MON	BS	HI	FS	ELEV
202	+465mm	Mon 202 LHO LVEA	+1100187	+0.5mm

465.5mm

+1196.8mm	1662.3	mm
1197.2	1662.7	1662.6 NW
1197.2	1662.7	CS
1197.0	1662.5	CE
1197.3	1662.8	CS ←

Kick-a-Leg

-1191.2

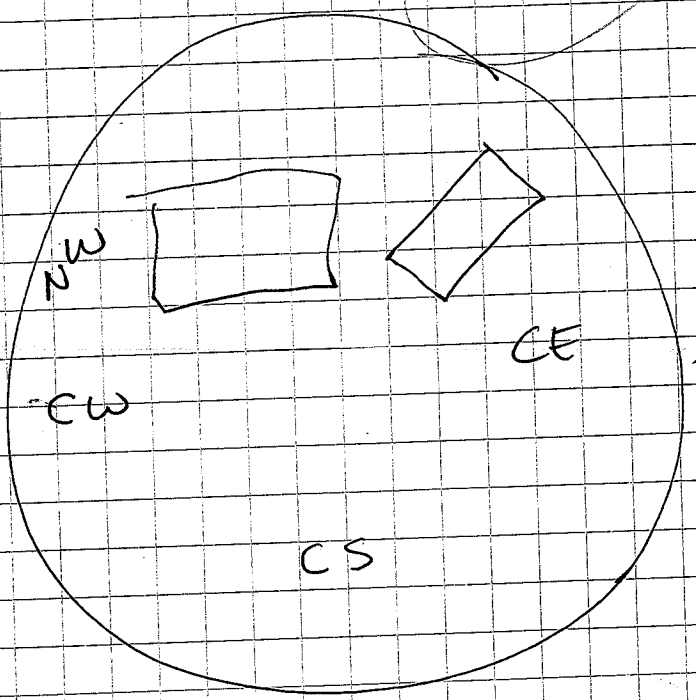
471.6mm

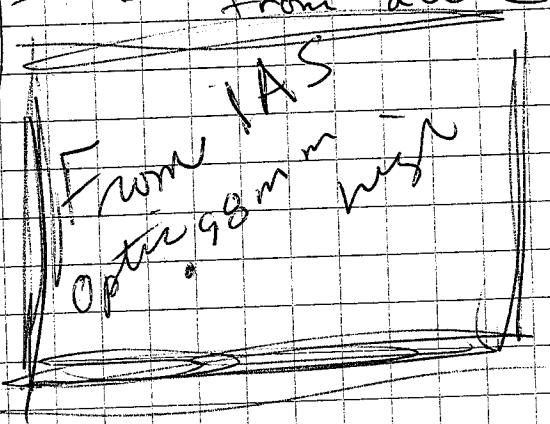
-471.0

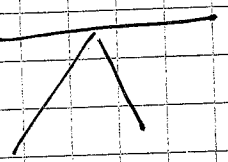
1662.8 CS Repeat

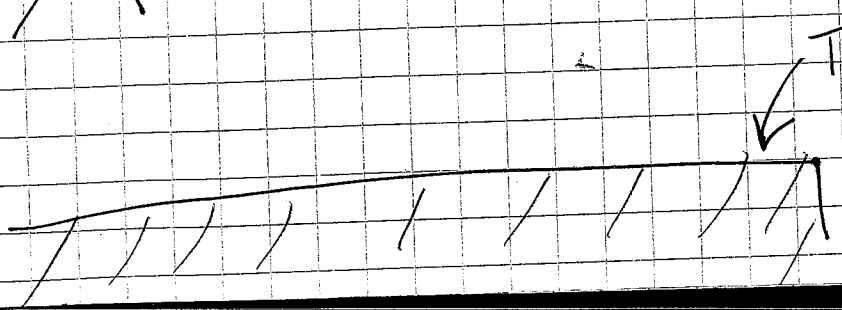
0.6mm (0.1mm ERROR - G

TP202 MON →









Hughes - Anderson
Jones - 9
SOKKIA
102471
OPTICAL T
~~OPTICAL~~ C

BSC8 Dec 20, 2011

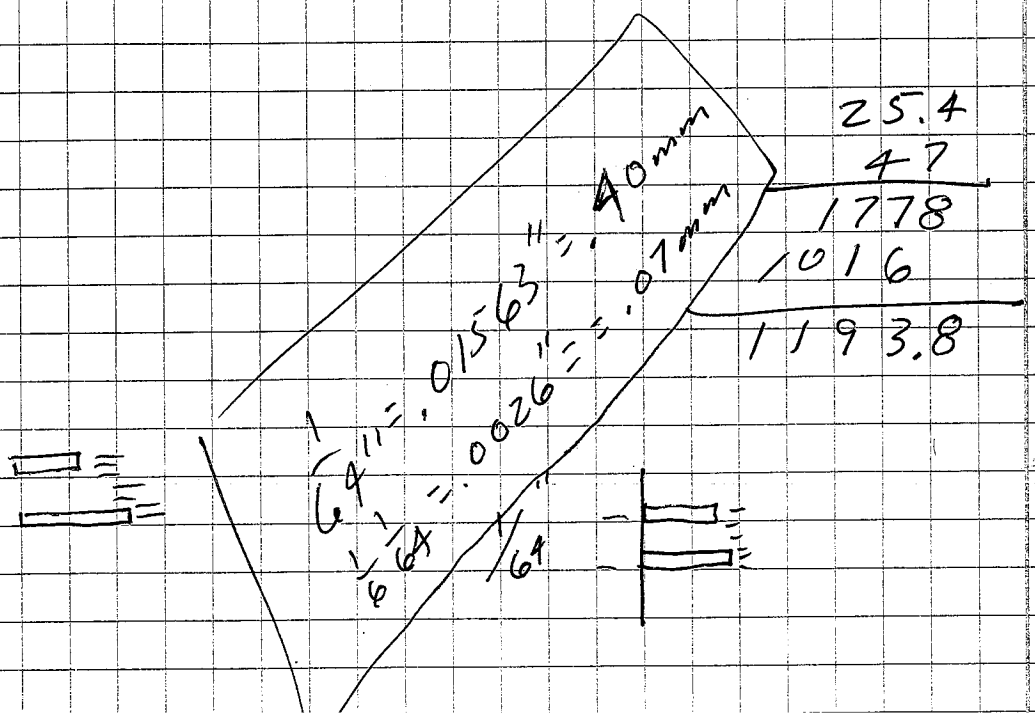
	BS	HI	FS	ELEV
	+467mm			.5
NE			+47"	
NW			47"+	
SC			47-	
NW			47 1/2/64	
NE			46 63 20/64	
SC			46 63 4/6/64	
NW			47 0 1/6	
NE			46 63 3/6	46.974" = 1193.73mm
SC			46 63 5/6	1660.2

Look for 1661.7 Level +- 0.3mm over

HEPI

	Load Cells	DIs V	DIs T	DIs L
1	2217	1 502	493	
2	2143	2 385	407	386
3	2114	3 698	390	495
4	2174	4 416	602	
5	2125			
6	2117			
7	2151			
8	1925			

+.5
467.
1193.8
1661.3

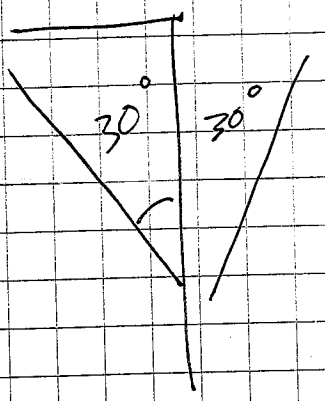


BSC

~~Hydro~~ DSC

Springs

Moves



$\cos 30° = \frac{Adj}{hyp}$

$x = hyp$

3/4-20 thread

20/inch

1/20" / turn

.050/turn

1.27mm/t

Vert

1.27mm cos30°

= 1.10 mm/turn

⇒ .27mm/$\frac{turn}{4}$

HORZ

1.27mm sin30° } Vert Proj — Correct motion on Spring

= 0.64mm/turn } Horz component

0.64mm cos 45° } Horz — Correct Horz motion of X

= 0.45mm/turn } housing to X & Y

⇒ 0.11mm/$\frac{turn}{4}$

Actual: Springs

$\frac{1}{2}$ turn ⇒ ~.0

BSC 8 21 Dec 2011 HEPI Moves

Move N 1.6mm
Move E 2.4mm

	V	T	L
1	503	495	
2(-)	387	409	488
3	698	389	495
4(-)	17	602	

½ turn (N) Should have been .22mm but we got

	V	T	L
1	501	530	
2(-)	384	372	489
3	699	420	492
4(-)	17	564	

ΔT: 35 mils, 37 " → ~36 mils; 38 mils

½ turn (E)

	V	T	L
1	501	535	
2	382	370	444
3	699	431	449
4	16	559	

ΔL: 45, 43 → 44 mils

½ E

	V	T	L
1	498	528	
2	387	379	414
3	702	420	422
4	16	66	

30, 37 → 34 mils

¼ N

	V	T	L
1	497	534	
2	387	376	417
3	702	423	422
4	515	561	

Hit stops

	V	T	L
1	502	554	
2	388	345	392
3	705	448	399
4	517	543	

Δ	V	T	L
	+1	+59	
	-1	+64	-96
	-7	+59	-96
	0	+58	

SPRING	OFFSETS
1	-14
2	+4
3	-19
4	-4
5	-14
6	-14
7	-19
8	-16

AIS. < .4mm W.
.05mm S

SURVEY

~~TP 201~~	BS	HI	FS	ELEV	~~.5mm~~
TP 202	475mm	475.5		.5mm	

NW 46 44 3/16"
NE 46 43 3/16
CS 46 43 3/16

NW is high ~1/64. 8 mils = 1/128 = ~1/64 1/2

Lower NW RAISE SE 1/4 each

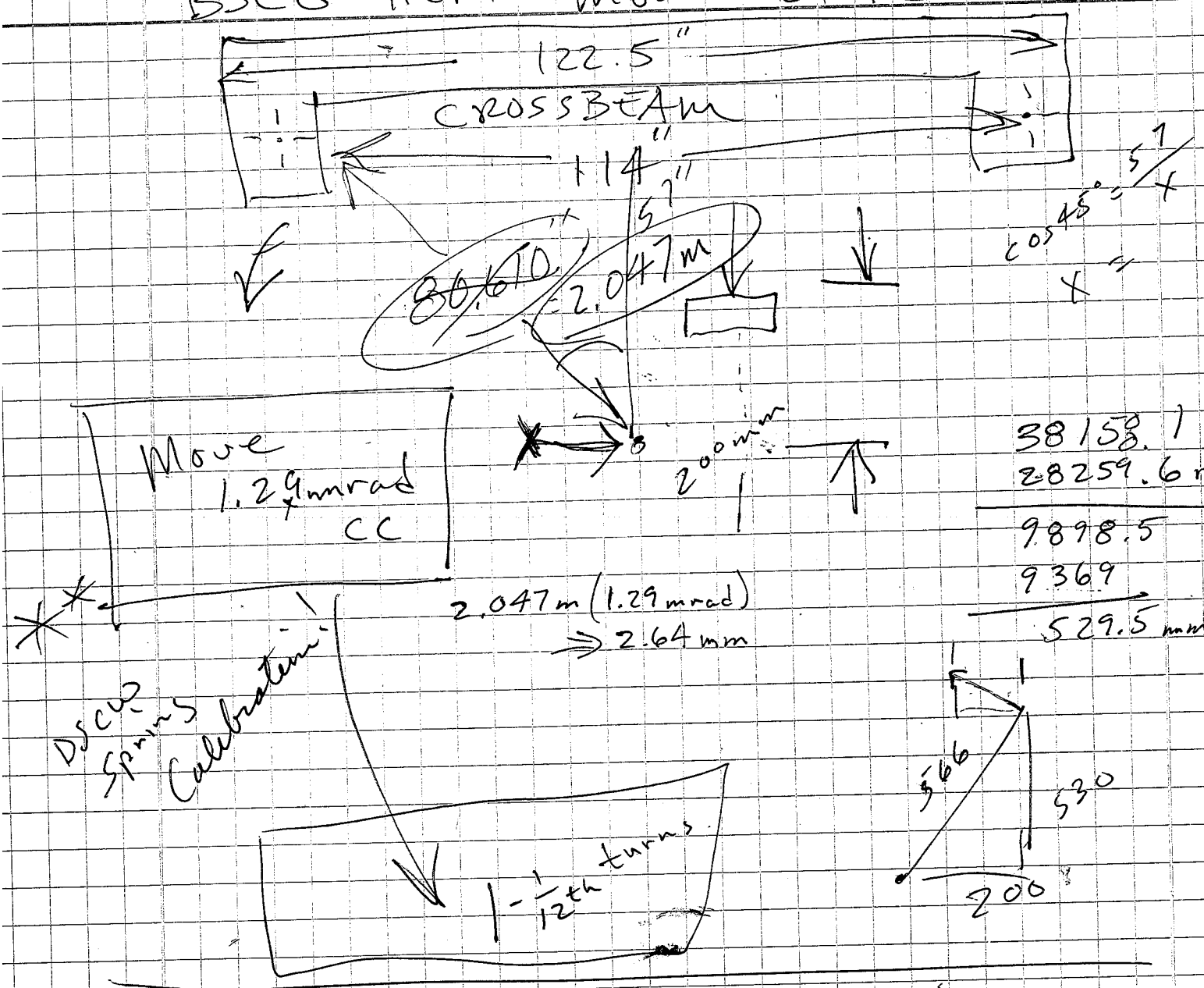
NW 46" 43 4/16
NE 43 1/16
CS 43 3/16
NS 43 3/16
SE 43 4/16
SW 43 1/16

1185.6mm
1661.1mm
nominal 1661.7

Load Cells	
1	2175
2	2133
3	2244
4	1995
5	2123
6	2168
7	2016
8	2053

DI	1	2	3	4
V	497	398	704	503
T	553	345	450	543
L		389	395	

BSC8 HEPI Move 21 Dec



Rotate: ½ turn each spring CCW

Pts	1	2	3	4
V	496	401	706	502
T	597	382	411	561
L		402	382	

~ 6700 μrads

Another ½ turn

	1	2	3	4
V	495	400	705	501
T	637	424	376	459
L		421	367	

~

BSC8 HEPI Move 2 Dec

Azimuth ½ turn (30°)

	1	2	3	4
V	495	400	705	501
T	644	431	370	452
L		422	364	

Final Load Cell

1	2129
2	2279
3	2272
4	2077
5	2064
6	2204
7	2000
8	2098

BSC 8 HEPI 22 Dec

Before

	4	1	2	3
V	500	495	399	704
T	452	644	434	367
L			425	363

Before Tight Locks of HEPI Set Screws - Outboard Vert & Horz

Jan 4 Checked Corners 1, 2, 4 Betsy Bumped DI's #3 corner so she'll re-read. 1, 2, & 4 where very close.

Before

	1	2	3	4
V	494	395	659	498
T	644	436	320	452
L		424	333	

Use above #s for all except #3, for 3 use these

Attached actuators - (Vert 4, 3, 1 - Horz 4)

JAWS - Continued Act. Installation (& Hackment)

	1	2	3	4
V	500	398	662	505
T	643	436	322	455
L		423	336	

No change

Act Valves Switched to Run (from Bleed)

	1	2	3	4
V	500	398	662	505
T	643	436	322	455
L		423	336	

Pull shims from Actuators

	1	2	3	4
V	500	398	659	503
T	643	437	316	457
L		428	342	

BSC8 HEP1

Some activity @ corner 3 (SUS FT/Cables) This corner may have suspect readings

Now install ACB Dummy (130 lbs)

	1	2	3	4
V	500	398	660	503
T	642	439	315	457
L		428	342	

	1	2	3	4
V	2	9	10	0
T	-6(S)	+7(S)	-4(S)	+8(S)
L		3W	5W	

Release Jack/Set Screws

1	2	3	4
502	407	670	503
636	446	311	465
	431	347	

Δ's after final Alignment

	1	2	3	4	Moved
V	-7	-7	-11	-2	7 Down
T	-8(S)	+15(S)	-9(S)	13(S)	~ 11 South
L		9(W)	14(W)		~ 12 W

Raise all ~ 7 mils (tighter 1/4 turn)

	1	2	3	4	
V	494	407	671	494	Error may have
T	635	449	307	466	Missed
L		436	349		

1/4 turn on Corner 3

	494	403	666	493
	634	450	307	466
		436	350	

	1	2	3	4
VΔ	8	04	4	10
	+1/8 W		-1/8 E	

	1	2	3	4
V	499	395	657	498
T	632	452	305	465
L		436	349	

1	2154
2	2293
3	2340
4	2101
5	2145
6	2270
7	1980
8	2198

3 12 13 5

Turn	1/8 E		ε	1/8 N
	1	2	3	4
V	499	396	660	498
T	638	~~452~~	309	460
L		433	~~340~~	

Final #s Thursday

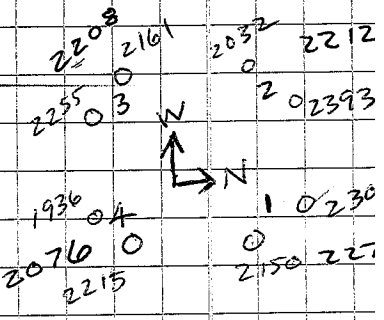
Next	First Look Friday →			
	499	396	660	
	638	452	309	498
		433	340	460

1	2150
2	2305
3	2393
4	2032
5	2161
6	2255
7	1936
8	2215

Jan 6 Anna

Δ from Nominal

	1	2	3	4
V	-4	+4	-1	+2
T	-6(S)	-22(S)	-14(S)	-8(S)
L		+11(W)	+7(W)	



SC

Minimum Gap on Adj Plate/Shields

Pier	1	2	3	4
H	.051	.051	~~.057~~	~~.054~~
U	.045	.050	~~.057~~	.038(Top) .060 bottom

51 Top 57 bottom

Adj Gaps Jan 2012

HAM2 Support Tube Position

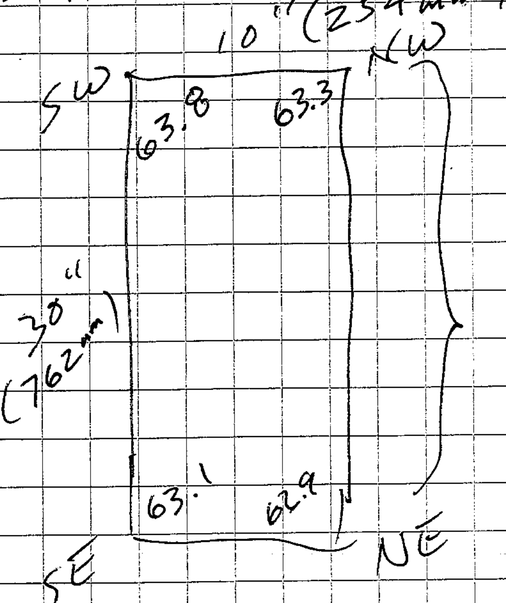
ST ℄ Zg=0 − STendRad + Local2GlobalOffset
−1209.6mm − 50.8mm + ~~14.1~~mm
12.5 = ~~−1246.3mm below~~
−1247.9mm below Local zero

HAM2 Support tube bottoms are 1247.9mm below Local

$0.14° \Rightarrow 0.14°\left(\frac{\pi\, rad}{180}\right) = 2.44 mrad$

9 Jan '12
MTS1
Solid Stock Panel
for ACB

63.2mm	NW	
62.9 mm	NE	
63.1	SE	
→ 63.8	SW	(No base)
63.4 .2mm	NW	"
62.9 ✓	NE	
63.1 ✓	SE	
63.7	SW	



Loosen Bolts on SW side

63.6	SW
63.4	NW

62.8	NE
62.7	SE
63.4	SW
63.4	NW

Final Read

---

10 Jan BSC8 post Actuator Work

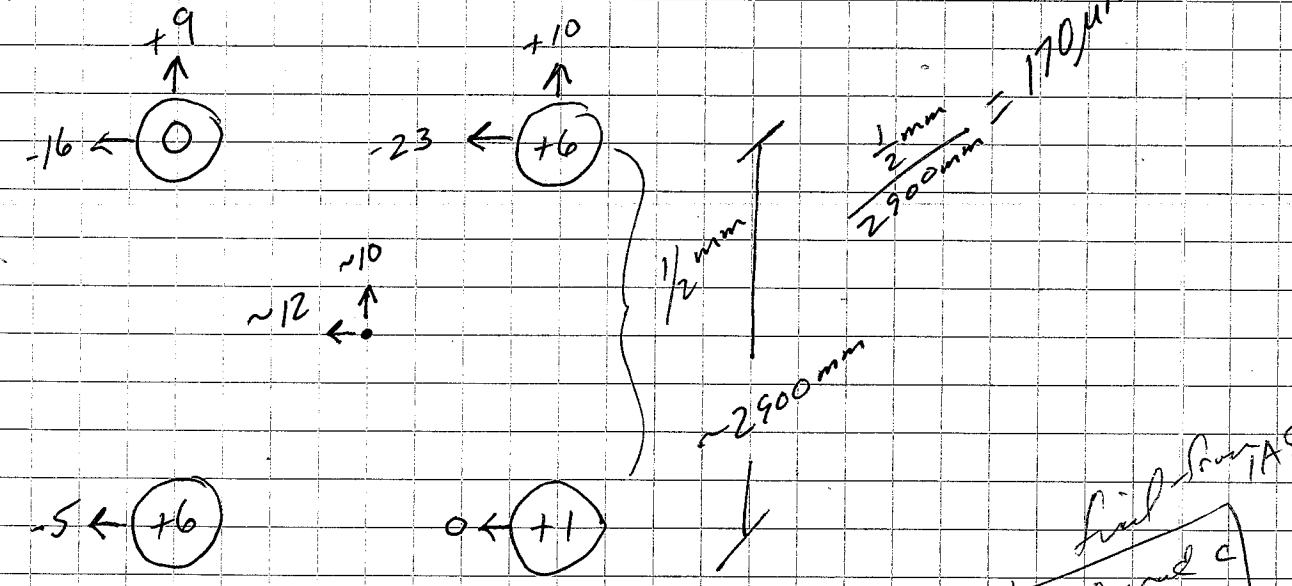
Dial Indicator Checks

	1	2	3	4
V	494	394	659	494
T	644	454	304	457
L		435	342	

} These were after freeing the actuators and repositioning to center actuators.

Δ from Post Alignment

V	+1	+6	0	+6
T	0	-23	-16	-5
L		+10	+9	



Final from IAS

50 mrad c

.35 s

SW 20 5/8 | NW 21 1/16 | NE 22 1/8

BSC8

	1	2	4
V	94	96	60 94
T	49	52	02 49
L		36	40

Set Drive HZ only
DI Reads zero

15000 Counts

T	60	
L	44	

⇒ IPS 19320

-3550

0

T	56
L	39

Connect w/ 15000 cts

T ⇒ IPS 30400

zero +1650

	Drive	DI	IPS
C2	15K	8	22870
C4	"	32	28850

Corner 2 — 15000 cts — 8 mils — "

C4 — 32 mils

-2700 +

BSC8
12 Dec 2012

	1	2	3	4
V	496	397	560	494
T	652	447	312	446
L		434	337	

Before IPS and Loads

Pretty good

Δ from post final align

V	-1	+3	-1	+7
T	+8	-16	-8	-6
L		+12	+4	

BSC8
Jan 17

	1	2	3	4
V	495	396	659	495
T	698	447	311	450
L		431	337	

} Before HGP1 Lock Down Pre ACB Install

Δ from Post Align

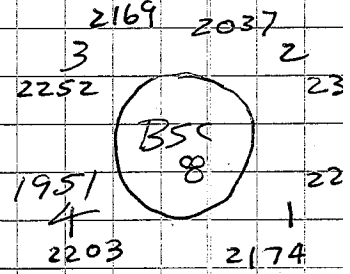
V	0	+4	0	+6
T	+4	-16	-9	-2
L		+9	+4	

BSC8 Jan 17 (tues)

	1	2	3	4
V	495	394	658	494
T	649	444	312	450
L		431	338	

Remove ACB Dummy weight, unlock HTD

V	497	395	659	497
T	648	445	310	450
L		430	338	



Δ from align

V	~~+2~~	+5	0	+4
T	~~+4~~	-14	-10	-2
L		+8	+5	

TIGHTEN 1, 5, 7 & LOOSEN 2, 6, 8 ¼ turn

V	497	395	659	497
T	638	443	313	461
L		432	343	

Δ

V	-2	+5	0	+4
T	-6	-12	-7	~~+9~~ -13
L		+10	+10	

Loosen 3 & Tighten 4 ¼

	396
	444
	435

HAM 12 Pier (HEP1) Height

Pier-Top Below Global
$-1503.5\text{ mm} + -5.3\text{ mm} = \boxed{-1508.8\text{ mm}}$
(See Page 86 this book) (T1100187)

BSC 8 Optical Table Level/Height Check

Sokkia 102471

HWL TP202 Sim ϕ
SW
SC
SE
N

BS +475.1 mm

HI

FS

ELEV .5 mm

$1\ \frac{32\frac{1}{16}}{64}$
$1\ \frac{32\frac{9}{16}}{64}$
$1\ \frac{31\frac{15}{16}}{64}$
$1\ \frac{32\frac{2}{16}}{64}$

Set HI of Rod

$1\ \frac{19\frac{5}{16}}{64} = 1.309'' = 33.3\text{ mm}$

Center of Table

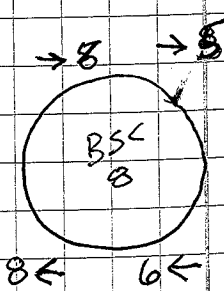
$46\ \frac{44\frac{1}{16}}{64} = 46.690'' \Rightarrow 1661.5$

TP202 475.1 m

	1	2	3	4
V	498	396	61	498
T	638	443	313	461
		33	44	

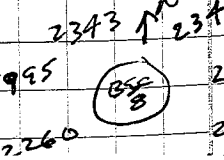
Disconnect Horz Actuators

	496	396	61	496
	638	426	328	460
		17	32	
ΔV	-1	+4	-2	+5
T	-6(S)	+5(N)	+8(N)	-8(S)
L		-5(E)	-1(E)	



Move 1.12 mm North
Tighten 2, 3, 5, 8 & Loosen 1, 4, 6, 7 ½ turn

V	494	393	659	494
T	673	386	372	425



BSC 8 Jan 18 Wednesday

	1	2	3	4
V	494	394	659	494
T	673	385	~~433~~ 372	425
L		414	~~433~~	

Disconnect Vertical Actuators

V	492	390	653	491
T	680	374	381	419
L		413	433	

Δ from align yesterday

V	+2	+3	+6	+3
T	+7 N	+~~12~~ 4(S)	+9(N)	+6(N)
L		-2(E)	-1(E)	

1/8 turn

V	491	389	656	491
T	693	363	390	407
L		412	~~430~~	

Δ V	+3	+4	+3	+3
T	+20(N)	+23(N)	+18(N)	+18(N)
L		-3(E)	-4(E)	

→ IAS jump .9N.

ΔV from yesterday post Optical Table Align Check

ΔV	+7	+7	+5	+7

→ less than .2mm shift up - it is even

Tighten 1,4,6,7 & Loosen 2,3,5,8 ½ turn

V	491	391	651	490
T	656	398	373	440
S		412	~~438~~	

→ IAS gauge .035. Good enough!

ΔV				
T	37s	35s	17s	33s
S				

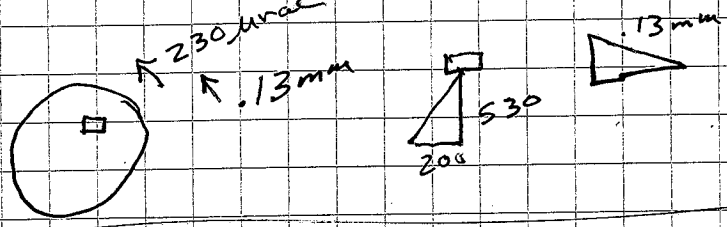
Coors side

Δ V	+4	+9	+8	+11
T	+12(N)	+33(N)	+14(N)	+12(N)

Jan 19 BSC8

IAS Reports ~230 μrad CW from nominal
Moved HEP1
tighten 2, 4, 6, 8 & Loosen 1, 3, 5, 7 1/12 turns then 1/6+
IAS thinks this is very good.

$\sqrt{200^2 + 530^2}$
$40000 + 280900$
$\sqrt{320900}$
~ 565 mm



This 230 μrad motion should only have translated the optic ~0.1 mm

So 1/4 turns (for Yaw) got ~230 μrad

BSC8 HEP1 23 Jan

	1	2	3	4
V	490	392	555	491
T	673	413	345	426
L		17	328	

from retaining

A V	+1	-1	-4	+1
T	+17(N)	15(S)	28(S)	14(N)
L		5(W)	10(E)	

Connect H Act (Leave align bolts)

491	391	553	490 88
66	08	345	43 33
	17	3289	

Release H Act align bolts

492	392	553	491

	1	2	3	4
Δ from final alignment to release of Horz Act.				
V	-2	0	+2	0
T	-7(s)	0	-7(s)	-7(s)
L		+6(w)	+9(w)	

→ This seems erroneous. Otherwise alignment should remain good

24 Jan 2012 BSC AM Look

	1	2	3	4
V	493	397	556	492
T	665	421	335	434
L		30	340	
~~24 Jan 2012~~ Δ V	-3	-5	-1	-1
T	-8(s)	-8(s)	-10(s)	-8(s)
L		+13(w)	+12(w)	

difference from post alignment 19 Jan

	SCOPE	Horz Act
NW	58	385
NE	62.5	357
SE	56	390
SW	56.5	381

FEB 2 BSC

	1	2	3	4
V	502	404	562	498
T	665	420	338	433
L		431	340	
Δ V	-12	-12	-7	-7
T	-8(s)	-7(s)	-7(s)	-7(s)
L		+14(w)	+12(w)	

Difference from 23 Jan post final alignment. Both HEPI actuators have been reattached

- Install Dome, pull fc, drop ACB, install Torque Dome bolts

Feb 3

	1	2	3	4
V	502	402	560	497
T	665	414	338	435
L		429	340	
Δ V	-4	-6	-1	+1
T	-8(s)	-1(s)	-5(s)	-9(s)
L		+17(w)	+2(w)	

→ from level pulse when OT was ~2mm level
→ post final IAS