

MULLARD SPACE SCIENCE LABORATORY

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SPIRE – MAIV FLOW CHART

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Change Record

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1. Scope of Document

This document presents the Manufacturing, Assembly, Integration and Test (MAIV) flowchart for the Spire Structure CQM, PFM and FS units. The manufacture of the STM model should also be derived from this flow chart, although some tasks will not be performed (reduced functionality). These tasks will be described in detail in the AIV plan.

According to AD1 the following models have to be manufactured:

- STM - Structural Thermal Model
- CQM - Cryogenic Qualification Model
- PFM - Proto Flight Model
- FS - Flight Spare

AD30 gives the overall view of the use of the different models and lists the various tests and test requirement references for each model. It stipulates that the STM model and the STM testing encompasses the qualification of the structure. The various subsystems mounted within and on the structure will have their own separate qualification tests. The STM test focuses primarily on the structure, thermal hardware and the qualification test serves as a reference for the subsystem qualification tests.


The CQM model and test serves as a reference for the qualification of the various subsystems. The structure CQM model is the same as the STM structure model. The CQM model will be used in conjunction with the other two instruments (HIFI and PACS) at ESTEC for further verification.

2. Documents

All documents are listed in the Figure 3.2 of the CIDL.

2.1 Glossary

All terms are listed in the CIDL.

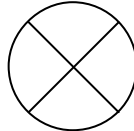
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3. MAIV Flow Chart

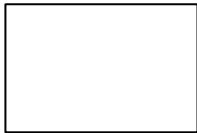
3.1 Explanation of Symbols



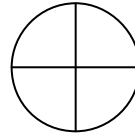
Test



Test Readiness Review
Post Test Review



Process/Action



Transport



Document/
Report



MIP/KIP



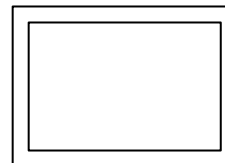
Single Item




Next Step



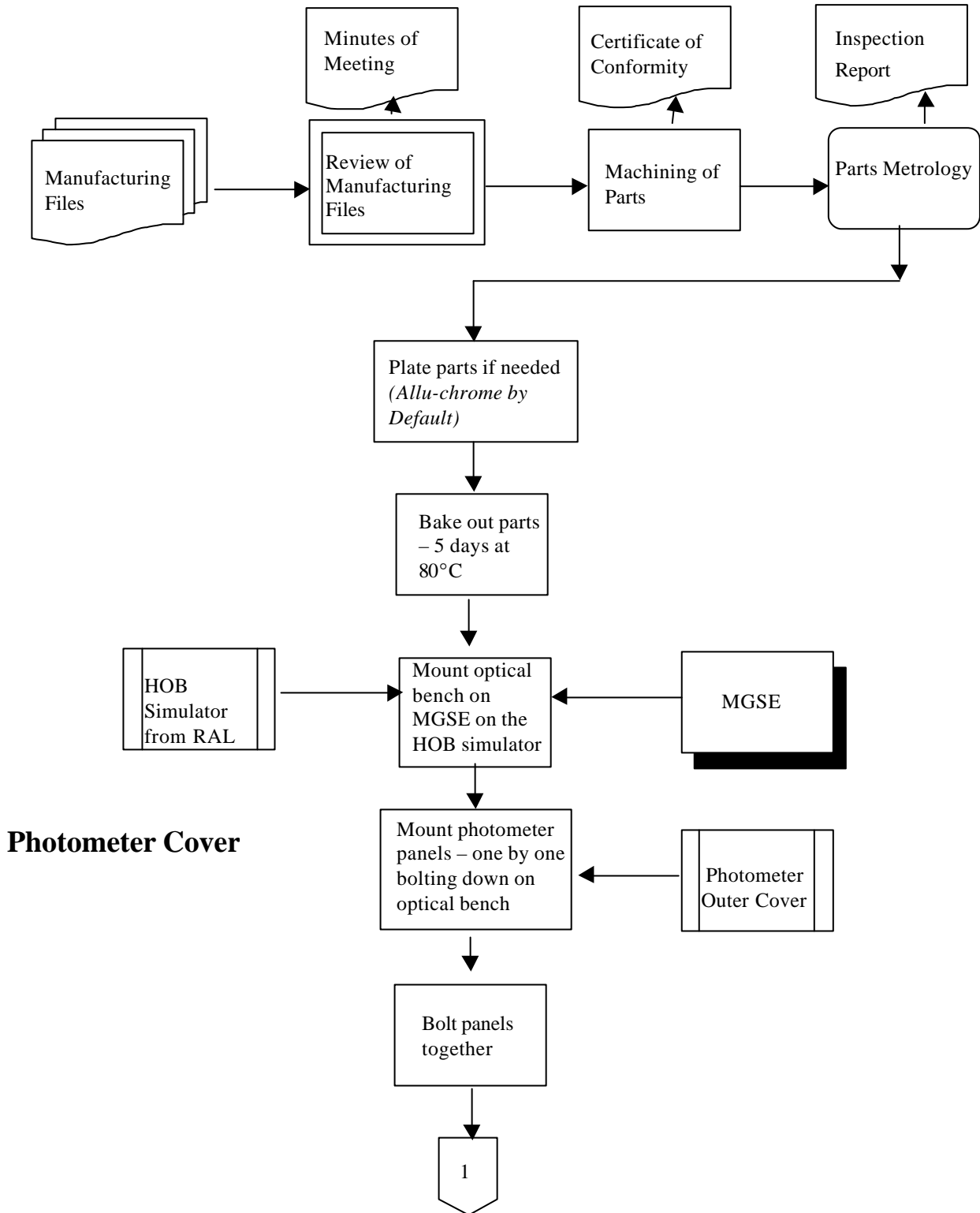
External
Equipment/GSE



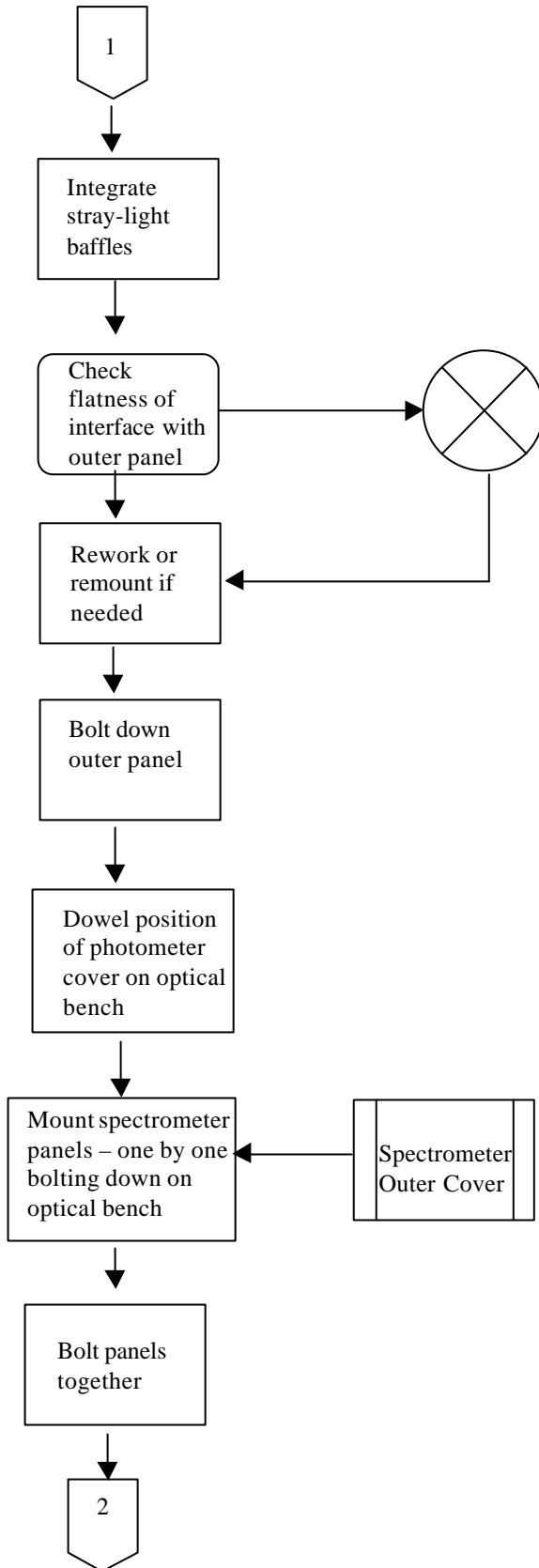
Major
Review

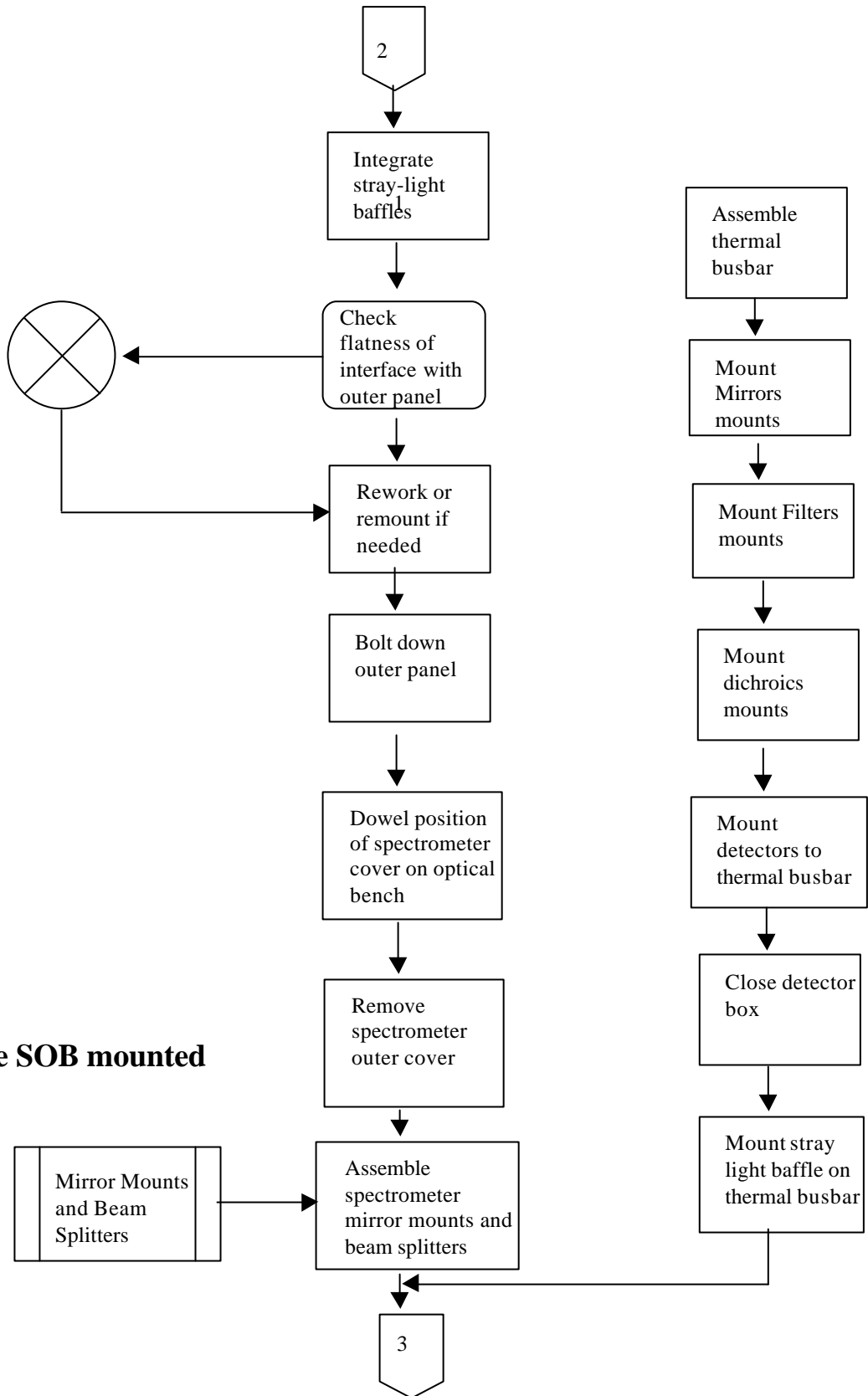
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3.3 Structure MAIV Flow Chart

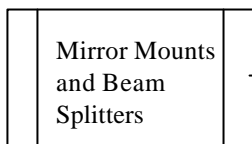


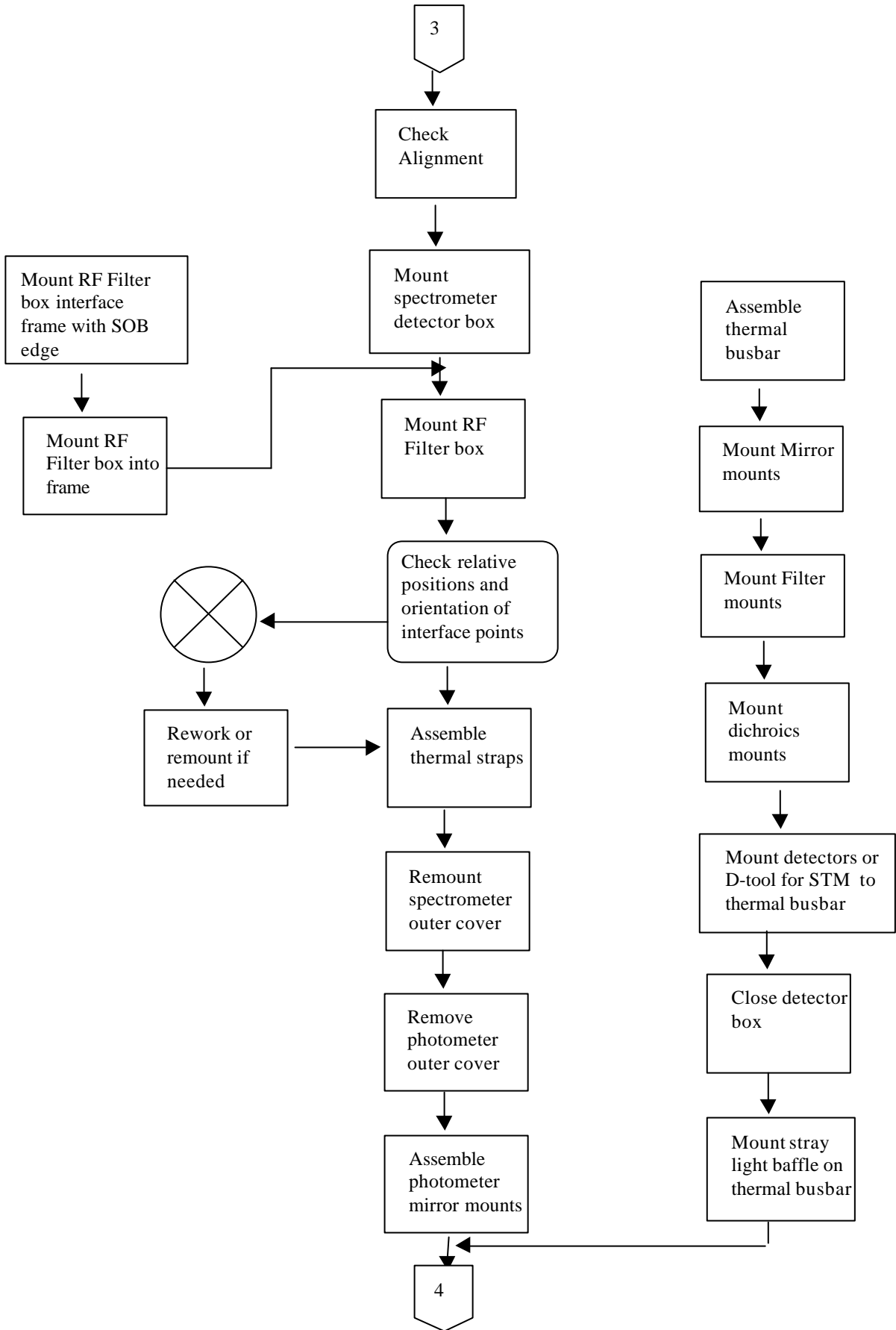
Spectrometer Cover

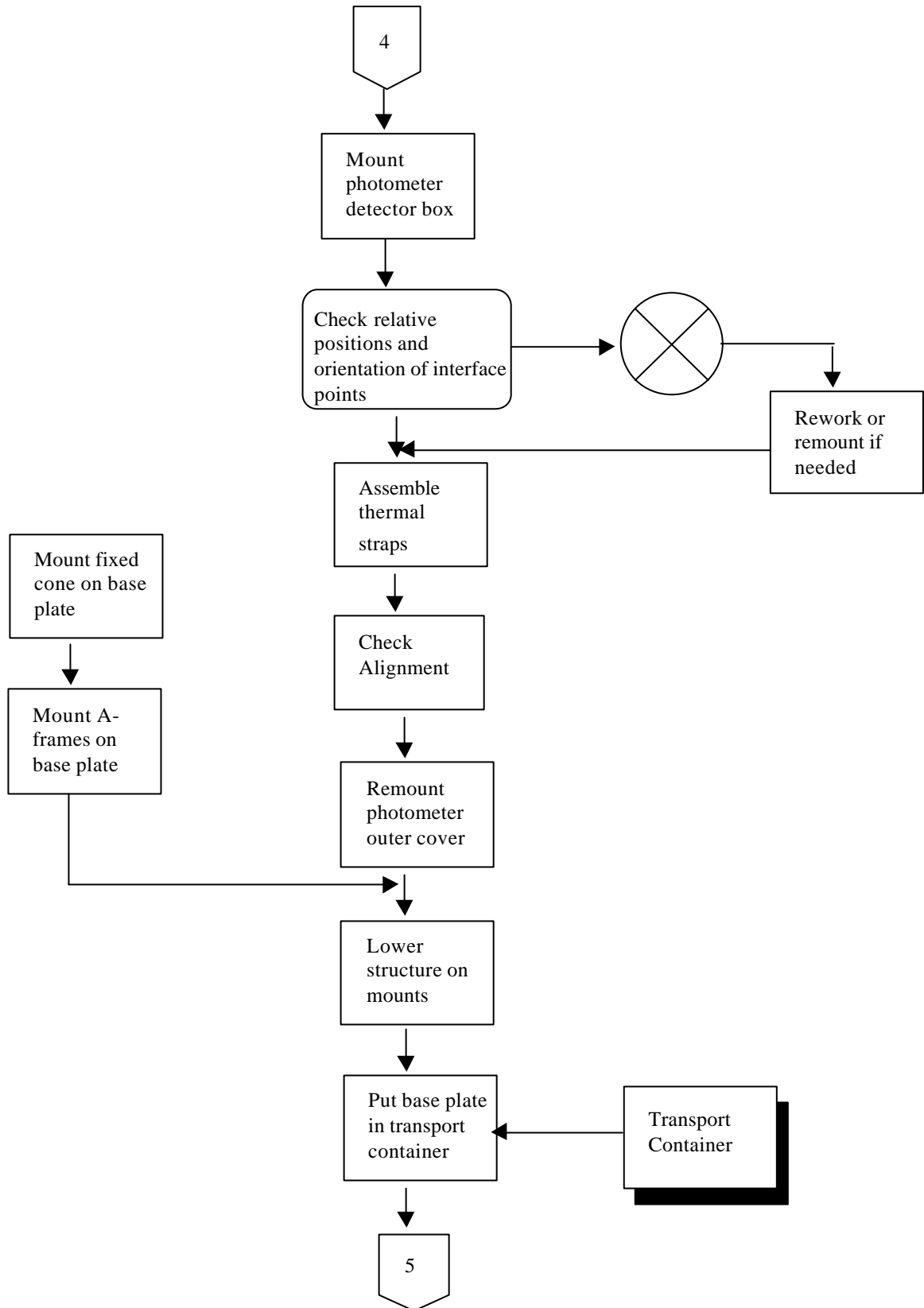


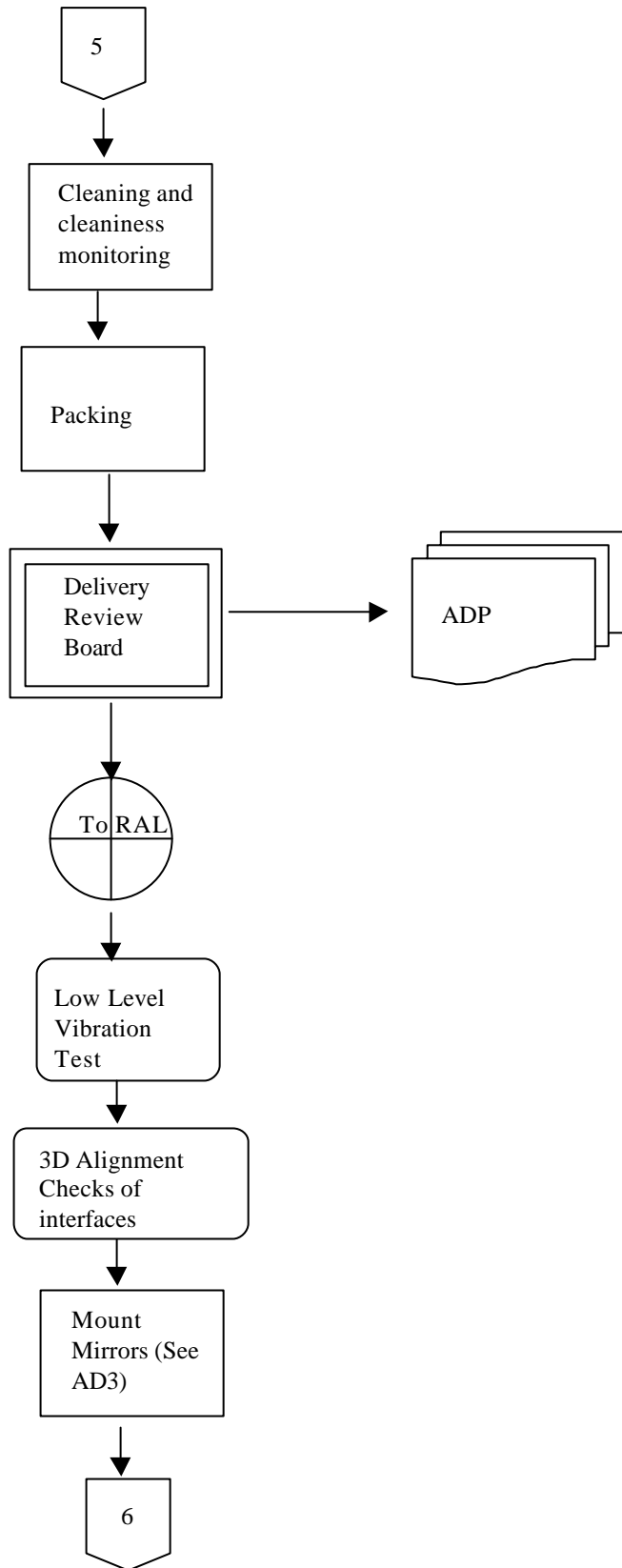



Second stage SOB mounted components

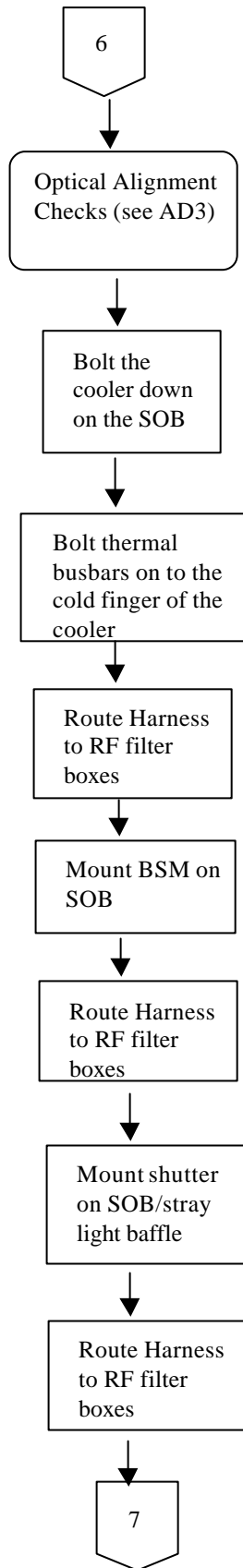







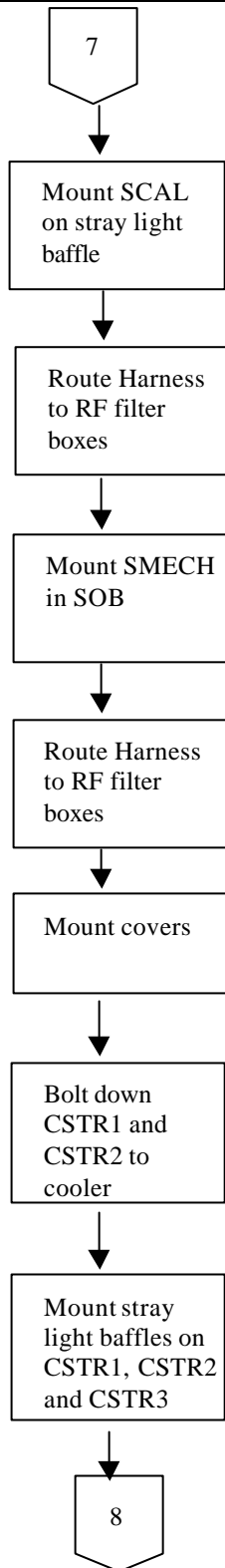



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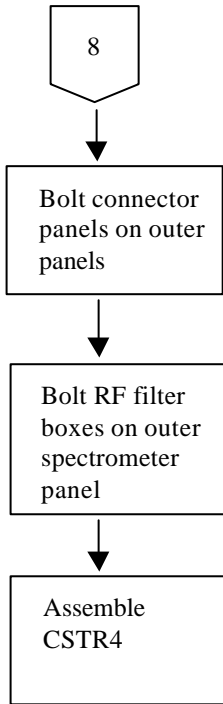



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Final mounting of outer covers



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4. Integration Notes

The SPIRE instrument consists of a monocoque shell holding a bending stiff optical bench. This optical bench supports a photometer and a spectrometer. All parts of these two measurement devices are mounted on the optical bench. The instrument is mounted on the FIRST optical bench via three interfaces. Two A-frames and a conical fixed point. These interfaces ensure a controlled contraction of the instrument when it is cooled down. The optical bench panel is on one side mounted on the fixed point, the side closest to the optical axis of the telescope. The two A-frames are mounted on the two corners the furthest away from the fixed point. The bending flexible direction of the A-frames is pointing towards the fixed point. Thus making the whole suspension kinematic.

The integration of the Spire structure is a very delicate operation. During the whole process great care has to be taken not to compromise the (future) alignment of the optical components. For this, during the manufacturing of the different parts and especially the optical bench, stress relaxation is required. In between various stages of machining the parts need to be heat treated. This to release as far as possible residual stress left behind after cutting the metal. The machining stages of the parts can be split between the first rough cutting and the final fine cutting. Before the final cutting, where the part is machined within its final tolerances, it is essential to have it heat treated.

The inaccuracy of machining of the various parts will lead to a build up of alignment errors of the structural interfaces upon which the various optical components will be mounted. The build up of this misalignment runs through the whole structure. It starts with the mounting of the instrument, continues through the covers and the optical bench. It is therefore of paramount importance that during integration the build-up of misalignment is minimised and moreover, to ensure that the construction and integration is done such that what ever the misalignment is, it will not change significantly after dismounting and re-mounting the covers.

The total allowable misalignment (error budget) of the optical components is given in AD24. The development plan, giving a listing of the various models required, is AD28. A more detailed description of the structure can be found in AD27.