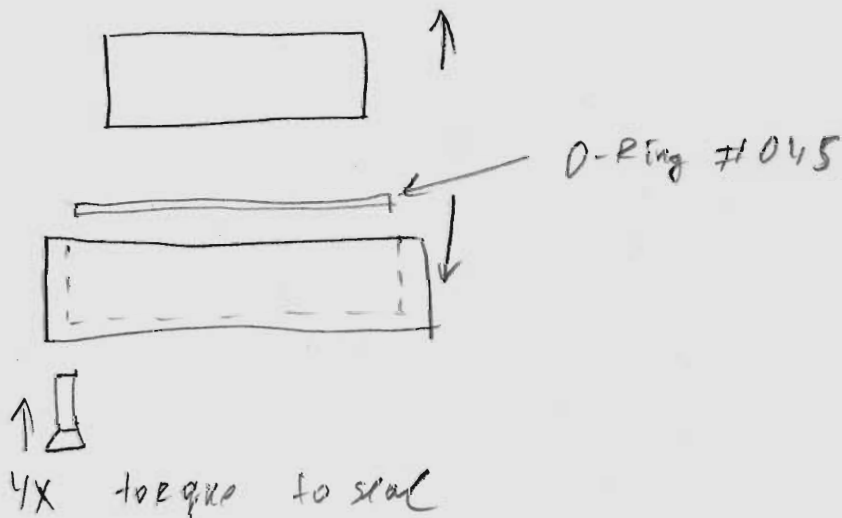
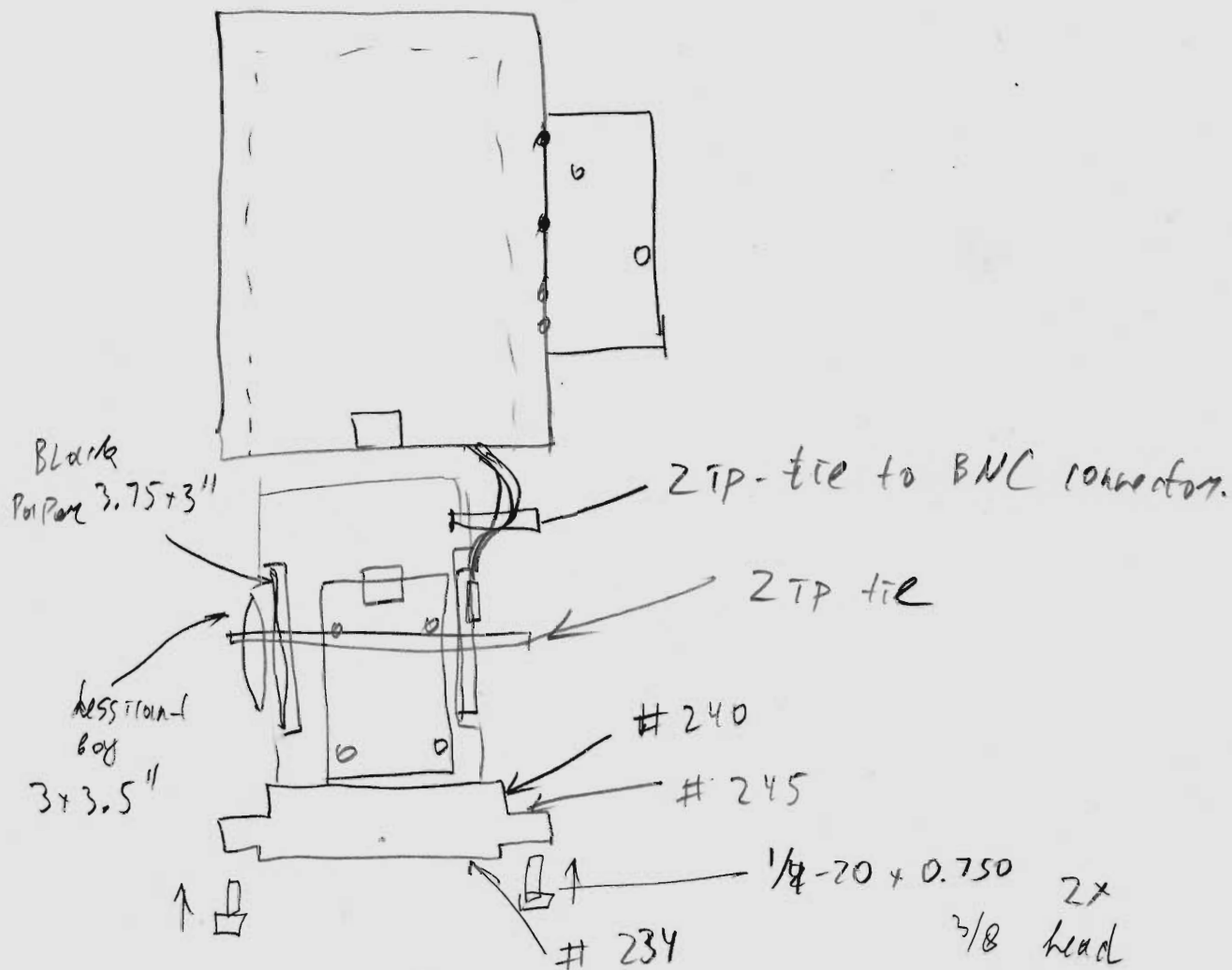
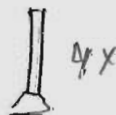
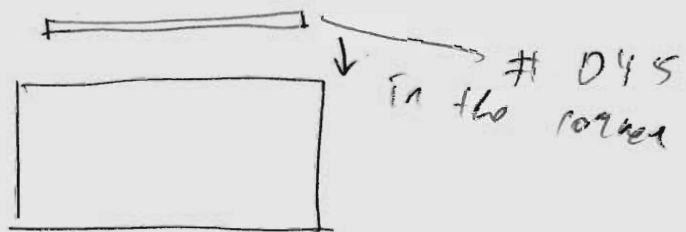
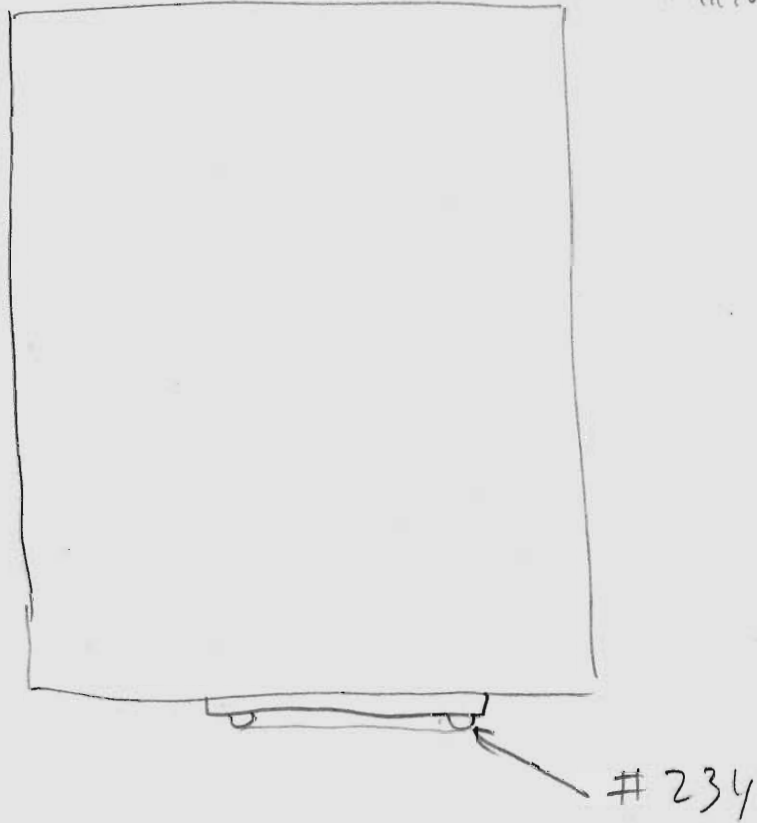
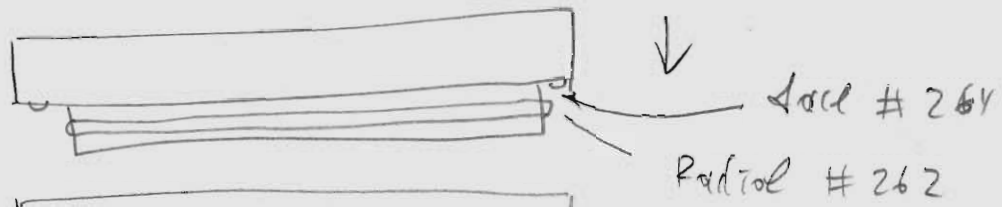


8/25/2011 Integration.

H<sub>2</sub>O fluorometer

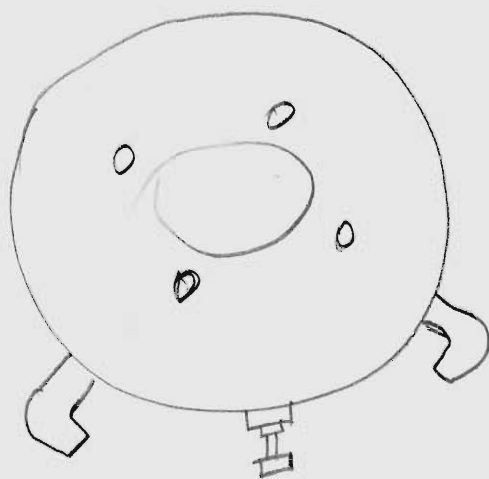
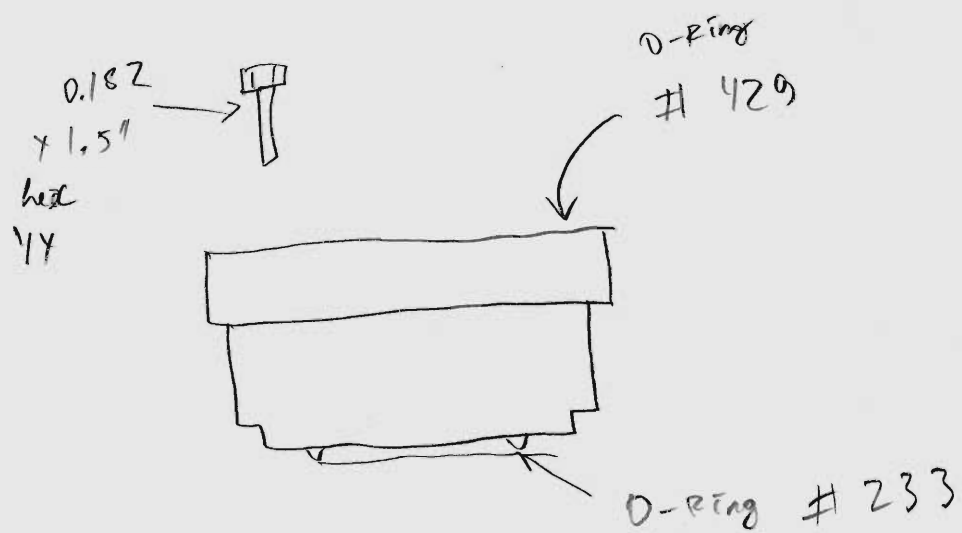


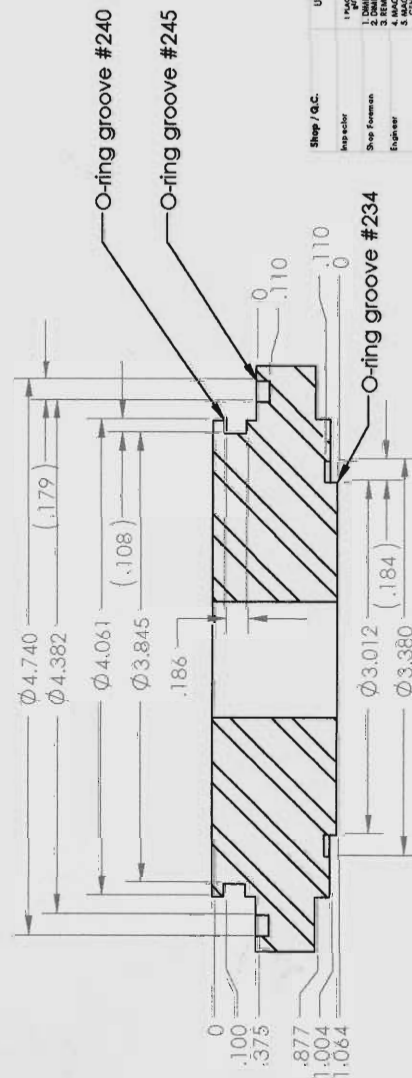
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# Window adaptor Integration





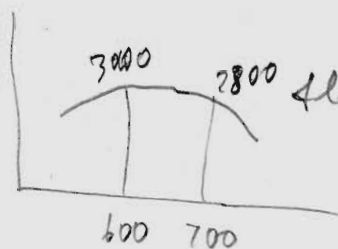
SECTION A-A

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240

|               |                                        |            |                                          |
|---------------|----------------------------------------|------------|------------------------------------------|
| Sheep / Q.C.  | DATE RELEASE                           | 9/14/2001  | MONTEREY BAY AQUARIUM RESEARCH INSTITUTE |
| Pre-processor | UNLESS OTHERWISE SPECIFIED TO CLARIFY: |            | MBARI                                    |
| 1. PROGRAM    | 1. NAME                                | 2. PROJECT |                                          |
| 2. DIMENSION  | 3. UNIT                                | 4. DATE    |                                          |
| 3. REMOVE     | 4. DIMENSION                           | 5. UNIT    |                                          |
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| 271. REMOVE   | 272. DIMENSION                         | 273. UNIT  |                                          |
| 272. REMOVE   | 273. DIMENSION                         | 274. UNIT  |                                          |
| 273. REMOVE   | 274. DIMENSION                         | 275. UNIT  |                                          |
| 274. REMOVE   | 275. DIMENSION                         | 276. UNIT  |                                          |
| 275. REMOVE   | 276. DIMENSION                         | 277. UNIT  |                                          |
| 276. REMOVE   | 277. DIMENSION                         | 278. UNIT  |                                          |
| 277. REMOVE   | 278. DIMENSION                         | 279. UNIT  |                                          |
| 278. REMOVE   | 279. DIMENSION                         | 280. UNIT  |                                          |
| 279. REMOVE   | 280. DIMENSION                         | 281. UNIT  |                                          |
| 280. REMOVE   | 281. DIMENSION                         | 282. UNIT  |                                          |
| 281. REMOVE   | 282. DIMENSION                         | 283. UNIT  |                                          |
| 282. REMOVE   | 283. DIMENSION                         | 284. UNIT  |                                          |
| 283. REMOVE   | 284. DIMENSION                         | 285. UNIT  |                                          |
| 284. REMOVE   | 285. DIMENSION                         | 286. UNIT  |                                          |
| 285. REMOVE   | 286. DIMENSION                         | 287. UNIT  |                                          |
| 286. REMOVE   | 287. DIMENSION                         | 288. UNIT  |                                          |
| 287. REMOVE   | 288. DIMENSION                         | 289. UNIT  |                                          |
| 288. REMOVE   | 289. DIMENSION                         | 290. UNIT  |                                          |
| 289. REMOVE   | 290. DIMENSION                         | 291. UNIT  |                                          |
| 290. REMOVE   | 291. DIMENSION                         | 292. UNIT  |                                          |
| 291. REMOVE   | 292. DIMENSION                         | 293. UNIT  |                                          |
| 292. REMOVE   | 293. DIMENSION                         | 294. UNIT  |                                          |
| 293. REMOVE   | 294. DIMENSION                         | 295. UNIT  |                                          |
| 294. REMOVE   | 295. DIMENSION                         | 296. UNIT  |                                          |
| 295. REMOVE   | 296. DIMENSION                         | 297. UNIT  |                                          |
| 296. REMOVE   | 297. DIMENSION                         | 298. UNIT  |                                          |
| 297. REMOVE   | 298. DIMENSION                         | 299. UNIT  |                                          |
| 298. REMOVE   | 299. DIMENSION                         | 300. UNIT  |                                          |
| 299. REMOVE   | 300. DIMENSION                         | 301. UNIT  |                                          |
| 300. REMOVE   | 301. DIMENSION                         | 302. UNIT  |                                          |
| 301. REMOVE   | 302. DIMENSION                         | 303. UNIT  |                                          |
| 302. REMOVE   | 303. DIMENSION                         | 304. UNIT  |                                          |
| 303. REMOVE   | 304. DIMENSION                         | 305. UNIT  |                                          |
| 304. REMOVE   | 305. DIMENSION                         | 306. UNIT  |                                          |
| 305. REMOVE   | 306. DIMENSION                         | 307. UNIT  |                                          |
| 306. REMOVE   | 307. DIMENSION                         | 308. UNIT  |                                          |
| 307. REMOVE   | 308. DIMENSION                         | 309. UNIT  |                                          |
| 308. REMOVE   | 309. DIMENSION                         | 310. UNIT  |                                          |
| 309. REMOVE   | 310. DIMENSION                         | 311. UNIT  |                                          |
| 310. REMOVE   | 311. DIMENSION                         | 312. UNIT  |                                          |
| 311. REMOVE   | 312. DIMENSION                         | 313. UNIT  |                                          |
| 312. REMOVE   | 313. DIMENSION                         | 314. UNIT  |                                          |
| 313. REMOVE   | 314. DIMENSION                         | 315. UNIT  |                                          |
| 314. REMOVE   | 315. DIMENSION                         | 316. UNIT  |                                          |
| 315. REMOVE   | 316. DIMENSION                         | 317. UNIT  |                                          |
| 316. REMOVE   | 317. DIMENSION                         | 318. UNIT  |                                          |
| 317. REMOVE   | 318. DIMENSION                         | 319. UNIT  |                                          |
| 318. REMOVE   | 319. DIMENSION                         | 320. UNIT  |                                          |
| 319. REMOVE   | 320. DIMENSION                         | 321. UNIT  |                                          |
| 320. REMOVE   | 321. DIMENSION                         | 322. UNIT  |                                          |
| 321. REMOVE   | 322. DIMENSION                         | 323. UNIT  |                                          |
| 322. REMOVE   | 323. DIMENSION                         | 324. UNIT  |                                          |
| 323. REMOVE   | 324. DIMENSION                         | 325. UNIT  |                                          |
| 324. REMOVE   |                                        |            |                                          |

1000 ms ;

8/18/2011

Initial: 25% filter 4x  
in each channel

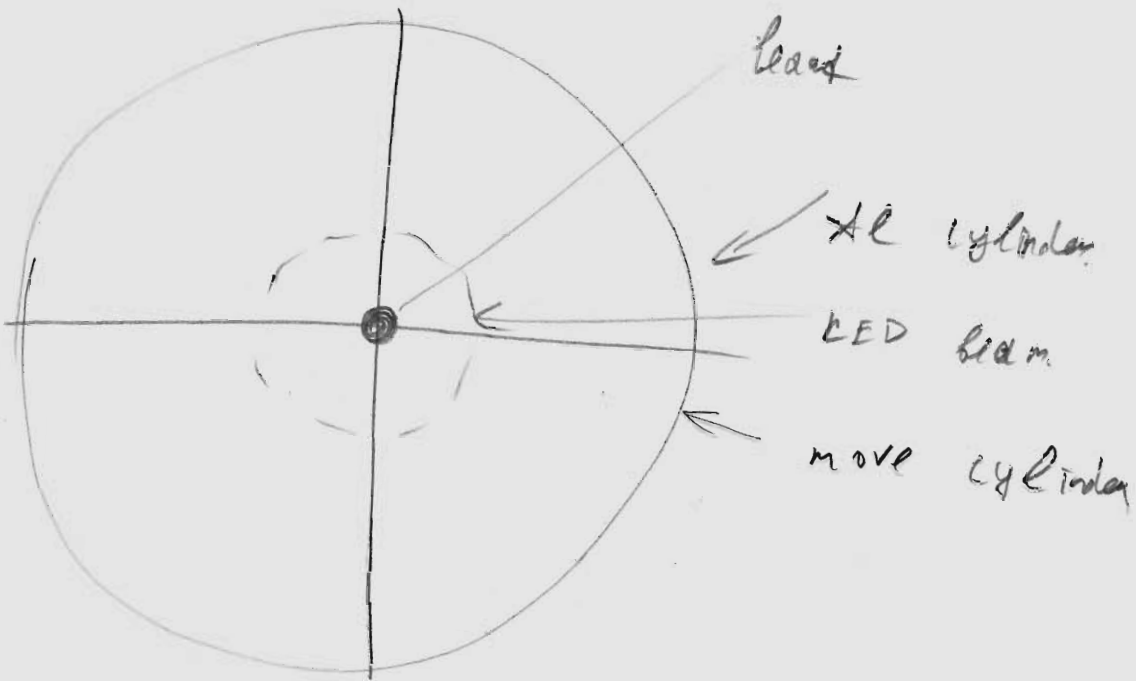
flashlight spectrum

sensitivity of 590 channel  
is 10-20 times lower

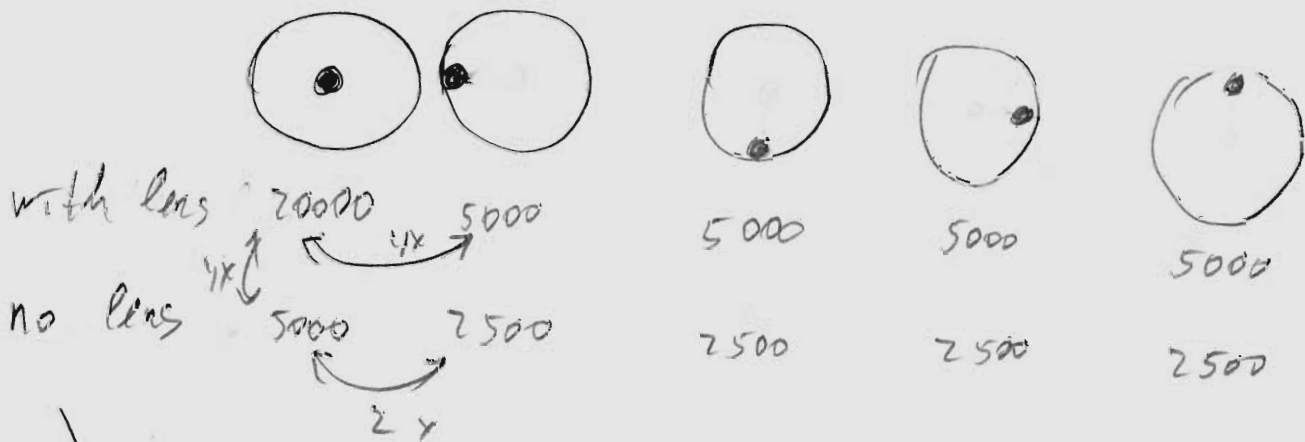
2 filters removed. now  $(0.25)^2 = 0.0625$   
no lens (removed, was 85mm)

| test                        | measure        | lens             | Final<br>Setting |
|-----------------------------|----------------|------------------|------------------|
| flashlight                  | 100            | 1000 25000 14000 |                  |
| AL 3.25"                    | 1000 177 247   | 1000 7 1         |                  |
| green leaves<br>on AL 3.25" | 1000 11013 442 |                  |                  |
| green-yellow<br>leaves      | 15413 604      |                  |                  |
|                             | 20200 594      |                  |                  |
| yellow lettuce              | 18000 353      |                  |                  |
|                             | 23000 353      |                  |                  |
|                             | 20000 352      |                  |                  |
| lemon leaf,                 | 16000 316      |                  |                  |
| green<br>section            | 19000 318      |                  |                  |
|                             | 26000 315      |                  |                  |
|                             | 27000 321      |                  |                  |
| yellow section              | 15500 978      |                  |                  |
|                             | 16900 962      |                  |                  |
|                             | 17200 964      |                  |                  |
|                             | 17000 975      |                  |                  |
| blue stick<br>on AL 3.25"   | 520 1980       | 5 0              |                  |
| AL 3.25                     | 184 425        | 1 1              |                  |

8/17/2011



real sensitivity



Remove Lens, increase current

8/15/2011

100 ms ; counting with scope

PI 690nm

P2 590nm

100ms; NOLED

102x64

32x64

100ms +LED

70x64

39x64

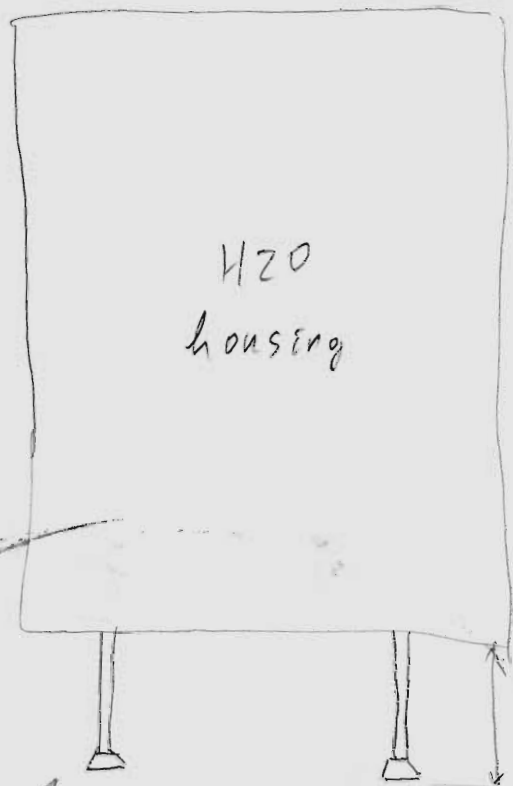
8/17/2011

|                      | measured                       | long      |                    |
|----------------------|--------------------------------|-----------|--------------------|
| housing<br>3.25" AL  | 1000 1500 128                  | 1000 12 1 |                    |
| housing<br>3.25" PVC | 1000 1380 123                  | 1000 5 1  |                    |
| 20" AL Pipe          | 1000 1390 127                  | 1000 3 0  |                    |
| 3.25" PVC            | 1000 66 19                     | 1000 3 1  | Painted<br>ports ↓ |
| 3.25" AL             | 1000 114 23                    | 1000 26 4 |                    |
| 3.25" Leave on<br>AL | 1000 <sup>371</sup><br>5310 22 | 1000 27 2 |                    |
| 3.25" Leave on<br>AL | 1000 21000 27                  | 1000 8 1  | Painted + Lens     |
| 3.25" on AL          | 1000 <sup>521</sup><br>397 24  | 1000 7 0  |                    |
| 3.25" on PVC         | 1000 163 21                    | 1000 8 0  |                    |
| 20" Pipe             | 1000 149 35                    | 1000 8 0  |                    |

|                                                                                                               |                      |            |          |      |
|---------------------------------------------------------------------------------------------------------------|----------------------|------------|----------|------|
| PROJECT NO.                                                                                                   | 902710               | SIZE       | DWG. NO. | REV. |
| PROJECT                                                                                                       | SES                  | SCALE      | 2:1      | 1    |
| Application                                                                                                   | DO NOT SCALE DRAWING | 901027-102 |          |      |
| 6. PERPENDICULARITY & PARALLELISM OF<br>MACHINED SURFACES .002 PER INCH<br>MAX .010 INCHES FOR SINGLE SURFACE |                      |            |          |      |
| NEXT ASSY Description                                                                                         | SHEET 1 OF 1         |            |          |      |

4/19/2011

SES



bottomed out



1.562

1.560

1.562

1.553

..607

3/31/2011

Al Block

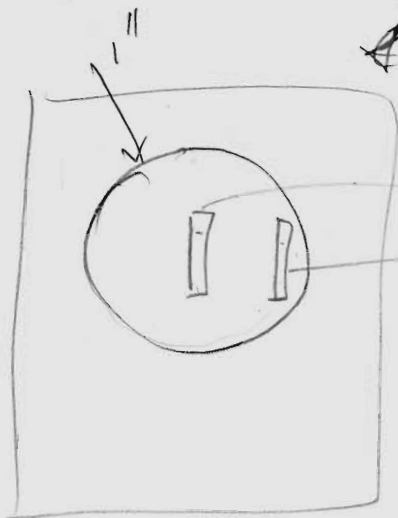
target

3 1/4

fluorescent piece 1/8 x 1/4 fabric

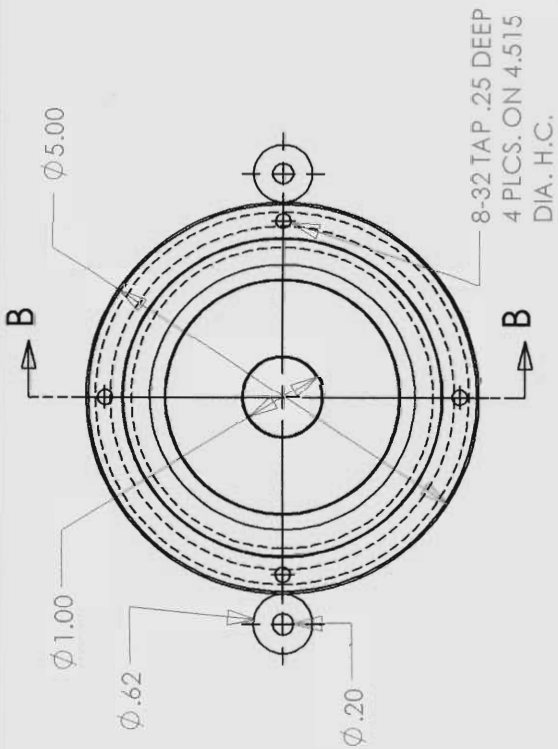
central position  
PERIF position

1 sec accumulation

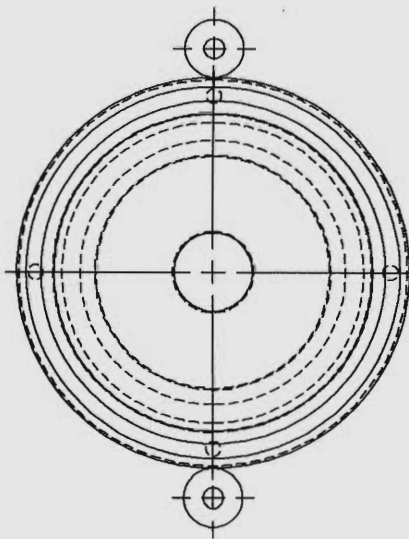
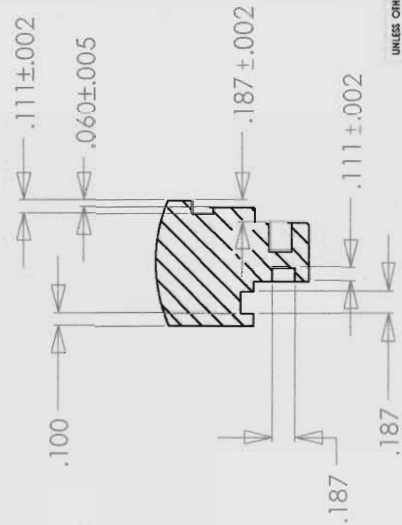
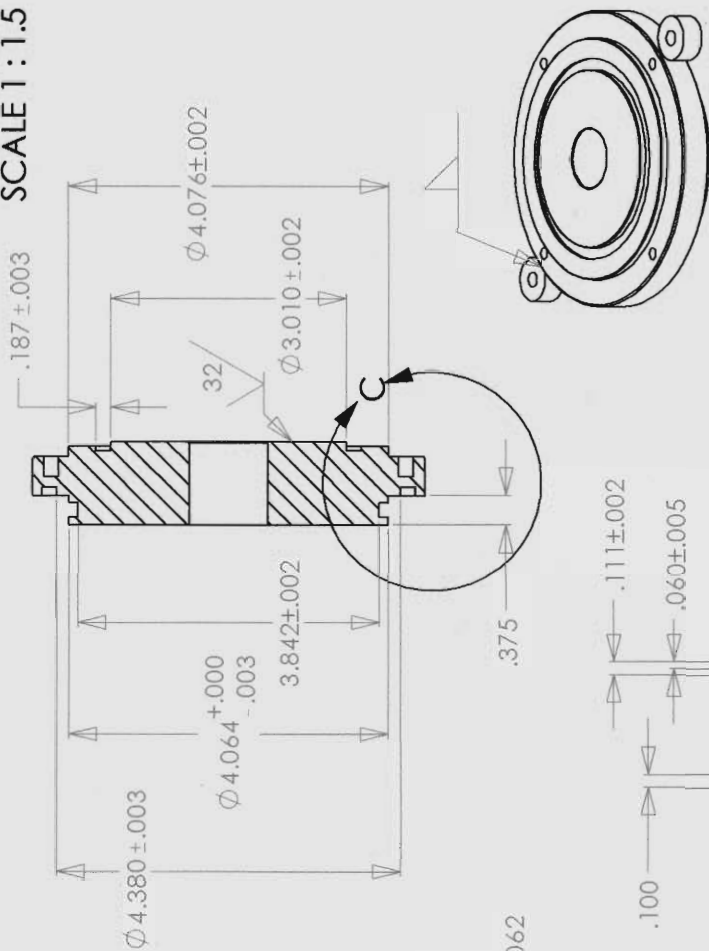
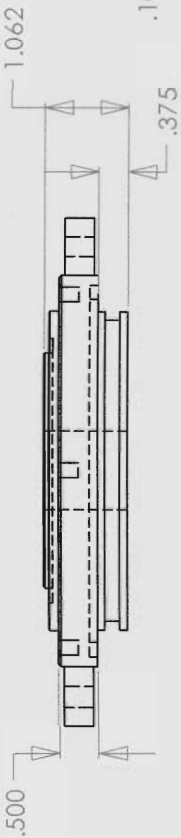


|                    | signal,<br>no fluor | counts  |         |         |     |
|--------------------|---------------------|---------|---------|---------|-----|
|                    |                     | central | Perif 1 | Perif 2 |     |
| 125mm<br>lens      | 42000               | 78100   | 72100   | 71200   | 83% |
| original<br>(80mm) | 46900               | 104000  | 86K     | 82K     | 65% |
| no lens            | 52.7K               | 62.8K   | 58.2    | 59.5    | 64% |

SECTION B-B  
SCALE 1:1.5



8-32 TAP .25 DEEP  
4 PLCS. ON 4.515  
DIA. H.C.

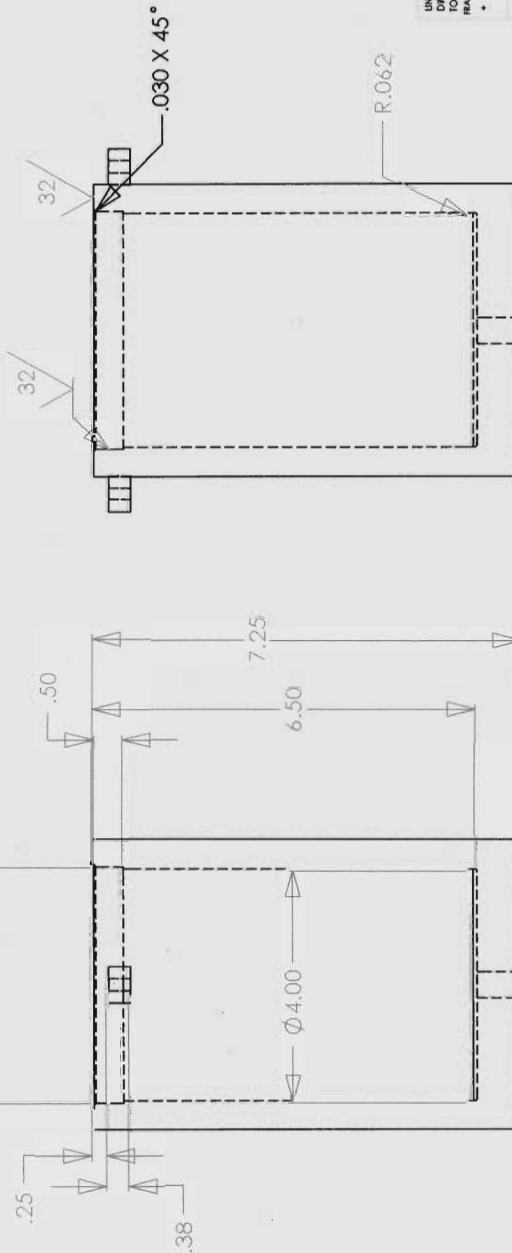
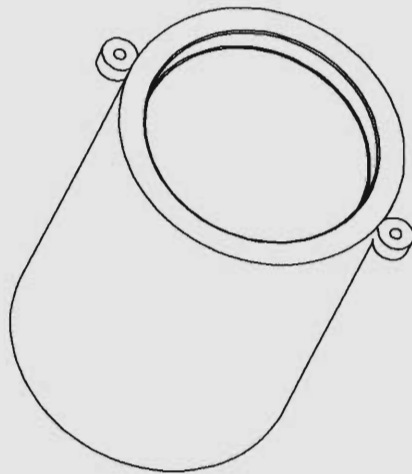
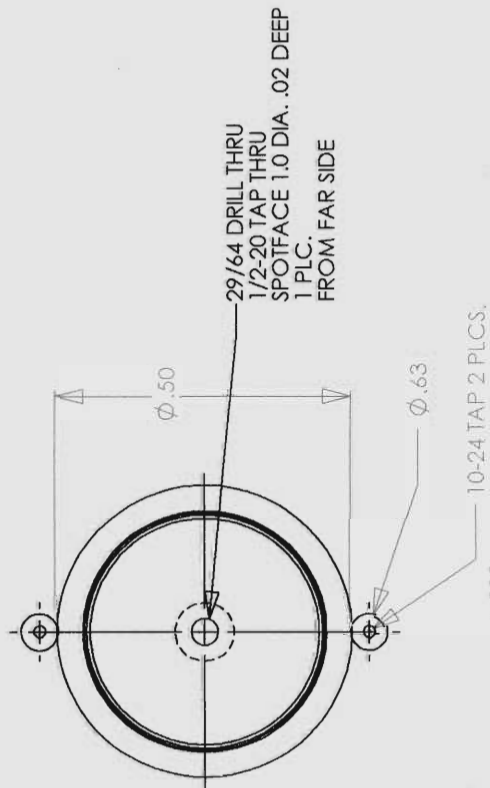


MAKE 1  
BREAK ALL SHARP EDGES  
O' RING SURFACES---32 MIN.

|                                                                           |            |                                                  |         |
|---------------------------------------------------------------------------|------------|--------------------------------------------------|---------|
| UNLESS OTHERWISE SPECIFIED<br>DIMENSIONS ARE IN INCHES<br>TOLERANCES ARE: |            | CAD GENERATED DRAWING.<br>DO NOT MANUALLY UPDATE |         |
| FRACTIONS                                                                 | DECIMALS   | APPROVALS                                        | DATE    |
| +                                                                         | .XX + 1    | DRAWN                                            | 12-4-02 |
| +                                                                         | .XX + .001 | CHECKED                                          |         |
| MATERIAL                                                                  | ALUMINUM   | REP' ING                                         |         |
| FINISH                                                                    |            | MFG' ING                                         |         |
| DO NOT SCALE DRAWING                                                      |            | QUAL' ING                                        |         |
| SIZE 100 SAMPLER SYSTEM-004                                               |            | SCALE                                            |         |
| B                                                                         |            | CAD FILE                                         |         |
| CONV.DWG                                                                  |            | SHEET 1 OF 1                                     |         |

FLUOROMETER  
END CAP

SCRIPPS INSTITUTION OF OCEANOGRAPHY  
UNIVERSITY OF CALIFORNIA, SAN DIEGO



MAKE 1  
BREAK ALL SHARP EDGES

|                                                                                     |                                                                                                                                                                                                                                              |                                                                    |          |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|----------|
| UNLESS OTHERWISE SPECIFIED<br>DIMENSIONS ARE IN INCHES<br>FRACTIONS DECIMALS ANGLES |                                                                                                                                                                                                                                              | CAD GENERATED DRAWING.<br>DO NOT MANUALLY UPDATE<br>APPROVALS DATE |          |
| +                                                                                   | .005 .010 .020 .030 .040 .050 .060 .070 .080 .090 .100 .125 .150 .175 .200 .250 .300 .375 .500 .625 .750 .875 1.000 1.250 1.500 1.750 2.000 2.500 3.000 3.750 4.000 4.500 5.000 5.500 6.000 6.500 7.000 7.500 8.000 8.500 9.000 9.500 10.000 | 1                                                                  | 12/05/02 |
| MATERIAL<br>ALUMINUM                                                                |                                                                                                                                                                                                                                              | DRAWN<br>TUNMAN                                                    |          |
| FINISH<br>—                                                                         |                                                                                                                                                                                                                                              | CHECKED<br>TUNMAN                                                  |          |
| DO NOT SCALE DRAWING                                                                |                                                                                                                                                                                                                                              | REVISIONS                                                          |          |
|                                                                                     |                                                                                                                                                                                                                                              | REV. DATE                                                          |          |
|                                                                                     |                                                                                                                                                                                                                                              | SCALE                                                              |          |
|                                                                                     |                                                                                                                                                                                                                                              | SHEET 1 OF 1                                                       |          |

SCRIPPS INSTITUTION OF OCEANOGRAPHY  
UNIVERSITY OF CALIFORNIA, SAN DIEGO

# FLUOROMETER CASE

SEE DIM. NO. 8  
8. HED FLUOROMETER-006  
SCALE CAD FILE: C:\MSDOWS\2000  
REV. DATE

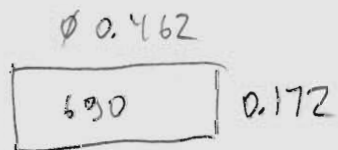
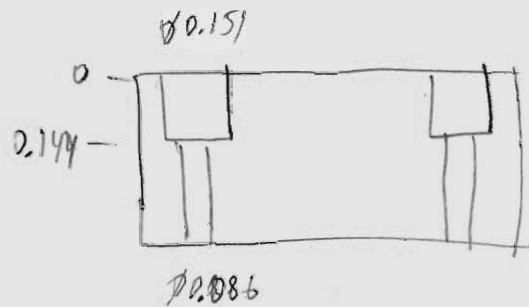
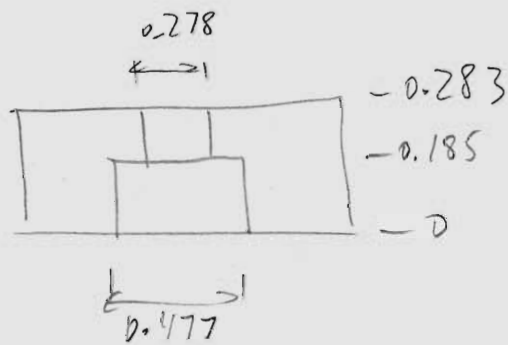
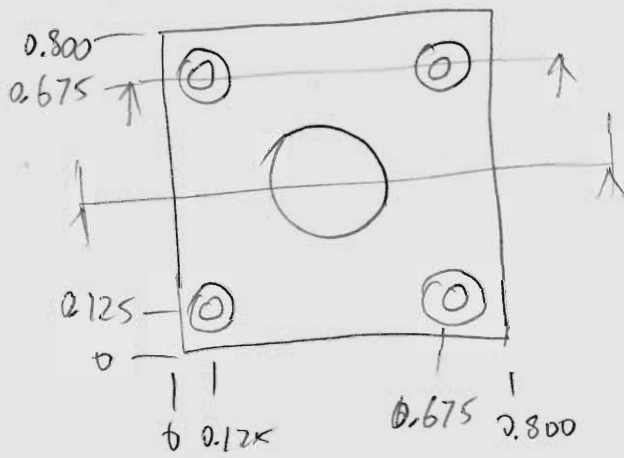
Do +  
Turn  
of  
Lig

Knock

First



filter holder  
for PI channel



4/7/2011 - 1

408-261-2022

Roberta

Kate → moved to Boston

called back 4/11/2011

\* Sandra - Replacement for Kate  
x 110

Adam x 7747

PMT Room light → with no power OK

in applied

photocell Bass

full sunlight - no damage to photocell

7155 - no protection circuit

surge, damaged

7122 - has protection - with 2 mA

$PMT < 1 \mu A$

- recommendations

↓ 100  $\mu A$

- limiting lifetime

$< 1 nW$

$100,000 \frac{A}{W}$

$> 1 nW$

- Risk of damaging

$1000 \frac{A}{W}$

100 nW - danger

H10682-110 - best replacement

100  $\mu A$  ;  $30 \cdot 10^3 \frac{A}{W} \rightarrow 3.3 nW$   
max

4/7/2011 -2

12

H5783-20 at 0.8 V:

$$3.9 \cdot 10^4 \frac{\text{A}}{\text{W}}; \quad 100 \mu\text{A max} \rightarrow 2.5 \text{ nW max.}$$

10nm Band; Sunlight:  $1 \text{ kW/m}^2$   $1000 \frac{\text{W}}{\text{m}^2} \rightarrow 100 \frac{\text{mW}}{\text{cm}^2}$

$$\phi 8 \text{ mm} \rightarrow 0.5 \text{ cm}^2$$

$$0.100 \frac{\text{W}}{\text{cm}^2} \cdot 0.5 \text{ cm}^2 \cdot \frac{10 \text{ nm}}{1000 \text{ nm}} = 5 \cdot 10^{-4} \text{ W} = 500,000 \text{ nW}$$

---

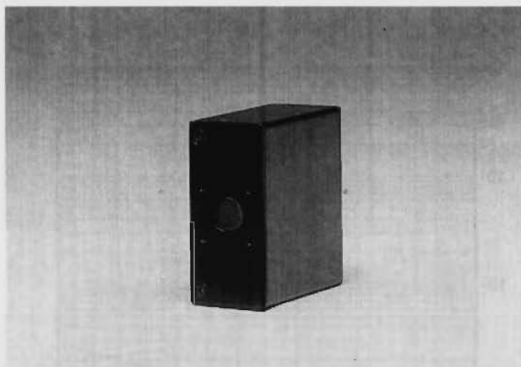
Room light:  $500 \mu\text{W/cm}^2 \cdot 0.5 \text{ cm}^2 \cdot \frac{10 \text{ nm}}{1000 \text{ nm}} = 2.5 \mu\text{W}$   
2500 nW

80-2002

60-5002

# Metal package PMT

## Photon Counting Head H7155 Series



The H7155 series are compact photon counting head devices consisting of a metal package photomultiplier tube along with a high-speed photon counting circuit and a high-voltage power supply circuit. The high voltage supply for photomultiplier tube and the discriminator level are preset to optimum values, allowing photon counting measurement by just connecting a +5 V supply. The H7155-20 has an internal prescaler of division by 4. This prescaler improves the count linearity 4-fold compared to the H7155.

908-231-0960 applications support  
left message.

x7671

### Product Variations

| Type No. | Spectral Response | Prescaler |
|----------|-------------------|-----------|
| H7155    | 300 nm to 650 nm  | No        |
| H7155-20 |                   | Yes       |

### Specifications

| Parameter                     |        | H7155             | H7155-20               | Unit                              |
|-------------------------------|--------|-------------------|------------------------|-----------------------------------|
| Input Voltage                 |        | +4.5 to +5.5      |                        | V                                 |
| Max. Input Voltage            |        | +6                |                        | V                                 |
| Max. Input Current            |        | 50                | 70                     | mA                                |
| Effective Area                |        | $\phi 8$          |                        | mm                                |
| Peak Sensitivity Wavelength   |        | 420               |                        | nm                                |
| Count Sensitivity             | 300 nm | $1.2 \times 10^5$ | $1.2 \times 10^5$ *2   | s <sup>-1</sup> .pW <sup>-1</sup> |
|                               | 400 nm | $2.7 \times 10^5$ | $2.7 \times 10^5$ *2   |                                   |
|                               | 500 nm | $2.2 \times 10^5$ | $2.2 \times 10^5$ *2   |                                   |
|                               | 600 nm | $2.1 \times 10^4$ | $2.1 \times 10^4$ *2   |                                   |
| Count Linearity *1            |        | $1.5 \times 10^6$ | $10 \times 10^6$ *2    | s <sup>-1</sup>                   |
| Dark Count *3                 | Typ.   | 100               | 100 *2                 | s <sup>-1</sup>                   |
|                               | Max.   | 500               | 500 *2                 |                                   |
| Pulse-pair Resolution         |        | 70                | 10                     | ns                                |
| Output Pulse Width            |        | 30                | Depends on count rate. | ns                                |
| Output Pulse Height *4        | Typ.   | 3.6               | 2.2                    | V                                 |
|                               | Min.   | 3.0               | 2.0                    |                                   |
| Recommended Load Resistance   |        | 50                |                        | $\Omega$                          |
| Signal Output Logic           |        | Positive logic    |                        | —                                 |
| Operating Ambient Temperature |        | +5 to +40         |                        | °C                                |
| Storage Temperature           |        | -20 to +50        |                        | °C                                |
| Weight                        |        | 75                |                        | g                                 |

\*1: Random pulse, at 10 % count loss

\*2: Output count will be decreased to 1/4 after the prescaler.

\*3: After 30 minute storage in darkness

\*4: With input voltage +5 V, Load resistance 50  $\Omega$  and Coaxial cable RG-174/U (450 mm)

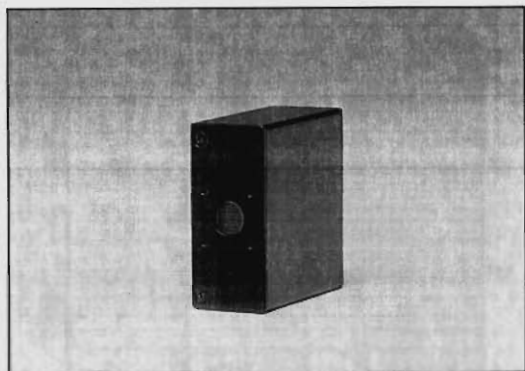
1 mW @ 500:  $220 \cdot 10^6$  counts/sec

$1.5 \cdot 10^6$  counts/sec: Limit  
 $14 \cdot 10^6$ : overdriving  
 $220 \cdot 10^6$ : damaging 1 mW

# Photon Counting Head

HAMAMATSU

## H7155 Series



The H7155 series are compact photon counting head devices consisting of a metal package photomultiplier tube along with a high-speed photon counting circuit and a high-voltage power supply circuit. The high voltage supply for photomultiplier tube and the discriminator level are preset to optimum values, allowing photon counting measurement by just connecting a +5 V supply. The H7155-20/H7155-21 has an internal prescaler of division by 4. This prescaler improves the count linearity compared to the H7155/H7155-01.

### Product Variations

| Type No. | Spectral Response | Prescaler |
|----------|-------------------|-----------|
| H7155    | 300 nm to 650 nm  | no        |
| H7155-01 | 300 nm to 850 nm  |           |
| H7155-20 | 300 nm to 650 nm  | yes       |
| H7155-21 | 300 nm to 850 nm  |           |

### Specifications

| Parameter                        |      |        | H7155             | H7155-20              | H7155-01          | H7155-21              | Unit                   |
|----------------------------------|------|--------|-------------------|-----------------------|-------------------|-----------------------|------------------------|
| Input Voltage                    |      |        | +4.5 to +5.5      |                       |                   |                       | V                      |
| Max. Input Voltage               |      |        | +6                |                       |                   |                       | V                      |
| Max. Input Current               |      |        | 50                | 70                    | 50                | 70                    | mA                     |
| Effective Area                   |      |        | φ8                |                       |                   |                       | mm                     |
| Peak Sensitivity Wavelength      |      |        | 420               |                       | 400               |                       | nm                     |
| Count Sensitivity                | Typ. | 300 nm | $1.2 \times 10^5$ | $1.2 \times 10^5$ *2  | $1.2 \times 10^5$ | $1.2 \times 10^5$ *2  | $s^{-1} \cdot pW^{-1}$ |
|                                  |      | 400 nm | $2.7 \times 10^5$ | $2.7 \times 10^5$ *2  | $2.7 \times 10^5$ | $2.7 \times 10^5$ *2  |                        |
|                                  |      | 500 nm | $2.2 \times 10^5$ | $2.2 \times 10^5$ *2  | $2.0 \times 10^5$ | $2.0 \times 10^5$ *2  |                        |
|                                  |      | 600 nm | $2.1 \times 10^4$ | $2.1 \times 10^4$ *2  | $1.4 \times 10^5$ | $1.4 \times 10^5$ *2  |                        |
|                                  |      | 700 nm | —                 | —                     | $6.7 \times 10^4$ | $6.7 \times 10^4$ *2  |                        |
| Count Linearity *1               |      |        | $1.5 \times 10^6$ | $10 \times 10^6$ *2   | $1.5 \times 10^6$ | $10 \times 10^6$ *2   | $s^{-1}$               |
| Dark Count *3                    |      | Typ.   | 50                | 50 *2                 | 600               | 600 *2                | $s^{-1}$               |
|                                  |      | Max.   | 100               | 100 *2                | 1000              | 1000 *2               |                        |
| Pulse-pair Resolution            |      |        | 70                | 10                    | 70                | 10                    | ns                     |
| Output Pulse Width               |      |        | 30                | Depends on count rate | 30                | Depends on count rate | ns                     |
| Output Pulse Height *4           | Min. | 3.0    | 2.0               | 3.0                   | 2.0               | V                     |                        |
|                                  | Typ. | 3.6    | 2.2               | 3.6                   | 2.2               |                       |                        |
| Recommended Load Resistance      |      |        | 50                |                       |                   |                       | Ω                      |
| Signal Output Logic              |      |        | Positive logic    |                       |                   |                       | —                      |
| Operating Ambient Temperature *5 |      |        | +5 to +40         |                       |                   |                       | °C                     |
| Storage Temperature *5           |      |        | -20 to +50        |                       |                   |                       | °C                     |
| Weight                           |      |        | 75                |                       |                   |                       | g                      |

\*1: Random pulse, at 10 % count loss

\*2: Output count will be decreased to 1/4 after the prescaler.

\*3: After 30 minutes storage in darkness

\*4: With input voltage +5 V, Load resistance 50 Ω and Coaxial cable RG-174/U (450 mm)

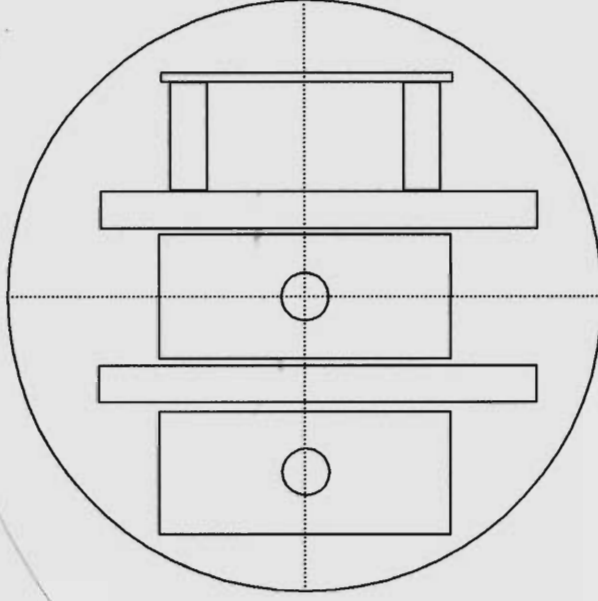
\*5: No condensation

11-10-74 (do) Pulse Store & Files Rob & Latt Rob & Latt

600nm, 690x10

Hydrogel  
 Reflets < 620nm  
 Trans > 620nm, < 550nm

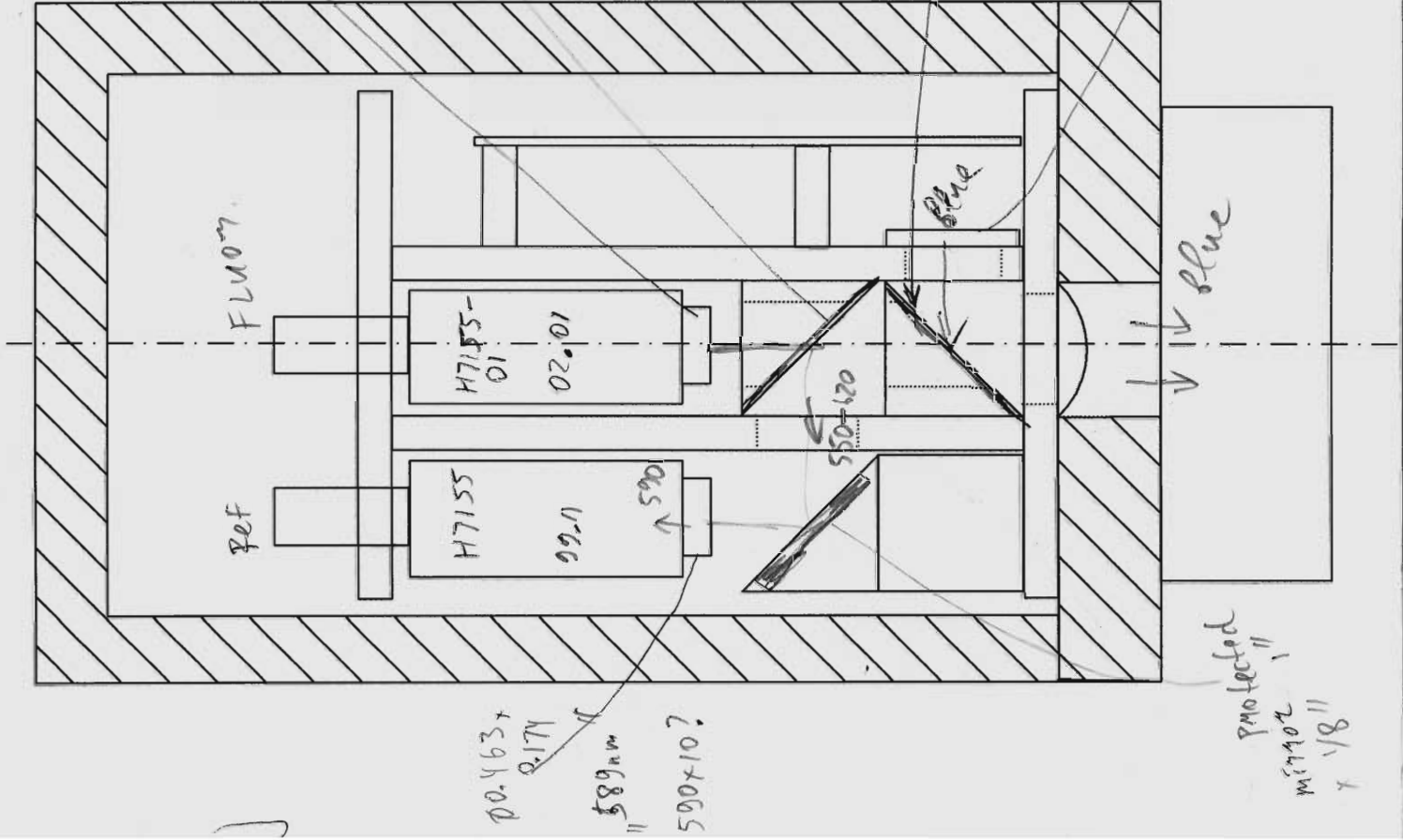
550-620nm



Hydrogel  
 Reflets < 510nm  
 Trans > 510nm

1" Round, ~1mm  
 1st surface

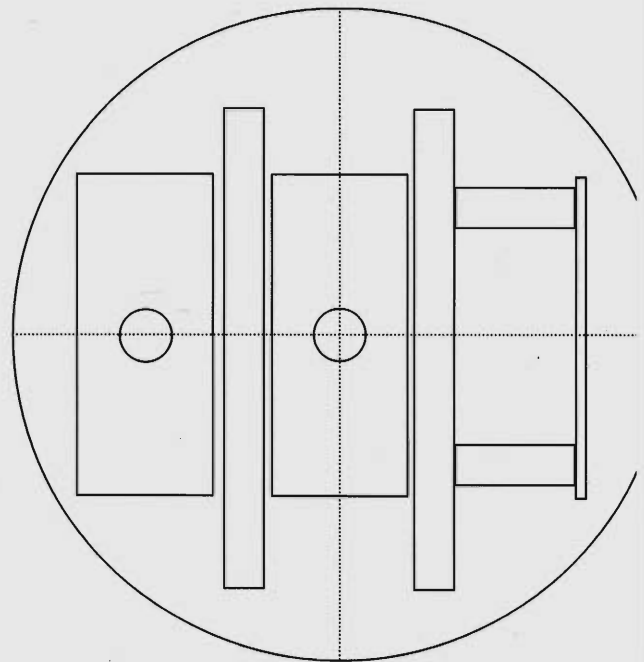
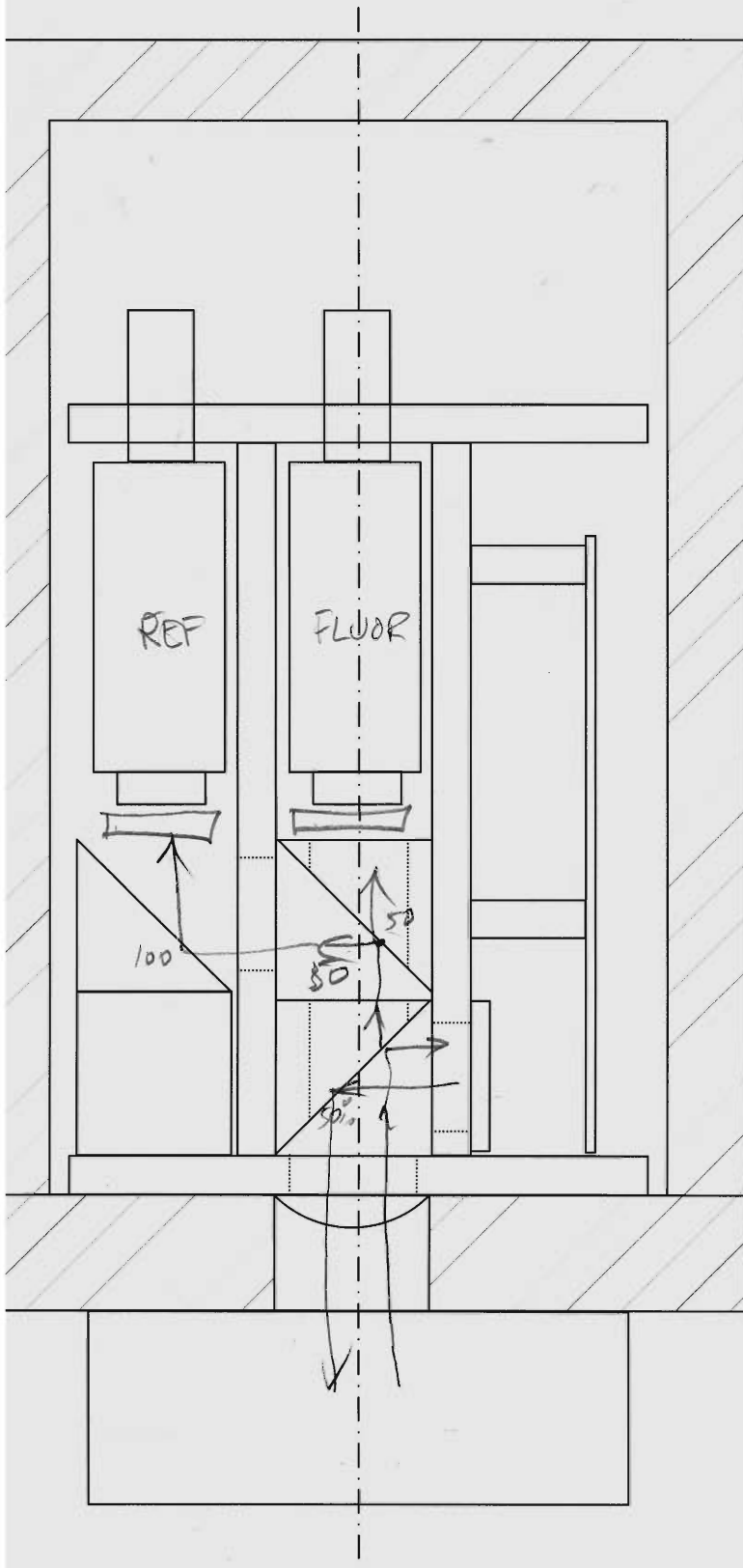
SWP 500 or Bandpass  
 1" diameter, thick  
 DISO/30



3/7/2013

Print out of

dx4 dxw



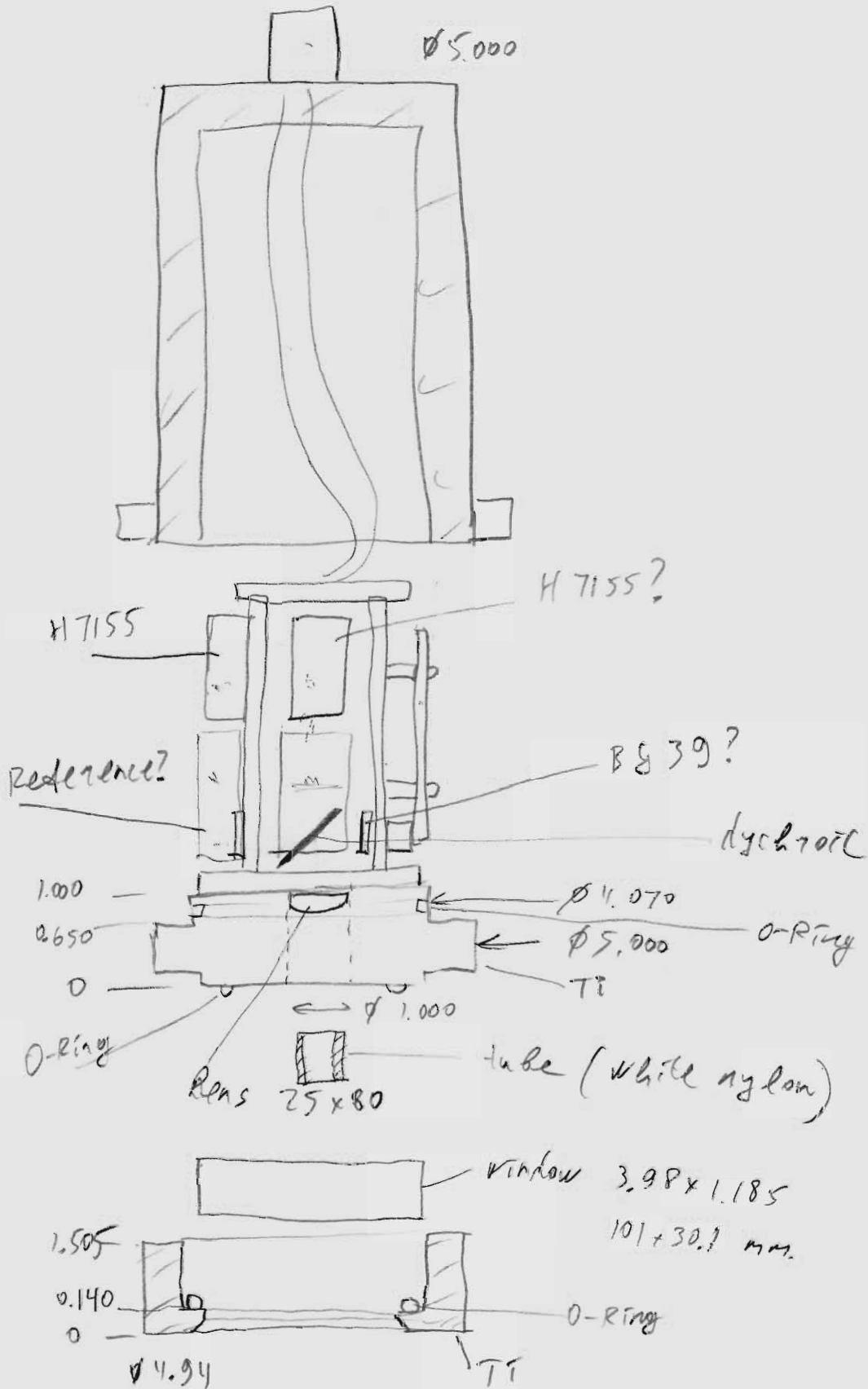
7/8/2011

901027

Sedimentation evaporation  
sensor

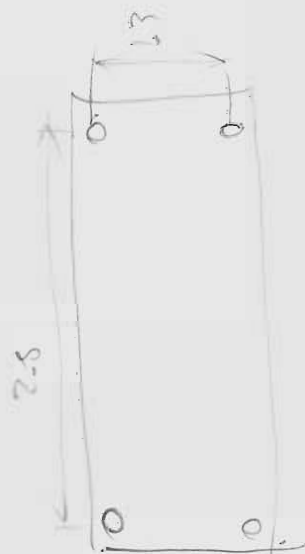
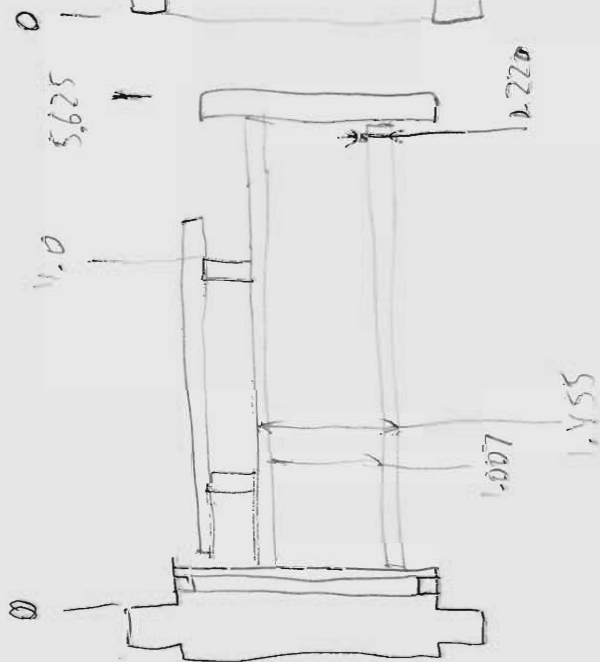
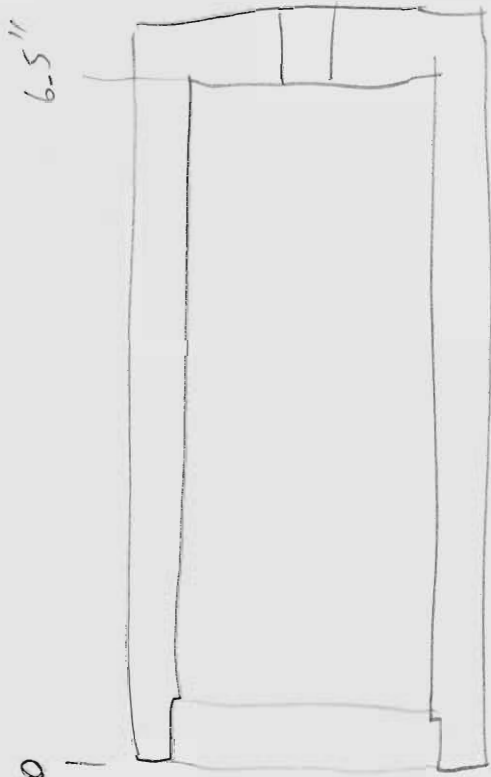
H<sub>2</sub>O fluorometer

Assembly notes



Initial disassembly

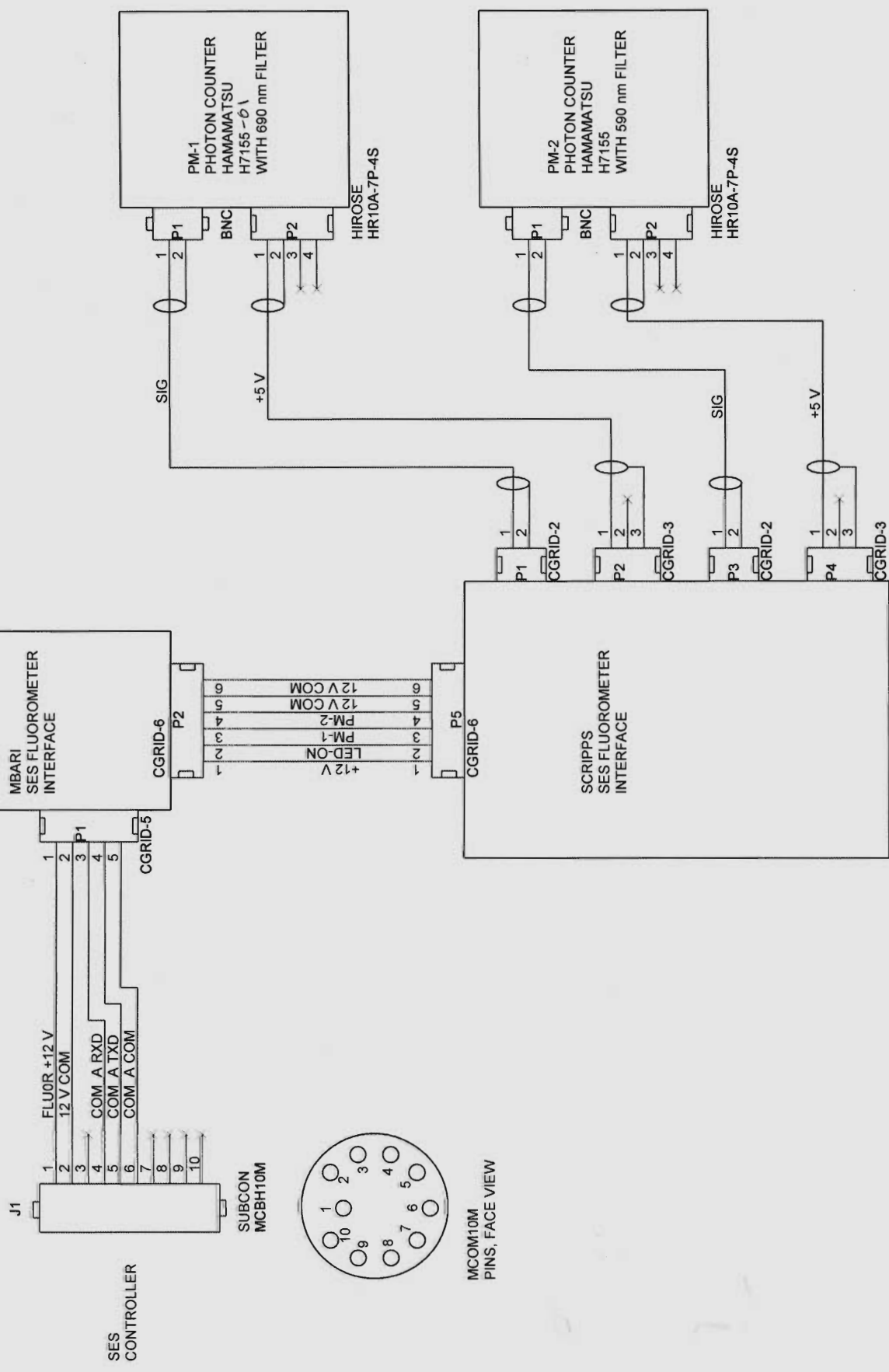
3/2013





Bottom.





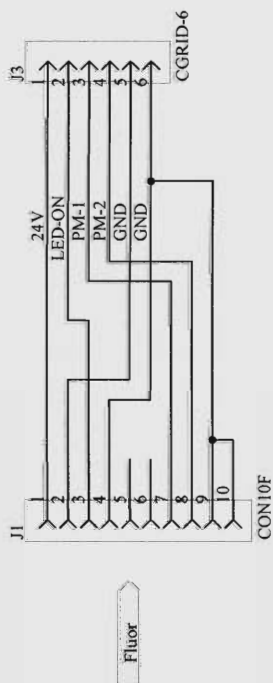
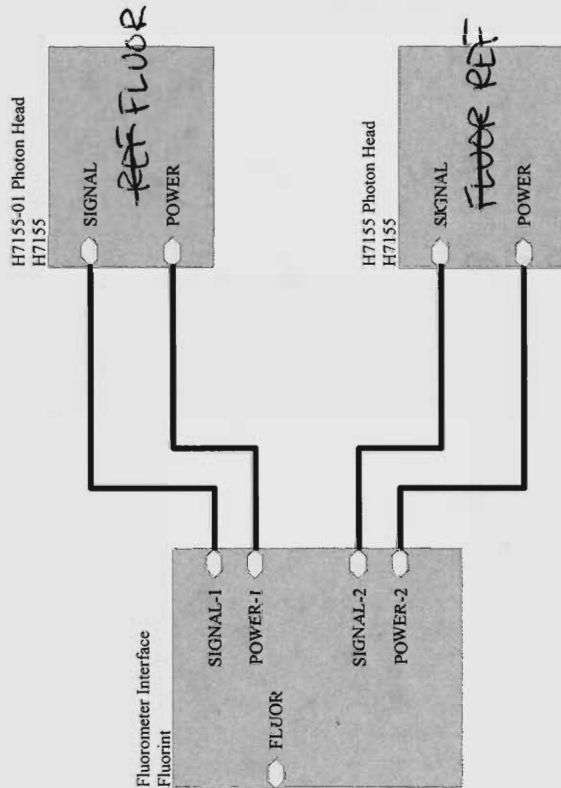
|                                         |                          |
|-----------------------------------------|--------------------------|
| Engineer: P. McGill                     |                          |
| Title                                   |                          |
| Sedimentation Event Sensor: Fluorometer |                          |
| Size                                    | Document Number          |
| A                                       | <Doc>                    |
| Date:                                   | Wednesday, July 20, 2011 |
| Sheet                                   | 1 of 1                   |
| Rev                                     | 1.0.0                    |

A

B

C

D



Fluor

# Fluorometer

Revision A

Date: 3/16/2011  
File: C:\Documents and Settings\...  
Sheet of 4