

## REVISIONS

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NAME	DATE	MASSACHUSETTS INSTITUTE OF TECHNOLOGY CENTER FOR SPACE RESEARCH			
Drawn: <i>Peter C. Zipp</i>	6-3-97	<b>ACIS Installation Procedure</b>			
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# ACIS INSTALLATION PROCEDURE

## SPECIAL TOOLS, SUPPLIES, AND EQUIPMENT

### Supplied by the Facility

1. Proof tested and certified Hoist with a Scale, Load Cell or equivalent
2. Ground Straps with alligator clips for the Experiment
3. Cylinder of Compressed Nitrogen
4. Cylinder of Grade 6 Compressed Nitrogen
5. Clean room garments
6. MSFC SPEC 1443 approved and ESD dissipative bagging material and equipment.

### Supplied by MIT/LMA

1. ACIS Detector Assembly, Venting Sub-System, DEA/DPA Assembly (including the Support Structure), and Radiators in the LMA SIM-Sim.
2. PSMC and W1 and W2 Cables
3. SIM-Sim Lifting Fixture.
4. ACIS DEA/DPA Assembly Lifting Fixture
5. ACIS DH and Venting Sub-System Lifting Fixture
6. Radiator Shipping Container
7. Vacuum GSE with hoses, cables, regulators, and laptop computer
8. Neslab Refrigerated Recirculator with hoses
9. High Speed Data Cable
10. Detector Assembly Shorting Plug Set
11. Assorted Tefzel Cable Ties
12. Kapton Tape, 3M 1205
13. OWS Container
14. Plastic bags for small parts
15. Spare Fasteners for all fasteners that are to be removed and reused.
16. Spot bonding material and supplies
17. Indium Foil for Warm Straps and Cold Straps
18. Heat Shrink Tubing for Warm Strap PRT Wires
19. MIT Procedures
  - 36-02016 Cleantent Dressing, Behavior, and Material Handling Procedure
  - 36-02030 ACIS Packaging, Packing, Handling, Storage and Transportation
  - 99-01003 Electrostatic Discharge (ESD), Handling of Parts and Equipment
  - 99-03002 Connector Mating and Demating Procedures

### Supplied by the technician

1. Nitrilite Powder Free Nitrile Disposable Gloves, Large

2. Personnel Wrist Grounding Straps
3. Calibrated Indicating Torque Wrenches, 300 in. lbs., 75 in. lbs., 30 in. lbs., 96 in. oz.
4. Ratchet handle and extra long extension
5. Straight Blade Hex Driver Set
6. Ball Blade Hex Driver Set
7. Small Slotted Screwdriver
8. Diagonal Cutters
9. Scalpel and Blades
10. Connector Pliers
11. Personnel Volt Meter

Supplied by TRW/BASD

1. Interface Fasteners
2. RCTU Interface Cables
3. ISIM Ground Wires
4. Detector Assembly Light Seal

Supplied by MSFC

1. Six (6) pre-measured Silicon Wafer Optical Witness Samples, (OWS), S/N ACIS 1 through 5 and ACIS Control.

## **REMOVAL OF THE DEA/DPA ASSEMBLY From The LMA SIM-Sim Shipping Container**

Note: All flight hardware is certified to MSFC-SPEC 1238. Special handling per clean room requirements is necessary. Whenever 1238 certified material is exposed to atmospheric conditions, at least three Silicon Wafers must be exposed to monitor contamination. (Two wafers are for continuous monitoring and one is for specific time exposure.) Observe the general handling requirements of MIT Procedure 36-02030.

1. Remove the LMA SIM-Sim Shipping Container Cover. Record Shock Watch, Temperature and Humidity readings. Move to Class 100k Clear Area. Attach ground strap to Shipping Container Base.
2. Remove the outer bag. Move to Class 10k Clean, ESD Controlled Area.
3. Expose four Silicon Wafers, S/N ACIS 1, 2, 3, and 4. Place in the general area of the clear room near ACIS. Remove the inner bag. Leave the temporary bag on the DEA and DPA. This is to be removed only at the last possible step in the assembly of the SIM or FAM.
4. Remove the +Y Heater Panel and cover the Optical Witness Sample (OWS), then remove it. Seal the OWS in a double bag along with its control sample and give to MSFC for characterization. Document the results in Table 1.
5. Remove any remaining Heater Panels. These Heater Panels were used in the thermal-vacuum testing and may be used as covers. Store the Panels in a safe clean location.
6. Install the 3/8" eye bolts onto the SIM Sim if not installed.
7. Remove 6 fasteners holding the SIM Sim to the SIM Sim Shipping Container Base.

**Warning: Black surfaces of the radiators are Critical Optical Surfaces and must not be contacted.**

8. Remove the #6 fasteners holding the Radiator Cover to the -X panel and loosen the #6 fasteners holding the Radiator Cover to the +X panel. Carefully remove the Cover from the SIM Sim making sure that the Radiators are not contacted. Place screws in a bag.
9. Loosen the eight #8 fasteners holding the Warm and Cold Straps to the Radiators until the bolts are free of the deformed threads in the inserts. Do not remove fasteners until both bolts are loose for each Strap (If one of the bolts is removed completely, then the Straps will try to rotate as the other bolt is removed, potentially damaging the flexible portion of the Strap). Carefully replace the cover on the SIM Sim making sure

that the Radiators are not contacted. Bag the screws.

10. Using the SIM-Sim Lifting Fixture and a certified hoist, carefully lift the SIM-Sim. and set it down on a surface high enough that there is access to the bolts holding the +Z panel to the +X Panel. Remove the #10 bolts holding the +Z Panel onto the +X Panel of the SIM-Sim.
11. Return the SIM-Sim to the Shipping Container base. Remove the remaining #10 bolts that attach the +Z Panel to the SIM-Sim. Carefully remove +Z Panel and Radiators from Sim-Sim making sure that warm and cold strap flanges do not catch on panel. Place the +Z Panel on a flat surface with the Radiators up. Bag the bolts.
12. Remove the 16 #6 fasteners holding the Radiators to the +Z panel. Each standoff has 2 #6 screws, 2 #6 washers, and an aluminum load spreader. Remove each piece of hardware using tweezers as they come loose. Requires 2 persons to carefully hold Radiator while the fasteners are removed. Store the Radiators in a safe location in the Radiator Shipping Container. Note: Radiators are removed and stored as an assembly.

**Warning: Black surfaces of the radiators are Critical Optical Surfaces and must not be contacted. Hold radiators by edges or by the holes for the thermal stand-offs.**

13. Observing all ESD protection requirements, remove the PSMC Interface Cables (W1, W2) from the DEA and DPA. Cap or bag the cable connectors. Note: The W1 and W2 Cables will be removed from the Detector Assembly (DA) later. Temporarily install protective dust covers.
14. Remove the -X Support Structure Cover.
15. Remove the -X DA Multi-layer Insulation (MLI).
16. Observing all ESD protection requirements, remove each of ten (10) CCD Cable Assemblies (W7 through W16) and install a Shorting Plug on each connector of the Detector Assembly (DA) as that cable is removed. Use care to turn each Jack Screw in small increments so as to walk the Connector out, and in the same way install the Shorting Plugs. Record in the Mate-Demate Log.
17. Remove both Connectors of the Heater Control Cable (W6) and the Ground Lug (E1).
18. Remove the Cable Brackets from the Detector Assembly Back Plate. Do not remove the Cables from the Brackets. Bag the connectors.
19. Install the ACIS DEA/DPA Assembly Lifting Fixture using care to install the end with the notch next to the DPA. Install screws and record running torque. Torque screws to 30 in. lbs. above running torque. Support the Cables (W6 through W16) from the Lift-

ing Fixture. Attach a ground strap to the DEA/DPA Assembly.

20. Attach a certified hoist; with a scale, load cell or similar weight indicating device to the Lifting Fixture and take up a load of approximately 50 pounds to stabilize the ACIS. The crane shall have a sufficiently slow speed to allow precise control of the lift.
21. Remove the Interface Mounting Bolts from three (3) of the Flexures, (+Y, -Y, and -Z). Bag the bolts.
22. Disengage but do not remove the fourteen (14) captive screws that connect the Upper and Lower +Z Panels of the Support Structure.
23. Lift the DEA/DPA Assembly using great care that it comes up straight and level, and that the load does not exceed 130 pounds. Gentle rocking about the Z Axis usually frees the Lower +Z Panel. At least three (3) observers are required to insure that nothing snags as it passes the DA and the +Y Warm Strap. The crane operator shall be able to view the scale at all times during the lift.
24. Remove the Lower +Z Panel.
25. Bag ACIS per MIT Procedure 36-02016. Use an ESD safe bag. The Radiators must be protected with the radiator cover so as to prevent the bagging material from contacting them. **DO NOT TOUCH OR LET THE BAG TOUCH THE RADIATORS.** If no cover is available for the radiators, leave them exposed along with an OWS to monitor contamination.
26. After bagging, cover the OWS. Measure OWS ACIS 3 with the control OWS. Do not measure S/N 1 or 2. They are to be measured only after assembly is complete. Document the measurement of S/N 3 in Table 1.
27. Store the DEA/DPA Assembly in a safe, clean and ESD protected location. Leave the Lifting Fixture in place to support the CCD Cables. Do not reassembly the -X Cover or the +Z Lower Panel.

## **REMOVAL OF THE DETECTOR ASSEMBLY and VENTING SUB-SYSTEM from the LMA SIM-Sim**

Note: Expose the OWS S/N 1, 2, and 4 during exposure of the instrument. Cover the OWS when the instrument is covered.

1. Remove the connector closeout MLI blanket from the DA and disconnect the Survival Heater Cables and the W1,W2 cables. Cap or bag the cable connectors.
2. Remove the rest of the SIM-Sim frames to give better access to the Mechanical and Electrical Interface Brackets and allow adequate clearance for the lifting fixture.
3. Remove any fasteners from DA and Venting Subsystem which are covered or have limited access when lifting fixture is in place. Leave at least 2 fasteners in place to prevent movement of the DA relative to the Venting Subsystem.
4. Manually lower and align the DA and Venting Subsystem Lifting Fixture and insert the #10 assembly bolts into the lifting points on the ACIS DA, Vent Valve and +Y Panel Interface Brackets.
5. Install the Lifting Fixture bolts and record running torque. Torque the lifting fixture bolts to 30 inch pounds above running torque.
6. Attach a certified hoist: with a scale, Load cell, or simulator indicating device to the Lifting Fixture and take up a load of approximately 10 pounds to stabilize the Detector Assembly. The hoist shall have a sufficiently slow speed to allow precise control of the lift.
7. Loosen and remove the remaining fasteners holding the hardware to the SIM-Sim.
8. Using appropriate ESD Safeguards, lift the fixture and the DA off of the SIM-Sim using a certified hoist.



## **ASSEMBLY OF THE DETECTOR ASSEMBLY and VENTING SUB-SYSTEM to the Five Axis Mount (FAM) Mounting Plate or to the Science Instrument Module (SIM)**

Note: The SIM +Z panel should not be installed when starting this procedure. Note: Expose the OWS S/N 1, 2, and 4 during exposure of the instrument. Cover the OWS when the instrument is covered.

1. Lower the lifting fixture and the ACIS DA/Venting Subsystem down onto the mounting plate (or the SIM).
  2. Install the flight Shims in the proper locations on the LASSZ or SIM making sure that the shim (labeled A) will mate with the Collimator foot (labeled 1), B to 2, and C to 3.
  3. Engage alignment pins on DA feet and slowly lower assembly until feet are flush with mechanical interface.
  4. Loosely install all accessible mounting bolts for the ACIS DA and the Venting Subsystem.
  5. Remove all lifting fixture bolts and carefully remove lifting fixture from DA and Venting Subsystem.
  6. Install any remaining mounting bolts and torque all #10 and .25 inch fasteners per BASD procedure.
  7. Install W1, W2, Fid Light, and Survival Heater cables and secure using Tefzel Wire Ties. Record in the Mate-Demate Log.
  8. Reinstall DA MLI blankets excluding the -X DA MLI.
- (. Cover the OWS S/N 1, 2, and 4. Measure OWS S/N 4 and document the results in Table 1.

## **ASSEMBLY OF THE DEA/DPA ASSEMBLY to the Five Axis Mount (FAM) Mounting Plate or to the Science Instrument Module (SIM)**

Note: Expose OWS S/N 1,2, and 5.

1. Install the Support Structure Lower +Z Panel. Install the interface bolts finger tight.
2. Attach a ground strap to the DEA/DPA Assembly.
3. Attach a certified hoist, with a scale, load cell or similar weight indicating device, to the Lifting Fixture. The crane shall have a sufficiently slow speed to allow precise control of the lift. Lift and move the DEA/DPA Assembly so that it is centered over the DA.
4. Align the DEA/DPA assembly with the Lower +Z Panel. Remove the Lower +Z Panel interface bolts and hand hold in position. With great care lower the DEA/DPA Assembly engaging the Lower + Z Panel. At least three (3) observers are required to insure that nothing snags as it passes the DA. It is essential that the DEA/DPA Assembly remain level and that the load does not drop below 115 pounds. Gently rocking the unit about the Z axis will usually relieve the binding. The hoist operator shall be able to view the scale at all times.
5. Install the Survival Heater Cable per Ball Aerospace Systems Division (BASD) procedure.
6. Install all interface bolts and torque all per BASD requirements.
7. Engage and record running torque of the fourteen (14) captive screws that connect the Upper and Lower +Z Panels. Torque to 30 in. lbs. above the running torque.
8. Remove the support for the Cables (W6 through W16) from the ACIS DEA/DPA Assembly Lifting Fixture. Remove the Lifting Fixture.
9. Install the Cable Brackets and ground wire. Install screws and record the running torque. Torque the fasteners to 10 in. lbs. above the running torque.
10. Observing all ESD protection requirements, remove the shorting plug on the Detector Assembly for each of the CCD Cable Assemblies (W7 through W16), one at a time, and mate the corresponding cable from the DEA in turn. Note: the W7 through W16 connectors are extremely fragile and the pins can be easily damaged. Use care to turn each Jack Screw in small increments so as to walk the Shorting Plug off and the Connector on. Torque the Jack Screws to 32 in. oz. Record in connector Mate-Demate Log.
11. Observing all of the warnings in 10 above, install both Connectors of the Heater Con-

trol Cable (W6) and the Ground Lug. Torque the Jack Screws to 32 in. oz. and spot bond. Torque the Ground Lug Screw to 30 in. lbs. Spot bond all of the Connector Hardware for final assembly on the SIM.

12. Install the -X DA MLI.

13. Install the -X Support Structure Cover and record the running torque. Torque the fasteners to 30 in. lbs. above the running torque.

14. Install the PSMC Interface Cables (W1, W2) onto the DEA and DPA. Note the positive lock and confirm the "Blue Dot" in the view port. Record in the Mate-Demate Log.

15. Install the RCTU Interface Cables onto the DPA per BASD procedure.

16. Install the ISIM Ground Straps onto the DPA per BASD procedure.

17. At XRCF only, Remove the Cover from the High Speed Data Connector and install the High Speed Data Cable. Record in the Mate-Demate Log. For assembly onto the SIM, be sure that the High Speed Data Cover is in place.

18. With the SIM +Z Panel laying flat, install the Warm Radiator and Cold Radiator per Fig. 5. Carefully bring radiator assembly up to +Z panel and align with #6 holes in radiator standoffs.

19. Install the washer and aluminum load spreader on #6 screw. Use #6 hex tool to hold screw/washer/ spreader as #6 screw is inserted through radiator standoff hole. Loosely snug up screw and repeat for second screw. Repeat step 24 on remaining 7 standoffs. Torque #6 Radiator Standoff hardware per the TCS Installation Drawing (849AC500003). See Fig. 5.

**Warning: Black surfaces of the radiators are Critical Optical Surfaces and must not be contacted. Hold radiators by edges or by the holes in the thermal standoffs.**

20. Install the +Z Panel per BASD procedure carefully inserting Warm and Cold Straps through holes in Panel.

21. Insert #8 bolts through holes in Cold Radiator and loosely thread first fastener into insert on Strap flange. Repeat for second fastener and then for other Cold Strap. Make sure that MLI blanket does not get trapped between flanges.

**Warning: Black surfaces of the radiators are Critical Optical Surfaces and must not be contacted.**

22. Repeat for Warm Strap flanges making sure that MLI blankets are not trapped under flanges.

**Warning: Black surfaces of the radiators are Critical Optical Surfaces and must not be contacted.**

23. Torque #8 Warm and Cold Strap hardware per the TCS Installation Drawing (849AC500003). See Fig.6. Make sure that strap flanges make metal to metal contact as they are brought into contact with radiator.

24. Install radiator cover to protect radiators until the hardware is ready to go into vacuum.

25. Cover OWS S/n 1, 2, and 5. Measure OWS S/N 1 and 5. and document in Table 1 and 2.

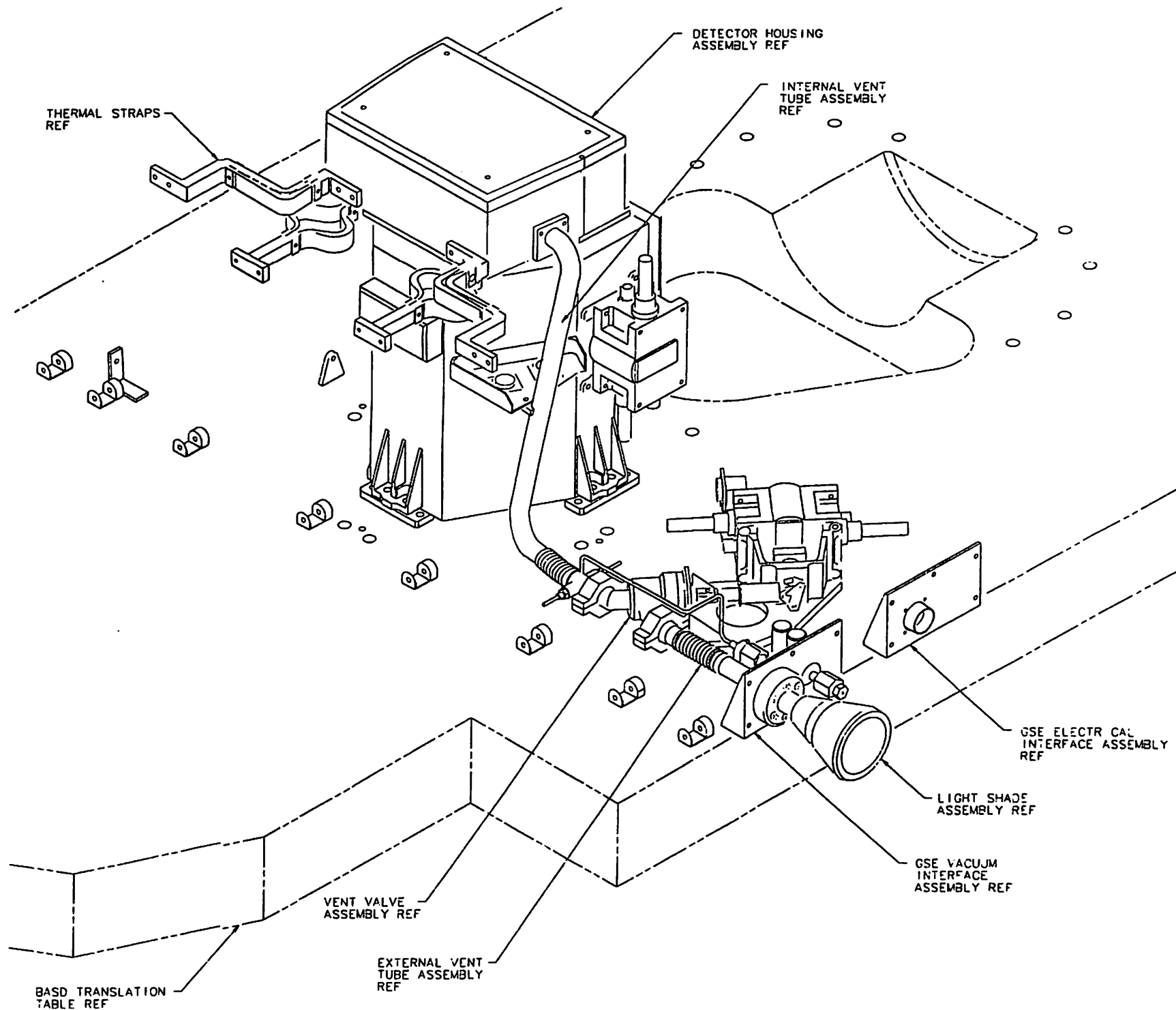


Fig. 1 ACIS Camera Concept Drawing

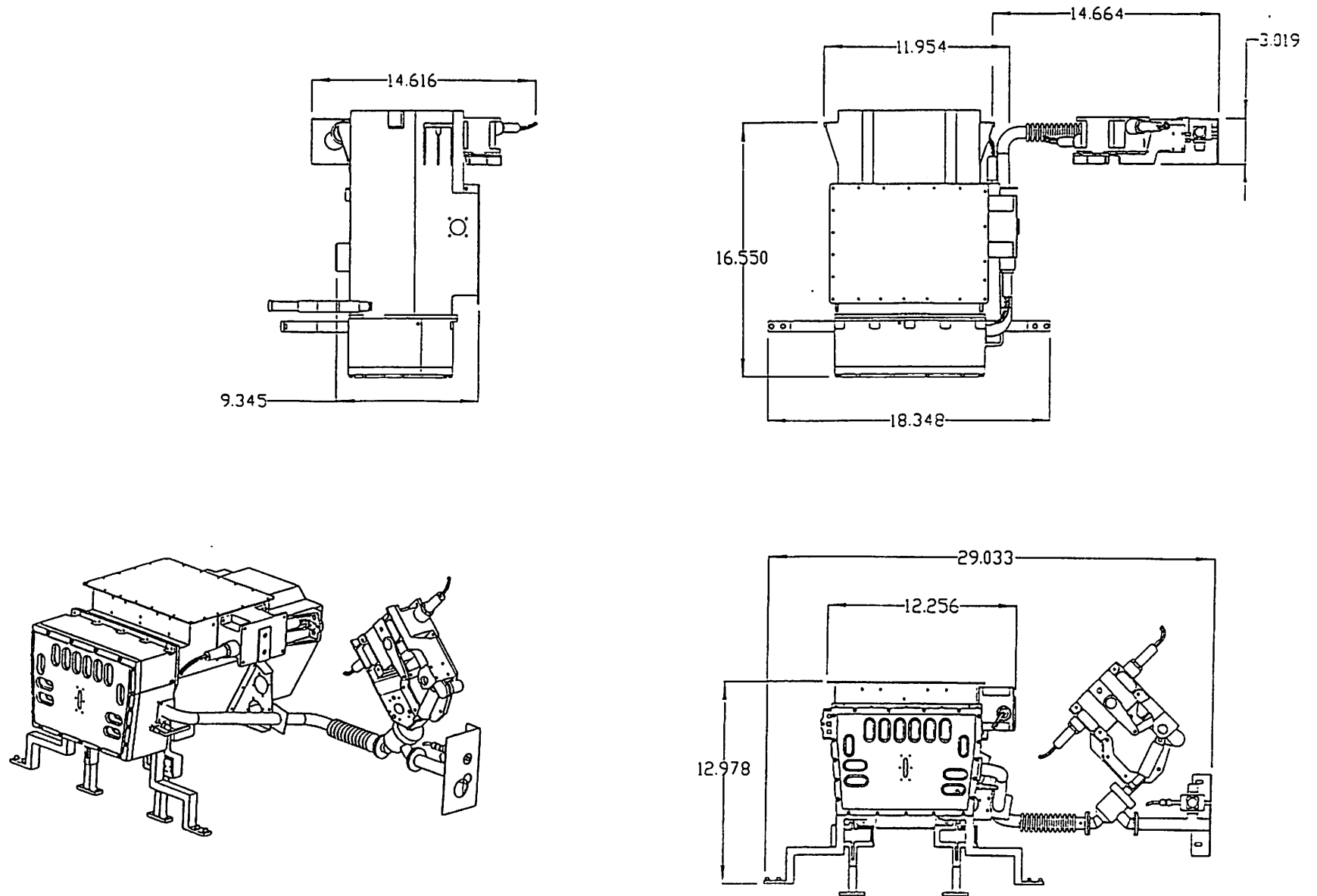


Fig. 2 Detector Assembly and Venting Sub-System

REV	LOG NO	DESCRIPTION	CHECKED	APPROVED	DATE
N	36-700	ADD PWR SAFF TO W6P1P4		RFQ	11/21/95
P	36-740	ADD PRELIM B TO W6P1P4 CHANGE W2C TO W25		RFQ	5/10/96
R	36-760	UPDATE W7-16P1, ADD CABLE PART NUMBERS		RFQ	9/16/96
S	36-830	ADD CHASSIS GNDS TO PSMC, DA AND DPA			
T	36-839	ADD WIRE GAUGES TO SH 6			

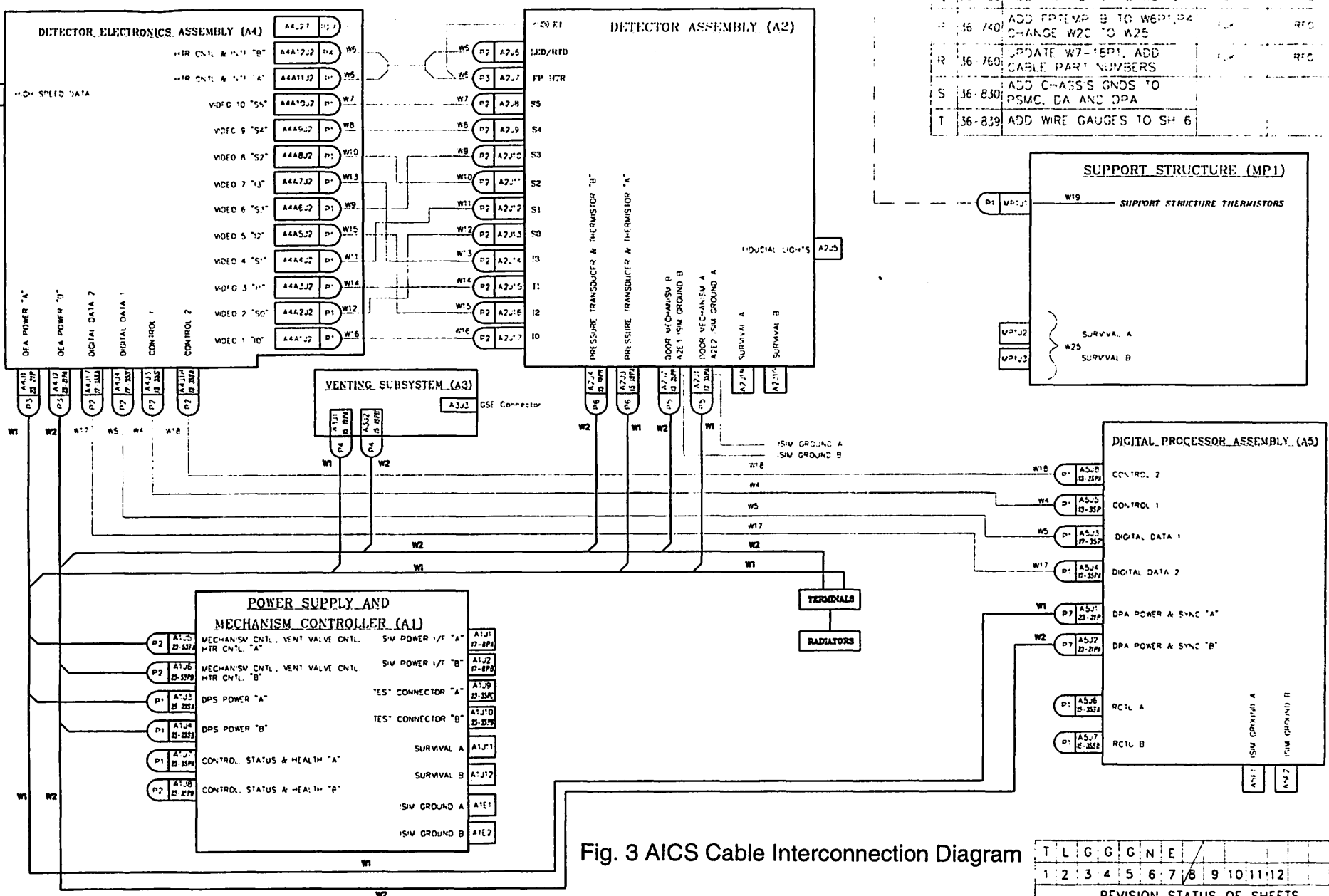


Fig. 3 AICS Cable Interconnection Diagram

NOTES

- UNLESS OTHERWISE NOTED, ALL WIRE TO BE 24 AWG.
- LEGEND:
  - 24 AWG TWISTED SHIELDED PAIR
  - 24 AWG TWISTED PAIR
- CONNECTOR DESIGNATION, MIL-C 38999, SERIES I, RECEPTACLE

REVISION STATUS OF SHEETS											
T	L	G	G	N	E	/	8	9	10	11	12
1	2	3	4	5	6	7	8	9	10	11	12

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCE ANGLES ± 1° 3 PLACE DECIMALS 3 005 2 PLACE DECIMALS ± 0'		NAME	DATE	MASSACHUSETTS INSTITUTE OF TECHNOLOGY CENTER FOR SPACE RESEARCH CAMBRIDGE, MA 02139
DRAWN	J. COOK	10/28/94		
CHECKED	Koschick	3/5/95		AICS CABLE INTERCONNECTION DIAGRAM
APPROVED	Goebel	3/5/95		
RELEASED	D. Goebel	3/9/95		SCALE NONE SHEET 1 OF 1
WEIGHT				C180230; 36-C3020.01

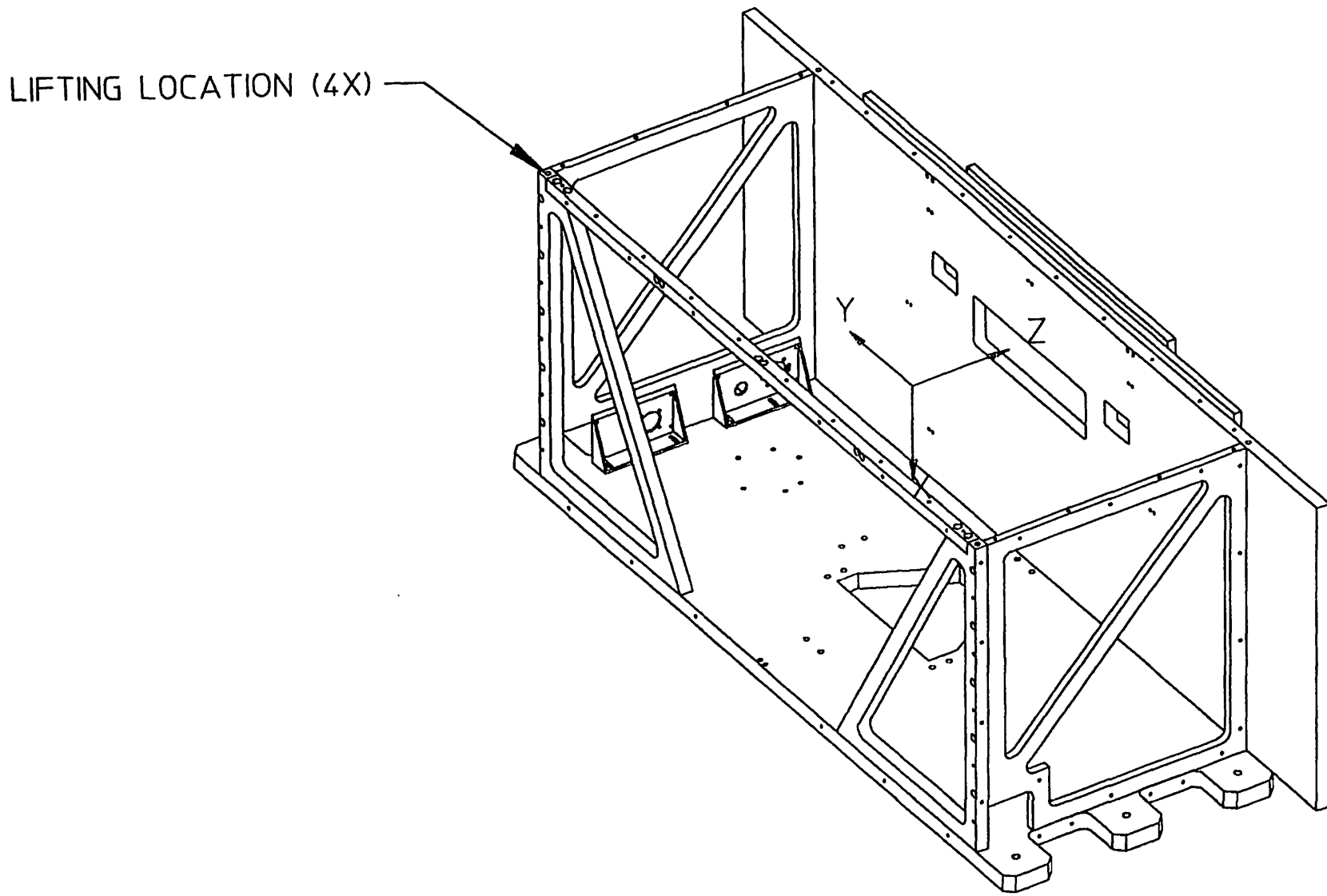


Fig. 4 Science Instrument Module Simulator (SIMSim)



ZONE	REV	PRG

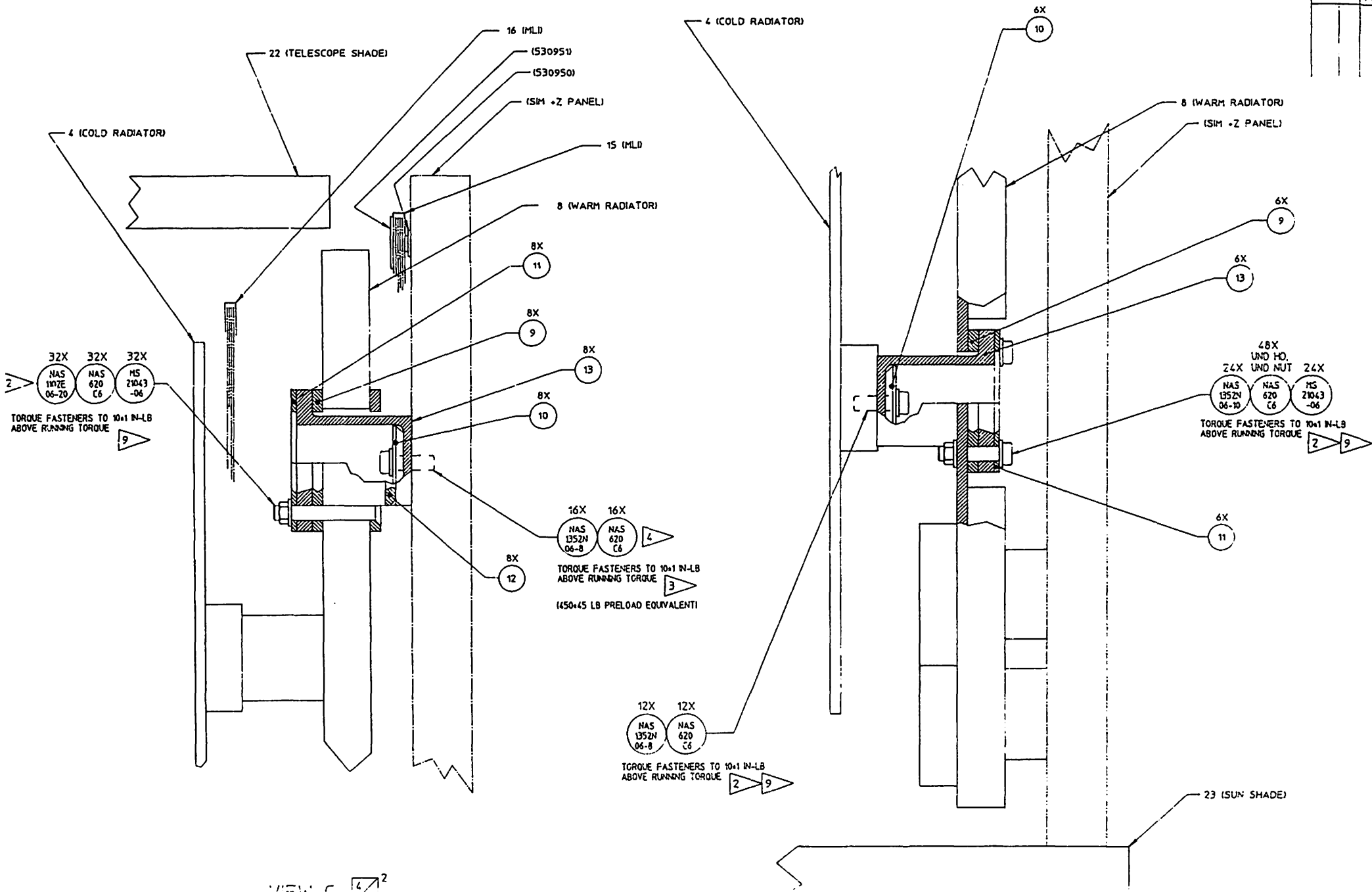


Fig. 5 Radiator Stand-Off Assembly

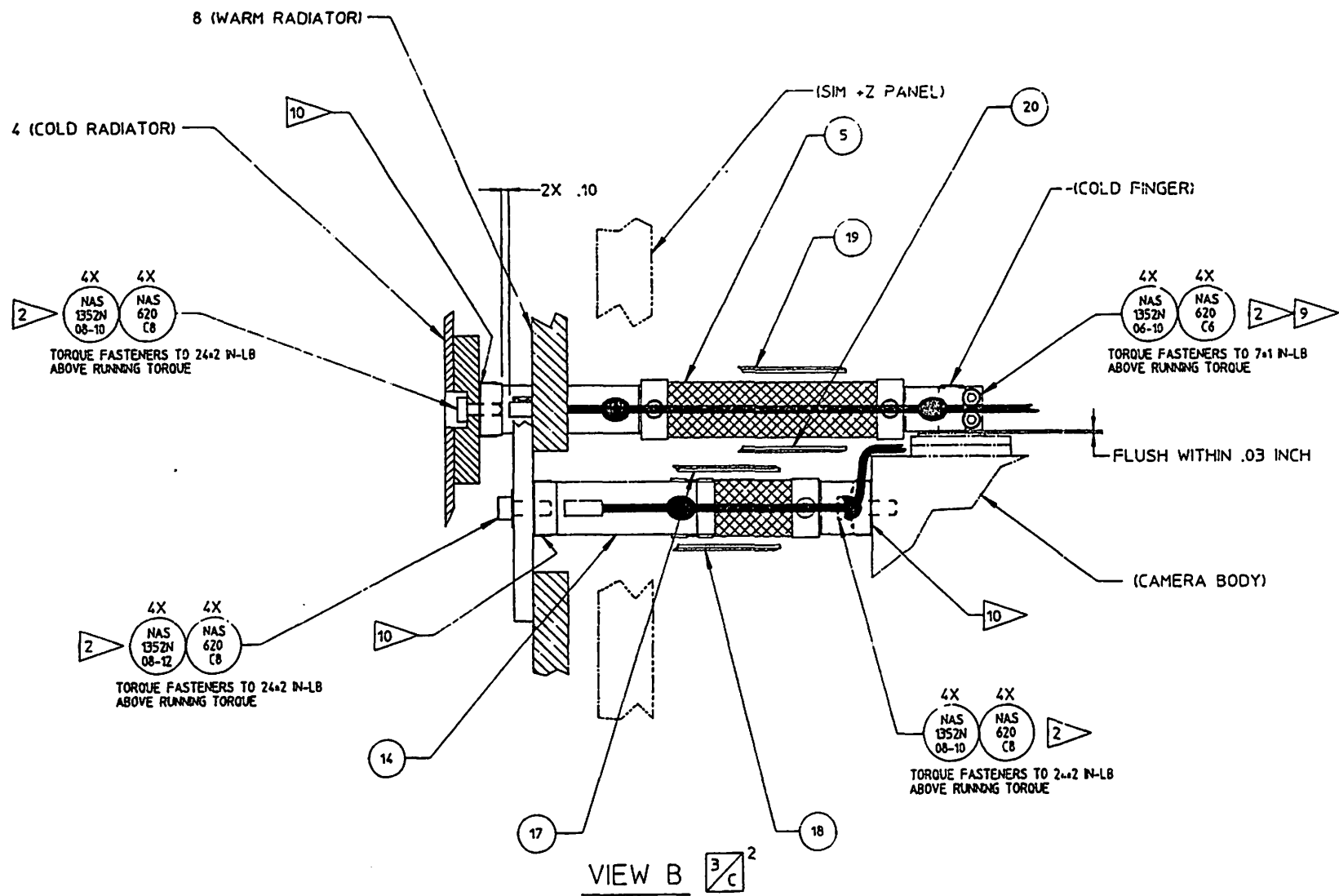


Fig. 6 Warm and Cold Strap Assembly