ATLAS DISK SECTOR FABRICATION AND SPECIFICATIONS

Introduction

This note describes the fabrication sequence of the ATLAS Pixel Disk Sector. This sequence is still under development and not all steps are specified here. The fabrication of both aluminum-tube and sealed-carbon-carbon-tube sectors are described. QC measurements for the aluminum-tube sector are summarized in a Table as the last section of this note. Key materials specifications are provided in Appendices. A drawing package for the aluminum-tube disk sector is also included as an Appendix.

Aluminum-tube Sector

Aluminum Tube

Cut tube to length
Measure tube length(record)
Weigh tube(record)
Anneal 3003 aluminum tubes to "O" condition (record)
Fill with wax
Bend-flatten-rebend as required (bending fixture) (flattening fixture)
Inspect_ go no-go gage & visual
Remove filler wax
Clean thoroughly
Weigh tube again (should be same as first) (record)
Plug both ends
Weigh (record)
Mount in anodize fixture
Anodize (need to spec. procedure)
Weigh (record)
Cut the tube to length (fixture)
Weigh cut tube (record)
Weigh tube end transition pieces (record)
Weigh PEEK tube strain relief pieces (record)
Bond tube end transition and strain relief pieces to cut tube (fixture)
Weigh assembly (record)
Leak/pressure test (record)
Inspect_ go no-go gage & visual (record)
Pack away in individual boxes with documentation (flat file)

Carbon-carbon Facesheets

Inspect raw materials flatness thickness weight @ ºC and %RH (record)
Cut profile and alignment holes on mill (vacuum fixture)
Inspect (Go, No-Go gage) (record)
Ultrasonic clean then bake dry
Weight @ ºC and %RH (record)

RVC Foam

Inspect raw materials flatness thickness weight @ ºC and %RH (record)
Rough-cut outer perimeter of foam using a scalpel to trace a pattern around a template
Face 2 sides using tape on foam held on mill table by a vacuum chuck
Ultrasonic clean then bake dry

Bond 1st Facesheet to Foam

Apply cyanate ester just prior to bonding with reticulated vitreous carbon foam. (position with alignment holes) chill, remove paper backing, protect and set aside to allow condensed moisture to evaporate from facesheet/cyanate ester

Weigh @ ºC and %RH with cyanate ester (record)
Rough position foam on facesheet w/cyanate ester
Place assemblly between flat plates w/spacers
Bake @ 250ºC for 3 hrs
Mount assembly onto same vacuum fixture in NC mill face to thickness, cut tube slot and clear foam from mounting holes.
Ultrasonic clean then bake dry
Weigh @ ºC and %RH (record)
Inspect_ go no-go gage & visual (record)

Apply CGL & Glass Beads to Tube

Fixture to hold tube assembly during CGL application
Weigh tube and fixture (record)
Apply CGL to 1st side of tube (mask or CNC stage)
Weigh tube and fixture (record)
Apply glass beads to 1st side of tube
Weigh tube and fixture (record)
Apply CGL to 2nd side of tube (mask or CNC stage)
Weigh tube and fixture (record)
Apply glass beads to 2nd side of tube
Weigh tube and fixture (record)

Bond 2nd Facesheet and Hard Points

Prepare 2nd Facesheet for bonding
Apply cyanate ester just prior to bonding with reticulated vitreous carbon foam. (position with alignment holes) (different cutting template) chill, remove paper backing, protect and set aside to allow condensed moisture to evaporate from facesheet/cyanate ester
Record weight @ ºC and %RH with cyanate ester
Add adhesive to strain relief positions Add hard points to 1st facesheet with cyanate ester (hand place in position)
Inspect and weigh washers that go on face of sector (6 ea) @ ºC and %RH
Apply cyanate ester to carbon carbon spacer washers. Record weight of spacers @ ºC and %RH with cyanate ester
Position 3 spacer washers on bonding fixture cyanate ester side up. Position 1st facesheet on bonding fixture. Position tube on 1st facesheet (pins through strain relief tabs?) Position 2nd facesheet on bonding fixture. Position 3 spacer washers on top of 2nd facesheet
Clamp both sides of bonding fixture together
Inspect for proper fit
Bake @ 80 ºC for 16 hrs then 250 ºC for 3 hrs
Remove from bonding fixture
Record weight @ ºC and %RH
Inspect for flatness thickness and parallel sides
Place sector on milling fixture to take skim cut on spacer washers
Final inspection

Final Assembly

Mount targets for survey
Seal foam
Clean
Inspect, weigh and record
Survey via optical CMM and record locations of targets relative to mounting buttons

Quality Control

A preliminary summary of quality control items is given in the table below. All length units are mm. All weights are in grams.

Item	Measurement/Inspection
Aluminum Tubes and Connections	
Length after initial cutting	
Weight after initial cutting	
Inspect after annealing	
Go/no-go and inspect after bend/flatten	
Weight after bending	
Weight with plugged ends for anodizing	
Weigh after anodizing	
Weight after cutting to length	
Weigh square-to-round pieces	
Weigh PEEK strain relief pieces	
Weigh tube/connection assembly	
Leak/pressure test	
Visual inspection/label	
Carbon-carbon Faceplates	
Inspect raw plates	
Go/no go after cutting faceplates	
Weigh faceplates	
RVC Foam	
Inspect raw materials	
Determine density	
Bond 1st Faceplates to Foam	
Weigh faceplate with cyanate ester	
Inspect after cutting foam	
Weigh after cutting foam	
CGL+Glass Beads	
Weigh tube in fixture	
Weigh tube and fixture after CGL applied side 1	
Weigh tube and fixture after CGL applied side 2	
Bond 2nd Faceplates and Hard Points	
Weigh 2nd faceplate with cyanate ester	
Weigh hard points, spacers and washers	
Weigh after heat cure	
Inspect for thickness	
Inspect for planarity	
Visual inspection after face cut mounting buttons	
Final Assembly	
Inspect after mounting targets and sealing foam	
Weigh after final cleaning	
Survey targets/reference mounting buttons	

Appendix A: Carbon-Carbon Sheet Specification

ATLAS Pixel Sector and Disk Ring
Carbon-Carbon Plate Specification
April 24, 2000
Draft

Carbon-carbon panels carbonized and heat treated to achieved performance parameters listed in Table 1. Panels are to be densified by a CVD carbon process and resin impregnated with RS3 cyanate ester. Scrub plates to remove excess resin.

Panel size: 48.26 cm (19 in.) square or larger.

Number of panels: Preproduction lot a minimum of 2 panels. Production lot of minimum of 24 panels.

Layup: Quasi-isotropic 8 layers: 0/45/-45/90/s

Item	Specification	Range or Comment
Tensile modulus-0° dir.	158.6 GPa (23 Msi)	Range +/-5%
Tensile modulus-90° dir.	151.7 GPa (22 Msi)	Range +/-5%
Tensile strength-0° dir.	296.4 MPa (43 ksi)	Range +/-5%
Tensile strength-90° dir.	296.4 MPa (43 Msi)	Range +/-5%
CTE-0° dir.	-1.2 ppm/K	Range +/-10%
CTE-90° dir.	-1.2 ppm/K	Range +/-10%
Conductivity K_{ab}-0° dir.	>170 W/mK	Target value: >190 W/mK
Conductivity K_c-90° dir.	>170 W/mK	Target value: >190 W/mK
Conductivity K transverse	>20 W/mK	Target value: > 25 W/mK
Density	1.75 g/cc	Range +5/-2%
Thickness	0.406 - 0.457 mm	

Appendix B - Reticulated Vitreous Carbon Foam Specification

Appendix C - Aluminum Tube Specification

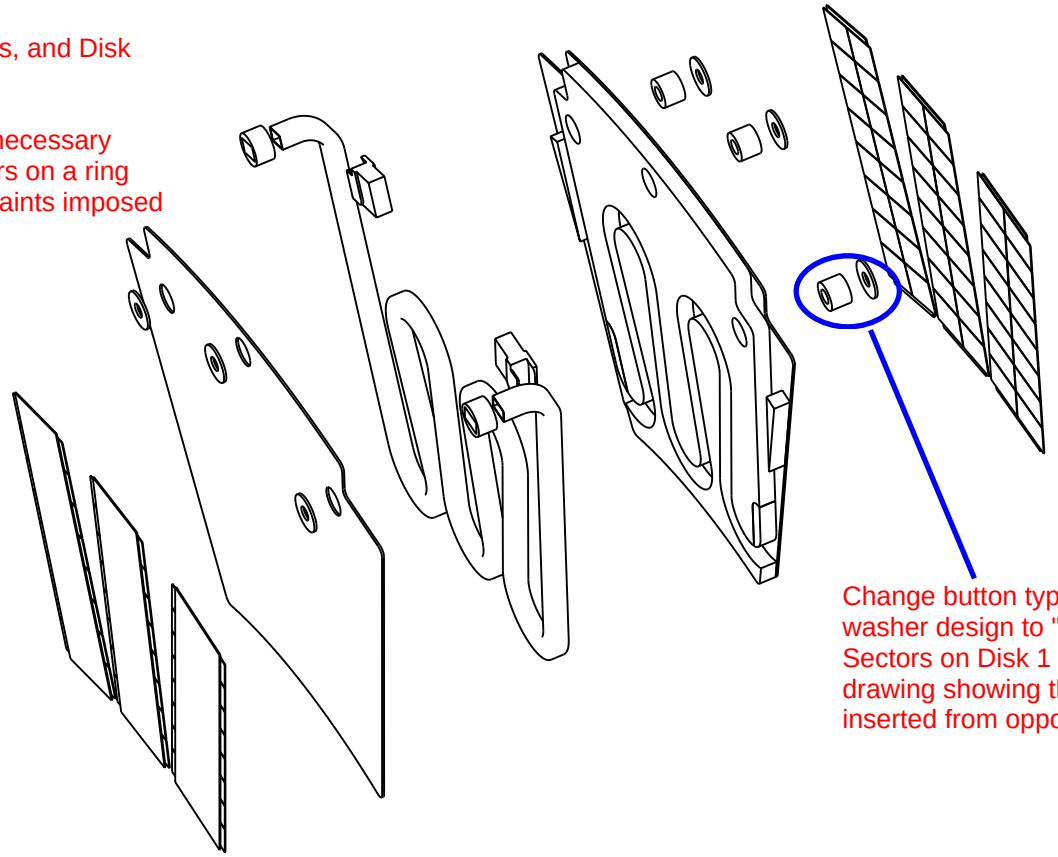
Appendix D - Drawings of Aluminum-Tube Sector

Want an unexploded assembly with layout dimensions capturing sector dimensions relative to Module placement, and contianing assembled dimensions/tolerances/GD&T

Table with different Thicknesses, and Disk one option to be included

Layout assembly may also be necessary showing two neighboring sectors on a ring segment which captures constraints imposed by assembly

ITEM	PART NO	REQD	DESCRIPTION	MATERIAL



Change button type from dual washer design to "T" washer type. Sectors on Disk 1 need an option drawing showing the washer face inserted from opposite side.

REV	DWG	CHK	ZONE	DATE	CHANGES

UNLESS OTHERWISE SPECIFIED

TOLERANCES: X.X ± 0.1 | FRAC. ± 1/64 | X.XX ± 0.03 | Angles ± 1.00° | X.XXX ± 0.010 | FINISH 125 √(μin)

DO NOT SCALE PRINT

THREADS ARE CLASS 2
CHAMFER ENDS OF ALL SCREW TREADS 30°
CUT ROUND, 1.5 THREAD RELIEF ON MACHINED THREADS
BREAK EDGES .016 MAX. ON MACHINED WORK
REMOVE BURRS, WELD SPLATTER & LOOSE SCALE
IN ACCORDANCE WITH ASME Y14.5M & B46.1

SHOP ORDERS

SER NO.	-		
ACCT NO.		NO. REQD	
DATE ISSD	-		
DEL TO		DATE REQD	-
SURFACE TREATMT			
IDENT METHOD	TAG		
PROJECT NUMBER	N/A		
PROJECT NAME	N/A		
DWG BY	David Uken	DATE	05-Apr-00
CHK BY		DATE	
APR BY		DATE	

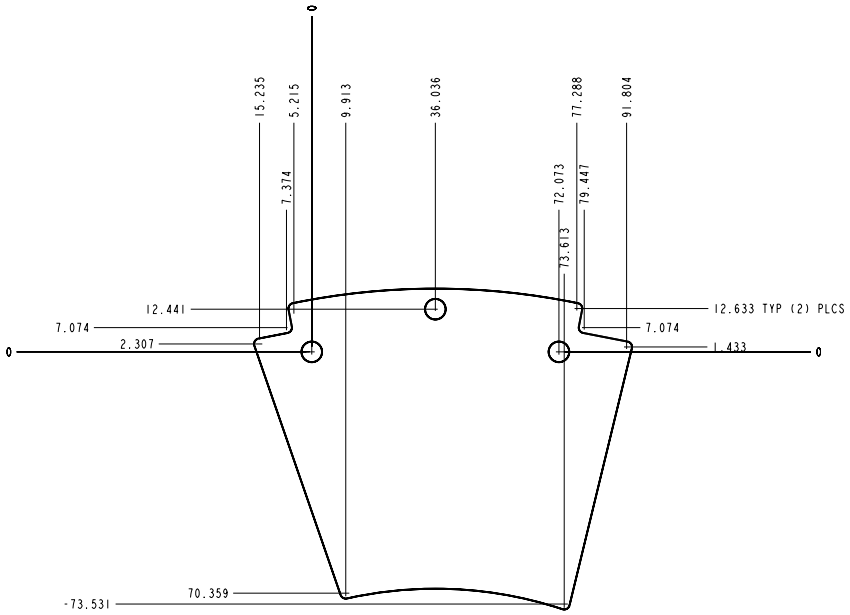
ERNEST ORLANDO LAWRENCE BERKELEY NATIONAL LABORATORY
UNIVERSITY OF CALIFORNIA - BERKELEY

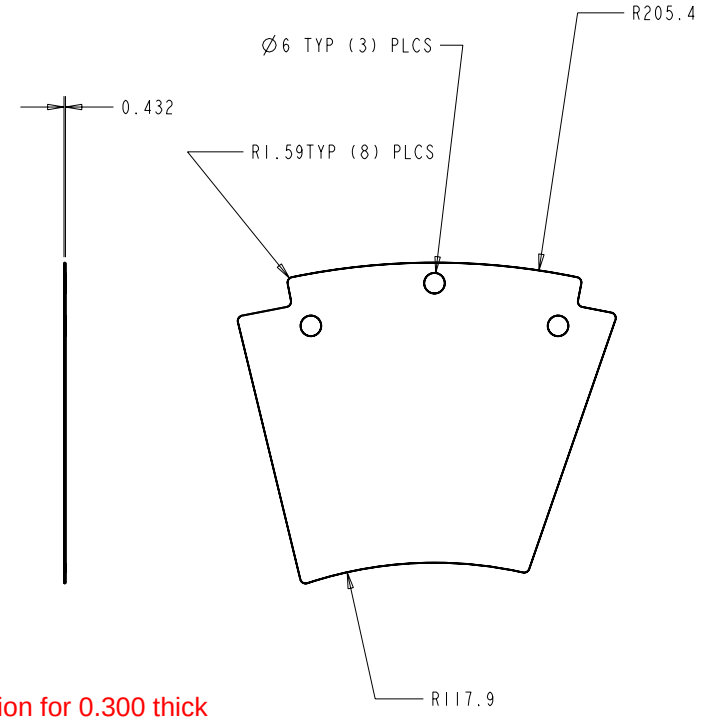
Atlas Pixel Detector
II-Sector Version
Sector II, Exploded View

MICROFILMED:	DWG. TYPE	SHOWN ON	SCALE: 1.500	DO NOT SCALE PRINTS
	ASSEM		SHEET 1 OF 1	
PATENT CLEAR:	DESIGN ACCT. NO.	CATEGORY CODE	DWG. NO. 3	SIZE / REV.

DWG. NO. 3 SIZE/REV. SH. 2000111

DESCRIPTION	MATERIAL	MAT. LOCATION
		-





Need table option for 0.300 thick face sheets--make table with dash number ref: drawings number.

REV	DWG	CHK	ZONE	DATE	CHANGES

UNLESS OTHERWISE SPECIFIED

TOLERANCES: X.X ± 0.1 | FRAC. ± 1/64 | X.XX ± 0.03 | Angles ± 1.00° | X.XXX ± 0.010 | FINISH 125 √(μin)

DO NOT SCALE PRINT

THREADS ARE CLASS 2

CHAMFER ENDS OF ALL SCREW TREADS 30°

CUT ROUND, 1.5 THREAD RELIEF ON MACHINED THREADS

BREAK EDGES .016 MAX. ON MACHINED WORK

REMOVE BURRS, WELD SPLATTER & LOOSE SCALE

IN ACCORDANCE WITH ASME Y14.5M & B46.1

SHOP ORDERS

SER NO.	-		
ACCT NO.	7916-27	NO. REQD	66
DATE ISSD	-		
DEL TO	ERIC ANDERSSEN	DATE REQD	-
SURFACE TREATMT			
IDENT METHOD	TAG		
PROJECT NUMBER	N/A		
PROJECT NAME	N/A		
DWG BY		DATE	03-Apr-00
CHK BY		DATE	
APR BY		DATE	

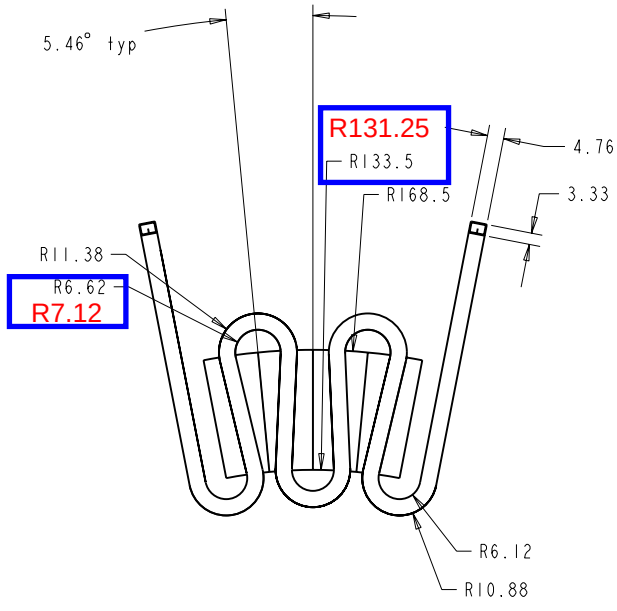
ERNEST ORLANDO LAWRENCE
BERKELEY NATIONAL LABORATORY
UNIVERSITY OF CALIFORNIA - BERKELEY

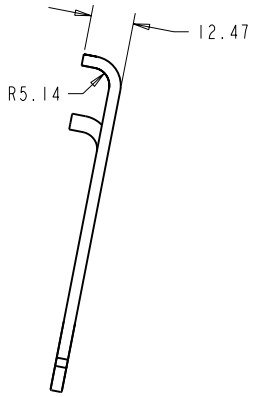
Sector Facing
II-Sector Version
Atlas Detector

MICROFILMED:	DWG. TYPE	SHOWN ON	SCALE: 1.000	DO NOT SCALE PRINTS
	PART		SHEET 1 OF 1	
PATENT CLEAR:	DESIGN ACCT. NO.	CATEGORY CODE	DWG. NO. 3	SIZE / REV.

DWG. NO. 33 SIZE REV. SH. 2000 1 1

DESCRIPTION	MATERIAL	MAT. LOCATION
		-





Changes intended to make tube closer to what is currently built. Note also changes to bend jig

Changes made to tube should also propogate to Foam and locations of strain reliefs

OVERALL LENGTH = 444.5 MM

REV	DWG	CHK	ZONE	DATE	CHANGES

UNLESS OTHERWISE SPECIFIED
TOLERANCES: X.X ± 0.1 FRAC. ± 1/64; X.XX ± 0.03 Angles ± 1.00°; X.XXX ± 0.010 FINISH 125 √(μin)
DO NOT SCALE PRINT
THREADS ARE CLASS 2
CHAMFER ENDS OF ALL SCREW TREADS 30°
CUT ROUND, 1.5 THREAD RELIEF ON MACHINED THREADS
BREAK EDGES .016 MAX. ON MACHINED WORK
REMOVE BURRS, WELD SPLATTER & LOOSE SCALE
IN ACCORDANCE WITH ASME Y14.5M & B46.1

SHOP ORDERS
ACCT NO. 7916-27 NO. REQD 33
DEL TO Eric Anderssen
SURFACE TREATMT
IDENT METHOD TAG
PROJECT NUMBER N/A
PROJECT NAME N/A
DWG BY David Uken DATE 03-Apr-00
CHK BY DATE
APR BY Eric Anderssen DATE
SER NO. -
DATE ISSD -
DATE REQD -

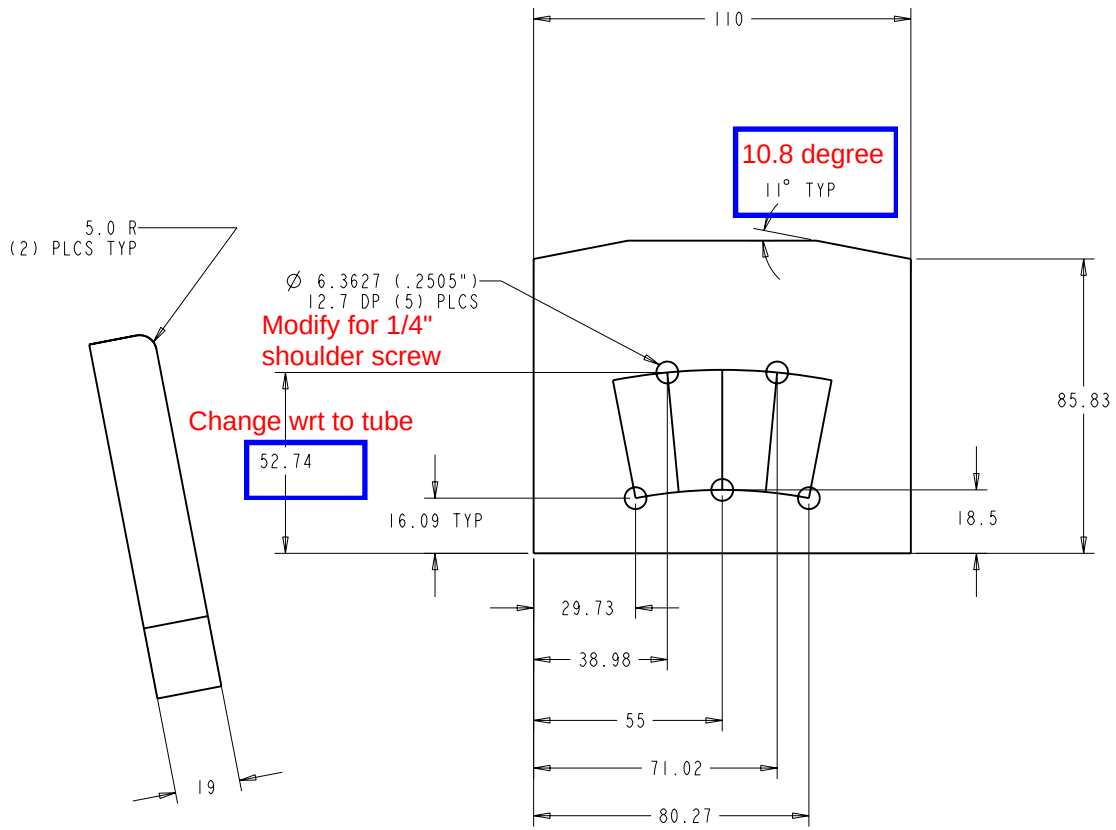
ERNEST ORLANDO LAWRENCE BERKELEY NATIONAL LABORATORY
UNIVERSITY OF CALIFORNIA - BERKELEY

Cooling Tube
II-Sector Version
ATLAS DETECTOR

MICROFILMED:	DWG. TYPE	SHOWN ON	SCALE: 1.000	DO NOT SCALE PRINTS
	PART		SHEET 1 OF 1	
PATENT CLEAR:	DESIGN ACCT. NO.	CATEGORY CODE	DWG. NO. 3	SIZE / REV.

DWG. NO. 13 SIZE REV. SH. 2000 11

DESCRIPTION	MATERIAL	MAT. LOCATION
		-



REV	DWG	CHK	ZONE	DATE	CHANGES

UNLESS OTHERWISE SPECIFIED

TOLERANCES: X.X ± 0.1 | FRAC. ± 1/64 | X.XX ± 0.01 | Angles ± 0.50° | X.XXX ± 0.001 | FINISH 125 √(μin)

DO NOT SCALE PRINT

THREADS ARE CLASS 2

CHAMFER ENDS OF ALL SCREW TREADS 30°

CUT ROUND, 1.5 THREAD RELIEF ON MACHINED THREADS

BREAK EDGES .016 MAX. ON MACHINED WORK

REMOVE BURRS, WELD SPLATTER & LOOSE SCALE

IN ACCORDANCE WITH ASME Y14.5M & B46.1

SHOP ORDERS

SER NO.	-		
ACCT NO.	7916-27	NO. REQD	1
DATE ISSD	-		
DEL TO	ERIC ANDERSSEN	DATE REQD	-
SURFACE TREATMT			
IDENT METHOD	TAG		
PROJECT NUMBER	N/A		
PROJECT NAME	N/A		
DWG BY	David Uken	DATE	03-Apr-00
CHK BY		DATE	
APR BY	Eric Anderssen	DATE	

ERNEST ORLANDO LAWRENCE
BERKELEY NATIONAL LABORATORY
UNIVERSITY OF CALIFORNIA - BERKELEY

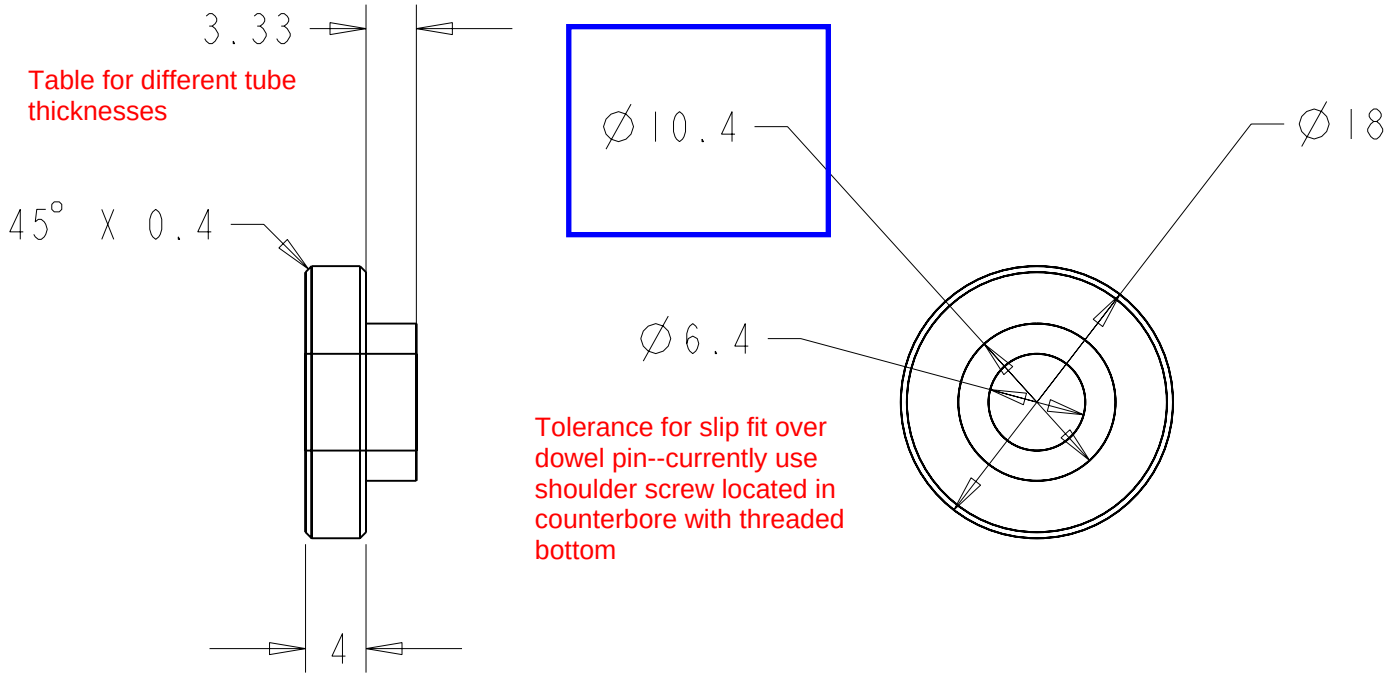
Cooling Tube Bending Jig
II-Sector Version
Atlas Detector

MICROFILMED:	DWG. TYPE	SHOWN ON	SCALE: 1.000	DO NOT SCALE PRINTS
	PART		SHEET 1 OF 1	
PATENT CLEAR:	DESIGN ACCT. NO.	CATEGORY CODE	DWG. NO. 3	SIZE / REV.

DWG. NO. 23 2000I1 SIZE REV. SH.

DWG. NO.	SIZE	REV.	SH.
1	2000i		1

Need table for different radii of bends (7.12 and 6.12)



REV	DWG	CHK	DATE	CHANGES

UNLESS OTHERWISE SPECIFIED

TOLERANCES			
X.X ±0.1	FRAC. ±1/64	FINISH 125 (Ra/µin)	
X.XX ±0.01	Angles ±0.50°		
X.XXX ±0.001			

DO NOT SCALE PRINT

THREADS ARE CLASS 2
CHAMFER ENDS OF ALL SCREW TREADS 30°
CUT ROUND, 1.5 THREAD RELIEF ON MACHINED THREADS
BREAK EDGES .016 MAX. ON MACHINED WORK
REMOVE BURRS, WELD SPLATTER & LOOSE SCALE
IN ACCORDANCE WITH ASME Y14.5M & B46.1

SHOP ORDERS

ACCT NO.	7916-27	NO. REQD 3	
DEL TO	Eric Andersen		
SURFACE TREATMT			
IDENT METHOD	TAG		
PROJECT NUMBER	N/A		
PROJECT NAME	N/A		
DWG BY	David Uken	DATE	05-Apr-00
CHK BY		DATE	
APR BY	Eric Andersen	DATE	

SER NO. -
DATE ISSD -
DATE REQD -

DESCRIPTION | MATERIAL

ERNEST ORLANDO LAWRENCE BERKELEY NATIONAL LABORATORY
UNIVERSITY OF CALIFORNIA - BERKELEY

Atlas Pixel Detector
9 and 11-Sector Versions
5.2 Radius Mandrel, Bending Jig

MICROFILMED:	DWG. TYPE	SHOWN ON	SCALE: 2.000	DO NOT SCALE PRINTS
	PART		SHEET 1 OF 1	
PATENT CLEAR:	DESIGN ACCT. NO.	CATEGORY CODE	DWG. NO. 1	SIZE / REV.

Dwg. File: BENDING_JIG_52R_MANDREL Model File: BENDING_JIG_52R_MANDREL

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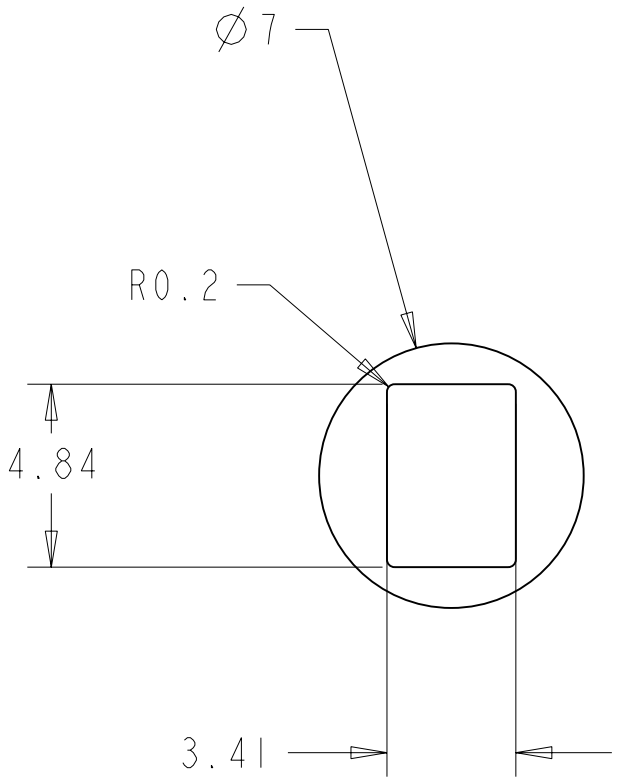
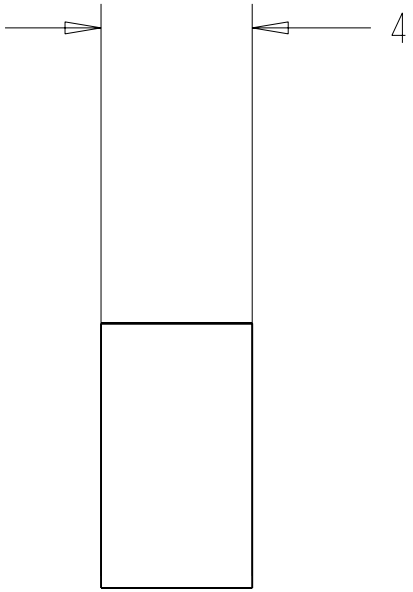
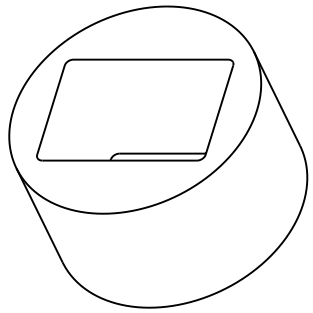
DWG. NO.	SIZE	REV.	SH.
1	2000i	1	

Part is obsolete







REV	DWG	CHK	DATE	CHANGES

UNLESS OTHERWISE SPECIFIED

TOLERANCES			
	X.X ±0.1	FRAC. ±1/64	
	X.XX ±0.01	Angles ±0.50°	
	X.XXX ±0.001	FINISH 125 (µin)	

DO NOT SCALE PRINT

THREADS ARE CLASS 2
CHAMFER ENDS OF ALL SCREW TREADS 30°
CUT ROUND, 1.5 THREAD RELIEF ON MACHINED THREADS
BREAK EDGES .016 MAX. ON MACHINED WORK
REMOVE BURRS, WELD SPLATTER & LOOSE SCALE
IN ACCORDANCE WITH ASME Y14.5M & B46.1

SHOP ORDERS

SER NO.	-		
ACCT NO.	91--	NO. REQD	
DATE ISSD	-		
DEL TO		DATE REQD	-
SURFACE TREATMT			
IDENT METHOD	TAG		
PROJECT NUMBER	N/A		
PROJECT NAME	N/A		
DWG BY	David Uken	DATE	07-Apr-00
CHK BY		DATE	
APR BY	Eric Anderssen	DATE	

DESCRIPTION | MATERIAL

ERNEST ORLANDO LAWRENCE BERKELEY NATIONAL LABORATORY
UNIVERSITY OF CALIFORNIA - BERKELEY

Atlas Pixel Detector
9 and 11-Sector Versions
Bushing Adapter, Cooling Tube to Round

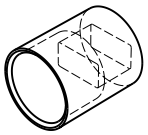
MICROFILMED:	DWG. TYPE	SHOWN ON	SCALE: 5.000	DO NOT SCALE PRINTS
	PART		SHEET 1 OF 1	
PATENT CLEAR:	DESIGN ACCT. NO.	CATEGORY CODE	DWG. NO. 1	SIZE / REV.

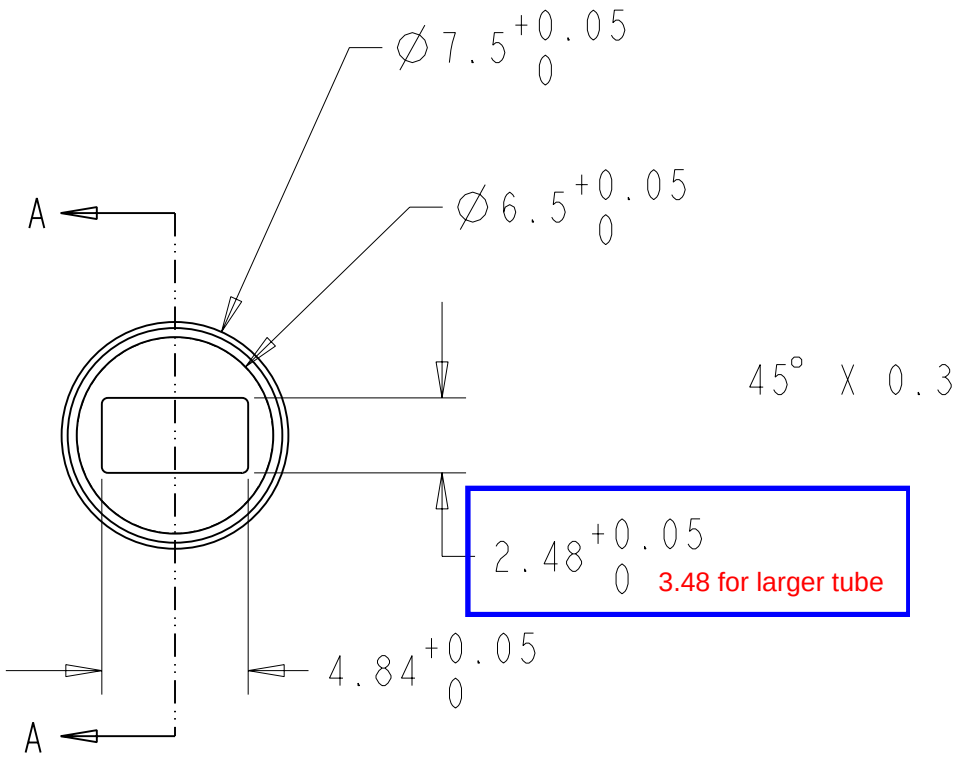
Dwg. File: BUSHING_3B4_4_TUBING Model File: BUSHING_3B4__4TUBING

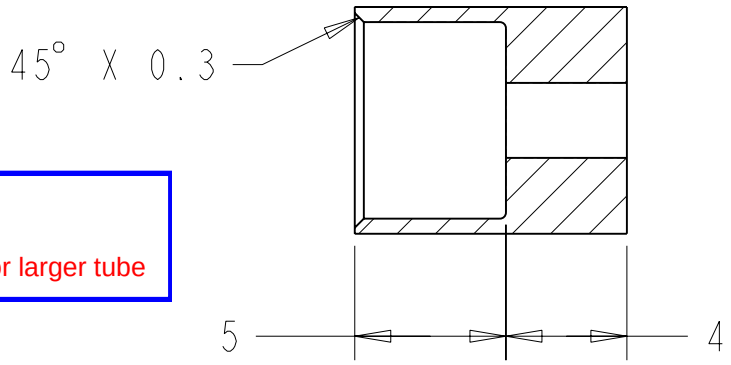
Rev. 1/29/2000 J. R. Osborn

DWG. NO.	SIZE	REV.	SH.
nnXnnn1		A	1

Will forward this part to D Uken for inclusion in sector assembly. It has a family table for different parts, but needs instances added to account for the larger square tube







SECTION A-A

SCALE 4.000

REV	DWG	CHK	DATE	CHANGES

UNLESS OTHERWISE SPECIFIED

TOLERANCES			
X.X ±0.5	FRAC. ±1/64		
X.XX ±0.05	Angles ±1.00°		
X.XXX ±0.010	FINISH 125 (Ra)		

DO NOT SCALE PRINT

THREADS ARE CLASS 2
CHAMFER ENDS OF ALL SCREW TREADS 30°
CUT ROUND, 1.5 THREAD RELIEF ON MACHINED THREADS
BREAK EDGES .016 MAX. ON MACHINED WORK
REMOVE BURRS, WELD SPLATTER & LOOSE SCALE
IN ACCORDANCE WITH ASME Y14.5M & B46.1

SHOP ORDERS			
ACCT NO. PIAP-12	NO. REQD 15	SER NO. -	
DEL TO PICK UP		DATE ISSD -	DATE REQD -
SURFACE TREATMT -			
IDENT METHOD TAG			
PROJECT NUMBER N/A			
PROJECT NAME N/A			
DWG BY E Anderssen		DATE 18-Apr-00	
CHK BY None		DATE 3/18/00	
APR BY Anderssen		DATE 3/18/00	

-	Aluminum
DESCRIPTION	MATERIAL

ERNEST ORLANDO LAWRENCE
BERKELEY NATIONAL LABORATORY
UNIVERSITY OF CALIFORNIA - BERKELEY

ATLAS Pixel Detector
Sector Tubing
TERMINATION FOR SECTOR PROTOTYPE

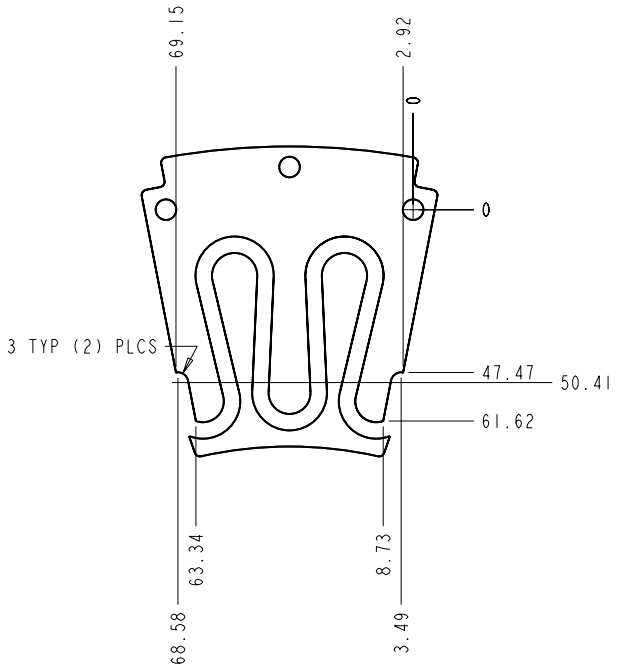
MICROFILMED:	DWG. TYPE	SHOWN ON	SCALE: 4.000	DO NOT SCALE PRINTS
	nnXnnn	nnXnnn	nnXSHEET 1 OF 1	
PATENT CLEAR:	DESIGN ACCT. NO.	CATEGORY CODE	DWG. NO. nnXnnn1	SIZE / REV.
	PIAP-12	XXnnnn		

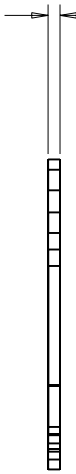
Dwg. File: TUBE_TERMINATION_250 Model File: QUARTER_INCH

Rev. 1/29/2000 J. R. Osborn

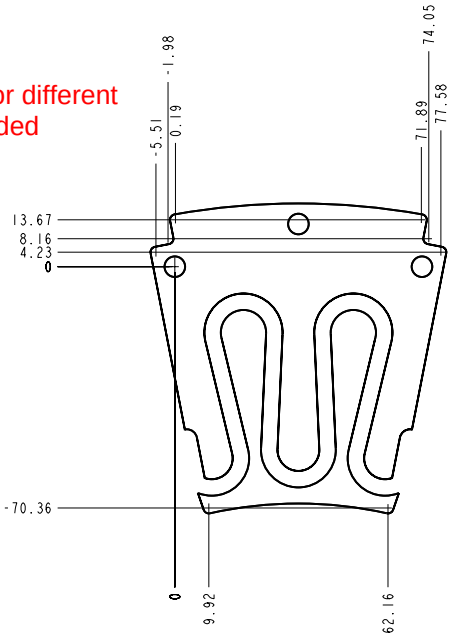
DESCRIPTION	MATERIAL	MAT. LOCATION
		-

Update model with new tube dimensions--also, need to allot gap between tube and foam. Currently this is a line fit, need to give 0.5mm per side. This will either move up the wedge piece, or make it shorter.





Need table for different thickness added



REV	DWG	CHK	ZONE	DATE	CHANGES

UNLESS OTHERWISE SPECIFIED

TOLERANCES: X.X ± 0.1 | FRAC. ± 1/64 | X.XX ± 0.03 | Angles ± 1.00° | X.XXX ± 0.010 | FINISH 125 √(μin)

DO NOT SCALE PRINT

THREADS ARE CLASS 2
CHAMFER ENDS OF ALL SCREW TREADS 30°
CUT ROUND, 1.5 THREAD RELIEF ON MACHINED THREADS
BREAK EDGES .016 MAX. ON MACHINED WORK
REMOVE BURRS, WELD SPLATTER & LOOSE SCALE
IN ACCORDANCE WITH ASME Y14.5M & B46.1

SHOP ORDERS

SER NO.	-		
ACCT NO.	7916-27	NO. REQD	33
DATE ISSD	-		
DEL TO	ERIC ANDERSSEN	DATE REQD	-
SURFACE TREATMT			
IDENT METHOD	TAG		
PROJECT NUMBER	N/A		
PROJECT NAME	N/A		
DWG BY	David Uken	DATE	04-Apr-00
CHK BY		DATE	
APR BY	Eric Anderssen	DATE	

ERNEST ORLANDO LAWRENCE BERKELEY NATIONAL LABORATORY
UNIVERSITY OF CALIFORNIA - BERKELEY

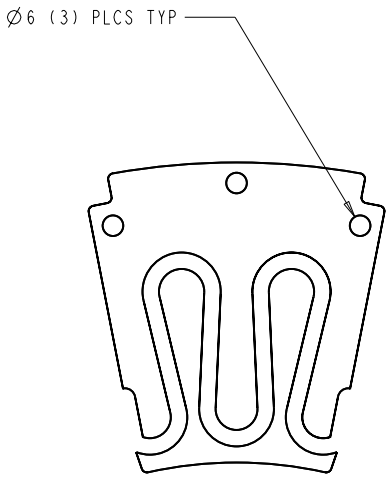
Foam, Perimeter Shape
II-Sector Version
Atlas Detector

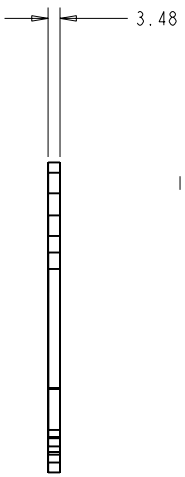
MICROFILMED:	DWG. TYPE	SHOWN ON	SCALE: 1.000	DO NOT SCALE PRINTS
	PART		SHEET 1 OF 2	
PATENT CLEAR:	DESIGN ACCT. NO.	CATEGORY CODE	DWG. NO. 3	SIZE / REV.

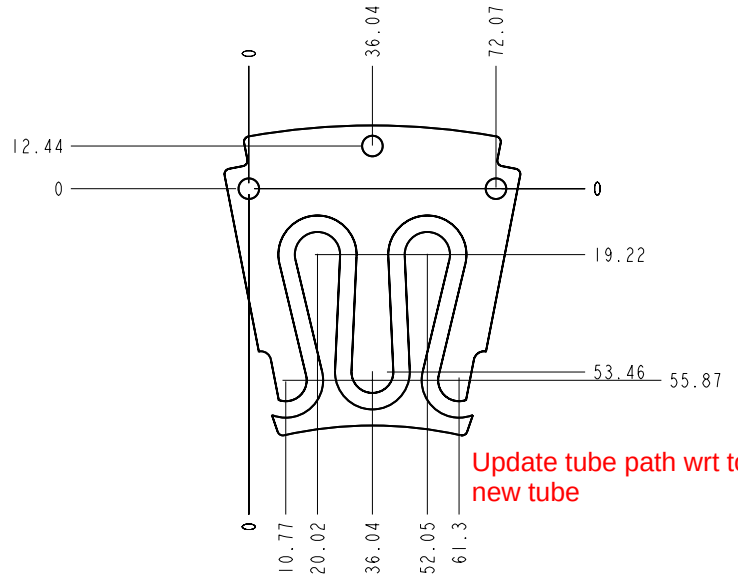
DWG. NO. 43 SIZE REV. SH. 2000 11

Ref. File: SECTOR_II_FOAM_Model File: SECTOR_II_FOAM

DESCRIPTION	MATERIAL	MAT. LOCATION
		-







Update tube path wrt to new tube

DWG. NO. 43 SIZE REV. SH. 2000 11

REV	DWG	CHK	ZONE	DATE	CHANGES

UNLESS OTHERWISE SPECIFIED

TOLERANCES: X.X ± 0.1 FRAC. ± 1/64; X.XX ± 0.03 Angles ± 1.00°; X.XXX ± 0.010 FINISH $\sqrt{}$ (125 µm)

DO NOT SCALE PRINT

THREADS ARE CLASS 2

CHAMFER ENDS OF ALL SCREW TREADS 30°

CUT ROUND, 1.5 THREAD RELIEF ON MACHINED THREADS

BREAK EDGES .016 MAX. ON MACHINED WORK

REMOVE BURRS, WELD SPLATTER & LOOSE SCALE

IN ACCORDANCE WITH ASME Y14.5M & B46.1

SHOP ORDERS

SER NO.	-		
ACCT NO.	7916-27	NO. REQD	33
DATE ISSD	-		
DEL TO	ERIC ANDERSSEN	DATE REQD	-
SURFACE TREATMT			
IDENT METHOD	TAG		
PROJECT NUMBER	N/A		
PROJECT NAME	N/A		
DWG BY	David Uken	DATE	04-Apr-00
CHK BY		DATE	
APR BY	Eric Anderssen	DATE	

ERNEST ORLANDO LAWRENCE BERKELEY NATIONAL LABORATORY
UNIVERSITY OF CALIFORNIA - BERKELEY

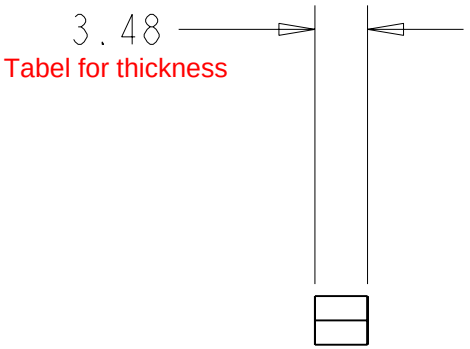
Foam, Interior Cutouts and Holes
II-Sector Version
Atlas Detector

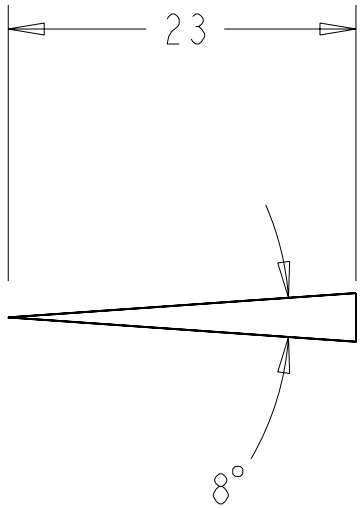
MICROFILMED:	DWG. TYPE	SHOWN ON	SCALE: 1.000	DO NOT SCALE PRINTS
	PART		SHEET 2 OF 2	
PATENT CLEAR:	DESIGN ACCT. NO.	CATEGORY CODE	DWG. NO. 3	SIZE / REV.

Dwg. File: SECTOR_II_FOAM2 Model File: SECTOR_II_FOAM

DWG. NO.	SIZE	REV.	SH.
81	2000i	1	

Wedge piece must be adjusted for gap between it and tube.





REV	DWG	CHK	DATE	CHANGES	DESCRIPTION	MATERIAL

UNLESS OTHERWISE SPECIFIED

TOLERANCES: X.X ±0.1 | FRAC. ±1/64 | X.XX ±0.01 | Angles ±0.50° | X.XXX ±0.001 | FINISH 125 √(μin)

DO NOT SCALE PRINT

THREADS ARE CLASS 2
CHAMFER ENDS OF ALL SCREW TREADS 30°
CUT ROUND, 1.5 THREAD RELIEF ON MACHINED THREADS
BREAK EDGES .016 MAX. ON MACHINED WORK
REMOVE BURRS, WELD SPLATTER & LOOSE SCALE
IN ACCORDANCE WITH ASME Y14.5M & B46.1

SHOP ORDERS

SER NO.	-		
ACCT NO.	7916-27	NO. REQD	66
DATE ISSD	-		
DEL TO		DATE REQD	-
SURFACE TREATMT			
IDENT METHOD	TAG		
PROJECT NUMBER	N/A		
PROJECT NAME	N/A		
DWG BY	David Uken	DATE	04-Apr-00
CHK BY		DATE	
APR BY	Eric Anderssen	DATE	

ERNEST ORLANDO LAWRENCE BERKELEY NATIONAL LABORATORY
UNIVERSITY OF CALIFORNIA - BERKELEY

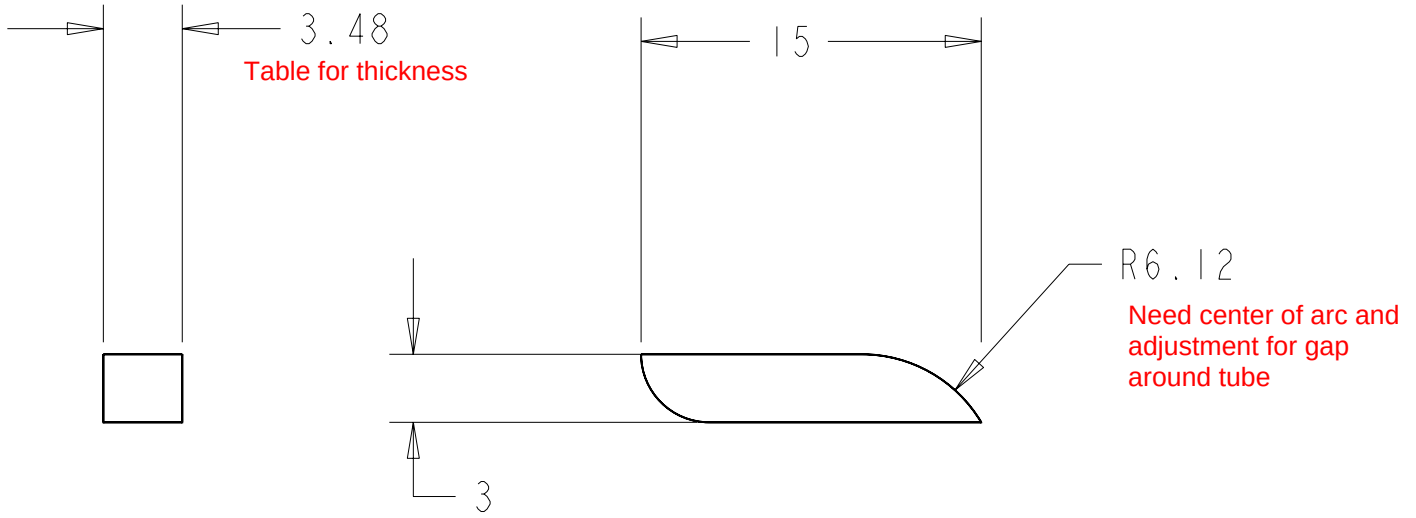
Support Wedge, Outer
II-Sector Version
Atlas Detector

MICROFILMED:	DWG. TYPE	SHOWN ON	SCALE: 2.000	DO NOT SCALE PRINTS
	PART		SHEET 1 OF 1	
PATENT CLEAR:	DESIGN ACCT. NO.	CATEGORY CODE	DWG. NO. 1	SIZE / REV.

Dwg. File: SUPPORT_WEDGE_II_OUTER Model File: SUPPORT_WEDGE_II_OUTER

Rev. 1/29/2000 J. R. Osborn

DWG. NO.	SIZE	REV.	SH.
71	2000	i	1



REV	DWG	CHK	DATE	CHANGES	DESCRIPTION	MATERIAL

UNLESS OTHERWISE SPECIFIED

TOLERANCES			
	X.X ±0.1	FRAC. ±1/64	
	X.XX ±0.01	Angles ±0.50°	
	X.XXX ±0.001	FINISH 125 (µin.)	

DO NOT SCALE PRINT

THREADS ARE CLASS 2
CHAMFER ENDS OF ALL SCREW TREADS 30°
CUT ROUND, 1.5 THREAD RELIEF ON MACHINED THREADS
BREAK EDGES .016 MAX. ON MACHINED WORK
REMOVE BURRS, WELD SPLATTER & LOOSE SCALE
IN ACCORDANCE WITH ASME Y14.5M & B46.1

SHOP ORDERS

SER NO.	-		
ACCT NO.	7916-27	NO. REQD	66
DATE ISSD	-		
DEL TO	Eric Anderssen	DATE REQD	-
SURFACE TREATMT			
IDENT METHOD	TAG		
PROJECT NUMBER	N/A		
PROJECT NAME	N/A		
DWG BY	David Uken	DATE	04-Apr-00
CHK BY		DATE	
APR BY	Eric Anderssen	DATE	

ERNEST ORLANDO LAWRENCE BERKELEY NATIONAL LABORATORY
UNIVERSITY OF CALIFORNIA - BERKELEY

Support Wedge, Inner
II-Sector Version
Atlas Detector

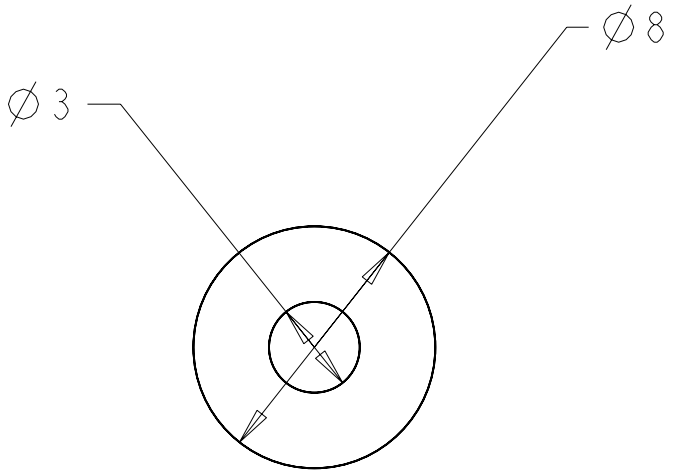
MICROFILMED:	DWG. TYPE	SHOWN ON	SCALE: 3.000	DO NOT SCALE PRINTS
	PART		SHEET 1 OF 1	
PATENT CLEAR:	DESIGN ACCT. NO.	CATEGORY CODE	DWG. NO. 1	SIZE / REV.

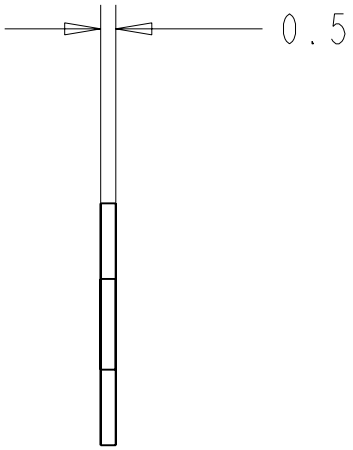
Dwg. File: SUPPORT_WEDGE_II_INNER Model File: SUPPORT_WEDGE_II_INNER

Rev. 1/29/2000 J. R. Osborn

DWG. NO.	SIZE	REV.	SH.
61	2000i	1	

Drawing obsolete, need new model for "T" washer





REV	DWG	CHK	DATE	CHANGES

UNLESS OTHERWISE SPECIFIED

TOLERANCES:
- X.X ±0.1
- X.XX ±0.03
- X.XXX ±0.010
- FRAC. ±1/64
- Angles ±1.00°
- FINISH 125 (µin)

DO NOT SCALE PRINT

THREADS ARE CLASS 2
CHAMFER ENDS OF ALL SCREW TREADS 30°
CUT ROUND, 1.5 THREAD RELIEF ON MACHINED THREADS
BREAK EDGES .016 MAX. ON MACHINED WORK
REMOVE BURRS, WELD SPLATTER & LOOSE SCALE
IN ACCORDANCE WITH ASME Y14.5M & B46.1

SHOP ORDERS

SER NO.	-		
ACCT NO.	7916-27	NO. REQD	306
DATE ISSD	-		
DEL TO	Eric Anderssen	DATE REQD	-
SURFACE TREATMT			
IDENT METHOD	TAG		
PROJECT NUMBER	N/A		
PROJECT NAME	N/A		
DWG BY	David Uken	DATE	04-Apr-00
CHK BY		DATE	
APR BY	Eric Anderssen	DATE	

DESCRIPTION | MATERIAL

ERNEST ORLANDO LAWRENCE BERKELEY NATIONAL LABORATORY
UNIVERSITY OF CALIFORNIA - BERKELEY

Washer
9 and 11-Sector Versions
Atlas Detector

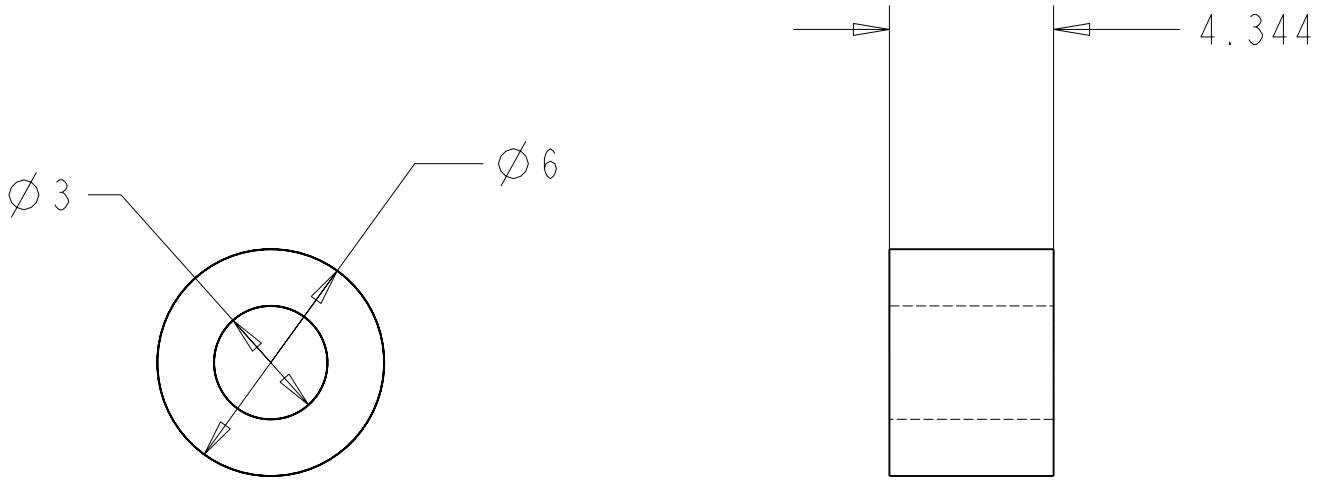
MICROFILMED:	DWG. TYPE	SHOWN ON	SCALE: 4.000	DO NOT SCALE PRINTS
	PART		SHEET 1 OF 1	
PATENT CLEAR:	DESIGN ACCT. NO.	CATEGORY CODE	DWG. NO. 1	SIZE / REV.

Dwg. File: WASHER Model File: WASHER

Rev. 1/29/2000 J. R. Osborn

DWG. NO.	SIZE	REV.	SH.
11	2000	1	

Drawing is obsolete, need drawing for "T" washer



REV	DWG	CHK	DATE	CHANGES

DESCRIPTION	MATERIAL

UNLESS OTHERWISE SPECIFIED

TOLERANCES			
X.X ±0.1	FRAC. ±1/64	FINISH 125 (µin)	
X.XX ±0.03	Angles ±1.00°		
X.XXX ±0.010			

DO NOT SCALE PRINT

THREADS ARE CLASS 2
CHAMFER ENDS OF ALL SCREW TREADS 30°
CUT ROUND, 1.5 THREAD RELIEF ON MACHINED THREADS
BREAK EDGES .016 MAX. ON MACHINED WORK
REMOVE BURRS, WELD SPLATTER & LOOSE SCALE
IN ACCORDANCE WITH ASME Y14.5M & B46.1

SHOP ORDERS

SER NO.	-		
ACCT NO.	7916-27	NO. REQD	153
DATE ISSD	-		
DEL TO	Eric Anderssen	DATE REQD	-
SURFACE TREATMT			
IDENT METHOD	TAG		
PROJECT NUMBER	N/A		
PROJECT NAME	N/A		
DWG BY	David Uken	DATE	04-Apr-00
CHK BY		DATE	
APR BY	Eric Anderssen	DATE	

ERNEST ORLANDO LAWRENCE BERKELEY NATIONAL LABORATORY
UNIVERSITY OF CALIFORNIA - BERKELEY

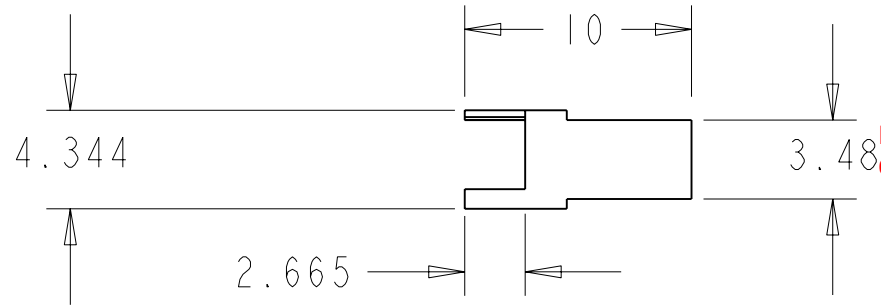
Bushing
9 and 11-Sector Versions
Atlas Detector

MICROFILMED:	DWG. TYPE	SHOWN ON	SCALE: 5.000	DO NOT SCALE PRINTS
	PART		SHEET 1 OF 1	
PATENT CLEAR:	DESIGN ACCT. NO.	CATEGORY CODE	DWG. NO. 1	SIZE / REV.

Dwg. File: BUSHING Model File: BUSHING

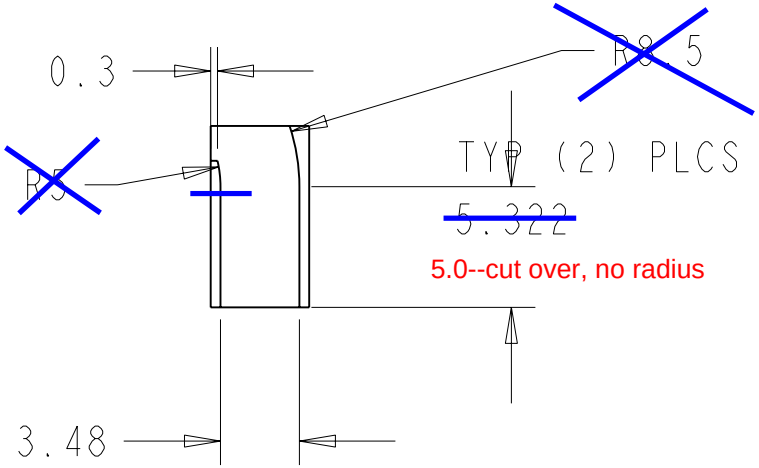
Rev. 1/29/2000 J. R. Osborn

DWG. NO.	SIZE	REV.	SH.
91	2000i	1	



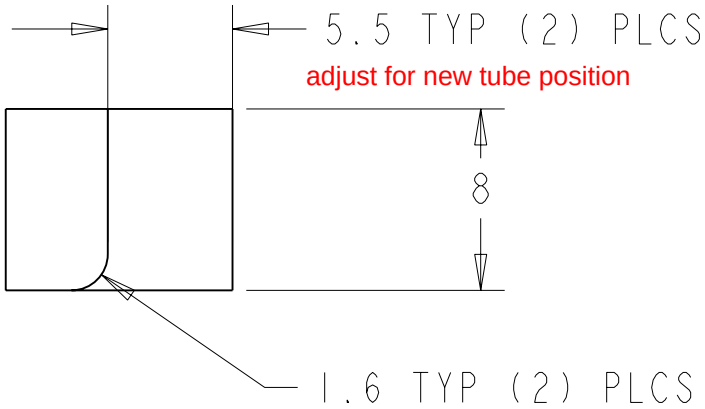
Need table for different thickness

Need table for different thickness

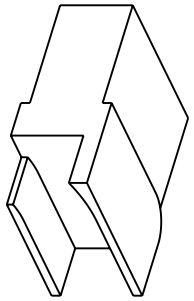


5.0--cut over, no radius

Need table for different tubes



adjust for new tube position



REV	DWG	CHK	DATE	CHANGES

DESCRIPTION | MATERIAL

UNLESS OTHERWISE SPECIFIED

TOLERANCES			
X.X ±0.1	FRAC. ±1/64		
X.XX ±0.01	Angles ±0.50°		
X.XXX ±0.001	FINISH 125 (µin)		

DO NOT SCALE PRINT

THREADS ARE CLASS 2
CHAMFER ENDS OF ALL SCREW TREADS 30°
CUT ROUND, 1.5 THREAD RELIEF ON MACHINED THREADS
BREAK EDGES .016 MAX. ON MACHINED WORK
REMOVE BURRS, WELD SPLATTER & LOOSE SCALE
IN ACCORDANCE WITH ASME Y14.5M & B46.1

SHOP ORDERS

SER NO.	-		
ACCT NO.	7916-27	NO. REQD	33
DATE ISSD	-		
DEL TO	Eric Anderssen	DATE REQD	-
SURFACE TREATMT			
IDENT METHOD	TAG		
PROJECT NUMBER	N/A		
PROJECT NAME	N/A		
DWG BY	David Uken	DATE	04-Apr-00
CHK BY		DATE	
APR BY	Eric Anderssen	DATE	

ERNEST ORLANDO LAWRENCE BERKELEY NATIONAL LABORATORY
UNIVERSITY OF CALIFORNIA - BERKELEY

Strain Relief, Right-side Cooling Tube
II-Sector Version
Atlas Detector

MICROFILMED:	DWG. TYPE	SHOWN ON	SCALE: 3.000	DO NOT SCALE PRINTS
	PART		SHEET 1 OF 1	
PATENT CLEAR:	DESIGN ACCT. NO.	CATEGORY CODE	DWG. NO. 1	SIZE / REV.

Dwg. File: SECTOR_II_STRAINRELIEF_RT Model File: SECTOR_II_STRAINRELIEF_RT

Rev. 1/29/2000 J. R. Osborn