Note 1: Boards are ESD sensitive; use anti-static protection while handling these assemblies.

Note 2: Handle PWAs with ESD control-compatible rubberized gloves to minimize contamination of flight hardware.

A. Disconnect cables and remove covers.

B. Remove all function cards in aft enclosure.

C. Remove jackpost hardware from 25 pin D power connector J12.

D. Remove 16 4-40 screws and washers that hold the backplane into the enclosure.

E. Gently remove the J12 D-connector from its cutout in the box wall, taking care not to stress the J12 cable more than necessary.

F. Lift backplane out of enclosure, paying particular attention not to stress the J12 connector and cable.

G. Replace any bracket holding the J12 D connector.

15.4. Installation of Aft Cards:

Note 1: Boards are ESD sensitive; use anti-static protection while handling these assemblies.

Note 2: Handle PWAs with ESD control-compatible rubberized gloves to minimize contamination of flight hardware.

A. Locate slot for the particular board of interest (refer to Figure 3)

B. Remove any existing Gold System card.

C. Inspect backplane connector pins on board of interest to ensure no pins are bent and that no debris is present in the connector.

D. Inspect backplane socket of interest to ensure no debris is present in the connector.

E. Orient card so that guideposts will properly engage when board is seated (refer to Figure 3 for orientations)

F. Slide card into slot and gently seat card once connector contacts are engaged.

G. Do not tighten wedgelocks; leave them loose.

H. Replace cover; secure around perimeter with 6 equally spaced 4-40 screws and washers.

I. Install jackposts for all connectors.

J. Gently tighten jackposts until snug. This operation will slightly unseat the backplane connector on each card with a connector protruding through cover.

15.5. Removal of aft cards.

Note 1: Boards are ESD sensitive; use anti-static protection while handling these assemblies.

Note 2: Handle PWAs with ESD control-compatible rubberized gloves to minimize contamination of flight hardware.

A. Remove all jackpost on connectors.

B. Remove cover.

C. Locate board of interest (refer to Figure 3).

D. With two hands, gently rock the card back and forth in its slot to unseat the backplane connector.

E. When unseated, slide the card out of the slot and return it to its packaging.

Location and orientation of the cards in the forward Gold System enclosure (Figure 4)

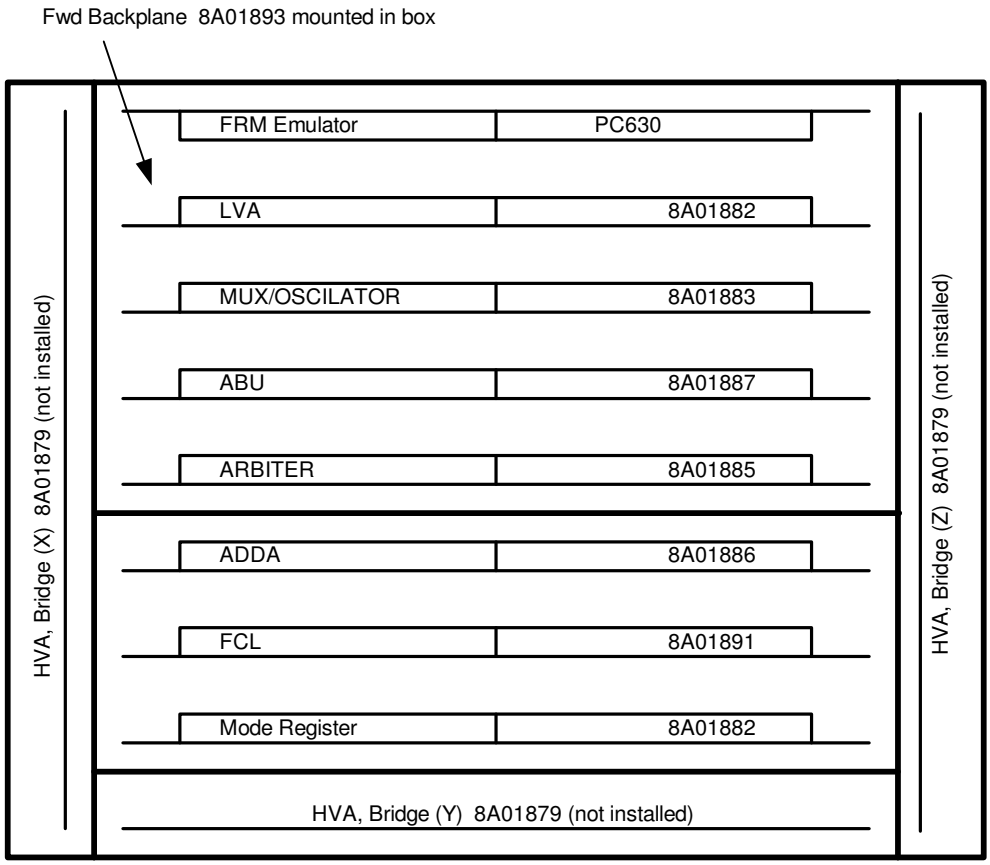

Figure 4: Location of cards in forward enclosure (view looking at the top of the backplane)

15.6. Installation of the Forward Backplane:

Note 1: Boards are ESD sensitive; use anti-static protection while handling these assemblies.

Note 2: Handle PWAs with ESD control-compatible rubberized gloves to minimize contamination of flight hardware.

A. Place backplane into empty forward GSE enclosure. Orient the PWB such that the 90 pin 2-row connector rests in the FRM slot.

B. Install 4 4-40 x 0.375 flat head screws and 6 4-40 x 0.375 fillister or pan-head screws and 16 NAS620C4L washers to attach the backplane to the enclosure. Place a washer between the screw head and the PWB and between the PWB and the enclosure for each of the screws. Tighten screws until snug.

15.7. Removal of Forward Backplane

Note 1: Boards are ESD sensitive; use anti-static protection while handling these assemblies.

Note 2: Handle PWAs with ESD control-compatible rubberized gloves to minimize contamination of flight hardware.

A. Remove all function cards in fwd enclosure.

B. Remove 10 4-40 screws and washers that hold the backplane into the enclosure.

C. Lift backplane out of enclosure.

15.8. Installation of Forward Cards:

Note 1: Boards are ESD sensitive; use anti-static protection while handling these assemblies.

Note 2: Handle PWAs with ESD control-compatible rubberized gloves to minimize contamination of flight hardware.

K. Locate slot for the particular board of interest (refer to Figure 4)

L. Remove any existing Gold System card.

M. Inspect backplane connector pins on board of interest to ensure no pins are bent and that no debris is present in the connector.

N. Inspect backplane socket of interest to ensure no debris is present in the connector.

O. Orient card so that guideposts will properly engage when board is seated (refer to Figure 4 for orientations)

P. Slide card into slot and gently seat card once connector contacts are engaged.

Q. Do not tighten wedgelocks; leave them loose.

R. Replace data-side cover, secure around perimeter with 6 equally spaced 4-40 screws and washers.

S. Install screws and washers for FCL card bracket..

T. Gently tighten screws until snug. This operation will slightly unseat the FCL connector at the backplane.

15.9. Removal of forward cards.

Note 1: Boards are ESD sensitive; use anti-static protection while handling these assemblies.

Note 2: Handle PWAs with ESD control-compatible rubberized gloves to minimize contamination of flight hardware.

A. Remove FCL bracket screws.

B. Remove cover.

C. Locate board of interest (refer to Figure 4).

D. With two hands, gently rock the card back and forth in its slot to unseat the backplane connector.

E. When unseated, slide the card out of the slot and return it to its packaging.