

Fermilab

May 10, 1990

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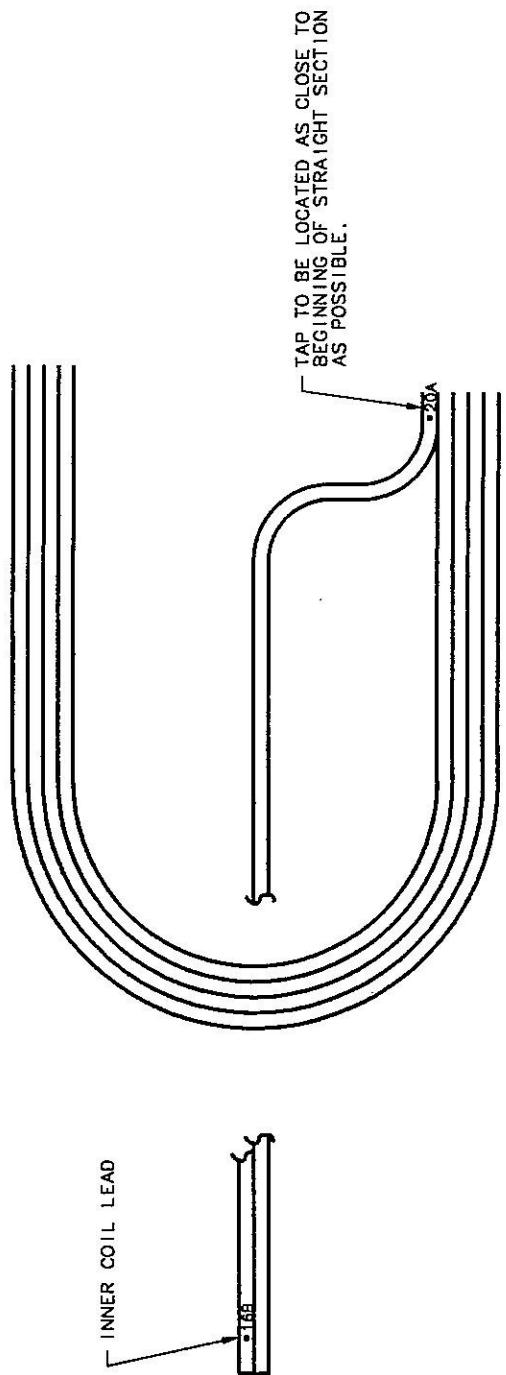
FROM: Jim Strait

SUBJECT: Locations of DS0308 Quenches

DS0308 is equipped with 55 voltage taps, mostly in the inner coil turns near the pole, as shown in Figures 1a and 1b. Table I is a summary of the quench data including quench locations as deduced from the voltage tap data. Initial voltage rises of the earliest three signals from selected quenches are displayed in Figures 2-6.

The one training quench (40 A below plateau) occurred in the lower inner pole turn on the side with the ramp splice. From the relative arrival times of the quench at the two ends, the quench velocity is estimated to be about 50 m/sec and the quench origin is about 25 cm from the lead end tap or about 40 cm from the end of the straight section. (See Figure 2.) All of the low ramp rate (≤ 25 A/sec) plateau quenches are on the other side of the lower inner pole turn. The inferred quench velocity is somewhat higher: 75 m/sec. The quench locations vary from about 0 to 15 cm from the lead end tap or about 15-30 cm from the end of the straight section. (See Figures 3 and 4.) The intermediate ramp rate quenches (50 and 75 A/sec) occur at the very end of the lead end segment between turns 16 and 15. (See Figure 5.) The lower quench velocity at the end is evident; the average quench velocity from the time of arrival at the two side taps is about 25 m/sec. The high ramp rate quenches (> 100 A/sec) all in the upper inner ramp splice. (See Figure 6.) If a quench velocity of 75 m/sec is assumed, then the quench origin is about 15 cm from the tap which is well into the segment of cable which is "pre-formed" and solder filled. It is presumably eddy current heating in the solder filled cable and not any mechanical weakness that causes the quenches in this location. It is not known why the intermediate ramp rate quenches are in a different location from those at high and low ramp rates.

REV:	DESCRIPTION	DEASN:	DR.
		APD:	
		GAT:	



- NOTE:
1. WIRE FROM TAP 20A SHOULD FOLLOW COIL LEAD AND THEN BE TWISTED IN A TRIPLET WITH WIRES FROM TAPS 16A AND 16B.
 2. COIL AS VIEWED FROM INSIDE.

ITEM	PART NO.	DESCRIPTION OR SIZE	QTY.
PARTS LIST			
UNLESS OTHERWISE SPECIFIED ORIGINATOR STRAIT/KOSKA			
XK	XXXX	NUMBER	DRAWN
+	-	REV.	CHECKED
1. BREAK ALL BUMPER SPRINGS 2. DO NOT SCALE DRAWINGS 3. DO NOT SCALE DRAWINGS 4. MATERIAL			
APPROVED USED ON ALL PARTS MATERIAL			
FERMILAB NATIONAL ACCELERATOR LABORATORY UNITED STATES DEPARTMENT OF ENERGY			
DSO308 VOLTAGE TAPS OUTER COIL			
NONE FILED DRAWING NUMBER			

Figure 1b

CREATED WITH 1-DEAS 4.1 USER NAME: SPUD
INCHES 0 1 2 3 4 5 6 METRIC 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

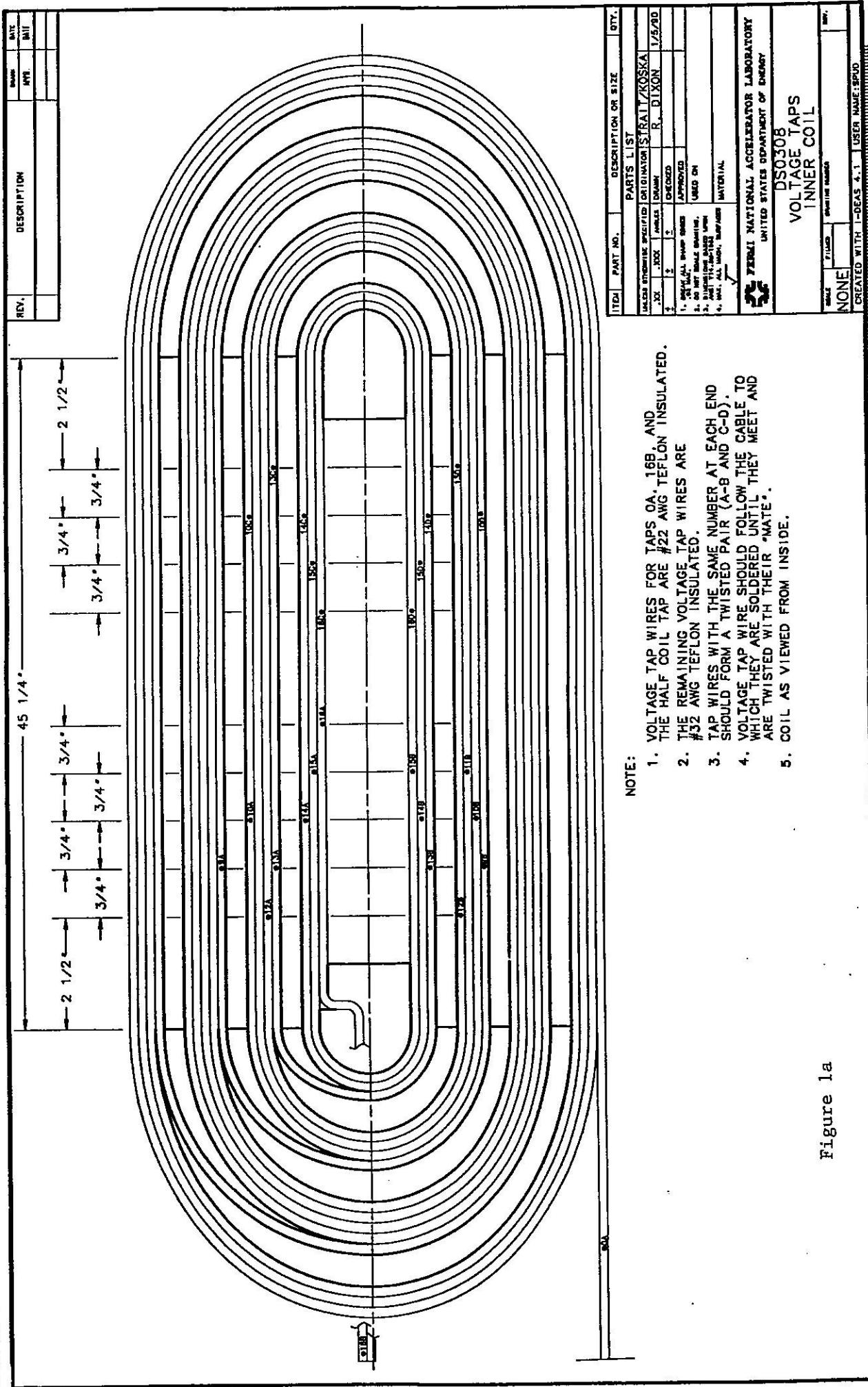


Table I
DS0308 Quench File Summary

Q#	File #	QDC	MIITS	t-Q	V-max	Col	t(H)	V(H)	T(m)	T(t)	P	LL	Location
1	1	0.0	0.000	-1.	LI	0.000	6.	4.19	4.18	4.16	741.	79.	
2	1	0.1	0.000	9.	LI	0.000	6.	4.19	4.16	4.16	741.	82.	
3	1	0.1	0.000	9.	LI	0.000	6.	4.19	4.15	4.16	740.	81.	
4	1	0.1	0.000	1.	LI	0.000	6.	4.19	4.15	4.14	740.	78.	
5	1	0.0	0.000	-1.	LI	0.000	6.	4.18	4.15	4.14	738.	81.	
6	1	0.0	0.000	-1.	LI	0.000	6.	4.20	4.17	4.16	744.	84.	
7	1	0.1	0.000	-6.	LI	0.000	6.	4.19	4.16	4.16	743.	83.	
8	1	0.1	0.000	-6.	LI	0.000	6.	4.19	4.16	4.15	744.	81.	
9	1	0.1	0.000	-6.	LI	0.000	6.	4.20	4.17	4.16	745.	81.	
10	1	0.1	0.000	-6.	LI	0.000	6.	4.20	4.17	4.16	744.	84.	
11	1	0.2	0.000	6.	LI	0.000	6.	4.20	4.17	4.16	749.	80.	
12	1	0.2	0.000	-26.	LI	0.000	6.	4.20	4.17	4.16	749.	80.	
13	1	0.3	0.000	4.8	LI	0.010	6.	4.21	4.18	4.16	797.	87.	IL16SL from tap 16A
14	1	0.3	0.000	4.8	LI	0.000	6.	4.21	4.18	4.16	797.	87.	IL16SR 2ms from tap 16B
15	1	0.3	0.000	4.8	LI	0.000	6.	4.20	4.16	4.16	747.	82.	IL16SR <1ms from tap 16B
16	1	0.3	0.000	4.8	LI	0.000	6.	4.20	4.17	4.17	748.	84.	IL16SR <1ms from tap 16B
17	1	0.3	0.000	4.8	LI	0.000	6.	4.20	4.17	4.16	747.	84.	IL16SR 2ms from tap 16B
18	1	0.3	0.000	4.8	LI	0.000	6.	4.20	4.17	4.16	750.	81.	IL16SR <1ms from tap 16B
19	1	0.3	0.000	4.8	LI	0.000	6.	4.20	4.17	4.16	750.	81.	IL16SR 1ms from tap 16B
20	1	0.3	0.000	4.8	LI	0.000	6.	4.21	4.18	4.17	753.	81.	IL16SR 2ms from tap 16B
21	1	0.3	0.000	4.7	LI	0.008	6.	4.21	4.18	4.17	753.	81.	IL16EF 4ms from taps 16A, 16B
22	1	0.3	0.000	4.7	LI	0.007	6.	4.21	4.18	4.17	753.	81.	IL16EF 4ms from taps 16A, 16B
23	1	0.3	0.000	4.8	LI	0.000	6.	4.20	4.17	4.16	752.	82.	IL16R SpI 2ms from tap 16A
24	1	0.3	0.000	4.8	LI	0.016	6.	4.21	4.18	4.17	752.	82.	IL16SR 2ms from tap 16B
25	1	0.3	0.000	4.9	LI	0.018	6.	4.21	4.18	4.17	752.	82.	IL16R SpI 2ms from tap 16A
26	1	0.3	0.000	4.8	LI	0.019	6.	4.21	4.18	4.17	752.	82.	IL16R SpI 2ms from tap 16A
27	1	0.3	0.000	4.9	LI	0.017	6.	4.21	4.18	4.17	752.	82.	IL16R SpI 2ms from tap 16A

Quench number or Spot heater number (e.g. 34 is spot heater 4)

Quench number or Spot heater number (e.g. #4 is Quench file number)
 Main coil current at quench
 Main coil dI/dt at quench
 Trim coil current at quench
 Trim coil dI/dt at quench
 Name of quench detection circuit which tripped:
 1) U-L Upper - Lower Coil
 2) V-dI Magnet - Idot
 3) SC SC Pwr | ands - Idot

#1-dot-dot-dot

(c) $\int_{t_0}^t \frac{dV}{dt} dt = V(t) - V(t_0)$
 Integral of $(I^2/2) dt$ from t_0 to "infinity"
 Time first voltage appears in V(upper) - V(lower) (relative to quench detection time)
 Maximum voltage across any quarter coil
 Corresponding to V_{max}
 Protection heater firing voltage; -999 if heater did not fire
 Temperature at top of magnet
 Temperature at middle of magnet
 Temperature at bottom of magnet
 Dewar pressure (Torr)
 Liquid level (%)
 Quench or snout heater location

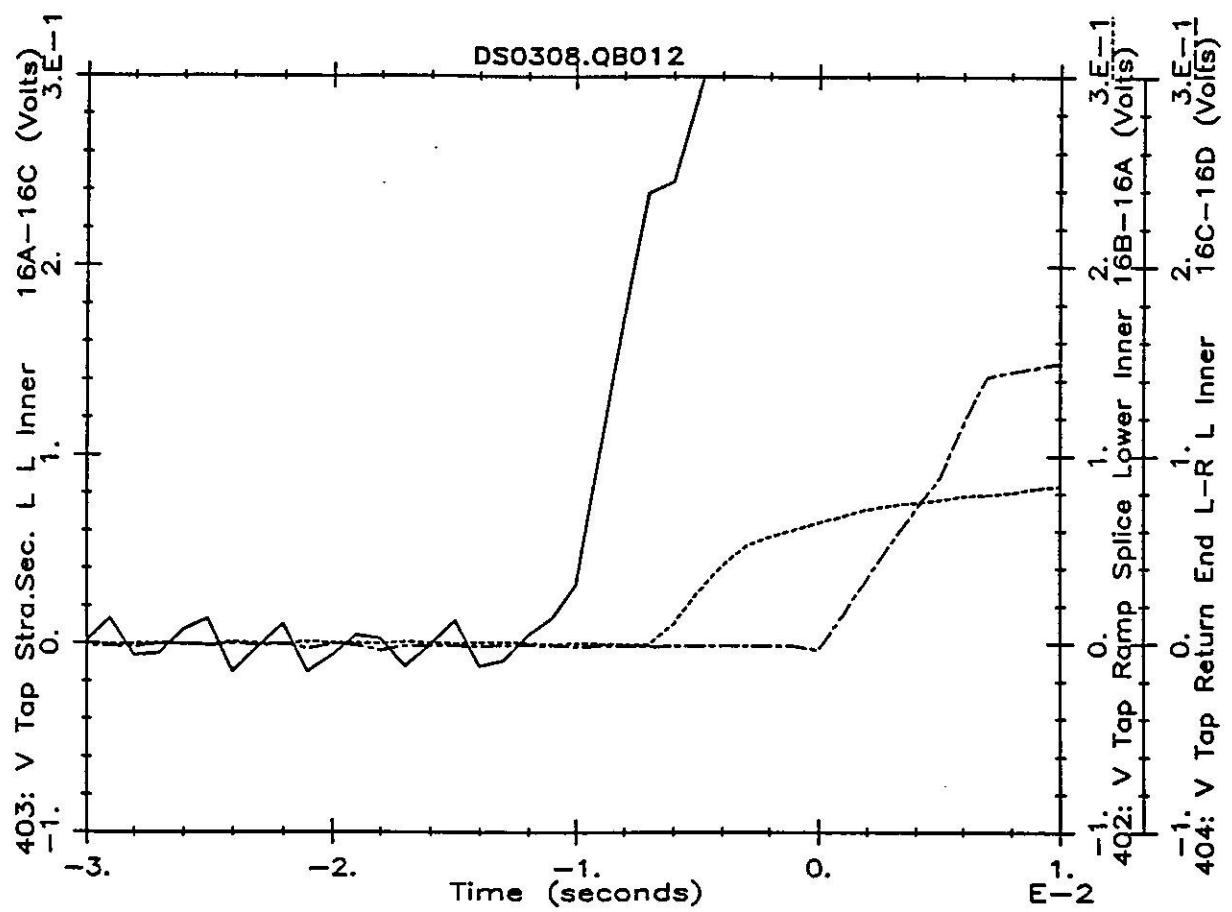


Figure 2

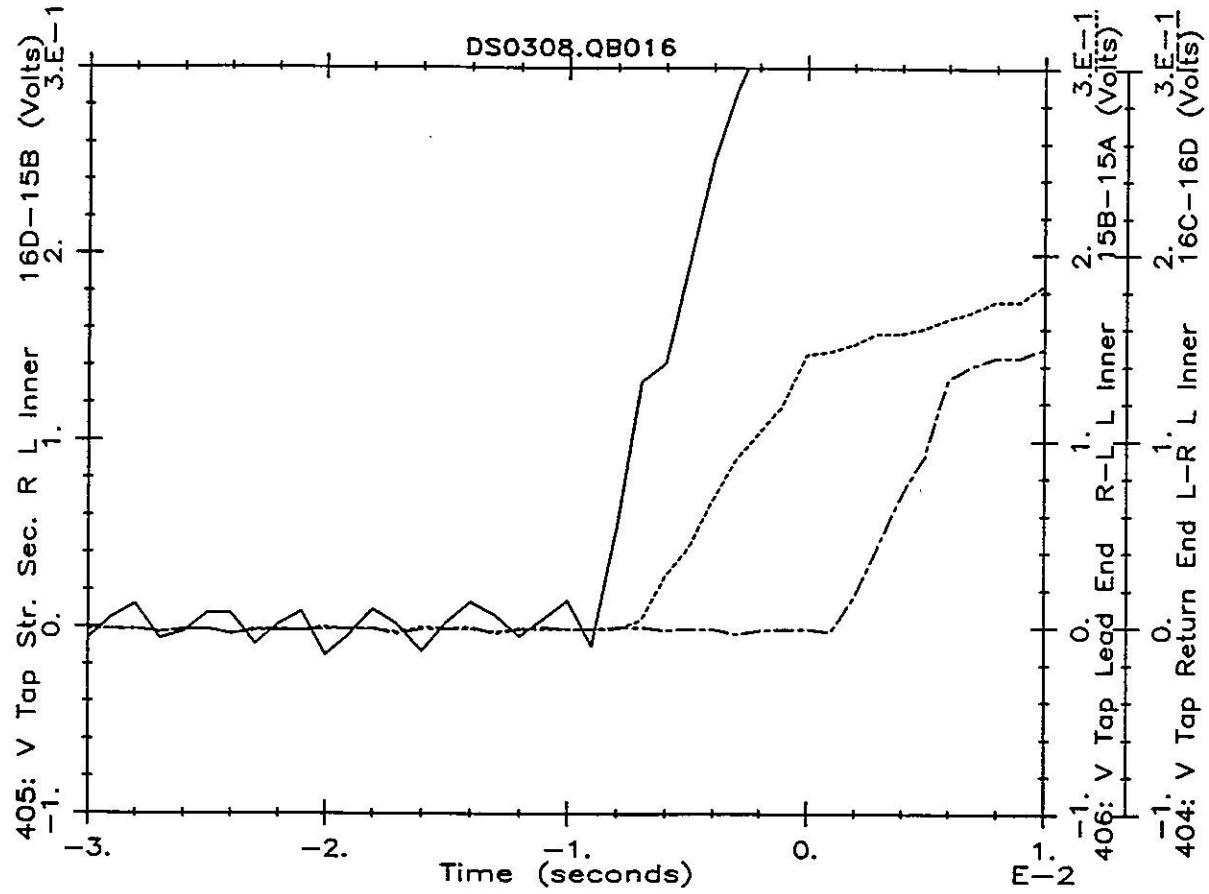


Figure 3

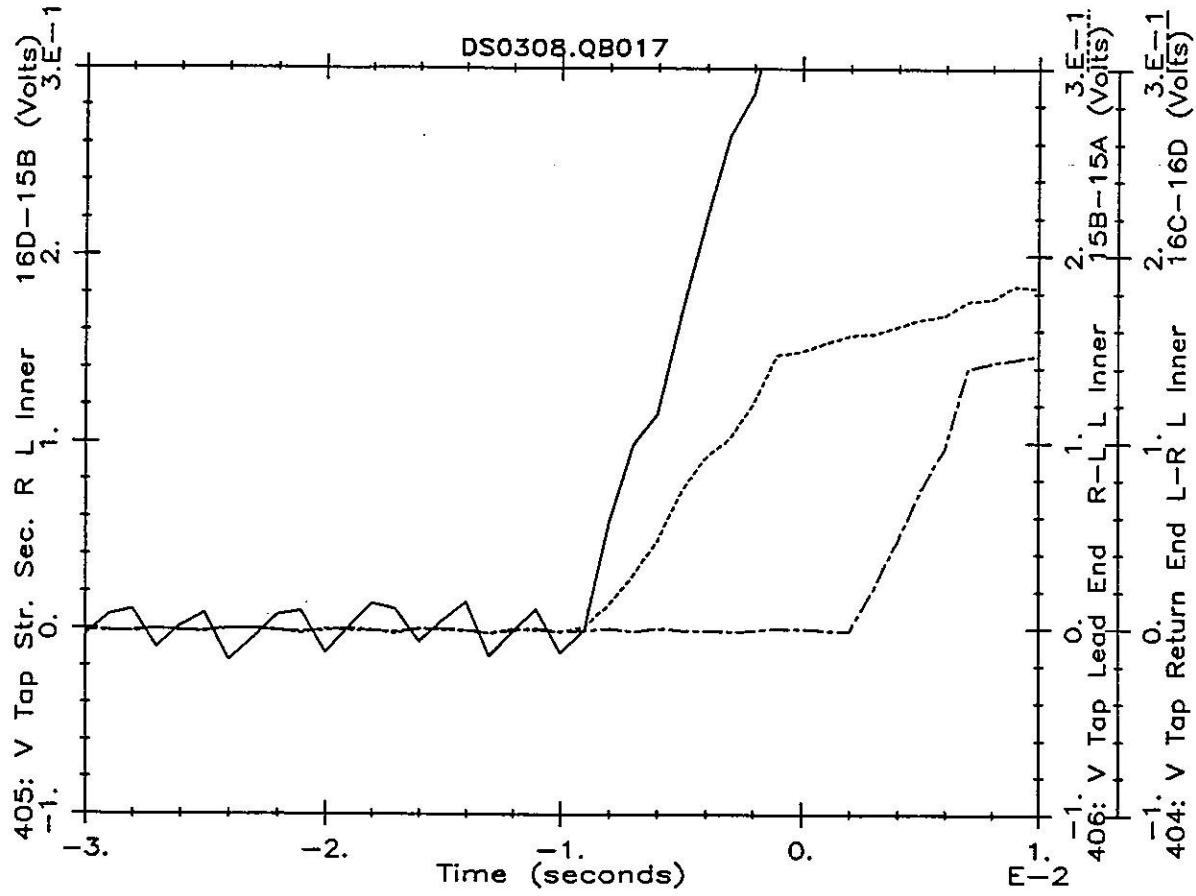


Figure 4

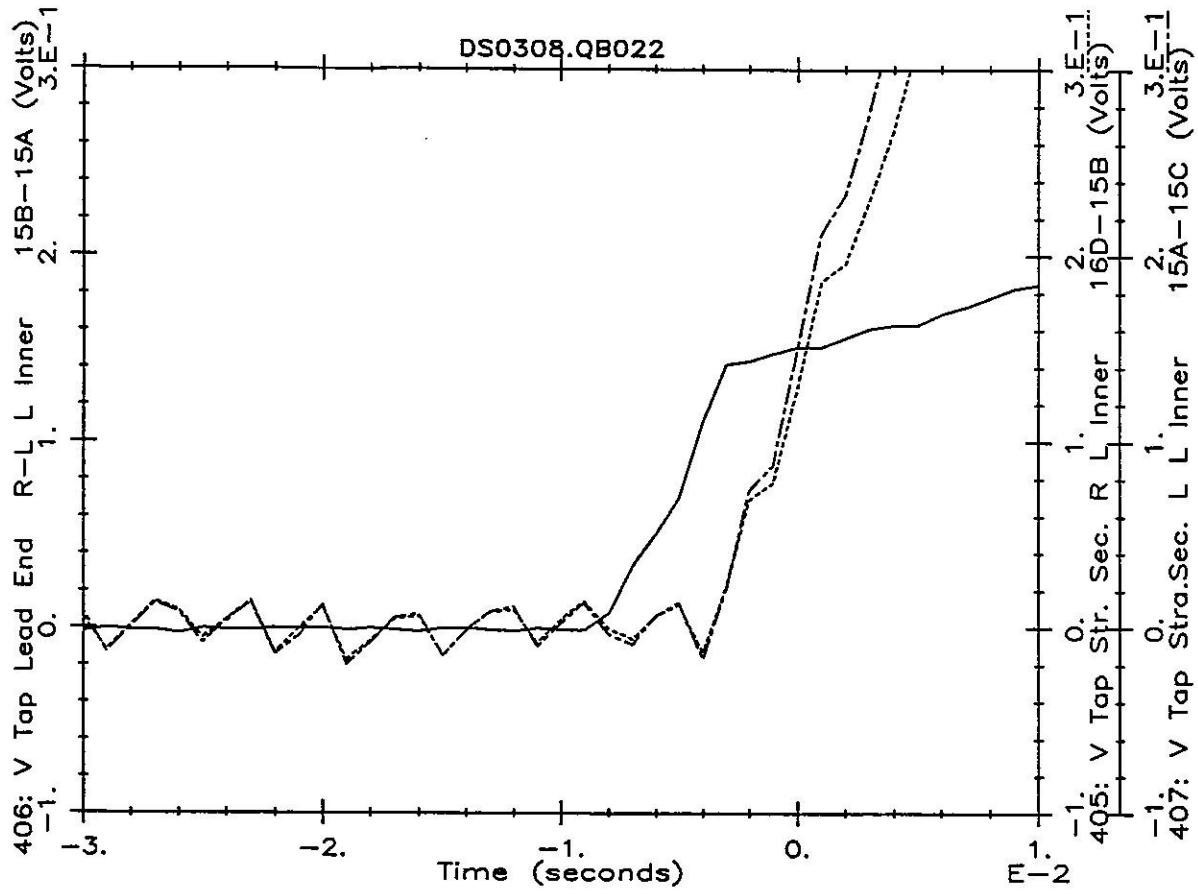


Figure 5

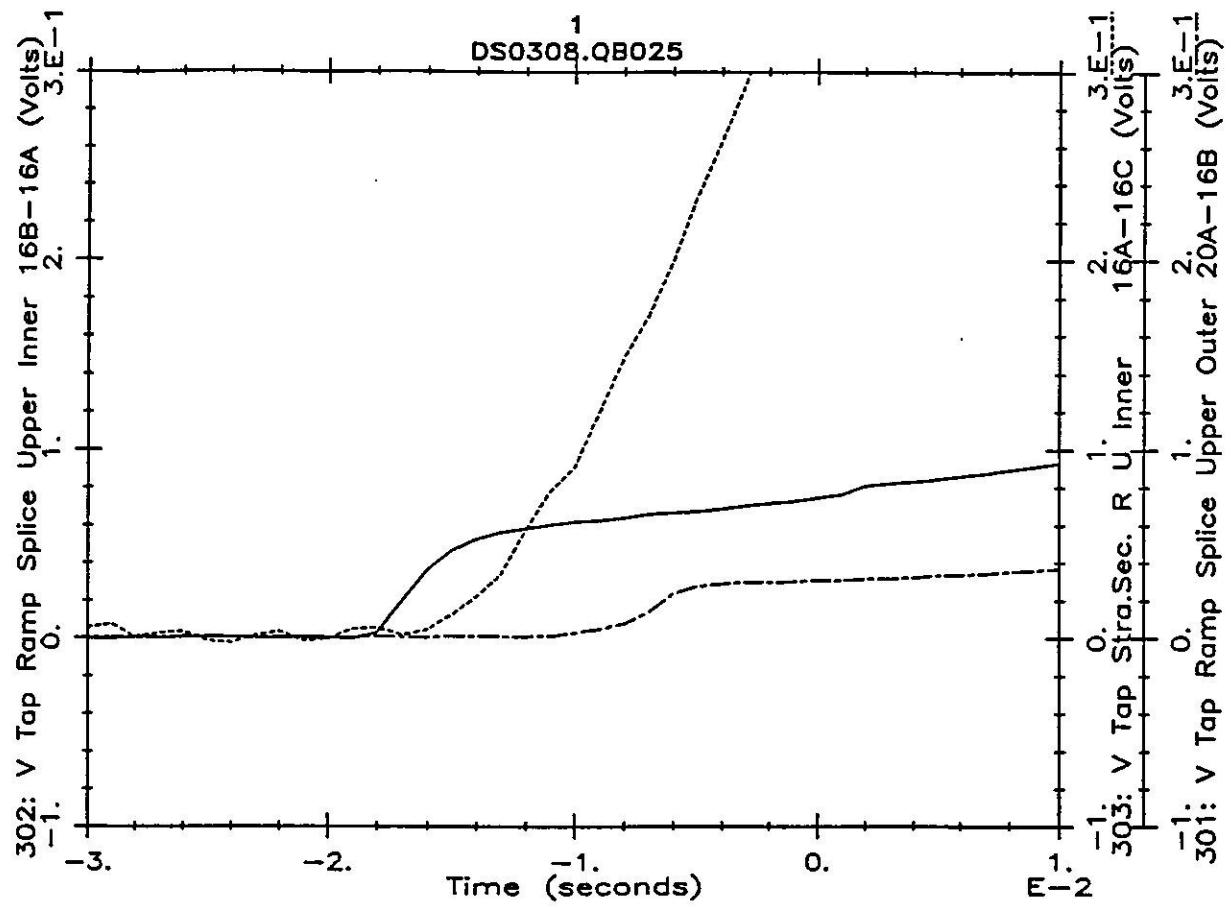


Figure 6