

STEREO IMPACT

PROBLEM REPORT

PR-3006

Walpole

1/7/05

PR Numbers: 1xxx=UCB, 2xxx=Caltech/JPL, 3xxx=UMd, 4xxx=GSFC/SEP, 5xxx=GSFC/Mag,
6xxx=CESR, 7xxx=Keil, 8xxx=ESTEC, 9xxx=MPAe

Assembly : SIT FM2	SubAssembly : Telescope
Component/Part Number: SSD	Serial Number: 42-104-A
Originator: Walpole	Organization: UMd
Phone : 301-405-6217	Email : walpole@sampex.umd.edu

Failure Occurred During (Check one \checkmark)

Functional test Qualification test S/C Integration Launch operations

Environment when failure occurred:

Ambient Vibration Shock Acoustic
 Thermal Vacuum Thermal-Vacuum EMI/EMC

Problem Description

During assembly of the FM2 SIT telescope it was noticed that the solid state detector (SN 42-104-A) did not fit properly in its mounting hardware. Removing the SSD from the telescope and sitting it on a glass plate we found that it would rock back and forth rather than sit flat on the plate.

This is cause for concern because a failure to fully constrain the detector could:

1. allow "chatter" during vibration possibly damaging the SSD
2. cause a loss of electrical contact with the detector resulting in complete loss of science from the instrument.

Analyses Performed to Determine Cause

We inspected the SSD and found that an irregular bead of epoxy holding the SSD to its ceramic frame had overflowed its intended channel and had deposited on the top and bottom surfaces of the detector frame. The epoxy bead as designed is shown in Fig 2a. The excess epoxy is shown in Fig 1 and Fig 2b. As can be seen from the figures, the excess epoxy interferes with the stacking of the detector components and with electrical contact between the detector, the focuser (ground) and the contactor (signal & bias).

Note: Contact is nominally made to the detector as follows: The detector frame top and bottom surfaces are thick filmed with a layer of PtAu, varying in thickness from 0.0005 to 0.002 inches. The detector is epoxied into the frame and a layer of aluminum is deposited on the signal side and of gold on the ground side. These layers carry the contact from the detector to its frame. When installed in the detector assembly (Fig 2a), the gold side of the frame makes contact with the focuser which is at signal ground and the aluminum side is pressed against the conductive side of the contactor. The contactor is a thin sheet of ceramic, thick filmed with conductor on one side and with a pin-jack soldered to the conductor for cable connection. Pressure to maintain the contact is supplied by a wave-washer spring. Details of the thick filming have been suppressed on the figures for clarity.

We currently have four mounted SSDs from Ortec. Two are flight units which have passed life testing at GSFC. The other two are recently-delivered spares which are just beginning test at GSFC. We inspected all four units and found the same problem – to varying degree – in all.

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Corrective Action/ Resolution

Rework

Repair

Use As Is

Scrap

We believe the discrepancy discovered has sufficiently serious potential consequences that it must be corrected. Due to long delivery times for these detectors it is unlikely that new detectors can be procured in time. Therefore the correction applied must work with all four of the SSDs in hand to allow the use of the existing spare detectors late in the program if one of the flight units fails during S/C testing. We believe that removing the excess epoxy is hazardous to the detectors and should be considered only as a last resort.

We have consulted with GSFC mechanical and QA personnel and have arrived at the following proposed solution (see Fig 2c):

1. Machine out a well about 0.007" deep around the inside of the focuser opening where the epoxy now interferes with the focuser (Well dimensions: 1.850" long, 0.760" wide, 0.007" deep). The depth of 7 mils is sufficient to accommodate the worst case epoxy intrusion from any of the four existing detectors with greater than 2 mils of margin. The pocket would be narrow enough that there would be plenty of surface contact between the focuser and the front surface of the detector frame, particularly at the ends where the thick filming is the thickest.
2. Install a 7 mil thick gold-plated BeCu washer between the back surface of the detector frame and the contactor. These washers can be produced quickly by modifying existing units produced as spare parts for other items in the telescope. The washer will sit outside the excess epoxy ring, avoiding the problem, and will carry electrical contact and mechanical load from the detector to the contactor.
3. To prevent the new washer from shorting to the focuser along its sides, the inner lips of the focuser will be covered with a strip of kapton tape.
4. To prevent the new washer from moving sideways during shake and launch, we will apply a stack of 3 strips of 1-mil thick kapton tape along each of the two ends of the detector frame. The tape will not be applied to the washer itself as this would interfere with its connection to the contactor, but will act as a barrier preventing large lateral movements of the washer. The washer will be in compression from the wave-washer spring on the other side of the contactor, so this tape may not be strictly necessary but will be applied anyway as a backup.

These corrective actions need to be applied to both FM1 and FM2 STI Telescopes. On January 10, 2005 a MRB was held regarding the above fix. The plan was approved by both UCB and GSFC.

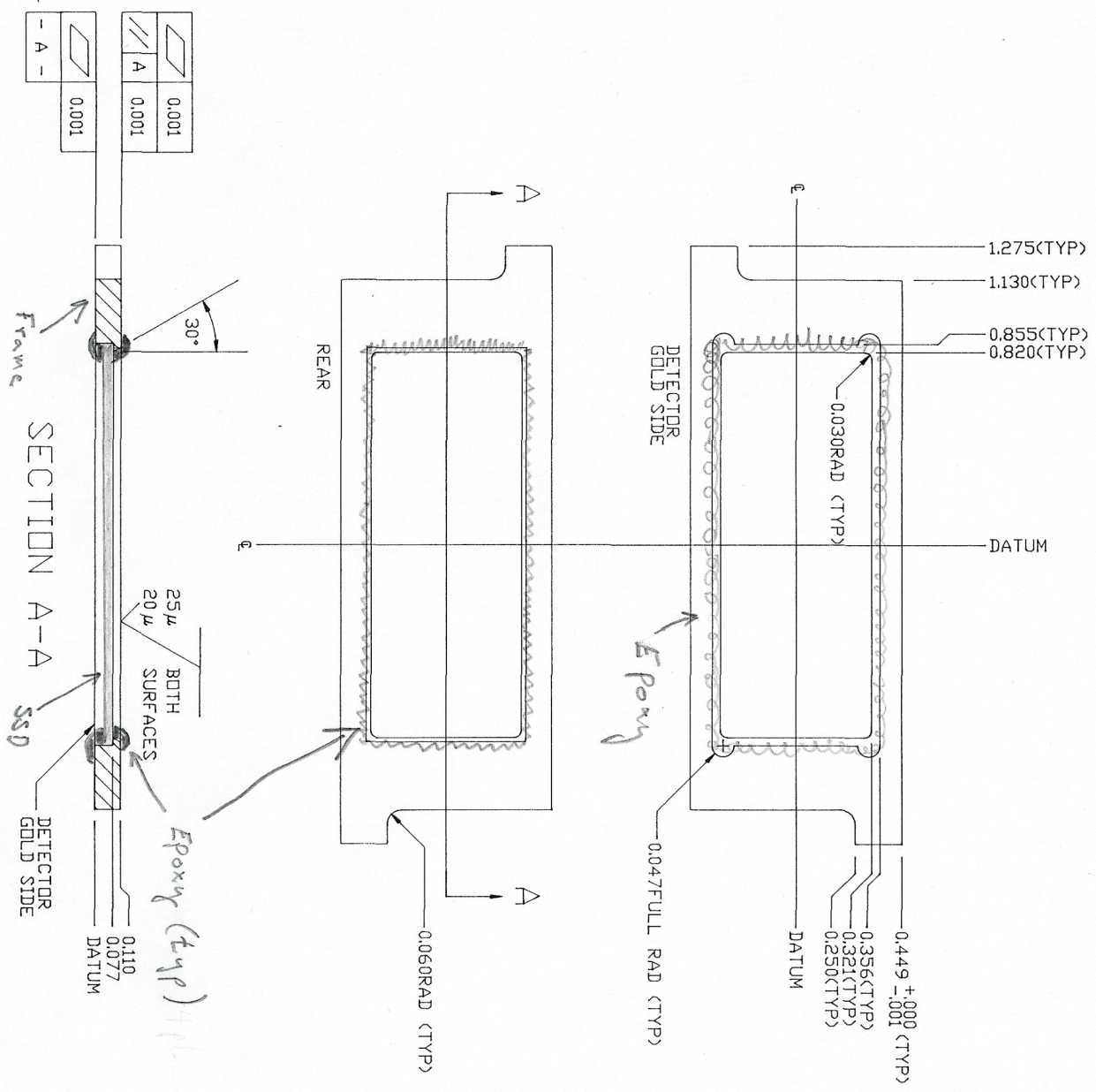
Date Action Taken: ___1/11/2005___ **Retest Results:** _Success, instrument level vacuum test.

Corrective Action Required/Performed on other Units x Serial Number(s): ___FM1___

Closure Approvals

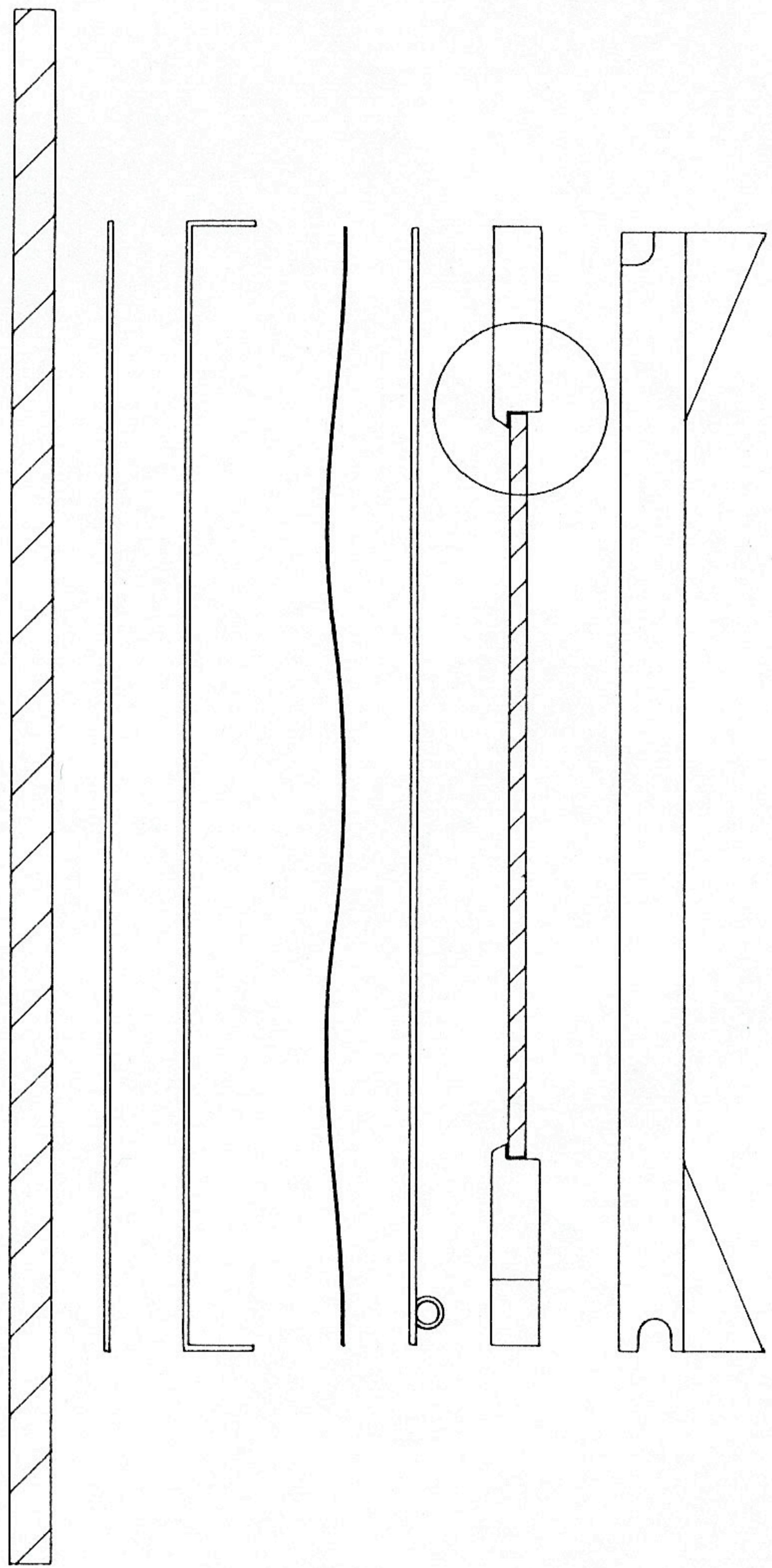
Subsystem Lead:	_____	Date:	_____
IMPACT Project Manager:	_____	Date:	_____
IMPACT QA:	_____	Date:	_____
NASA IMPACT Instrument Manager:	_____	Date:	_____

Fig 1

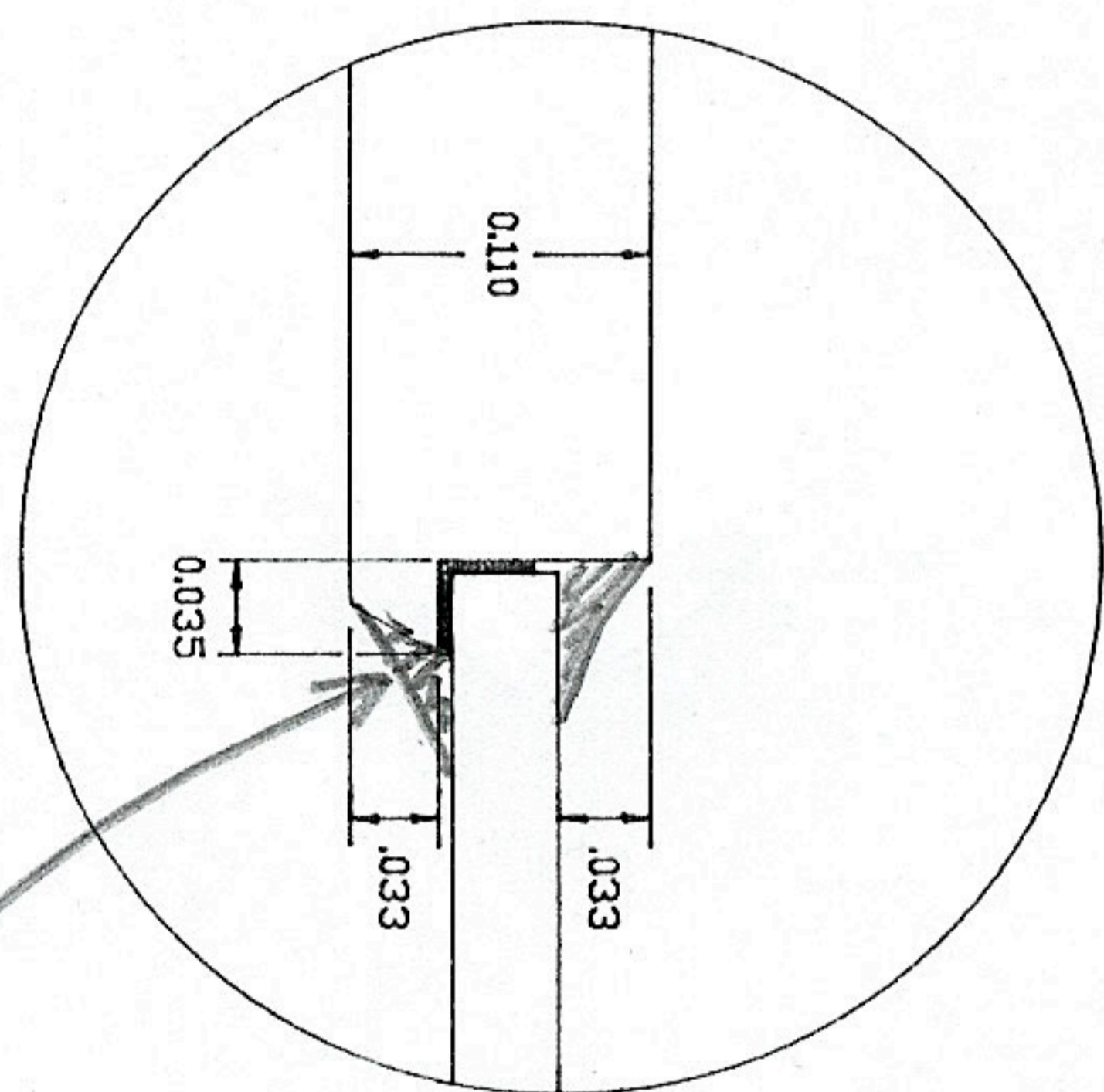
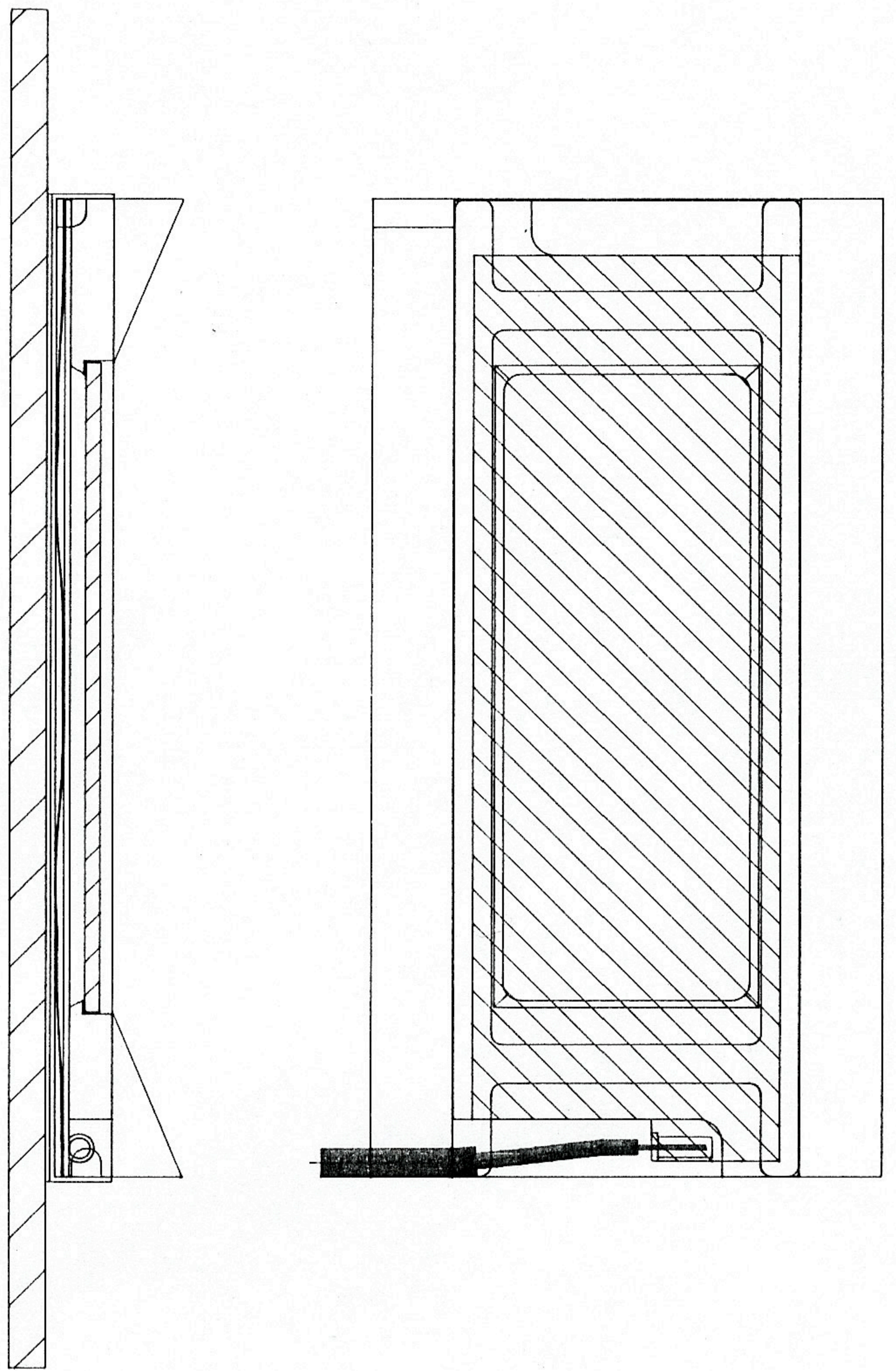


TOLERANCES (UNLESS NOTED) DECIMALS, .x ±0.050 .xx ±0.010 .xxx ±0.003 ANGLES, ±0°30' 0" SURFACE,	QUANTITY 12 PCS	DETECTOR FRAME	STEP 01-5-26030		
	MATERIAL ALUMINA		REVISION B	NEXT ASSEMBLY 74D08	
DRAWN BY CTS	SPECIFICATION AD-94	UNIVERSITY of MARYLAND SPACE PHYSICS GROUP/PHAST COLLEGE PARK, MARYLAND 20742		SCALE 2/1	SHEET OF 1 2
DATE 21 NOV 90	FINISH -	WEIGHT -	MARK SARDELLA (301) 405-6217	DRAWING NUMBER 74D01	

Fig 2a As Designed



FOCUSER
 DETECTOR
 CONTACTOR
 SPRING
 SHIELD
 INSULATOR
 HOUSING



as designed
 Epoxy
 Bead

TOLERANCES (UNLESS NOTED)
 DECIMALS, .X: ±0.050
 .XX: ±0.010
 .XXX: ±0.003
 ANGLES: ±0°30' 0"
 SURFACE:

DRAWN BY CTS

DATE 10 MAY 90

QUANTITY
 MATERIAL
 SPECIFICATION
 FINISH
 WEIGHT

DETECTOR ASSEMBLY

UNIVERSITY of MARYLAND
 SPACE PHYSICS GROUP/PHAST
 COLLEGE PARK, MARYLAND 20742

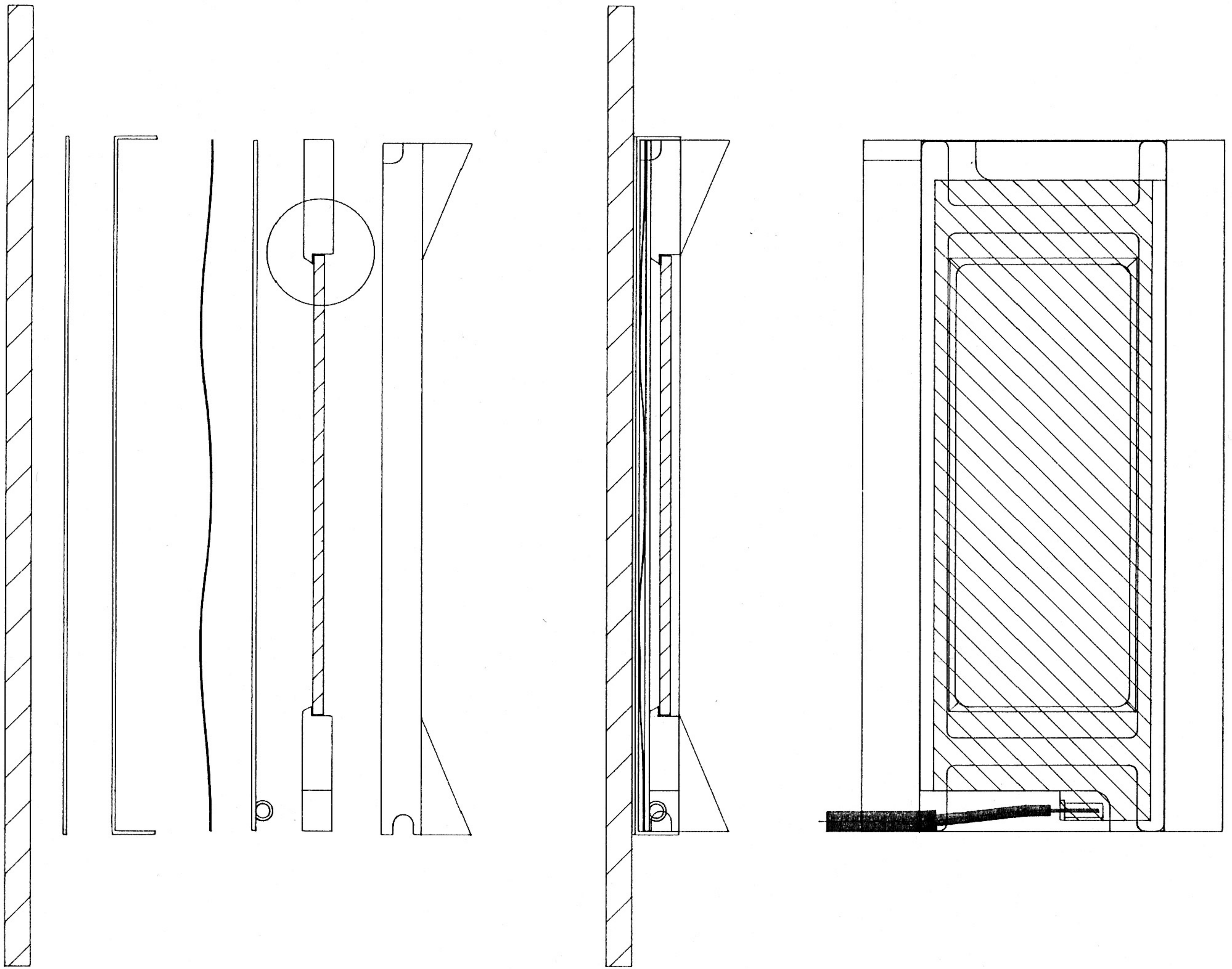
MARK SARDELLA (301)454-7302

STEP

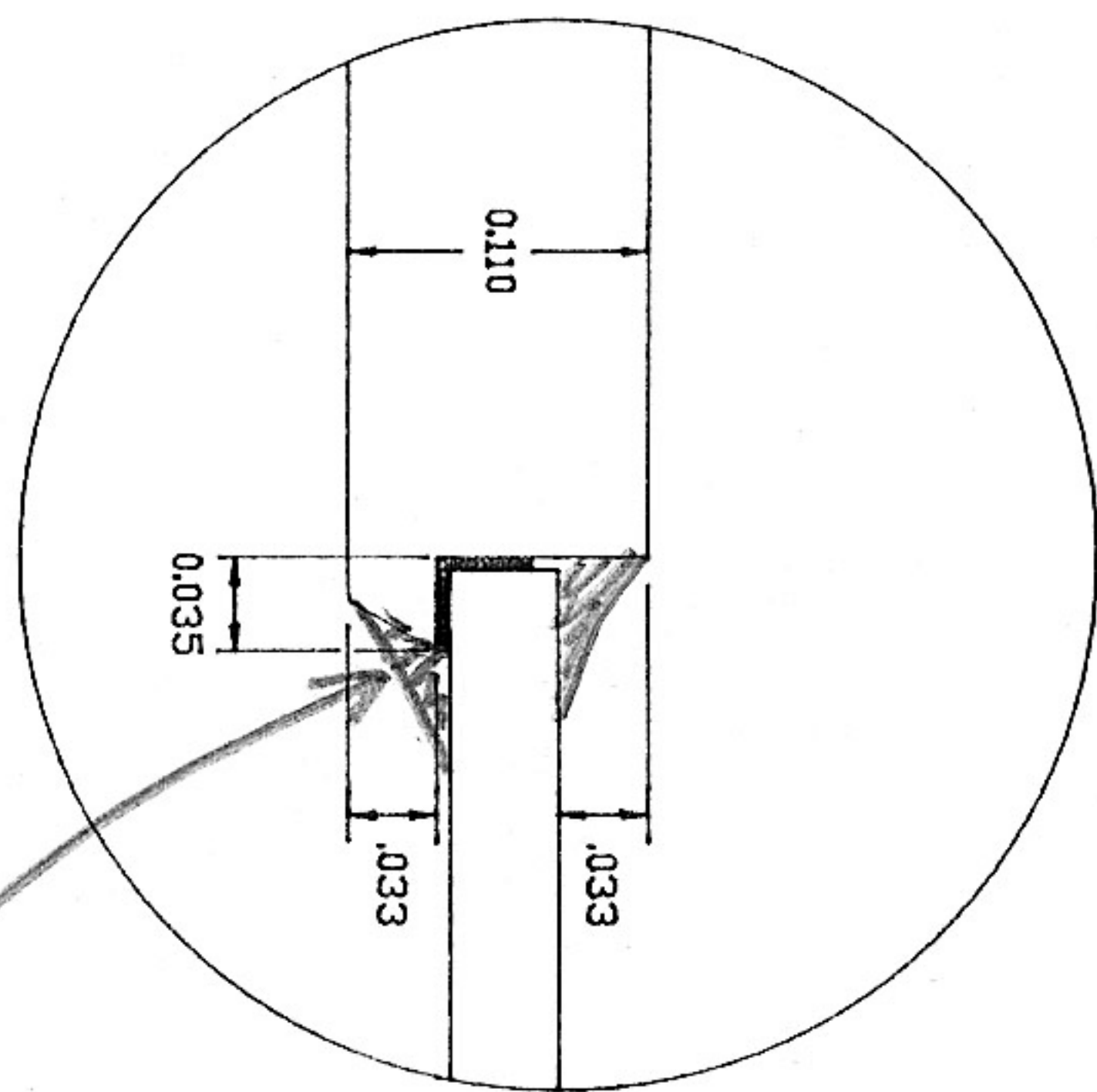
REVISION A	NEXT ASSEMBLY	
SCALE 2/1	SHEET: 1	OF: 1

DRAWING NUMBER
 D00

Fig 2a AS DESIGNED



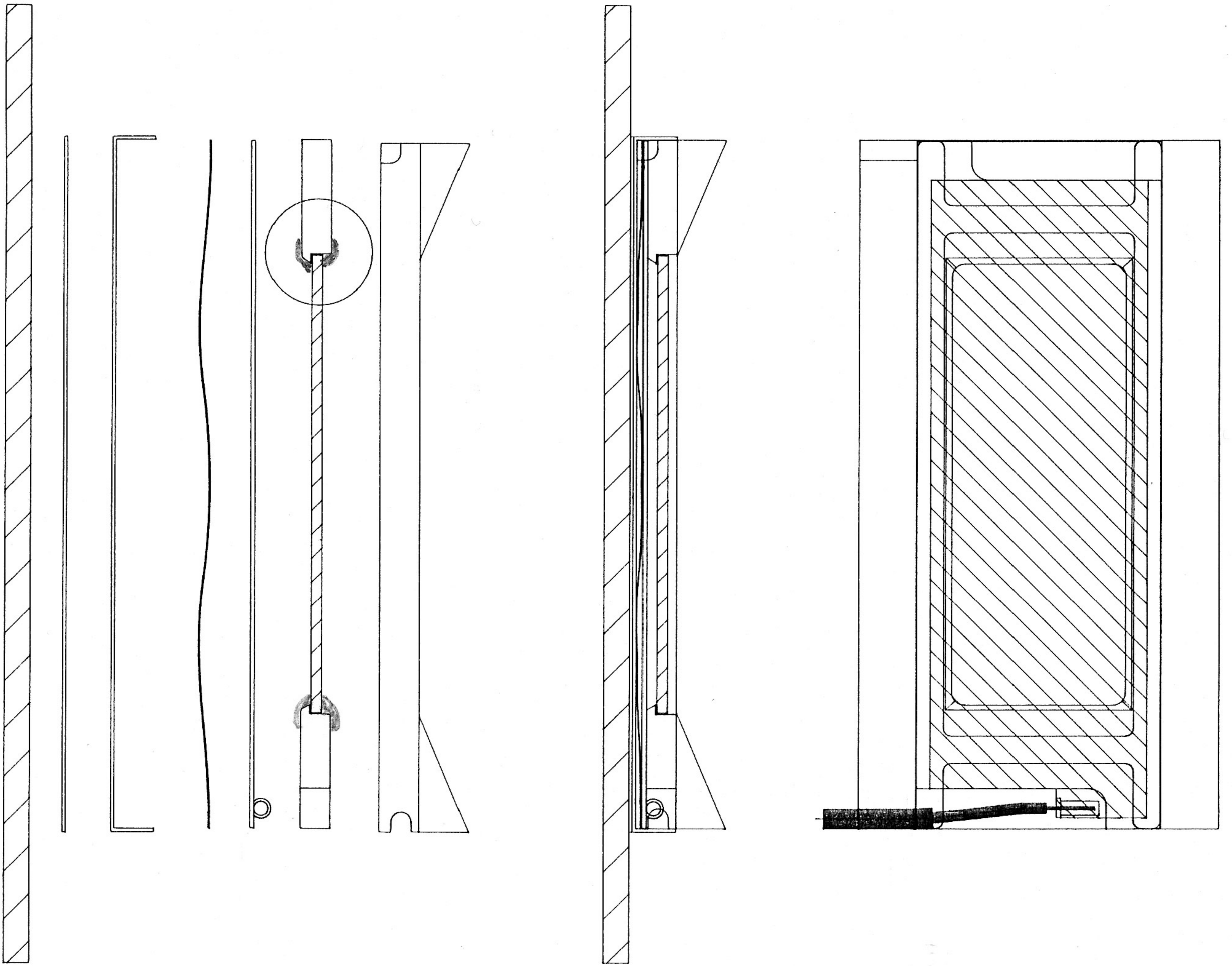
HOUSING
INSULATOR
SHIELD
SPRING
CONTACTOR
DETECTOR
FOCUSER



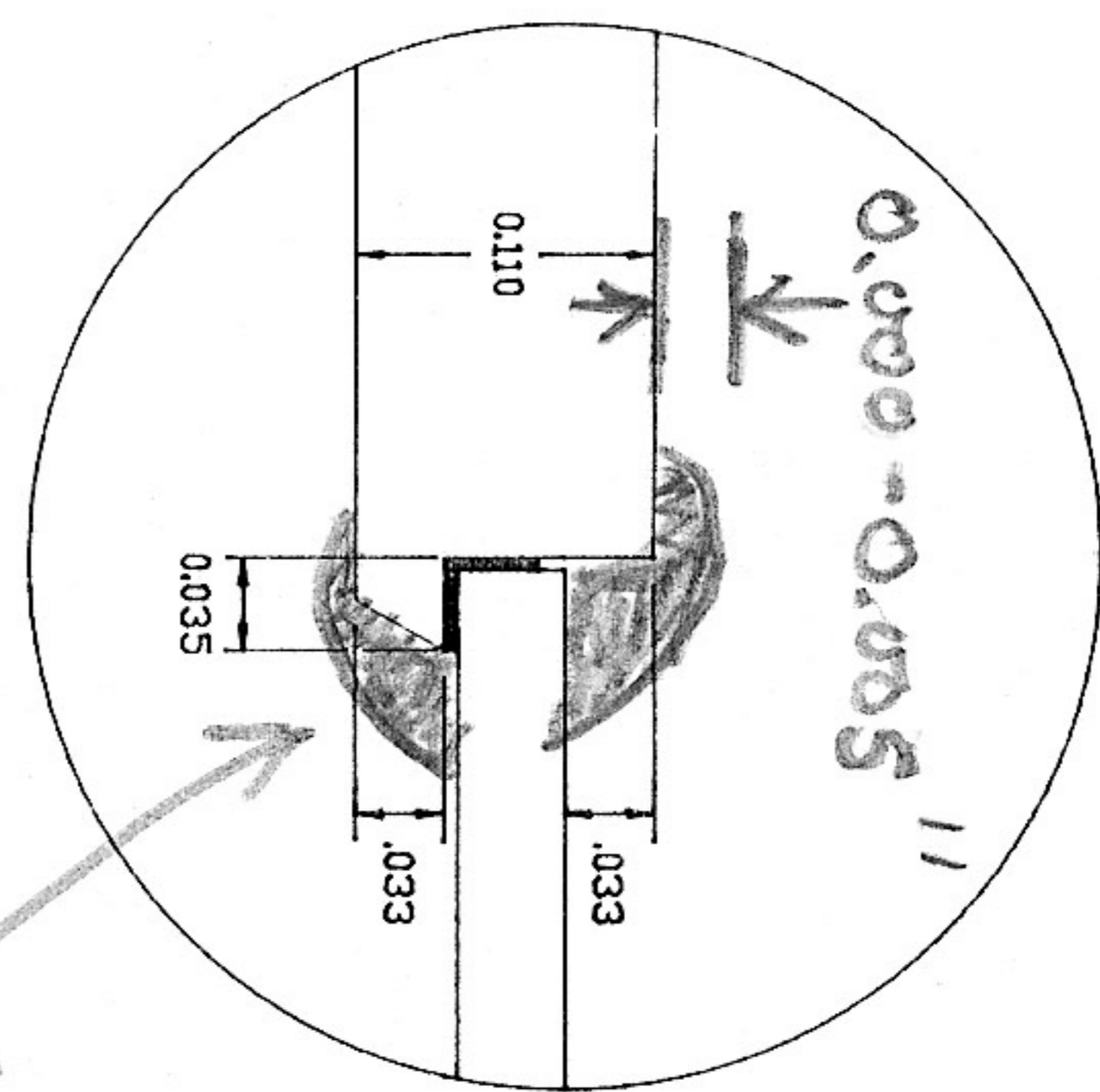
as designed
Epoxy
Bead

TOLERANCES (UNLESS NOTED) DECIMALS, .x: ±0.050 .xx: ±0.010 .xxx: ±0.003 ANGLES: ±0°30' 0" SURFACE:	QUANTITY	DETECTOR ASSEMBLY UNIVERSITY of MARYLAND SPACE PHYSICS GROUP/PHAST COLLEGE PARK, MARYLAND 20742	STEP	
	MATERIAL		REVISION A	NEXT ASSEMBLY
DRAWN BY CTS DATE 10 MAY 90	SPECIFICATION	MARK SARDELLA (301)454-7302	SCALE 2/1	SHEET: 1 OF 1
	FINISH		DRAWING NUMBER D00	
	WEIGHT			

Fig 2b AS DELIVERED



FOCUSER
 DETECTOR
 CONTACTOR
 SPRING
 SHIELD
 INSULATOR
 HOUSING



as delivered
Epoxy
bond

TOLERANCES (UNLESS NOTED)
 DECIMALS, .X: ±0.050
 .XX: ±0.010
 .XXX: ±0.003
 ANGLES: ±0°30' 0"
 SURFACE:

QUANTITY
 MATERIAL
 SPECIFICATION
 FINISH

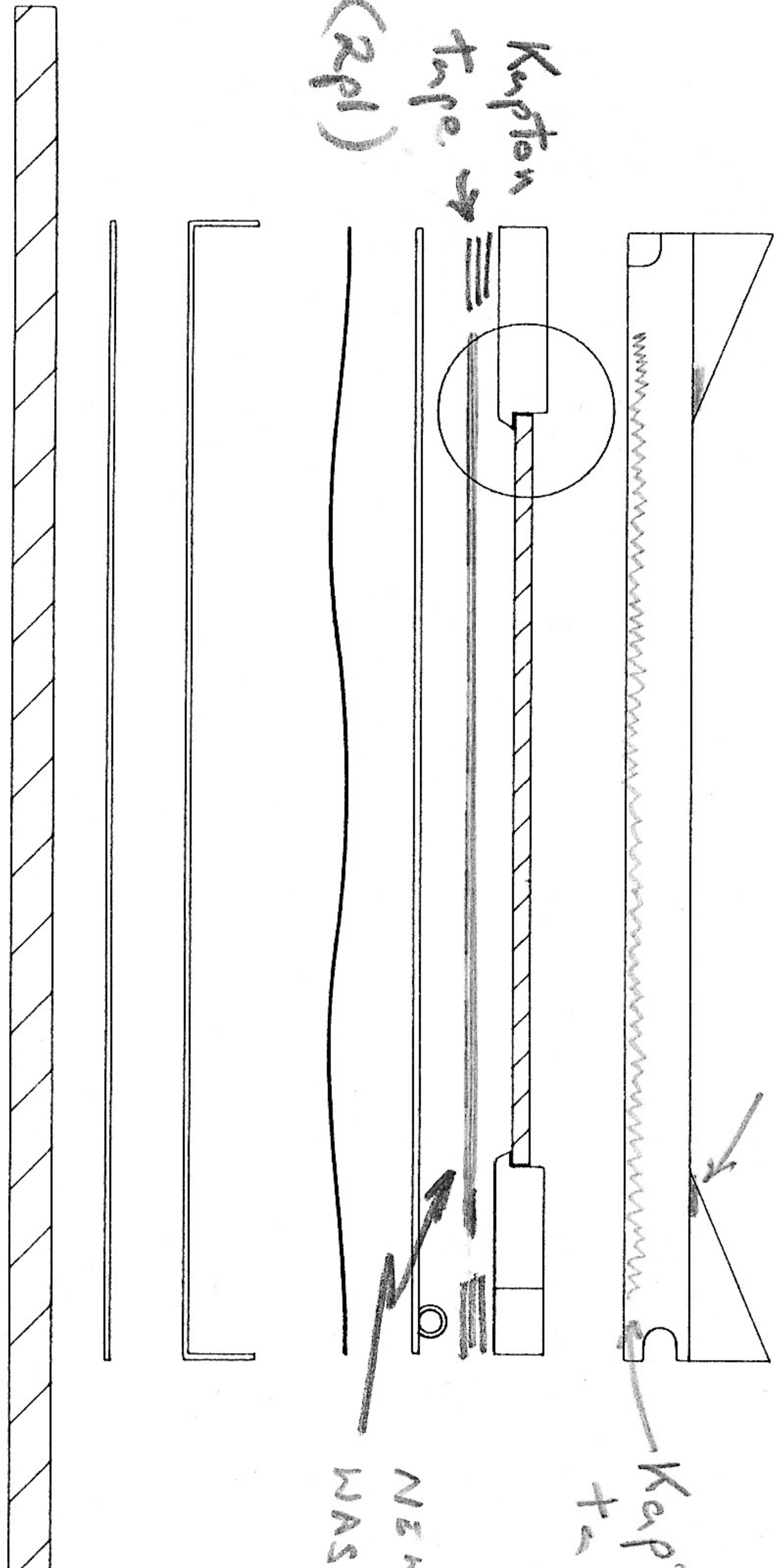
DRAWN BY CTS
 DATE 10 MAY 90

WEIGHT

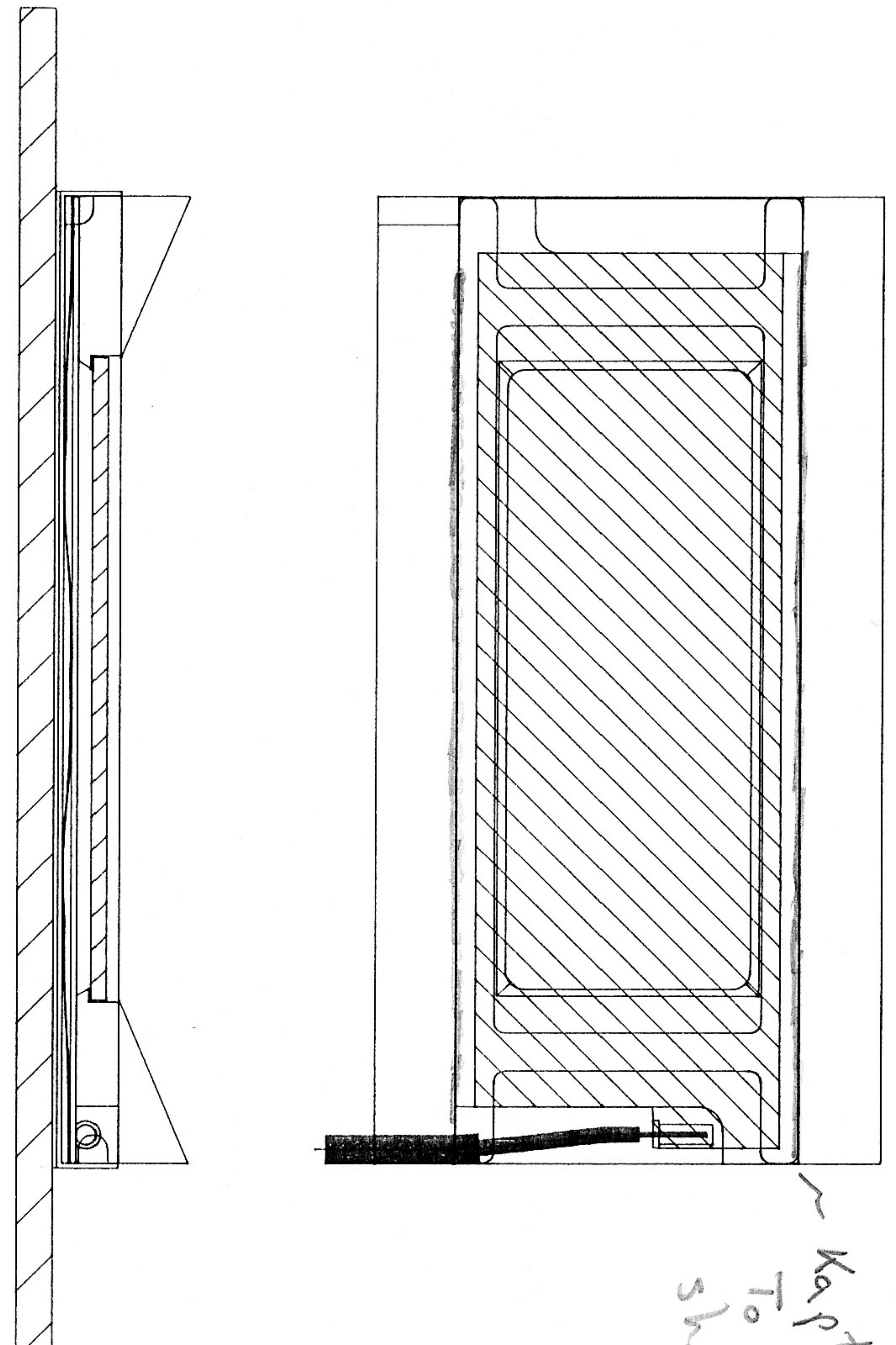
DETECTOR ASSEMBLY
 UNIVERSITY of MARYLAND
 SPACE PHYSICS GROUP/PHAST
 COLLEGE PARK, MARYLAND 20742
 MARK SARDELLA (301)454-7302

STEP
 REVISION A
 SCALE 2/1
 DRAWING NUMBER D00
 NEXT ASSEMBLY
 SHEET: 1 DF: 1

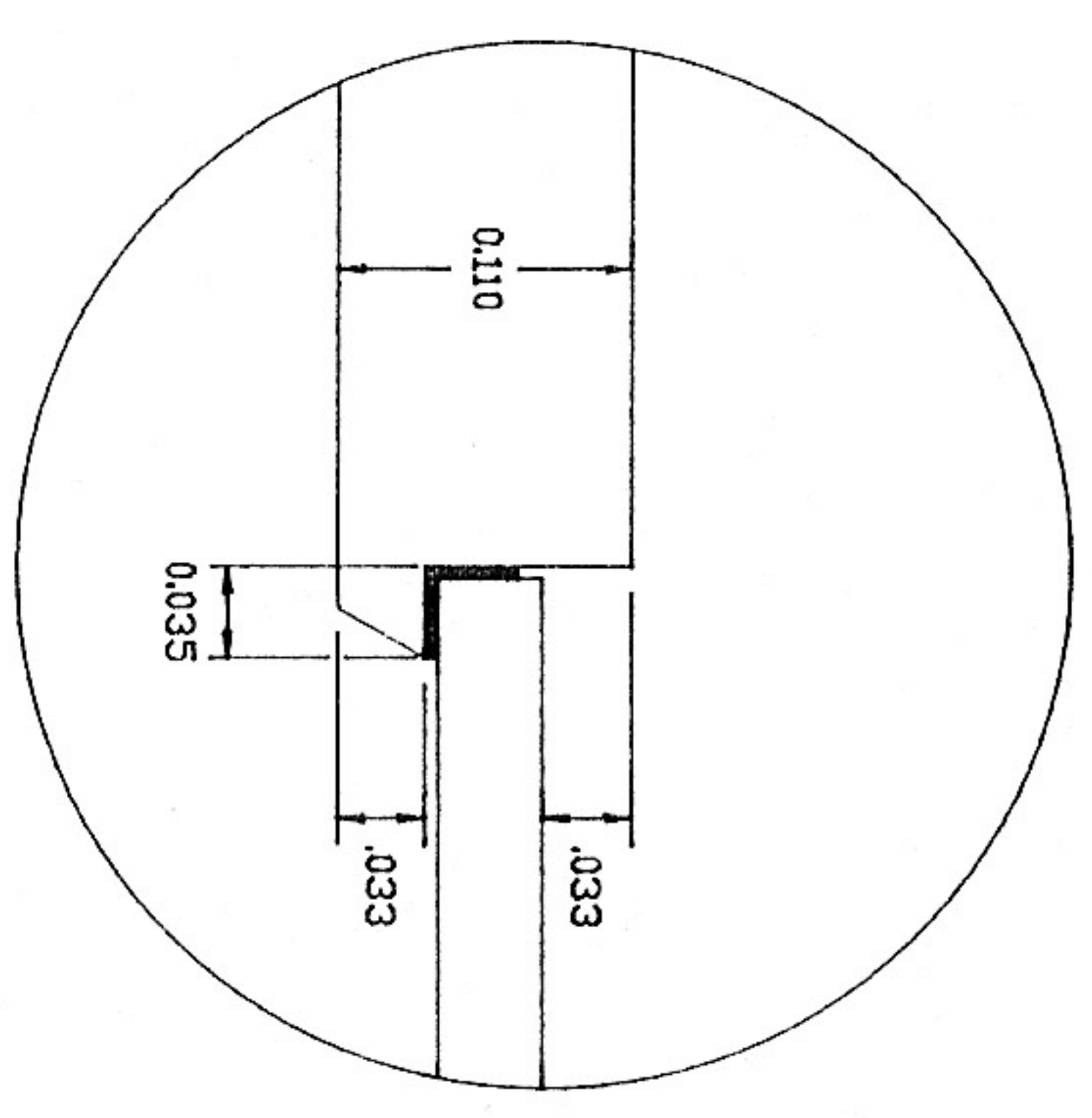
Fig 2a Proposed Solution



Will out pocket all around to prevent contact of excess epoxy.



Kapton Tape on focuser wall, 2 places
To prevent "new washer" from shorting to ground.



TOLERANCES (UNLESS NOTED) DECIMALS, .x: ±0.050 .xx: ±0.010 .xxx: ±0.003 ANGLES: ±0°30' 0" SURFACE:		QUANTITY MATERIAL SPECIFICATION FINISH WEIGHT		DETECTOR ASSEMBLY UNIVERSITY of MARYLAND SPACE PHYSICS GROUP/PHAST COLLEGE PARK, MARYLAND 20742		STEP	
DRAWN BY CTS						REVISION A	NEXT ASSEMBLY
DATE 10 MAY 90				MARK SARDELLA (301)454-7302		DRAWING NUMBER D00	