SPIRE

SUBJECT: **SPIRE FPU Handling and Integration Procedure**

PREPARED BY: **E Sawyer**

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APPROVED BY: ……. **Date:** …….

Distribution

Change Record

ISSUE	DATE	
Draft	3/12/03	First draft
Draft 2	15/12/03	Additions from MSSL Inclusion of electrical integration procedure
1	20/5/04	Comments from ASED incorporated as appropriate Drawings added

Table of Contents

Glossary

SPIRE	Spectral and Photometric Imaging REceiver
FPU	Focal Plane Unit
CQM	Cold Qualification Model
PFM	Proto Flight Model
JFET	Junction Field Effect Transistor
RAL	Rutherford Appleton Laboratory
MSSL	Mullard Space Science Laboratory
HSJS	Herschel Spire JFET Spectrometer
HSJP	Herschel Spire JFET Photometer
DCU	Detector Control Unit
FCU	Focal plane Control Unit
L0	Level 0 (zero)
HOB	Herschel Optical Bench
ESD	Electro static Discharge
TBC	To Be Confirmed
OBA	Optical Bench Assembly

References

Applicable Documents

AD1	SPIRE-RAL-DOC-001132	SPIRE warm electronics integration plan
AD2		Cryo-harness cross talk check procedure

Reference Documents

1. INTRODUCTION

2. SCOPE

This document describes the procedures to be followed when handing the SPIRE FPU after delivery to ESA/Alcatel.
It covers the handling and integration procedures to be followed.
It covers both the CQM and PFM units

3. DELIVERY CONDITION

The SPIRE instrument is delivered in the following condition:-

The FPU is supplied in a dedicated, re-useable, container.
Alignment cube is fitted to the FPU. (red tag item). See section 8 for further details.
FPU aperture cover fitted (red tag item). See section 8 for further details.
Harnesses Between the FPU and JFETs fitted.
FPU and JFETs attached to a baseplate.
Shorting plus or covers will be fitted to all electrical connectors See section 8 for further details.
FPU and JFETs double wrapped in polythene or lumalloy film.
Witness mirrors and/or PFO plates will be fitted to the baseplate
Silica gel moisture control devices will not be used

3.1 Shock recorders

Attached to the FPU baseplate, inside the transportation container are re-settable shock indicators These operate in three axis and are set to 5,10 and 25g.
Upon inspection, if any of these recorders have triggered the project team at RAL should be informed.
'Tip and Tell' tilt sensors are attached to the outside of the FPU container.
Upon inspection, if any of these recorders have triggered the project team at RAL should be informed

4. TRANSPORT

4.1 In dedicated experiment containers

Protect from rain and moisture.
Transport in closed vehicles only.
Protect from extremes of temperature, -10°C to +50°C, and prevent the formation of dew at any time.

4.2 After integration on the spacecraft (in spacecraft container)

Equivalent to Cleanroom 100 conditions
Assuming that the cryostat is closed:

FPU Aperture cover (red-tag item) shall be removed
Alignment cube (red-tag item) shall be removed
No other specific requirement.
For transport the CVV is closed, evacuated, cooled, OBA in vertical position, z-axis downwards]

5. STORAGE

5.1 In dedicated experiment container

Ensure aperture cover (red-tag item) is fitted.
Protect from rain and moisture.
Protect from extremes of temperature, 10°C to +30°C.
Alignment cube is fitted.

5.2 Out of container (in RR100 cleanroom, awaiting integration)

Ensure aperture cover (red-tag item) is fitted.
Alignment cube is fitted

6. HANDLING

6.1 General.

The FPU is a delicate optical instrument and should be handled with extreme care at all time. Contamination of the optical surfaces within the instrument is prevented by the aperture cover. This cover should remain in place unless it is necessary to remove it.
WARNING: The bipod legs on two corners of the instrument are very thin section and easily damaged. Care must be taken at all times not to put side loads into these items. These are at risk at all times when the FPU is not attached to a rigid plate. When it is attached to a rigid plate i.e the HOB ot its transport plate then it is tolerant of loads from vibration, lateral expansion, thermal tests, etc.

6.2 ESD protection

The SPIRE instrument contains very sensitive detectors that are susceptible to damage by Electro static discharge.
On delivery all connectors will be protected by covers or shorting plugs as appropriate.
When handling, all personnel shall wear anti static protection (wrist straps or other suitable method)
When the FPU is not connected electrically to the warm electronics, the chassis is isolated from ground.

6.3 Unpacking from dedicated experiment container.

The FPU is supplied attached to a baseplate together with the JFETs and the JFET harness already integrated. It is bagged in polythene or lumaloy film.
To remove the FPU and JFETs from its container, the following procedure should be followed: -
In an area with a cleanliness of class 100,000 minimum, undo the eight latches that secure the container lid and remove the lid.
The protective bagging encloses the FPU, JFETs and harness and is taped to the baseplate.
Unscrew and remove the four off M8 cap head screws that secure the baseplate to the anti vibration mounts.
Attach the lifting frame Ref MSSL/5264/404 to a crane and hydra-set. Lower the lifting frame to the baseplate and attach to the eyebolts provided on the baseplate.

The FPU, JFETs and baseplate can now be lifted out of the container with a crane.
Clean bagging material and baseplate, then transport to RR100 airlock.
Remove bagging
The instrument can now enter RR100
Shorting plugs provide ESD protection at this stage.

6.4 Preparation for integration.

The FPU is supplied with the JFETs and associated harness already fitted.
The following tasks need to be carried out before integration onto the spacecraft.
Only standard tools are required at this stage.

a) Fitting of JFET supports.
The JFETs will be fitted to the spacecraft together with the FPU. They will need supporting during this activity.
The SPIRE supplied MGSE provides provision to support the JFETS during integration.

b) **Fitting of Lifting attachment**
Fit the lifting attachment to the FPU as shown in annex A.
Attach the lifting wires to the JFETS.

c) **Alignment cube.**
The FPU is supplied with the alignment cube fitted, and should be left in place until all alignment activities are complete, it can be removed and replaced within the alignment tolerances required if necessary..

d) **Thermal strap.**
Remove the detector level 0 thermal strap and the Torlon support frames; leave the other two thermal straps in place

e) **Removal from baseplate**
WARNING: The bipod legs on two corners of the instrument are very thin section and easily damaged. Care must be taken at all times not to put side loads into these items. These are at risk at all times when the FPU is not attached to a rigid plate.
Undo the five M4 fasteners which secure the Photometer JFET rack (HSJP) (8 JFETs) to the baseplate.

Undo the four M4 fasteners that secure the Spectrometer JFET rack (HSJS) (2 JFETs) to the baseplate. Note that two of these fasteners are studs with nuts on the top, the nuts should be removed and the studs left in place.
The two remaining L0 straps are also secured to the baseplate. To release these from the baseplate, undo the 4 off M4 fasteners on each strap and remove the fasteners. NOTE. The undersides of these straps form the thermal interface to the spacecraft helium tank pods. Their surfaces are flat and soft gold plated, these surfaces can easily be damaged and the thermal performance of the instrument may suffer as a result.
Remove the Level 0 straps from the supports by undoing the clamps at the top of the strap support frames and the bolts at the joining plates, situated after the light traps.
Unbolt the cone from the FPU by undoing the M8 nut, thus leaving the cone on the baseplate.
Undo and remove the 8 fasteners that attach the FPU to the baseplate.
The FPU and JFETs can now be lifted from the baseplate.
Undo and remove the FPU cone from the baseplate and re-attach it onto the Optical Bench]. Note: there are special washers (part number A3/5264/302-3) under the head of each screw and also Vespel insulating bushes (A3/5264/302-2) either side of the mounting flange.
Torque the screws to 8.1 Nm. +/- 10% above running torque
The FPU and JFETs are now ready for integration.
Note: All screws that interface to the spacecraft are metric threads.
]

6.5 Preparation for packing.

All units should be wrapped in clean film and replaced in their transit containers. The FPU should be refitted to its baseplate using the following procedure:

Assuming activities described in section 6.3 have been carried out, and the FPU and JFETs are supported on a crane, with the FPU mounting cone still attached to the optics bench.
Remove the cone mount from the spacecraft deck optics bench
Fix the cone to the SPIRE baseplate using the four M6x21 cap head screws. Note: there are special washers (part number A3/5264/302-3) under the head of each screw and also Vespel insulating bushes (A3/5264/302-2) either side of the mounting flange.
Torque the screws to 8.1 Nm. +/- 10% above running torque.
The Spectrometer JFET studs (2 off) as indicated on interface drawing 0-KE-0104-360. Should still be fitted to the baseplate
Lift the FPU and JFETs using the lifting gear as described in section 6.
Very gently lower the assembly onto the baseplate, ensuring that the JFET studs engage on the JFETs and the cone mount engages in its location on the FPU.
NOTE: the cone is very thin walled section and large moments can be applied if the FPU is not lowered with its interface plane parallel to the baseplate
When all units are resting on the baseplate, fit the attachment screws (M6X21) to the bipod feet as for the cone mount, torque the screws to 8.1 Nm. +/- 10% above running torque.
Fit the M8 kaylock nut and Belleville washer to the mounting cone. Torque to 8.25 Nm. +/- 10% above running torque.
Remove the lifting/handling fixture.
Fit the two long bolts and two nuts to secure the spectrometer JFET. Torque the screws to 2.1 Nm. +/- 10% above running torque.
Fit the 5 long bolts to secure the photometer JFET. Torque the screws to 2.1 Nm. +/- 10% above running torque.

Secure the L0 straps to the baseplate using M4X20 socket head cap screws. Torque the screws to 1.5 Nm. +/- 10% above running torque.
Cover the FPU and JFETs with a double layer of clean polythene or lumaloy film and secure each one with tape to the baseplate.
Fit the lifting frame Ref MSSL/5264/404 to the four eyebolts in the plate.

6.6 Packing in containers.

Lift the plate into the container.
Remove lifting frame.
Secure baseplate to the anti-vibrations mounts in the floor of the transit container.
Fit container lid.

7. INTEGRATION

7.1 Required tools/MGSE

SPIRE supplied tools/MGSE:-

FPU and JFET handling frame.
FPU/JFET/baseplate lifting gear
JFET fixation hardware
Isolation washers, special screws and studs
L3 pressure plates 2-off
L1 strap screws M8 2off, M3 4off (these screws will be prepared for wire locking)
Wire for locking above screws.
L1 bushes for the vent line end
Temporary FPU Grounding Strap including M4 x 6mm fastener to connect to OBA
NOTE, Could possibly be attached to the unused harness support bracket holes, or any other convenient tapped hole.

Supplied by spacecraft
[ASED: More specified in detail (material, standard etc.)

Crane, with Hydraset
Fixation bolts,
FPU M6 12 off -
L0 straps M4 16 off -
L0 pressure plate 4 off
L3 strap M4 4off
Torque wrench to cover 1.5 to 8.25 Nm
Allan key, spanners etc
DVM for electrical isolation testing

7.2 Mechanical integration to spacecraft.

FPU and JFETs

Assuming activities described in section 6 have been carried out, and the FPU and JFETs are supported on a crane.
Fix the cone to the SPIRE baseplate using the four M6x21 cap head screws. Note: there are special washers (part number A3/5264/302-3) under the head of each screw and also Vespel insulating bushes (A3/5264/302-2) either side of the mounting flange.
Torque the screws to 8.1 Nm.+/- 10% above running torque.
Fix the Spectrometer JFET studs (2 off) as indicated on interface drawing 0-KE-0104-360. Note these should be screwed into the HOB until 45mm of stud are protruding from the surface.
Lift the FPU and JFETs using the lifting gear as described in section 6.
Very gently lower the assembly onto the HOB, ensuring that the JFET studs engage on the JFETs and the cone mount engages in its location on the FPU.
The flexible ends of the L0 straps are unsupported at this stage and will need to be guided by hand into place as the FPU is lowered
NOTE: the cone is very thin walled section and large moments can be applied if the FPU is not lowered with its interface plane parallel to the HOB
When all units are resting on the HOB, fit the attachment screws (M6X21) to the bipod feet as for the cone mount.
Fit the two Bellville washers and the M8 Kaylock nut to the cone mount. Torque to 8.25Nm.
Remove the lifting/handling fixture.

L0 straps

- The cooler pump and evaporator straps

These will be in place at this stage.
Ensure that the lower flexibles of these two straps align with the pod interfaces. Fit the attachment screws (ten M4 For the evaporator strap, six M4 screws for the pump
Torque to specification defined by Astrium

- Detector strap

The light baffle, upper flexible strap should already be in place on the FPU.
Fit the Torlon support frames.
Move the level 0 main strap into place and align the dowel holes (see Assembly drawing 5264/309).
Push in Dowels and ensure that the flexibles are aligned.
Place the cold strap support clamp plates over the top.
Fit the four 4-40 UNC fixings to the cold strap support clamp plates to secure the main strap. Torque to 0.76 Nm.+/- 10% above running torque.
Ensure that the lower flexibles align with the pod interface. Fit the six M4 attachment screws .
Torque in accordance with Astrium specification.
Fit the joining plates of the main supports to the joining plates of the upper flexibles, using eight 4-40 UNC bolts and Kaylock nuts. Torque to 0.76 Nm. +/- 10% above running torque

L1 straps.

Fit the two L1 straps to the FPU using at each location, one Bellville washer type B0750-056-S and one M8 bolt, torque to 10.5 Nm +/- 10% above running torque. And two M4 bolts and two Bellville washers (type B0375-020-S) under each screw head. Torque to 1.5 Nm +/- 10% above running torque.
On final assembly the M8 fasteners to be wire locked to the M4 fasteners. Screws will be prepared for wire locking

L3 straps.

Fit the two L3 straps to the JFETs using the attachment hardware (L3 thermal strap clamp provided by SPIRE) as shown in interface drawings 0-KE-0104-350 and 0-KE-0104-360. Torque to 2.5 Nm.
[ASED:
Note. Spacecraft temperature sensors, two sensors on each clamp, fit to this interface. [ASED:]

Isolation test

Measure and record the electrical isolation between the chassis of the FPU and the cryostat. Reading should be more than 1 MΩ. Fix the temporary grounding strap from the FPU to the OBA. Repeat the measurement of the resistance between the cryostat and the FPU to ensure that grounding has been successful, reading should be less than 3Ω

7.3 Electrical integration

7.3.1 General

Several subsystems with the SPIRE FPU are ESD sensitive and especially vulnerable during the integration process. All normal precautions shall be taken when handling the FPU especially when open connectors are present.

Assumptions:

1. The cryoharness has been routed on the S/C and the grounding checked as per 7.3.2 below.
2. The FPU, JFP and JFS are mechanically integrated to the OBA and are temporarily grounded to OBA chassis.
3. The warm electronics have been integrated on to the SVM as per 7.3.3

7.3.2 Cryo-Harness check

Before any electrical integration of the SPIRE FPU a check of the grounding within the cryoharness shall be carried out. This must verify that the FPU Faraday shield[1] is isolated from the chassis of the CVV/SVM when the Cold SIH, the Intermediate SIH and the Warm SIH are routed on the S/C but not mated with either the focal plane units or the SVM units. To verify this, it may be necessary to temporarily isolate the un-mated cryoharness connectors of the cold units from the CVV.

7.3.3 Warm electronics units integration.

Before any electrical integration of the SPIRE FPU, the warm electronics shall be integrated according to the warm electronics integration plan. AD 1.

7.3.4 Cryo-harness Cross talk checks

Before any electrical integration of the SPIRE FPU, a cross talk check of the cryo-harness shall be carried out. This is described in a separate document AD2

7.3.5 Electrical Connection.

When delivered, the JFET units will be fitted with shorting connectors and/covers to protect the detectors. These should be left in place during the mechanical integration.

[1] The FPU Faraday Shield is fully explained in the SPIRE Harness Definition Document, SPIRE-RAL-PRJ-000608, Issue 1.1, 05/03/03.

NOTE: This order of connection must be maintained to protect the sensitive electronics in the SPIRE FPU and warm electronics.

It is not planned to use connector savers on the cold end of the cryo-harness as multiple insertions are not expected.

Connect the cryo-harness to connectors J19 to J30 on the FPU.

Connect the warm end of the cryoharness to connectors, J11, J12, J13, J14, J17, J18, J19, J20, J21, J22 J23, J24, J25, J26, J29, J30, on the FCU.

At the warm end of the cryo-harness SPIRE supplied shorting plugs (these plugs will be supplied on a panel with the same layout as the DCU (tbc) shall be fitted to the connectors on the cryo-harness that connect to the fixed connectors, J5 to J28, on the DCU.

HSJFS harness should be connected to connectors J1 to J8 on the spectrometer JFET (HSJFS), removing the connector covers one at a time and connecting the harness to that connector.

HSJFP harness should be connected to connectors J1 to J24 on the photometer JFET (HSJFP), removing the shorting plugs or covers one at a time and connecting the harness to that connector.

Connect the HSJFS bias harness to connectors J9 and J10, on the spectrometer JFET (HSJFS), by removing the shorting plugs one at a time.

Connect the HSJFP bias harness to connectors J25 to J28, on the Photometer JFET (HSJFP), by removing the shorting plugs one at a time.

Connect the warm end of the cryoharness to the DCU by removing the bias harness, connectors J29 to J32 one at a time from the shorting panel and connecting them to J29 to J32 on the DCU.

Repeat the process for J5 to J28.

Remove the temporary ground strap from the FPU.

7.4 Grounding verification

On the DCU and FCU cryoharness connectors, break all the connections between the FPU Faraday Shield Link and the EMC backshells.

Measure and record the isolation resistance between the FPU Faraday Shield links and the chassis of the DCU.

Reconnect all the links between the FPU Faraday Shield Links and the Cryoharness EMC backshells.

The electrical integration is now complete.

Warm SFT can now start.

7.5 Electrical disconnection

Disconnection is the reverse of connection

7.6 Removal from spacecraft.

WARNING: The bipod legs on two corners of the instrument are very thin section and easily damaged. Care must be taken at all times not to put side loads into these items. These are at risk at all times when the FPU is not attached to a rigid plate.

Unbolt the cone from the FPU by undoing the M8 nut, thus leaving the cone on the baseplate.

Remove all electrical connections, see section 7.4

Undo the five M4 fasteners which secure the Photometer JFET rack (HSJFP) to the HOB.

Undo the four M4 fasteners that secure the Spectrometer JFET rack (HSJFS)to the HOB. Note that two of these fasteners are studs with nuts on the top.
Undo the 6 off M4 fasteners on each L0 strap and remove, separate the cold strap from the helium tank pod. NOTE. The underside of these straps form the thermal interface to the spacecraft helium tank pods. Their surfaces are flat and soft gold plated, these surfaces can easily be damaged and the thermal performance of the instrument may suffer as a result.
Remove the Level 0 straps from the supports by undoing the clamps at the top of the strap support frames, the lower flexibles from the spacecraft pod interface and the bolts at the joining plates with the upper flexibles.
Undo and remove the one M8 and two M4 screws from each of two L1 cold strap interface, separate the cold strap from the FPU
Undo and remove the two M4 screws from the L3 interfaces on each JFET, separate the cold strap from the JFET.
Undo and remove the 8 fasteners that attach the FPU to the baseplate.

The FPU and JFETs can now be lifted from the HOB

8. RED TAG ITEMS

The following red tag items are fitted to the FPU when delivered.

1 An aperture cover
2 Alignment cube
3 Temporary grounding strap
4 Shorting plugs

When removed all red tag items shall be bagged and stored in the dedicated “red tag box”.

The aperture cover is removed by unscrewing the four 2-56 UNC (imperial) cap head screws and lifting the cover clear.

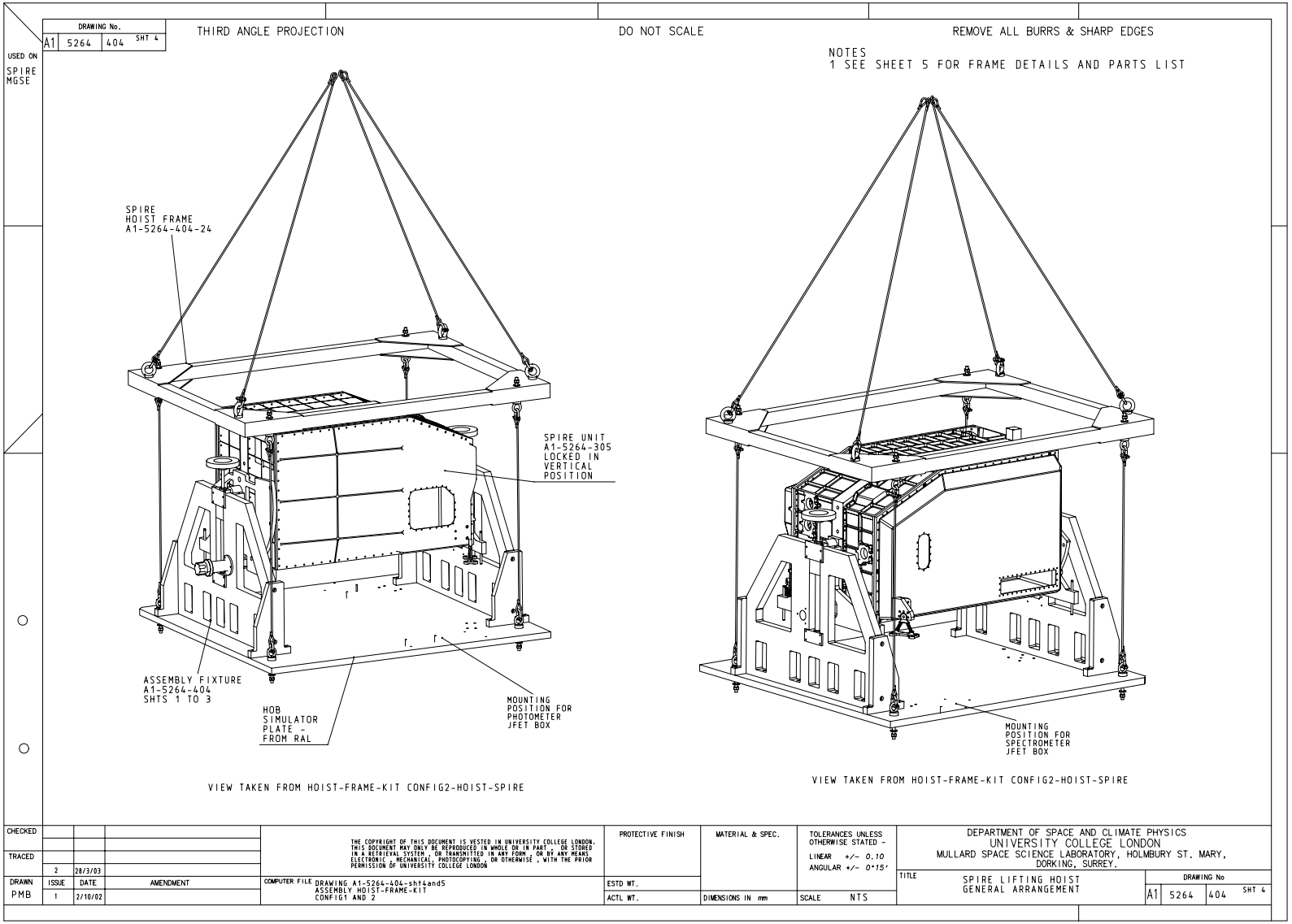
The alignment cube is removed by unscrewing the three fixing screws and lifting clear.

9. GREEN TAG ITEMS

There are no green tag items

Annex A

Drawings of SPIRE FPU MGSE


DRAWING No. A1 5264 404 SHT 4
USED ON SPIRE MGSE
THIRD ANGLE PROJECTION
DO NOT SCALE
REMOVE ALL BURRS & SHARP EDGES
NOTES
1 SEE SHEET 5 FOR FRAME DETAILS AND PARTS LIST
SPIRE HOIST FRAME A1-5264-404-24
SPIRE UNIT A1-5264-305 LOCKED IN VERTICAL POSITION
ASSEMBLY FIXTURE A1-5264-404 SHTS 1 TO 3
HOB SIMULATOR PLATE - FROM RAL
MOUNTING POSITION FOR PHOTOMETER JFET BOX
VIEW TAKEN FROM HOIST-FRAME-KIT CONFIG2-HOIST-SPIRE
MOUNTING POSITION FOR SPECTROMETER JFET BOX
VIEW TAKEN FROM HOIST-FRAME-KIT CONFIG2-HOIST-SPIRE
CHECKED
TRACED
DRAWN PMB
ISSUE 2 1
DATE 28/3/03 2/10/02
AMENDMENT
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COMPUTER FILE DRAWING A1-5264-404-sht1and5 ASSEMBLY HOIST-FRAME-KIT CONFIG1 AND 2
PROTECTIVE FINISH
ESTD WT.
ACTL WT.
MATERIAL & SPEC.
DIMENSIONS IN mm
TOLERANCES UNLESS OTHERWISE STATED - LINEAR +/- 0.10 ANGULAR +/- 0°15'
SCALE NTS
DEPARTMENT OF SPACE AND CLIMATE PHYSICS
UNIVERSITY COLLEGE LONDON
MULLARD SPACE SCIENCE LABORATORY, HOLMBURY ST. MARY, DORKING, SURREY.
TITLE SPIRE LIFTING HOIST GENERAL ARRANGEMENT
DRAWING No A1 5264 404 SHT 4

DRAWING No.			
A1	5264	404	SHT 5

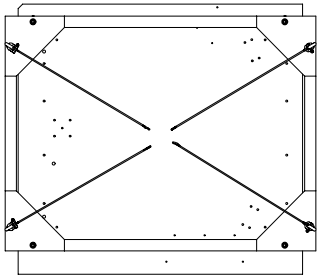
USED ON SPIRE MGSE

THIRD ANGLE PROJECTION

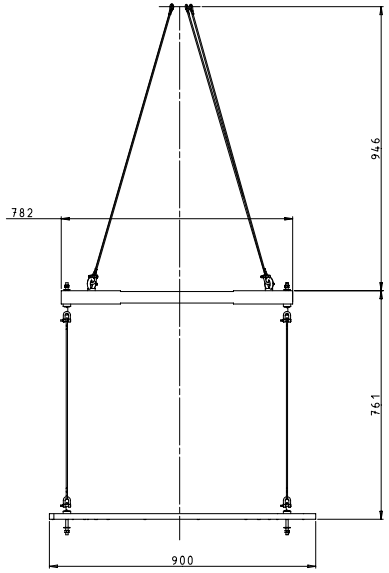
DO NOT SCALE

REMOVE ALL BURRS & SHARP EDGES

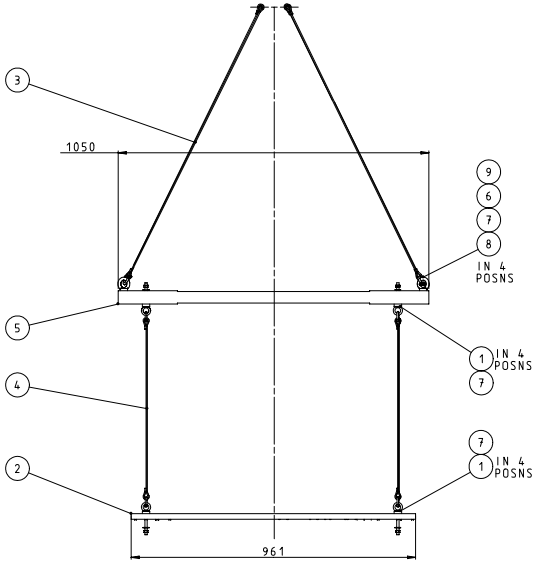
NOTES
1 SEE SHEET 1 FOR PICTORIAL VIEWS WITH SPIRE AND THE MGSE FITTED
2 ANGLES QUOTED ARE APPROXIMATE



VIEW TAKEN FROM HOIST-FRAME-KIT CONFIG1-HOIST-FRAME



VIEW TAKEN FROM HOIST-FRAME-KIT CONFIG2-HOIST-FRAME



VIEW TAKEN FROM HOIST-FRAME-KIT CONFIG1-HOIST-FRAME

ITEM No	DRAWING No	DESCRIPTION	QTY	REMARKS
9		WASHER M10	4	
8		EYEBOLT (SHOULDER) M10	4	ANGLIA HANDLING (ST STL)
7	927A078N	SHACKLE STANDARD	12	KEY INDUSTRIAL
6		NUT M10 HEX	4	ST STL
5	A1-5264-404-24	HOIST FRAME	1	
4	A3-5264-404-21	HOIST CABLE SHORT	4	
3	A3-5264-404-22	HOIST CABLE LONG	4	
2	REF	HOB SIMULATOR PLATE	1	
1	947A078N	EYEBOLT M8	8	KEY INDUSTRIAL

CHECKED				
TRACED				
	2	28/3/03		
DRAWN	ISSUE	DATE	AMENDMENT	
PMB	1	2/10/02		

COMPUTER FILE DRAWING A1-5264-404-sht4and5 ASSEMBLY HOIST-FRAME-KIT CONFIG1 AND 2

PROTECTIVE FINISH

ESTD WT.

ACTL WT.

MATERIAL & SPEC.

DIMENSIONS IN *mm*

TOLERANCES UNLESS OTHERWISE STATED –
LINEAR +/- 0.10
ANGULAR +/- 0°15'

SCALE NTS

DEPARTMENT OF SPACE AND CLIMATE PHYSICS
UNIVERSITY COLLEGE LONDON
MULLARD SPACE SCIENCE LABORATORY, HOLMBURY ST. MARY, DORKING, SURREY.

TITLE SPIRE LIFTING HOIST GENERAL ARRANGEMENT

DRAWING No A1 5264 404 SHT 5

DRAWING No.			
A1	5264	404	SHT 6 OF 7

USED ON SPIRE MGSE

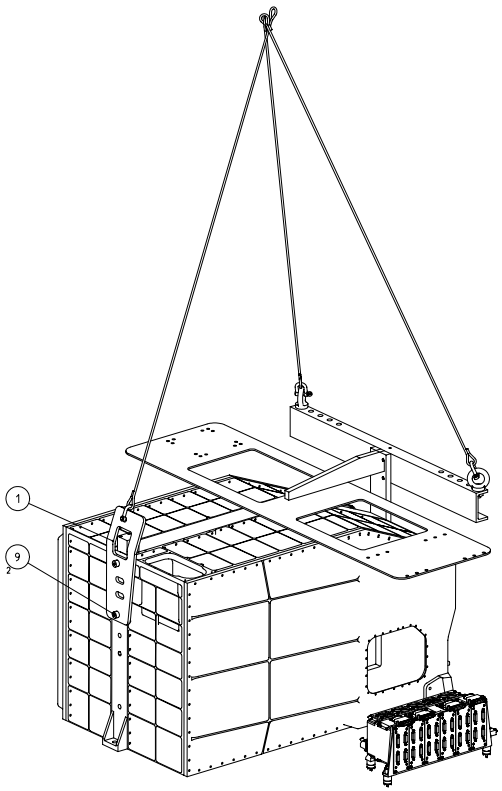
THIRD ANGLE PROJECTION

DO NOT SCALE

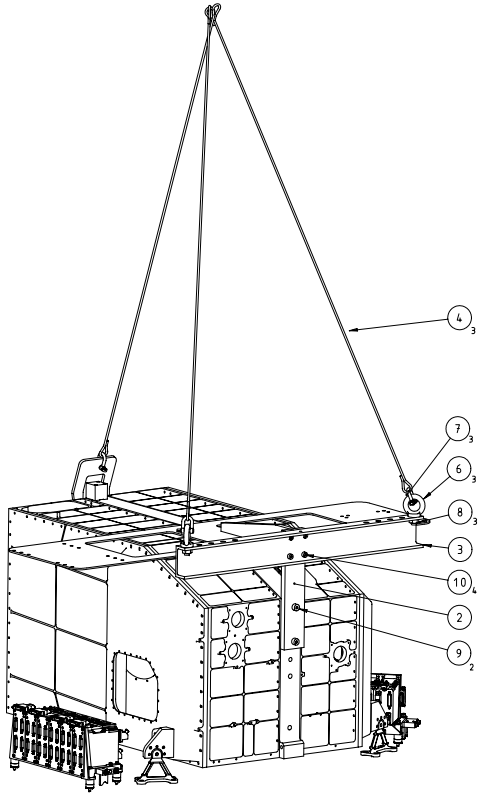
REMOVE ALL BURRS & SHARP EDGES

NOTES
1 DIMENSIONS ARE NOMINAL AND MAY VARY DUE TO MANUFACTURING TOLERANCES

NOTE
1 SEE SHEET 7 FOR SPIRE INSTALLATION LIFTING REFERENCE DIMENSIONS



VIEW SCALE 0.25 : 1



VIEW SCALE 0.25 : 1

ITEM No	DRAWING No	DESCRIPTION	QTY	REMARKS
10		SCREW M6x20 L SKT CAP HD	4	ST STEEL
9		SCREW M8X25 L SKT CAP HD	4	ST STEEL
8		M10 NUT HEX FULL	2	ST STEEL
7	927A078N	SHACKLE	3	KEY INDUSTIAL LTD
6		SHOULDER EYEBOLT M10	2	ANGLIA HANDLING
5				
4	A3-5264-404-22	HOIST CABLE	3	
3	A3-5264-404-16	REAR LIFT CHANNEL	1	
2	A3-5264-404-15	REAR LIFT PLATE	1	
1	A2-5264-404-34	FRONT LIFT BRACKET	1	

CHECKED	5	2/2/04	SUPPORT PLATE FOR JFET BOXES ADDED
	4	28/1/04	ASSEMBLY JIG PARTS REMOVED DUE TO SPACE LIMITATIONS
TRACED	3	8/8/03	FRONT LIFT BRACKET REPLACED WITH FRONT LIFT STRAP
	2	28/3/03	
DRAWN	ISSUE	DATE	AMENDMENT
PMB	1	2/10/02	

COMPUTER FILE
SPIRE-LIFT (ASSEMBLY)
CONFIG1-SPIRE-LIFT
A1-5264-404-SHT 6 and 7 (dwg)

PROTECTIVE FINISH	MATERIAL & SPEC.	TOLERANCES UNLESS OTHERWISE STATED – LINEAR +/- 0.10 ANGULAR +/- 0°15'
ESTD WT.		
ACTL WT.	DIMENSIONS IN mm	SCALE SEE VIEWS

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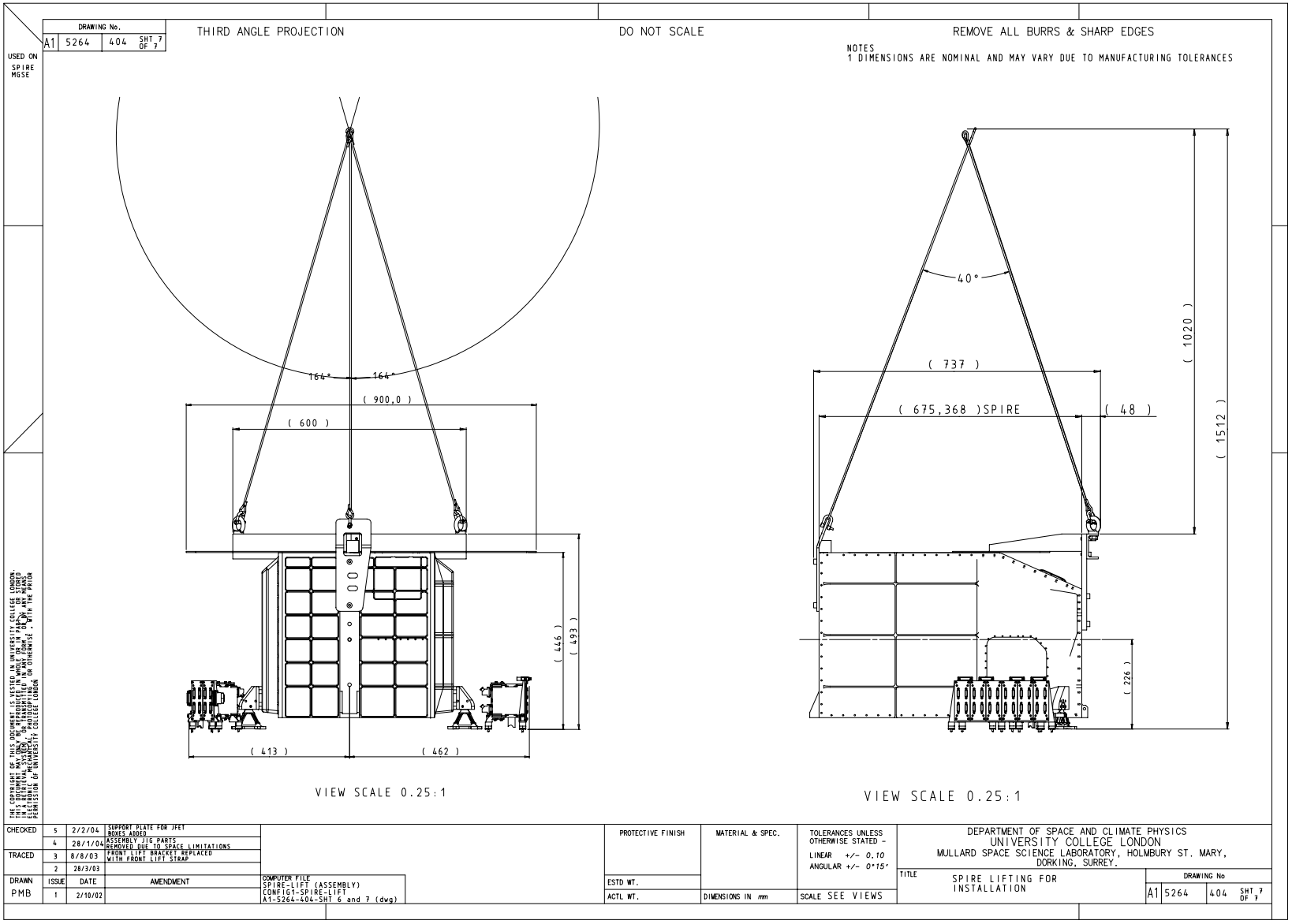
MULLARD SPACE SCIENCE LABORATORY, HOLMBURY ST. MARY, DORKING, SURREY.

TITLE: SPIRE LIFTING FOR INSTALLATION

DRAWING No			
A1	5264	404	SHT 6 OF 7


DRAWING No.
A1 5264 404 SHT 7 OF 7
USED ON SPIRE MGSE
THIRD ANGLE PROJECTION
DO NOT SCALE
REMOVE ALL BURRS & SHARP EDGES
NOTES
1 DIMENSIONS ARE NOMINAL AND MAY VARY DUE TO MANUFACTURING TOLERANCES
164°
164°
(900,0)
(600)
(446)
(493)
(413)
(462)
VIEW SCALE 0.25:1
40°
(737)
(675,368)SPIRE
(48)
(1020)
(1512)
(226)
VIEW SCALE 0.25:1
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CHECKED
TRACED
DRAWN PMB
5 2/2/04 SUPPORT PLATE FOR JFET BOXES ADDED
4 28/1/04 ASSEMBLY JIG PARTS REMOVED DUE TO SPACE LIMITATIONS
3 8/8/03 FRONT LIFT BRACKET REPLACED WITH FRONT LIFT STRAP
2 28/3/03
ISSUE DATE AMENDMENT
1 2/10/02
COMPUTER FILE SPIRE-LIFT (ASSEMBLY) CONFIG1-SPIRE-LIFT A1-5264-404-SHT 6 and 7 (dwg)
PROTECTIVE FINISH
ESTD WT.
ACTL WT.
MATERIAL & SPEC.
DIMENSIONS IN mm
TOLERANCES UNLESS OTHERWISE STATED -
LINEAR +/- 0.10
ANGULAR +/- 0°15'
SCALE SEE VIEWS
DEPARTMENT OF SPACE AND CLIMATE PHYSICS
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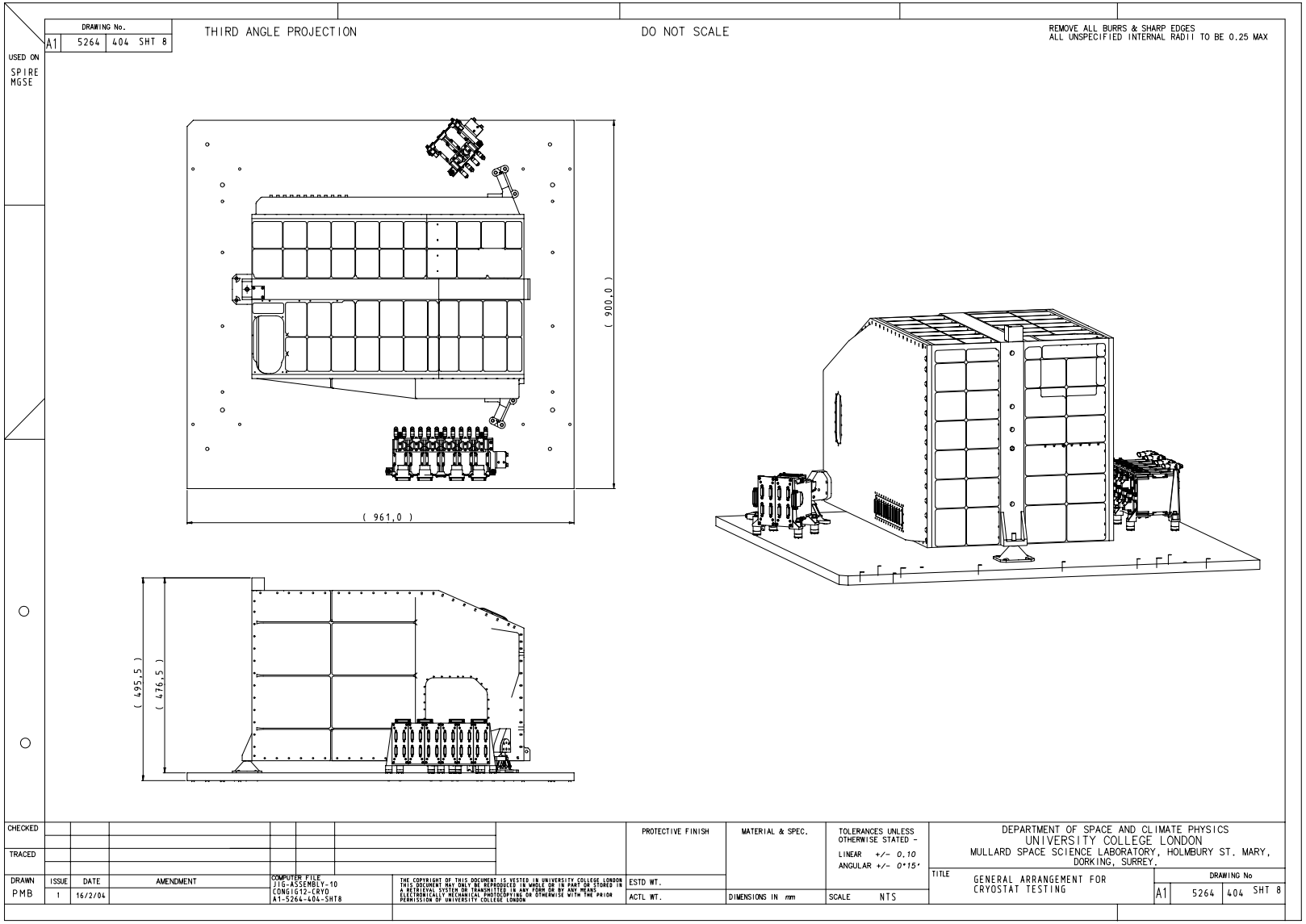
TITLE SPIRE LIFTING FOR INSTALLATION
DRAWING No
A1 5264 404 SHT 7 OF 7


DRAWING No.
A1 5264 404 SHT 8
THIRD ANGLE PROJECTION
DO NOT SCALE
REMOVE ALL BURRS & SHARP EDGES
ALL UNSPECIFIED INTERNAL RADII TO BE 0.25 MAX
USED ON
SPIRE
MGSE
(900,0)
(961,0)
(495,5)
(476,5)
CHECKED
TRACED
DRAWN
PMB
ISSUE
1
DATE
16/2/04
AMENDMENT
COMPUTER FILE
JIG-ASSEMBLY-10
CONG1G12-CRYO
A1-5264-404-SHT8
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ESTD WT.
ACTL WT.
MATERIAL & SPEC.
DIMENSIONS IN mm
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ANGULAR +/- 0°15'
SCALE NTS
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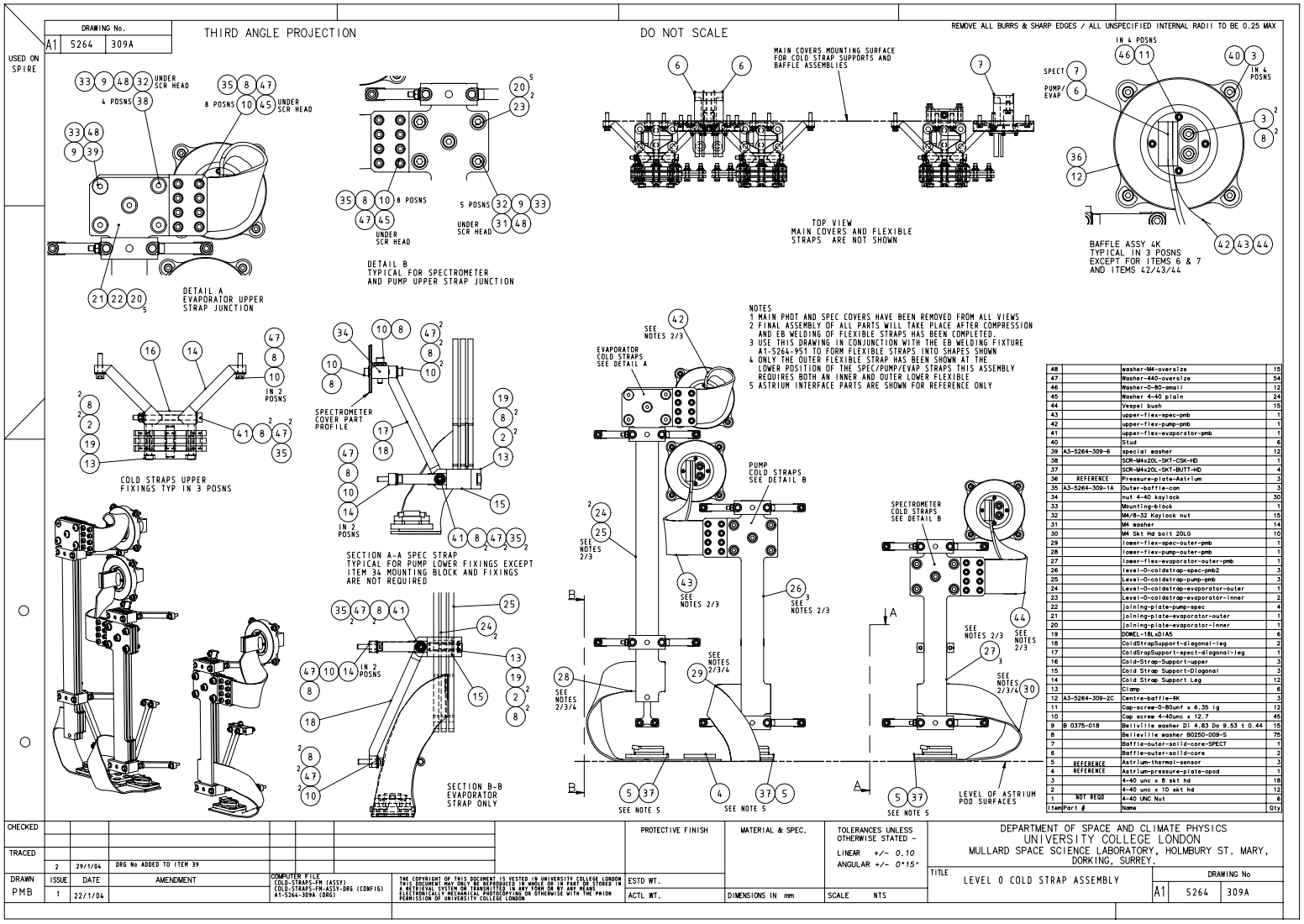
DORKING, SURREY.
TITLE
GENERAL ARRANGEMENT FOR
CRYOSTAT TESTING
DRAWING No
A1 5264 404 SHT 8

ANNEX B

L0 thermal strap assembly


DRAWING No. A1 5264 309A
THIRD ANGLE PROJECTION
DO NOT SCALE
REMOVE ALL BURRS & SHARP EDGES / ALL UNSPECIFIED INTERNAL RADII TO BE 0.25 MAX
USED ON SPIRE
DETAIL A EVAPORATOR UPPER STRAP JUNCTION
DETAIL B TYPICAL FOR SPECTROMETER AND PUMP UPPER STRAP JUNCTION
MAIN COVERS MOUNTING SURFACE FOR COLD STRAP SUPPORTS AND BAFFLE ASSEMBLIES
TOP VIEW MAIN COVERS AND FLEXIBLE STRAPS ARE NOT SHOWN
BAFFLE ASSY 4K TYPICAL IN 3 POSNS EXCEPT FOR ITEMS 6 & 7 AND ITEMS 42/43/44
COLD STRAPS UPPER FIXINGS TYP IN 3 POSNS
SECTION A-A SPEC STRAP TYPICAL FOR PUMP LOWER FIXINGS EXCEPT ITEM 34 MOUNTING BLOCK AND FIXINGS ARE NOT REQUIRED
SECTION B-B EVAPORATOR STRAP ONLY
NOTES
1 MAIN PHOT AND SPEC COVERS HAVE BEEN REMOVED FROM ALL VIEWS
2 FINAL ASSEMBLY OF ALL PARTS WILL TAKE PLACE AFTER COMPRESSION AND EB WELDING OF FLEXIBLE STRAPS HAS BEEN COMPLETED.
3 USE THIS DRAWING IN CONJUNCTION WITH THE EB WELDING FIXTURE A1-5264-951 TO FORM FLEXIBLE STRAPS INTO SHAPES SHOWN
4 ONLY THE OUTER FLEXIBLE STRAP HAS BEEN SHOWN AT THE LOWER POSITION OF THE SPEC/PUMP/EVAP STRAPS THIS ASSEMBLY REQUIRES BOTH AN INNER AND OUTER LOWER FLEXIBLE
5 ASTRIUM INTERFACE PARTS ARE SHOWN FOR REFERENCE ONLY
EVAPORATOR COLD STRAPS SEE DETAIL A
PUMP COLD STRAPS SEE DETAIL B
SPECTROMETER COLD STRAPS SEE DETAIL B
LEVEL OF ASTRIUM POD SURFACES
SPECTROMETER COVER PART PROFILE
48 washer-M4-oversize 15
47 Washer-440-oversize 54
46 Washer-0-80-small 12
45 Washer 4-40 plain 24
44 Vespel bush 15
43 upper-flex-spec-pmb 1
42 upper-flex-pump-pmb 1
41 upper-flex-evaporator-pmb 1
40 Stud 6
39 A3-5264-309-6 special washer 12
38 SCR-M4x20L-SKT-CSK-HD 1
37 SCR-M4x20L-SKT-BUTT-HD 4
36 REFERENCE Pressure-plate-Astrium 3
35 A3-5264-309-1A Outer-baffle-can 3
34 nut 4-40 kaylock 30
33 Mounting-block 1
32 M4/8-32 Kaylock nut 15
31 M4 washer 14
30 M4 Skt Hd bolt 20LG 10
29 lower-flex-spec-outer-pmb 1
28 lower-flex-pump-outer-pmb 1
27 lower-flex-evaporator-outer-pmb 1
26 level-0-coldstrap-spec-pmb2 3
25 Level-0-coldstrap-pump-pmb 3
24 Level-0-coldstrap-evaporator-outer 1
23 Level-0-coldstrap-evaporator-inner 2
22 joining-plate-pump-spec 4
21 joining-plate-evaporator-outer 1
20 joining-plate-evaporator-inner 1
19 DOWEL-18LxDIA5 6
18 ColdStrapSupport-diagonal-leg 2
17 ColdStrapSupport-spect-diagonal-leg 1
16 Cold-Strap-Support-upper 3
15 Cold Strap Support-Diagonal 3
14 Cold Strap Support Leg 12
13 Clamp 6
12 A3-5264-309-2C Centre-baffle-4K 3
11 Cap-screw-0-80unf x 6.35 lg 12
10 Cap screw 4-40unc x 12.7 45
9 B 0375-018 Bellville washer Di 4.83 Do 9.53 t 0.44 15
8 Belleville washer BO250-009-S 75
7 Baffle-outer-solid-core-SPECT 1
6 Baffle-outer-solid-core 2
5 REFERENCE Astrium-thermal-sensor 3
4 REFERENCE Astrium-pressure-plate-opod 1
3 4-40 unc x 8 skt hd 18
2 4-40 unc x 10 skt hd 12
1 NOT REQD 4-40 UNC Nut 6
Item Part # Name Qty
CHECKED
TRACED
2 29/1/04 DRG No ADDED TO ITEM 39
DRAWN PMB
ISSUE 1 DATE 22/1/04 AMENDMENT
COMPUTER FILE COLD-STRAPS-FM (ASSY) COLD-STRAPS-FM-ASSY-DRG (CONFIG) A1-5264-309A (DRG)
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TITLE LEVEL 0 COLD STRAP ASSEMBLY
DRAWING No A1 5264 309A