

DWG NO. 574502			SH 1	REV B		
APPLICATION			REVISIONS			
PART NO.	NEXT ASSY	USED ON	REV	DESCRIPTION	DATE	APPROVED
NA	N/A	IN0112A	-	INITIAL RELEASE	02/06/21	H. PATERSON
			A	Additional Tests Added	02/06/28	W.ANDERSON
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All Sheets Same Revision Level

										DRAWING TYPE (PER MIL-T 31000)	
REVISION										CONCEPT. DES.	
SHEET										DEVELOP. DES.	
REVISION										PRODUCT	X
SHEET										COMMERCIAL	
REVISION											
SHEET											

REVISION STATUS OF SHEETS

UNLESS OTHERWISE SPECIFIED

BRK SHARP EDGES --
 INTERPRET DRAWING
 PER DOD-STD-100 AND
 PRODUCT STANDARD 25030

SURFACE TEXTURE 125
 EXCEPT AS NOTED v

DIMENSIONS ARE IN INCHES
 TOLERANCES

.XX .XXX X°
 ±.03 ±.010 ±1°

LAYOUT NO.



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**FUNCTIONAL TEST PROCEDURE,
 IRFPA**

APPROVED	DATE	APPROVED	DATE	SIZE	CAGE CODE	DWG. NO.	REV
THERMAL NA		PREP BY Mike Ensminger	020812	A	13993	574502	B
STRL ANAL NA		RESP ENGR Mike Ensminger	020812				
MATL & PRCS NA		PRODUCTION NA					
SAFETY NA		OPTICAL NA		SCALE NA WT NA SHEET 1 of 23			
QA John King	020812	FIT/FUNC CHK NA					
MECHANICAL NA		SYSTEMS Marty Huisjen	020812				
INTEGRATION & TEST Lyle Hunter	020812	RELIABILITY NA					
CONTRACT NO. Z667708							



GODDARD SPACE FLIGHT CENTER

GSFC STI PUBLIC DISCLOSURE EXPORT CONTROL CHECKLIST

Title: Deep Impact - Integration and Test Instrument - Document No: 574502 & 574503

Instructions – This checklist is used for the disclosures of STI, and ITAR or EAR controlled information.

For STI (scientific and technical information) disclosures subject to NPG 2200.2 (Guidelines for Documentation, Approval, and Dissemination of STI), this checklist should be forwarded with the NASA Form 1676 (NASA Scientific and Technical Document Availability Authorization (DAA)). For all other ITAR (International Traffic in Arms Regulations, 22 CFR 120-130) and EAR (Export Administration Regulations, 15 CFR 730-774) disclosures, this checklist should be forwarded with a copy of the information to the GSFC Export Control Office for review/approval. Completion of this checklist should minimize delays in approving most requests.

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Generally, the export of information pertaining to the design, development, production, manufacture, assembly, operation, repair, testing, maintenance or modification of defense articles (e.g., space flight hardware, ground tracking systems, launch vehicles to include sounding rockets and meteorological rockets, radiation hardened hardware and associated hardware and engineering units for these items) are controlled by the State Department under the ITAR. The export of information with respect to ground based sensors, detectors, high-speed computers, and “dual use” (military/commercial) technology items are controlled by the Commerce Department under the EAR. A complete listing of items covered by the ITAR and the EAR can be accessed at <http://export.gsfc.nasa.gov>. If the information intended for release falls within the above categories but fits into one or more of the following exemptions, the information may be released.

EXEMPTION I – Public domain information

If your information is already in the public domain in its entirety through a non-NASA medium and/or through a NASA release previously approved by any NASA Export Control Office, the information is exempt. If the information falls into this category, you may attest that you are using this exemption by signing below.

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EXEMPTION II – Scientific data

If your information pertains exclusively to the release of scientific data (e.g., data pertaining to studies of clouds, soil, vegetation, oceans, planets, stars, galaxies and the universe) without the disclosure of information pertaining to articles controlled by the ITAR or EAR, such as flight instruments, high-speed computers, or launch vehicles, the information is exempt. If the information falls into this category, you may attest that you are using this exemption by signing below.

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**GSFC STI PUBLIC DISCLOSURE
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If your information falls into the ITAR or EAR areas of concern as referenced above, but is offered at a general purpose or high level (e.g., poster briefs and overviews) where no detailed technical information (e.g., design, development, production, or manufacturing) pertaining to ITAR or EAR controlled items is offered, the information is exempt. If the information falls into this category you may attest that you are using this exemption by signing below.

Edwin J Grayzeck 690.1

Edwin J Grayzeck

Sept 28, 2005

Print Name and Code

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EXEMPTION IV – Software safety and assurance methodologies

If your information pertains exclusively to the release of software safety and assurance methodologies or studies, without disclosing information pertaining to articles controlled by the ITAR or EAR, the information is exempt. If the information falls into this category, you may attest that you are using this exemption by signing below.

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REQUEST FOR ITAR 125.4(b)(13) EXEMPTION – Technical data

If your information is not satisfied by the exemptions stated above, the information might be releasable using exemption 125.4(b)(13) of the ITAR. This exemption allows the release of ITAR controlled information into the public domain and does not require that the information be published in order to qualify. Use of this exemption is afforded only to agencies of the Federal Government. The GSFC Export Control Office will approve this exemption only after receiving assurance that such a release is a responsible action. The following guideline has been established regarding the use of this authority: The information may not offer specific insight into the design, development, production, or manufacture of an identified ITAR controlled item (reference paragraph 2 above) in sufficient detail (by itself or in conjunction with other information in the public domain) to allow potential adversaries to replicate the item, or exploit or defeat controlled U.S. technologies. All signatures of approval on NASA Form 1676 (and in the signature blocks below) expressly indicate concurrence with the responsible use of this exemption when it is requested. If you determine that you have met these criteria, you may attest your determination by signing below, and the GSFC Export Control Office will offer favorable consideration toward approving your request under this special exemption.

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Date

If a NASA Form 1676 does not accompany this request, use of this exemption requires approval from a Branch-level or higher management official.

Print Name and Code

Signature

Date

The GSFC Export Control Office approves does not approve this exemption/request.

Thomas A. Weisz, Code 232 234

Thomas A. Weisz

9/28/05
9/28/05

Center Export Administrator (CEA)

Signature

Date

If your STI, ITAR, or EAR disclosure does not satisfy any of the above exemptions, please contact the GSFC Export Control Office for further clarification on the releasability of your information under the ITAR or EAR.

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1. INTRODUCTION

This procedure supports the IRFPA sensor during test and integration by providing a general test of the FPA environment prior to the application of power.

2. APPLICABLE DOCUMENTS

The following documents form a part of this procedure to the extent specified herein. Unless a specific issue or revision is listed, these documents shall be of the latest issue or revision in effect at the time of the test. In the event of a conflict between this procedure and the reference documents, the contents of this procedure shall govern.

2.1. DEEP IMPACT PROGRAM DOCUMENTS / DRAWINGS

561177A	Deep Impact Instruments Requirements Specification
SPS 1930	Special Handling and Packaging for Infrared Detectors
SPS 3096	Electrostatic Discharge Protection, Components & Assemblies Sensitive to 50 Volts or less
SPS 2780	Cleaning and Contamination Control, Marking and Packaging, Deep Impact
559651-500	Spectral Imaging Module - HRI
559649-500	Optical Bench Assembly, SIM - HRI
559495-500	Optic Assembly, Mirror, FM1 – HRI
T131422	SIM ND filter holder
559487-500	Secondary Radiator/Primary Support Assembly
559471-500	Primary Radiator/Detector Assembly
559461-500	Stimulator Assembly
561146	Contamination Control Plan
561286	Deep Impact Integration and Test Plan

SER DI-INST-ELC-020A Infrared Sensor Subsystem (IRSS) Design Description Rev A



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564449 Test and Alignment Procedure, SIM Instrument

568640 Instrument Test Operations Console, Deep Impact

SER DI-I&T-029 Instrument Command and Telemetry Handbook

3. TEST CONDITIONS AND REQUIREMENTS

3.1. PRECAUTIONS

Failure to follow the procedures contained in this document may result in damage to flight hardware.

3.1.1. ESDS Equipment. (If Applicable)


The test specimen contains electrostatic-discharge sensitive (ESDS) devices that may be exposed at the electrical interfaces. Therefore, it shall be handled per MIL-STD-1686 Class 1, as implemented by SPS 120211. The test specimen, the test operator (using wrist straps), and related electrical test equipment shall be connected to a common ground before any electrical connecting or disconnecting operations, and during the use of any electrical test equipment probes. The following requirements are important:

- A. All personnel within 1 meter of the Instrument or Electronics, and all related test equipment shall be connected to a common ground at all time.
- B. An ionizing blower shall be in place and operating whenever static generators such as nylon sheeting or paper are within one meter of exposed electrical interfaces.
- C. Under no circumstances shall connections be made to the unit under test while power is applied.
- D. Test cables and equipment shall have all pins shorted to equal potential (or ground) prior to being connected to ESDS hardware. This requirement shall be met by using shorting devices on applicable connectors prior to mating.

3.1.2. Proof Load Certification

All equipment to be used for flight hardware lifts shall have current proof load certification. If certification paperwork does not exist, or is out of date, proof load testing must be performed, using a technique appropriate for the device in question. Immediately prior to use, each such device shall be visually inspected for damage. Any hardware exhibiting cracks, or any cable having parted strands, or any similar defects, shall be disposed of and replaced or documented on an MDR, regardless of its state of certification.

3.1.3. General Precautions for Connectors:

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- A. Connector savers shall be used on all flight hardware electrical connectors as specified in the Deep Impact Connector Guidelines. (Reference SER # DI-SYS-MA-005)
- B. Flight hardware electrical connectors shall be capped with ESD approved covers when they are not in use, to minimize contamination, and to prevent damage from electrostatic discharge.
- C. Before mating any connector, examine the connector to assure that there is no interference or visible contaminants at the pin or socket interface. Notify QA if connectors exhibit any problems.
- D. Extreme care shall be exercised should connectors need to be probed at any time, and the following precautions taken:
 - The probing pin shall be a mating pin or socket that is insulated to prevent shorting.
 - The probing pin shall be gold plated, or of a non-marring smooth surface.

3.2. SAFETY REQUIREMENTS

In accordance with the Reliability, Parts and System Safety Handbook SP0031A-014, the System Safety Engineer or his delegate has final authority over safety provisions contained in this procedure, and in controlling any hazardous conditions which may arise during any operations performed in accordance with this procedure.

3.2.1. Responsibility for Safety.

All personnel are responsible for maintaining a safe work environment. The Test Conductor or cognizant operator shall assure that appropriate safe practices are implemented during these operations, and that operations are performed in a proper order.

3.2.2. Test Readiness Reviews

Prior to the commencement of any activities detailed in this document, and again at each shift change, the Test Conductor or cognizant operator shall conduct a pre-test briefing. Also, immediately prior to each hazardous sequence of operations, the Test Conductor or cognizant operator shall conduct a pre-task briefing. Both the pre-test and pre-task briefings shall include a discussion of:

- A. Test sequence, objectives, and equipment.
- B. Nature and location of the specific hazards to be encountered.
- C. Hazard controls, including protective equipment, safety boundaries, personnel access, etc.
- D. Limitations on concurrent activity.
- E. Emergency instructions and response, and, when the situation warrants, the availability of emergency shutdown procedures.



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3.2.3. Caution and Warning Notations

In this procedure follow these definitions:

- **Caution:** Operational step, etc., which if not adhered to or observed could result in damage to the equipment;
- **Warning:** Operational step, etc., when not adhered to or observed, could result in loss of life, personal injury, or exposure.

3.2.4. Mechanically Assisted Lift Hazard

Severe damage to personnel and flight hardware may result if lifting fixtures are excessively loaded. Lifting hardware shall never be used in a configuration that may apply loads greater than the working load that is clearly marked on each piece of lifting hardware. Never use lifting hardware that is not marked with a working load and proof test date. A properly certified crane operator shall control the lift.

3.3. CLEANLINESS AND ENVIRONMENT

Except as provided herein, these operations shall be conducted in a Class 10,000 or better clean area as defined in FED-STD-209B, and as implemented by BATC process standard BPS 21.04. Cleanliness of the test units shall be established and maintained per BATC specification SPS 2780.

Standard laboratory conditions of atmospheric temperature (18 to 28°C), pressure (520 to 810 torr), and relative humidity (25 to 70 percent) are acceptable for the operations defined herein.

3.4. CONTROLLED REDLINE PROCEDURES

BATC DEEP IMPACT test procedure change control shall be implemented in compliance with DEEP IMPACT QWI.

- Any testing of flight hardware shall be required to be done in accordance with a test procedure that has been formally released prior to the start of the applicable test. This means that test procedures must be released through BATC Engineering Document Control prior to use.
- Once the test procedure is released, it may be changed in compliance with WI Test.4.3.005 Controlled Redline Test Procedure. Such changes may also be made during the test.
- Such changes must be approved by the following personnel:
Minor Changes: Test Engineer and Quality Engineer.
Major Changes: Test Engineer, Quality Engineer and Responsible Design Engineer and/or Systems Engineer (As determined by QE)



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- D. The "AS-RUN COPY" of the test procedure containing such changes is controlled by the Test Engineer.
- E. Subsequent to completion of the applicable test, but before final buyoff of that test in the applicable Certification Log, the redline changes to the "AS- RUN COPY" test procedure shall be incorporated in a formal revision of the test procedure. (Note: At the discretion of the program the final Spacecraft Integration procedures may not be updated.)

4. QUALITY ASSURANCE PROVISIONS / TEST MANAGEMENT RESPONSIBILITIES

4.1. QUALITY ASSURANCE PROVISIONS

QA provisions operative during activities defined in this procedure are derived from the DEEP IMPACT Product Assurance (PA) Plan and the DEEP IMPACT Quality Work Instructions (QWI) document. These provisions, summarized below, identify the interfaces between QA and test personnel.

- A. The PEQA shall be notified, in advance, of performance of any activities described in this procedure. A QA Inspector shall be assigned to monitor those activities as is deemed necessary or appropriate, in accordance with the QWI. When required, QA shall notify the customer and/or government representatives, who may, at their option, monitor or witness the activity. The PEQA shall attend the "Ready-to-Test" meeting with assigned QA personnel, to assure QA support during the test, and to address and resolve outstanding QA items.
- B. The PEQA shall assure that the proper "as-run copy" of this procedure document has been prepared, and that the required Cert Log is in proper order. When all pre-test conditions have been met, the PEQA shall complete the "Ready-to-Test" entry in the applicable Cert Log.
- C. During testing, the PEQA shall approve, **prior to its implementation**, any major changes to the test procedure involving actual testing deviation, test set-up, measurement methodology, or tolerance changes, along with the cognizant design engineer and the Test Conductor.
- D. Test Support provided by the QA Inspector shall be as follows:
 - Verify that calibration is current for test and measuring equipment in accordance with QSP 11.1 " Selection, Maintenance, and Control of Inspection, Measuring, and Test Equipment".

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- Verify that applicable lifting and handling GSE has been properly proof tested and tagged.
- Assure that the proper change control practices are applied as described in section 3.4, which implements the applicable provisions of QSP 4.4 Design Changes.
- Assist in assuring that the precautionary and safety requirements stated in sections 3.1 and 3.2 are met.
- Assist in the inspection of test setups prior to application of power to a test specimen, and prior to any mechanism-assisted lifts or moves.
- Prepare quality assurance test documents as applicable. In the Action Item List of the Certification Log, document any discrepancies or non-conformances noted during or after testing, and immediately notify the PEQA.

E. At completion of the test, the PEQA/Inspector shall perform the following:

- Review all test data for completeness, and to verify that all measurements are within tolerances.
- Assure that the resulting test data fulfills the test requirements of the end item.
- Verify completion of any related action items and disposition of any related MDR's in the test Cert Log.

F. Upon the occurrence of a test anomaly (any event that deviates from the planned procedures, exceeds normal variations, or generates unexpected data), operation of the test article shall be stopped immediately. All other test conditions and parameters shall be maintained (except as those conditions that may pose an immediate hazard). The Inspector and the Test Conductor shall review the anomaly. Minor, non-destructive, investigative troubleshooting that will not change the failure mode of the article under test, may be conducted by the Test Conductor, with PEQA concurrence. All troubleshooting shall be performed in accordance with QSP 13.1 Control of Nonconforming Product and WI PA.13.1.004 Test Anomaly Work Sheet (TAWs). If the anomaly is found to result from human error or test equipment problems that have not affected the test article, corrective action shall be taken and testing may continue. The PEQA will check the "continue test" box, the approval box, and sign the TAWs along with the Responsible Engineer.

G. If a test anomaly cannot be resolved as described above, the PEQA shall be notified, and an appropriate entry shall be made in the Action Item List (AIL) portion of the Certification Log. The PEQA shall prepare a Material Discrepancy Report (MDR) and convene the Material Review Board (MRB) for action as specified in WI PA.13.1.002 "Completion of Material Discrepancy Report". The MRB convened to resolve an anomaly that occurred during testing shall include a representative of the project test



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group. Testing of the failed item shall then not continue without prior authorization from the MRB.



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4.2. TEST MANAGEMENT RESPONSIBILITIES

4.2.1. INTEGRATION AND TEST MANAGER

The Integration and Test Manager shall have responsibility for the following:

- a. Delegate responsibility to conduct the SIM Alignment and Test Procedure or portions of this procedure to qualified personnel.
- b. Release of the Alignment and Test Procedure.
- c. Release of all required procedures, drawings, E.O.'s and other documents.
- d. Approve exceptions to requirements of this procedure, including facility ambient requirements.
- e. Availability and certification of required GSE.
- f. Approval on the final completion of the SIM Alignment and Test Procedure

4.2.2. TEST CONDUCTOR

The test conductor (T/C) as delegated by the Integration and Test Manager is assigned shift responsibility for the following:

- a. Verify that required flight hardware and GSE are available and certified for integration and alignment as described in this procedure.
- b. Verify that GSE and other test equipment is available and calibrated where applicable and that calibration will not expire during performance of this procedure.
- c. Verify that required documentation is released, correct and complete. Documentation will include:
 - A copy of the latest revision of the Integration and Alignment Procedure
 - The Certification Log for the Instrument
 - The Assembly drawing for the FPA integration to the Telescope Assembly
 - All necessary prints, E.O.'s and other documents
- d. Verify that setup, integration and alignment are in accordance with the requirements of this procedure, including facility ambient conditions. Setup shall be verified by an independent observer and recorded in the Certification Log.
- e. Collect, identify and store all raw data generated during the procedure. Data storage will be in the program SER files and referenced in the Certification Log.



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- f. Responsible for sign off, on completion, all integration and alignment process steps, torque values and / or other measured and recorded values as specified in this procedure in the Certification Log. The person who performed the operation shall perform sign off.
- g. Conduct the integration and alignment in a safe manner.
- h. Notify the Integration and Test Manager and QA monitor or PEQA if out of tolerance conditions occur. Flag out of tolerance conditions in the Certification Log.
- i. Supervise the troubleshooting and rework as required.
- j. Maintain a record in the Certification Log of all action items and ensure that all items are closed prior to final sign-off of the Certification Log.
- k. Notify the Integration and Test Manager and QA monitor or PEQA of completion of this procedure for data review and sign-off in the certification log.

The test conductor has the authority to change, in writing, the sequence of events of this procedure, during the conduct of this procedure, to facilitate availability of certain test equipment, flight hardware or personnel. The T/C is responsible for certifying that such deviations do not jeopardize the intent or the data integrity of this procedure.

The test conductor has the authority to substitute equivalent test equipment for those items called out in Section 6 of this procedure. The T/C is responsible for certifying that the substituted items are up-to-date in terms of their certification and that these substitutions do not jeopardizing the intent nor the data integrity of this procedure.

5. TEST DESCRIPTION

5.1. TEST ARTICLE CONFIGURATION

The IRFPA as assembled per drawing TBR may be in various states of configuration. The minimum requirement for these tests is any combination of the IRFPA, the IRSS, and the cable assembly.

5.2. PERSONNEL

Test Conductor. In addition to functions described in Section 4.2.2, the test conductor person monitors test, fills out the log file, and takes notes on any *ad hoc* activities.

5.3. REQUIRED TEST EQUIPMENT

This section lists the SIM Alignment and Test equipment, and other materials (or the equivalent, as determined by the test conductor) required to perform the tests described in Section 8. The actual model numbers, calibration or certification due dates for all items used during this procedure shall be recorded in the Certification Log. All GSE, test equipment, and other materials must be QA and Clean Room approved as appropriate, and have current calibration status if applicable. The following items are required to perform this procedure.



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5.4. TEST DESCRIPTION

The IRFPA Functional Test has 3 components:

1. Shorts/Opens – to verify that the IRFPA is healthy and is correctly wired to the SIM interface.
2. Safe-to-Mate – to verify that proper signals are supplied to the IRFPA at the SIM interface.
3. Warm Clock – to verify that the IRFPA operates normally at room temperature.

5.5. TEST EQUIPMENT

The following test equipment (or equivalent, as determined by the test conductor) is required to perform the tests delineated in Section 7. Record actual model numbers and calibration due dates for applicable items on this form, *at the time of the test run*. Record certification due dates for any Deep Impact program GSE that is used.

EQUIPMENT	MFR.	MODEL NO. TDSG40A	S/N BASG Tag	Cal Due	✓
Oscilloscope	Tektronix	FDS540E	P115732	1/8/03	✓
Multimeter	Wavetek	28XT	P119089	8/22/03	✓
Break Out Box (BOB)	Ball	JVC 11/26/02	T1115	8/22/03	✓
IRFPA Primary Radiator Shorting Plug, 37 pin	Ball	T131438		N/A	✓
IRFPA Primary Radiator Shorting Plug, 25 pin	Ball	T	S/N 17	N/A	✓
Cable Assembly, 37 Pin	Ball	T131494 11/26/02	572377-575	8/23/03	✓
Cable Assembly, 25/9 Pin	Ball	T131495 JVC	-544 #1		
Cable Assembly, 37F Socket	Ball	T131496	-544 #1	8/23/03	✓
Cable Assembly, 25/9F Socket	Ball	T131497	-516 #1	8/22/03	✓
Ionizing air blower		EMS000018	P130723	2/19/03	✓
Wrist strap fault monitor		EMS000020			✓

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△ If the stimulator does not require testing, equivalent certified 37 pin/socket and 25 pin/socket cables may be used. Record in table above

JVC
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25/9 pin

Ball

-517 SN #1

10/14/03

✓



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P.O. Box 1062
Boulder, Colorado 80306

SIZ
E

A

CAGE
CODE

13993

DWG. NO.

574502

REV

B

Operator: Van Clave

Date: 11/26/02

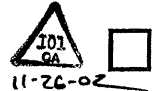
SHEET 13

6. TEST SETUP

CAUTION !

The Deep Impact IRFPA detector is static sensitive. Follow all precautions for handling Flight Hardware per SPS 1930 and PSP 120211. Test Conductors and operators must be ESD certified. These ESD requirements must be followed!

1. Verify that QA has given an "OK TO TEST" in the Cert Log



2. Turn on the Oscilloscope. Set it for the following conditions; (The oscilloscope setting may be adjusted to different values as required by the test conductor.)

- a) DC coupling
- b) Vertical Scale 1.0V / div
- c) Horizontal scale 1us / div
- d) Trigger Auto
- e) Trigger Level 3.0v ±0.5v

ON

3. Turn on the 28XT multimeter and set to DC volts. Test for functionality.

Note: In the following tables "OL" and or "Open" indicates a DMM overload reading for a diode measurement, i.e., the voltage reading is between 2.8 and 3.0 Volts.



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7. TEST PROCEDURE

The following sections may be performed out of sequence at the discretion of the test engineer.

7.1. SAFE-TO-MATE SIGNAL VERIFICATION

Ensure that the requirements of SPS 1930 are in force. ✓

1. If required remove flight cables from between the IRFPA and the Interface Electronics (IE). *N/A*
2. Place shorting plugs on IRFPA cables. *N/A*
3. Inspect all pins and sockets on the IE socket for irregularities before testing and ensure that connector savers are in place.
4. Connect cables T131496 and T131497 to the BOB connectors J1 and J2 RED. ✓ *(375) (255) DLH 11/26/02*
5. Connect cables T131496 and T131497 to the IE connectors. *cables ✓*
6. Connect a banana cable from the multimeter ground plug to BOB RED 2. ✓
7. Switch the multimeter function switch to the 20Vdc measurement range. ✓
8. Turn on and initialize IE as per Section 8.1 and 8.3 ✓
9. Measure and record the voltages at the indicated pins as shown in Table 7.1 and Table 7.2.

Table 7.1 Test Cable Data Sheet, Biases

Signal Name	BOB Jack #	Minimum Value	Measured Value	Maximum Value	Notes
VDDA	1	4.5	5.00	5.5	1.
BIASGATE	9	3.35	3.42	3.52	
VDD	3	4.5	5.00	5.5	
DSUB	7	0.7	0.75	0.8	
READ	64	4.5	5.07	5.5	
VRESET	5	0.20	0.25	0.30	

1. These are nominal values based on the EM unit. Flight units may exhibit variation. The test engineer shall determine the validity of the measurement and then provide a brief narrative of the change at the bottom of this page.

Table 7.2 Test Cable Data Sheet, Signals

Signal Name	BOB Jack #	Minimum Value	Measured Value	Maximum Value	Notes
VID_OUT_1	16	4.5	5.39	5.5	
VID_OUT_2	17	4.5	5.36	5.5	
	15	-0.05	-0.02	0.05	

10. Remove Multimeter cables from BOB.



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








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11. Connect Oscilloscope ground to BOB RED 2. ✓
12. Command 32 mode 6 images as per Section 8.4.1.
13. Sequentially measure each pin indicated in Table 7.3 and record the values in "Measured Value" column. Repeat the exposure command if the clocks stop before you are done. ✓
14. Shut down the IRFPA and SIM as per Section 8.5. ✓

Table 7.3 Test Cable Data Sheet, Clocks

Signal Name	BOB Jack #	Low Value	Measured Value	High Value	Voltage	Wave form
RSTIN	61	0.0		5.5	0/5	
FSYNC	51	0.0		5.5	0/5	
VCLK	55	0.0		5.5	0/5	
CLK1	57	0.0		5.5	0/5	
LSYNC	53	0.0		5.5	0/5	
CLK2	59	0.0		5.5	0/5	

The high value has a tolerance of +/- 0.5V and the low value has a tolerance of +0.5 and -0.0.

Monitor shut down by connecting the WaveTek ground to BOB RED 2 and the WaveTek + lead to BOB RED 1 (VDDA). When the ITOC operator has confirmed power off, and the WaveTek also read <10 mV, the Safe to mate is test complete. Remove the BOB cables from the IE and replace shorting caps, if any. ✓

Safe to Mate Test Notes and Annotations.



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7.2. WARM SHORTS/OPENS TEST PROCEDURE

Ensure that the requirements of SPS 1930 are in force.

1. Remove cables T131496 and T131497 from the BOB connectors J1 and J2 RED. ✓
2. Replace shorting connectors on IE MDM connectors. *N/A*
3. Remove the shorting connector from IRFPA cable. ✓
4. Inspect all pins and sockets before mating. ✓
5. Connect cables T131494 and T131495 to the BOB connectors J1 and J2 RED. (37) (25)
6. Connect the 37 pin cable to the SIM ✓
7. Connect the 25 pin cable to the SIM. ✓
8. Connect the 9 pin cable to the SIM. *N/A*
9. Set WaveTek to diode mode. ✓
10. Connect the positive lead of the Wavetek multimeter to BOB jack RED #2 (AGND).
Sequentially measure each pin indicated in Table 7.4 on the BOB with respect to BOB RED jack #2 and record the values in "Measured Value" column.

at first Wavetek was on MAX

Table 7.4 "Positive AGND" Shorts/Opens Test Results

Signal Name	BOB Pin Number	Minimum Value	Measured Value	Maximum Value
VDDA	1	0.416	.467	0.508
BIASGATE	9	0.611	.685	0.747
VDD	3	0.409	.457	0.499
VRESET	5	0.459	.515	0.561
DSUB	7	0.444	.497	0.542
RSTIN	61	0.600	.702	0.750
FSYNC	51	0.600	.702	0.750
VCLK	55	0.600	.702	0.750
CLK1	57	0.500	.655	0.700
OUT 1	16	0.658	.736	0.804
OUT 2	17	0.658	.736	0.804
READ	64	OL	OL	OL
LSYNC	53	0.552	.702	0.750
CLK2	59	0.508	.655	0.700
	15	0.00	.013	0.02

11. Set Wavetek to 200 kohm scale and measure ✓

TEMP (Voltage sense)	13 & 14	18K	18.6K	20K
----------------------	---------	-----	-------	-----

12. Set Wavetek to 20 kohm scale and measure

N/A DLH 11/26/02

STIM	77 & 78	2.5 K		5 K
------	---------	-------	--	-----

13. Disconnect the 9 pin cable to the SIM. *N/A*



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14. Disconnect the 25 pin cable to the SIM. ✓
15. Disconnect the 37 pin cable to the SIM. ✓
16. Re-install IRFPA to IE cable ✓ or place shorting plugs on SIM connectors N/A. Examine all pins for damage before mating.
17. At completion of measurements remove BOB cables.

Order 37, 25, 9
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Test complete.

Test Result (Circle one)

PASS Fail

7.3. WARM CLOCKING PROCEDURE

1. Perform Sections 8.1 to 8.3. ✓
2. Collect 2 images using mode 6 using the CSTOL proc "HRI SIM Single Mode Calibration" start ~~TP575086~~, Section 8.4.1. *instirexp Δ DLH 11/26/02*
3. The SIMian will provide the median reset level of the Diagnostic (mode 6) data Quad A -939 DN, Quad B -3496 DN. Verify that these results are between -4196 and +4196 ✓ If they are not in range, then continue. If they are in range, go to Section 8.5.
4. Command the preamp offset DACs to low limit using the OASIS commands
CMD IHF IR_DAC_ADJ with DAC_SELECT 4, DAC_VALUE x#00
CMD IHF IR_DAC_ADJ with DAC_SELECT 5, DAC_VALUE x#00
5. Collect 2 images using mode 6 using the CSTOL proc "HRI SIM Single Mode Calibration" start TP575086, Section 8.4.1. Verify that the median is -8192.
6. Command the preamp offset DACs to the high limit using the OASIS commands
CMD IHF IR_DAC_ADJ with DAC_SELECT 4, DAC_VALUE x#FF
CMD IHF IR_DAC_ADJ with DAC_SELECT 5, DAC_VALUE x#FF
7. Collect 2 images using mode 6 using the CSTOL proc "HRI SIM Single Mode Calibration" start TP575086, Section 8.4.1. Verify that the median is +8191.
8. Use the transfer function 280 DN/bit to calculate the correct preamp offset DAC setting to put the median signal level near zero. Write that setting here: _____
9. Command the preamp offset DACs to the zero-estimate value limit using the OASIS commands
CMD IHF IR_DAC_ADJ with DAC_SELECT 4, DAC_VALUE x#??
CMD IHF IR_DAC_ADJ with DAC_SELECT 5, DAC_VALUE x#??
10. The SIMian will provide the median reset level of the Diagnostic (mode 6) data Quad A _____ DN, Quad B _____ DN. Verify that these results are between +-4196 and +4196 _____ If that is not correct, check your work for sign errors and repeat steps 8-10.
11. Turn off as per Section 8.5.

8. APPENDIX: HOW TO OPERATE THE SIM IRFPA

The assumed hardware state in this Section is that the IE is cabled to the SIM.
Use the initials 'StM' for Safe-to-Mate and 'WC' for warm-clock in the following checklists.



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analog telem - no

DWG NO.

SH 20

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Engineering if an error occurs. The system will then be shut down using individual CSTOL commands.

3. Initialize the IE IRFPA DACs and turn on the IRFPA by sending the CSTOL proc "HRI SIM Standard Initialization" start TP574496 *b ov*
4. Record the time of power-on in the Operations Log 16:10 *updated to align OASIS DB*
5. If the preamp offset DAC setting is known, enter it here x0 (x0 for warm-clock) *DLH 18:27 } commands*
6. If the values are different from xB8, then command the preamp offset DACs to the new values using the OASIS commands ✓
 CMD IHF IR_DAC_ADJ with DAC_SELECT 4, DAC_VALUE x#??
 CMD IHF IR_DAC_ADJ with DAC_SELECT 5, DAC_VALUE x#??

8.4. COLLECT IMAGE DATA

Image data is collected using two CSTOL procedures. Single-mode (TP575086) permits the operator to specify mode and number of frames, while multiple-mode (TP574495) collects 8 frames of each of the 6 modes, as described below:

8.4.1. Single-mode TP575086

Description:

```

; Procedure: IR Single Mode Calibration new
;
; Project: Deep Impact
;
; Purpose: Initiates an operator-controlled loop to send single HRI IR
; image commands
;
; Inputs: Image Mode ($IMAGEMODE)= 1-7, 9 to terminate image loop
; Exposure ID ($EXP_ID)= 1-255
; Image Count ($COUNT) = 1-255
;
; Process: Verify IR voltage levels.
;
; Enter image loop.
;
; Send single image command, based on user inputs.
;
; Check keep alive counter to ensure processor is still active.
;
; Re-verify IR voltage levels.
;
; Re-enter image loop or exit procedure.
;
; Invokes: None.
;
; Notes: In order to abort an imaging command during execution,
; send command: CMD IHF IR_ABORT.
;
; History: 02.06.10 - Checked into CVS: Rev. 1.1
;
; *****

```



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5. TEST DESCRIPTION

5.1. TEST ARTICLE CONFIGURATION

The CCD as assembled may be in various states of configuration. The minimum requirement for this test is any combination of the CCD Detector/Mount Assembly (559559-500, -501 or -502), the CCD Signal processor (564317), the CCD Preamp and bias assembly (564325), the CCD Clock Driver assembly (564326) and the associated CCD cable assemblies (564377 and 564378). Specifically, these tests will be performed at the appropriate cable interfaces.

5.2. PERSONNEL

Test Conductor. In addition to functions described in Section 4.2.2, the test conductor monitors testing, fills out the log file in Section 6, and takes notes on any unplanned activities.


5.3. REQUIRED TEST EQUIPMENT

This section lists the test equipment, and other materials (or the equivalent materials as determined by the test conductor) required to perform the tests described in Section 7. If different from the listed equipment, the actual manufacture, model numbers and calibration or certification due dates for all items shall be recorded in the Certification Log.

All GSE, test equipment, and other materials must be QA and Clean Room approved as appropriate, and have current calibration status if applicable. The following items are required to perform this procedure.

5.4. TEST DESCRIPTION

The DI CCD safe-to-mate test is used to ensure that the proper signals will be supplied by examining the voltage level and clocking signals present at each pin of the CCD.

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	A	13993	574503	-
	SCALE	NA	SHEET 10	

A6356 BR22813[18A]-11/21/02

8.1. COMMAND AND TELEMETRY STARTUP/VERIFICATION

1. Log into GSE computer. Userid: [tribe]gse password: [tribe]gse1
2. Type oasis
3. In ask_window type ITOC
4. Move the display menu banner to the 2nd monitor (T2) using the "display menu to T2" button
5. In the CSTOL window, type switch on dicmd.
6. Display the telemetry pages ihfdo, ihfst, and ihfhs050. They are accessed from pulldown menus S/C → Flyby → IHF
7. Display the ITOC power status window from pulldown menu GSE → itoc → gse
8. Display the CSTOL proc windows from the pulldown menu oasis → procedures (scroll window named U CSTOL_PROCS) and oasis → procedure control (starts procedure control GUI).
9. Verify that all required IR CSTOL procs are precompiled _____. Else, use commands new_proc [procname] and compile [procname]. Record the names of CSTOL procs which were not precompiled _____

When a proc is run, you must confirm the proc revision and date. If the revision or date is incorrect, press 'quit' on the proc control GUI. If the revision and date are both correct, press 'go' on the proc control GUI.

The CSTOL command window CSTOL_PROMPT has a somewhat unusual recall buffer. When the cursor is on a line of text in that window, Enter executes that line; it is not necessary to paste text to the CSTOL> prompt. To edit commands, move the cursor to a previous line and edit the text in place, press Enter to execute that text.

8.2. DATA ANALYSIS STARTUP

1. If not logged in, login to arm or hammer as [arm, hammer]gse.
2. Enter the password: [arm, hammer]gse1.
3. Enter cd DIVE
4. Enter IDL
5. Start DIVE by entering @view at the IDL prompt.
6. Create directory of day: /data/2002/HRI-IR/DOY/img for images and /log for logs
7. Verify that there is 2 Gb of space on the /data partition. Else, clean the disk until there is 2 Gb available.
8. Open an ftp window into the GSE computer, directory ~/itoc/gse.


8.3. TURN ON SIM AND IRFPA

1. Check that all cables are properly connected and tight. ✓
2. Power up the IE by sending the CSTOL proc "HRI SIM Power On": start TP574498. You will see a blue comment line "The instrument is now powered on." It may take a full minute to start the telemetry processes. You will then be prompted "Do you want to run software patches?... (y, n)". With the concurrence of System Engineering, reply 'y'. Else, reply 'n.' Check one: patched _____ not patched Check that patch operations will give the messages "IR ADCClockDelay Patch" N/A and "IR STIMDACMax Patch" N/A. The procedure has terminated normally when you see the message "The HRI SIM Power On procedure is now complete." System Engineering will, in addition, verify that no errors occurred, and will notify S/W

o = STM ✓ = warm clock

DLH 11/26/02

DLH
start
nstp wrong
(no patch)

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You will be prompted to verify that this is the correct CSTOL proc:

WAIT ;Enter GO when procedure revision and release date are verified

You will then be asked

"Which Image Mode do you want to run?... (1-7, 9 to quit)"

Then

"How many images do you want to take?... (1-255)"

If you are doing a memory check (mode 7), you will also be asked

"Enter a SEED value for Image Mode 7."

Enter 1234 unless you have a good reason to do otherwise.

This procedure will repeat until you enter a 9. It will then print out the Exposure ID of the last exposure collected, which you should record in the file log.

8.4.2. Multiple-mode (TP574495)

Description:

```

; Procedure: IR Multiple Mode Calibration
;
; Project:   Deep Impact
;
; Purpose:   Initiates an operator-controlled loop to send a block of 6
;            HRI IR image commands.
;
; Inputs:    Loop ($LOOP)= Y, N to execute or terminate image loop
;            Initial Exposure ID ($EXP_ID)= 1-255
;
; Process:   Verify IR voltage levels.
;
;            Enter image loop.
;
;            Send block of image commands, based on user inputs.
;
;            Check keep alive counter following each command to ensure
;            processor is still active.
;
;            Re-verify IR voltage levels.
;
;            Re-enter image loop or exit procedure.
;
; Invokes:   None.
;
; Notes:     In order to abort an imaging command during execution,
;            send command: CMD IHF IR_ABORT.
;
; History:   02.06.10 - Checked into CVS: Rev. 1.1
; *****
    
```



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You will be prompted to verify that this is the correct CSTOL proc:

WAIT ;Enter GO when procedure revision and release date are verified

Then

"Do you want to perform the imaging sequence?... (y/n) "

The procedure repeats until you enter n at the above prompt. It will then print out the Exposure ID of the last exposure collected.

8.5. TURN OFF SIM AND IRFPA

inst power off 11/26/02 ADH

1. Power down the IE by sending the CSTOL proc "HRI SIM Power Off" START ~~PP574499~~
2. Record the time of IE and IRFPA power-off in Operations Log 18:37
3. Check that gse telemetry item PSST is OFF
4. Check on the upper HP power supply on the ITOC console that $V < 0.5 V$ and $I < 10 mA$.



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