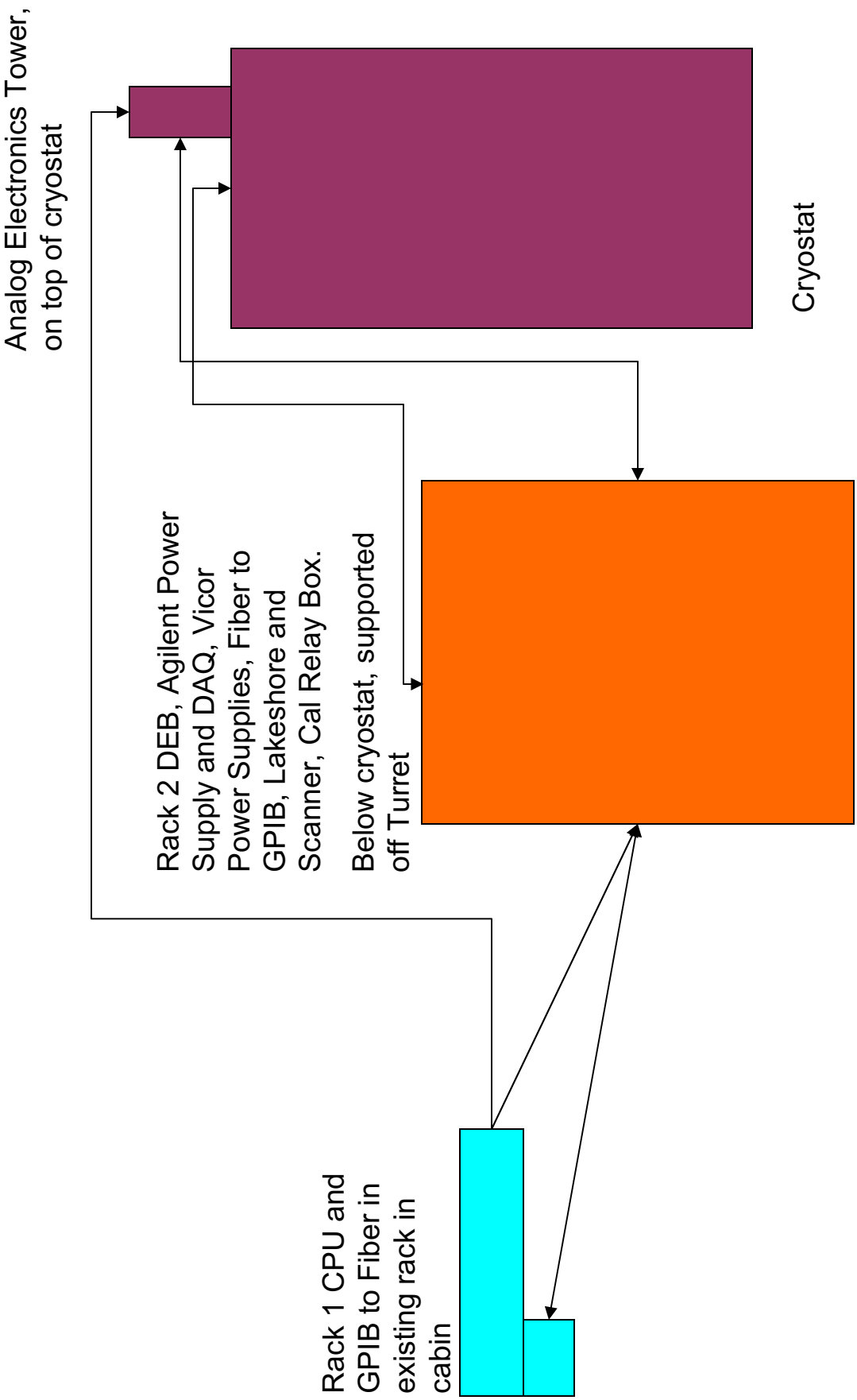
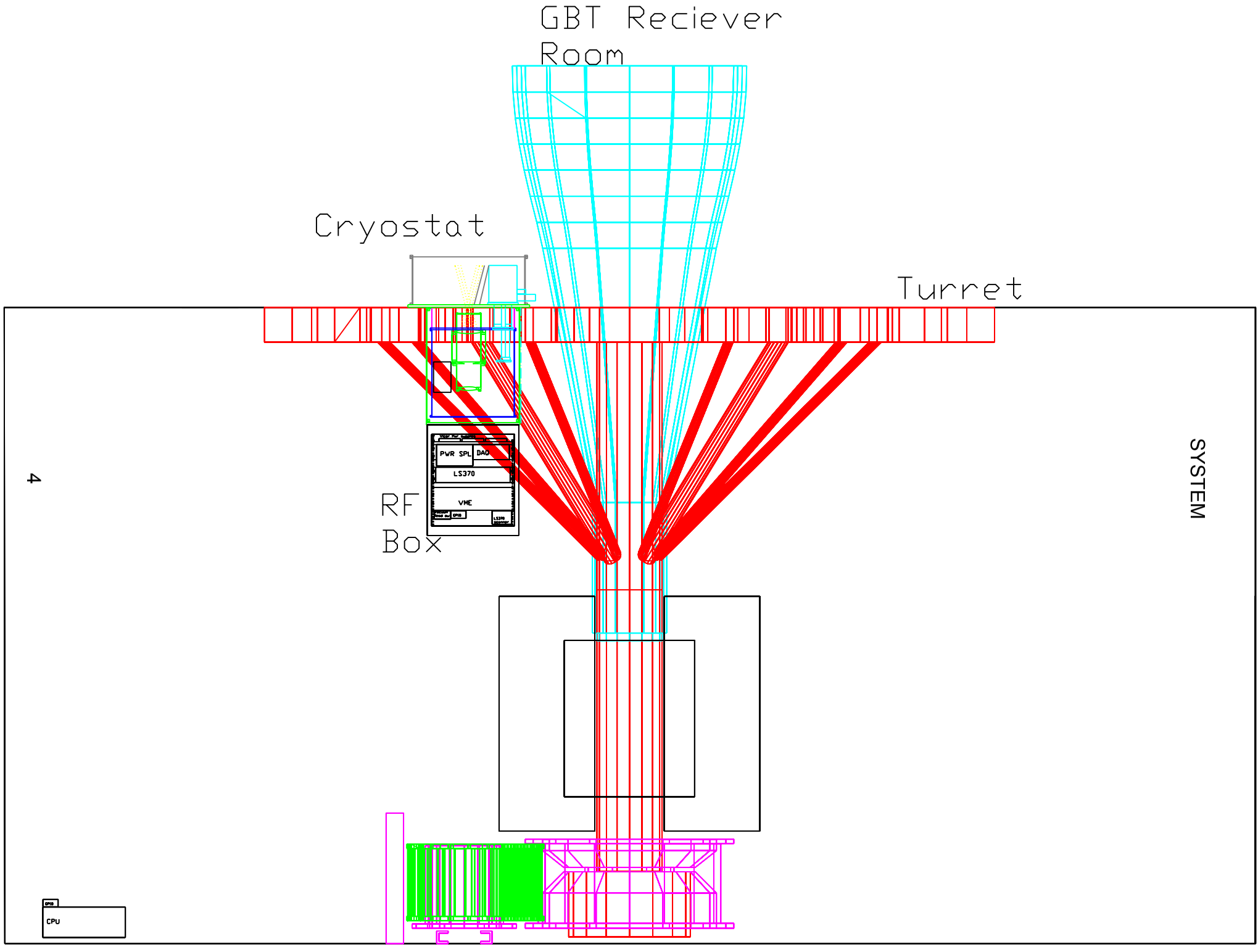
# Penn Array Receiver

## Penn Array Receiver CDR Document 5: Supplementary Material

# Contents

# System Block Diagram




GBT Reciever Room
Cryostat
Turret
RF Box
PWR SPL
DAQ
LS370
VME
CPU
SYSTEM
4

# 90 GHz array – Bill of materials

| Part# | total #required | description |
|---|---|---|
| **CABLES** | **46** | **see cables bill of materials & wiring diagrams (pg 9,10)** |
| **COMPUTER – used to control the whole experiment, mounted off the turret.** | | |
| Computer | 1 | 19" rack mounted computer, 2.4GHz single CPU, running LINUX, Ethernet, parallel, 2 USB, & serial ports on mother board, CDRW, and floppy disk. |
| IEEE interface card | 1 | PCI GPIB interface card with LINUX drivers. |
| Serial port card | 1 | PCI serial port extender – provides two more serial ports. |
| Custom IO card | 1 | PCI 16 channel fiber IO card, custom made by NIST. |
| **RFI enclosure – 19" rack** | **1** | **made by Green Bank, mounted on the turret.** |
| DIGITAL ELECTRONICS BOX – part of the multiplexing electronics mounted in the RFI enclosure. | | |
| Rack | 1 | 19" 3U high rack, custom backplane from NIST. |
| Digital feedback cards | 8 | Custom made digital feedback cards from NIST. |
| Clock card | 1 | Custom made clock card from NIST. |
| Facilities acquisition card | 1 | Custom made DAQ card from NIST. |
| Agilent 34970A | 1 | 20 Analogue inputs, 4 Analogue outputs, 4 digital inputs/outputs, GPIB interface. |
| Agilent E3647A | 1 | dual power supply GPIB interface. |
| Lakeshore 370 | 1 | 16 channel scanning resistance bridge & temperature controller. |
| Power supply for the digital electronics box & the electronics tower. | | |
| Box | 1 | 1U high 19" rack mount box. |
| Vicor VPA1104185 | 1 | three channel power supply, 12V,12V, & 12V (adjustable). |
| Vicor VPA1104077 | 1 | three channel power supply, 12V,12V, & 3.3V (adjustable). |
| Vicor VPA1104081 | 1 | three channel power supply, 12V,15V, & 12V (adjustable). |
| **ELECTRONICS TOWER – part of the multiplexing electronics, located on top of the cryostat.** | | |
| Box | 1 | Machined metal box by Penn. |
| Power card | 1 | custom made by NIST. |
| Address card | 1 | custom made by NIST. |
| Pre-amp card | 1 | custom made by NIST. |
| Bias cards | 4 | custom made by NIST. |
| **CRYOSTAT** | **1** | **see cryostat bill of materials & drawings (pg 19)** |
| **INSIDE THE CRYOSTAT** | | |
| Lakeshore RX-202A-AA-M | 12 | ROX thermometers, matched. |
| 0.5W resistors | 6 | used as heaters, values 200–20kΩ. |
| Address card | 1 | custom card for multiplexing. Made by NIST. |
| Series array | 1 | 3rd stage of amplification for detector readout, at 3 kelvin. |
| Detector package | 1 | made by GSFC. |
| Optics tower | 1 | see optics tower bill of materials and drawings . |
| Heatswiches | 2 | $He^3$ gas gap heatswitches from Chase Research. |
| PT405 | 1 | 2 stage pulse tube from Cryomech. |
| Sorption refrigerator | 1 | $He^3$ adsorption refrigerator made by Penn. |
| Sorption refrigerator | 1 | $He^4$ adsorption refrigerator made by Penn. |
| OFHC heat straps | 7 | to link; the PT405 to the base plates (2);the optics to the 3K baseplate; the heatswitches to the charcoal pumps (2); the $He^4$ evaporator to the $He^3$ condenser; the $He^3$ evaporator to the array. |
| **Vacuum valve** | **1** | **KF40 style vacuum valve.** |

**Spares are not included in this list.**

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# Electronics - wiring diagrams and parts list

NOTES

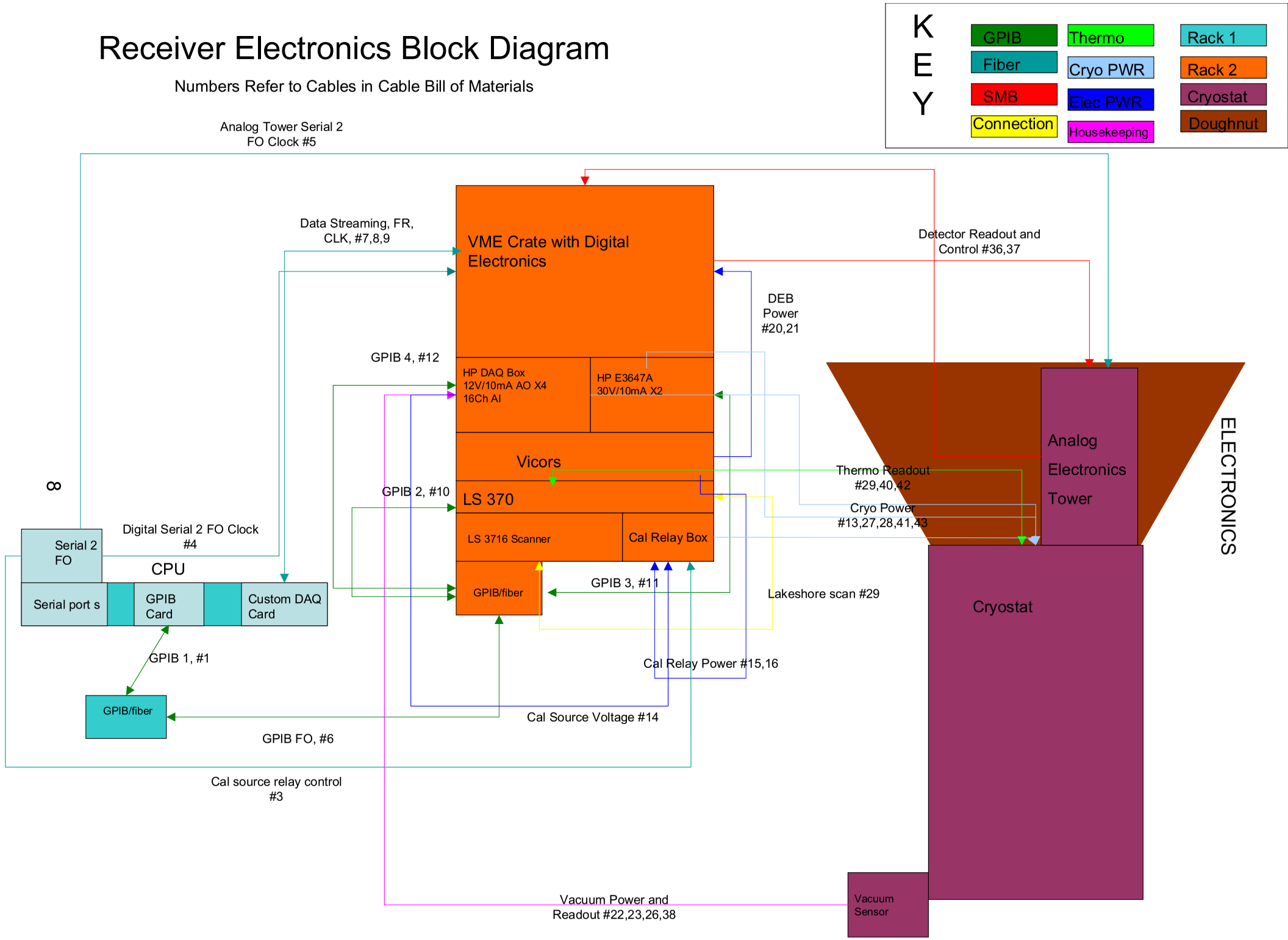
The complete wiring diagram for the PAR is available on the website: http://chile1.physics.upenn.edu/GBT
.
Username : GBT
Password : greenbank

Selected parts are included in this document.

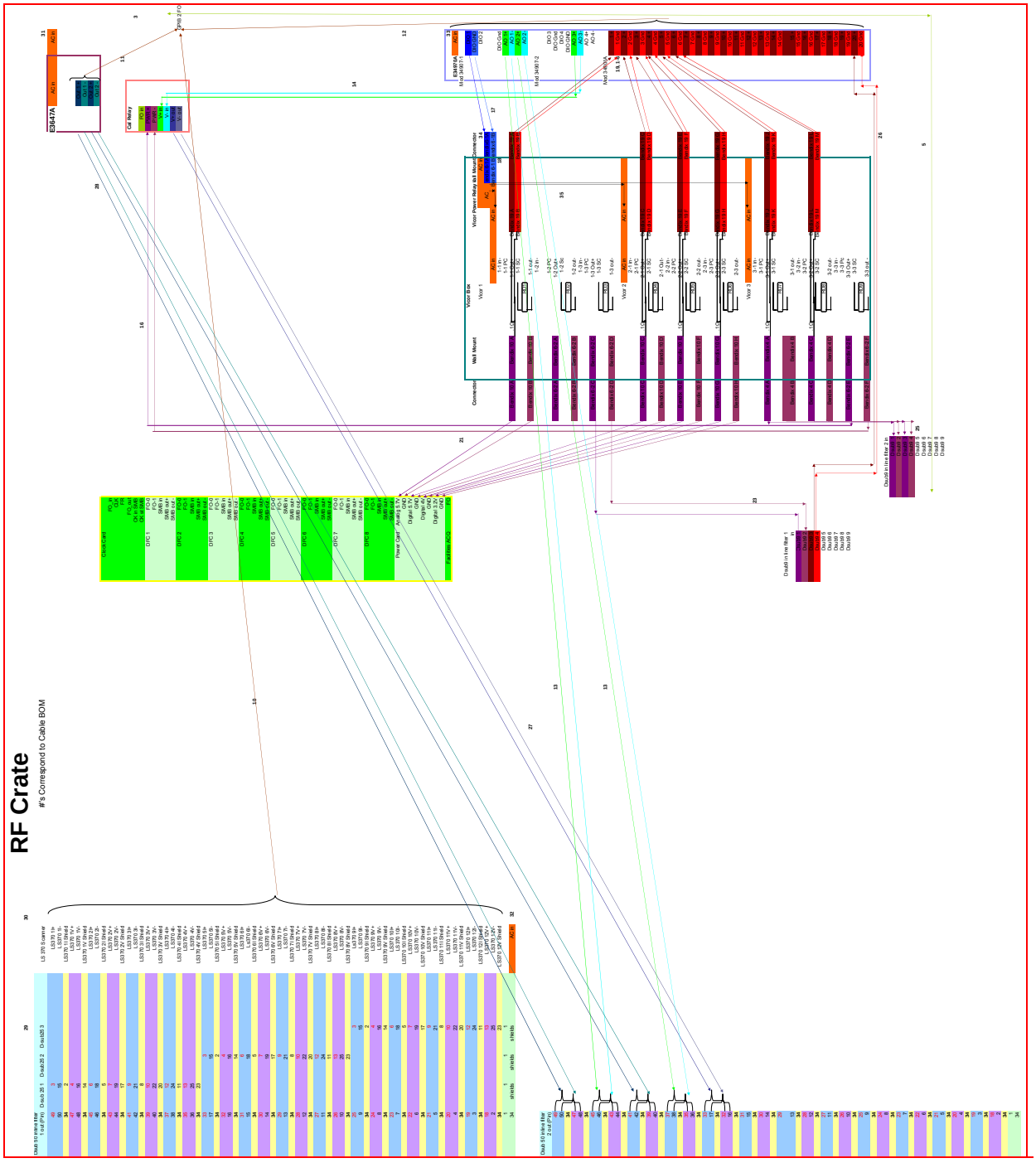
It is important to ensure that power to the analog electronics tower is turned on after the digital electronics To do this hold up capacitors delay the power-up of the Vicor supplies by different amounts.

# Receiver Electronics Block Diagram

Numbers Refer to Cables in Cable Bill of Materials



RF Crate - schematic diagram



# Non-Cryogenic Cabling Bill of Materials

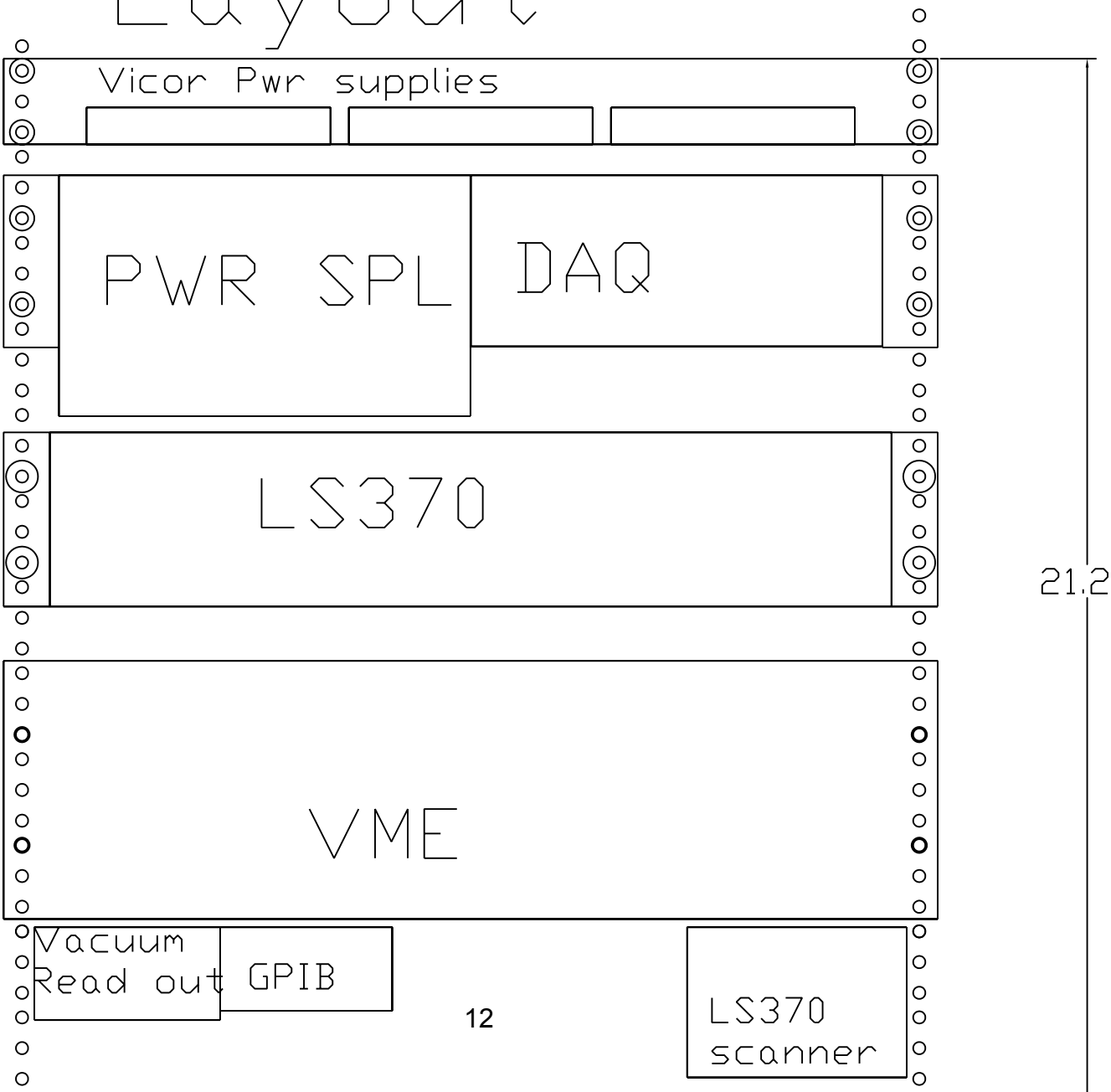
| | | | | CPU Rack | RX Room | Electronics Rack | Doughnut |
|---|---|---|---|---|---|---|---|
| **Cable #** | **Cable Name** | **# of Cables** | **Start Location** | **End Location** | **Start Connector Type** | **End Connector Type** | **Cable Type** |
| 1 | GPIB 1 | 1 | CPU Rack, GPIB PCI Card | CPU Rack GPIB to FO Box | GPIB | GPIB | GPIB |
| 2 | CPU Power | 1 | CPU Rack | CPU | AC | AC | AC |
| 3 | Relay Box serial 2 FO | 1 | CPU Rack, Serial Port 0 Converter | Rack Relay Box FO in | Fiber optic versalint | fiber optic versalint | Fiber optic |
| 4 | DEB serial 2 FO | 1 | CPU Rack, Serial Port 2 Converter | Rack, DEB, Clock Card FO in | Fiber optic versalint | fiber optic versalint | Fiber optic |
| 5 | Analog serial 2 FO | 1 | CPU Rack, Serial Port 3 Converter | Analog Tower Power Card FO (thru Rack) | Fiber optic versalint | fiber optic versalint | Fiber optic |
| 6 | GPIB FO | 1 | CPU Rack GPIB to FO Box | RACK DEB, FO 2 GPIB Box | Fiber optic versalint | fiber optic versalint | Fiber optic |
| 7 | DEB FR FO | 1 | CPU Rack, Custom PCI Card, FR | Rack, DEB, Clock Card, FR | Fiber optic versalint | fiber optic versalint | Fiber optic |
| 8 | DEB CLK FO | 1 | CPU Rack, Custom PCI Card, CLK | Rack, DEB, Clock Card, CLK | Fiber optic versalint | fiber optic versalint | Fiber optic |
| 9 | Data FO | 8 | CPU Rack, Custom PCI Card, fo0-7 | Rack, DEB, DFC1-8, FO-1 | Fiber optic versalint | fiber optic versalint | Fiber optic |
| 10 | GPIB 2 | 1 | LS370 | Fiber Box to GPIB | GPIB | GPIB | GPIB |
| 11 | GPIB 3 | 1 | Agilent E3647A | Fiber Box to GPIB | GPIB | GPIB | GPIB |
| 12 | GPIB 4 | 1 | Agilent 34970A | Fiber Box to GPIB | GPIB | GPIB | GPIB |
| 13 | Heat Switch Powers | 1 | Agilent 34970A Mod 1 AO1,2 | Rack Dsub 50 Filter 2 (in) | Screw terminals | Dsub 50 socket | shielded twisted pair |
| 14 | Cal Source Voltage | 1 | Agilent 34970A Mod 2 AO3 | Relay Box | Screw Terminals | 9 pin Bendix | shielded twisted pair |
| 15 | Cal Relay Box Power (Vicor) | 1 | Vicor 3-3 Out+,- | Vicor Bendix 6 Pin #2 in | Lugs | 6 pin Bendix | shielded twisted pair |
| 16 | Cal Relay Box Power (rack) | 1 | Vicor Bendix 6 pin #2 out | Relay Box | 6 Pin Bendix | 9 pin Bendix | |
| 17 | Vicor Power Relay Control (rack) | 1 | Agilent 34970A Mod 1 DIO1 | Vicor Bendix 6 pin #1 out | Screw terminals | 6 Pin Bendix | shielded twisted pair |
| 18 | Vicor Power Relay Control (vicor) | 1 | Vicor Bendix 6 pin #1 in | Vicor Power Relay | 6 Pin Bendix | relay | |
| 19 | Current Monitors | 6 | Agilent 34970A Mod3 AI1-6 | Vicor Power Modules Resistors | Screw terminals | Bendix 19 pin | shielded twisted pair |
| 20 | DEB Power Cable (Vicor) | 1 | Vicors 1-1, 2-1, 2-2, 2-3 | Vicor Bendix 10 pin in | Lugs | Bendix 10 pin | shielded twisted pair |
| 21 | DEB Power Cable (rack) | 1 | Vicor Bendix 10 Pin Out | DEB Box Power | 10 Pin Bendix | Card Connector | |
| 22 | Vacuum Power (vicor) | 1 | Vicor 1-3 Out+,- | Bendix 6 pin #2 (in) | Lugs | 6 pin bendix | shielded twisted pair |
| 23 | Vacuum Power (rack) | 1 | Bendix 6 pin #2 (out) | Dsub9 in line filter 1 at Rack exit | 6 pin bendix | Dsub 9 | |
| 24 | Analog Tower Power (Vicor) | 1 | Vicor 3-1,3-2, Out+,- | Bendix 4 pin (in) | Lugs | 4 Pin Bendix | shielded twisted pair |
| 25 | Analog Tower Power (rack) | 1 | Bendix 4 Pin (out) | Dsub9 in line filter 2 at Rack exit | 4 Pin Bendix | Dsub 9 | |
| 26 | Vacuum Reading (rack) | 1 | Agilent 34970A Mod3 AI20 | Dsub9 in line filter 1 at Rack exit | Screw terminals | Dsub 9 | shielded twisted pair |
| 27 | Cal source signal | 1 | Relay Box Vout+,- Bendix 9 Pin | Rack Dsub 50 Filter 2 (in) | Bendix 9 pin | Dsub 50 | shielded twisted pair |
| 28 | Charcoal Powers | 1 | E3647A | Rack Dsub 50 Filter 2 (in) | Screw terminals | Dsub 50 | shielded twisted pair |
| 29 | Thermo Readings 1 | 1 | LS370 | Lakeshore scanner | various | various | |
| 30 | Thermo Readings 2 | 1 | Lake Shore Scanner | Dsub 50 inline filter 1 | 3 Dsub25 | Dsub50 | shielded twisted pair |
| 31 | E3647A power | 1 | Electronics Rack | E3647a | AC | AC | AC |
| 32 | Lakeshore Power | 1 | Electronics Rack | Lakeshore | AC | AC | AC |
| 33 | 34970A Power | 1 | Electronics Rack | 34970A | AC | AC | AC |
| 34 | Vicor power 1 | 1 | Electronics Rack | Vicor Power Relay | AC | AC | AC |
| 35 | Vicor Power 2 | 1 | Vicor Power Relay | Vicors 1-3 | AC | AC | AC |
| 36 | Detector Control | 8 | DEB SMB Out + (DFC 1-8) | Analog tower 1st FB A | SMB | SMB | SMB |
| 37 | Detector Readout | 8 | Analog Tower 3rd out A | DEB SMB in (DFC 1-8) | | | |
| 38 | Vacuum Power and Reading | 1 | Dsub 9 in line filter 1 out | Vacuum gauge | Dsub 9 | soldered | shielded twisted pair |
| 39 | RX room analog tower power | 1 | Dsub 9 in line filter 2 out | Dsub 9 inline filter 3 in | Dsub 9 | Dsub 9 | shielded twisted pair |
| 40 | RX Room Thermo Read out | 1 | Dsub 50 inline filter 1 out | Dsub 50 inline filter 3 in | Dsub 50 | Dsub 50 | shielded twisted pair |
| 41 | RX Room Cryo Power | 1 | Dsub 50 inline filter 2 out | Dsub 50 inline filter 4 in | Dsub 50 | Dsub 50 | shielded twisted pair |
| 42 | Doughnut Thermo Read out | 1 | Dsub 50 inline filter 3 out | Dsub 50 thermo top of cryostat | Dsub 50 | Dsub 50 | shielded twisted pair |
| 43 | Doughnut Cryo Power | 1 | Dsub 50 inline filter 4 out | Dsub 50 power top of cryostat | Dsub 50 | Dsub 50 | shielded twisted pair |
| 44 | PT405 Power | 1 | PT405 PWR supply | PT405 | Detronics | Detronics | shielded cable |
| 45 | Doughnut Analog Tower Power | 1 | Dsub 9 inline filter 3 out | Analog tower power | Dsub 9 | Various | shielded twisted pair |
| 46 | PT405 Power Supply Power | 1 | | PT405 Power Supply | AC | AC | AC |

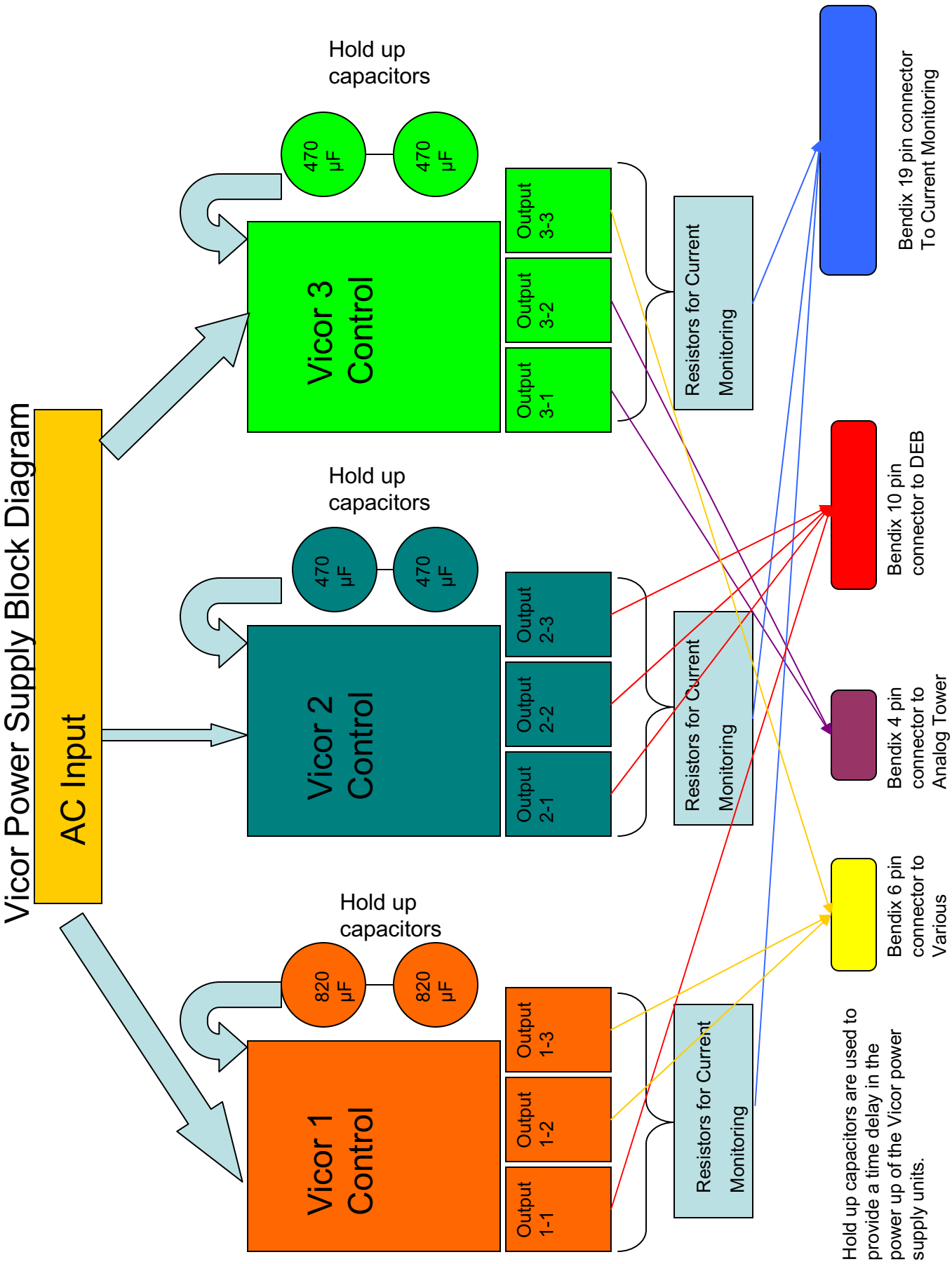
# Electronics items - sizes

| Rack Below Cryostat | | | |
|---|---|---|---|
| Component | Height | Width | Depth |
| VME Crate | 5.25" | 19" | 11.61" |
| 1 HP E3647A Power Supply | 5.2" | 8.4" | 13.7" |
| HP DAQ Box | 3.48" | 8.37" | 13.7" |
| GPIB/Fiber Convertor | 1.7" | 3.5" | 5.7" |
| LS370 | 3.54" | 17.12" | 12.48" |
| Vicor Box | 1.74" | 19" | 11.5" |
| LS370 Scanner | 3.056" | 4.465" | 6.273" |
| Fiber to TTL Box | | | |

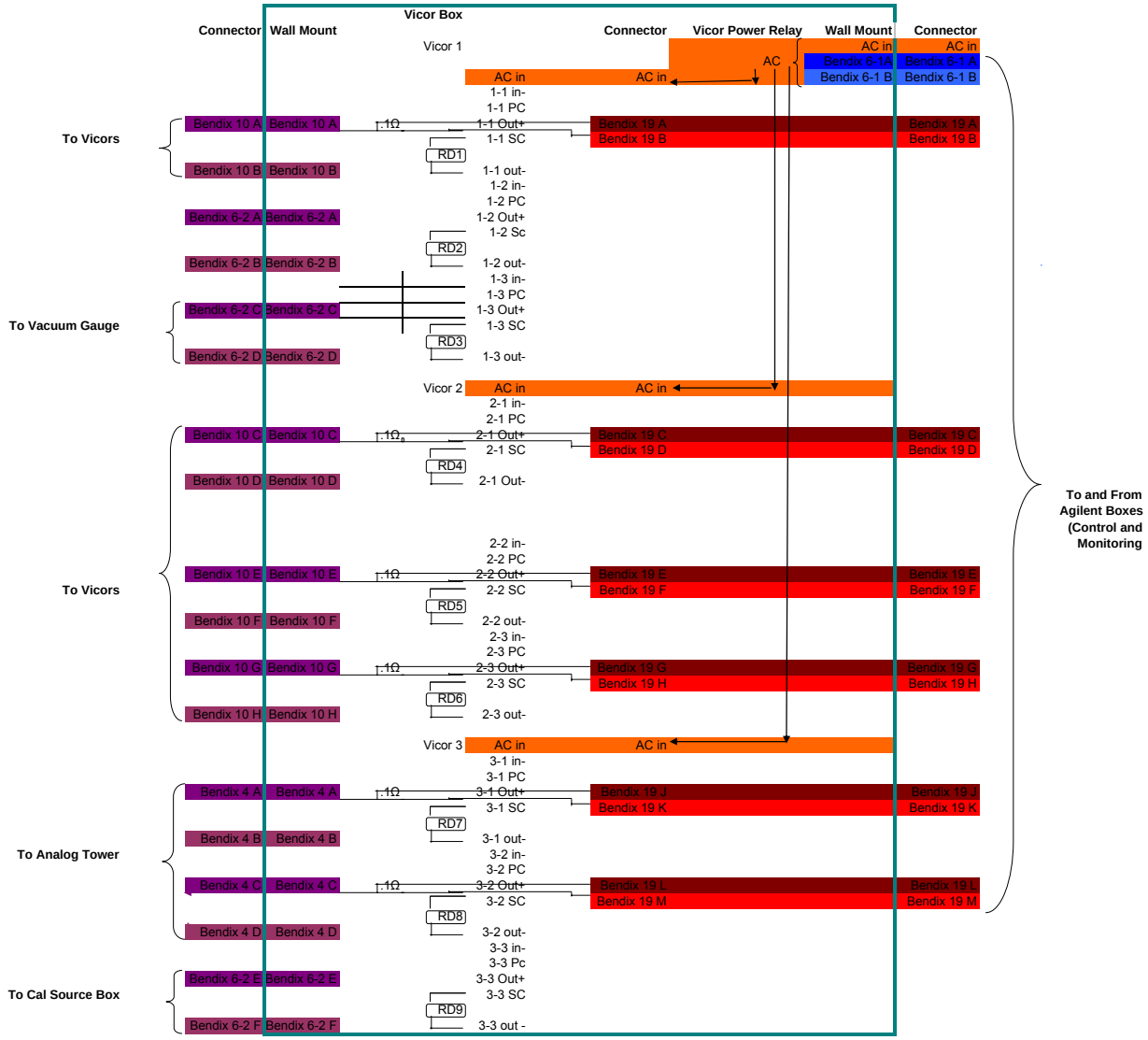
| CPU Rack | 50" | 21.062" | 36" |
|---|---|---|---|
| Component | Height | Width | Depth |
| CPU | 7" | 19" | 20" |
| GPIB/Fiber Convertor | 3.5" | 1.7" | 5.7" |

# RF Crate Layout

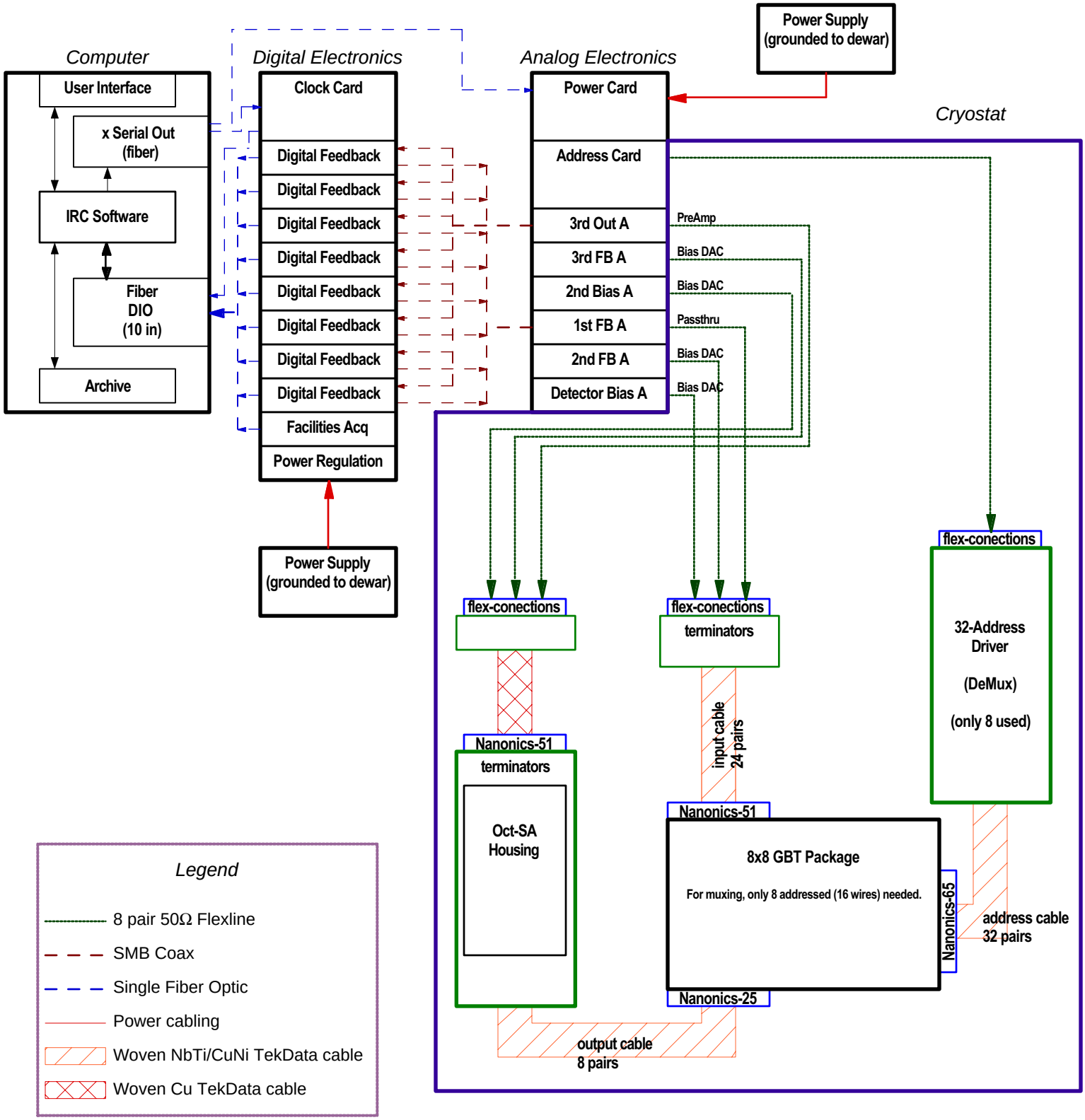



Vicor Power Supply Block Diagram
AC Input
Vicor 3 Control
Vicor 2 Control
Vicor 1 Control
Hold up capacitors
470 µF
470 µF
Hold up capacitors
470 µF
470 µF
Hold up capacitors
820 µF
820 µF
Output 3-3
Output 3-2
Output 3-1
Output 2-3
Output 2-2
Output 2-1
Output 1-3
Output 1-2
Output 1-1
Resistors for Current Monitoring
Resistors for Current Monitoring
Resistors for Current Monitoring
Bendix 19 pin connector To Current Monitoring
Bendix 10 pin connector to DEB
Bendix 4 pin connector to Analog Tower
Bendix 6 pin connector to Various
Hold up capacitors are used to provide a time delay in the power up of the Vicor power supply units.

## Vicor Schematic



# Penn/GBT: 8x8 Array Detector Electronics Block Diagram



# **Superconducting TES Array** Detector **Electronics** Bill of Materials

## Parts List (including spares):

Tower Cards:

2 Power cards (1 in use + 1 spare)
2 Address Interface cards (1 in use + 1 spare)
5 Bias DAC cards (4 in use + 1 spare)
3 Modified Bias DAC cards (2 in use + spare; modification for passthru channels)
2 Passthru cards (1 in use + 1 spare)
2 Modified 2/6 Passthru cards (2 in use; 2 normal, 6 partially isolated)
1 Modified 4/4 Passthru cards (1 in use; 4 normal, 4 partially isolated)
2 PreAmp cards (1 in use + 1 spare)

Cold Cards:

2 SA Mount cards (in use & spare)
2 Address Driver cards (as above)

Crate Cards:

10 Digital Feedback (Column Controller) cards (8 in use + 2 spares)
2 Clock cards (1 in use + spare)
2 Power Regulation cards (1 in use + spare)
2 Facilities Acquisition Cards (1 in use + spare)

Computer Cards:

2 PCI Fiber-fed DIO cards (1 in use + spare)

TekData Cables:

1 32-pair NbTi/CuNi woven, with Nanonics-65 on one end, soldered to Address Driver
1 24-pair NbTi/CuNi woven, with Nanonics-51 on one end, soldered to Terminator
1 8-pair NbTi/CuNi woven, with Nanonics-25 on one end, soldered to SA Board
1 24-pair Cu woven, with Nanonics-51 on one end, soldered to Terminator

SMB Cables:

10 short (6") SMB cables + spares
20 long (3'?) SMB cables + spares
12 fiber optic cables + spares

Flex Cables:
7 flex cables (8 50Ω striplines) in hermetic feedthrough; length TBD

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# 90 GHz array - final cryostat parts list & drawings

DRAWING REVISIONS

- 1: the first draft
- 1b: the first draft with parts y & ac completed + extra assembly drawings.
- 2: 3K cold plate - extra feed through hole added, vacuum can - extra screw holes in base & thicker o-ring flange for ease of welding, missing dimensions etc corrected, some holes removed in 40K baseplate, 40K heatshield made 1/8 longer., new parts ad & ae, added lifting handles to assembly 1

PARTS LIST & BILL OF MATERIALS

Items marked with a * can be supplied by Penn from lab stock

| **Part#** | **total #required** | **description** |
|---|---|---|
| a | 1 | cryostat lid & mounting plate. |
| D559B-4m-50 | 1* | pop valve, 0.5"NPT fitting. |
| Assembly 1 : parts b to f (1 needed). | | |
| b | 1 | doughnut outer flange. |
| c | 1 | doughnut inner flange & cone. |
| d | 1 | outer doughnut wall. |
| e | 1 | doughnut lid. |
| f | 1 | doughnut gortex clamp. |
| Assembly 2 : parts g to i (1 needed). | | |
| g | 1 | vacuum can o-ring groove. |
| h | 1 | vacuum can wall. |
| i | 1 | vacuum can bottom. |
| Assembly 3 : parts j to l (1 needed). | | |
| j | 1 | 40K shield flange. |
| k | 1 | 40K shield wall. |
| l | 1 | 40K shield bottom. |
| Assembly 4 : parts m to o (1 needed). | | |
| m | 1 | 3K shield flange. |
| n | 1 | 3K shield wall. |
| o | 1 | 3K shield bottom. |
| p | 1 | window clamp. |
| q | 1 | window blank. |
| r | 2 | large feedthrough blank. |
| s | 1 | large feedthrough for 50 pin D. |
| t | 3 | small feedthrough blank. |
| u | 1 | small feedthrough vacuum port. |
| pti-nw40-lw-s | 1* | NW40 weldable flange. |
| v | 1 | small feedthrough vacuum gauge. |

Assembly 5 : parts w to y (1 needed).

| | | |
|---|---|---|
| w | 1 | 40K baseplate flange. |
| x | 10 | 40K FR4 stand-off. |
| y | 1 | 40K baseplate. |
| z | 2 | bronze bushing. |

Assembly 6 : parts aa to ab

| | | |
|---|---|---|
| aa | 14 | 3K stand-off ends. |
| ab | 8 | 3K FR4 stand-offs. |
| ac | 1 | 3K baseplate. |
| ad | 1 | 40K electrical feedthrough. |
| ae | 2 | 3K electrical feedthrough. |

Other parts

- o-rings:

For weather shield & mating to turret:
177" Allied seals inc 0.210 dia closed cell epd m medium density sponge cord
177" Chromerics pola-strip RFI Gasket cord p/n 07-0101-0025-77

Vacuum o-rings
60" 3/16 round Buna-n o-ring cord (to make main vacuum o-ring)
dash numbers

- 1x254(fridge)*
- 3x237(large feedthrough & window)*
- 3x223 (small feedthroughs) *
- 1x234(electronics tower)*

Choose Buna-n as the material - available from McMaster & Penn. GET spares!

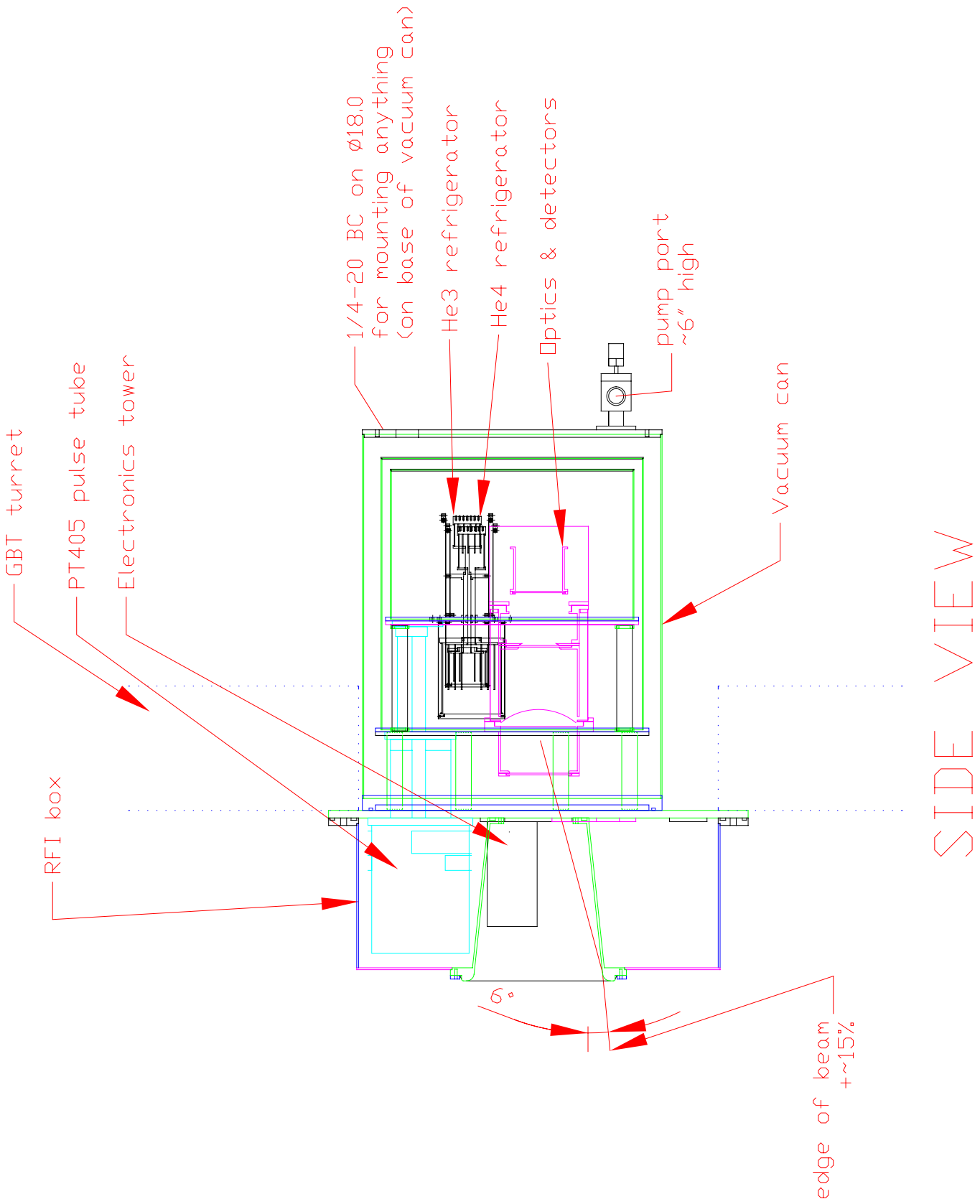
- Vacuum sensor, 1/8 NTP ruggedized, DV-6R from Teledyne Hastings instruments

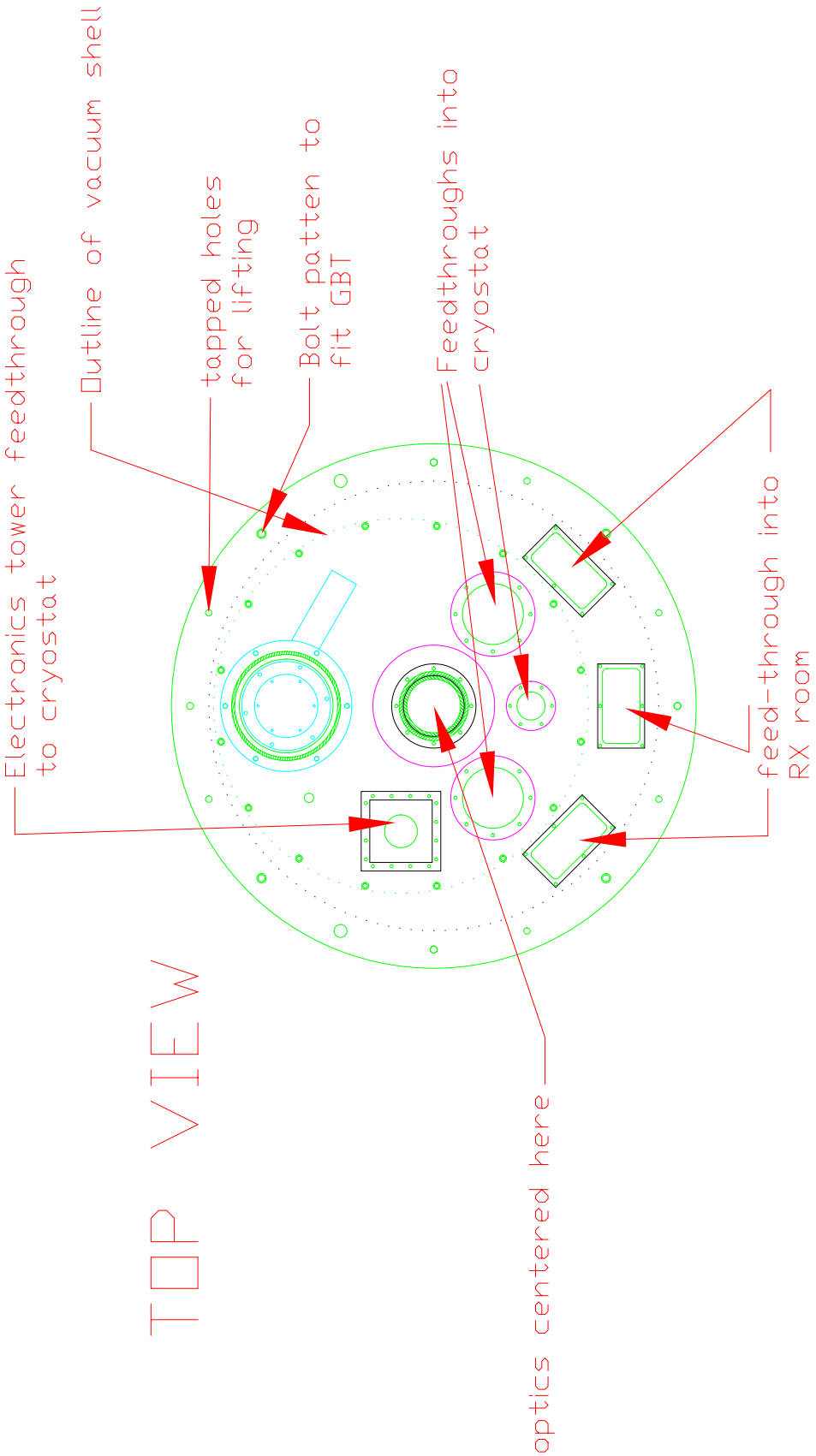
## Cryostat thermal loading calculations

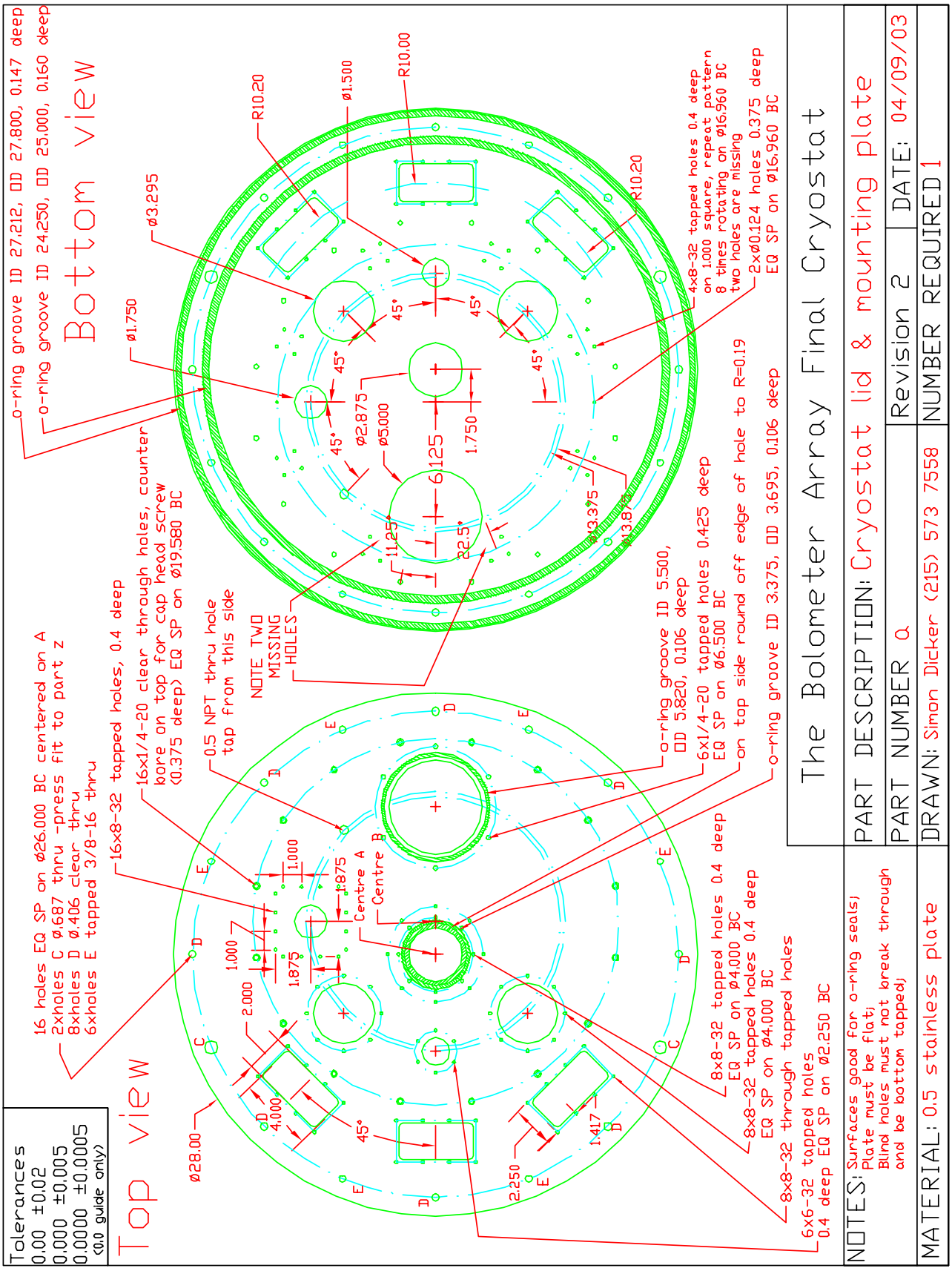
| | | | | |
|---|---|---|---|---|
| **between room temperature and the 1st stage:** | | | | |
| legs | | | | |
| Room temperature | 300.0 K | | | |
| Temperature of 1st stage | 40.0 K | | | |
| | | | | LOADING |
| diameter of legs | 1.00 inches | | | |
| thickness of fr4/G10 | 0.020 inches | A/l for fr4 is: | 0.118 inches | |
| number of legs | 8 | | 3.00E-03 m | 4.67E-01 W |
| length of legs | 4.25 inches | | | |
| | | | | |
| flex line cables | | | | |
| number of flex lines | 7 | | | |
| width | 0.850 inches | | | |
| thickness | 0.0060 inches | | | |
| material | Kapton | A/l for kapton | 0.0022 inches | |
| number of wires | 8 | | 5.67E-05 m | 4.19E-03 W |
| width of wires | 0.095 inches | | | |
| thickness of wires | 0.0020 inches | | | |
| material of wires | Constantin | A/l for Constantin | 0.0007 inches | |
| length | 16.000 inches | | 1.69E-05 m | 8.90E-02 W |
| | | | | |
| housekeeping cable | | | | |
| number of wires | 72 | | | |
| diameter of wires | 0.0044 inches | A/l | 0.0001 inches | |
| material of wires | Manganin | | 3.48E-06 m | 1.46E-02 W |
| length | 8.000 inches | | | |
| | | | | |
| Radiation | | | | |
| diameter of 1st stage | 17.500 inches | Surface area of can | 1485.7770 inch^2 | |
| length of 1st stage | 18.275 inches | | 9.59E-01m^2 | 4.40E-01 W |
| blackness of surface | 0.001 | | **TOTAL** | **1.02E+00 W** |

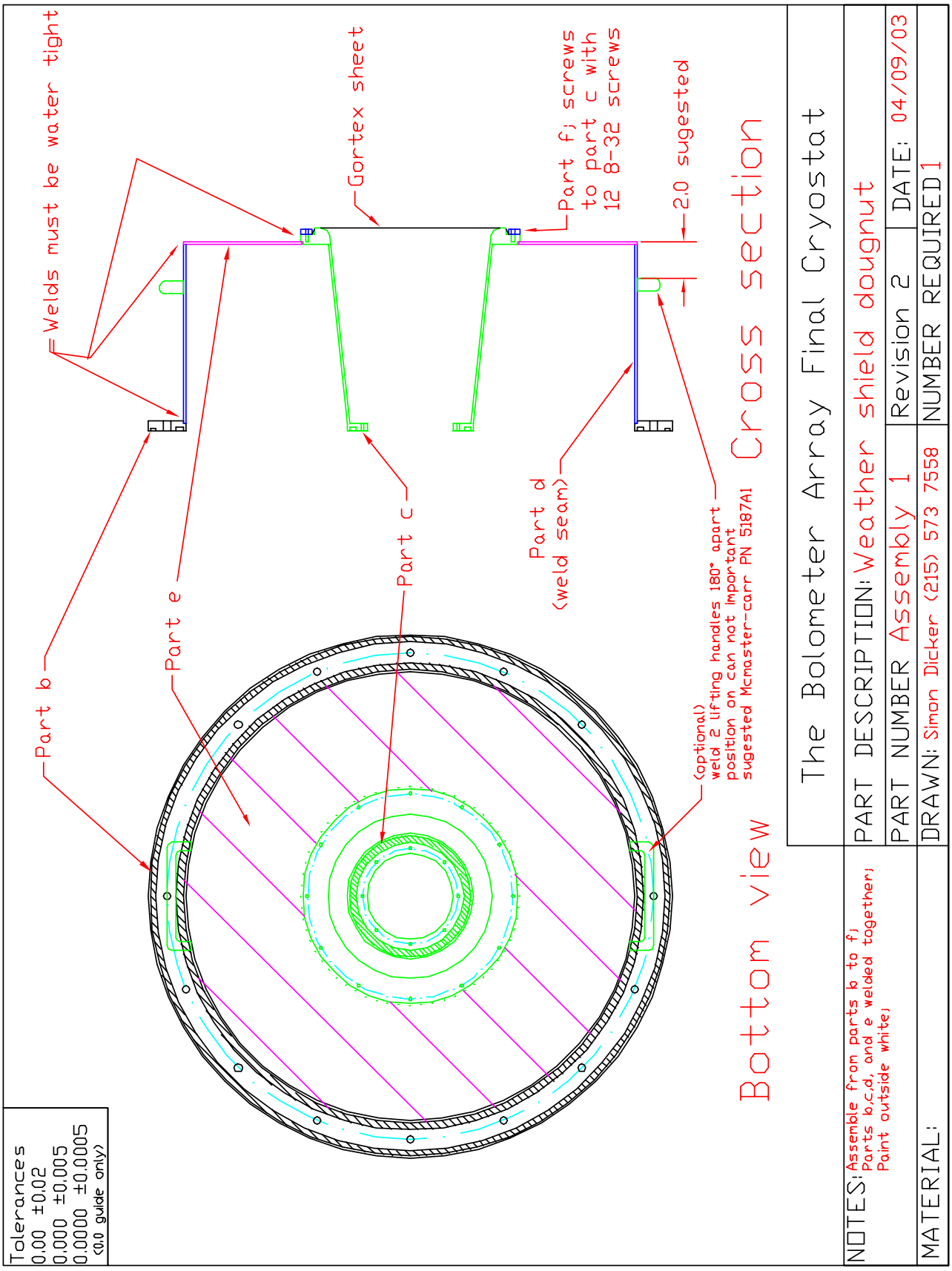
| | | | | |
|---|---|---|---|---|
| **between 1st and 2nd stages** | | Temperature of 1st stage | 40.0 K | |
| | | Temperature of 2nd stage | 2.7 K | |
| legs | | | | |
| number of legs | 6 | | | |
| diameter | 1.000 inches | | | |
| wall thickness | 0.020 inches | A/l for legs | 0.055 inches | |
| length | 6.850 inches | | 1.40E-03 m | 1.01E-02 W |
| material | G10warp | | | |
| | | | | |
| flex line cables | | A/l for Constantin | 0.0009 inches | |
| length | 12.000 inches | | 2.25E-05 m | 6.47E-03 W |
| | | A/l for Kapton | 0.003 inches | |
| houskeeping cables | | | 7.56E-05 m | 8.56E-06 W |
| length | 8.000 inches | A/l for housekeeping | 0.000 inches | |
| | | | 3.48E-06 m | 5.08E-04 W |
| optics tower support | | | | |
| diameter of tube | 5.625 inches | | | |
| length of tube | 6.425 inches | | | |
| wall thickness 1 | 0.015 inches | | | |
| material 1 | G10warp | A/l material 1 | 0.041 inches | |
| wall thickness 2 | 0.0005 inches | | 1.05E-03 m | 7.54E-03 W |
| material 2 | SS316 | A/l material 2 | 0.001 inches | |
| | | | 3.49E-05 m | 3.07E-03 W |
| Radiation | | | | |
| diameter of 2nd stage | 16.000 inches | Surface area of can | 1206.3716 inch^2 | |
| length of 2nd stage | 16.000 inches | | 7.78E-01m^2 | 1.13E-04 W |
| blackness of surface | 0.001 | | | |
| | | | | |
| | | | **TOTAL** | **2.78E-02 W** |

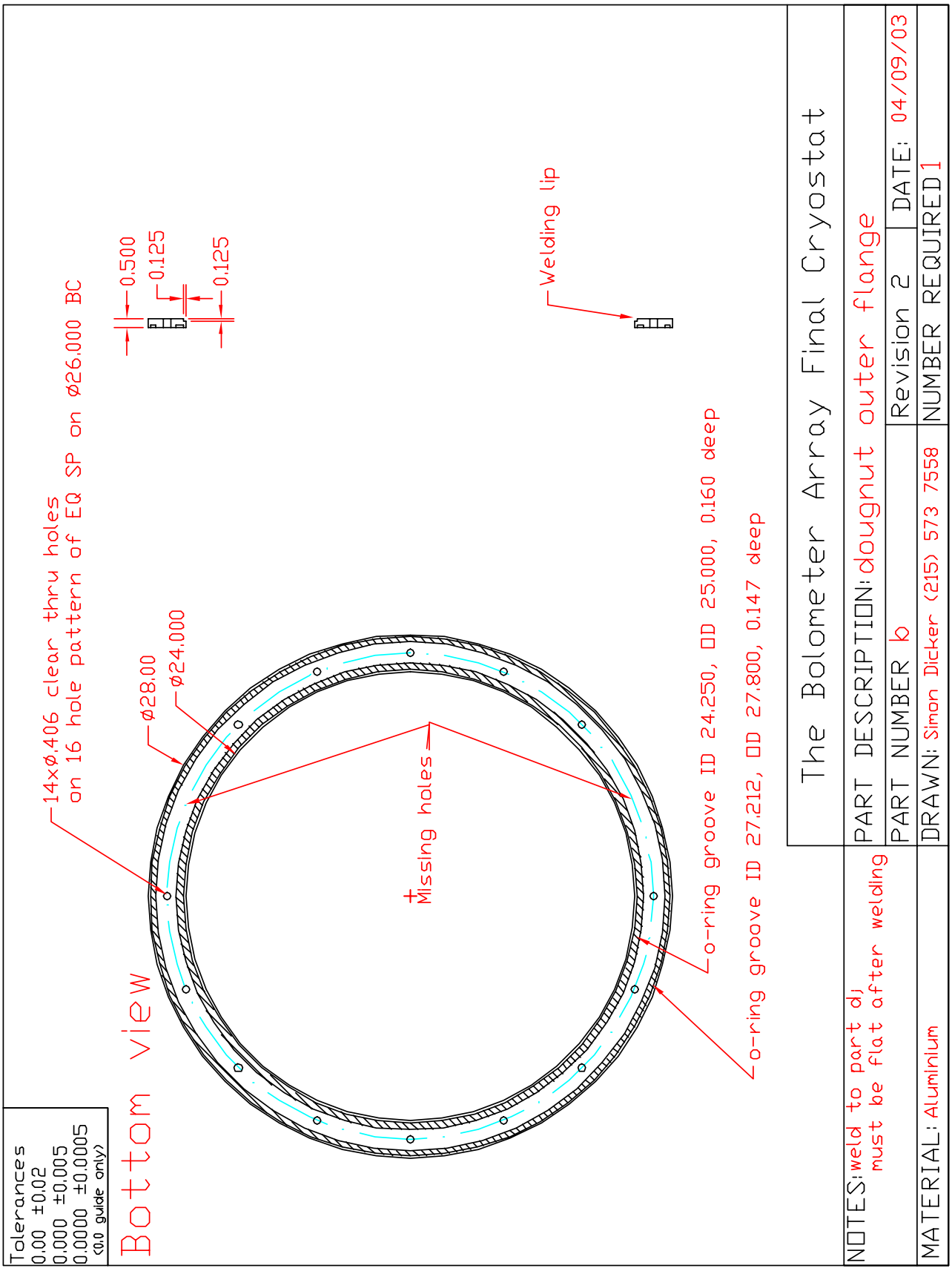
**both these are acceptable**

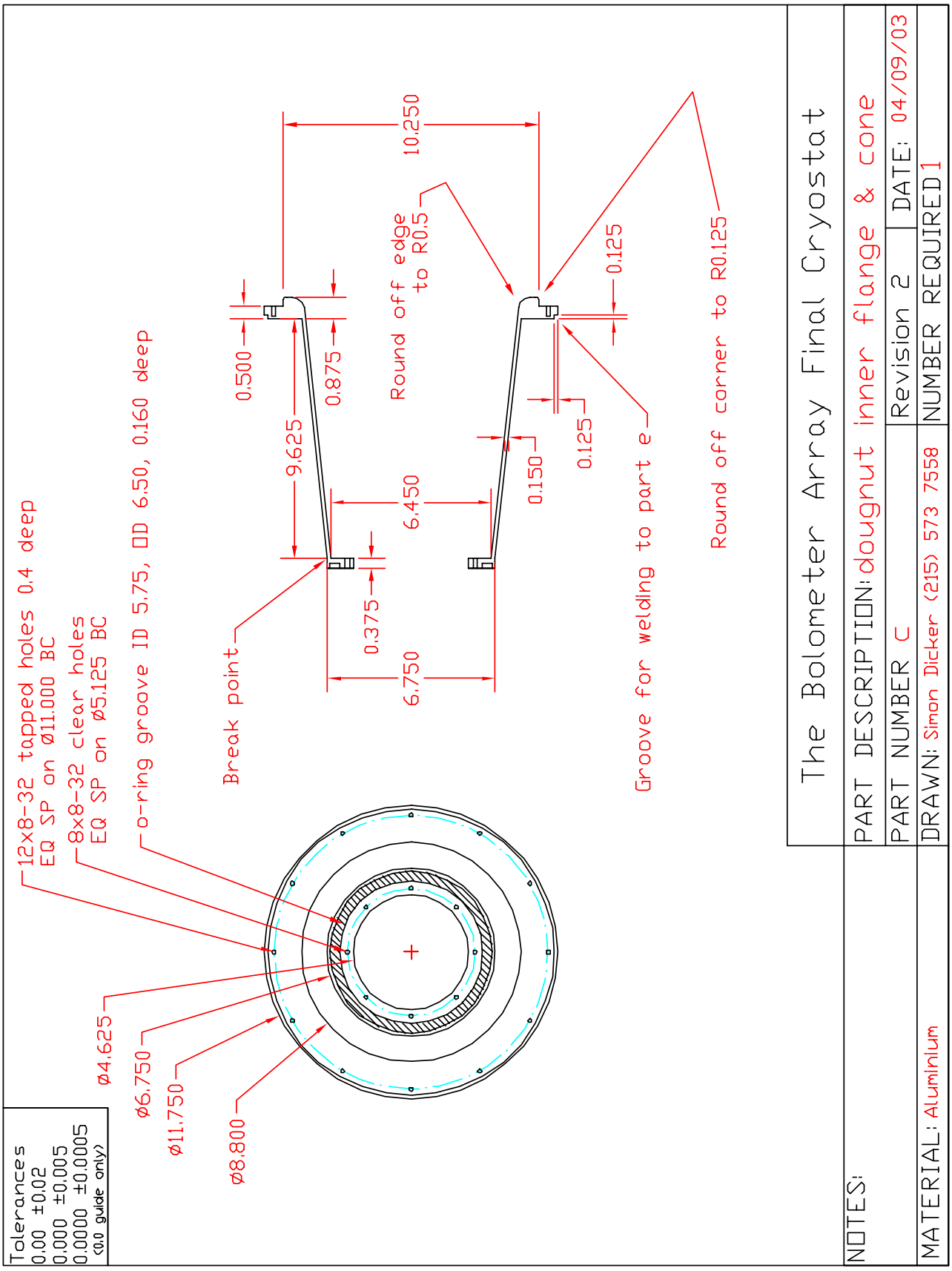

1/4-20 BC on Ø18.0
for mounting anything
(on base of vacuum can)
He3 refrigerator
He4 refrigerator
Optics & detectors
pump port
~6" high
GBT turret
PT405 pulse tube
Electronics tower
Vacuum can
RFI box
SIDE VIEW
6°
edge of beam
+~15%

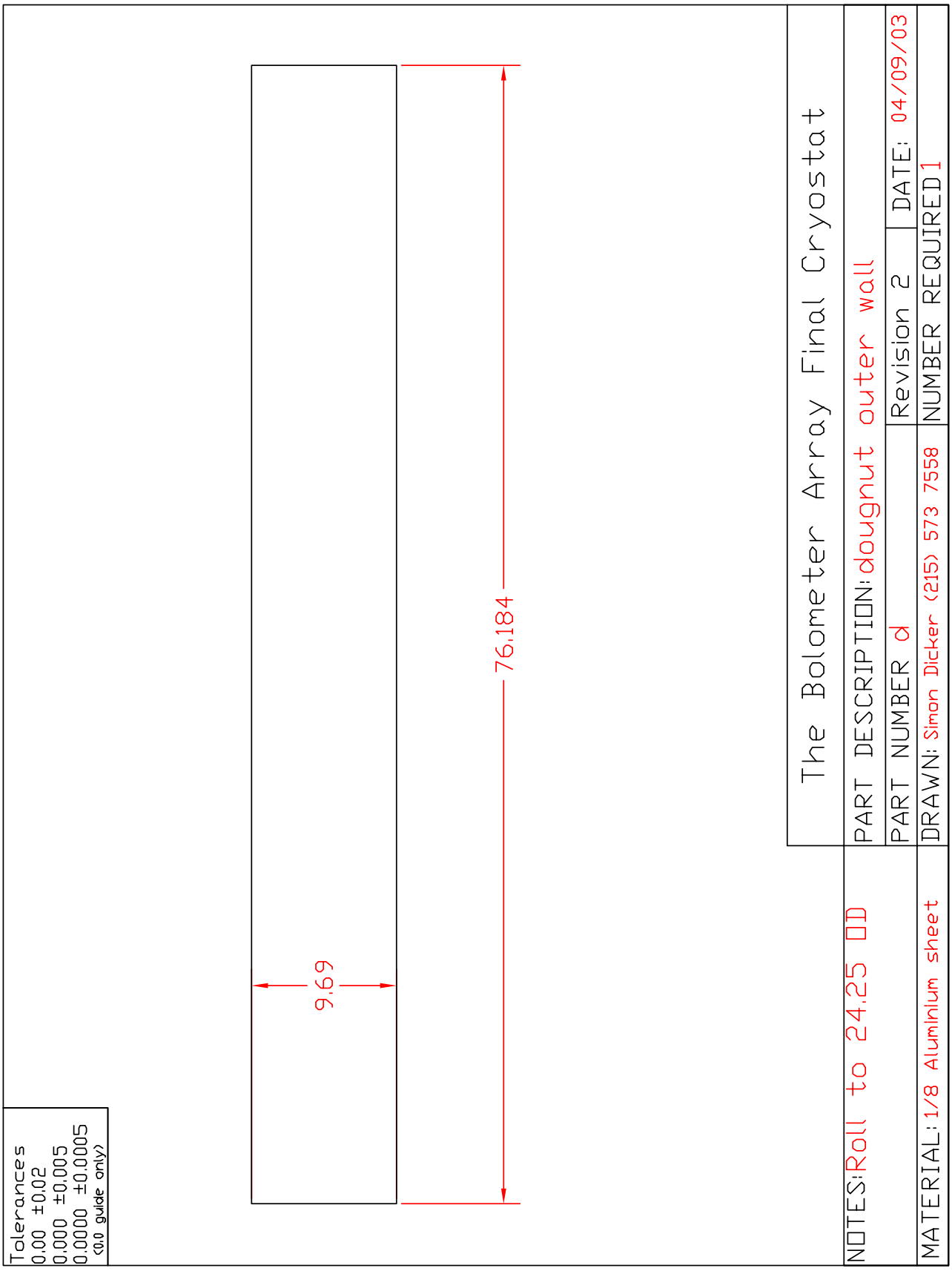

Electronics tower feedthrough
to cryostat
Outline of vacuum shell
tapped holes
for lifting
Bolt patten to
fit GBT
Feedthroughs into
cryostat
feed-through into
RX room
optics centered here
TOP VIEW

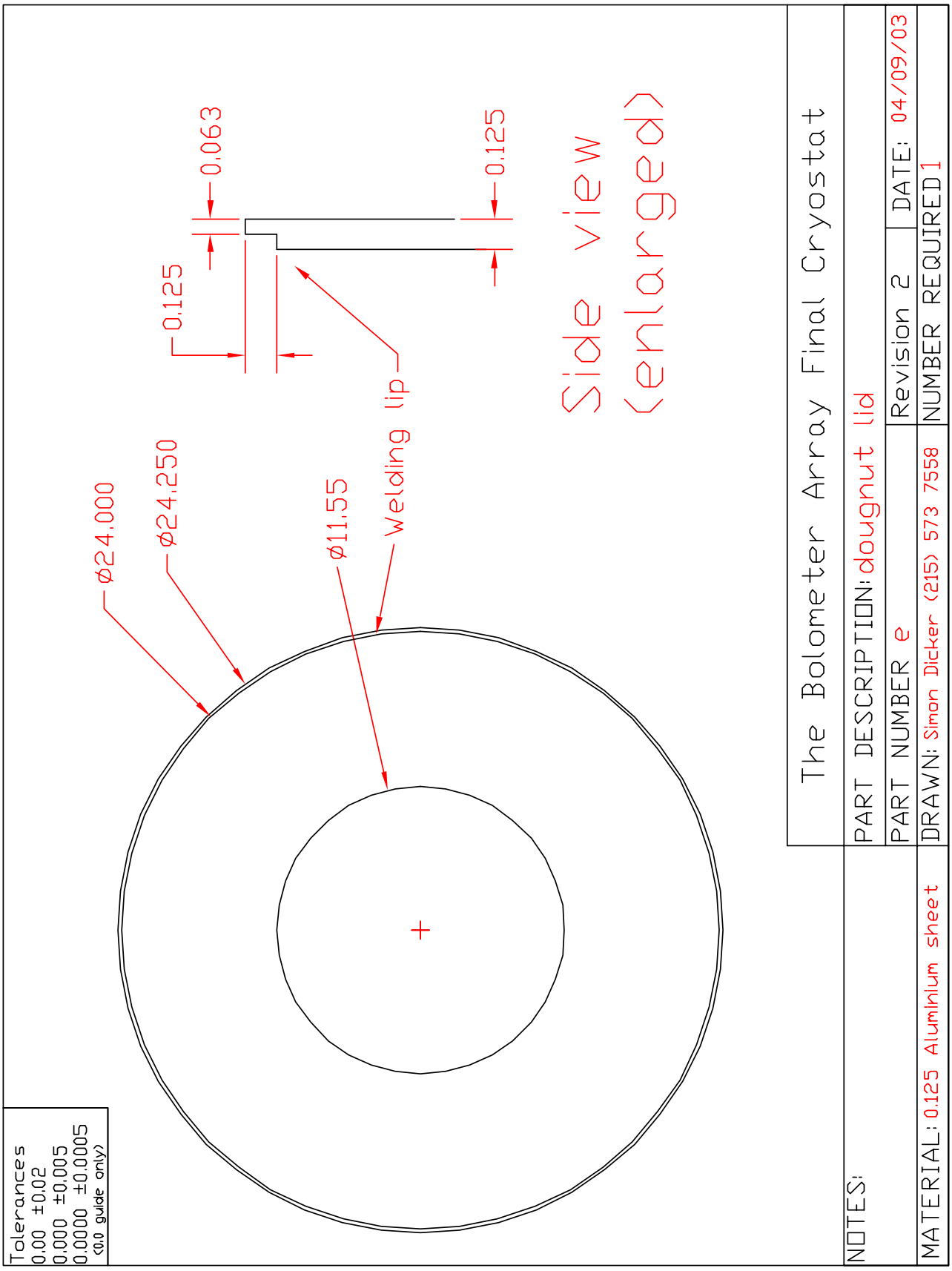

Top view
Bottom view
The Bolometer Array Final Cryostat
PART DESCRIPTION: Cryostat lid & mounting plate
PART NUMBER 0
Revision 2
DATE: 04/09/03
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 1
MATERIAL: 0.5 stainless plate
NOTES: Surfaces good for o-ring seals; Plate must be flat; Blind holes must not break through and be bottom tapped;
Tolerances
0.00 ±0.02
0.000 ±0.005
0.0000 ±0.0005
(0.0 guide only)
16 holes EQ SP on ø26.000 BC centered on A
2xholes C ø.687 thru -press fit to part z
8xholes D ø.406 clear thru
6xholes E tapped 3/8-16 thru
16x8-32 tapped holes, 0.4 deep
16x1/4-20 clear through holes, counter bore on top for cap head screw (0.375 deep) EQ SP on ø19.580 BC
0.5 NPT thru hole tap from this side
NOTE TWO MISSING HOLES
o-ring groove ID 27.212, OD 27.800, 0.147 deep
o-ring groove ID 24.250, OD 25.000, 0.160 deep
ø1.750
ø3.295
ø1.500
R10.20
R10.00
ø28.00
4.000
2.000
1.000
1.875
.875
Centre A
Centre B
2.250
1.417
45°
22.5°
11.25
ø2.875
ø5.000
6.125
1.750
ø3.375
ø3.810
8x8-32 tapped holes 0.4 deep EQ SP on ø4.000 BC
8x8-32 tapped holes 0.4 deep EQ SP on ø4.000 BC
8x8-32 through tapped holes
6x6-32 tapped holes 0.4 deep EQ SP on ø2.250 BC
o-ring groove ID 5.500, OD 5.820, 0.106 deep
6x1/4-20 tapped holes 0.425 deep EQ SP on ø6.500 BC
on top side round off edge of hole to R=0.19
o-ring groove ID 3.375, OD 3.695, 0.106 deep
4x8-32 tapped holes 0.4 deep on 1.000 square, repeat pattern 8 times rotating on ø16.960 BC two holes are missing
2xø0.124 holes 0.375 deep EQ SP on ø16.960 BC

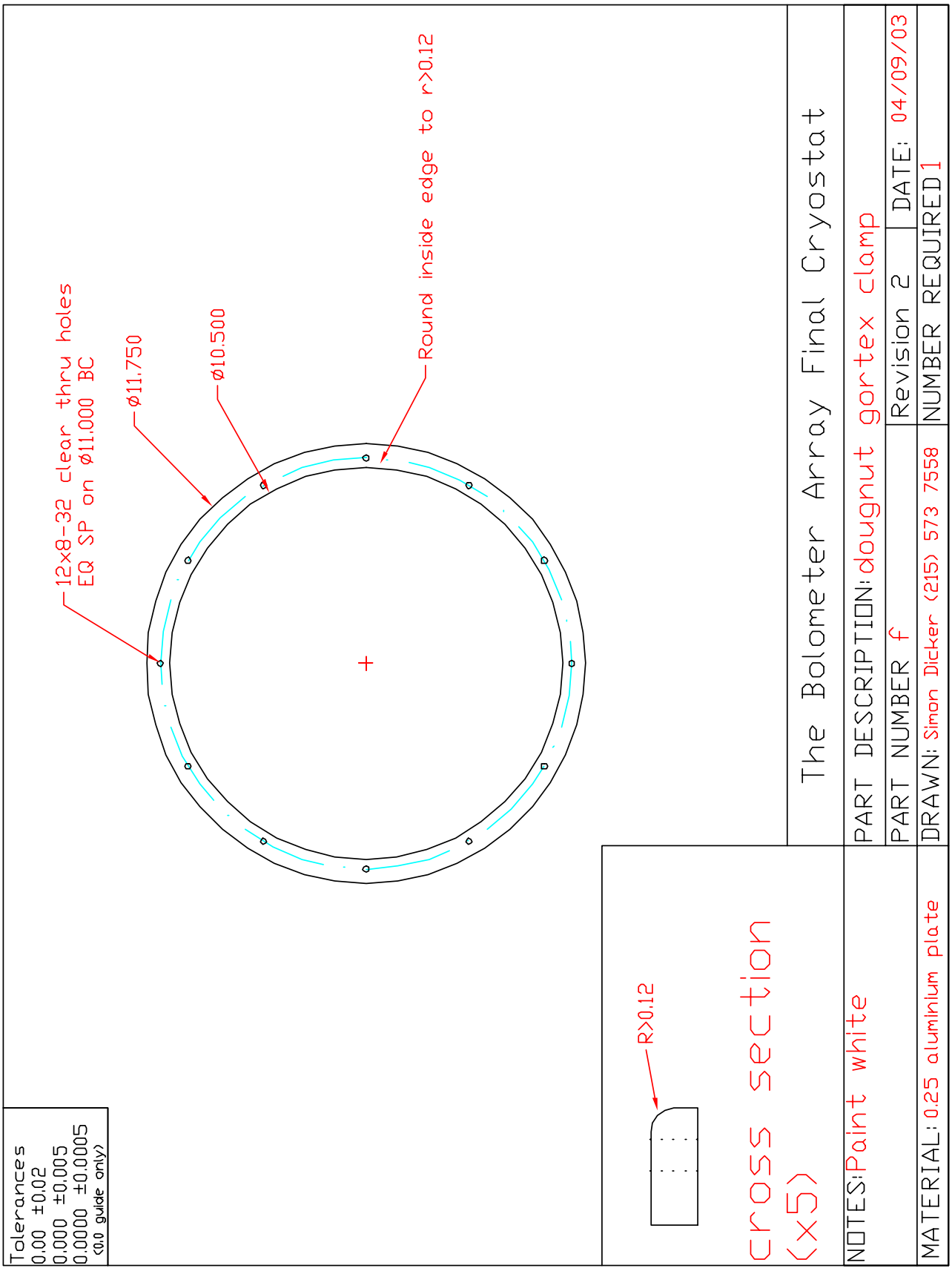

Tolerances
0.00 ±0.02
0.000 ±0.005
0.0000 ±0.0005
(0.0 guide only)
Bottom view
Cross section
Welds must be water tight
Gortex sheet
Part f; screws
to part c with
12 8-32 screws
2.0 sugested
Part b
Part e
Part c
Part d
(weld seam)
(optional)
weld 2 lifting handles 180° apart
position on can not important
sugested Mcmaster-carr PN 5187A1
The Bolometer Array Final Cryostat
PART DESCRIPTION: Weather shield dougnut
PART NUMBER Assembly 1
Revision 2
DATE: 04/09/03
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 1
NOTES: Assemble from parts b to f;
Parts b,c,d, and e welded together;
Paint outside white;
MATERIAL:

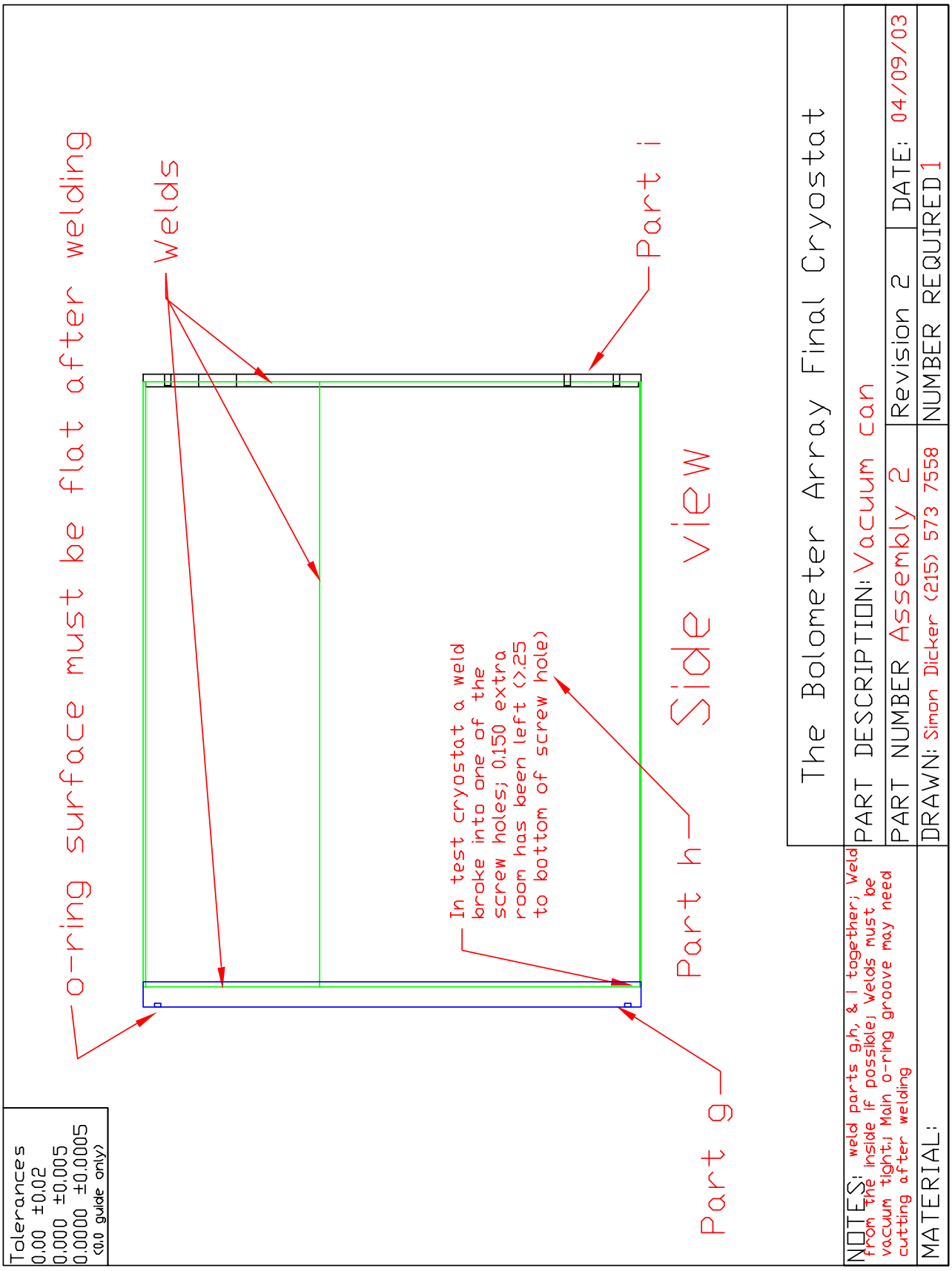

Tolerances
0.00 ±0.02
0.000 ±0.005
0.0000 ±0.0005
(0.0 guide only)
Bottom view
14xø.406 clear thru holes
on 16 hole pattern of EQ SP on ø26.000 BC
ø28.00
ø24.000
0.500
0.125
0.125
Welding lip
Missing holes
o-ring groove ID 24.250, OD 25.000, 0.160 deep
o-ring groove ID 27.212, OD 27.800, 0.147 deep
The Bolometer Array Final Cryostat
NOTES: weld to part dj
must be flat after welding
PART DESCRIPTION: dougnut outer flange
PART NUMBER b
Revision 2
DATE: 04/09/03
MATERIAL: Aluminium
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 1

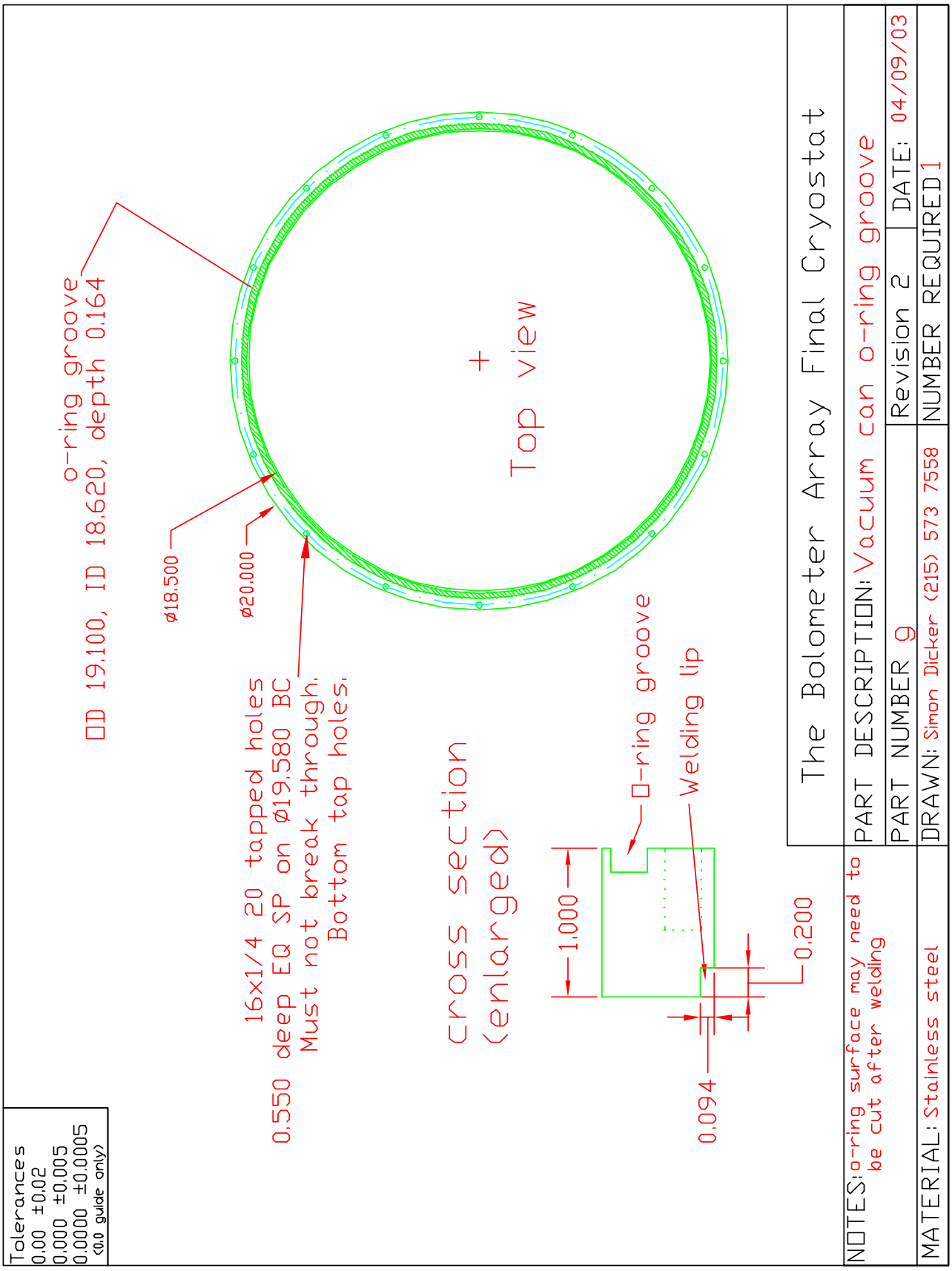

Tolerances
0.00 ±0.02
0.000 ±0.005
0.0000 ±0.0005
<0.0 guide only>
12x8-32 tapped holes 0.4 deep
EQ SP on Ø11.000 BC
8x8-32 clear holes
EQ SP on Ø5.125 BC
o-ring groove ID 5.75, OD 6.50, 0.160 deep
Break point
Round off edge
to R0.5
Groove for welding to part e
Round off corner to R0.125
0.500
0.875
9.625
10.250
6.450
6.750
0.375
0.150
0.125
0.125
Ø4.625
Ø6.750
Ø11.750
Ø8.800
The Bolometer Array Final Cryostat
NOTES:
PART DESCRIPTION: dougnut inner flange & cone
PART NUMBER C
Revision 2
DATE: 04/09/03
MATERIAL: Aluminium
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 1

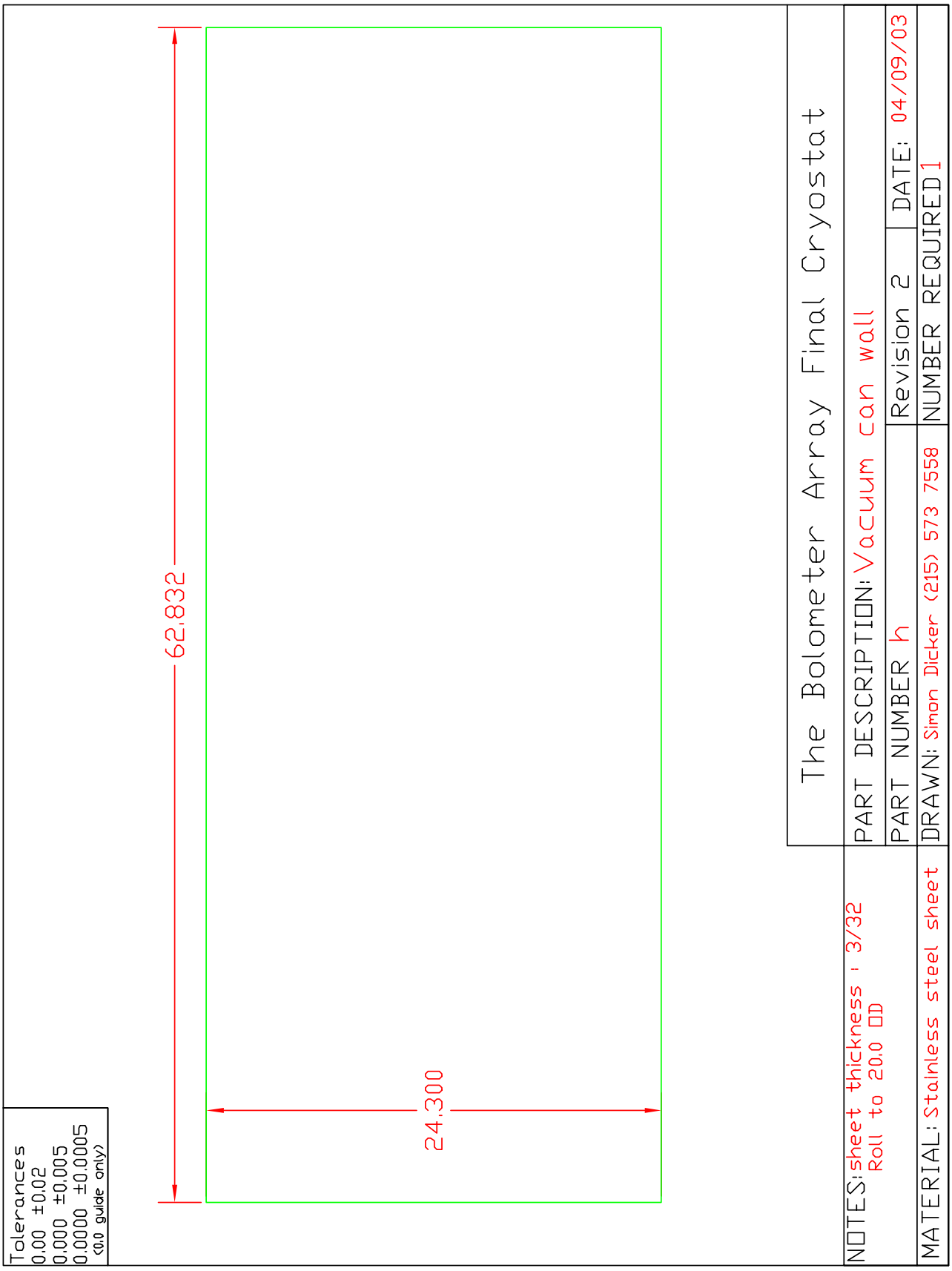

Tolerances
0.00 ±0.02
0.000 ±0.005
0.0000 ±0.0005
(0.0 guide only)
9.69
76.184
The Bolometer Array Final Cryostat
NOTES:Roll to 24.25 OD
PART DESCRIPTION:dougnut outer wall
PART NUMBER d
Revision 2
DATE: 04/09/03
MATERIAL:1/8 Aluminium sheet
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 1

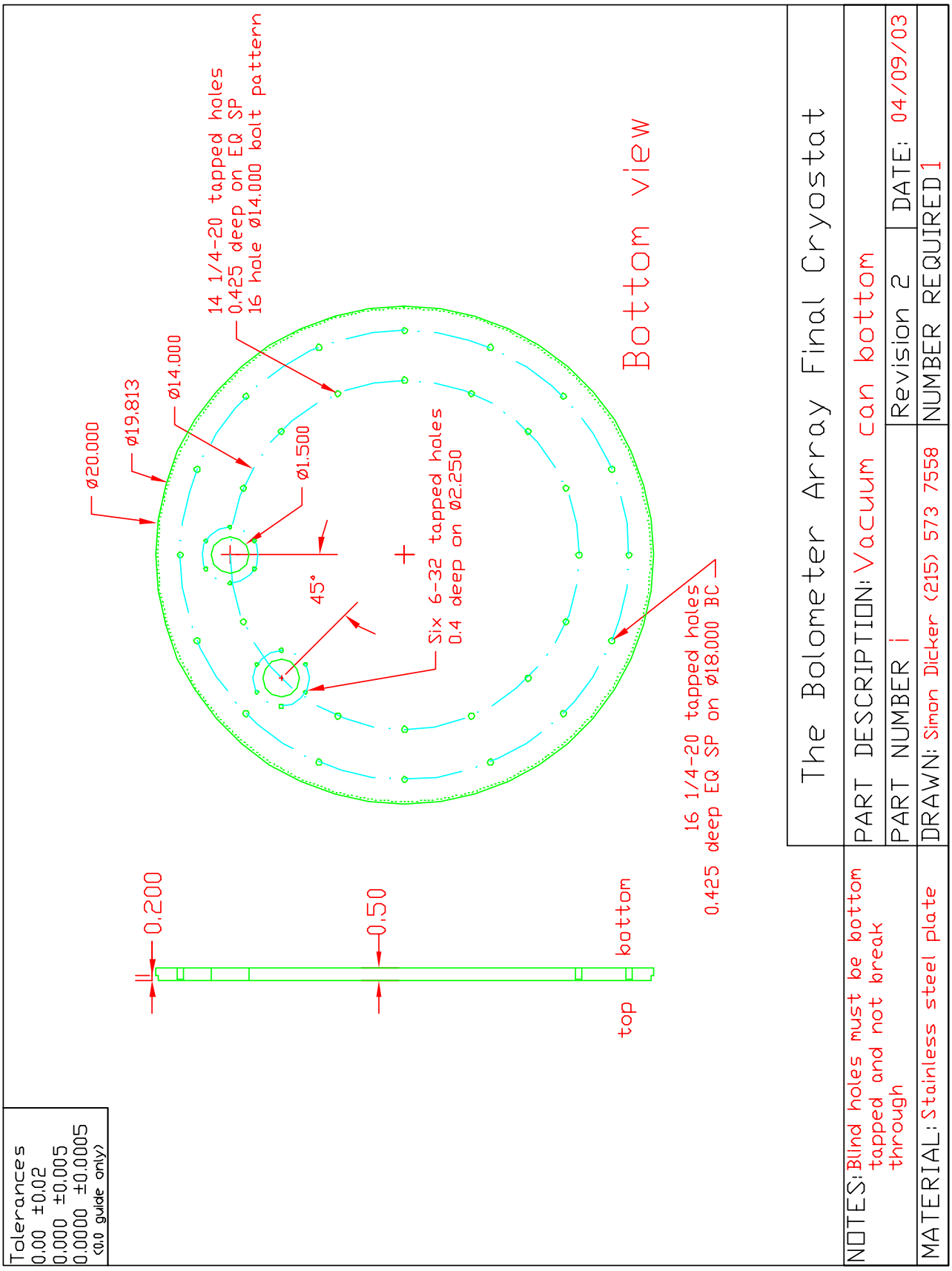

Tolerances
0.00 ±0.02
0.000 ±0.005
0.0000 ±0.0005
(0.0 guide only)
ø24.000
ø24.250
ø11.55
Welding lip
0.125
0.063
0.125
Side view
(enlarged)
The Bolometer Array Final Cryostat
NOTES:
PART DESCRIPTION: dougnut lid
PART NUMBER e
Revision 2
DATE: 04/09/03
MATERIAL: 0.125 Aluminium sheet
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 1

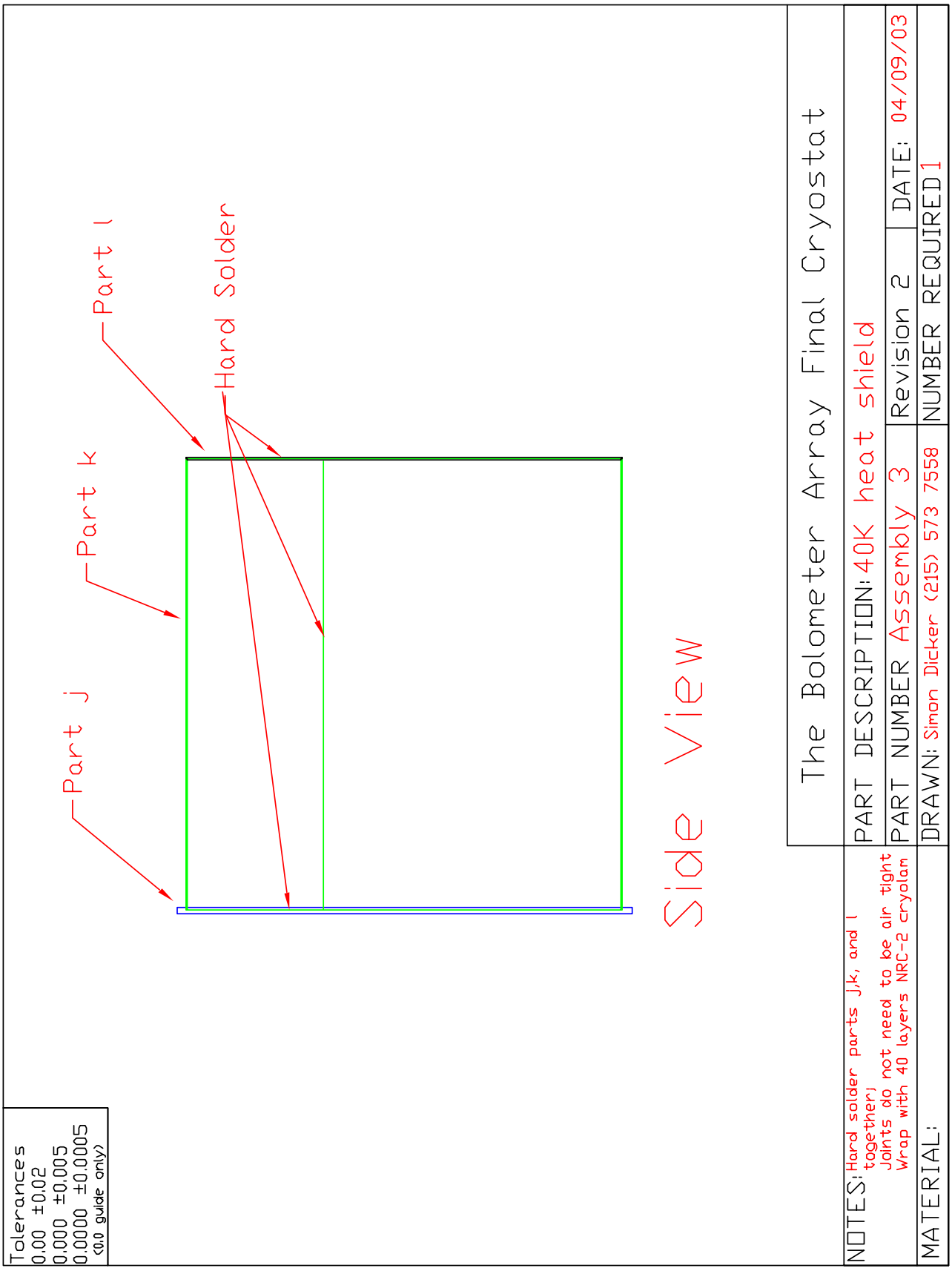

12x8-32 clear thru holes
EQ SP on ø11.000 BC
ø11.750
ø10.500
Round inside edge to r>0.12
R>0.12
cross section
(x5)
The Bolometer Array Final Cryostat
PART DESCRIPTION: dougnut gortex clamp
PART NUMBER f
Revision 2
DATE: 04/09/03
NOTES: Paint white
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 1
MATERIAL: 0.25 aluminium plate
Tolerances
0.00 ±0.02
0.000 ±0.005
0.0000 ±0.0005
(0.0 guide only)

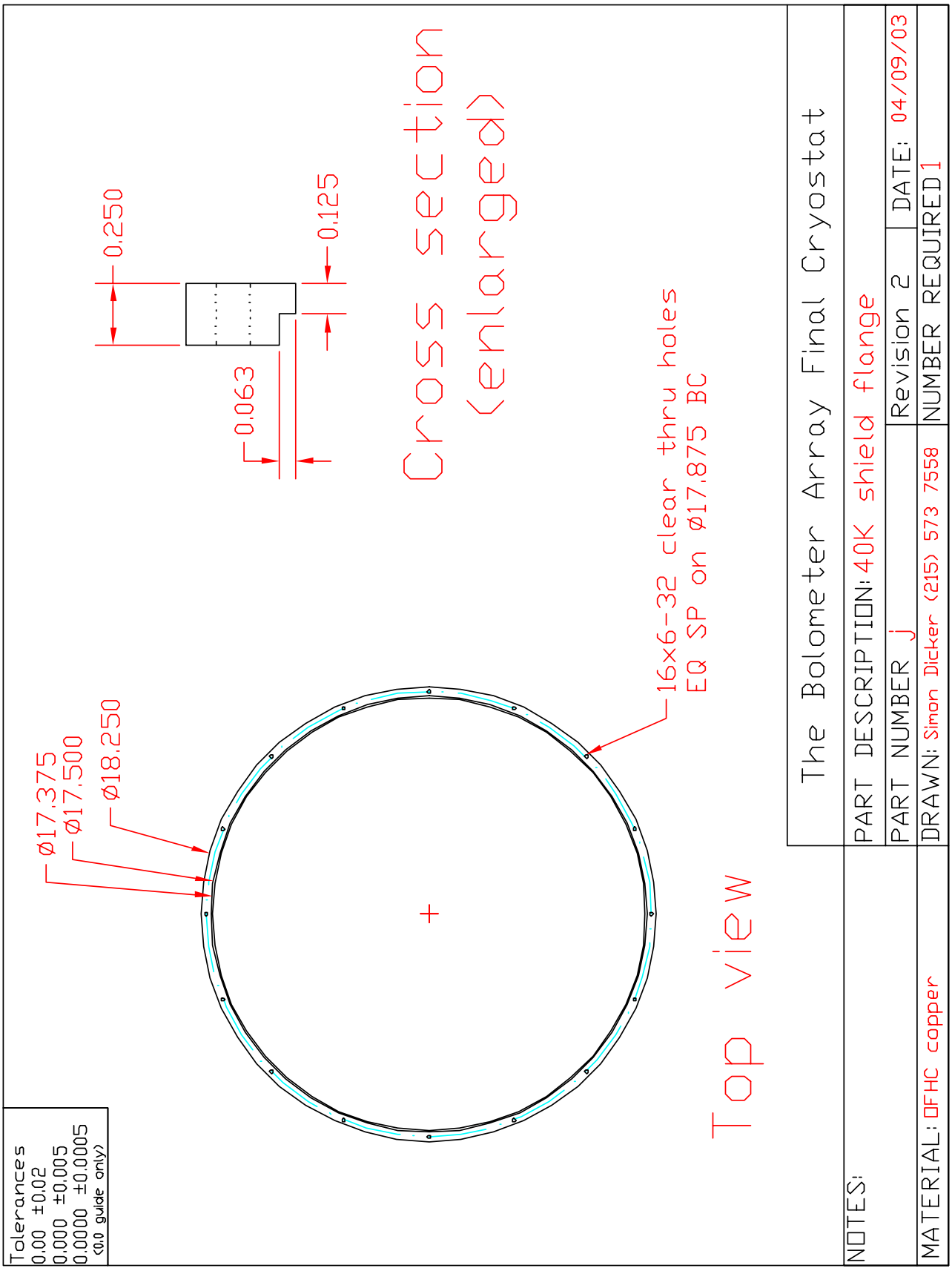

Tolerances
0.00 ±0.02
0.000 ±0.005
0.0000 ±0.0005
(0.0 guide only)
o-ring surface must be flat after welding
Welds
Part i
In test cryostat a weld broke into one of the screw holes; 0.150 extra room has been left (>.25 to bottom of screw hole)
Part h
Side view
Part g
The Bolometer Array Final Cryostat
PART DESCRIPTION: Vacuum can
PART NUMBER Assembly 2
Revision 2
DATE: 04/09/03
NOTES: weld parts g,h, & i together; Weld from the inside if possible; Welds must be vacuum tight; Main o-ring groove may need cutting after welding
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 1
MATERIAL:

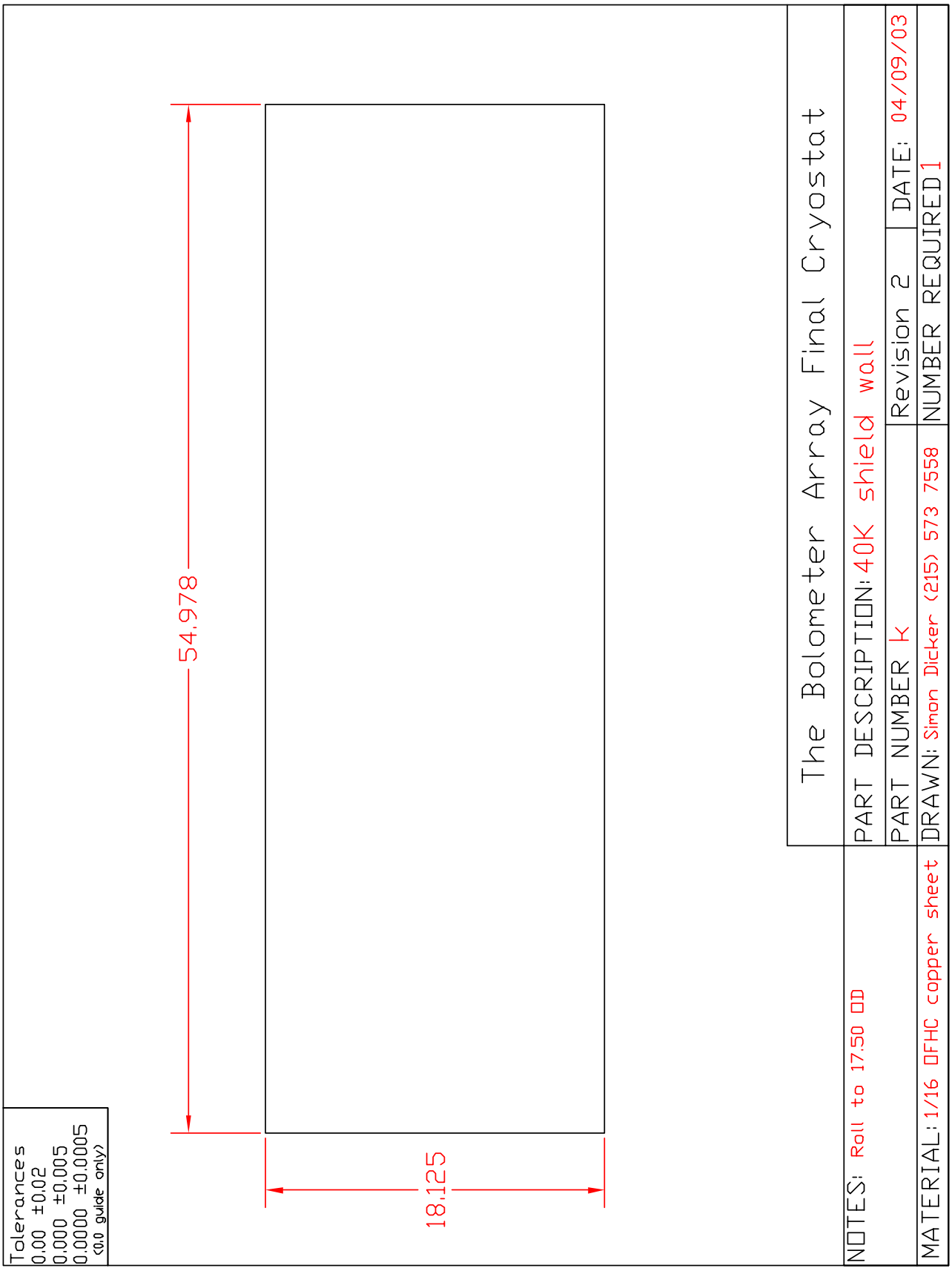

Tolerances
0.00 ±0.02
0.000 ±0.005
0.0000 ±0.0005
(0.0 guide only)
o-ring groove
OD 19.100, ID 18.620, depth 0.164
ø18.500
ø20.000
16x1/4 20 tapped holes
0.550 deep EQ SP on ø19.580 BC
Must not break through.
Bottom tap holes,
Top view
cross section
(enlarged)
O-ring groove
Welding lip
1.000
0.094
0.200
The Bolometer Array Final Cryostat
NOTES; o-ring surface may need to be cut after welding
PART DESCRIPTION: Vacuum can o-ring groove
PART NUMBER 9
Revision 2
DATE: 04/09/03
MATERIAL: Stainless steel
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 1

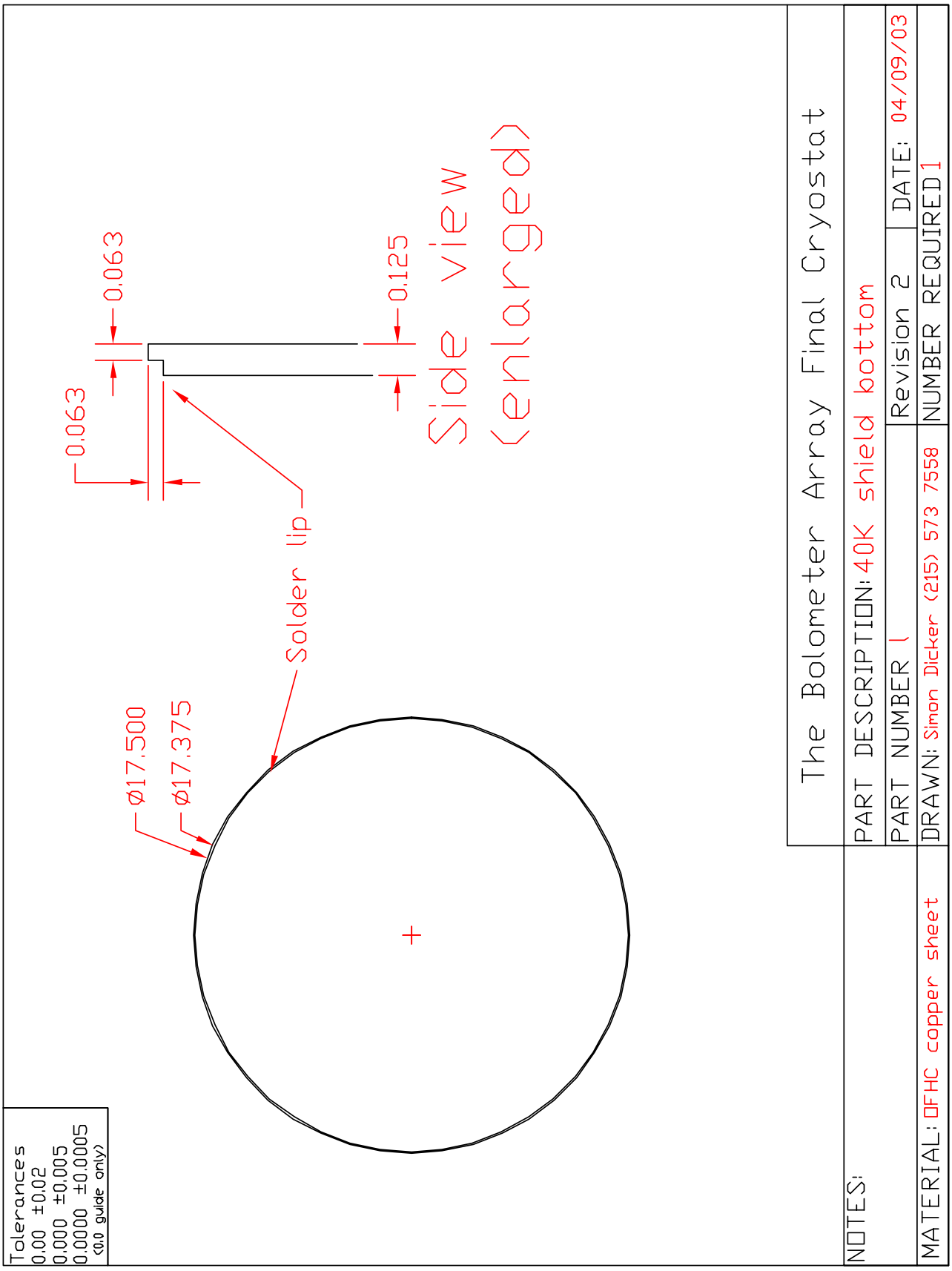

62.832
24.300
Tolerances
0.00 ±0.02
0.000 ±0.005
0.0000 ±0.0005
(3.0 guide only)
The Bolometer Array Final Cryostat
PART DESCRIPTION: Vacuum can wall
PART NUMBER h
Revision 2
DATE: 04/09/03
NOTES; sheet thickness ' 3/32
Roll to 20.0 ID
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 1
MATERIAL; Stainless steel sheet


Tolerances
0.00 ±0.02
0.000 ±0.005
0.0000 ±0.0005
(0.0 guide only)
Bottom view
Ø20.000
Ø19.813
Ø14.000
14 1/4-20 tapped holes
0.425 deep on EQ SP
16 hole Ø14.000 bolt pattern
Ø1.500
45°
Six 6-32 tapped holes
0.4 deep on Ø2.250
16 1/4-20 tapped holes
0.425 deep EQ SP on Ø18.000 BC
0.200
0.50
top
bottom
The Bolometer Array Final Cryostat
PART DESCRIPTION: Vacuum can bottom
PART NUMBER 1
Revision 2
DATE: 04/09/03
NOTES: Blind holes must be bottom tapped and not break through
MATERIAL: Stainless steel plate
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 1

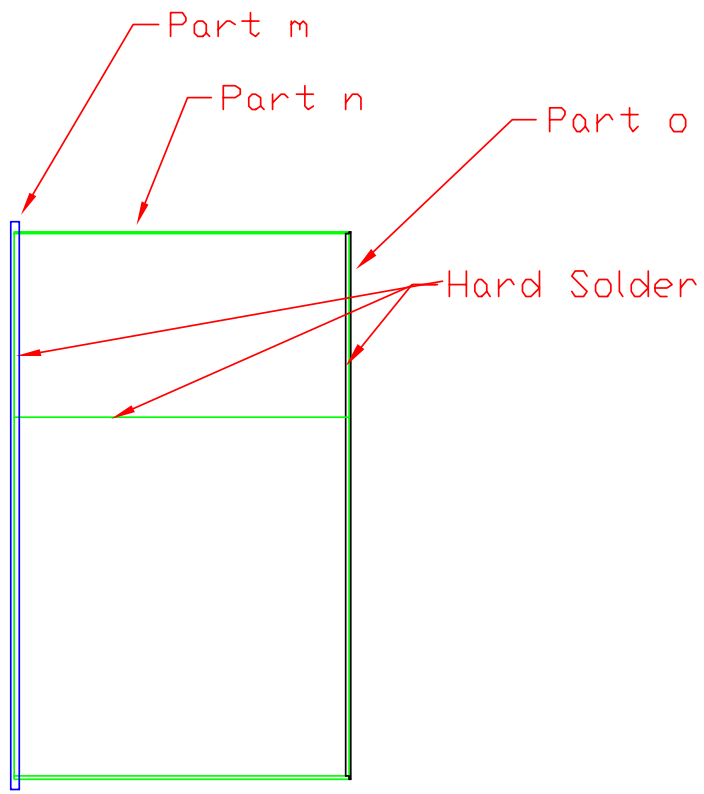

Part l
Hard Solder
Part k
Part j
Side View
The Bolometer Array Final Cryostat
PART DESCRIPTION: 40K heat shield
PART NUMBER Assembly 3
Revision 2
DATE: 04/09/03
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 1
NOTES: Hard solder parts j,k, and l together
Joints do not need to be air tight
Wrap with 40 layers NRC-2 cryolam
MATERIAL:
Tolerances
0.00 ±0.02
0.000 ±0.005
0.0000 ±0.0005
(3.0 guide only)


Tolerances
0.00 ±0.02
0.000 ±0.005
0.0000 ±0.0005
(0.0 guide only)
Top view
Ø17.375
Ø17.500
Ø18.250
16x6-32 clear thru holes
EQ SP on Ø17.875 BC
Cross section
(enlarged)
0.250
0.125
0.063
The Bolometer Array Final Cryostat
NOTES:
PART DESCRIPTION: 40K shield flange
PART NUMBER J
Revision 2
DATE: 04/09/03
MATERIAL: OFHC copper
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 1


54.978
18.125
Tolerances
0.00 ±0.02
0.000 ±0.005
0.0000 ±0.0005
(0.0 guide only)
The Bolometer Array Final Cryostat
NOTES: Roll to 17.50 OD
PART DESCRIPTION: 40K shield wall
PART NUMBER k
Revision 2
DATE: 04/09/03
MATERIAL: 1/16 OFHC copper sheet
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 1

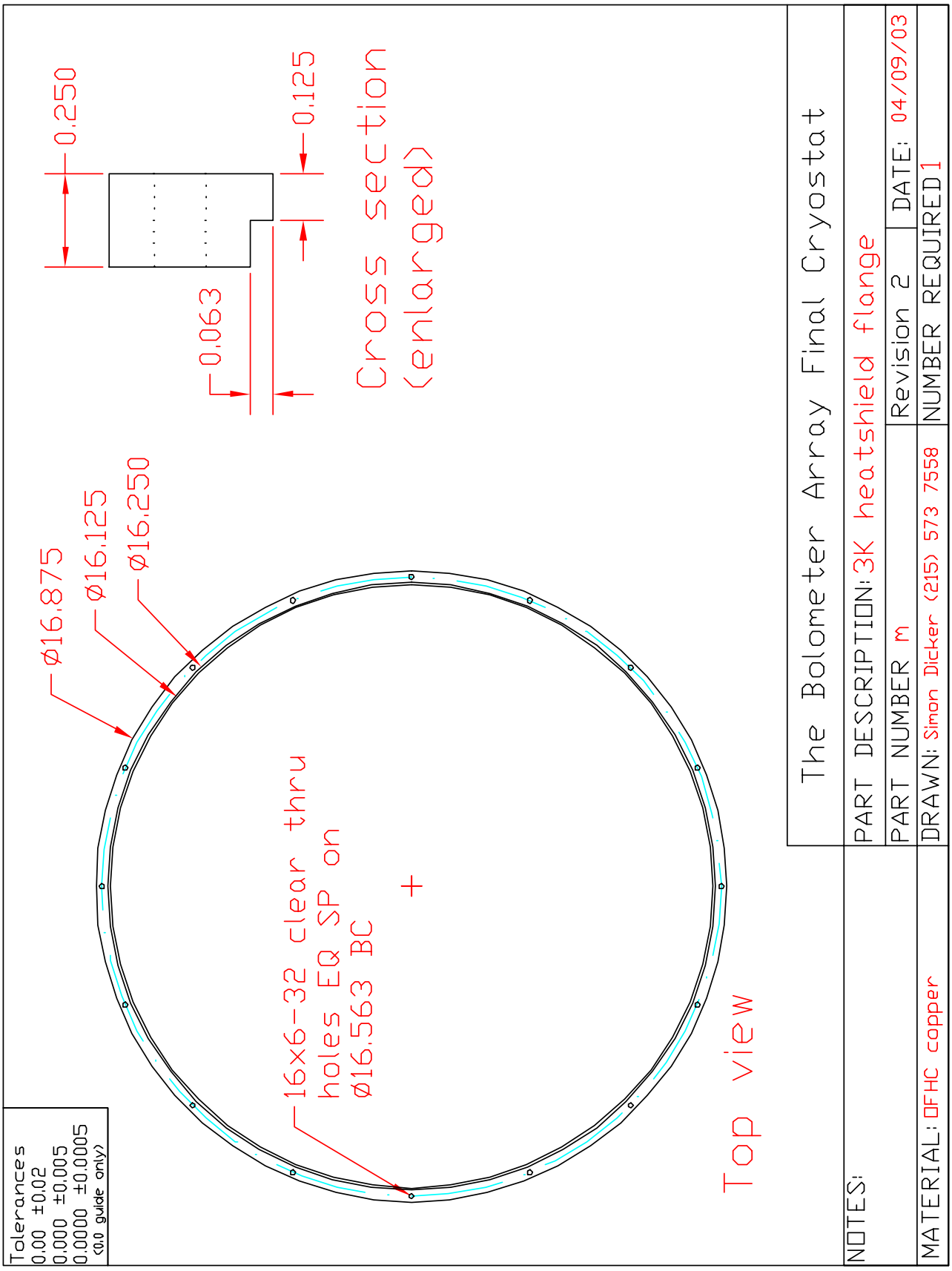

Tolerances
0.00 ±0.02
0.000 ±0.005
0.0000 ±0.0005
(0.0 guide only)
ø17.500
ø17.375
Solder lip
0.063
0.063
0.125
Side view
(enlarged)
The Bolometer Array Final Cryostat
NOTES:
PART DESCRIPTION: 40K shield bottom
PART NUMBER 1
Revision 2
DATE: 04/09/03
MATERIAL: OFHC copper sheet
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 1

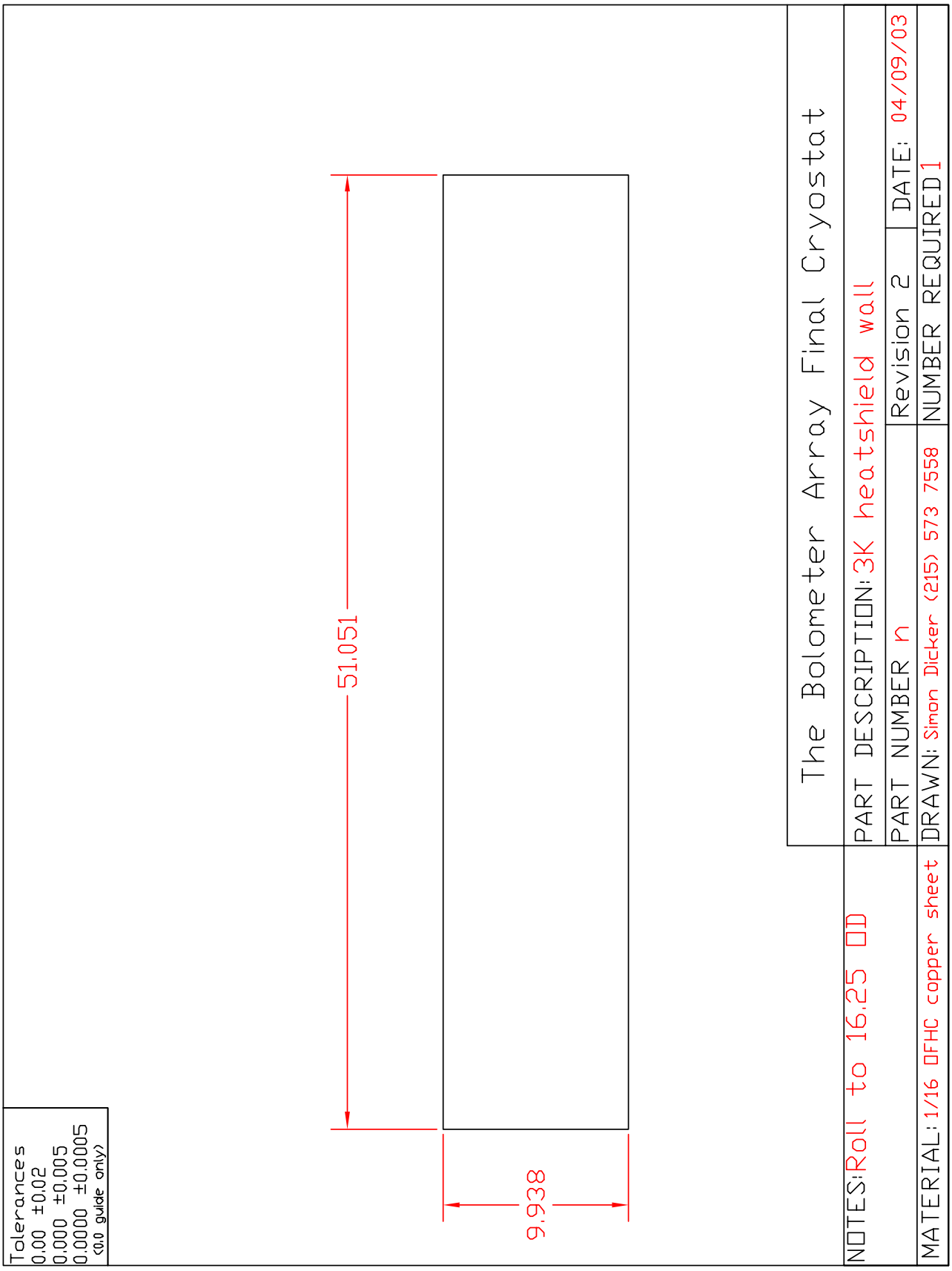
Tolerances
0.00 ±0.02
0.000 ±0.005
0.0000 ±0.0005
(0.0 guide only)

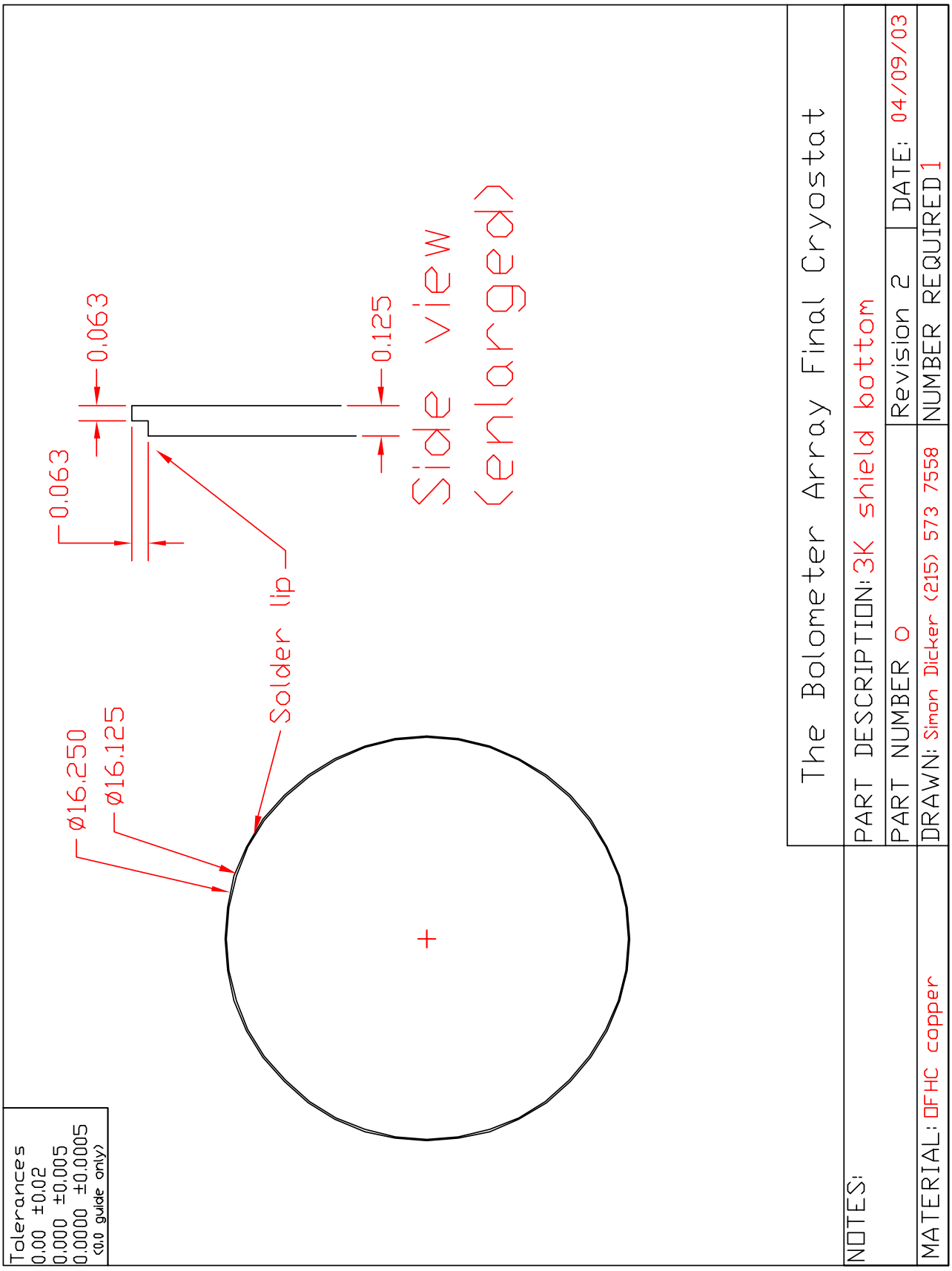


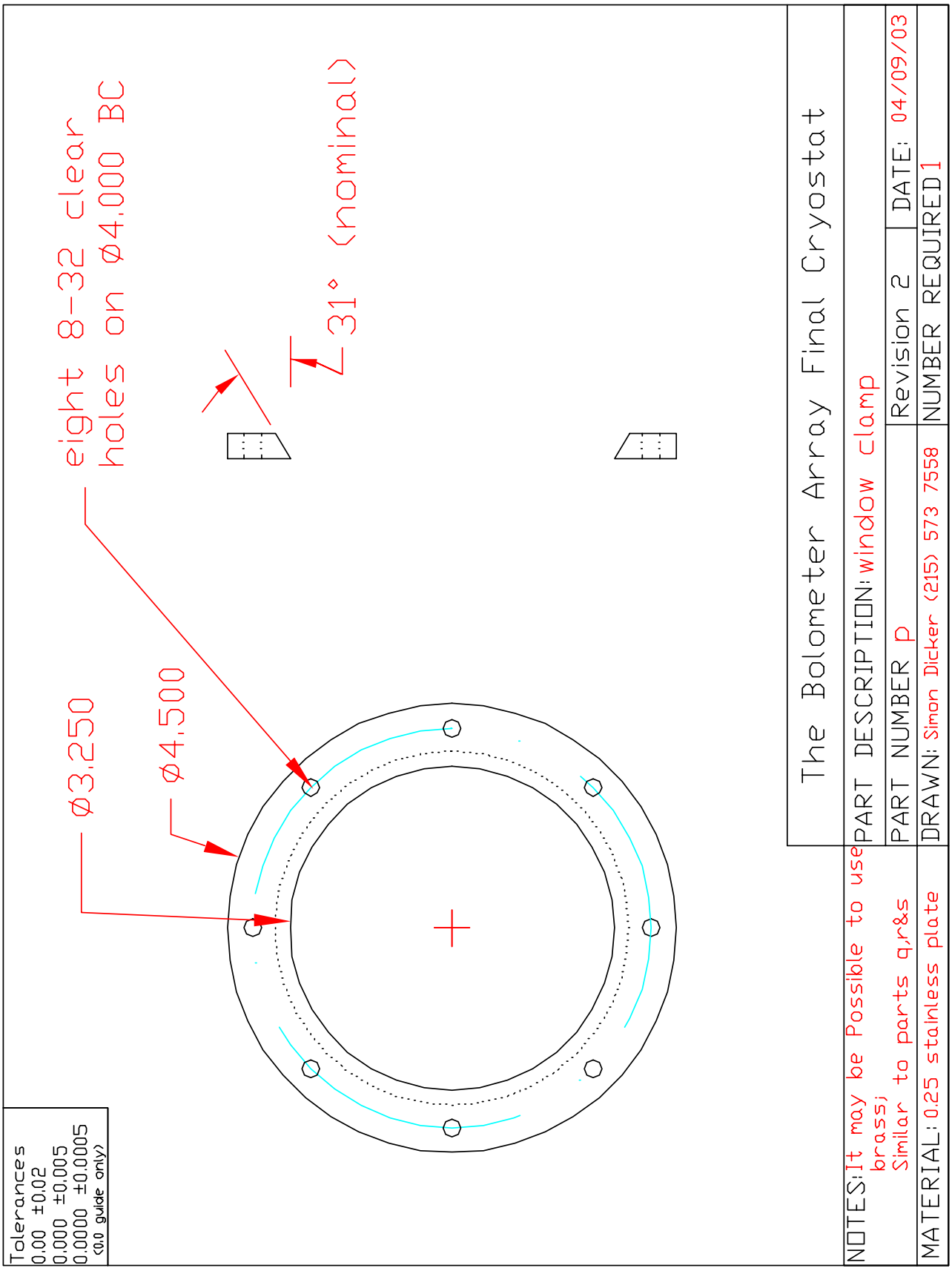

Side View

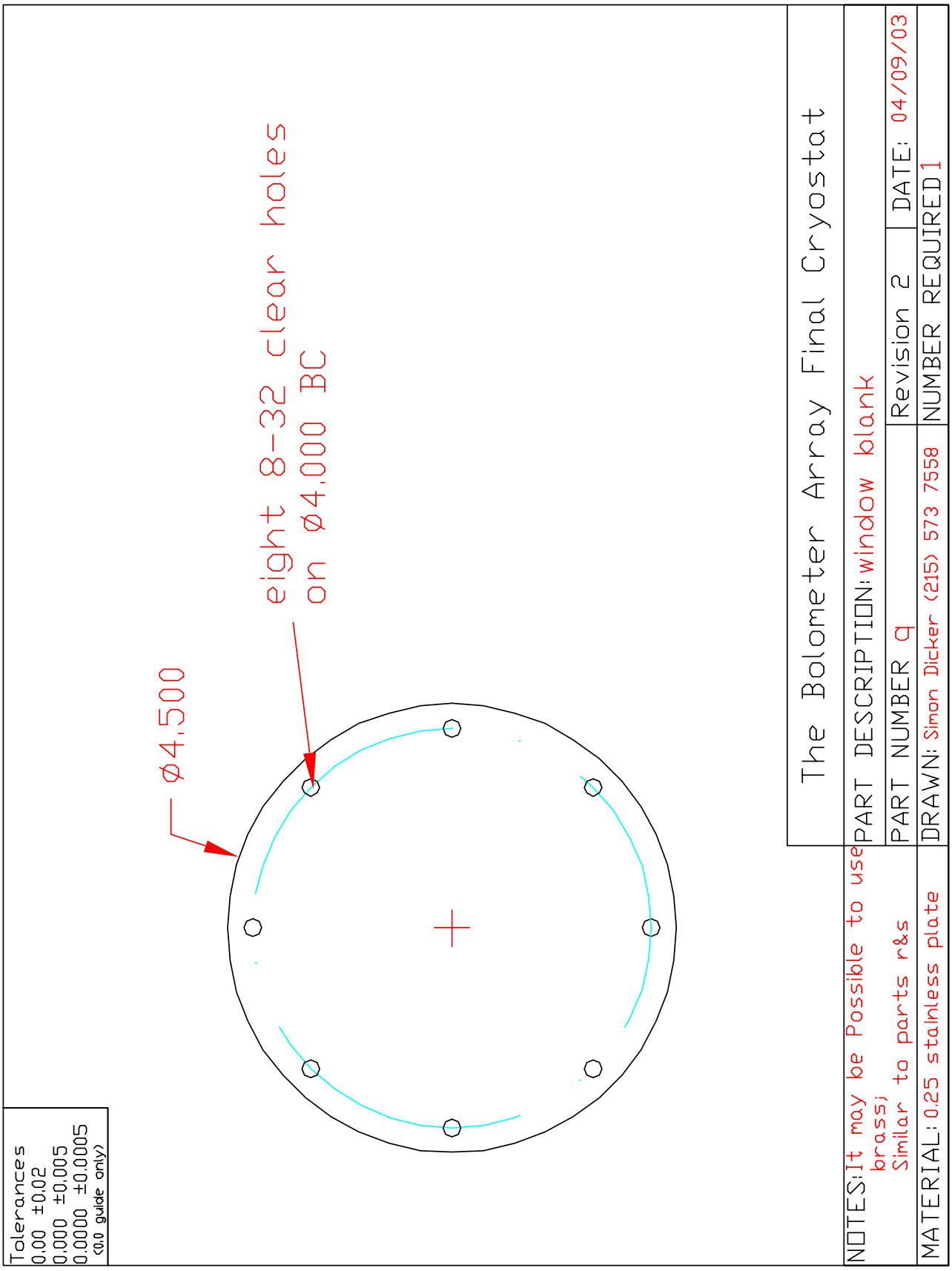
| | | | |
|---|---|---|---|
| | The Bolometer Array Final Cryostat | | |
| NOTES: Hard solder parts m,n, and o together; Joints do not need to be air tight wrap with 40 layers NRC-2 cryolam | PART DESCRIPTION: 3K heat shield | | |
| | PART NUMBER Assembly 4 | Revision 2 | DATE: 04/09/03 |
| MATERIAL: | DRAWN: Simon Dicker (215) 573 7558 | NUMBER REQUIRED 1 | |

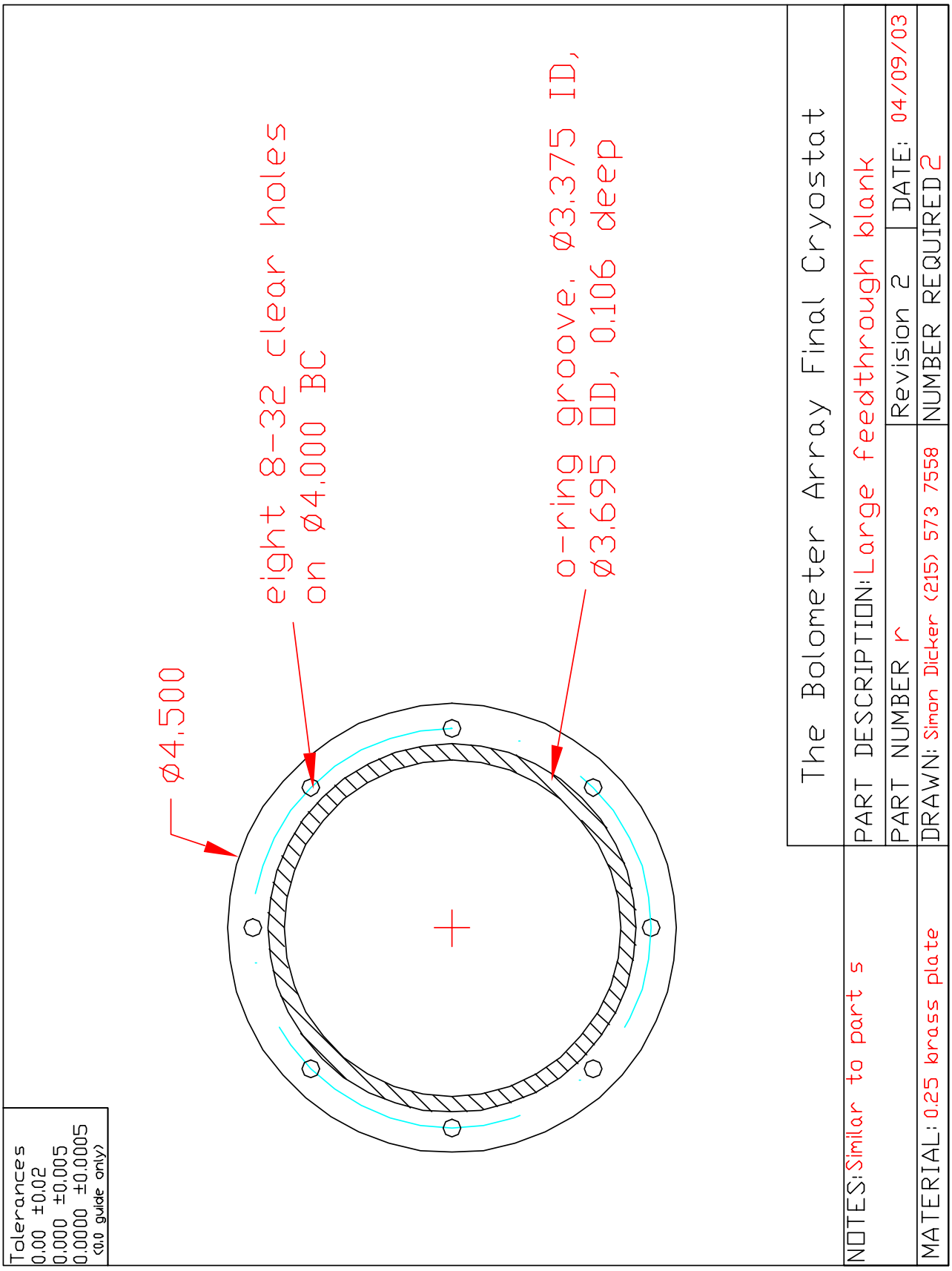

Tolerances
0.00 ±0.02
0.000 ±0.005
0.0000 ±0.0005
(0.0 guide only)
Ø16.875
Ø16.125
Ø16.250
16x6-32 clear thru
holes EQ SP on
Ø16.563 BC
Top view
0.250
0.125
0.063
Cross section
(enlarged)
The Bolometer Array Final Cryostat
NOTES:
PART DESCRIPTION: 3K heatshield flange
PART NUMBER m
Revision 2
DATE: 04/09/03
MATERIAL: OFHC copper
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 1

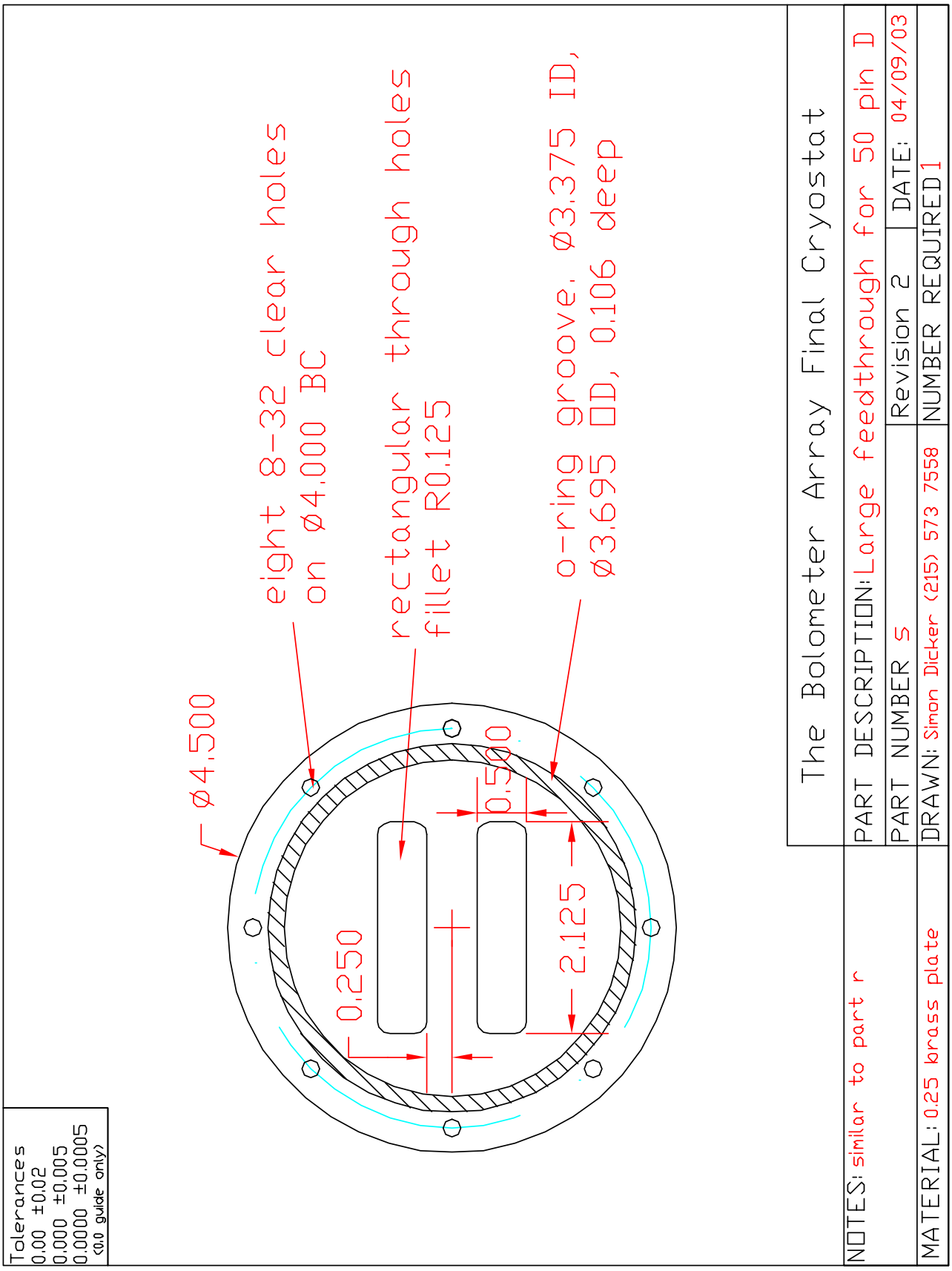

51.051
9.938
Tolerances
0.00 ±0.02
0.000 ±0.005
0.0000 ±0.0005
(0.0 guide only)
The Bolometer Array Final Cryostat
NOTES:Roll to 16.25 OD
PART DESCRIPTION:3K heatshield wall
PART NUMBER n
Revision 2
DATE: 04/09/03
MATERIAL:1/16 OFHC copper sheet
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 1


Tolerances
0.00 ±0.02
0.000 ±0.005
0.0000 ±0.0005
(0.0 guide only)
Ø16.250
Ø16.125
Solder lip
0.063
0.063
0.125
Side view
(enlarged)
The Bolometer Array Final Cryostat
NOTES:
PART DESCRIPTION: 3K shield bottom
PART NUMBER 0
Revision 2
DATE: 04/09/03
MATERIAL: OFHC copper
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 1

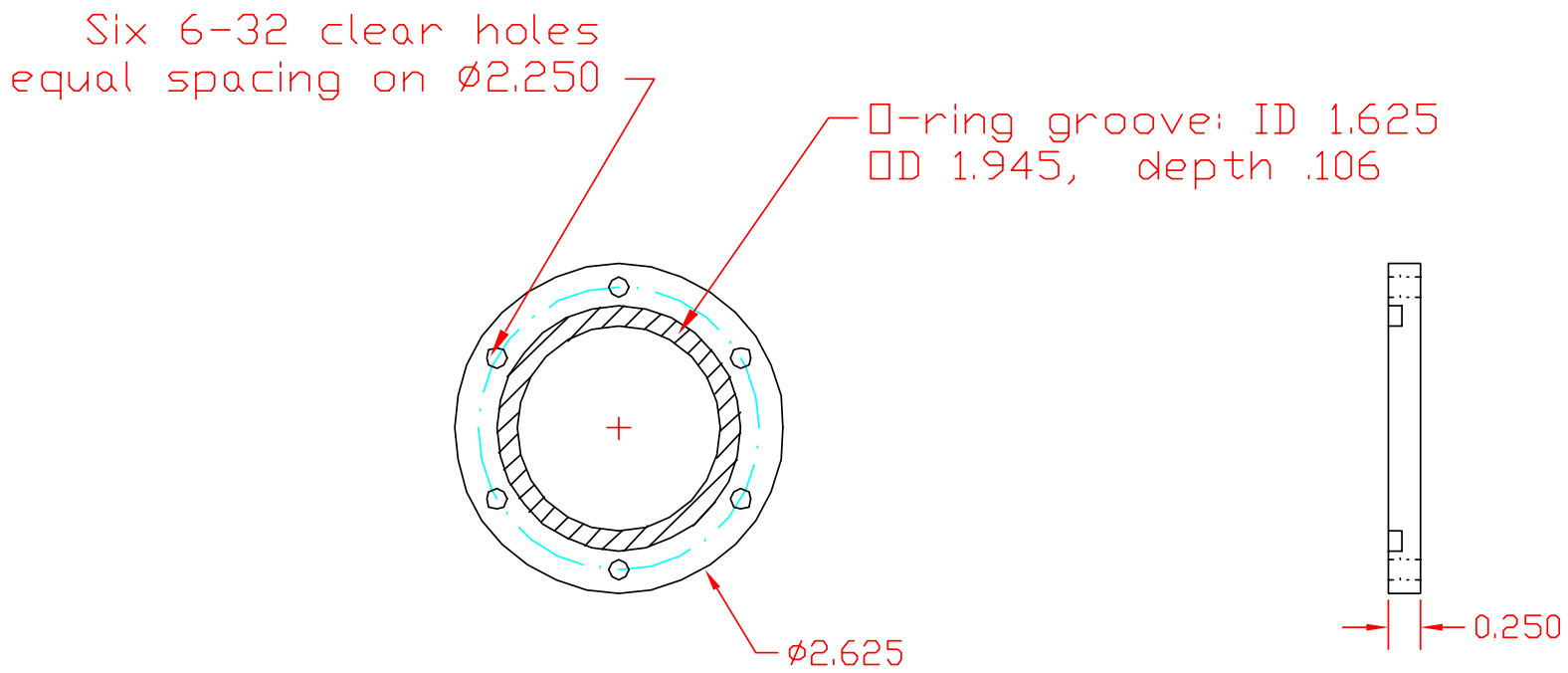

eight 8-32 clear
holes on Ø4.000 BC
31° (nominal)
Ø3.250
Ø4.500
The Bolometer Array Final Cryostat
PART DESCRIPTION: window clamp
PART NUMBER P
Revision 2
DATE: 04/09/03
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 1
NOTES: It may be Possible to use brass; Similar to parts q,r&s
MATERIAL: 0.25 stainless plate
Tolerances
0.00 ±0.02
0.000 ±0.005
0.0000 ±0.0005
(0.0 guide only)


Tolerances
0.00 ±0.02
0.000 ±0.005
0.0000 ±0.0005
(0.0 guide only)
Ø4.500
eight 8-32 clear holes
on Ø4.000 BC
The Bolometer Array Final Cryostat
NOTES: It may be Possible to use brass; Similar to parts r&s
PART DESCRIPTION: window blank
PART NUMBER 9
Revision 2
DATE: 04/09/03
MATERIAL: 0.25 stainless plate
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 1

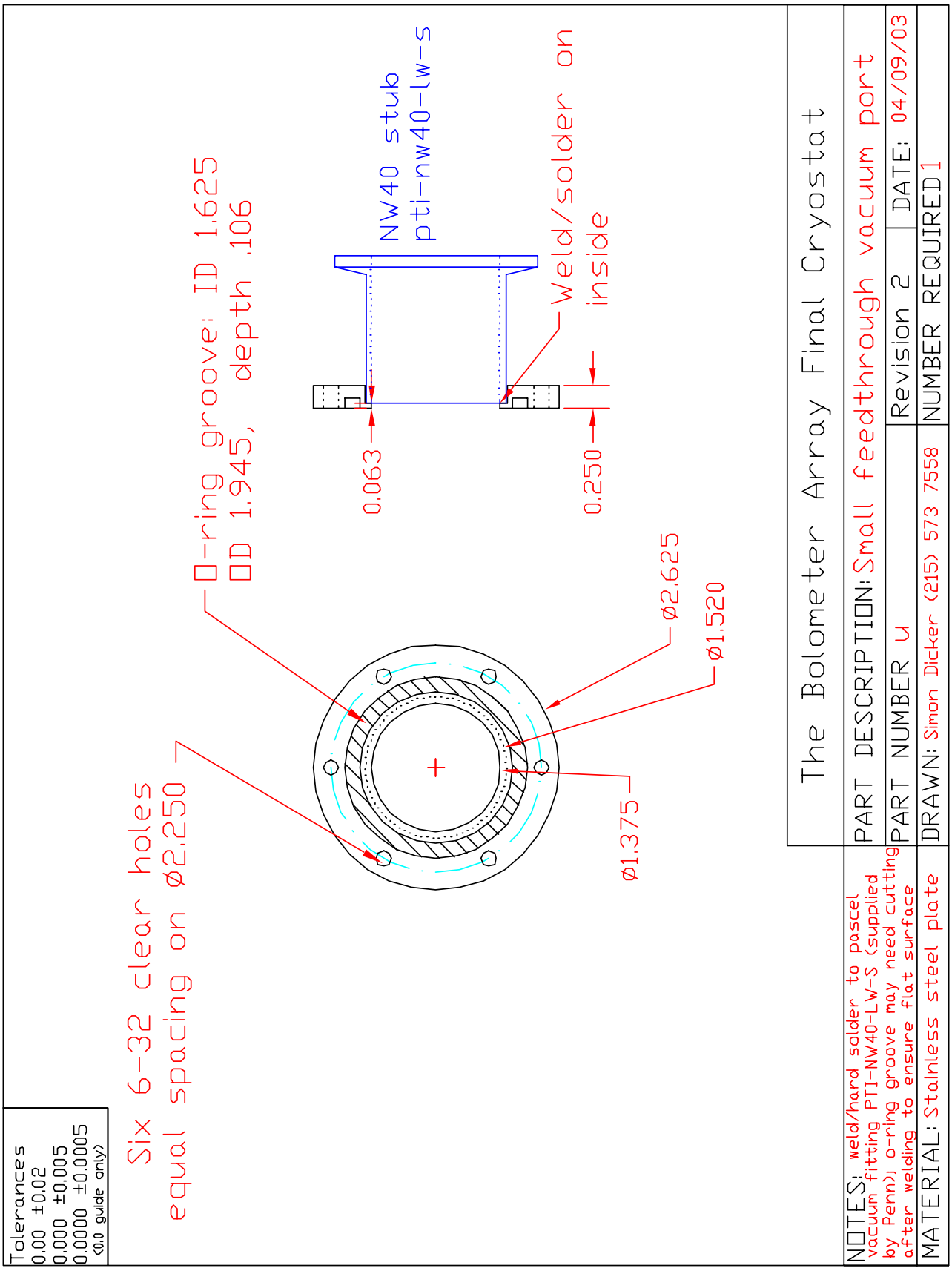

Ø4.500
eight 8-32 clear holes
on Ø4.000 BC
o-ring groove, Ø3.375 ID,
Ø3.695 OD, 0.106 deep
The Bolometer Array Final Cryostat
PART DESCRIPTION: Large feedthrough blank
PART NUMBER r
Revision 2
DATE: 04/09/03
NOTES: Similar to part s
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 2
MATERIAL: 0.25 brass plate
Tolerances
0.00 ±0.02
0.000 ±0.005
0.0000 ±0.0005
(0.0 guide only)

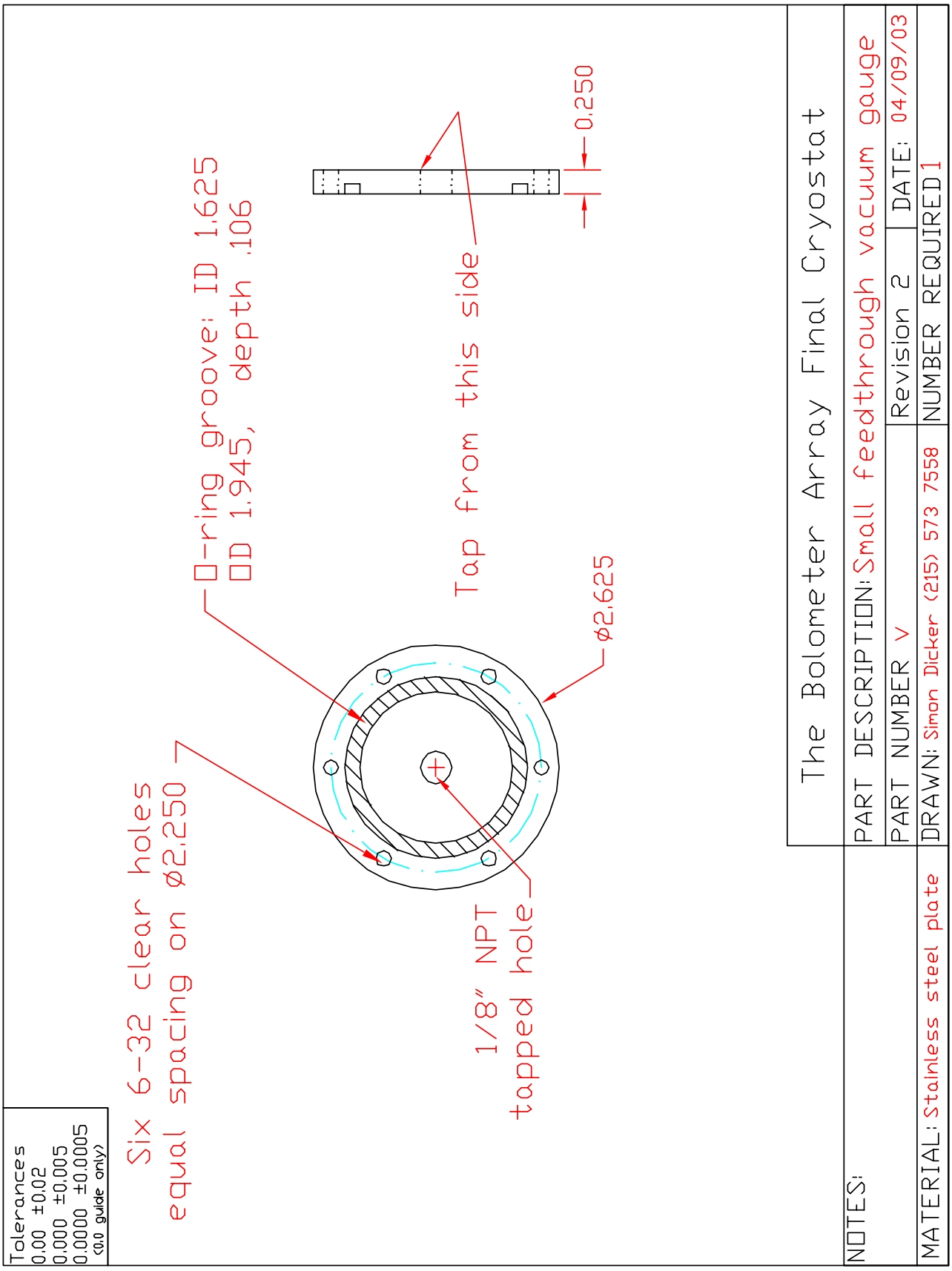

Tolerances
0.00 ±0.02
0.000 ±0.005
0.0000 ±0.0005
(0.0 guide only)
ø4.500
eight 8-32 clear holes
on ø4.000 BC
rectangular through holes
fillet R0.125
o-ring groove, ø3.375 ID,
ø3.695 OD, 0.106 deep
0.250
0.500
2.125
The Bolometer Array Final Cryostat
NOTES: similar to part r
PART DESCRIPTION: Large feedthrough for 50 pin D
PART NUMBER s
Revision 2
DATE: 04/09/03
MATERIAL: 0.25 brass plate
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 1

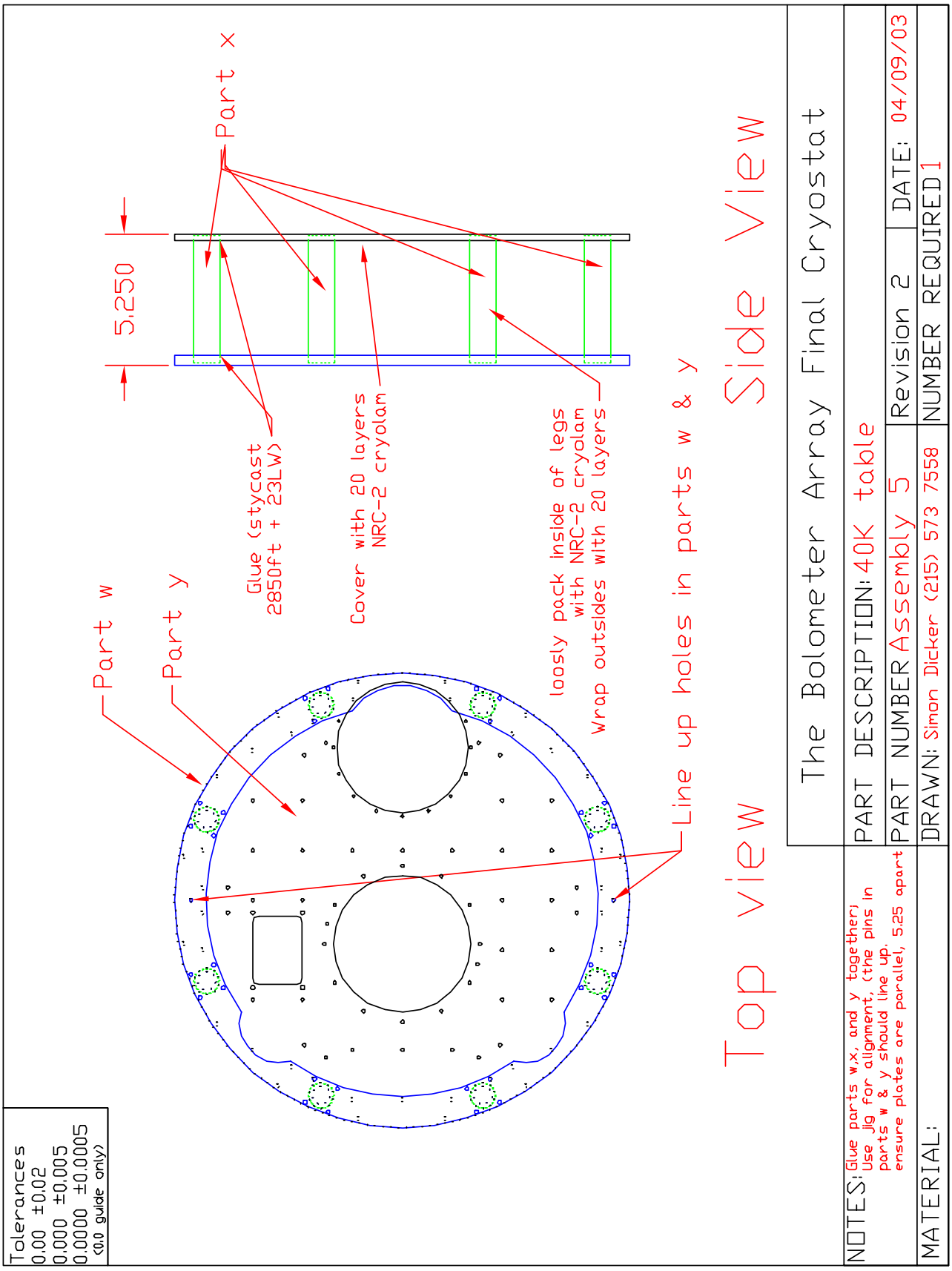
Tolerances
0.00 ±0.02
0.000 ±0.005
0.0000 ±0.0005
(0.0 guide only)

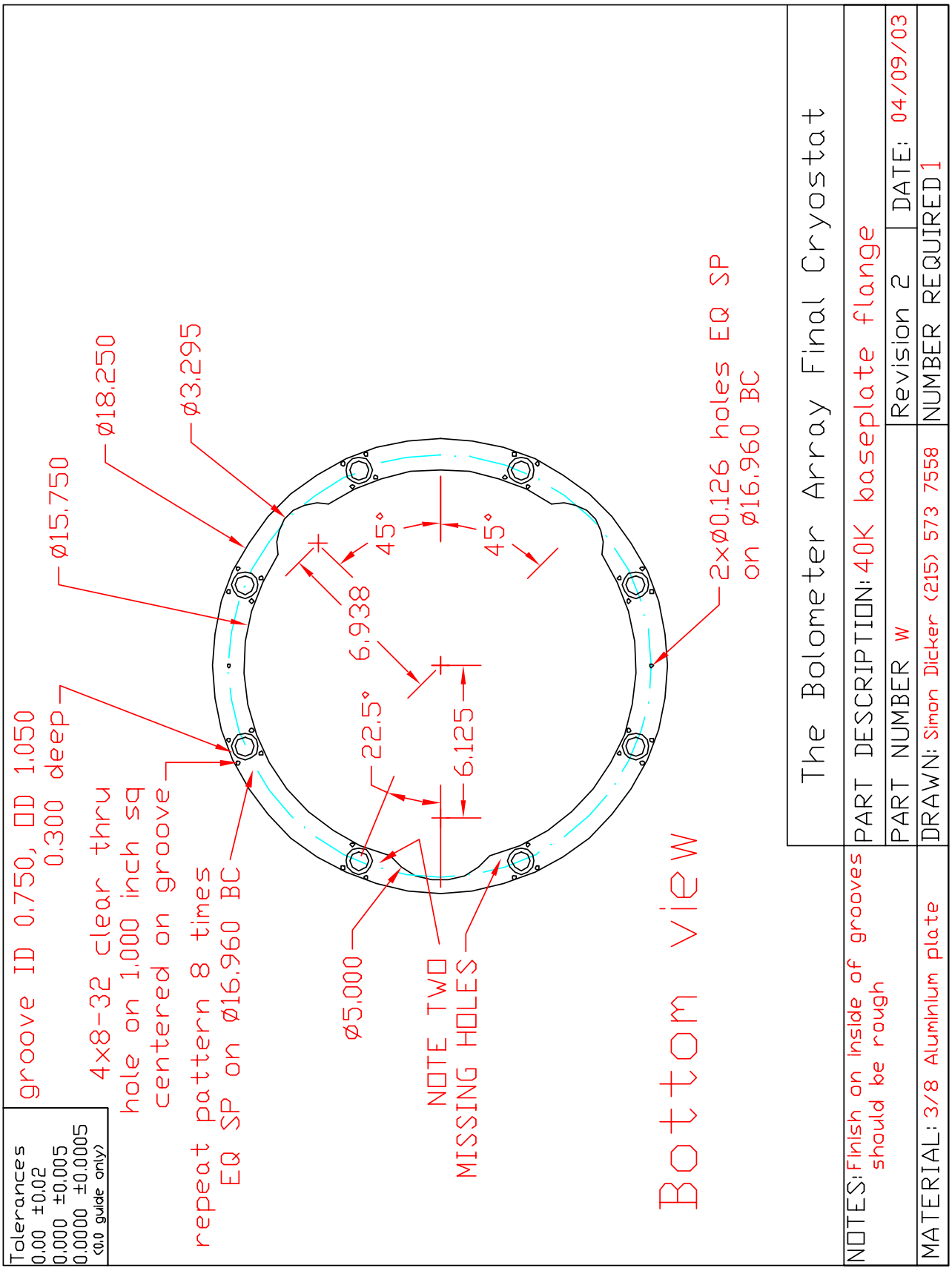


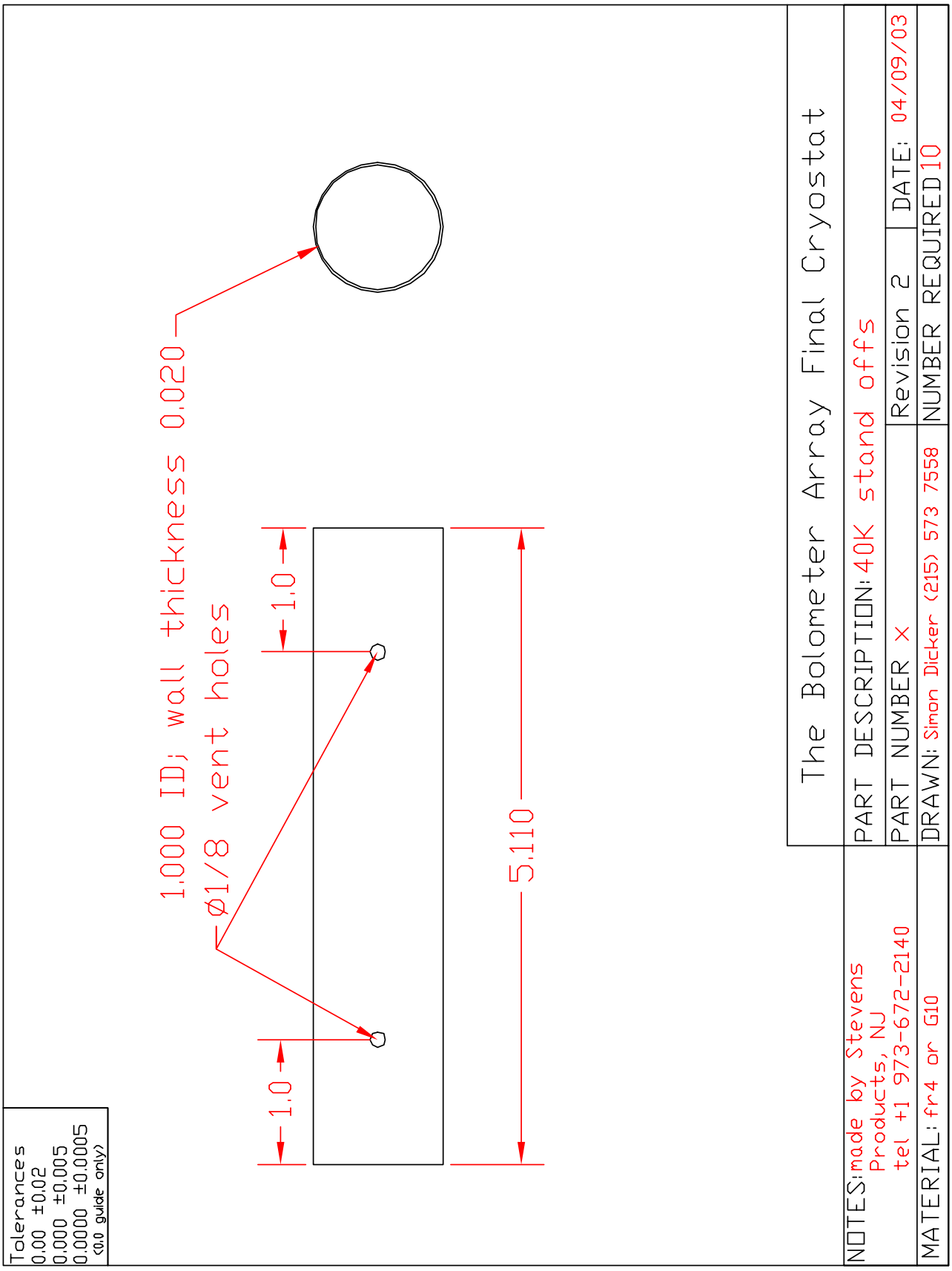

| | | | |
|---|---|---|---|
| | The Bolometer Array Final Cryostat | | |
| NOTES: Similar to parts u & v | PART DESCRIPTION: Small feedthrough blank | | |
| | PART NUMBER t | Revision 2 | DATE: 04/09/03 |
| MATERIAL: Brass plate | DRAWN: Simon Dicker (215) 573 7558 | NUMBER REQUIRED 3 | |

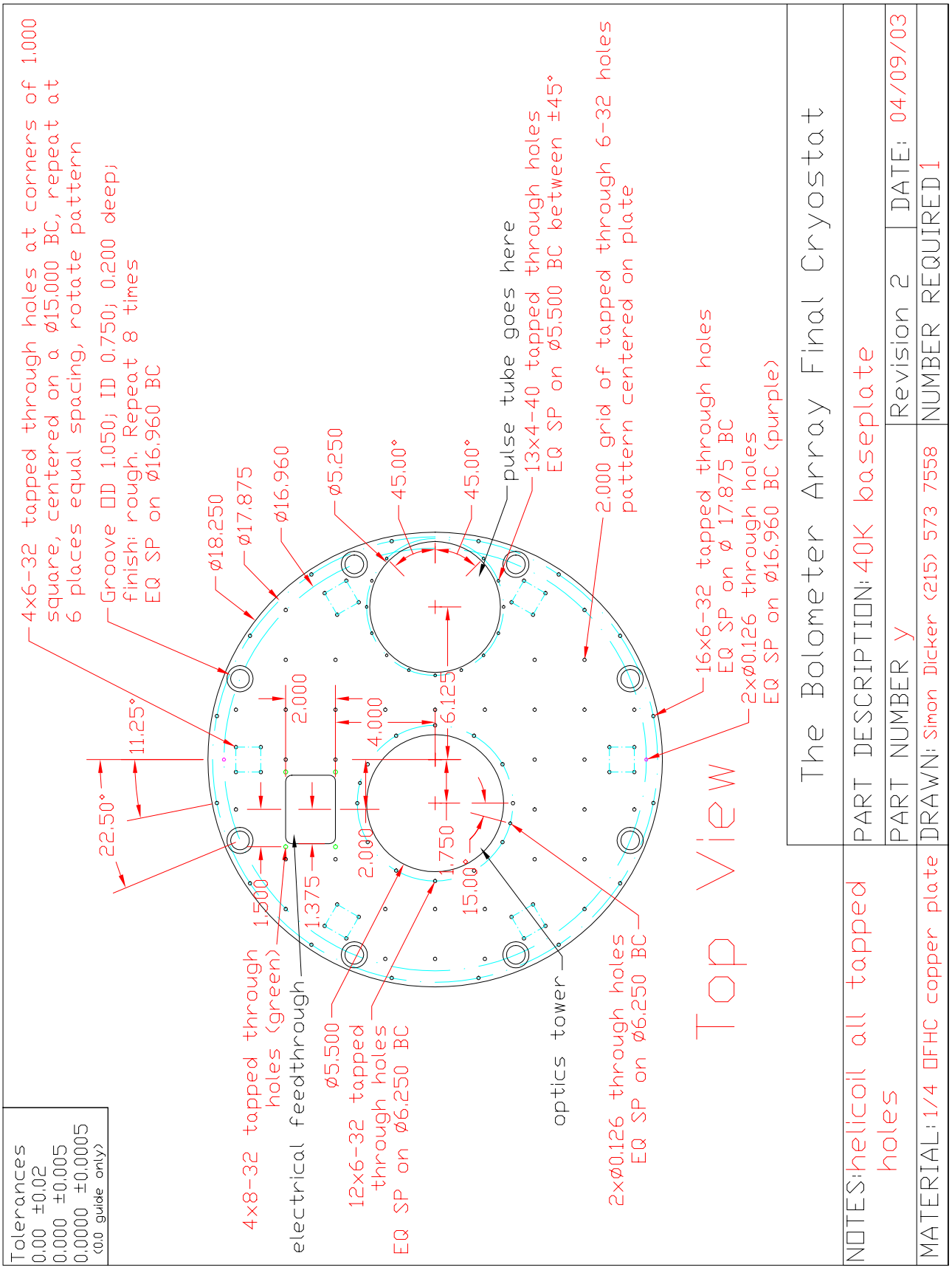

Tolerances
0.00 ±0.02
0.000 ±0.005
0.0000 ±0.0005
(0.0 guide only)
Six 6-32 clear holes
equal spacing on Ø2.250
O-ring groove: ID 1.625
OD 1.945, depth .106
NW40 stub
pti-nw40-lw-s
Weld/solder on
inside
0.063
0.250
Ø2.625
Ø1.520
Ø1.375
The Bolometer Array Final Cryostat
NOTES: weld/hard solder to pascel vacuum fitting PTI-NW40-LW-S (supplied by Penn); o-ring groove may need cutting after welding to ensure flat surface
PART DESCRIPTION: Small feedthrough vacuum port
PART NUMBER 4
Revision 2
DATE: 04/09/03
MATERIAL: Stainless steel plate
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 1

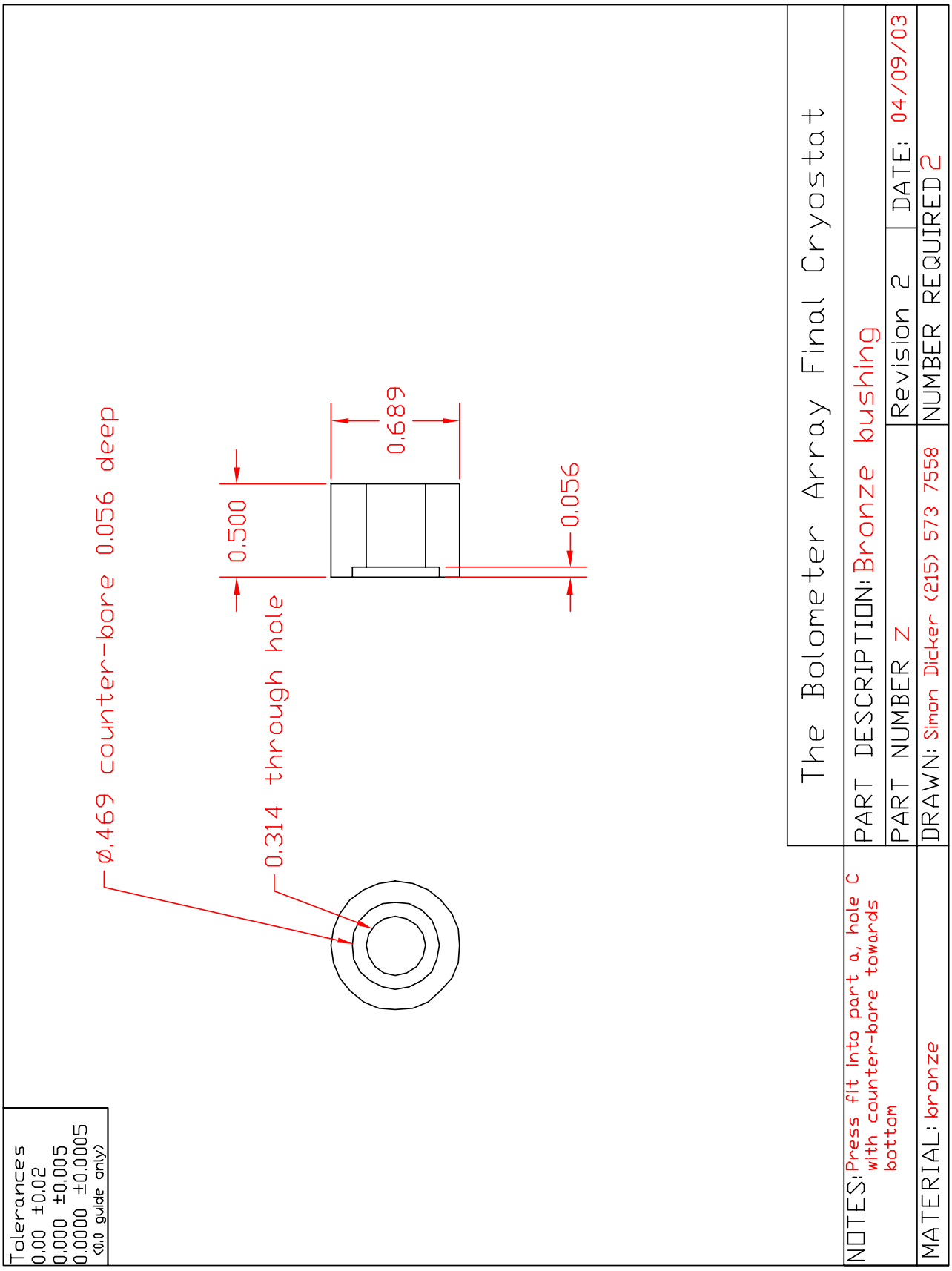

Tolerances
0.00 ±0.02
0.000 ±0.005
0.0000 ±0.0005
(0.0 guide only)
Six 6-32 clear holes
equal spacing on ø2.250
O-ring groove: ID 1.625
OD 1.945, depth .106
Tap from this side
0.250
ø2.625
1/8" NPT
tapped hole
The Bolometer Array Final Cryostat
NOTES:
PART DESCRIPTION: Small feedthrough vacuum gauge
PART NUMBER V
Revision 2
DATE: 04/09/03
MATERIAL: Stainless steel plate
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 1

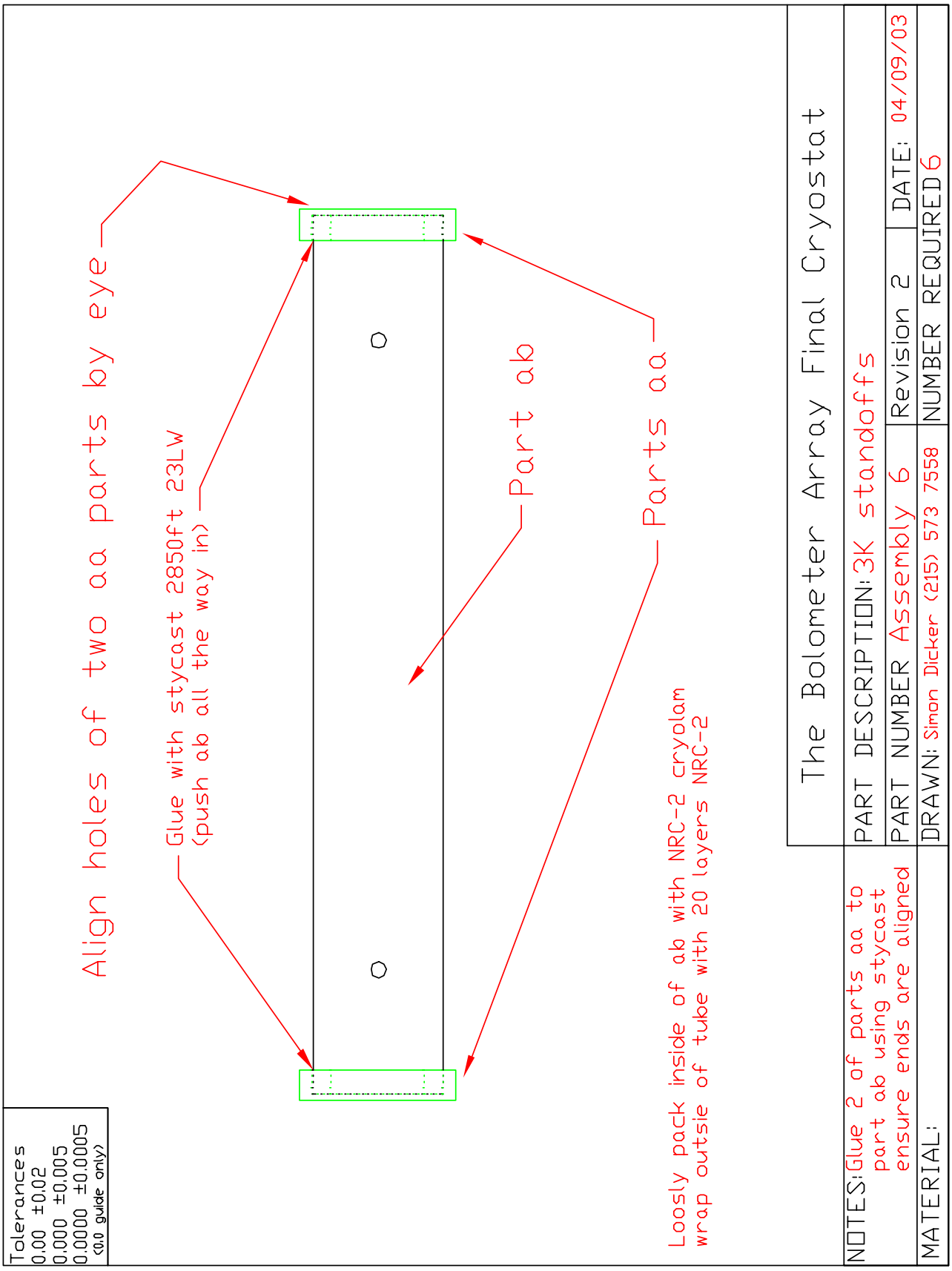

Tolerances
0.00 ±0.02
0.000 ±0.005
0.0000 ±0.0005
(0.0 guide only)
Top view
Part w
Part y
Line up holes in parts w & y
Side View
Part x
5.250
Glue (stycast 2850ft + 23LV)
Cover with 20 layers NRC-2 cryolam
loosly pack inside of legs with NRC-2 cryolam
Wrap outsides with 20 layers
The Bolometer Array Final Cryostat
PART DESCRIPTION: 40K table
PART NUMBER Assembly 5
Revision 2
DATE: 04/09/03
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 1
MATERIAL:
NOTES: Glue parts w,x, and y together; Use jig for alignment, (the pins in parts w & y should line up. ensure plates are parallel, 5.25 apart

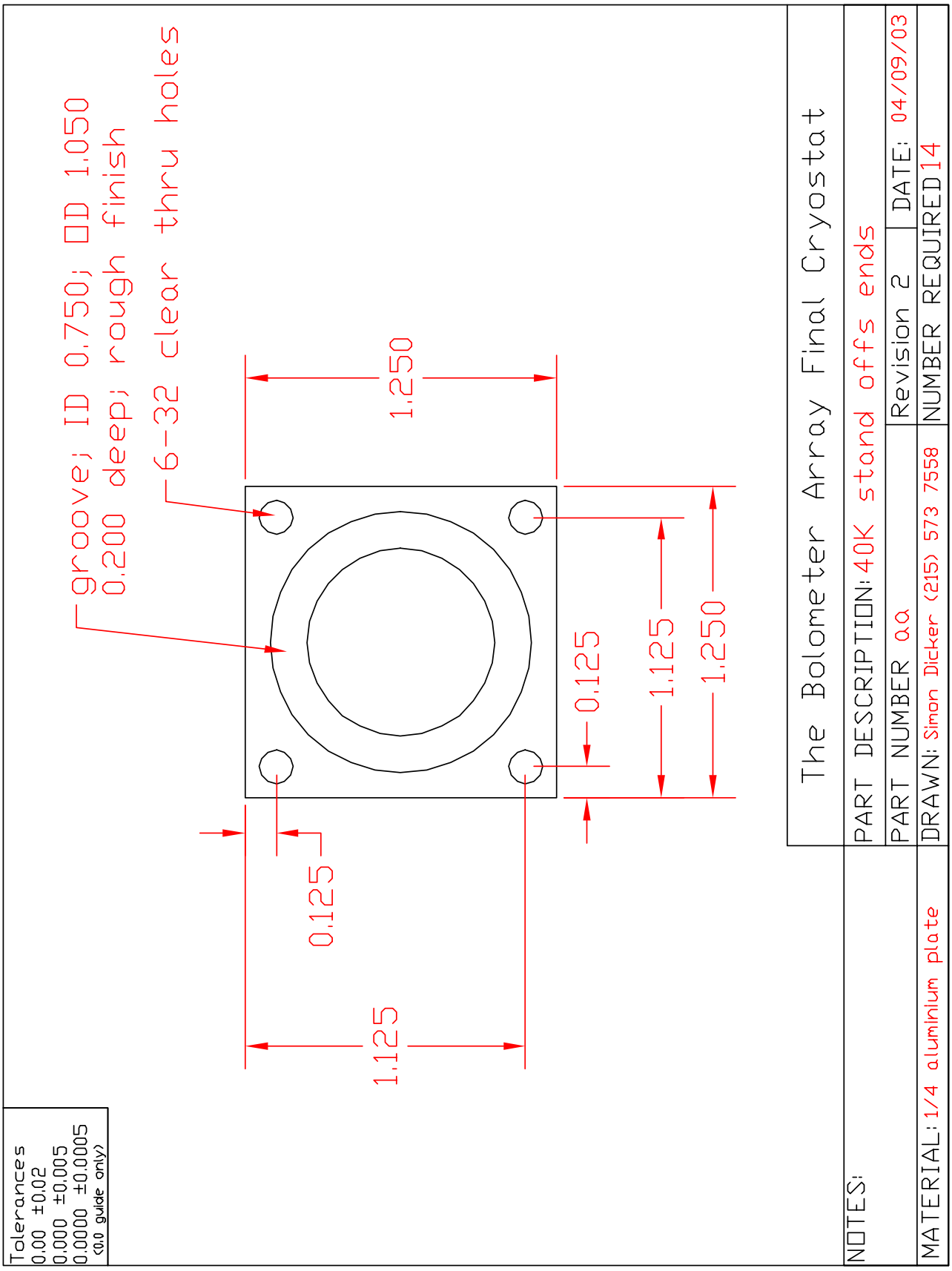

Tolerances
0.00 ±0.02
0.000 ±0.005
0.0000 ±0.0005
(0.0 guide only)
groove ID 0.750, OD 1.050
0.300 deep
4x8-32 clear thru
hole on 1.000 inch sq
centered on groove
repeat pattern 8 times
EQ SP on ø16.960 BC
ø15.750
ø18.250
ø3.295
ø5.000
NOTE TWO
MISSING HOLES
22.5°
6.938
45°
45°
6.125
2xø0.126 holes EQ SP
on ø16.960 BC
Bottom view
The Bolometer Array Final Cryostat
NOTES: Finish on inside of grooves should be rough
PART DESCRIPTION: 40K baseplate flange
PART NUMBER W
Revision 2
DATE: 04/09/03
MATERIAL: 3/8 Aluminium plate
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 1

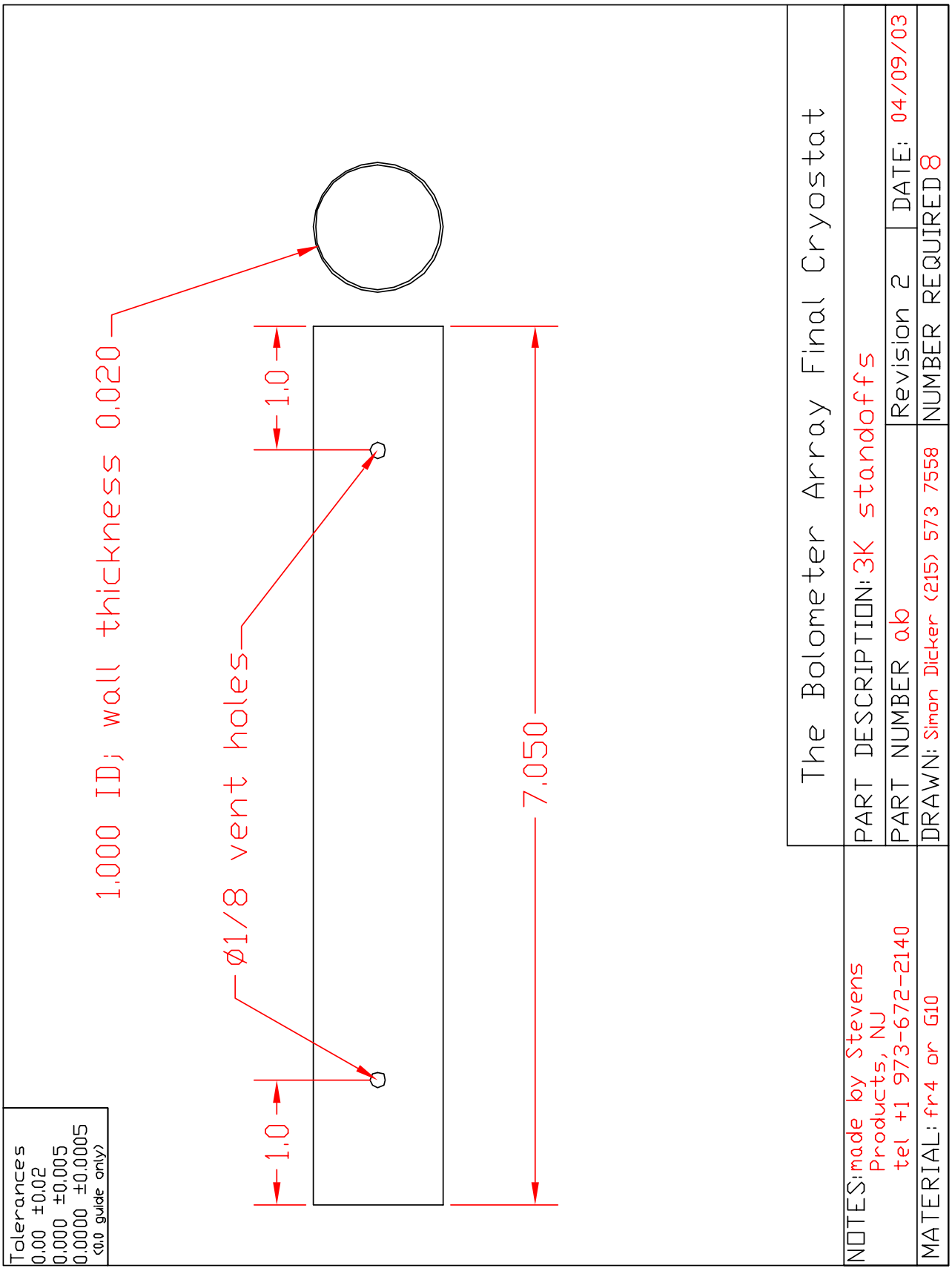

Tolerances
0.00 ±0.02
0.000 ±0.005
0.0000 ±0.0005
(0.0 guide only)
1.000 ID; wall thickness 0.020
Ø1/8 vent holes
1.0
1.0
5.110
The Bolometer Array Final Cryostat
PART DESCRIPTION: 40K stand offs
PART NUMBER X
Revision 2
DATE: 04/09/03
NOTES: made by Stevens Products, NJ tel +1 973-672-2140
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 10
MATERIAL: fr4 or G10

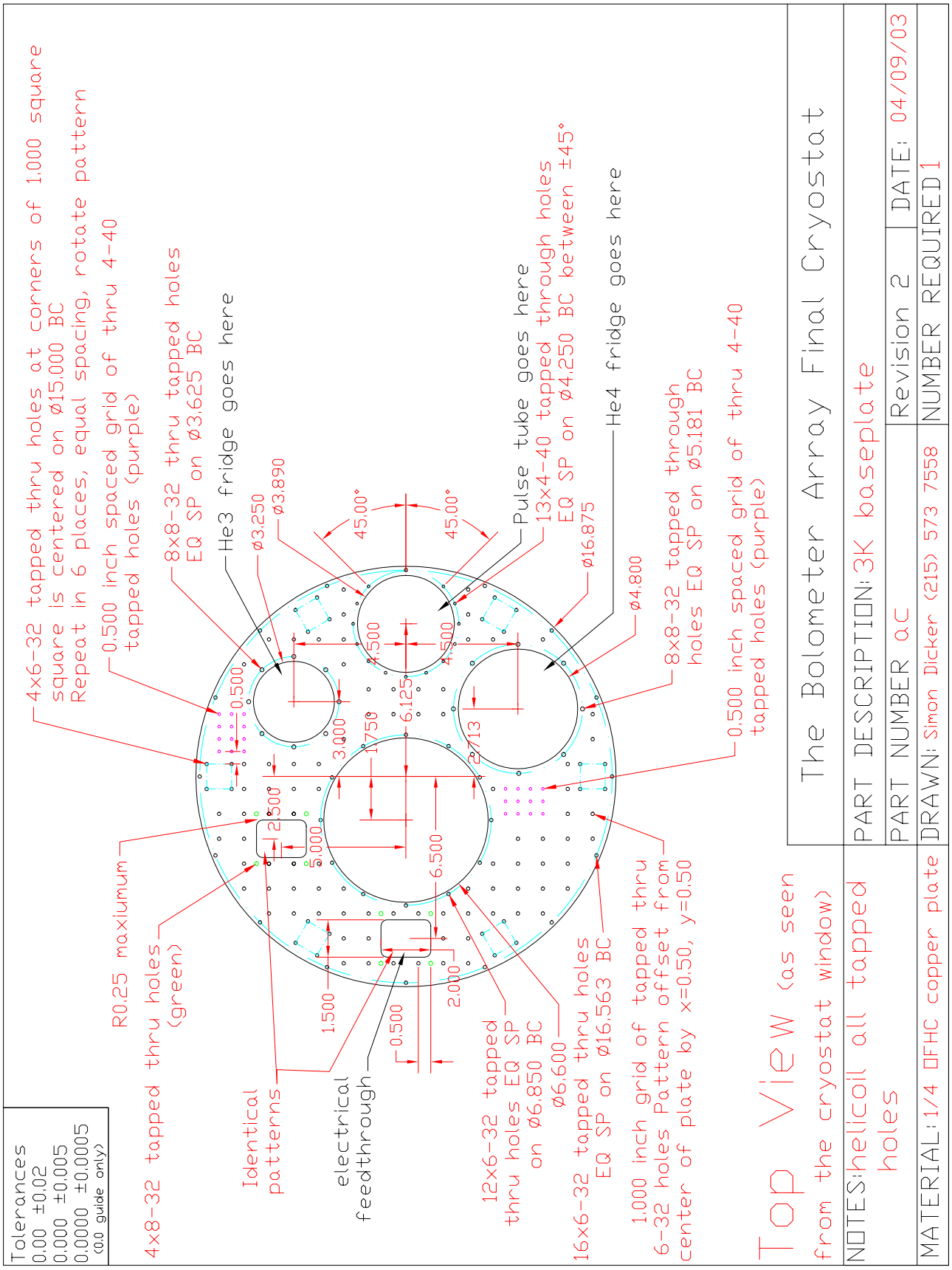

Tolerances
0.00 ±0.02
0.000 ±0.005
0.0000 ±0.0005
(0.0 guide only)
4x6-32 tapped through holes at corners of 1.000 square, centered on a ø15.000 BC, repeat at 6 places equal spacing, rotate pattern
Groove OD 1.050; ID 0.750; 0.200 deep; finish: rough. Repeat 8 times EQ SP on ø16.960 BC
ø18.250
ø17.875
ø16.960
ø5.250
45.00°
45.00°
pulse tube goes here
13x4-40 tapped through holes EQ SP on ø5.500 BC between ±45°
2.000 grid of tapped through 6-32 holes pattern centered on plate
16x6-32 tapped through holes EQ SP on ø 17.875 BC
2xø0.126 through holes EQ SP on ø16.960 BC (purple)
22.50°
11.25°
2.000
4.000
6.125
1.500
1.375
2.000
1.750
15.00°
4x8-32 tapped through holes (green)
electrical feedthrough
ø5.500
12x6-32 tapped through holes EQ SP on ø6.250 BC
optics tower
2xø0.126 through holes EQ SP on ø6.250 BC
Top View
The Bolometer Array Final Cryostat
NOTES: helicoil all tapped holes
PART DESCRIPTION: 40K baseplate
PART NUMBER y
Revision 2
DATE: 04/09/03
MATERIAL: 1/4 OFHC copper plate
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 1

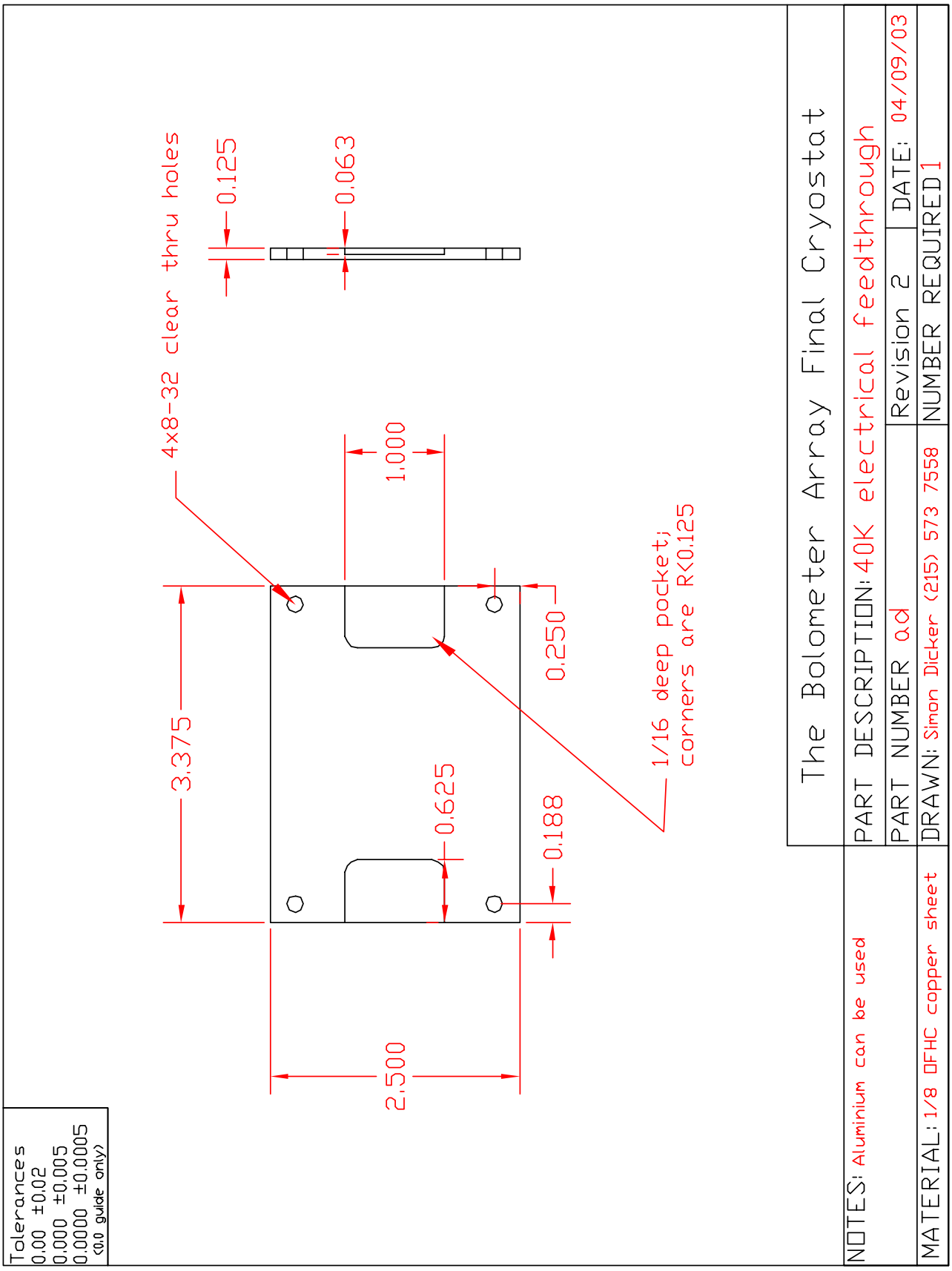

Tolerances
0.00 ±0.02
0.000 ±0.005
0.0000 ±0.0005
<0.0 guide only>
Ø.469 counter-bore 0.056 deep
0.314 through hole
0.500
0.689
0.056
The Bolometer Array Final Cryostat
NOTES; Press fit into part a, hole c with counter-bore towards bottom
PART DESCRIPTION: Bronze bushing
PART NUMBER 2
Revision 2
DATE: 04/09/03
MATERIAL; bronze
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 2

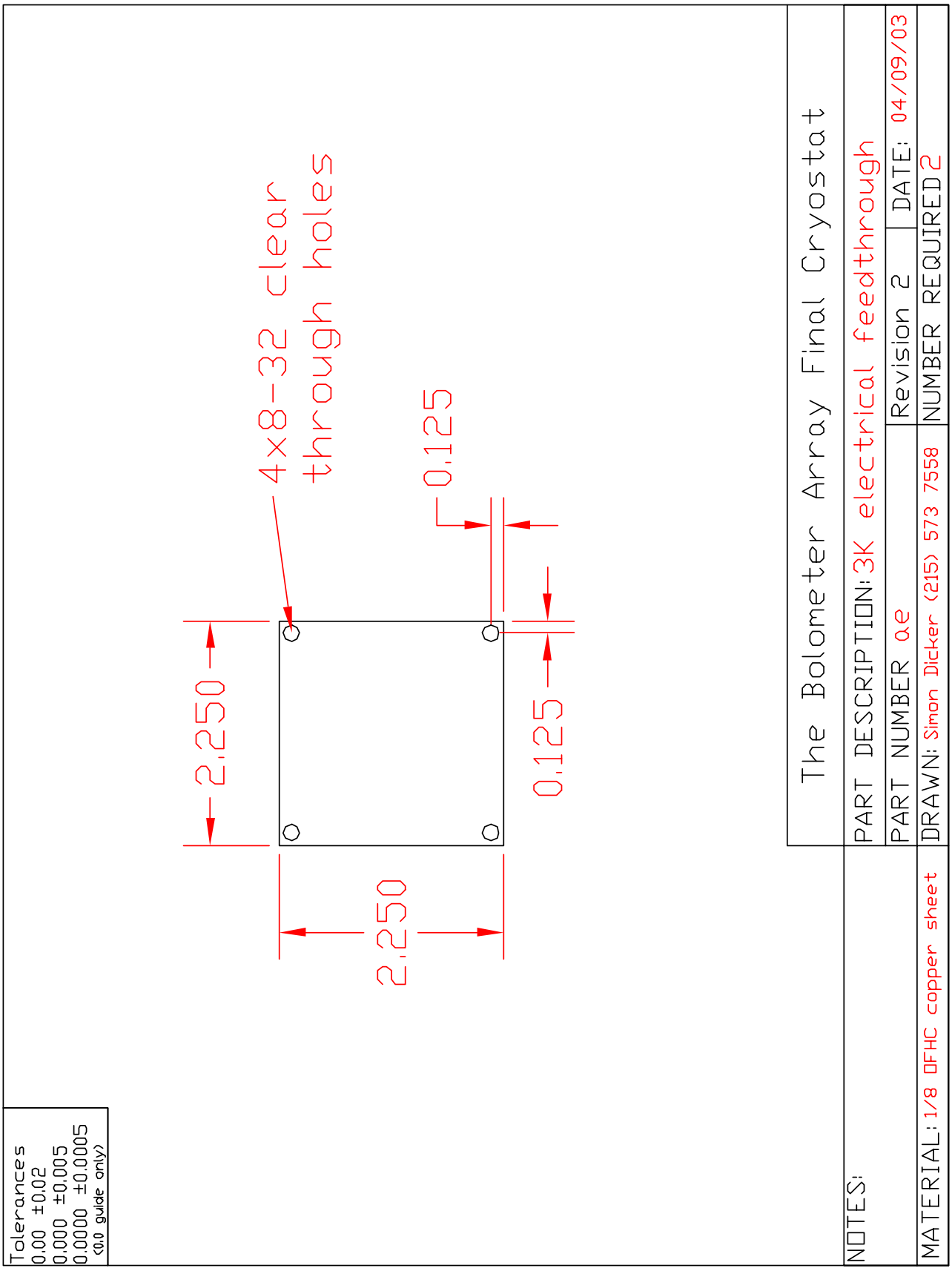

Tolerances
0.00 ±0.02
0.000 ±0.005
0.0000 ±0.0005
<0.0 guide only>
Align holes of two aa parts by eye
Glue with stycast 2850ft 23LW
(push ab all the way in)
Part ab
Parts aa
Loosly pack inside of ab with NRC-2 cryolam
wrap outsie of tube with 20 layers NRC-2
The Bolometer Array Final Cryostat
NOTES: Glue 2 of parts aa to part ab using stycast ensure ends are aligned
PART DESCRIPTION: 3K standoffs
PART NUMBER Assembly 6
Revision 2
DATE: 04/09/03
MATERIAL:
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 6


groove; ID 0.750; OD 1.050
0.200 deep; rough finish
6-32 clear thru holes
1.250
0.125
1.125
1.250
0.125
1.125
Tolerances
0.00 ±0.02
0.000 ±0.005
0.0000 ±0.0005
(3.0 guide only)
The Bolometer Array Final Cryostat
PART DESCRIPTION: 40K stand offs ends
PART NUMBER aa
Revision 2
DATE: 04/09/03
NOTES:
MATERIAL: 1/4 aluminium plate
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 14


1.000 ID; wall thickness 0.020
Ø1/8 vent holes
1.0
1.0
7.050
The Bolometer Array Final Cryostat
PART DESCRIPTION: 3K standoffs
PART NUMBER ab
Revision 2
DATE: 04/09/03
NOTES: made by Stevens Products, NJ tel +1 973-672-2140
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 8
MATERIAL: fr4 or G10
Tolerances
0.00 ±0.02
0.000 ±0.005
0.0000 ±0.0005
(3.0 guide only)


Tolerances
0.00 ±0.02
0.000 ±0.005
0.0000 ±0.0005
(0.0 guide only)
Top View (as seen from the cryostat window)
The Bolometer Array Final Cryostat
PART DESCRIPTION: 3K baseplate
PART NUMBER aC
Revision 2
DATE: 04/09/03
NOTES: helicoil all tapped holes
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 1
MATERIAL: 1/4 OFHC copper plate
4x6-32 tapped thru holes at corners of 1.000 square
square is centered on ø15.000 BC
Repeat in 6 places, equal spacing, rotate pattern
0.500 inch spaced grid of thru 4-40
tapped holes (purple)
8x8-32 thru tapped holes
EQ SP on ø3.625 BC
He3 fridge goes here
ø3.250
ø3.890
45.00°
45.00°
Pulse tube goes here
13x4-40 tapped through holes
EQ SP on ø4.250 BC between ±45°
ø16.875
He4 fridge goes here
ø4.800
8x8-32 tapped through
holes EQ SP on ø5.181 BC
0.500 inch spaced grid of thru 4-40
tapped holes (purple)
R0.25 maximum
4x8-32 tapped thru holes
(green)
Identical
patterns
electrical
feedthrough
12x6-32 tapped
thru holes EQ SP
on ø6.850 BC
ø6.600
16x6-32 tapped thru holes
EQ SP on ø16.563 BC
1.000 inch grid of tapped thru
6-32 holes Pattern offset from
center of plate by x=0.50, y=0.50
0.500
3.000
1.750
6.125
4.500
4.500
2.713
2.500
5.000
6.500
1.500
0.500
2.000


Tolerances
0.00 ±0.02
0.000 ±0.005
0.0000 ±0.0005
(0.0 guide only)
4x8-32 clear thru holes
0.125
0.063
1.000
0.250
3.375
0.625
0.188
2.500
1/16 deep pocket;
corners are R0.125
The Bolometer Array Final Cryostat
PART DESCRIPTION: 40K electrical feedthrough
PART NUMBER ad
Revision 2
DATE: 04/09/03
NOTES: Aluminium can be used
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 1
MATERIAL: 1/8 OFHC copper sheet


Tolerances
0.00 ±0.02
0.000 ±0.005
0.0000 ±0.0005
(0.0 guide only)
4x8-32 clear
through holes
0.125
2.250
0.125
2.250
The Bolometer Array Final Cryostat
NOTES:
PART DESCRIPTION: 3K electrical feedthrough
PART NUMBER ae
Revision 2
DATE: 04/09/03
MATERIAL: 1/8 OFHC copper sheet
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 2

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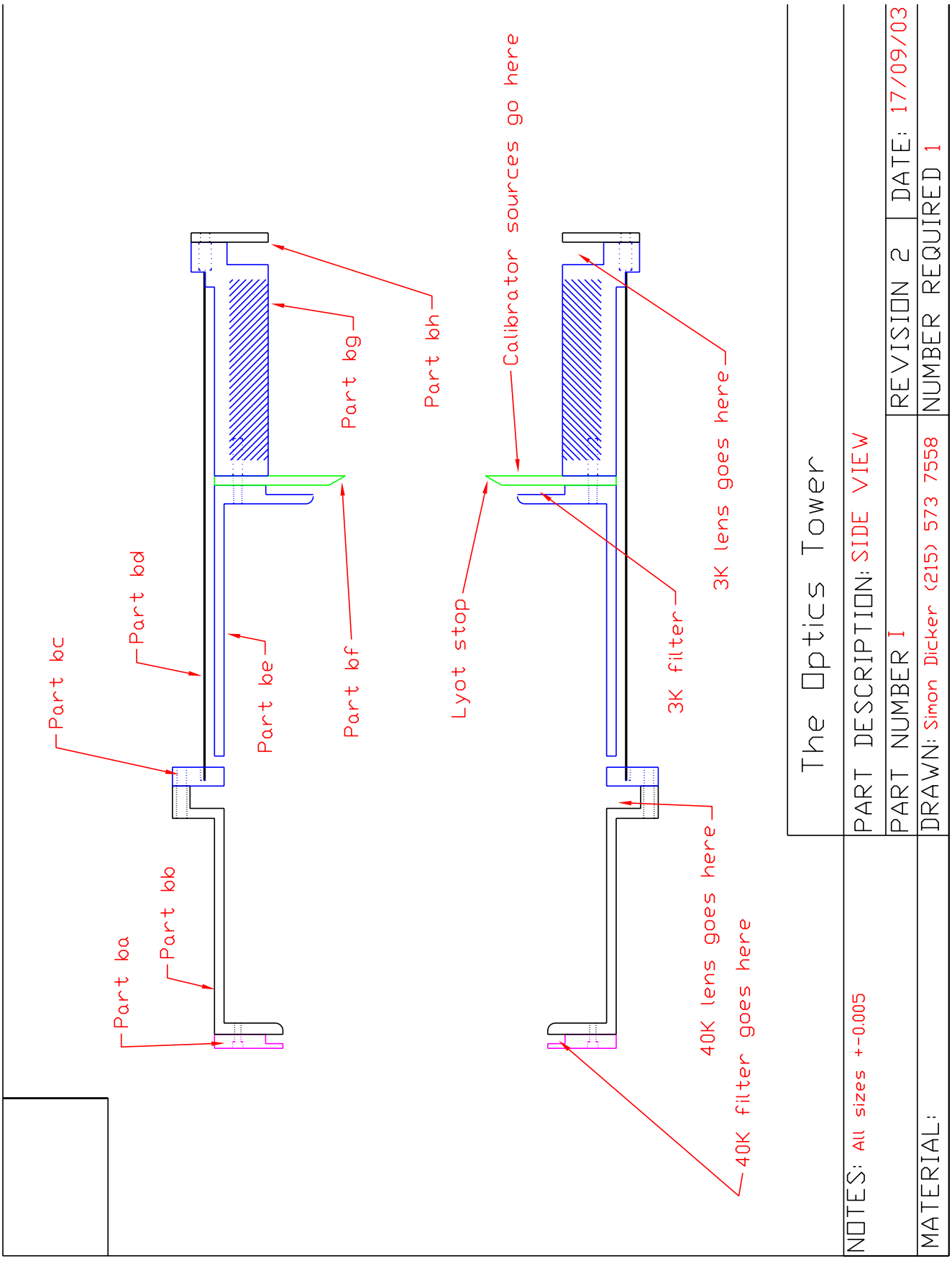
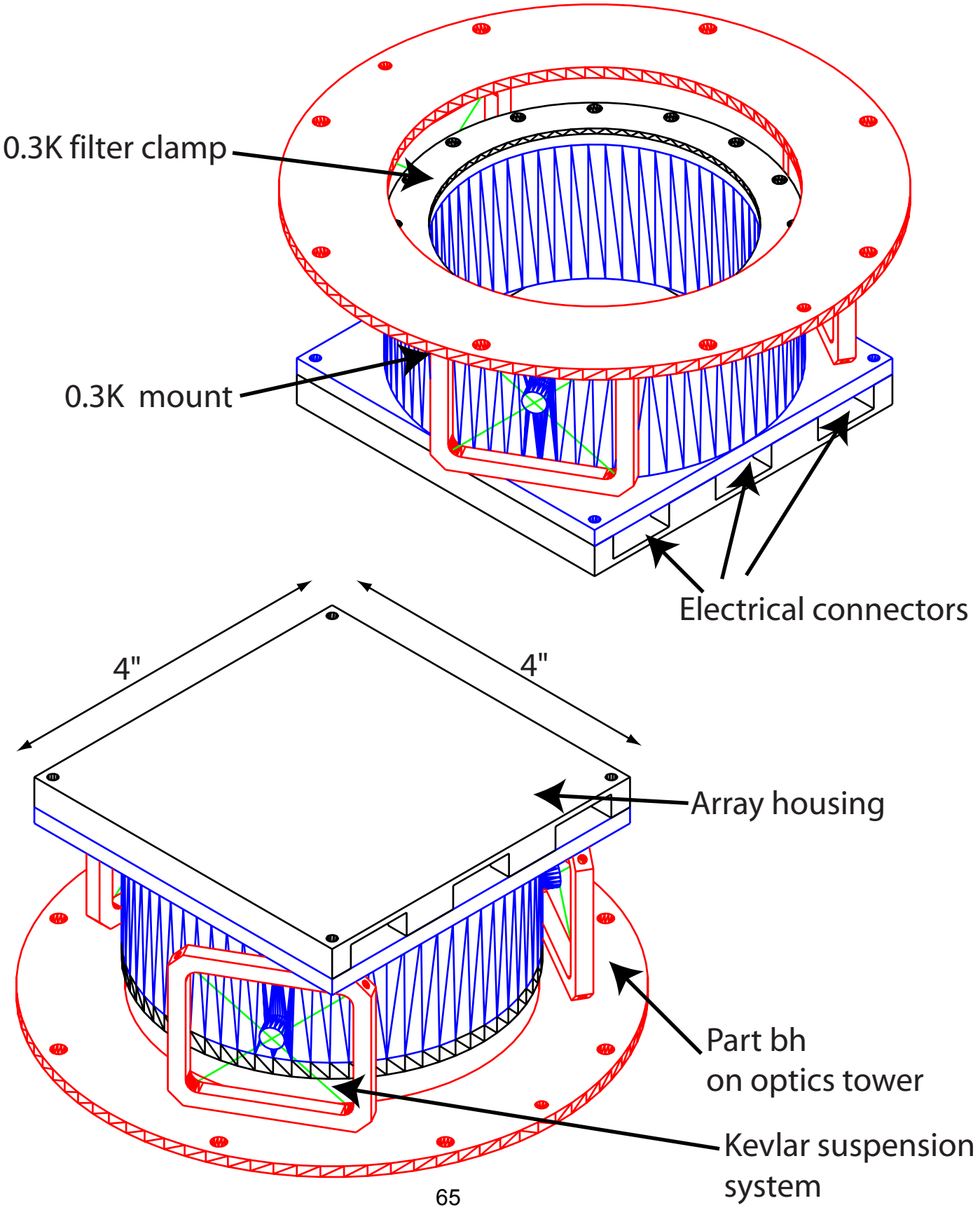
# Optics – Bill of Materials

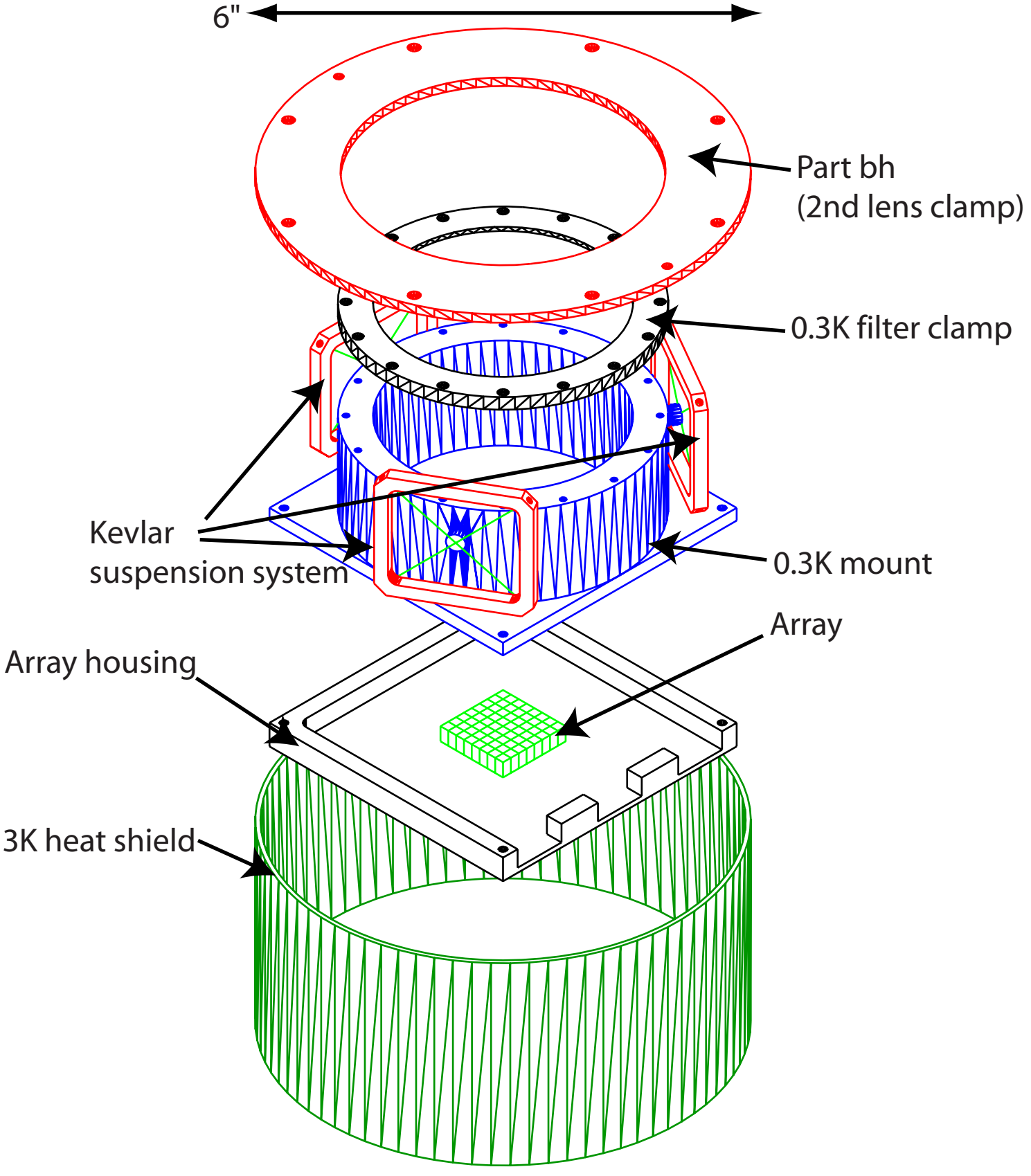
| Part# | Number required | Description |
|---|---|---|
| **optics tower** | | |
| ba | 1 | clamp for 40K filter |
| bb | 1 | lens 1 holder and mount to 40 K baseplate |
| bc | 1 | lens 1 clamp |
| bd | 1 | G10 standoff |
| be | 1 | 3K filter clamp and heat shield |
| bf | 1 | Lyot stop |
| bg | 1 | lens 2 holder |
| bh | 1 | lens 2 clamp and mounting plate for array |
| **Lens 1** | **1** | **diamond turned silicon, AR coated** |
| **Lens 2** | **1** | **diamond turned silicon, AR coated** |
| **Filter 1** | **1** | **40K filter – low pass** |
| **Filter 2** | **1** | **3K filter – low pass** |
| **Filter 3** | **1** | **0.3K filter – bandpass** |

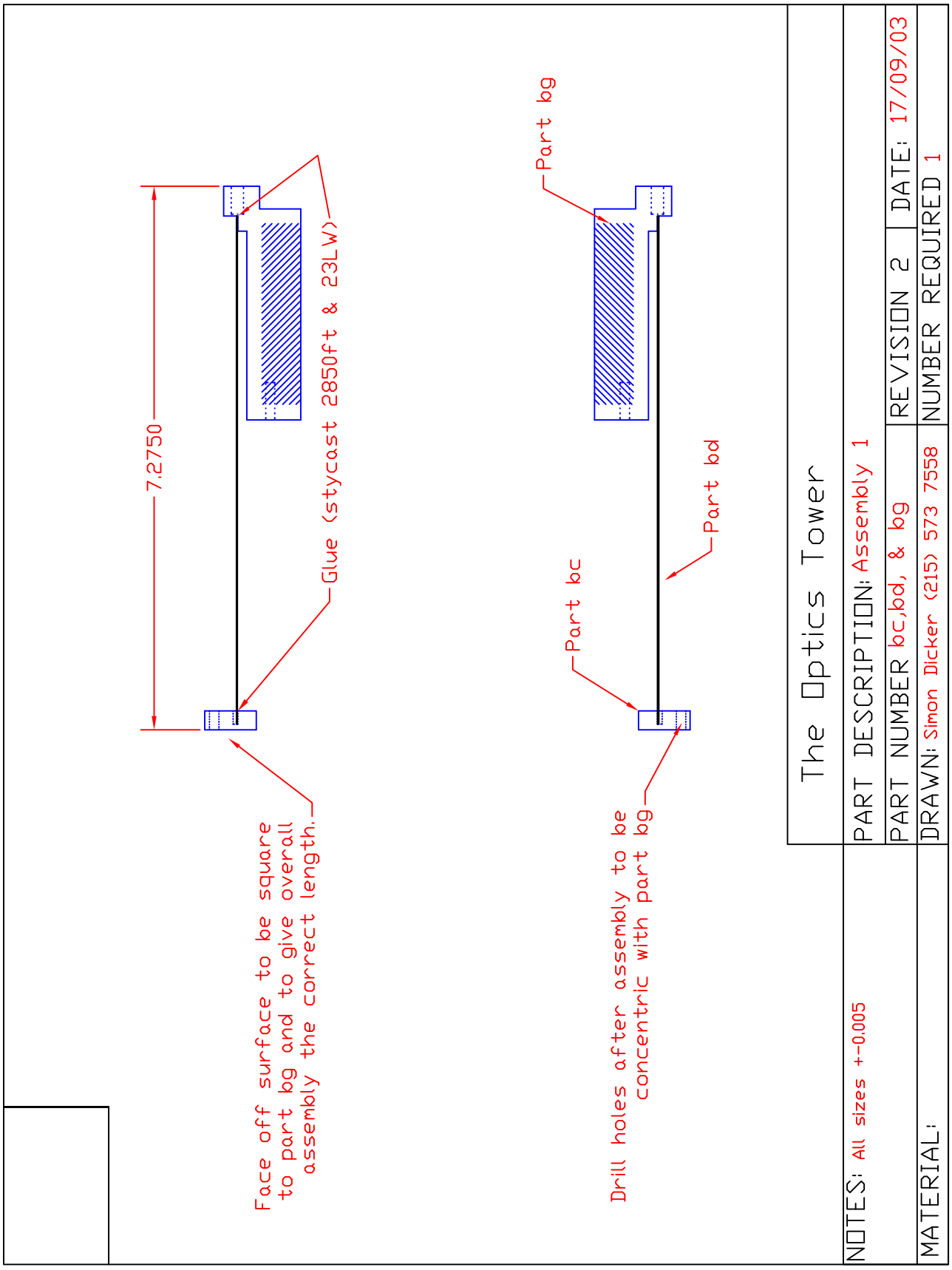

Part ba
Part bb
Part bc
Part bd
Part be
Part bf
Part bg
Part bh
Lyot stop
Calibrator sources go here
3K filter
3K lens goes here
40K lens goes here
40K filter goes here
The Optics Tower
PART DESCRIPTION: SIDE VIEW
PART NUMBER 1
REVISION 2
DATE: 17/09/03
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 1
NOTES: All sizes +-0.005
MATERIAL:

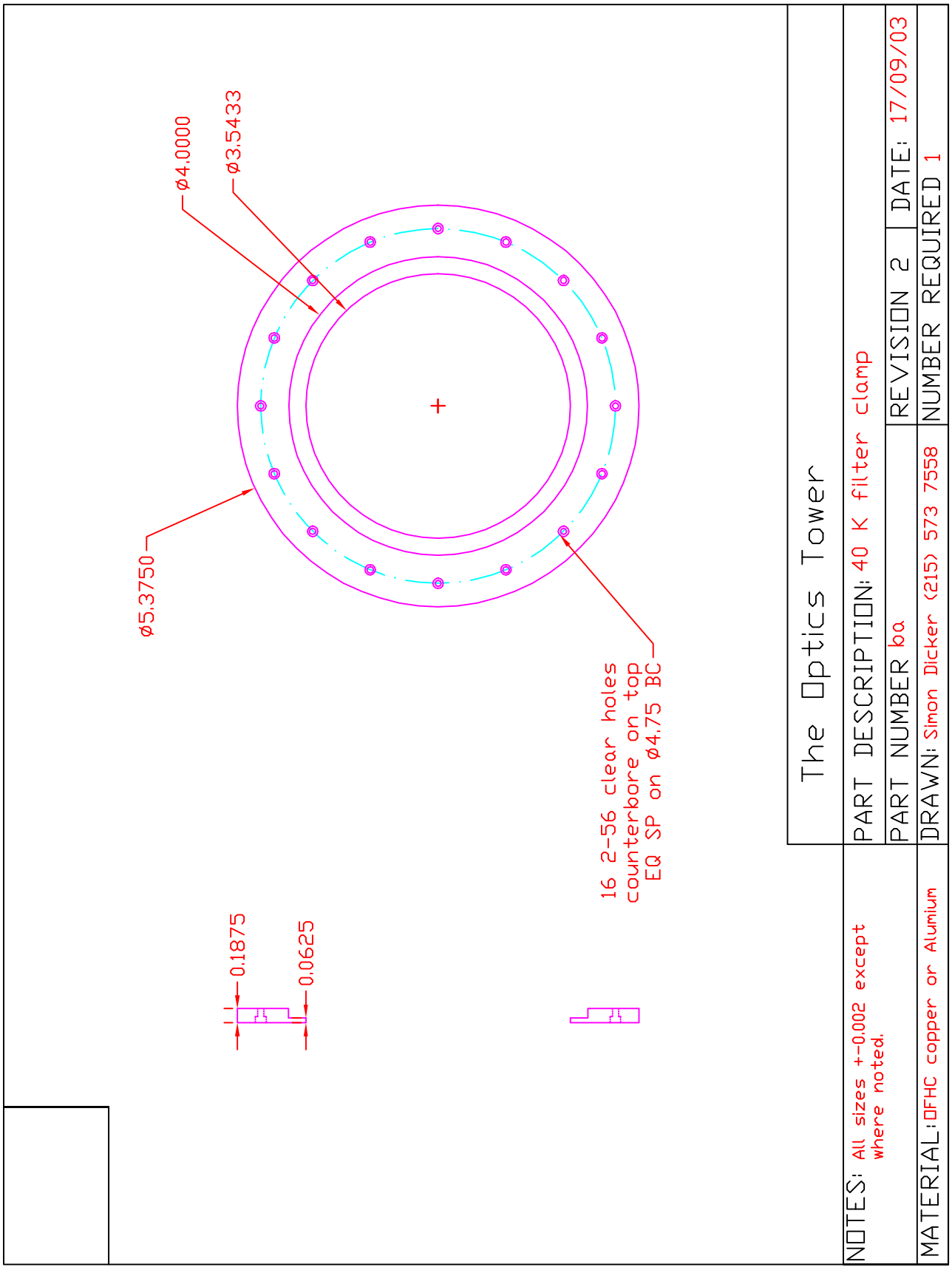
# A 3D sketch of the array mount (without heatshield)

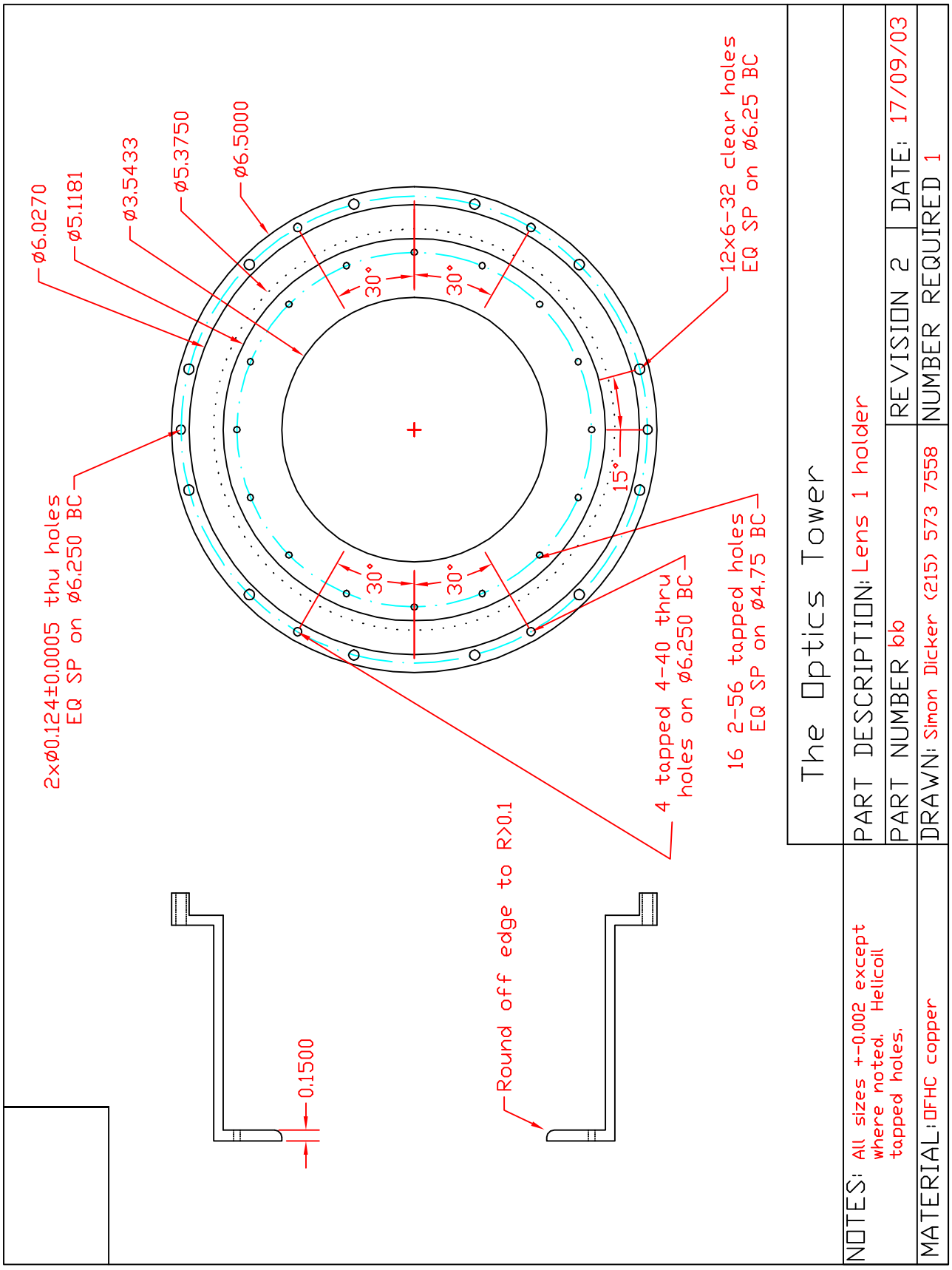


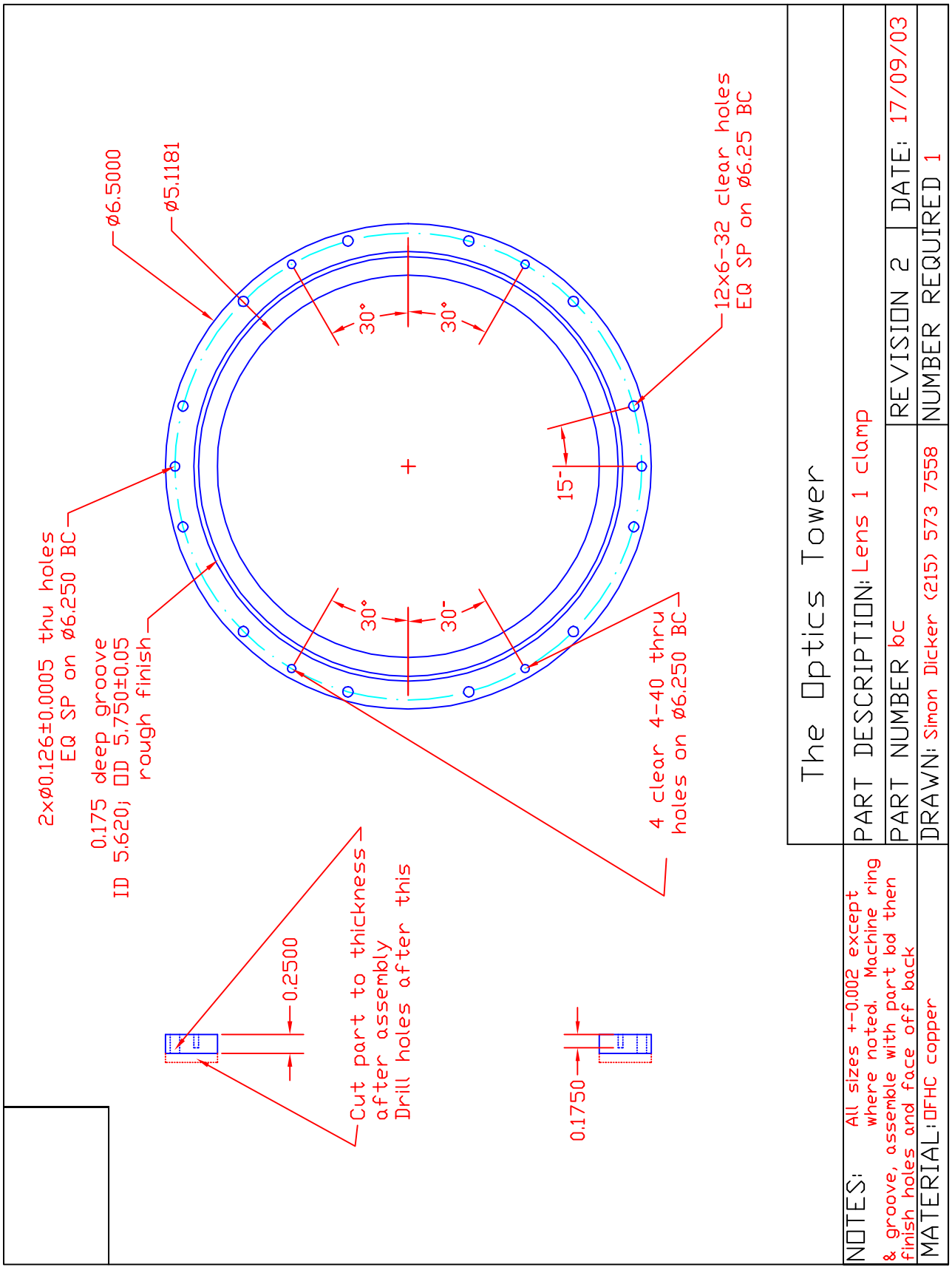
# An exploded view of the array mount

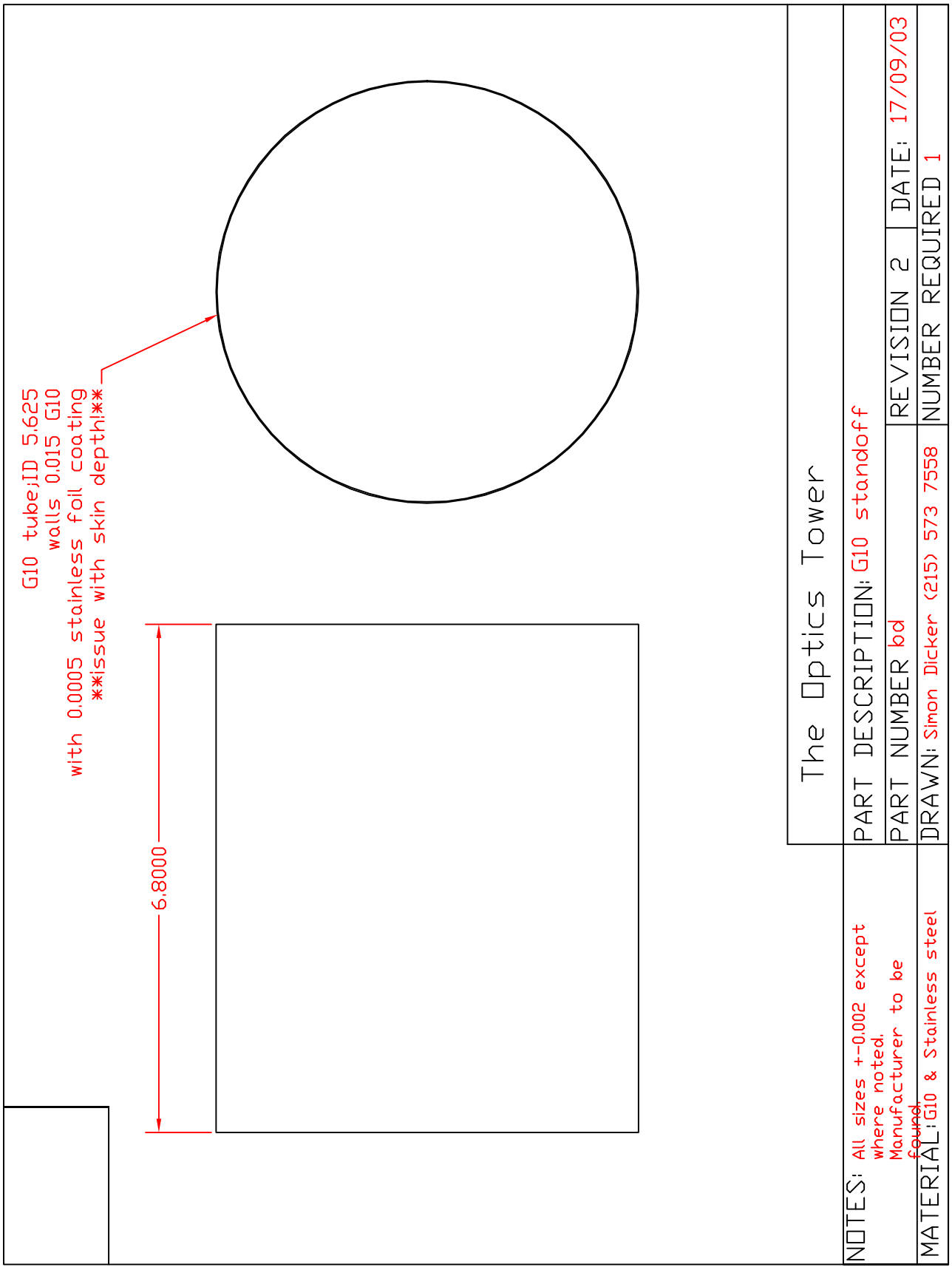


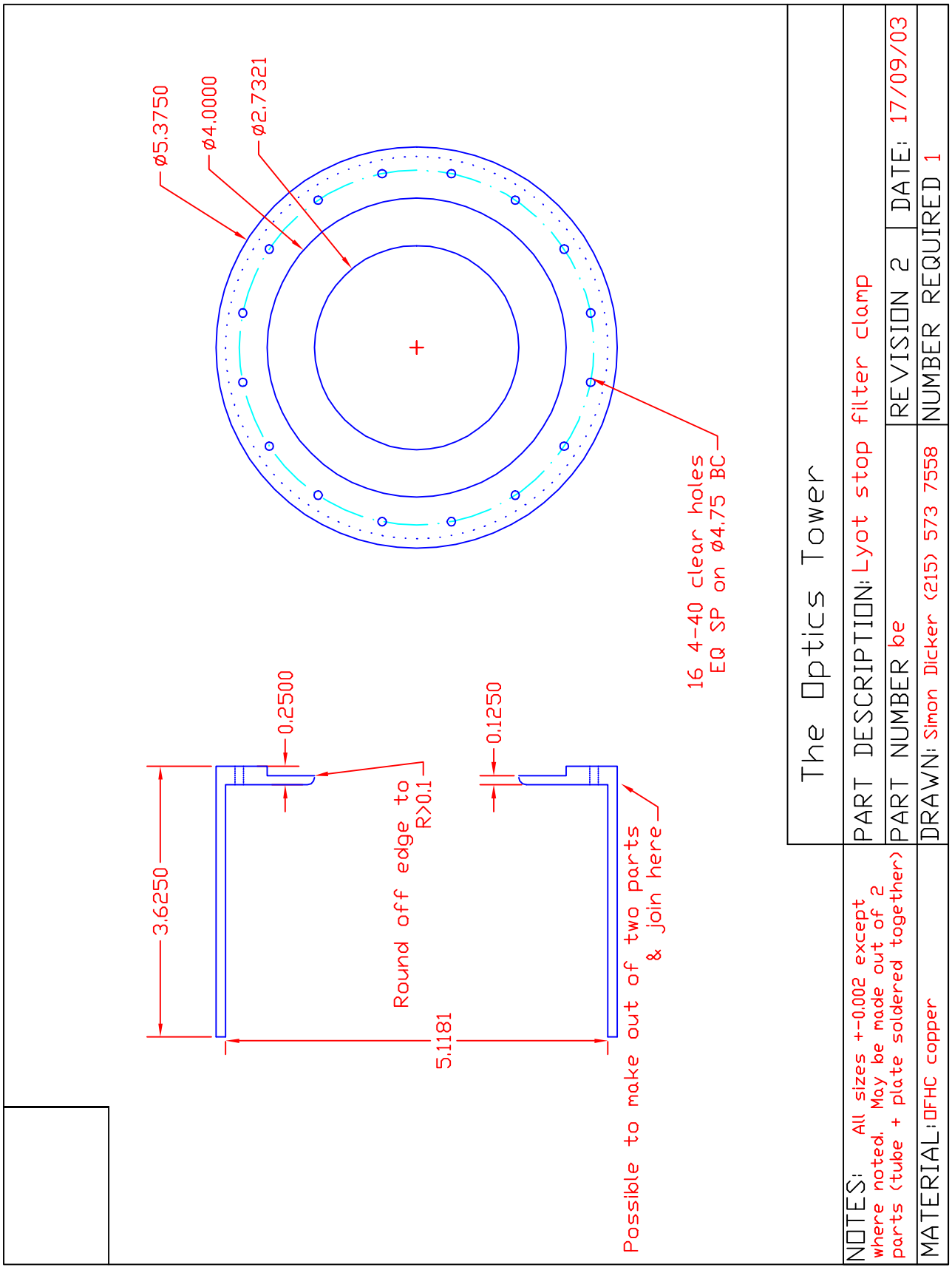

7.2750
Face off surface to be square
to part kg and to give overall
assembly the correct length.
Glue (stycast 2850ft & 23LW)
Part kg
Part kc
Part kd
Drill holes after assembly to be
concentric with part kg
The Optics Tower
NOTES: All sizes +-0.005
PART DESCRIPTION: Assembly 1
PART NUMBER kc,kd, & kg
REVISION 2
DATE: 17/09/03
MATERIAL:
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 1

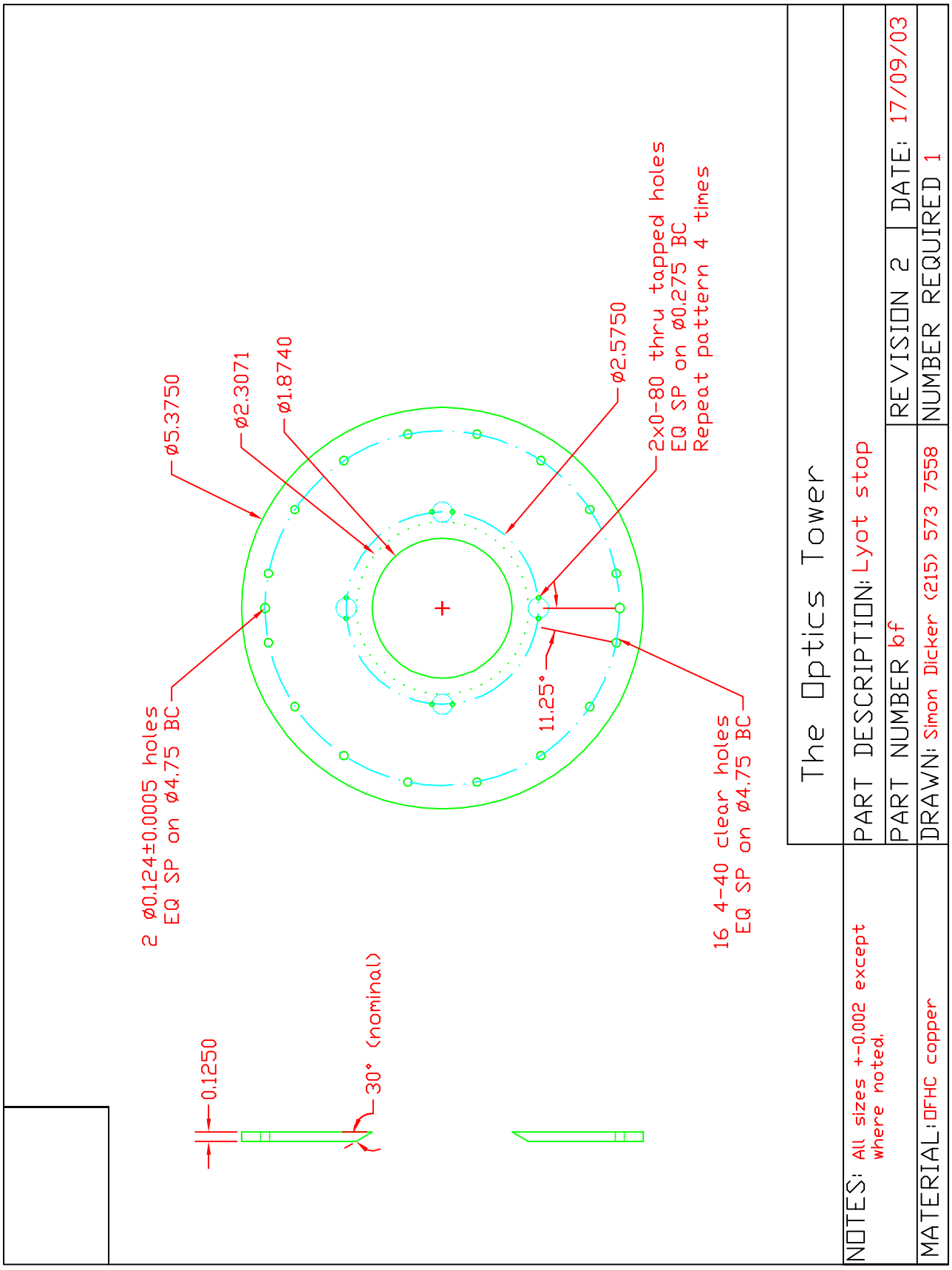

ø4.0000
ø3.5433
ø5.3750
16 2-56 clear holes
counterbore on top
EQ SP on ø4.75 BC
0.1875
0.0625
The Optics Tower
PART DESCRIPTION: 40 K filter clamp
PART NUMBER ba
REVISION 2
DATE: 17/09/03
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 1
NOTES: All sizes +-0.002 except where noted.
MATERIAL: OFHC copper or Alumium

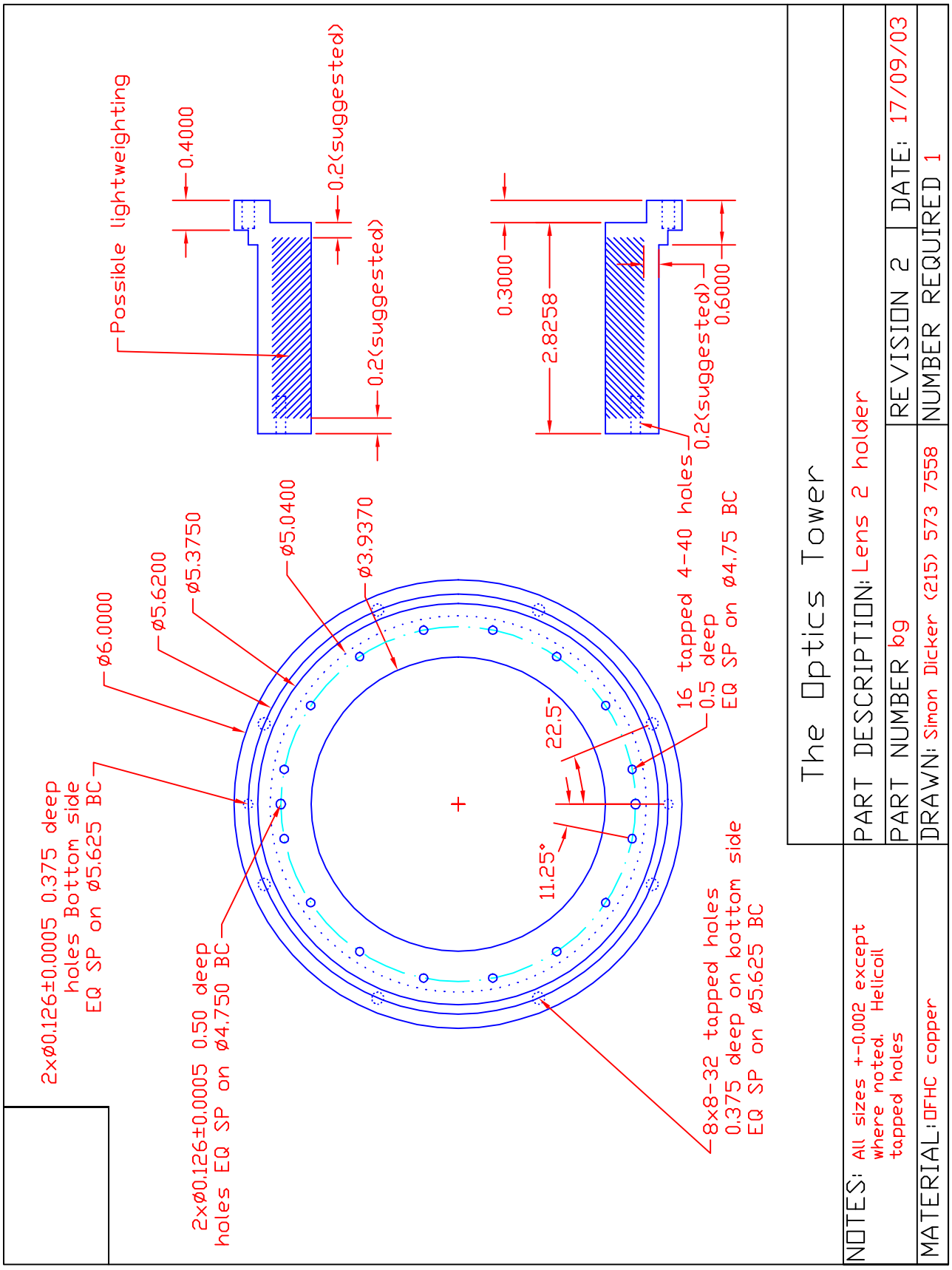

ø6.0270
ø5.1181
ø3.5433
ø5.3750
ø6.5000
2xø0.124±0.0005 thu holes
EQ SP on ø6.250 BC
12x6-32 clear holes
EQ SP on ø6.25 BC
30°
30°
30°
30°
15°
4 tapped 4-40 thru
holes on ø6.250 BC
16 2-56 tapped holes
EQ SP on ø4.75 BC
0.1500
Round off edge to R>0.1
The Optics Tower
PART DESCRIPTION: Lens 1 holder
PART NUMBER bb
REVISION 2
DATE: 17/09/03
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 1
NOTES: All sizes +-0.002 except where noted. Helicoil tapped holes.
MATERIAL: OFHC copper

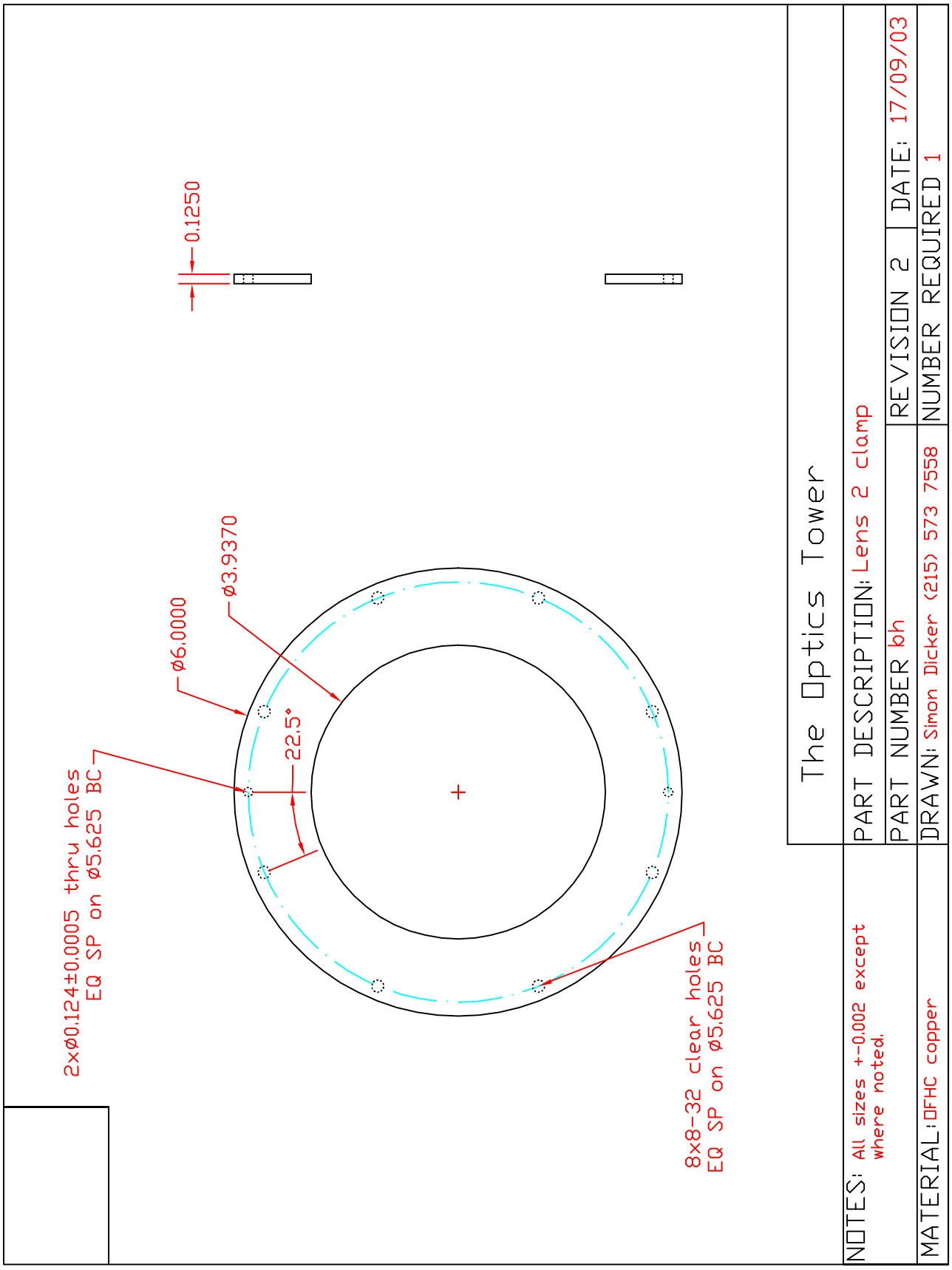

ø6.5000
ø5.1181
2xø0.126±0.0005 thu holes
EQ SP on ø6.250 BC
0.175 deep groove
ID 5.620; OD 5.750±0.05
rough finish
30°
30°
30°
30°
15°
12x6-32 clear holes
EQ SP on ø6.25 BC
4 clear 4-40 thru
holes on ø6.250 BC
0.2500
Cut part to thickness
after assembly
Drill holes after this
0.1750
The Optics Tower
NOTES: All sizes +-0.002 except where noted. Machine ring & groove, assemble with part bd then finish holes and face off back
PART DESCRIPTION: Lens 1 clamp
PART NUMBER bc
REVISION 2
DATE: 17/09/03
MATERIAL: OFHC copper
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 1


G10 tube,ID 5.625
walls 0.015 G10
with 0.0005 stainless foil coating
**issue with skin depth!**
6.8000
The Optics Tower
PART DESCRIPTION: G10 standoff
PART NUMBER bd
REVISION 2
DATE: 17/09/03
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 1
NOTES: All sizes +-0.002 except where noted. Manufacturer to be found.
MATERIAL: G10 & Stainless steel


ø5.3750
ø4.0000
ø2.7321
16 4-40 clear holes
EQ SP on ø4.75 BC
0.2500
0.1250
3.6250
5.1181
Round off edge to
R>0.1
Possible to make out of two parts
& join here
The Optics Tower
PART DESCRIPTION: Lyot stop filter clamp
PART NUMBER be
REVISION 2
DATE: 17/09/03
NOTES: All sizes +-0.002 except
where noted. May be made out of 2
parts (tube + plate soldered together)
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 1
MATERIAL: OFHC copper


ø5.3750
ø2.3071
ø1.8740
ø2.5750
2x0-80 thru tapped holes
EQ SP on ø0.275 BC
Repeat pattern 4 times
2 ø0.124±0.0005 holes
EQ SP on ø4.75 BC
16 4-40 clear holes
EQ SP on ø4.75 BC
11.25°
0.1250
30° (nominal)
The Optics Tower
PART DESCRIPTION: Lyot stop
PART NUMBER bf
REVISION 2
DATE: 17/09/03
NOTES: All sizes +-0.002 except where noted.
MATERIAL: OFHC copper
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 1


Possible lightweighting
0.4000
0.2(suggested)
0.2(suggested)
0.3000
2.8258
0.2(suggested)
0.6000
ø6.0000
ø5.6200
ø5.3750
ø5.0400
ø3.9370
2xø0.126±0.0005 0.375 deep
holes Bottom side
EQ SP on ø5.625 BC
2xø0.126±0.0005 0.50 deep
holes EQ SP on ø4.750 BC
16 tapped 4-40 holes
0.5 deep
EQ SP on ø4.75 BC
22.5°
11.25°
8x8-32 tapped holes
0.375 deep on bottom side
EQ SP on ø5.625 BC
The Optics Tower
NOTES: All sizes +-0.002 except where noted. Helicoil tapped holes
PART DESCRIPTION: Lens 2 holder
PART NUMBER bg
REVISION 2
DATE: 17/09/03
MATERIAL: OFHC copper
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 1


0.1250
ø3.9370
ø6.0000
22.5°
2xø0.124±0.0005 thru holes
EQ SP on ø5.625 BC
8x8-32 clear holes
EQ SP on ø5.625 BC
The Optics Tower
PART DESCRIPTION: Lens 2 clamp
PART NUMBER bh
REVISION 2
DATE: 17/09/03
DRAWN: Simon Dicker (215) 573 7558
NUMBER REQUIRED 1
NOTES: All sizes +-0.002 except where noted.
MATERIAL: OFHC copper