Jefferson Lab Alignment Group
Data Transmittal

TO: B. Miller, J. Hogan, R. Fair	**DATE:** 22 Jun 2017	
FROM: Kelly Tremblay	**Checked:** (*see kt)	**# :** B1798

DETAILS: data: inspection\hallb\eti_solenoid\170622a

A survey of the solenoid cart (ref: survey transmittal B1769) and a separate survey of the solenoid bolt hole locations (at the ETI facility) has been completed. Below, find the transformed coordinates of the found solenoid bolt holes to the cart bolt locations. Units millimeters.

The results from a transformation of the as-found solenoid bolt locations to the cart bolt locations is shown below. The standard deviation for the transformation is 0.10 mm. The X_TR/Y_TR/Z_TR are the transformed coordinates. The deltas indicate how much the rigid transformed point differs from the cart coordinate. A positive dX indicates the solenoid bolt is to beam left, a positive dY indicates the solenoid bolt is above the cart point and a positive dZ indicates the found solenoid point is downstream of the found cart point. The last three columns indicate whether the individual cart coordinate was held or left as an unknown in the solution.

From the data, the solenoid should fit in the cart in length with shims being required on the beam right post as shown in the dZ columns and on the downstream post (the negatives showing how short the solenoid is). No shims in length are required for the beam left post.

TRANSFORMED coordinates									
	Transformed Coordinates			Deltas			held / unknown. coordinate		
name	X_TR	Y_TR	Z_TR	dX	dY	dZ	x fix/unk	y fix/unk	z fix/unk
bl_1	511.93	-839.98	0.27	0.23	-0.08	-0.12	FIX	FIX	FIX
bl_2	402.89	-839.88	0.39	-0.21	-0.08	0.20	FIX	FIX	FIX
bl_3	402.90	-894.89	0.53	0.00	0.11	0.14	FIX	FIX	FIX
bl_4	403.13	-1047.69	0.89	0.43	-0.79	0.00	UNK	UNK	FIX
bl_5	512.00	-1047.32	0.77	0.30	-0.22	-0.22	UNK	UNK	FIX
br_1	-512.20	-840.12	1.42	-0.20	-0.12	2.33	UNK	FIX	UNK
br_2	-403.24	-840.10	1.30	-0.14	0.10	2.11	UNK	FIX	UNK
br_3	-403.20	-895.15	1.43	-0.10	0.05	2.04	UNK	FIX	UNK
br_4	-402.97	-1047.99	1.80	0.23	-1.09	2.01	UNK	UNK	UNK
br_5	-511.76	-1047.54	1.92	0.14	-0.84	2.23	UNK	UNK	UNK
ds_1	54.37	-897.08	1800.73	-0.03	0.22	-2.06	FIX	FIX	UNK
ds_2	-53.73	-897.09	1800.81	-0.13	0.01	-2.18	FIX	FIX	UNK
ds_3	-53.79	-963.19	1799.71	0.01	-0.19	-3.58	FIX	FIX	UNK
ds_4	54.33	-963.22	1799.64	0.13	-0.02	-3.45	FIX	FIX	UNK

In the above data, the beam left (bl) and beam right (br) points are upstream. The downstream points have ds as their prefixes. The sketch below for the bolt locations on the cart.
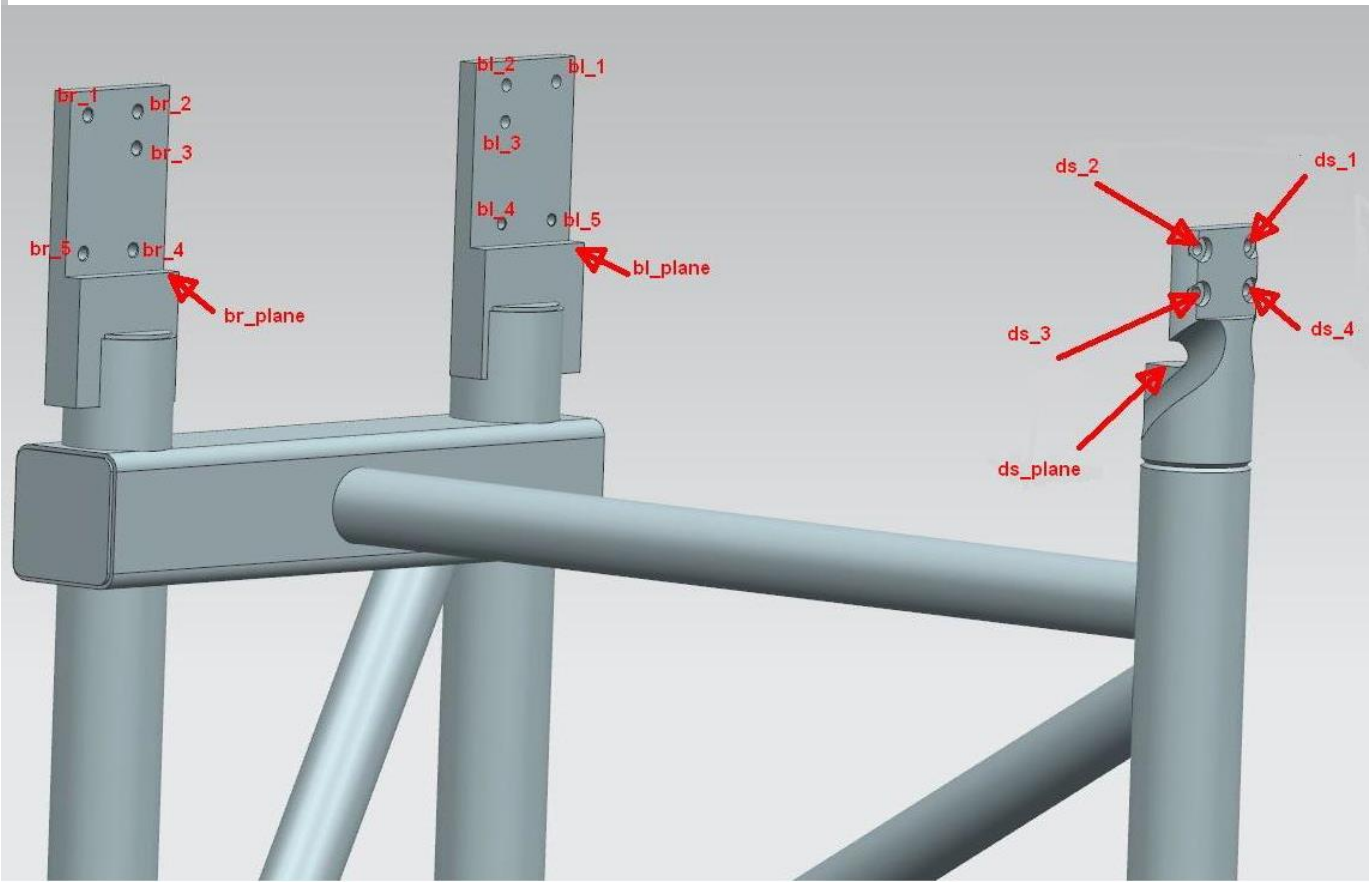
The distances between the bolts to the three support planes (dY) is explained below:

Distances from lower bolts to reference surface								
Bolt Loc.	bl_5	bl_4	br_4	br_5		ds_3	ds_4	
Cart	33.8	34	33.9	34.1		116.7	116.5	
Solenoid	32.6	32.3	32.3	32.8		117.2	117.2	
Shim	1.2	1.7	1.6	1.3	Cut	-0.5	-0.7	

The data above shows the amount of shim that is required on the plane underneath each of the referenced bolts. The downstream plane would need to be cut by approximately 0.6 mm. As discussed with Bob Miller, either some of the surface of the vacuum vessel could be ground off, or the downstream bolt holes radius could be increased.