

# **HIRDLS**

## **HIGH RESOLUTION DYNAMICS LIMB SOUNDER**

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Subject / Title      **ELECTRICAL INTERFACE TEST PROCEDURES**  
                                 **for In-Flight Calibrator (IFC) Subsystem**

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**Contents / Description / Summary:**

This is one of a family of test procedure documents for the IFC which together cover the following phases from manufacture to delivery:

<b>PHASE</b>	<b>DESCRIPTION</b>	<b>DOCUMENT #</b>	<b>TEST RECORD #</b>
1	Initial build checks	SP-OXF-222	TR-OXF-222/n
2	Functional & electrical interface test proc's	SP-OXF-212	TR-OXF-212/n
3	Mechanical environment test procedures	SP-OXF-211	TR-OXF-211/n
4	Thermal test procedures	SP-OXF-223	TR-OXF-223/n
5	EMC test procedures	SP-OXF-224	TR-OXF-224/n
6	Limited & Comprehensive test procedures	SP-OXF-225	TR-OXF-225/n
7	Mechanical and physical interface checks	SP-OXF-226	TR-OXF-226/n
8	IFC IPU Simulator set up & Operating procedures	SP-OXF-254	Logbook
9	IFC Safe to mate procedures	SP-OXF-252	TR-OXF-252/n

**NOTE:** unless stated otherwise, the term "IFC" includes the Black Body, the BEU and cable U25

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## **1 GENERAL**

### **1.1 Scope of this Document**

This document defines the procedures for the formal verification of the Protoflight Model IFC between the completion of initial build, and integration of the Subsystem with the HIRDLS PFM Instrument. Provision is made for testing the entire Subsystem, and for testing the BEU using a dummy Black Body.

A copy/copies of this document shall be used to record results, as described in section 1.4.

### **1.2 Applicable and Related Documents**

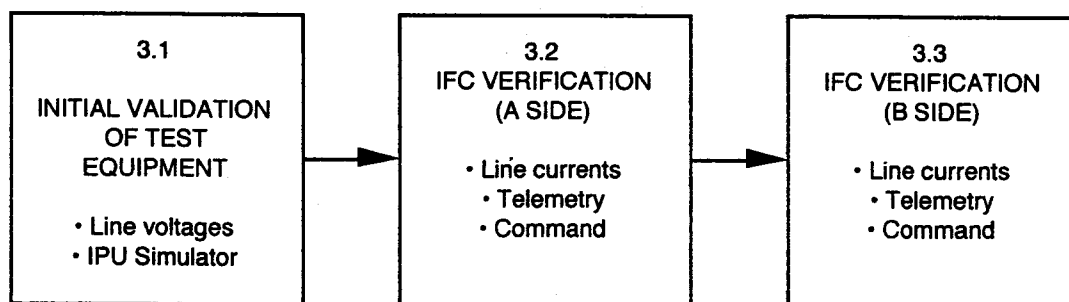
The following documents are applicable to - or relate to - this Document:

TP-OXF-179	IFC Test Plan
SP-HIR-044	IFC Subsystem Specification Document
PA-OXF-152	Performance Assurance Implementation Plan (Oxford)

### **1.3 List of Acronyms & Abbreviations**

### **1.4 Recording of Results**

Each time these procedures are performed, the results shall be recorded in a printed copy of this document. The (partially or wholly) completed document shall be re-designated and released as "TR-OXF-212/x", where x=1 for the first release, and x=2, etc. for subsequent releases.



**Fig. 1-1 Stages in Procedure Flow**

## **2 EQUIPMENT & FACILITIES REQUIRED**

### **2.1 Test Facilities, Environment & Conditions**

The following conditions shall be met:

- 2.1.1 The BEU and cable U25 (if used) shall be kept clean to Level 200\* or better
- 2.1.2 The BB shall be kept clean to Level 100\* or better
- 2.1.3 Gloves and masks shall be worn at all times while handling IFC items, or other parts which come into contact with IFC items.
- 2.1.4 Anti-static (ESD) measures shall be in place when performing these procedures
- 2.1.5 Appropriate measures shall be taken to safeguard the IFC and associated hardware from accidental or uncontrolled damage, interference or access. Appropriate warning and/or advisory notices shall be prominently displayed while testing is in preparation or in progress

\* MIL-STD-1246

### **2.2 List of Equipment**

The following items of equipment are required (\* denotes 'flight' item):

- 2.2.1 \*IFC PFM Black-body Electronics Unit (BEU)
- 2.2.2 \*IFC PFM Black Body (BB)
- 2.2.3 \*BEU-BB PFM cable U25 (per SP-HIR-266)
- 2.2.4 DC power supplies as defined in SP-HIR-267
- 2.2.5 IPU Simulator supporting the data protocol defined in SP-HIR-267
- 2.2.6 IFC Interface Adaptor Box
- 2.2.7 Dummy BB

### **2.3 Test Configurations**

The configurations to be used are specified in section 3

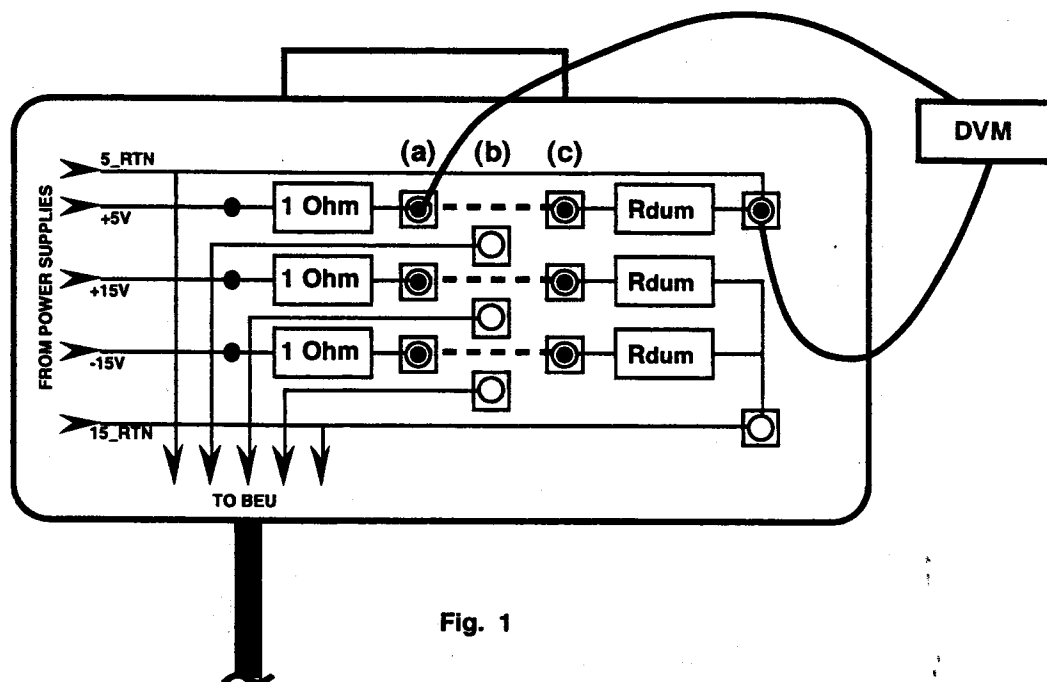
### 3 PROCEDURES

- Shaded cells can be ignored.
- √ indicates 'check' if OK - otherwise record readings/results

STEP	DETAILS	RESULTS	INLS
<b>3.1</b>	<b>INITIAL VALIDATION OF TEST EQUIPMENT (DO NOT USE ANY IFC ITEMS AT THIS STAGE)</b>		
3.1.1	Configure I/F Adaptor Box per Fig. 1, i.e. link each (a) socket to the corresponding (c) socket; see Note a.	√	
3.1.2	Connect power supplies to I/F Adaptor Box (see Note b.) and adjust voltage settings per SP-HIR-267 (nominal), using DVM with 50mV resolution or better to measure each line voltage in turn (Fig. 1 - see Note c.). Record DVM readings. Switch power supply outputs OFF after completing this stage, but leave connected to I/F Adaptor Box.	(+5V): (+15V): (-15V):	
3.1.3	Power up IPU Simulator (do not connect to I/F Adaptor Box) and perform the following checks: Verify Clock timing & waveform: Verify Envelope timing & waveform: Verify Sync timing and waveform: Verify Control timing & waveform: all conform to the ICD: Verify Data line is inactive: (H/L) When these checks completed, IPU Simulator should be running in normal data cycle mode		

Note a.: this connects a dummy load to each line, approximately equivalent to the IFC load.  
 Note b.: +5V return and +/-15V return must be linked together at power supply end.  
 Note c.: use correct 0V return !

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(first draft)



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(first draft)

STEP	DETAILS	RESULTS	INLS
<b>3.2</b>	<b>RECONFIGURATION OF EQUIPMENT AND IFC VERIFICATION - A SIDE</b>		
3.2.1	Choose IFCBB or Dummy BB for this test. State which here --->		
3.2.2	Reconfigure I/F Adaptor Box per Fig. 2-1, i.e. link each (a) socket to the corresponding (b) socket; see Note d.	✓	
3.2.3	Referring to Fig. 2-2, connect BEU side A to I/F Adaptor Box; connect real or dummy BB to BEU using cable U25.	✓	
3.2.4	Switch on power supplies to I/F Adaptor Box. Using DVM with 50mV resolution or better, measure each line voltage in turn (see Fig. 2-1). Record DVM readings. Leave power supply outputs switched ON.	(+5V): (+15V): (-15V):	
3.2.5	Use DVM with 2mV resolution or better to measure each line current in turn (see Fig. 2-3). Scale is 1mA per 1 mV. Record DVM readings.	(+5V): (+15V): (-15V):	
3.2.6	See Note e. Record expected (previously recorded) values, and note from which test record they were copied ... or mark "N/A". Ref. TR #: _____	(+5V): (+15V): (-15V):	
3.2.7	Connect the IPU simulator, set it running in normal data cycle mode. WAIT 40 SECONDS FOR TELEMETRY DATA TO BECOME VALID.	✓	
3.2.8	Verify that the following telemetry readings are displayed: PRT1: 0xAFB7 ± 2. PRT2: 0xABC4 ± 2. PRT3: 0xA7D4 ± 2. Ref. resistor temp: Note f. 0x007B ± 2. +5V mon: 0x00DD ± 1. +15V mon: 0x00EA ± 1. -15V mon: 0x00EA ± 1.	(✓ or x, and record reading)	
3.2.9	Dummy BB ONLY! - connect DVM across "heater" terminals; send Heater Control Word (HCW) from IPU Simulator, with parameter value set to 255. Verify DVM reads 10.5 ± 0.5. V	(✓ or x, and record reading)	
3.2.10	Send HCW with parameter value set to zero; verify DVM reads < 10 mV	✓	
3.2.11	Disconnect IPU Simulator from I/F Adaptor Box. Switch power supply outputs OFF, but leave connected to I/F Adaptor Box.	✓	
3.2.12	Were all above checks satisfactory ?	(YES / NO)	

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Note d.: this connects the actual IFC loads to each line.

Note e.: DO NOT perform this step if this is the first run through this Procedure (i.e. TR# = /1)

Note f: Reference resistor oven temperature depends upon the BEU environment temperature.

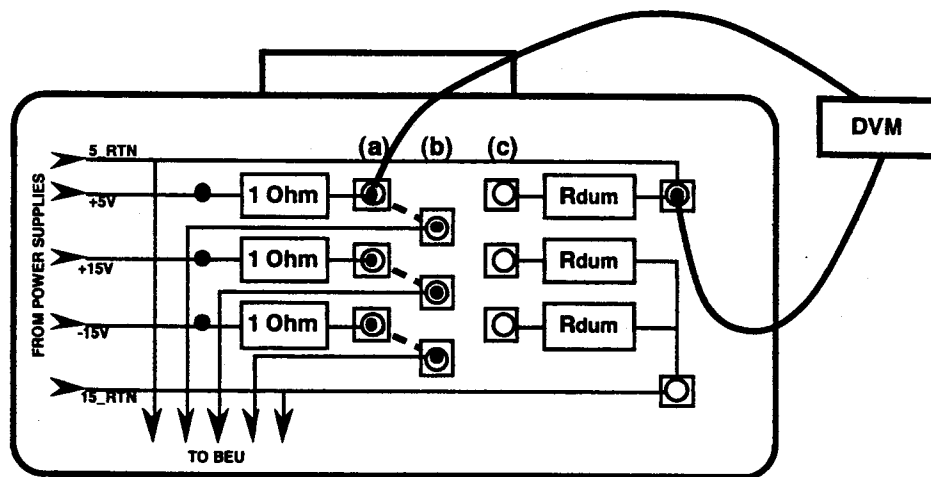


Fig. 2-1

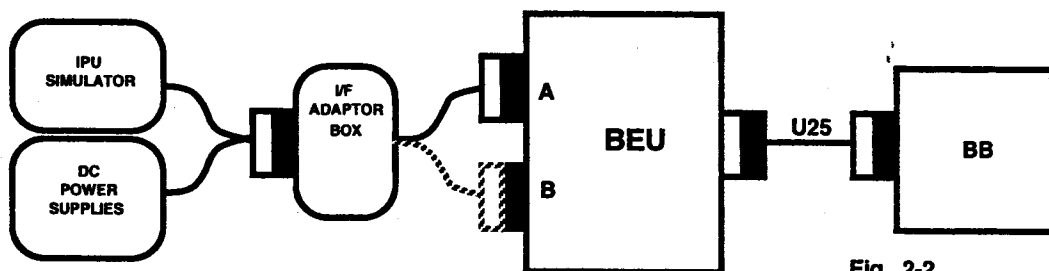


Fig. 2-2

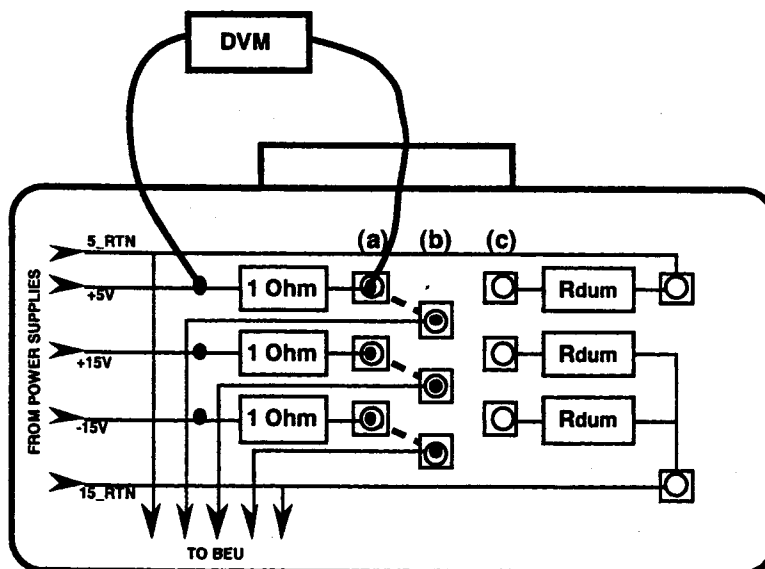


Fig. 2-3



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(first draft)

STEP	DETAILS	RESULTS	INLS
<b>3.3</b>	<b>RECONFIGURATION OF EQUIPMENT AND IFC VERIFICATION - B SIDE</b>		
3.3.1	Choose IFCBB or Dummy BB for this test. State which here --->		
3.3.2	Referring to Fig. 2-2, connect BEU side B to I/F Adaptor Box; (connect real or dummy BB to BEU using cable U25).	✓	
3.3.3	Switch on power supplies to I/F Adaptor Box. Using DVM with 50mV resolution or better, measure each line voltage in turn (see Fig. 2-1). Record DVM readings. Leave power supply outputs switched ON.	(+5V): (+15V): (-15V):	
3.3.4	Use DVM with 2mV resolution or better to measure each line current in turn (see Fig. 2-3). Scale is 1mA per 1 mV. Record DVM readings.	(+5V): (+15V): (-15V):	
3.3.5	See Note f. Record expected (previously recorded) values, and note from which test record they were copied ... or mark "N/A". Ref. TR #: _____	(+5V): (+15V): (-15V):	
3.3.6	Connect the IPU simulator, when running in normal data cycle mode WAIT 40 SECONDS FOR TELEMETRY DATA TO BECOME VALID.	✓	
3.3.7	Verify that the following telemetry readings are displayed:  PRT1: 0xAFC8 ± 2. PRT2: 0xABCF ± 2. PRT3: 0xA7DC ± 2. Ref. resistor temp: 0x007B ± 2. +5V mon: 0x00DD ± 1. +15V mon: 0x00EA ± 1. -15V mon: 0x00EA ± 1.	(✓ or x, and record reading)	
3.3.8	Connect DVM across "heater" terminals on Dummy BB; send Heater Control Word (HCW) from IPU Simulator, with parameter value set to 255. Verify DVM reads 10.5 ± 0.5. V	(✓ or x, and record reading)	
3.3.9	Send HCW with parameter value set to zero; verify DVM reads < 10 mV	✓	
3.3.10	Were all above checks satisfactory ?	(YES / NO)	

/ continued . . . . .

Note f.: DO NOT perform this step if this is the first run through this Procedure (i.e. TR# = /1)

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**(first draft)**