

JEM-X Assembly Detector
Handling, Storage, Packaging and Transportation
Instruction

(IN-13-JEM-0010)

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Prepared: JP

Authorized:

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1. INTRODUCTION

This instruction is ment to give some general directions for handling/transportation/packaging and storage of the Jem-X Detector Assembly Flight Models during or in between the different phases they will be subjected to before mounting on the Integral satellite structure, e.g. vibration and thermal tests or calibration tests.

To ease the understanding of this instruction it is mainly based on pictures and drawings.

2. DESCRIPTION

The Jem-X Detector Assembly consists of the pressurized stainless steel vessel supported on four legs that connect it to the mounting surface of the electronic box, the so called DFEE-box (panted black). The detector has a thin Be-window supported by the grid of square plates composing the so-called collimator. The window, connector housings and gas inlet pipe as well as the cables and glass prisms are the most vulnerable parts on the detector that need a special attention during handling and packaging. Fig.: 1 shows the overall picture of the Jem-X Detector Assembly.

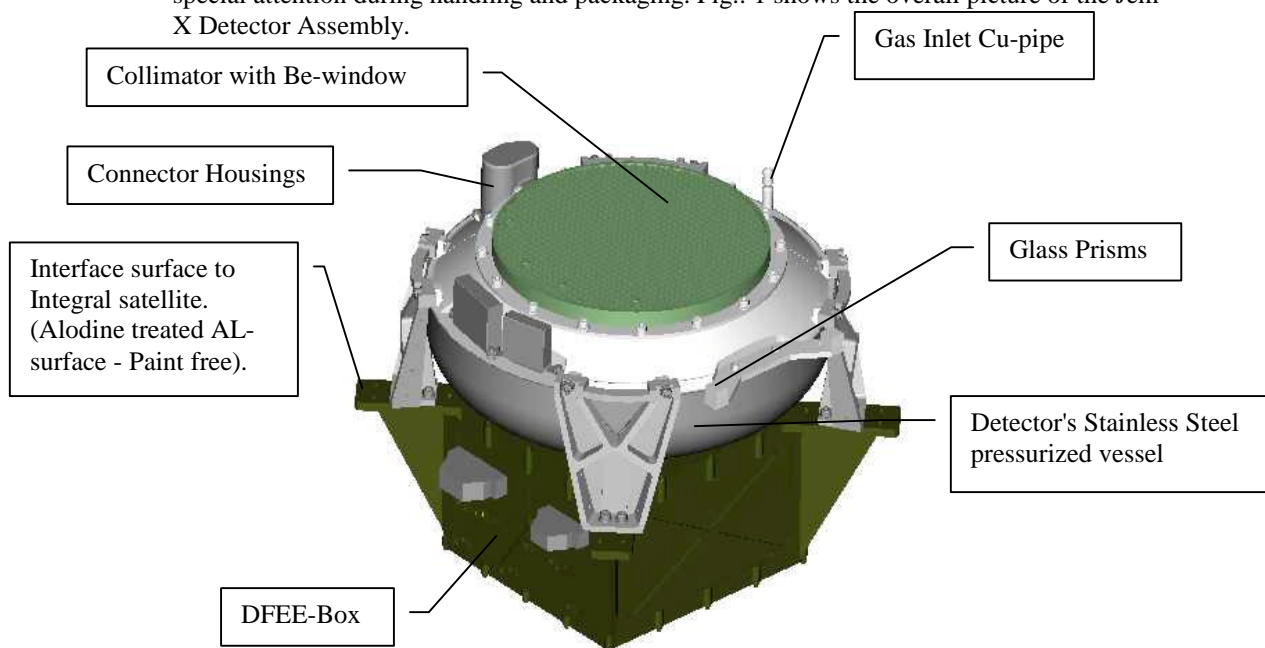


Fig. 1. 3D view of the Jem-X-Detector Assembly.

The lifting of Jem-X Detector Assembly is always done by lifting the elements of the DFEE box, close to the Alenia-interface plane.

3. TRANSPORTATION AND PACKAGING

Transportation should always be carried out in the transportation container prepared for the Flight and Spare Models see Fig. 2 and 3. The transportation container consists of two nested boxes. The outer made of weather resistive plywood can be exposed to the typical transportation environment and the inner box is dedicated to go into clean room and laboratories.

The outer box is mounted on the four wheels with dimensions that allow application of the forklift. The inner box is made of Aluminum plate that is relatively easy to clean. The inner box is made dust tight and it is equipped with the valve limiting the pressure difference, see Fig. 4. The same valve allows decompression of the box by pressing its center rod if the pressure difference has build up.

The Jem-X Detector Assembly is bolted inside the inner box to the support plate resting on the damped blade springs (shock dampers).

The shocks and vibrations, induced during transportation, are damped additionally by the foam the inner box is supported by in the outer box.

The thermal isolation of the inner box is solely passive and limited to the isolation action of the foam separating the inner box from the outer box and the isolation action of the plywood the outer box is made of.



Fig. 2. Outer transportation box.

Two of the outer transportation box' wheels are equipped with the brakes.

The four locks open by first turning the butterfly handles outwards, so they stick out and can be easily operated by hand. Then they need to be turned and tilted outwards to free the brackets in the upper part of the box.

When locking the locks one need to pay attention that the butterfly handles are stored in the grooves of the locks, so they do not stick outside and can be damaged. The butterfly handles should be secured during the unattended transportation with wire and lead seals or other means documenting that no unauthorized personnel have accessed the transportation box.



Fig. 3. Inner transportation box for Jem-X Detector Assembly positioned in the bottom part of the outer box

The inner box has no wheels. It can be lifted with two handles on the side of the box. The overall weight of the box and the detector is about 45 kG. Each handle can withstand the force of 50 kG.

The transportation on the longer distances in clean rooms or laboratories should be done with the dedicated clean room trolley. Before entering the clean room the loose particles and dust should be wiped of the outer surfaces of the inner box.

The ventilation valve should be activated (pressed) in the clean room just before opening the box.

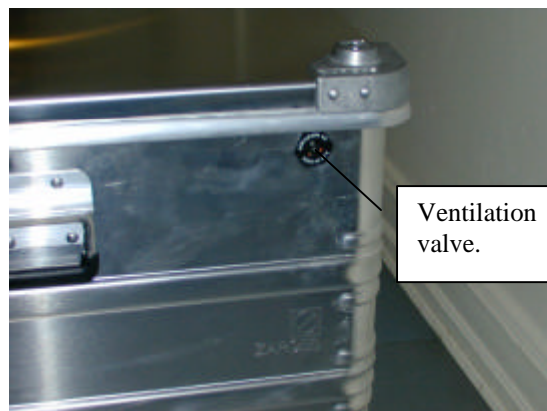


Fig. 4. The detail of the inner transportation box: ventilation valve position in one upper corner of the box

Inside the inner transportation box the Detector Assembly is to be positioned with the detector part at the top and DFEE part in the bottom of the box. This is opposite configuration with respect of the original one. This means that the Detector Assembly is withdrawn from the box together with the support plate.

The overall layout of the inner transportation box is shown in a schematic form in fig. 5.

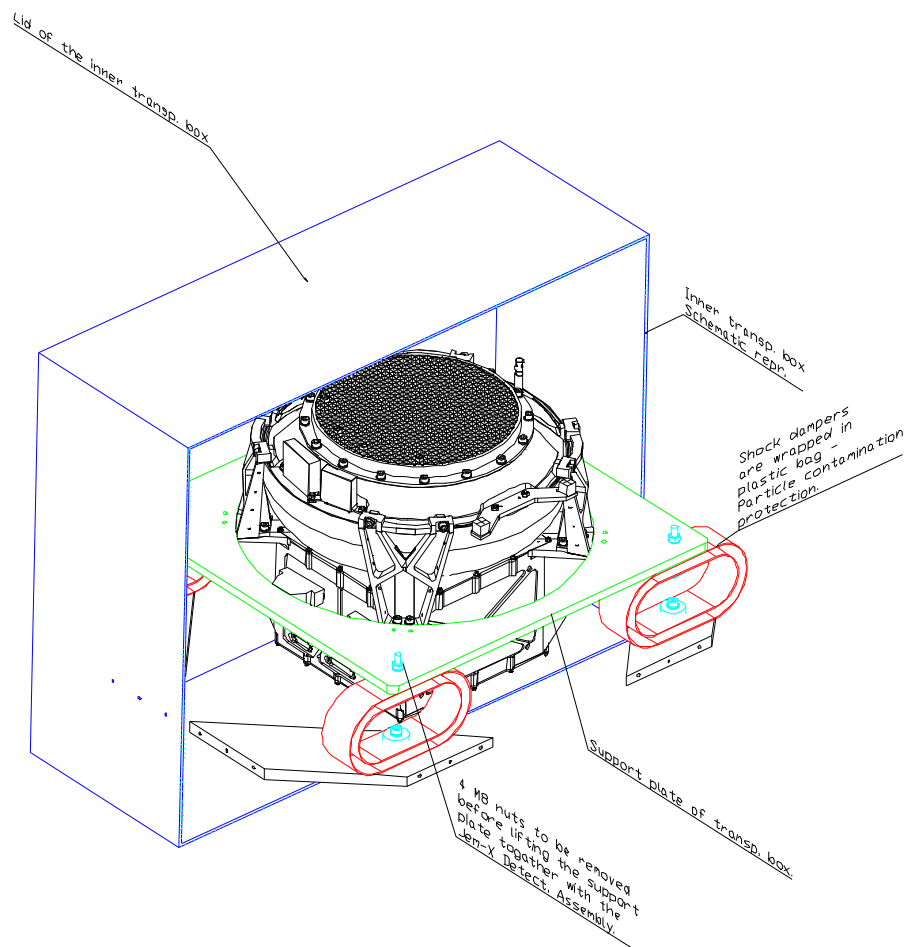


Fig. 5. The layout of the inner box with the Jem-X Detector Assembly positioned with its X-axis pointing upwards.

4. HANDLING OF THE JEM-X DETECTOR ASSEMBLY

In order to remove the Jem-X Detector Assembly from the inner box the following sequence of actions is to be followed.

- ? Unscrew the 4 nuts holding the support plate. Remove the nut, bolt and steel washers and bottom plastic washer. Fig. 6 shows the details of the connection between the support plate and the shock dampers. Here the fork spanner #13 and the allen key #6 can be used.
- ? Lift the support plate together with the Detector Assembly out of inner box (see fig. 7) and place it on the table, supporting the Assembly on the bottom of the DFEE-box.
- ? Loosen the 8 M6 bolts holding the Detector Assembly on the support plate. This job has to be done in the position from bottom up, see fig. 8.
- ? Remove the support plate, see fig. 9. Pay attention to the alignment cubes that are 1 mm outside of the outline of the hole in the support plate. In fig. 9 the prisms are covered by the black protection plastic tubes.
- ? Packing the Jem-X Detector Assembly in to the inner box follows the same sequence in the opposite direction.

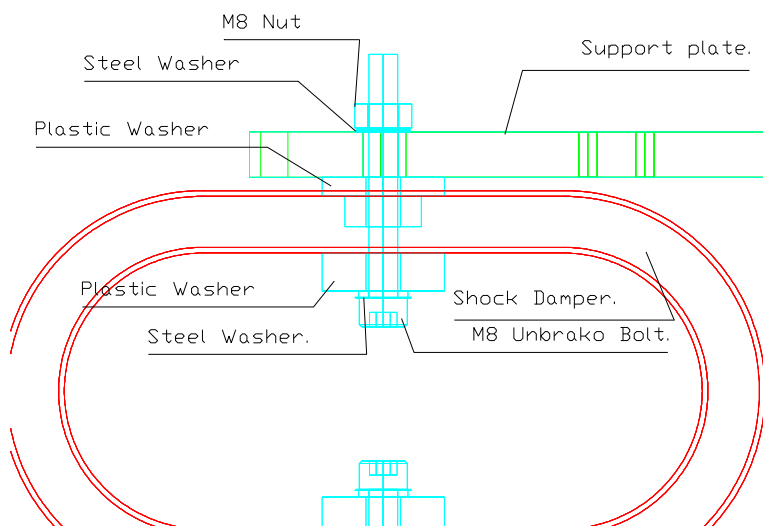


Fig. 6. Detail sketch of the support plate - shock damper connection

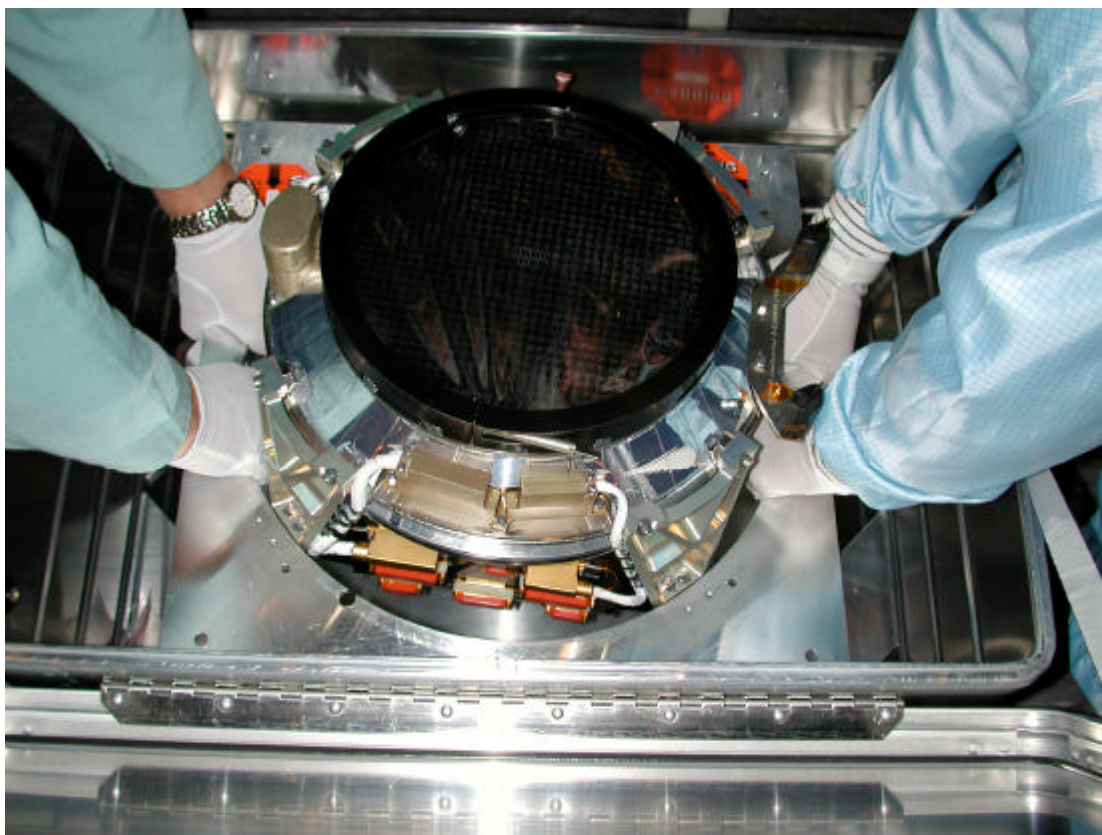


Fig. 7. Removal/placement of the support plate with the Jem-X Det. Ass. out/into the inner box.



Fig. 8. Removal of the bolts holding the Det. Ass. on the support plate.

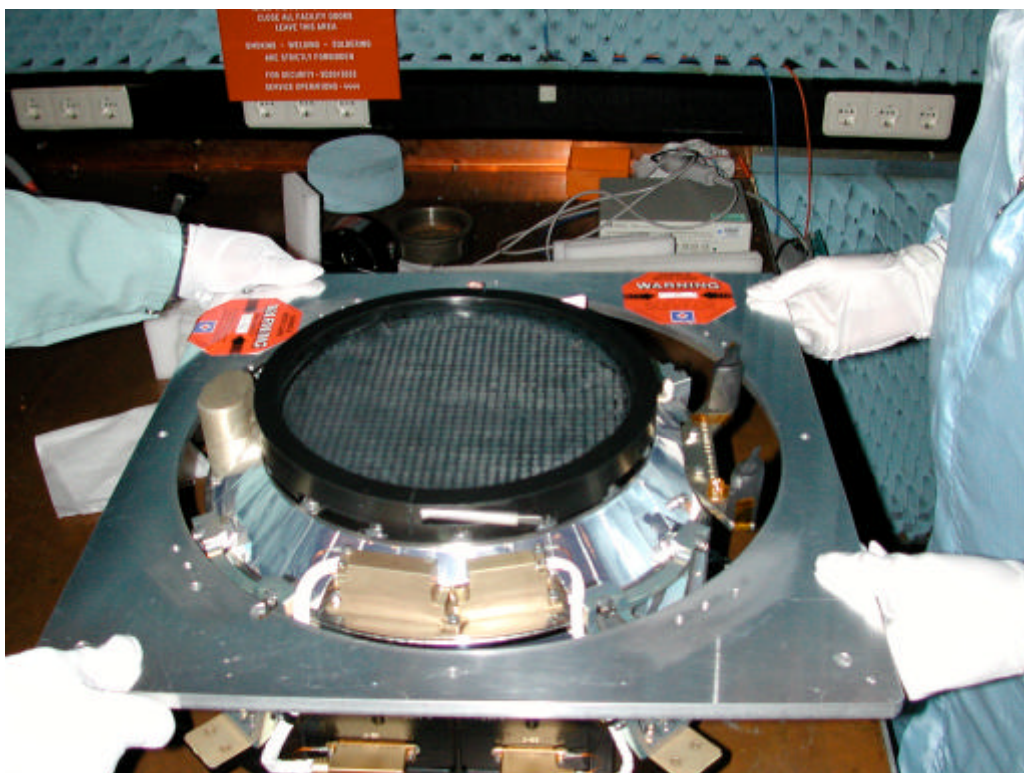


Fig. 9. Removal of the support plate. Pay attention to the alignment prisms, here shown protected with black plastic tube on the right side of the Detector.

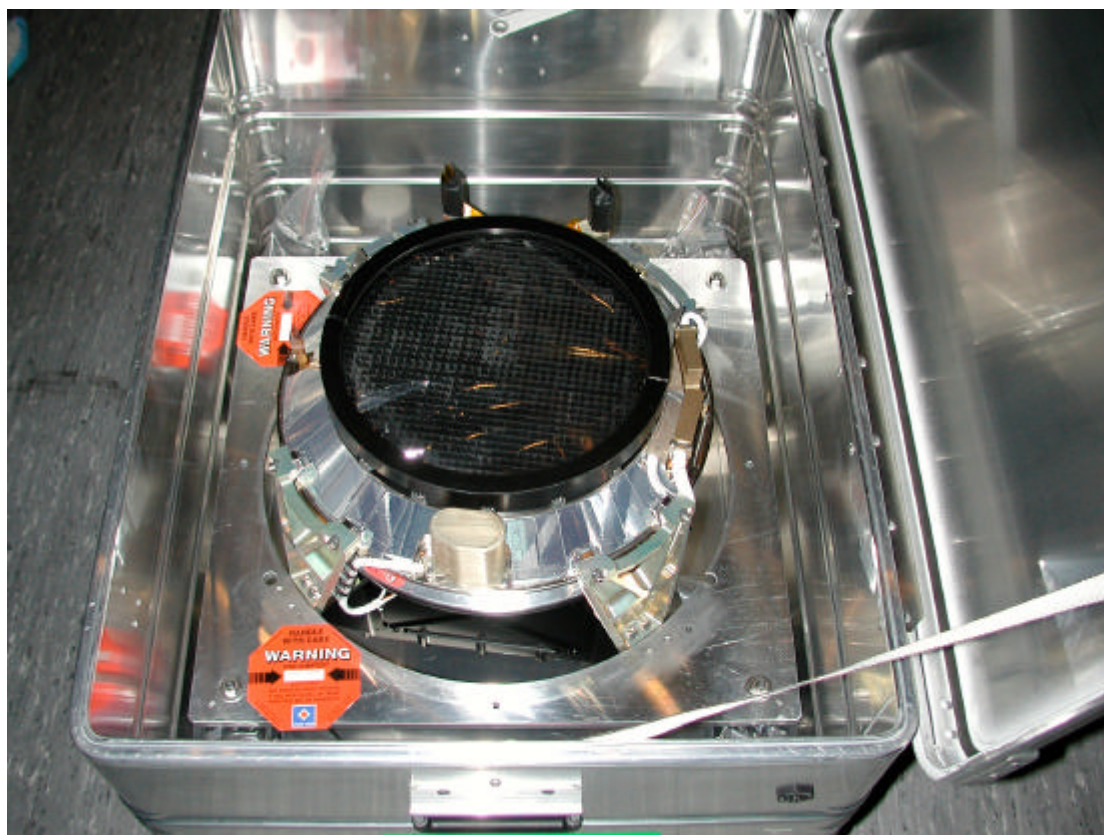


Fig. 10. Detector Assembly prepared for transportation/storage in the inner transportation box.

5. STORAGE

The storage should be preferable carried out in the dedicated transportation boxes described here. The temperature during storage should be in the range $[-25; +30^{\circ}\text{C}]$. The temperature change rate should be less than $4^{\circ}\text{C}/\text{hour}$. The humidity (RH) should be less than 60%. The transportation boxes should be stored with the lids pointing upwards. If the dehumidifying capsules (see fig. 11) show the pink color of the silicagel that can be seen through the half transparent plastic walls the capsules should be regenerated or exchanged.



Fig. 11. Close up picture of the dehumidifying capsules, shock damper and M8 nut holding the support plate

6. SECURITY

The Detector Assembly contains four small radioactive sources. They are encapsulated in Au and Ti tubes in the Al container. The level of the radioactivity that leaks from the detector can be compared with the background radiation level. The Detector has the thin Be window positioned behind the collimator grid. The collimator volume is protected by the protection cover that is the red tag item to be removed after all mechanical works are completed on the Integral satellite. Inside the detector is mounted the glass plate that requires special attention when handling the detector to secure that shocks are minimized.