EA02-025

TEXAS INSTRUMENTS, INC.'S 9/10/03 ATTACHMENT

REQUEST NO. 7

BOX 8

PART A-U

PART D

PART NO. 4656-37

DATE 1-7-93

CLOCK NO. 62972

QTY. 2000

LOT NO. 3

REEL NO. 2

S.S. 301

MIC. SETTINGS

A. 29.0

R. 26.4

FREE DISC PRESSURES From 269

B. H. T.		4TH READING			
ACTUATION	RELEASE	ACTUATION	RELEASE	ACTUATION	RELEASE
		24.7	12.7	24.2	12.7
		24.4	11.9	24.6	12.3
		24.7	12.6	24.8	12.7
		24.2	12.3	24.7	12.7
		23.9	12.4	24.2	13.2

MAT'L I.D. NO. 28175- B-B-1-5

24.44 / 12.55
±0.302 / .347

FORM 2113

TI-NHTSA 011458

K A N - B A N

PILOT ROUTE CARD — **77PSL2-1** — 48515-2 BROWN BASE

PASS CAR

PRESSURE TEST LIMITS

ACT HI 180 CRIMP TIME 10 MS

ACT LO 90 PRE-CYCLE PRESS. 600 PSI

MIN DEL 20

COMPONENTS

27400-1 CONVERTER LOT#: 191

27600-1 WASHER LOT#: 214-1cut

27713-1 CUP LOT#: mixed Lot

30060-27 DISC LOT #: 558

DISC LOT DATE: [illegible]-7-8-93

DISC ACT. 2149 DISC REL. 1255

CUSTOMER PART #: F2VC-9F924-AB ~~909.38~~ 32175

OPERATION	DATE	TIME	CLOCK #	SHIFT	QTY GOOD	QTY BAD
ASSEMBLE SENSOR	5-5	8:00	722082	2	24	[stamp: ACCEPT]
ASSEMBLE BASE	"	9:05	"	"	24	
FINAL ASSEMBLY	"	9:45	"	"	24	
PRESSURE TEST	5-5	11:10	20629	2	24	
Q.C. CYCLE						

FORM 20011

TI-NHTSA 011457

DEVICE: 77P8L2-1

05-05-03 23:35

ACTUATION YIELD ----) 99.9 %
BAD HIGH 0 %
BAD LOW 0 %
RELEASE YIELD -----) 99.9 %
BAD HIGH 0 %
BAD LOW 0 %
DIFFERN'L YIELD ----) 100 %
OVERALL LOT YIELD --) 99.9 %
STAT. PROJ. YIELD --) 99.88884

ACTUAL FINAL X(ACT) =	136.8
ACTUATION SIGMA =	5.31
ACTUAL FINAL X(REL) =	85.9
RELEASE SIGMA =	4.1
ACTUAL DIFFERENTIAL =	74.9
DIFFERN'L SIGMA =	5.42
ACTUATION + 3SIGMA =	146.73
ACTUATION - 3SIGMA =	114.87
RELEASE + 3SIGMA =	68.2
RELEASE - 3SIGMA =	43.6
DIFFERN'L - 3SIGMA =	58.64

5-MAY-1993 23:06:13.47 FINAL CYCLE TIMEOUT 1

SER 9; FIX 1; C= 0000000; MIN=0000 ; MRRU=45.7; MRRD=29.3; LEAK RATE= 1.5
ACT= 140.3; REL= 61.6; DIF= 78.7 PSI; ACTOR= 0.0ms; RELOR= 0.3

SER 10; FIX 2; C= 0000000; MIN=0000 ; MRRU=45.7; MRRD=29.3; LEAK RATE= 1.5
ACT= 134.2; REL= 59.7; DIF= 74.6 PSI; ACTOR= 0.0ms; RELOR= 0.5

SER 11; FIX 3; C= 0000000; MIN=0000 ; MRRU=45.7; MRRD=29.3; LEAK RATE= 1.5
ACT= 132.5; REL= 62.4; DIF= 70.1 PSI; ACTOR= 0.0ms; RELOR= 0.0

SER 12; FIX 4; C= 0000000; MIN=0000 ; MRRU=45.7; MRRD=29.3; LEAK RATE= 1.5
ACT= 126.6; REL= 61.7; DIF= 64.9 PSI; ACTOR= 0.0ms; RELOR= 0.5

5-MAY-1993 23:06:28.04 OPEN DOOR DID NOT CLOSE 1

SER 13; FIX 1; C= 0000000; MIN=0000 ; MRRU=46.0; MRRD=28.9; LEAK RATE= 1.4
ACT= 131.9; REL= 60.8; DIF= 71.1 PSI; ACTOR= 0.0ms; RELOR= 0.2

SER 14; FIX 2; C= 0000000; MIN=0000 ; MRRU=46.0; MRRD=28.9; LEAK RATE= 1.4
ACT= 123.9; REL= 57.0; DIF= 66.9 PSI; ACTOR= 0.0ms; RELOR= 0.5

SER 15; FIX 3; C= 0000000; MIN=0000 ; MRRU=46.0; MRRD=28.9; LEAK RATE= 1.4
ACT= 134.2; REL= 56.6; DIF= 77.7 PSI; ACTOR= 0.0ms; RELOR= 0.5

SER 16; FIX 4; C= 0000000; MIN=0000 ; MRRU=46.0; MRRD=28.9; LEAK RATE= 1.4
ACT= 126.0; REL= 53.7; DIF= 72.9 PSI; ACTOR= 0.0ms; RELOR= 0.3

SER 17; FIX 1; C= 0000000; MIN=0000 ; MRRU=45.8; MRRD=29.2; LEAK RATE= 1.7
ACT= 130.9; REL= 53.5; DIF= 77.4 PSI; ACTOR= 0.0ms; RELOR= 0.5

SER 18; FIX 2; C= 0000000; MIN=0000 ; MRRU=45.8; MRRD=29.2; LEAK RATE= 1.7
ACT= 135.6; REL= 54.2; DIF= 81.5 PSI; ACTOR= 0.0ms; RELOR= 0.8

SER 19; FIX 3; C= 0000000; MIN=0000 ; MRRU=45.8; MRRD=29.2; LEAK RATE= 1.7
ACT= 131.5; REL= 53.4; DIF= 78.1 PSI; ACTOR= 0.0ms; RELOR= 0.5

SER 20; FIX 4; C= 0000000; MIN=0000 ; MRRU=45.8; MRRD=29.2; LEAK RATE= 1.7
ACT= 133.9; REL= 51.5; DIF= 82.4 PSI; ACTOR= 0.0ms; RELOR= 0.5

SER 21; FIX 1; C= 0000000; MIN=0000 ; MRRU=46.2; MRRD=29.9; LEAK RATE= 1.6
ACT= 129.8; REL= 55.7; DIF= 74.1 PSI; ACTOR= 0.0ms; RELOR= 0.3

SER 22; FIX 2; C= 0000000; MIN=0000 ; MRRU=46.2; MRRD=29.9; LEAK RATE= 1.6
ACT= 136.2; REL= 49.4; DIF= 86.8 PSI; ACTOR= 1.0ms; RELOR= 0.8

SER 23; FIX 3; C= 0000000; MIN=0000 ; MRRU=46.2; MRRD=29.9; LEAK RATE= 1.6
ACT= 122.6; REL= 52.6; DIF= 70.0 PSI; ACTOR= 0.0ms; RELOR= 0.5

SER 24; FIX 4; C= 0000000; MIN=0000 ; MRRU=46.2; MRRD=29.9; LEAK RATE= 1.6
ACT= 121.6; REL= 46.5; DIF= 75.0 PSI; ACTOR= 0.0ms; RELOR= 0.8

5-MAY-1993 23:07:52.05 OPEN DOOR DID NOT CLOSE 1

5-MAY-1993 23:08:10.39 TEST STATION ZERO PRES CONT 1

SER 26; FIX 2; C= 0200005; BIN=ZPLF ; MMAX= 0.0; MMIN= 0.0; LEAK RATE= 0.0
ACT= 0.0; REL= 0.0; DIF= 0.0 PSI; ACTCR= 0.0ms; RELCR= 0.0

SER 27; FIX 3; C= 0200005; BIN=ZPLF ; MMAX= 0.0; MMIN= 0.0; LEAK RATE= 0.0
ACT= 0.0; REL= 0.0; DIF= 0.0 PSI; ACTCR= 0.0ms; RELCR= 0.0

SER 28; FIX 4; C= 0200005; BIN=ZPLF ; MMAX= 0.0; MMIN= 0.0; LEAK RATE= 0.0
ACT= 0.0; REL= 0.0; DIF= 0.0 PSI; ACTCR= 0.0ms; RELCR= 0.0

5-MAY-1993 23:08:34.63 OPER DOOR DID NOT CLOSE 1

5-MAY-1993 23:08:53.54 TEST STATION ZERO PRES CONT 1

SER 29; FIX 1; C= 0200005; BIN=ZPLF ; MMAX= 0.0; MMIN= 0.0; LEAK RATE= 0.0
ACT= 0.0; REL= 0.0; DIF= 0.0 PSI; ACTCR= 0.0ms; RELCR= 0.0

SER 30; FIX 2; C= 0200005; BIN=ZPLF ; MMAX= 0.0; MMIN= 0.0; LEAK RATE= 0.0
ACT= 0.0; REL= 0.0; DIF= 0.0 PSI; ACTCR= 0.0ms; RELCR= 0.0

SER 31; FIX 3; C= 0200005; BIN=ZPLF ; MMAX= 0.0; MMIN= 0.0; LEAK RATE= 0.0
ACT= 0.0; REL= 0.0; DIF= 0.0 PSI; ACTCR= 0.0ms; RELCR= 0.0

SER 32; FIX 4; C= 0200005; BIN=ZPLF ; MMAX= 0.0; MMIN= 0.0; LEAK RATE= 0.0
ACT= 0.0; REL= 0.0; DIF= 0.0 PSI; ACTCR= 0.0ms; RELCR= 0.0

5-MAY-1993 23:09:11.42 OPER DOOR DID NOT OPEN 1

7748 PRESSURE TESTER LOT REPORT

PATTERN:77PBL2-1
LOT ID:558-PILOT
LOT STARTED: 5-MAY-1993 23:01:50.55
LOT FINISHED: 5-MAY-1993 23:10:14.14

SETUP DATA:
DISC LOT ID: 0.00
DISC MEAN ACT: 24.4 MEAN REL: 12.4
LIMIT (NC)
ACTUATION: 90.0 TO 160.0 PSI
RELEASE: 20.0 TO 120.0 PSI
DIFFERENTIAL: 0.0 TO 160.0 PSI
MAX MILLIVOLT: 200.0 mv
ACT CREEP TIME: 25.0 PSI
REL CREEP TIME: 150.0 PSI
MAX CREEP TEST.
PRECYCLE PRESS: 800.0 PSI
PRECYCLE COUNT: 2

NUMBER OF PIECES TESTED: 32
NUMBER OF PIECES GOOD: 24
YIELD: 75.00 %

REJECT COUNTS

BIN	COUNT	% OF REJECTS
LEAK	0	0.00 %
CONT	0	0.00 %
ACCK	0	0.00 %
ACLO	0	0.00 %
ACHI	0	0.00 %
RLHI	0	0.00 %
RLLO	0	0.00 %
DFLO	0	0.00 %
RLCR	0	0.00 %
[illegible]	[illegible]	[illegible]

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STATISTICS	MEAN	SIGMA	CPK
ACTUATION:	130.8	5.51	1.83
RELEASE:	55.9	4.10	2.92
MILLIVOLTS:	0.0	0.00	0.00
DIFFERENTIAL:	74.9	5.42	4.61

HISTOGRAM OF ACTUATION PRESSURE

```
                5   10   15   20   25   30   35   40   45   50
               ----+----+----+----+----+----+----+----+----+----+
UNDER    0|
122.5    3|***
125.0    2|**
127.5    2|**
130.0    5|*****
132.5    4|****
135.0    6|******
137.5    1|*
140.0    2|**
OVER     0|
```

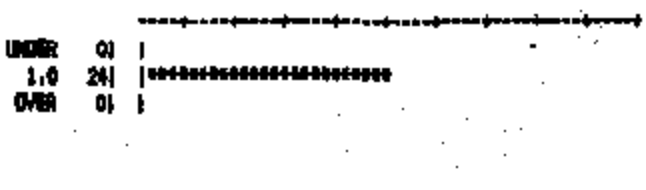
HISTOGRAM OF RELEASE PRESSURE

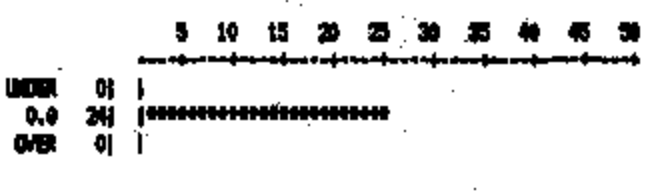
```
                5   10   15   20   25   30   35   40   45   50
               ----+----+----+----+----+----+----+----+----+----+
UNDER    0|
45.0     1|*
50.0     2|**
55.0    14|**************
60.0     7|*******
OVER     0|
```

HISTOGRAM OF DIFFERENTIAL PRESSURE

```
                5   10   15   20   25   30   35   40   45   50
               ----+----+----+----+----+----+----+----+----+----+
UNDER    0|
65.0     2|**
70.0     5|*****
75.0     6|******
80.0     8|********
85.0     1|*
OVER     0|
```

HISTOGRAM OF ACTUATION CREEP


UNDER 0
1.0 24
OVER 0


5 10 15 20 25 30 35 40 45 50
UNDER 0
0.0 24
OVER 0

[illegible] 1; FIX 1; C= 0000000; BIN=8000 ; MAX=46.1; MAX=28.0; LEAK RATE= 1.8
ACT= 125.4; REL= 55.4; DIF= 70.1 PSI; ACTOR= 0.8ms; RELOR= 0.3

[illegible] 2; FIX 2; C= 0000000; BIN=8000 ; MAX=46.1; MAX=28.0; LEAK RATE= 1.8
ACT= 140.6; REL= [illegible]; DIF= [illegible] PSI; ACTOR= [illegible]; RELOR= [illegible]

BER 3; FIX 3; C= 0000000; BIN=8000 ; MAX=46.1; MAX=28.0; LEAK RATE= 1.8
[illegible] 4; FIX 4; C= 0000000; BIN=8000 ; MAX=46.1; MAX=28.0; LEAK RATE= 1.8
ACT= 132.1; REL= 53.1; DIF= 79.0 PSI; ACTOR= 0.8ms; RELOR= 0.2

5-MAY-1993 23:02:11.33 UPER DOOR DID NOT CLOSE !

BER 5; FIX 1; C= 0000000; BIN=8000 ; MAX=46.0; MAX=28.0; LEAK RATE= 1.4
ACT= 130.1; REL= 56.0; DIF= 73.3 PSI; ACTOR= 0.8ms; RELOR= 0.2

BER 6; FIX 2; C= 0000000; BIN=8000 ; MAX=46.0; MAX=28.0; LEAK RATE= 1.4
ACT= 125.4; REL= 57.7; DIF= 67.7 PSI; ACTOR= 0.8ms; RELOR= 0.8

BER 7; FIX 3; C= 0000000; BIN=8000 ; MAX=46.0; MAX=28.0; LEAK RATE= 1.4
ACT= 128.8; REL= 54.1; DIF= 74.8 PSI; ACTOR= 0.8ms; RELOR= 0.2

BER 8; FIX 4; C= 0000000; BIN=8000 ; MAX=46.0; MAX=28.0; LEAK RATE= 1.4
ACT= 126.8; REL= 56.0; DIF= 80.8 PSI; ACTOR= 1.0ms; RELOR= 0.3

5-MAY-1993 23:02:35.34 UPER DOOR DID NOT CLOSE !

5-MAY-1993 23:02:55.34 UPER DOOR STILL DID NOT CLOSE !

(8) 120 - 50
(9) 120 - 50
(8) 135 - 45
(9) 135 - 45

(7) 115 - 50
(7) 120 - 50
(8) 125 - 45
(8) 130 - 50

TPMS PRESSURE TESTER LOT REPORT

RATING: 77PML2-1 Sample
LOT ID: 358
LOT STARTED: 19-MAY-1993 18:16:02.37
LOT FINISHED: 19-MAY-1993 18:28:21.44

SETUP DATA:
DISC LOT SIZ: 0.00
DISC MEAN ACT: 24.4 MEAN REL: 12.4
LIMIT (PSI)
ACTIVATION: 90.0 TO 160.0 PSI
RELEASE: 20.0 TO 120.0 PSI
DIFFERENTIAL: 0.0 TO 150.0 PSI
MAX MILLIVOLTS: 200.0 mv
ACT CREEP TIME: 25.0 PSI
REL CREEP TIME: 150.0 PSI
MAX CREEP TEST
PRECYCLE PRESS: 900.0 PSI
PRECYCLE COUNT: 2

NUMBER OF PIECES TESTED: 50
NUMBER OF PIECES BAD: 50
YIELD: 96.15 %

REJECT COUNTS
[illegible] COUNT % OF REJECTS
[illegible] 0 0.00 %
[illegible] 0 0.00 %
[illegible] 0 0.00 %
[illegible] 0 0.00 %
[illegible] 0 0.00 %
[illegible] 0 0.00 %
[illegible] 0 0.00 %
[illegible] 0 0.00 %
[illegible] 0 0.00 %
[illegible] 0 0.00 %

[illegible] 0.0% 2+

RELEASE:	62.8	5.75	2.40
MILLIVOLTS:	0.0	0.00	0.00
DIFFERENTIAL:	82.4	5.68	4.07

HISTOGRAM OF ACTUATION PRESSURE

		5 10 15 20 25 30 35 40 45 50
UNDER	0	|
135.0	4	|****
137.5	1	|*
140.0	2	|**
142.5	7	|*******
145.0	8	|********
147.5	18	|******************
150.0	6	|******
152.5	3	|***
155.0	3	|***
OVER	0	|

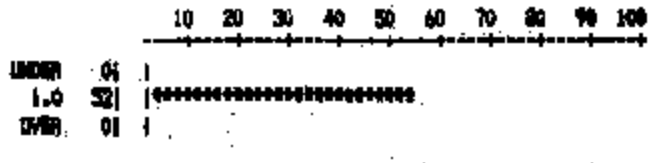
HISTOGRAM OF RELEASE PRESSURE

		5 10 15 20 25 30 35 40 45 50
UNDER	0	|
50.0	2	|**
55.0	7	|*******
60.0	14	|**************
65.0	17	|*****************
70.0	10	|**********
75.0	1	|*
80.0	1	|*
OVER	0	|

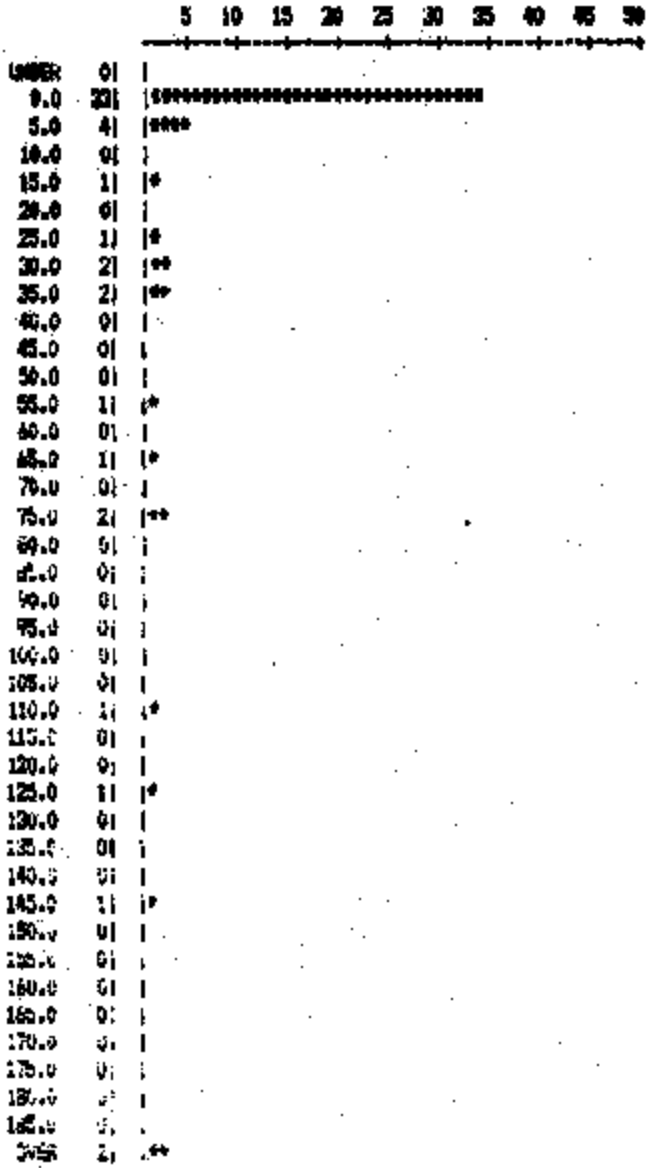
HISTOGRAM OF DIFFERENTIAL PRESSURE

		5 10 15 20 25 30 35 40 45 50
UNDER	0	|
75.0	2	|**
77.5	4	|****
80.0	17	|*****************
82.5	14	|**************
85.0	10	|**********
87.5	3	|***
OVER	0	|

HISTOGRAM OF ACTUATION TIME



HISTOGRAM OF RELEASE SPEED



TYPE PRESSURE TESTER LOT REPORT

PARTNO:77PRL2-1
LOT ID:558
LOT STARTED:10-MAY-1993 21:57:44.64
LOT FINISHED:10-MAY-1993 23:56:02.41

SETUP DATA:
DISC LOT ID: 0.00
DISC MEAN ACT: 24.4 MEAN REL: 12.6
LIMIT (NC)
ACTUATION: 90.0 TO 160.0 PSI
RELEASE: 20.0 TO 120.0 PSI
DIFFERENTIAL: 0.0 TO 100.0 PSI
MIN MILLIVOLTS: 200.0 mv
ACT CREEP TIME: 25.0 PSI
REL CREEP TIME: 100.0 PSI
MAX CREEP TEST
PRECYCLE PRESS: 900.0 PSI
PRECYCLE COUNT: 2

NUMBER OF PIECES TESTED: 439
NUMBER OF PIECES GOOD: 381
YIELD: 86.71 %

REJECT COUNTS

BIN	COUNT	% OF REJECTS
LEAK	0	0.00 %
CANT	5	7.69 %
ACTH	1	2.56 %
ACTL	0	0.00 %
RELH	2	5.13 %
RELL	0	0.00 %
MILH	0	0.00 %
DIFF	0	0.00 %
MILL	29	74.36 %
OPEN	0	0.00 %

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RELEASE:	55.0	7.[illegible]3	1.[illegible]1
MILLIVOLT:	0.0	0.00	0.00
DIFFERENTIAL:	89.5	6.31	3.71

HISTOGRAM OF ACTUATION PRESSURE

Scale: 10 20 30 40 50 60 70 80 90 100

UNDER	0
117.5	2
120.0	0
122.5	0
125.0	0
127.5	1
130.0	6
132.5	7
135.0	17
137.5	43
140.0	51
142.5	67
145.0	60
147.5	48
150.0	47
152.5	34
155.0	16
157.5	7
160.0	4
162.5	0
165.0	1
OVER	0

HISTOGRAM OF RELEASE PRESSURE

Scale: 15 30 45 60 75 90 105 120 135 150

UNDER	0
35.0	1
40.0	1
45.0	34
50.0	124
55.0	126
60.0	86
65.0	23
70.0	11
75.0	5
80.0	1
85.0	0
90.0	0
95.0	0
100.0	0
105.0	0
110.0	0
115.0	0
120.0	0
125.0	[illegible]
[illegible]	[illegible]

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HISTOGRAM OF DIFFERENTIAL PRESSURE

```
                 20   40   60   80  100  120  140  160  180  200
               --+----+----+----+----+----+----+----+----+----+
UNDER     0|   |
 30.0     1|   |
 35.0     0|   |
 40.0     0|   |
 45.0     0|   |
 50.0     0|   |
 55.0     0|   |
 60.0     0|   |
 65.0     1|   |
 70.0     3|   |*
 75.0     6|   |**
 80.0    28|   |*******
 85.0    89|   |**********************
 90.0   154|   |***************************************
 95.0   106|   |***************************
100.0    24|   |******
105.0     1|   |
 OVER     0|   |
```

HISTOGRAM OF ACTUATION [illegible]

```
                 45   90  135  180  225  270  315  360  405  450
               --+----+----+----+----+----+----+----+----+----+
UNDER     0|   |
  1.0   412|   |**********************************************
  2.0     0|   |
  3.0     0|   |
  4.0     0|   |
  5.0     0|   |
  6.0     0|   |
  7.0     0|   |
  8.0     0|   |
  9.0     0|   |
 10.0     0|   |
 11.0     0|   |
 12.0     0|   |
 13.0     0|   |
 14.0     0|   |
 15.0     0|   |
 16.0     0|   |
 17.0     0|   |
 18.0     0|   |
 19.0     0|   |
 20.0     0|   |
 21.0     0|   |
 22.0     0|   |
 23.0     0|   |
 24.0     0|   |
 25.0     0|   |
 26.0     0|   |
```

28.0	0	
29.0	0	
30.0	0	
31.0	0	
32.0	0	
33.0	0	
34.0	0	
35.0	0	
OVER	1	

DURATION OF RELEASE CREEP

		30 60 90 120 150 180 210 240 270 300
UNDER	0	
0.0	297	**********
5.0	38	***
10.0	17	***
15.0	6	*
20.0	4	*
25.0	2	
30.0	6	*
35.0	4	*
40.0	5	*
45.0	1	
50.0	1	
55.0	3	*
60.0	0	
65.0	1	
70.0	4	*
75.0	2	
80.0	0	
85.0	3	*
90.0	1	
95.0	0	
100.0	0	
105.0	0	
110.0	1	
115.0	1	
120.0	1	
125.0	0	
130.0	1	
135.0	0	
140.0	0	
145.0	2	
150.0	0	
155.0	1	
160.0	2	
165.0	1	
170.0	0	
175.0	2	
180.0	0	
185.0	1	
OVER	23	****

7700 PRESSURE TESTER LOT REPORT

PATCH:7700L2-1
LOT ID:500
LOT STARTED:11-MAY-1993 07:14:00.54
LOT FINISHED:11-MAY-1993 11:00:16.76

SETUP DATA:
DISC LOT ID: 500.00
DISC MEAN ACT: 26.4 MEAN REL: 12.6
LIMIT (HC)
ACTUATION: 90.0 TO 140.0 PSI
RELEASE: 20.0 TO 120.0 PSI
DIFFERENTIAL: 0.0 TO 140.0 PSI
MAX MILLIVOLT: 200.0 mv
ACT CREEP TIME: 25.0 PSI
REL CREEP TIME: 150.0 PSI
MAX CRAMP TEST
PRECYCLE PRESS: 800.0 PSI
PRECYCLE COUNT: 2

NUMBER OF PIECES TESTED: 1421
NUMBER OF PIECES GOOD: 1274
YIELD: 89.24 %

REJECT COUNTS

BIN	COUNT	% OF REJECTS
LEAK	4	2.38 %
CONT	3	1.79 %
ACCR	1	0.60 %
RCLO	1	0.60 %
ACHI	14	8.33 %
RLHI	0	0.00 %
RLLO	0	0.00 %
DFLO	0	0.00 %
RLCH	147	87.50 %
LFHI	0	0.00 %

STATISTICS

	MEAN	SIGMA	CPK
ACTUATION:	146.4	6.85	0.66
RELEASE:	58.0	6.94	1.83
MILLIVOLT:	0.0	0.00	0.00
DIFFERENTIAL:	88.4	6.20	3.85

HISTOGRAM OF ACTUATION PRESSURE

25 50 75 100 125 150 175 200 225 250

Under 87.5 11
60.0 1

TI-NHTSA 011472

```
  92.5    1|  |
  95.0    0|  |
  97.5    0|  |
 100.0    0|  |
 102.5    0|  |
 105.0    0|  |
 107.5    0|  |
 110.0    0|  |
 112.5    0|  |
 115.0    1|  |
 117.5    0|  |
 120.0    1|  |
 122.5    0|  |
 125.0    1|  |
 127.5    3|  |*
 130.0    8|  |**
 132.5   21|  |****
 135.0   47|  |**********
 137.5   85|  |*****************
 140.0  110|  |**********************
 142.5  167|  |**********************************
 145.0  170|  |**********************************
 147.5  235|  |***********************************************
 150.0  234|  |***********************************************
 152.5  177|  |************************************
 155.0   83|  |*****************
 157.5   42|  |*********
 160.0   19|  |****
 162.5    5|  |*
 165.0    1|  |
  OVER    0|  |
```

HISTOGRAM OF RELEASE PRESSURE

```
               45   90  135  180  225  270  315  360  405  450
           ----+----+----+----+----+----+----+----+----+----+
 UNDER    0|  |
  30.0    1|  |
  35.0    0|  |
  40.0    1|  |
  45.0   50|  |**********
  50.0  265|  |*****************************************************
  55.0  404|  |*********************************************************************************
  60.0  359|  |************************************************************************
  65.0  217|  |********************************************
  70.0   80|  |****************
  75.0   26|  |******
  80.0   14|  |***
  85.0    2|  |
  OVER    0|  |
```

HISTOGRAM OF DIFFERENTIAL PRESSURE

```
   55  110  165  220  275  330  385  440  495  550
---------------------------------------------------
```

TI-NHTSA 011473

```
 25.0     1|  |
 30.0     0|  |
 35.0     0|  |
 40.0     0|  |
 45.0     2|  |
 50.0     0|  |
 55.0     2|  |
 60.0     0|  |
 65.0     5|  |
 70.0     8|  |*
 75.0    48|  |****
 80.0   126|  |***********
 85.0   350|  |******************************
 90.0   532|  |**********************************************
 95.0   306|  |***************************
100.0    38|  |***
 OVER     0|  |
```

HISTOGRAM OF ACTUATION CREEP

```
              145  290  435  580  725  870 1015 1160 1305 1450
             ----+----+----+----+----+----+----+----+----+----+
UNDER     0|  |
  0.0     1|  |
  1.0  1421|  |**************************************************
  2.0     0|  |
  3.0     0|  |
  4.0     0|  |
  5.0     0|  |
  6.0     0|  |
  7.0     0|  |
  8.0     0|  |
  9.0     0|  |
 10.0     0|  |
 11.0     0|  |
 12.0     0|  |
 13.0     0|  |
 14.0     0|  |
 15.0     0|  |
 16.0     0|  |
 17.0     0|  |
 18.0     0|  |
 19.0     0|  |
 20.0     0|  |
 21.0     0|  |
 22.0     0|  |
 23.0     0|  |
 24.0     0|  |
 25.0     0|  |
 26.0     0|  |
 27.0     0|  |
 28.0     0|  |
 29.0     0|  |
 30.0     0|  |
 31.0     0|  |
 32.0     0|  |
 33.0     0|  |
 34.0     0|  |
 35.0     0|  |
[illegible]
```

TI-NHTSA 011474

HISTOGRAM OF RELEASE CREEP

		95 190 285 380 475 570 665 760 855 950
UNDER	0	|
0.0	924	|**********
5.0	43	|***
10.0	38	|**
15.0	32	|**
20.0	20	|*
25.0	15	|*
30.0	12	|*
35.0	6	|
40.0	20	|*
45.0	12	|*
50.0	19	|*
55.0	3	|
60.0	3	|
65.0	7	|
70.0	3	|
75.0	5	|
80.0	11	|*
85.0	6	|
90.0	8	|
95.0	3	|
100.0	6	|
105.0	3	|
110.0	10	|*
115.0	6	|
120.0	4	|
125.0	2	|
130.0	7	|
135.0	7	|
140.0	4	|
145.0	3	|
150.0	4	|
155.0	11	|*
160.0	11	|*
165.0	3	|
170.0	1	|
175.0	1	|
180.0	1	|
185.0	1	|
OVER	121	|******

TIRE PRESSURE TESTER LOT REPORT

RATING: TPGL2-1
LOT ID: 900
LOT STARTED: 11-MAY-1993 11:09:16.77
LOT FINISHED: 11-MAY-1993 11:06:31.50

SETUP DATA:
DISC LOT ID: 550.00
DISC MEAN ACT: 24.4 MEAN REL: 12.6
LIMIT (PSI)
ACTUATION: 90.0 TO 160.0 PSI
RELEASE: 20.0 TO 120.0 PSI
DIFFERENTIAL: 0.0 TO 160.0 PSI
MAX MILLIVOLT: 200.0 mv
ACT CREEP TIME: 25.0 PSI
REL CREEP TIME: 150.0 PSI
MAX CREEP TEST
PRECYCLE PRESS: 800.0 PSI
PRECYCLE COUNT: 2

NUMBER OF PIECES TESTED: 52
NUMBER OF PIECES GOOD: 47
YIELD: 90.38 %

REJECT COUNTS

BIN	COUNT	% OF REJECTS
LEAK	0	0.00 %
LGHT	0	0.00 %
ACHI	0	0.00 %
ACLO	0	0.00 %
RCHI	0	0.00 %
RLHI	1	20.00 %
RLLO	0	0.00 %
DPLO	0	0.00 %
MLOA	4	80.00 %
DPHI	0	0.00 %

STATISTICS	MEAN	SIGMA	CPK
ACTUATION:	148.6	5.21	0.72
RELEASE:	61.7	10.86	1.28
MILLIVOLT:	0.0	0.00	0.00
DIFFERENTIAL:	86.9	10.83	1.28

HISTOGRAM OF ACTUATION PRESSURE

0 5 10 15 20 25 30 35 40 45 50

147.5	121	
150.0	46	
152.5	8	
155.0	7	
157.5	2	
160.0	1	
OVER	0	

HISTOGRAM OF RELEASE PRESSURE

		5 10 15 20 25 30 35 40 45 50
UNDER	0	
20.0	3	
25.0	15	
30.0	17	
35.0	9	
40.0	5	
45.0	1	
50.0	0	
55.0	1	
60.0	0	
65.0	1	
70.0	0	
75.0	0	
80.0	0	
85.0	0	
90.0	0	
95.0	0	
100.0	0	
105.0	0	
110.0	0	
115.0	0	
120.0	0	
125.0	1	
OVER	0	

HISTOGRAM OF DIFFERENTIAL PRESSURE

		5 10 15 20 25 30 35 40 45 50
UNDER	0	
25.0	1	
30.0	9	
35.0	0	
40.0	0	
45.0	0	
50.0	0	
55.0	0	
60.0	0	
65.0	1	
70.0	2	
75.0	0	
80.0	2	
85.0	15	
90.0	19	
95.0	11	
100.0	1	
OVER	0	

HISTOGRAM OF ACTUATION CREEP

		10	20	30	40	50	60	70	80	90	100
UNDER	0	|									
1.0	32	|**********									
OVER	0	|									

HISTOGRAM OF RELEASE CREEP

		5	10	15	20	25	30	35	40	45	50
UNDER	0	|									
0.0	32	|**********									
5.0	4	|****									
10.0	3	|***									
15.0	0	|									
20.0	0	|									
25.0	1	|*									
30.0	0	|									
35.0	2	|**									
40.0	0	|									
45.0	2	|**									
50.0	0	|									
55.0	0	|									
60.0	0	|									
65.0	0	|									
70.0	0	|									
75.0	0	|									
80.0	0	|									
85.0	0	|									
90.0	1	|*									
95.0	0	|									
100.0	0	|									
105.0	0	|									
110.0	0	|									
115.0	1	|*									
120.0	1	|*									
125.0	0	|									
130.0	0	|									
135.0	0	|									
140.0	0	|									
145.0	0	|									
150.0	0	|									
155.0	0	|									
160.0	0	|									
165.0	0	|									
170.0	0	|									
175.0	0	|									
180.0	0	|									
185.0	0	|									
OVER	3	|***									

1600 °F - ½ HOUR

PART NO. 21656-87

DATE 3-26-88

CLOCK NO. Becker

QTY. 2000/1688

LOT NO. 4

REEL NO. 1

S.S. 301

MIC. SETTINGS

A. 37.0

R. 38.0

FREE DISC PRESSURES					
S. H. T.		4TH READING			
ACTUATION	RELEASE	ACTUATION	RELEASE	ACTUATION	RELEASE
		24.7	12.7	25.2	12.5
		25.1	12.5	25.5	12.0
		25.0	12.5	24.7	12.5
		25.0	12.2	25.3	12.2
		25.4	12.3	24.8	12.3

MAT'L I.D. NO. 74868 - A.0.5.5

25.0 / 12.3

0.28 / 5.0

FORM 21139

VACUUM TESTING OF SPEED CONTROL DEACTIVATE SWITCH.

01/08/93

OBJECTIVE: THE FOLLOWING IS A SUMMARY OF TESTS PERFORMED TO DETERMINE SWITCH LIFE AFTER EXPOSURE TO DIFFERENT VACUUM LEVELS. THOUGH THE ENGINEERING SPEC ES-F2VC-9F924-AA DOES NOT CALL OUT FOR THE IMPULSE TEST TO BE PRECEDED BY VACUUM EXPOSURE, THIS TEST WAS EXECUTED TO SIMULATE POSSIBLE VACUUM EXPOSURE SCENARIOS IN THE APPLICATION. A SWITCH WAS DEEMED TO HAVE FAILED IF IT LEAKED FLUID:

1. VACUUM EXPOSURE FOLLOWED BY IMPULSE TEST (VACUUM LEVEL PER ES SPEC)

VACUUM LEVEL:	4 mBar (3 mm Hg)
# OF VACUUM CYCLES:	5 FOR 60 Sec EACH
IMPULSE PRESSURE:	0 - 1450 psi
BRAKE FLUID TEMP:	135°C
AMBIENT TEMP:	121°C
# OF CYCLES:	TO FAILURE
RESULTS:	ALL SWITCHES PASSED ES REQUIREMENT OF 500K CYCLES. THE CYCLES TO FAILURE WERE: 913, 1068, 1074, 1194, 1196, 1206
RELIABILITY:	USING WEIBULL TECHNIQUES, RELIABILITY AT 500K CYCLES WITH 90% CONFIDENCE IS 99.99%.

1. VACUUM EXPOSURE FOLLOWED BY IMPULSE TEST (VACUUM LEVEL PER MODIFIED ES SPEC FOR FORD AUSTRALIA CAPRI PROGRAM)

VACUUM LEVEL:	0.4 mBar (0.3 mm Hg)
# OF VACUUM CYCLES:	1 FOR 60 Sec
IMPULSE PRESSURE:	0 - 1450 psi
BRAKE FLUID TEMP:	135°C
AMBIENT TEMP:	121°C
# OF CYCLES:	TO FAILURE
RESULTS:	ALL SWITCHES PASSED ES REQUIREMENT OF 500K CYCLES. THE CYCLES TO FAILURE WERE: 846, 1219, 1555, 1619, 1681, 1782
RELIABILITY:	USING WEIBULL TECHNIQUES, RELIABILITY AT 500K CYCLES WITH 90% CONFIDENCE IS 99.50%

CONCLUSION: THE SWITCH EXCEEDS THE SPECIFIED LIFE AND RELIABILITY REQUIREMENTS AFTER EXPOSURE TO VACUUM LEVELS OF 4 mBar AND 0.4 mBar.

MSG ZARN ETB TBTV FFUN MJS2

TO: TED BALLARD ETB
MATT SELLERS MJS2
DAVID CZARN ZARN
TED BREDEKIN TBTV

CC: DALE SOGGE FFUN

FR: AZIZ RAHMAN ZIZ

RE: SILENT DISC DEVELOPMENT - MEETING MINUTES - 1/11/93

OBJECTIVE: TO INCREASE THE "THROW" OF THE SILENT DISC (36656-35 AND -41) USED ON 77PS CAR AND TRUCK PROGRAMS.

GENERAL NOTES:

-CURRENT USAGE FOR BOTH -35 AND -41 IS .0122" THICK 301V S.S.

- DISC THROW IS DIRECTLY RELATED TO MATERIAL COMPOSITION, THICKNESS AND GEOMETRY. IN ORDER TO INCREASE THE THROW OF A DISC, WE NEED TO FORM A HIGHER CROWN. THIS NEEDS A THINNER, LOWER YIELD STRENGTH MATERIAL. FATIGUE LIFE NEEDS TO BE MAINTAINED AT CURRENT LEVELS.

- INCREASED THROW CAN BE ACHIEVED BY WEAKENING THE GEOMETRY THROUGH ADDITION OF HOLES, OR OTHER METAL REDUCING PATTERNS.

- CURRENT POSSIBLE ELEMENTS OF THE MATRIX:

MATERIAL	THICKNESS	GEOMETRY
301V SS.	.0122 & .010	NO HOLE, HOLE, FLOWER PATTERN
455 SS.	.0122	NO HOLE, HOLE, FLOWER PATTERN

- MATERIAL COST OF 455 SS IS ABOUT $14/LB AS COMPARED TO $6/LB FOR 301 SS.

- THERE IS SOME REDUCTION IN DISC THROW AT HIGH TEMPERATURES BUT IS CONSIDERED NEGLIGIBLE RELATIVE TO PLASTIC CHANGES.

- A SIMPLER RE-DESIGN COULD POSSIBLY ALLOW RE-USE OF A SNAP DISC.

- A FORMABLE STEEL LAMINATE MATERIAL WITH SOUND ABSORBING PROPERTIES HAS BEEN USED IN THE AUTO INDUSTRY FOR OIL PANS ETC.

THE FOLLOWING ACTION PLANS WERE GENERATED:

- ESTABLISH BASELINE CORRELATION BETWEEN ADC II DEFLECTION DATA AND LAB PRESSURE DEFLECTION CURVES — RAHMAN 1/13

- RUN CURRENT .0122" 301 SS MATERIAL WITH CENTER HOLE	BALLARD	1/14
- PROCURE 20 LBS .010" 301 SS MATERIAL	RAHMAN	1/15
- ESTABLISH HOLED AND FLOWER PATTERN EX PRINTS	RAHMAN	1/19
- RUN MATRIX OF .0122" 455, .0122" 301, AND .010" 301	BALLARD	1/25
- ESTABLISH TEST PLAN FOR ABOVE MATRIX	RAHMAN	1/21
- OBTAIN INFORMATION ON STEEL LAMINATE	RAHMAN	1/25

- Run Curvature test using trunk of transverse.

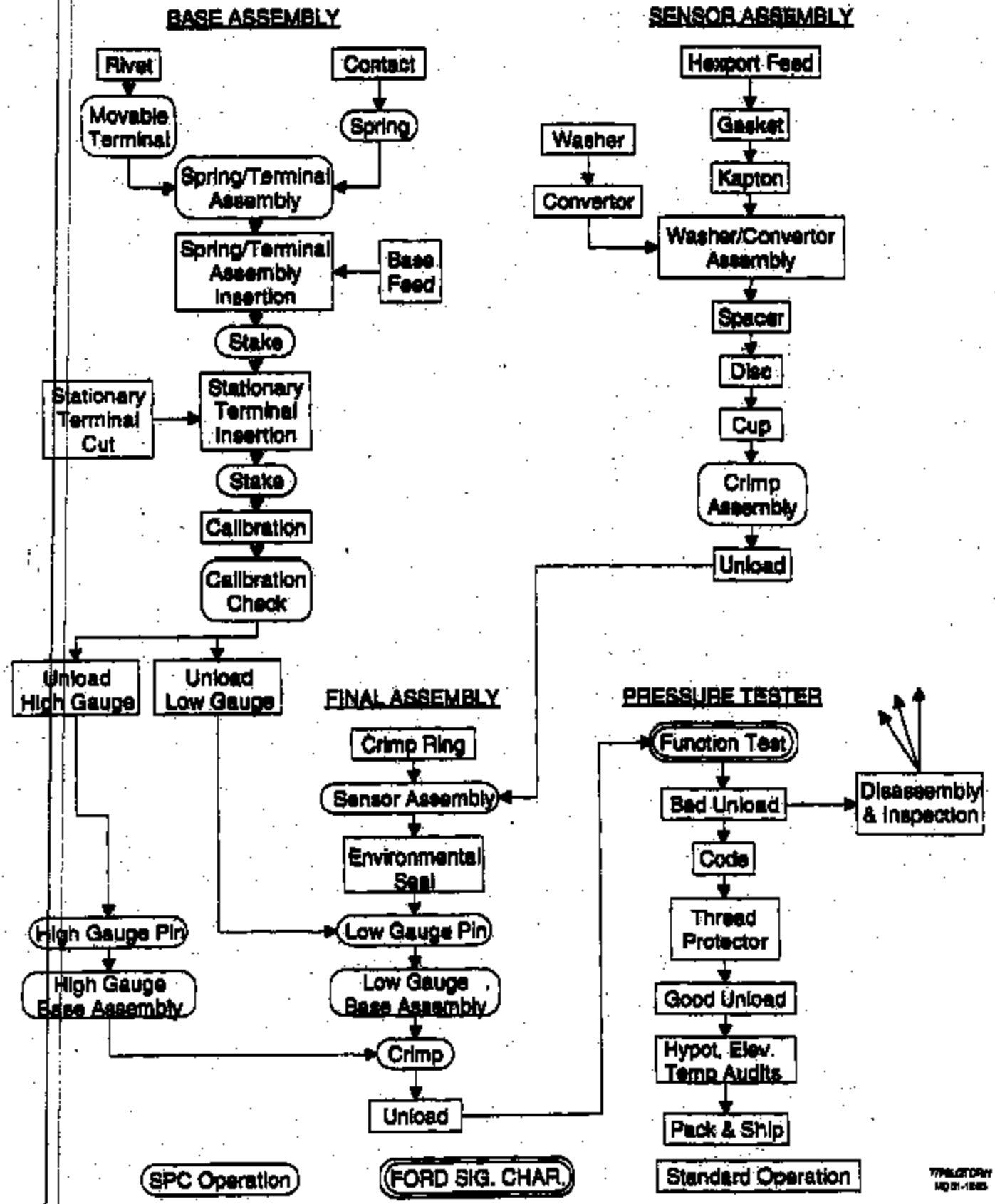
REGARDS

AZIZ RAHMAN, X-1660, MSGID: ZIZ

PROCESS FLOW/
CONTROL PLANS

TI-NHTSA 011483

FORD NEXT GENERATION SPEED CONTROL (77P8)
QUIET SWITCH PROCESS FLOW CHART



TI-NHTSA 011484

FORD NEXT GENERATION SPEED CONTROL (77PS)
MANUFACTURING CONTROL PLAN
77PSL QUIET SWITCH

PROCESS STEP DESCRIPTION	PRODUCT CHARACTERISTICS	EVALUATION METHOD	CONTROL METHOD	FREQUENCY OF TEST	REACTION PLAN
BASE ASSEMBLY (AMI AUTOMATION)	TERMINAL HEIGHT	DIAL INDICATOR	X/R	5pc/Hr.	SORT SINCE LAST CHECK
	TERMINAL PUSHOUT	FORCE GAGE/ DIAL INDICATOR	X/R	5pc/Hr.	SORT SINCE LAST CHECK
	TERMINAL SEPARATION/ ALIGNMENT	PLUG GAGE	X/R	5pc/Hr.	SORT SINCE LAST CHECK
	SPRING ANGLE (B)	COMPARATOR	X/R	5pc/4Hr.	SORT SINCE LAST CHECK
	SPRING CONTACT WIDTH	CALIPERS	X/R	5pc/Hr.	SORT SINCE LAST CHECK
	SPRING TORQUE	FORCE GAGE	X/R	5pc/Hr.	SORT SINCE LAST CHECK
	SPRING BUMP HGHT (B)	CALIPERS	X/R	5pc/4Hr.	SORT SINCE LAST CHECK
	RIVET HEIGHT	DIAL INDICATOR	X/R	5Pc/Hr.	SORT SINCE LAST CHECK
	CALIBRATION DEFORMATION	CUSTOM CONTINUITY SYSTEM	X/R	5pc/Hr.	SORT SINCE LAST CHECK
	VISUAL QUALITY	VISUAL	X/R	5pc/Hr.	SORT SINCE LAST CHECK
SENSOR ASSEMBLY	CRIMP DIAMETER	CALIPERS	X/R	5pc/Hr.	SORT SINCE LAST CHECK
	CRIMP HEIGHT	CALIPERS	X/R	5pc/Hr.	SORT SINCE LAST CHECK
	VISUAL QUALITY	VISUAL	P	5pc/Hr.	SORT SINCE LAST CHECK

Revision: B

FORD NEXT GENERATION SPEED CONTROL (77PS)
MANUFACTURING CONTROL PLAN
77PSL QUIET SWITCH

PROCESS STEP DESCRIPTION	PRODUCT CHARACTERISTICS	EVALUATION METHOD	CONTROL METHOD	FREQUENCY OF TEST	REACTION PLAN
FINAL ASSEMBLY (AMI AUTOMATION)	CRIMP DIAMETER (B)	GO/NO-GO GAGE	P	5pc/Hr.	SORT SINCE LAST CHECK
	CRIMP HEIGHT (B)	GO/NO-GO GAGE	P	5pc/Hr.	SORT SINCE LAST CHECK
	BASE TORQUE	TORQUE GAGE	X/R	5pc/Hr.	SORT SINCE LAST CHECK
	CODE CRIMP RING/ DIAMETER-LEGIBILITY	PLUG-VISUAL	P	5pc/Hr.	SORT SINCE LAST CHECK
	PIN HEIGHT (B)	DIAL INDICATOR	P	100%	SEPARATE FAILED LOT. PRODUCT TEAM REVIEW.
FUNCTION TESTER (CUSTOM)	ACTUATION/RELEASE POINTS (Ford Significant Char.)	MASTERS	X/R	EACH SHFT	E N G I N E E R I N G EVALUATIONS
	ACTUATION/RELEASE POINTS	RAMP THROUGH PRESSURE RANGE	P	100%	YIELD TRACKING/ SCRAP CONTROL
PRODUCT AUDITS (PRODUCTION)	HIGH PINNING (B)	CUSTOM HYPOT SYSTEM	P	20PC/LOT	SEPARATE FAILED LOT. PRODUCT TEAM REVIEW.
	LOW PINNING (B)	OVEN/CONT METER	P	10pc/Lot	SEPARATE FAILED LOT. PRODUCT TEAM REVIEW.

Q.C. AUDITS

* OUTLINED IN DETAIL IN TEXAS INSTRUMENTS (QAS 208), FMC
* ELEVATED TEMP IMPULSE CYCLING AUDITS. FREQUENCY TBD. PER DELTA ES-F2VC-9F924-AA SEC.III-E

Revision: B

-MSG M#= 19527 FR=SB01 TO=ZIZ SENT=01/12/93 09:22 AM
R#=109 ST=C DIV=0050 CC=00101 BY=SB01 AT=01/12/93 09:08 AM

To: Andy Mckenna AJM3 [redacted]
Matt Sellers MJS2

Copy: David Czarn ZARN

From: Stephen B. Offiler SB01

Subj: Notes on 77PS Spring Arm Life

* Life is affected by loading - energy from the disc, pinning preload.

* Life is affected by cycle rate. We took high-speed video of 120/min and 610/min and saw very different spring "bounce" effects which apply additional cycles.

* Life is apparently affected by the cycler (this may be directly linked to the above). The CCPS cycler seemed more forgiving relative to the production cyclers.

* I never did any Weibull analysis, because the CCPS cycler never broke a spring to the best of my knowledge. The time required to run a failure test on the CCPS cycler is measured in weeks or months. On the other hand, Matt may have some kind of data of this nature collected on the production cycler.

Regards, SO
-******** ORIGINAL MSG # 04078419 RECEIVED ON 01/12 AT 01:26 FOLLOWS ********-

To: STEVE OFFILER SB01
AZIZ RAHMAN ZIZ

Copy: DAVID CZARN ZARN

From: ANDY MCKENNA AJM3

Subj: 77PS INFORMATION

DOES ANY RELIABILITY DATA EXIST FOR THE 77PS SPRING ARM? I'M CONSIDERING USING THIS DESIGN FOR THE TIJ HBB SWITCH PROGRAM. OUR GOAL IS 2KK SWITCH CYCLES. IDEALLY I'D LIKE WEIBULL RELIABILITY ESTIMATION DATA, IE. CHARACTERISTIC LIFE AND WEIBULL SLOPE. IF YOU HAVE THIS OR ANY OTHER RELIABILITY DATA, COULD YOU SEND ME A BRIEF MESSAGE OF THE DETAILS?

THANKS AND REGARDS,
ANDY

MSG ETB ZARN TBTV MJ82

TO: TED BALLARD
TED BREDIKIN
MATT SELLERS
DAVE CZARN

FR: AZIZ RAHMAN

RE: 77PS QUIET DISC

DT: 1/13/93

THE FOLLOWING IS A SUMMARY OF THE PRESSURE DEFLECTION STUDY DONE ON 36856-35 DISCS PREVIOUSLY CHARACTERIZED ON THE ADC-II.

LOT 2:

		ADC-II	LAB
ACTUATION	MEAN (PSI)	25.90	27.28
	SIGMA	0.31	0.30
RELEASE	MEAN (PSI)	23.80	22.98
	SIGMA	0.26	0.28
DIFFER.	MEAN (PSI)	2.10	4.30
	SIGMA	0.31	0.29
DISPL.	MEAN (MILS)	12.98	11.18
	SIGMA	2.91	0.40

LOT 3:

		ADC-II	LAB
ACTUATION	MEAN (PSI)	25.70	27.15
	SIGMA	0.56	0.64
RELEASE	MEAN (PSI)	23.70	22.79
	SIGMA	0.36	0.30
DIFFER.	MEAN (PSI)	2.00	4.36
	SIGMA	0.32	0.49
DISPL.	MEAN (MILS)	12.95	10.90
	SIGMA	0.94	0.74

THERE IS A 1-2 PSI DIFFERENCE IN ACT/REL/DIFF AND 2 MILS DIFFERENCE IN DISPLACEMENT. THIS COULD BE ATTRIBUTABLE TO THE DIFFERENCES IN SET-UP FIXTURES. ONE INTERESTING OBSERVATION WAS THAT THESE DISCS MADE

AUDIBLE NOISE ON RELEASE. IT IS NOT KNOWN WHETHER THE NOISE WILL BE PRESENT ON A COMPLETED SWITCH.

THE ABOVE CORRELATION WILL FORM THE BASELINE TO COMPARE ANY CHANGES AGAINST.

REGARDS
AZIZ X-1560, MSGID: ZIZ

1st

3866
3701
95.73

Tuesday
1-14
1st
BAM

77PS BASE ASSEMBLY MACHINE LOT REPORT

LOT ID:1-14
DEVICE ID:77PSL2-1
LOT STARTED:14-JAN-1993 08:13:52.58
LOT FINISHED:14-JAN-1993 12:51:04.95
DURATION: 0 04:37:12.37

CALIBRATION SETUP PARAMETERS

INITIAL CAL -85.00 MILS
MODIFIED CAL-85.00 MILS CAL TOLERANCE: 0.50 MILS
CHK POINT:-87.25 MILS CHK TOLERANCE: 1.75 MILS
CHECK MEAS SORT LIMIT: DISABLED
CAL/CHK DIFFERENCE LIMIT: DISABLED

SPRINGBACK AI MODE DISABLED

CHECK FEEDBACK AI MODE DISABL
DEFAULT SPRINGBACK: 1.00 MILS FINAL SPRINGBACK: 0.00 MILS

TOTAL PIECES CYCLED	1929	
PIECES GOOD	0	0.00 %
PIECES GOOD (STA DISABLED)	1835	95.13 %
PIECES BAD	94	4.87 %
NO BASE	0	0.00 %
NO STA TERM	35	1.81 %
NO STAKE STA TERM	0	0.00 %
NO MOV TERM	0	0.00 %
NO STAKE MOV TERM	0	0.00 %
NO CONTACT	0	0.00 %
FAILED CALIBRATION	6	0.31 %
FAILED CAL CHECK	53	2.75 %
CAL/CHK DIFF FAILURE	0	0.00 %
FAILED UNLOAD	0	0.00 %
EMERGENCY STOP	0	0.00 %
SPRING ARM MISFEEDS	138	
CALIBRATION CYCLES	5	
EFFECTIVITY		22.07 %

INITIAL MEAS DATA	MEAN	SIGMA		COUNT
	-81.31	1.09		1886
CALIBRATED DATA	MEAN	SIGMA	CPK	COUNT
	-85.01	0.27	0.601	1826
CHK MEAS DATA	MEAN	SIGMA	CPK	COUNT
	-85.02	0.25	0.653	1784

MSG NO= 11P185 FR=ELB TO=ZIZ SENT=01/14/93 04:20 PM
R#=116 ST=C DIV=0050 CC=00101 BY=ELB AT=01/14/93 04:20 PM
JANUARY 14, 1993

TO: ANDY MCKENNA AJM3 CC: STAN HOMOL SH2
CHRIS WAGNER CDN3
AZIZ RAHMAN ZIZ

FR: DAVE CZARN ZARN

RE: 1. 77PS BASES
2. LINE MOUNT PSPS SEAL ENCAPSULATION

ANDY,

I SENT THE 77PS BASE ASSEMBLIES BY INTERNAL MAIL TODAY. THERE ARE ABOUT 12 EACH OF RED NORYL (USED ON 77PSL3-3) AND GRAY PBT (USED ON 87PSL2-2). WE'RE USING THE NORYL GENERALLY FOR THE QUIET SWITCH, WHERE WE NEED BETTER DIMENSIONAL STABILITY AT ELEVATED TEMPERATURES DUE TO A SHORTER PINNING RANGE. THE NORYL IS BETTER THAN PBT, BUT 2-3 CENTS MORE EXPENSIVE. IF YOU USE THE BASES, AS THEY ARE (I.E., WITHOUT REMOVING THE FLANGE) YOU SHOULD EXPECT THE EFFECTIVE PIN LENGTH TO BECOME SHORTER AT ELEVATED TEMP; THE ROUGH NUMBERS ARE:

	PBT	NORYL
125 C	APPROX.3-4 MILS	APPROX.2-3 MILS
150 C	APPROX.4-6 MILS	APPROX.3-4 MILS

YOU'LL WANT TO SKEW YOU'RE PINNING RANGE SLIGHTLY HIGH TO COMPENSATE FOR THIS. I'D RECOMMEND YOU VERIFY THAT YOUR HIGH TEMP. CALIBRATION IS OK ONCE YOU'VE SETTLED ON A PINNING RANGE. WE CAN REVIEW THIS IN MORE DETAIL IF YOU FIND THE 77PS DESIGN WORKS.

I SENT YOU A FEW DIFFERENT PINS THAT I TOOK AT RANDOM FROM THE LINE. THIS SHOULD GET YOU STARTED. PLEASE LET ME KNOW IF YOU NEED ANYTHING ELSE.

REGARDING THE NISSAN AND HONDA BASE DESIGN, (MSG. YOU SENT TO STAN) I MADE A NOTE ON WHAT YOU TOLD ME OF TIJ'S THERMAL SHOCK TESTING. WE'LL TAKE THIS INTO CONSIDERATION WHEN GOING TO THE PRODUCTION DESIGNS. THE REASON THEY'RE NOT ON THE PROTOTYPES IS MAINLY BECAUSE WE DECIDED TO GO WITH THE DESIGN WE KNOW. THEN MODIFY LATER AS NEEDED. WE JUST HAVEN'T TAKEN THE NEXT STEP YET. I THINK WE'LL LOOK MOSTLY AT MODIFYING THE BASE, RATHER THAN A SEAL REDESIGN BUT. I'D LIKE TO SEE TIJ'S SEAL CONCEPT IF YOU CAN SEND US A SKETCH/DRAWING AT YOUR CONVENIENCE.

REGARDS,
DAVE

CONFIDENTIAL

TI-NHTSA 011491

MEMORANDUM

TO: DAVE CZARN

FR: AZIZ RAHMAN

RE: HIGHLIGHTS FOR WEEK ENDING 1/22/93

77PSL3-3: QUIET LIGHT TRUCK

THERMAL SHIFT TEST WAS COMPLETED ON DEVICES PINNED AT STATISTICAL (3SIGMA) EXTREMES OF WINDOW. CALIBRATION READINGS WERE TAKEN AT -40, 0, 25, 150 AND 170 DEG C. MEAN ACTUATIONS WERE AS FOLLOWS:

TEMP	MEAN ACT	
	MIN PRE-LOAD	MAX PRE-LOAD
-40	290	325
0	285	315
25	280	305
150	220	265
170	185	260

ONE MIN-PRELOAD DEVICE WAS STUCK OPEN AT 150 AND 170 C, AND ONE MIN PRE-LOAD DEVICE WAS UNEXPECTEDLY STUCK CLOSED AT 0 AND -40 C. ROOT CAUSE INVESTIGATION IS IN PROGRESS. IT SEEMS THAT THE MEAN ROOM TEMP WAS, AT 280 & 305, UNUSUALLY HIGH TO BEING WITH. FOR A DEVICE TO BE WITHIN 200-300 PSI ACTUATION CALIBRATION THROUGHOUT ITS TEMP RANGE, THE TOLERANCE FOR PRE-LOAD WORKS OUT TO BE +/- .0011" COMPARED TO CURRENT PROCESS' +/- .00235".

BASELINE VERIFICATION TESTING WAS COMPLETED ON QUIET L3-3 INCLUDING RATCHET CURVES, PRE-POST VAC MEASUREMENTS AND IMPULSE TEST. ALL TEST DEVICES WERE FUNCTIONAL AT END OF TEST.

77PSL4-1: FORD-AUST-FALCON

PRODUCTION HEXPORT DRAWING HAS BEEN COMPLETED AND SENT TO ELCO FOR FINAL QUOTES. Q.C IS OFF PROCURING GAGES FOR THE M10 THDS. WE ARE STILL ON SCHEDULE FOR ISW SHIP DATE OF 5/31.

ENVELOPE DRAWING AND PARTS LIST ECNs HAVE BEEN COMPLETED. EXPECT TO RELEASE ENV. DWG TO FORD FIRST WEEK OF FEB.

77PSL6-1 FORD-AUSTRALIA-CAPRI

ISW VALIDATION TESTING IS BEHIND BY A WEEK DUE TO UNAVAILABILITY OF BASES. DEVICES HAVE NOW BEEN BUILT AND TESTING WILL START TOMORROW. WE STILL HAVE A GOOD SHOT AT MEETING 2/26 SHIP DATE.

36656 QUIET DISC

A CORRELATION STUDY BETWEEN THE LASER CHECKER AND LAB HATCHET CURVES WAS COMPLETED WITH POSITIVE RESULTS. THE LASER CHECKER WAS WITHIN 1-2 PSI OF LAB DATA. THIS WILL FORM THE BASIS FOR FURTHER QUIET DISC DEVELOPMENT. .010" 301V SS HAS BEEN ORDERED FOR SAMPLES. EX PRINTS SHOWING FLOWER PATTERN HAVE BEEN SET-UP. WE SHOULD BE IN A POSITION TO TEST SAMPLES NEXT WEEK.

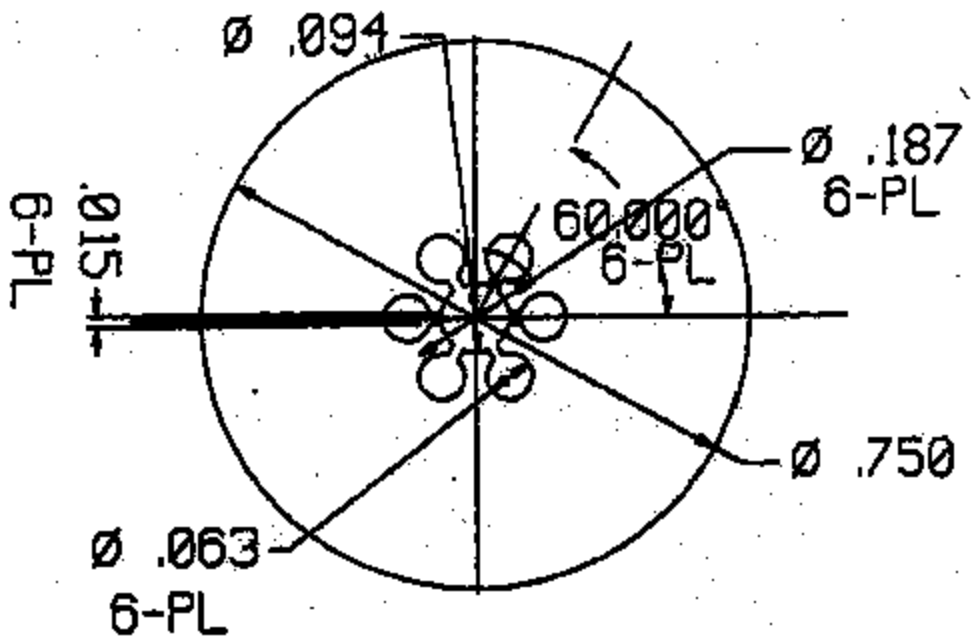
SAMPLE BUILDS

THE FOLLOWING SAMPLE ORDERS WERE RECEIVED:

77P8L3-3	TOKICO	30	SHIPPED 1/22
77P8L3-3	FORD	275	DUE 2/5
77P8L3-2	FORD	82	DUE 3/11
80P8L2-2	HONDA	5	DUE 1/31
87P8L2-2	M.B	2	SHIPPED 1/22

EX3423-67
77PS- QUIET DISC

REV 1
1/25/93
A R.



Note: Disc Act/Rel per 36656-35

CONFIDENTIAL

-3	455 S.S.	.0122
-2	301V S.S	.010
-1	301V S.S	.0122
Part #	Material	Thickness

-MSG M#- 384639 FR-ZIZ TO-JW02 SENT-01/25/93 07:58 AM
RF-073 ST-C DIV-0050 CC-00101 BY-ZIZ AT-01/25/93 07:45 AM

To: PETER BURNER SAGT

Copy: DAVID CZERN ZARN
JIM WATT JW02
CHARLIE DOUGLAS CPPC

cc: Blaine R.

From: AZIZ RAHMAN ZIZ

Subj: 777SL6-1 REV C

PETER,

REGARDING YOUR MSG # 380349:

1. OTP/LTP REVISIONS: I HAVE FORWARDED YOUR REQUEST TO CHARLIE FOR FOLLOW-UP.
2. JOHN PECK'S FAX DATED 11/06/92 SPECIFIES IMPULSE TEST TO BE RUN PER ORIGINAL ES-SPEC EXCEPT FOR PRESSURE LEVEL TO BE AT 1000 +/- 50 PSI. THE ES SPECIFIES A BRAKE FLUID TEMP OF 135 +/- 14 C, NOT 120 C AS IN YOUR MSG. PLEASE RE-CONFIRM TEST TEMPERATURE ASAP. WE ARE SCHEDULED TO RUN THIS TEST LATER THIS WEEK.
3. CHANGE TO OVERALL LENGTH AND ADDITION OF AN O-RING ARE O.K.
4. WE ARE IN A GOOD POSITION TO SATISFY BCIA SIR SUBMISSION DATE OF 14 APRIL.

REGARDS
AZIZ, X-1660, MSGID: ZIZ

PRESSURE SWITCH DATA Form 21605 TEST NO. 376-03-30

DEVICE	DATE REQUESTED	REQUESTED BY	REQUESTED COMPL. DATE
77PS	930129	Art Reboar	

PERFORMED BY	DATE STARTED	DATE COMPLETED	APPROVED BY
Jeffrey D. Duncan	930130		

PROJECT TITLE: Cruise Control

CUSTOMER:

PURPOSE OF TEST: To determine the effects of impulse on preloaded disc

PROCEDURE: Test stopped 1149K cycles

Device #	Sensor Style	Pre-test height	post-test height	Preload	Pre-Burst	Burst	Δp	act vol	Mr Burst
376-03-01	1	46.7	46.6	4.6	51.3	91.0	142.3	132 104	4.5
-02	1	46.4	46.4	4.6	51.0	91.4	142.4	120 107	5.7
-03	1	46.3	46.3	5.3	55.0	96.9	141.9	136 119	6.4
-04	1	46.4	46.4	5.3	57.0	96.3	143.5	165 147	5.0
-05	1	46.4	46.3	-	-				
-06	1	46.0	46.0	-	-				
376-03-07	2	46.7	46.4	4.9	51.6	96.3	141.9	133 108	6.1
-08	2	46.3	46.0	4.9	51.2	96.2	142.4	134 108	5.5
-09	2	46.6	46.4	5.3	55.5	96.8	141.3	130 113	5.2
-10	2	46.8	46.8	6.9	55.7	98.7	143.4	148 124	4.9
-11	2	46.7	46.9	-	-				
-12	2	46.7	46.9	-	-				
376-03-13	3	47.1	46.9	4.3	51.4	96.7	143.1	120 105	5.2
-14	3	47.7	47.4	4.3	52.0	97.1	143.1	118 100	5.5
-15	3	47.1	46.9	4.3	56.4	96.9	141.3	130 119	4.8
-16	3	47.4	47.3	4.3	56.7	96.8	141.9	146 132	5.0
-17	3	46.7	46.7	-	-				
-18	3	47.2	47.1	-	-				
376-03-19	4	47.7	47.7	2.0	49.7	96.7	146.4	105 88	5.3
-20	4	47.6	47.7	2.0	49.6	97.9	141.4	111 93	5.7
-21	4	49.0	47.9	11.5	59.2	96.8	146.6	321 316	4.9
-23	4	48.9	48.8	11.9	60.7	96.6	141.9	480 475	4.3
-23	4	49.7	49.6	-	-				
-24	4	50.6	50.9	-	-				

(OVER)

TI-NHTSA 011498

Device #	Stepper Style	Preload	Actuation	Release	Cyc. to fail	Remarks
376-03-01	1	4.6	122	104		
376-03-02	1	4.6	120	107		
376-03-03	1	8.8	136	119	1249 K	
376-03-04	1	8.8	165	147		
376-03-05	1	sensor only				
376-03-06	1	sensor only				
376-03-07	2	4.9	133	105	1187 K	
376-03-08	2	4.9	134	105	1143 K	
376-03-09	2	8.9	130	113		
376-03-10	2	8.9	143	124		
376-03-11	2					
376-03-12	2					
376-03-13	3	4.3	122	105		
376-03-14	3	4.3	113	100		Thermal shift
376-03-15	3	9.3	130	119		
376-03-16	3	9.3	146	133		
376-03-17	3	sensor only				
376-03-18	3	sensor only				
376-03-19	4	2.0	105	88		Thermal shift
376-03-20	4	2.0	111	93		
376-03-21	4	11.8	351	326		
376-03-22	4	11.8	~760	465		
376-03-23	4	sensor only			1170 K	
376-03-24	4	sensor only				
376-03-25	5	3.2	121	99		
376-03-26	5	3.2	108	84		
376-03-27	5	9.8	>1000		1144 K	
376-03-28	5	9.8	>1000			
376-03-29	5	sensor only				
376-03-30	5	sensor only				

TEST376.XLS
JAD 2/22/93

Device #	Sensor Style	Pre-vac height	Post-vac height	Peeled	Pin-Base	Base	Pin	act rel	Mvdrop
376-01-25	5	51.2	51.3	2.2	54.4	96.7	141.3	121 98	5.
-26	5	51.1	51.0	2.2	54.3	96.6	140.9	124 94	6.0
-27	5	51.2	51.3	2.5	61.1	96.1	142.2	<1000	4.8
-28	5	51.5	51.5	2.8	61.3	96.4	142.7	<1000	6.3
-29	5	51.2	51.2	–	–				
-30	5	49.8	49.7	–	–				

Device #	500, 0-1000 [illegible] act rel	1st mVdrop	[illegible] act rel	[illegible] mVdrop	Remarks
376-03-01	127 100	16.7	125 100	75.4	
-02	116 97	6.9	127 98	54.7	
-03	148 115	7.8	128 115	22.1	Leak: 1099K
-04	114 116	12.1	159 119	72.7	
-05	Sensor				
-06	Carrier				
376-03-07	134 106	7.6	130 105	17.2	Leak: 1147K
-08	139 109	7.6	126 107	13.2	Leak: 1149K cyc
-09	139 109	7.6	142 109	53.0	
-10	141 116	21.9	131 109	24.7	
-11	Sensor				
-12	Carrier				
376-03-13	126 97	7.8	123 100	16.8	
-14	112 87	15.3	109 87	68.1	T=51.6
-15	130 106	13.2	125 104	25.8	
-16	142 121	36.8	138 115	39.7	
-17	Sensor				
-18	Carrier				
376-03-19	95 77	26.4	99 79	26.6	T=51.5
-20	116 90	18.0	113 91	24.2	
-21	287 214	17.1	277 240	61.7	
-22	458 363	34.2	390 341	34.6	
-23	Sensor				Leak: 1130K
-24	Carrier				
376-03-25	132 101	16.2	118 98	125.7	
-26	131 97	23.2	113 96	34.8	
-27	>1000	23.3	>1000	62.4	Leak: 1149K cyc
-28	>1000	20.3	>1000	61.7	
-29	Sensor				
-30	Carrier				

77PS DISC PRE-DEFLECTION STUDY

OBJECTIVE: TO DETERMINE EFFECT OF DISC PRE-DEFLECTION ON DEVICE LIFE.

NOTE: ALL CRIMPING TO BE DONE ON AMI/TAM

1. BUILD SENSORS PER THE FOLLOWING MATRIX Use quiet Ca dies

SENSOR STYLE	CUP	# OF SPACERS	# OF SENSORS
1	27713-1	1	6
2	27713-1	2	6
3	27713-2	1	6
4	27713-2	2	6
5	27713-2	3	6
6	27713-2	4	6

2. MEASURE SENSOR HT. PRE-POST VACUUM
3. RUN SENSOR CURVES ON ALL SENSORS
4. BUILD DEVICES PER FOLLOWING MATRIX

NOTE: DETERMINE MAX/MIN PIN PRE-LOAD FROM CHART 77PS-2 ON PRODUCTION LINE.

DEVICE	SENSOR	PIN PRE-LOAD	# OF DEVICES
1	1	MAX	2
2	1	MIN	2
3	2	MAX	2
4	2	MIN	2
5	3	MAX	2
6	3	MIN	2
7	4	MAX	2
8	4	MIN	2
9	5	MAX	2
10	5	MIN	2
11	6	MAX	2
12	6	MIN	2

5. CALIBRATE DEVICES FOR ACT/REL/NV DROP

6. RUN IMPULSE TEST: 0-1450 PSI, 135 C, 3 HZ, DEVICES POWERED UP ?
   EVERY 24 HRS:
   RECORD # OF CYCLES COMPLETED
   CALIBRATE DEVICES
   RUN CURVES ON SENSORS

RUN IMPULSE TEST TILL EVERY SENSOR / DEVICE FAILS OR 3 MILLION CYCLES WHICHEVER COMES FIRST.

77PSL2-1 SAMPLES (WIN68)
Customer P.O. No.: 47-1-F48773
January 28,1993

Per Part Weight Data (without plastic thread cap)

Device #	Grams
375-01	62.6
375-02	62.5
375-03	62.4
375-04	62.3
375-05	62.4
375-06	62.7
375-07	62.6
375-09	62.3

TEST375.XLS
JAD 1/29/93

RESSURE SWITCH DATA Form 21605 TEST NO. 376-03-30

DEVICE	DATE REQUESTED	REQUESTED BY	REQUESTED COMPL. DATE
77PS	970129	Alice Release	
PERFORMED BY	**DATE STARTED**	**DATE COMPLETED**	**APPROVED BY**
Jeffrey DiRenzo	970130		

ROJECT TITLE: Cervico Control

CUSTOMER:

PURPOSE OF TEST: To determine the effects of impulse on preloaded disc

PROCEDURE: Test Stopped 1249K cycles

Device #	Sensor Style	Pre-test Height	Post-test Height	Preload	Pre-Base	Base	Pre	act cal	A-Ref
376-03-01	1	96.7	96.6	4.6	51.3	96.0	192.3	124 104	4.5
-02	1	96.4	96.7	4.6	51.0	96.4	192.4	120 107	5.7
-03	1	96.2	96.3	5.3	55.0	96.7	191.9	126 119	6.4
-04	1	96.4	96.4	5.3	52.0	96.3	193.5	165 147	5.0
-05	1	96.4	96.3	-	-				
-06	1	96.0	96.0	-	-				
376-03-07	2	96.7	96.4	4.1	51.6	96.2	192.9	133 108	6.1
-08	2	96.3	96.0	4.9	51.2	96.2	192.4	134 108	5.5
-09	2	96.8	96.4	9.1	55.5	96.8	191.3	138 113	9.2
-10	2	96.5	96.2	8.9	55.7	98.2	193.4	208 129	4.9
-11	2	96.7	96.4	-	-				
-12	2	96.7	96.4	-	-				
376-03-13	3	97.1	96.9	4.3	51.4	96.7	193.1	128 105	5.2
-14	3	97.7	97.4	4.2	52.0	96.1	193.1	113 109	5.3
-15	3	97.1	96.9	9.7	56.4	96.7	194.2	130 119	4.8
-16	3	97.4	97.3	9.3	56.7	96.8	193.9	196 132	5.0
-17	3	96.7	96.7	-	-				
-18	3	97.2	97.1	-	-				
376-03-19	4	97.7	97.7	2.6	47.7	96.7	191.4	105 88	5.2
-20	4	97.6	97.3	2.0	47.6	96.9	194.4	111 93	5.7
-21	4	98.0	97.9	11.8	59.8	96.8	196.6	361 316	4.9
-22	4	97.9	97.8	11.9	60.7	96.6	197.9	460 415	4.3
-23	4	97.7	97.6	-	-				

TI-NHTSA 011501

Device #	Sensor Style	Preload	Actuation	Release	Cyc. to fail	Remarks
376-03-01	1	4.6	122	104		
376-03-02	1	4.6	120	107		
376-03-03	1	8.8	136	119	1249 K	
376-03-04	1	8.8	165	147		
376-03-05	1	sensor only				
376-03-06	1	sensor only				
376-03-07	2	4.9	139	106	1187 K	
376-03-08	2	4.9	134	108	1143 K	
376-03-09	2	8.9	150	113		
376-03-10	2	8.9	148	124		
376-03-11	2					
376-03-12	2					
376-03-13	3	4.3	122	105		
376-03-14	3	4.3	113	100		Thermal shift
376-03-15	3	9.3	130	119		
376-03-16	3	9.3	146	133		
376-03-17	3	sensor only				
376-03-18	3	sensor only				
376-03-19	4	2.0	105	88		Thermal shift
376-03-20	4	2.0	111	99		
376-03-21	4	11.8	351	336		
376-03-22	4	11.8	-750	486		
376-03-23	4	sensor only			1170 K	
376-03-24	4	sensor only				
376-03-25	5	3.2	121	99		
376-03-26	5	3.2	106	84		
376-03-27	5	9.8	>1000		1144 K	
376-03-28	5	9.8	>1000			
376-03-29	5	sensor only				
376-03-30	5	sensor only				

TEST376.XLS
JAD 2/22/93

77PS DISC PRE-DEFLECTION STUDY

OBJECTIVE: TO DETERMINE EFFECT OF DISC PRE-DEFLECTION ON DEVICE LIFE.

NOTE: ALL CRIMPING TO BE DONE ON AMI/FAM

1. BUILD SENSORS PER THE FOLLOWING MATRIX Use quiet Car dies.

SENSOR STYLE	CUP	# OF SPACERS	# OF SENSORS
1	27713-1	1	6
2	27713-1	2	6
3	27713-2	1	6
4	27713-2	2	6
5	27713-2	3	6
~~6~~	~~27713-2~~	~~4~~	~~6~~

2. MEASURE SENSOR HT. PRE-POST VACUUM
3. RUN SENSOR CURVES ON ALL SENSORS
4. BUILD DEVICES PER FOLLOWING MATRIX

77PS2-2

NOTE: DETERMINE MAX/MIN PIN PRE-LOAD FROM CHART ON PRODUCTION LINE.

DEVICE	SENSOR	PIN PRE-LOAD	# OF DEVICES
1	1	MAX	2
2	1	MIN	2
3	2	MAX	2
4	2	MIN	2
5	3	MAX	2
6	3	MIN	2
7	4	MAX	2
8	4	MIN	2
9	5	MAX	2
10	5	MIN	2
~~11~~	~~6~~	~~MAX~~	~~2~~
12	6	MIN	2

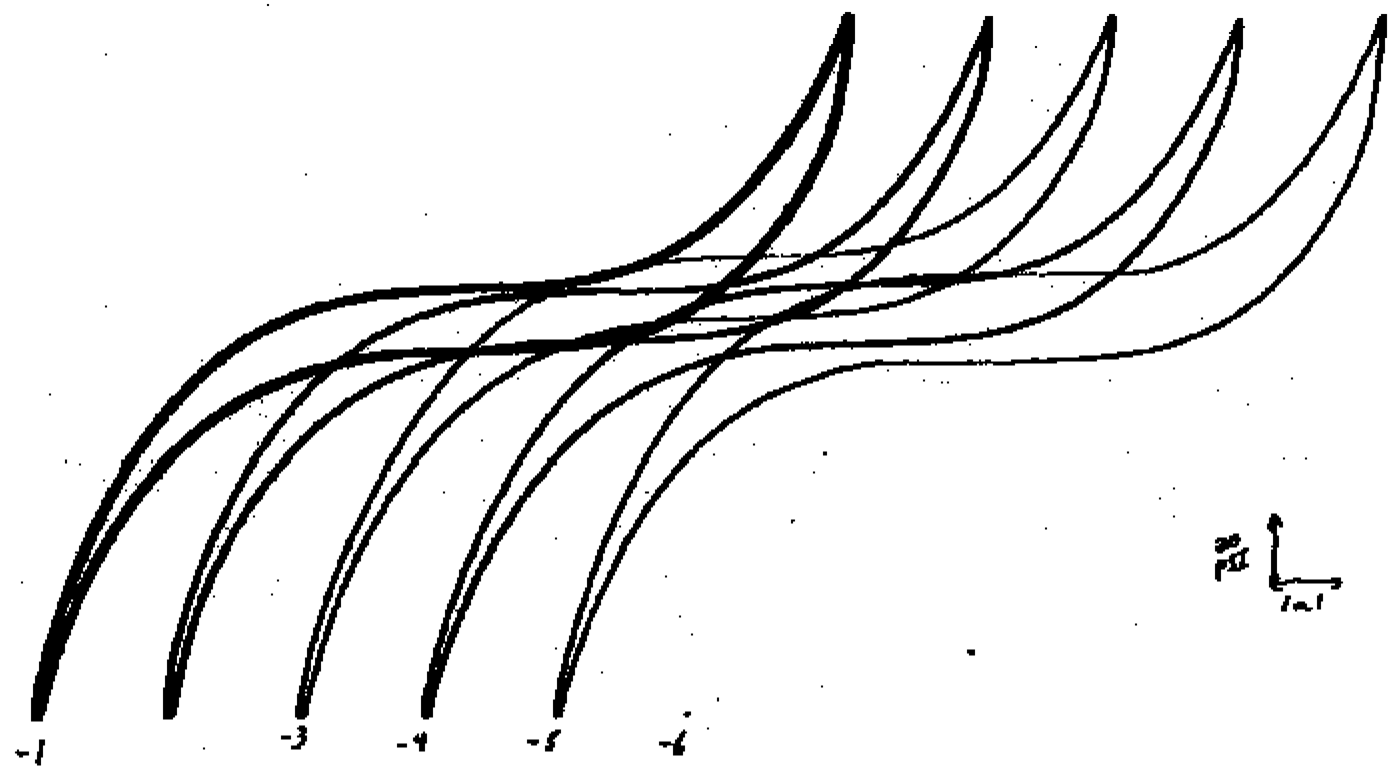
5. CALIBRATE DEVICES FOR ACT/REL/MV DROP

6. RUN IMPULSE TEST: 0-1450 PSI, 135 C, 3 HZ, DEVICES POWERED UP ?
   EVERY 24 HRS:
   RECORD # OF CYCLES COMPLETED
   CALIBRATE DEVICES
   RUN CURVES ON SENSORS

RUN IMPULSE TEST TILL EVERY SENSOR / DEVICE FAILS OR 3 MILLION CYCLES WHICHEVER COMES FIRST.

RANGES: 720.0mV 10.00V 2.450V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.00S
POST-TRIG: 0.0S
TRIGGER: MAN
08:11:20 04 FEB 93

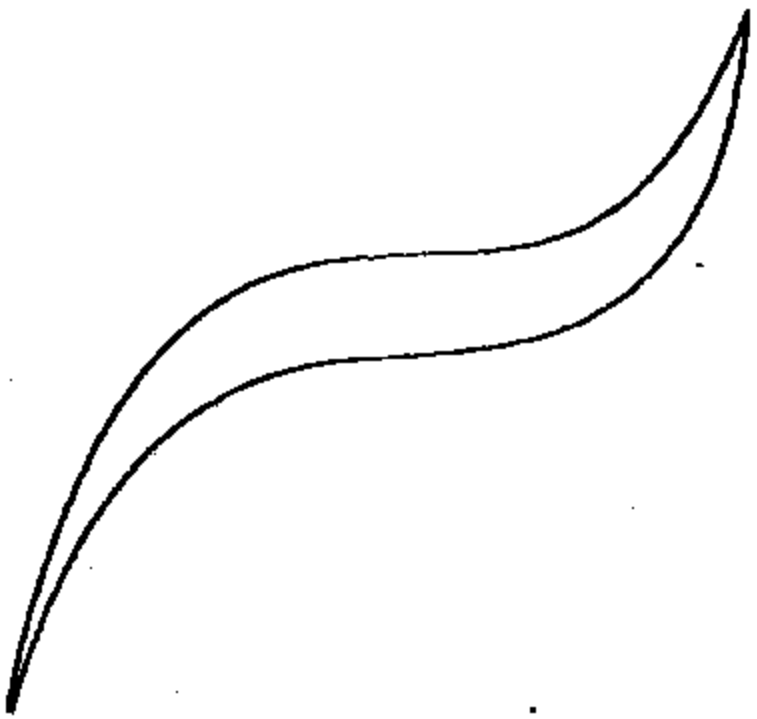
Test 376-03-30
27713-1 Cap
1 spacer
Sensor Style 1
Pre- Impulse

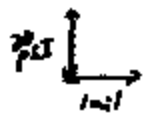


RANGES: 720.0mV 10.00V 2.400V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.000
PRET-TRIG: 0.00
TRIGGER: MAN
10:00:11 00 FEB 00

gD

Test 376-03-20
37713-1 Cup
1 Spacer
Sensor Style 2
500 K impulses, 0-1000 psi



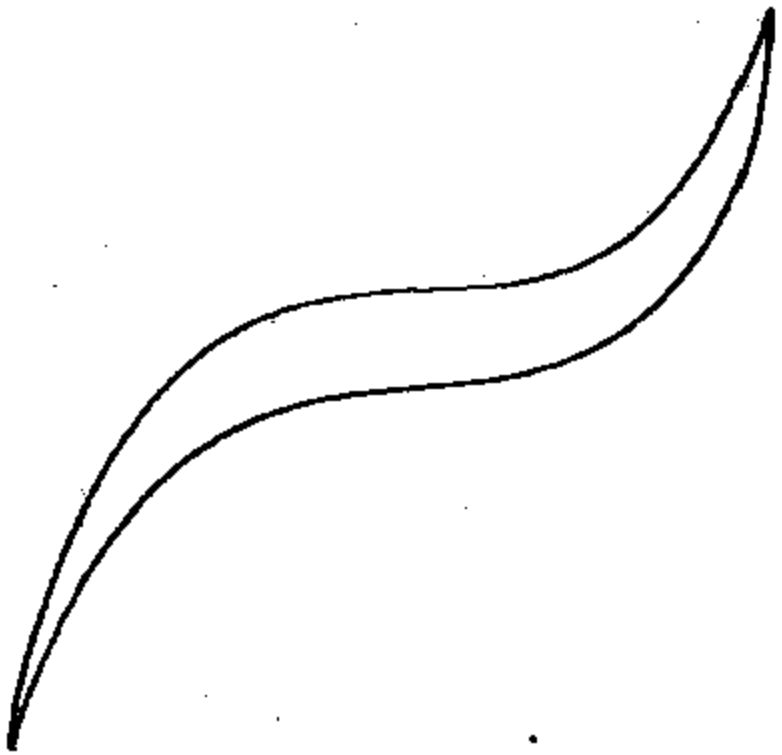


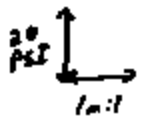
TI-NHTSA 011506

RANGES: 720.0mV 10.00V 2.400V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.000
POST-TRIG: 0.00
TRIGGER: MAN
00:00:04 11 FEB 99

JD

Test 3-76-03-26
27713-1 Cap
1 Spacer
Sensor Style 2
500K impulses, 0-1400 PSI
500K impulses, 0-1450 PSI



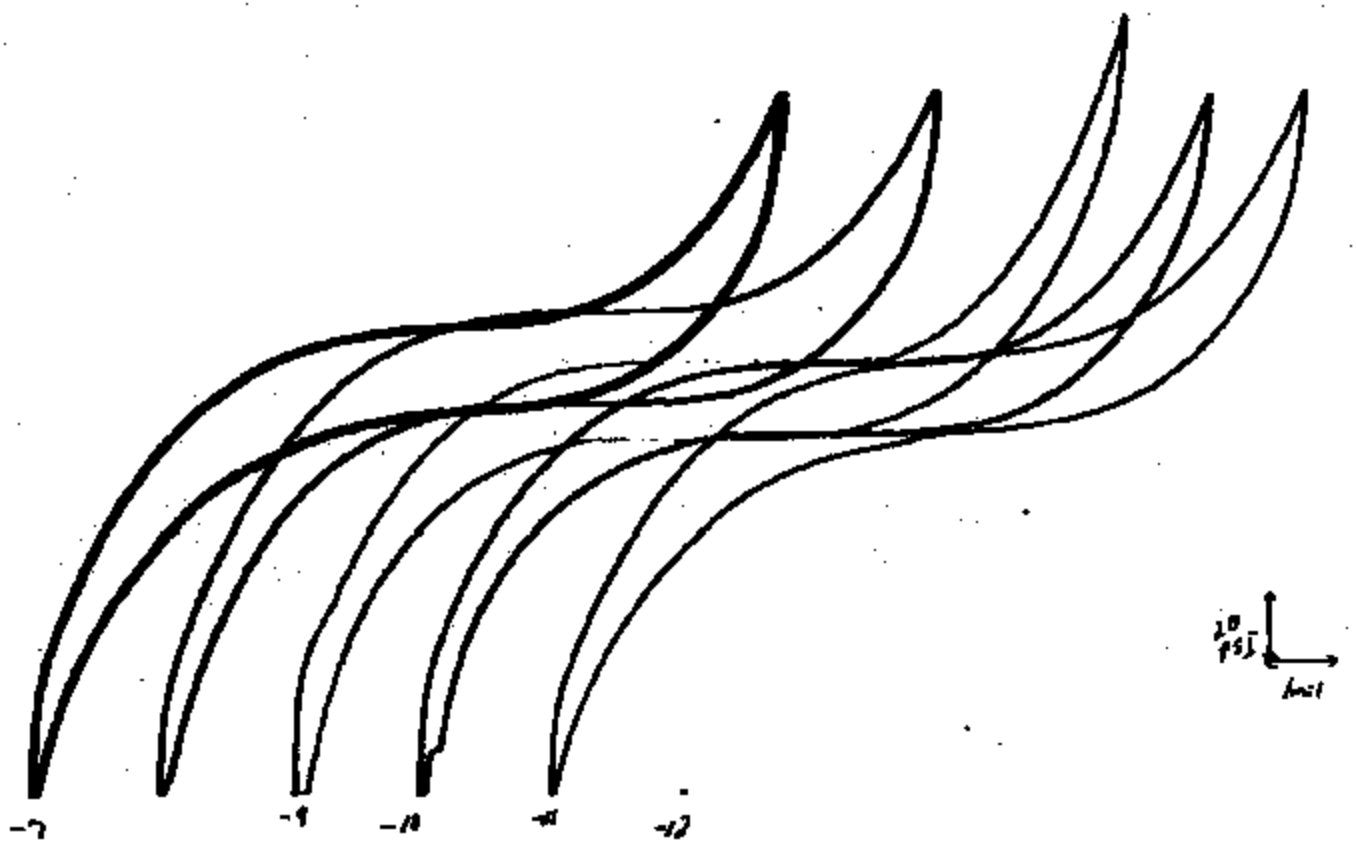


TI-NHTSA 011506

RANGES: 720.0mV 10.00V 2.450V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.00S
POST-TRIG: 0.0S
TRIGGER: MAN
09:49:05 04 FEB 99

g D

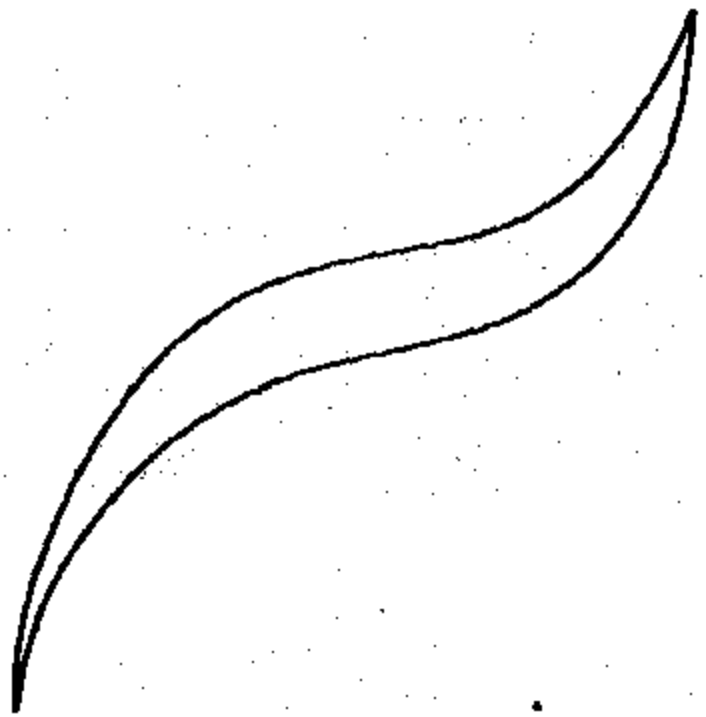
Test 326-03-30
22713-1 Cap
2 spares
Sensor Style 2
pre-impulse

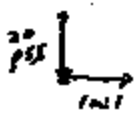


RANGES: 720.0mV 10.00V 2.450V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.00S
POST-TRIG: 0.0S
TRIGGER: MAN

10

Test 378-03-30
33713-1 Cap
2 spacers
Sensor Style 2
500K impulses, 0-1000 PSI

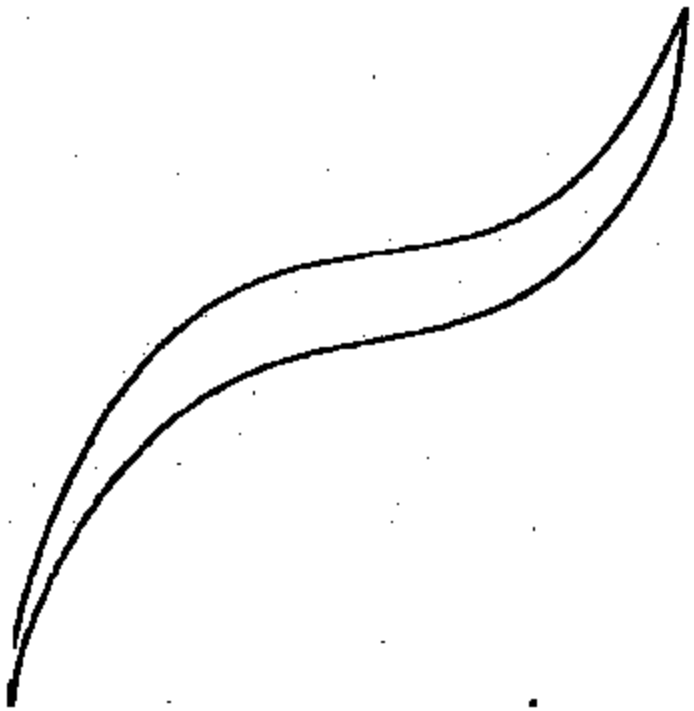




TM-HTBA 011508

RANGES: 720.0mV 10.00V 2.450V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.00S
POST-TRIG: 0.0S
TRIGGER: MAN
10:15:42 11 FEB 99

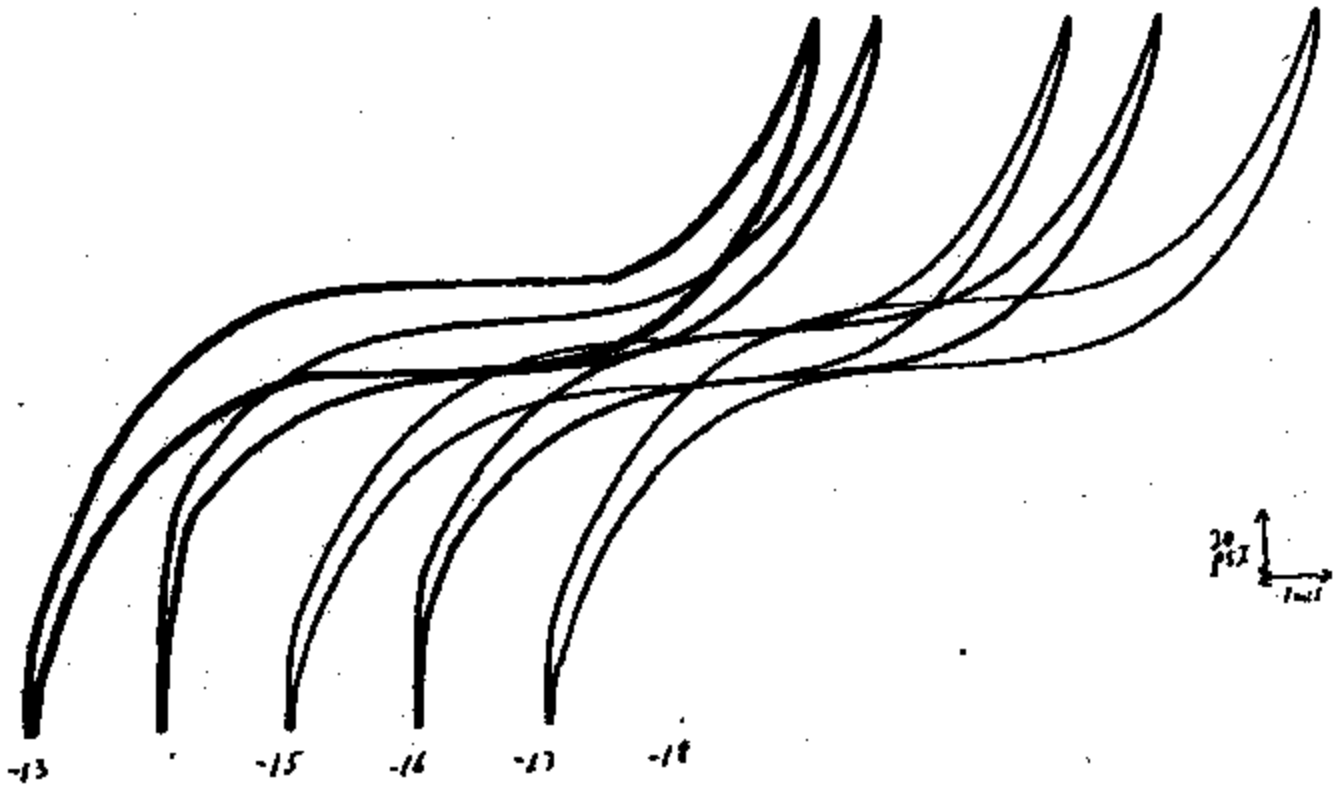
Test 376-03-70
27713-1 cal
2 spacers
sensor style 2
500K impulses, 0-1000 PSI
500K impulses, 0-1470 PSI



RANGES: 720.0mV 10.00V 2.450V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.00S
POST-TRIG: 0.0S
TRIGGER: MAN
10:17:34 04 FEB 93

JD

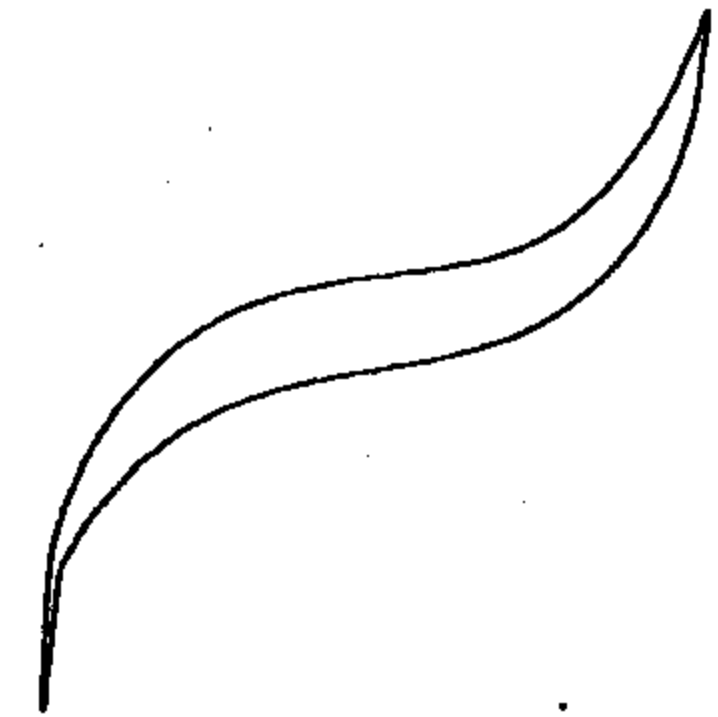
Test 378-03-30
22713-2 cup
1 spacer
season style 3
pre-impulse

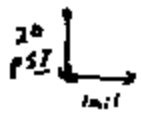


RANGES: 720.0mV 10.00V 2.450V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.00S
POST-TRIG: 0.0S
TRIGGER: MAN

JD

Test 376-67-30
27713-2 cap
1 spacer
Sensor Style 3
500K Impulse 0-1000 PSI





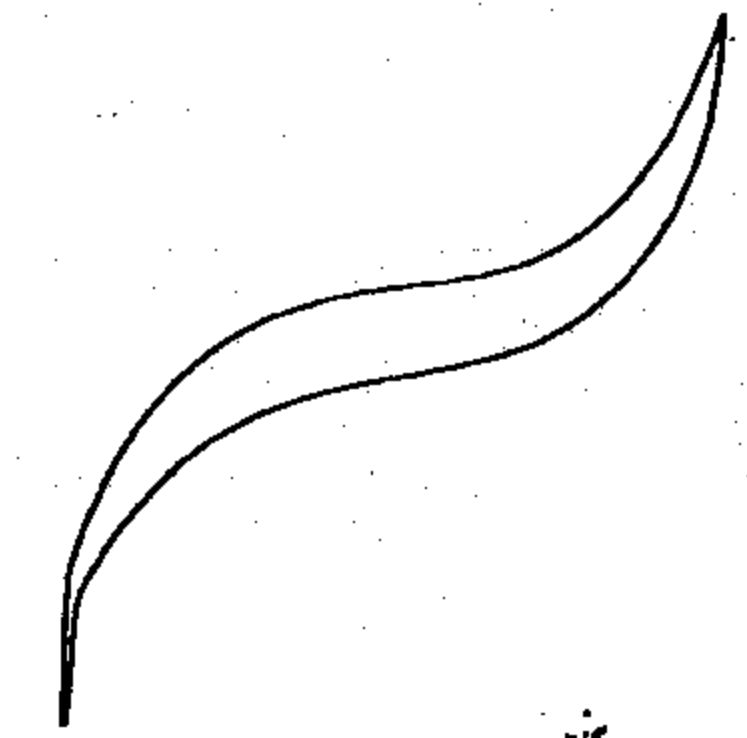
TI-NHTSA 011511

-17

-19

RANGES: 720.0mV 10.00V 2.450V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.00S
POST-TRIG: 0.0S
TRIGGER: MAN
10:22:47 11 FEB 93

Test 376-03-30
27713-2 Comp
1 Space V
Sensor Style 3
500 K impulses 0-1000 PSI
750 K impulses 0-1450 PSI



1000 PSI
1mS

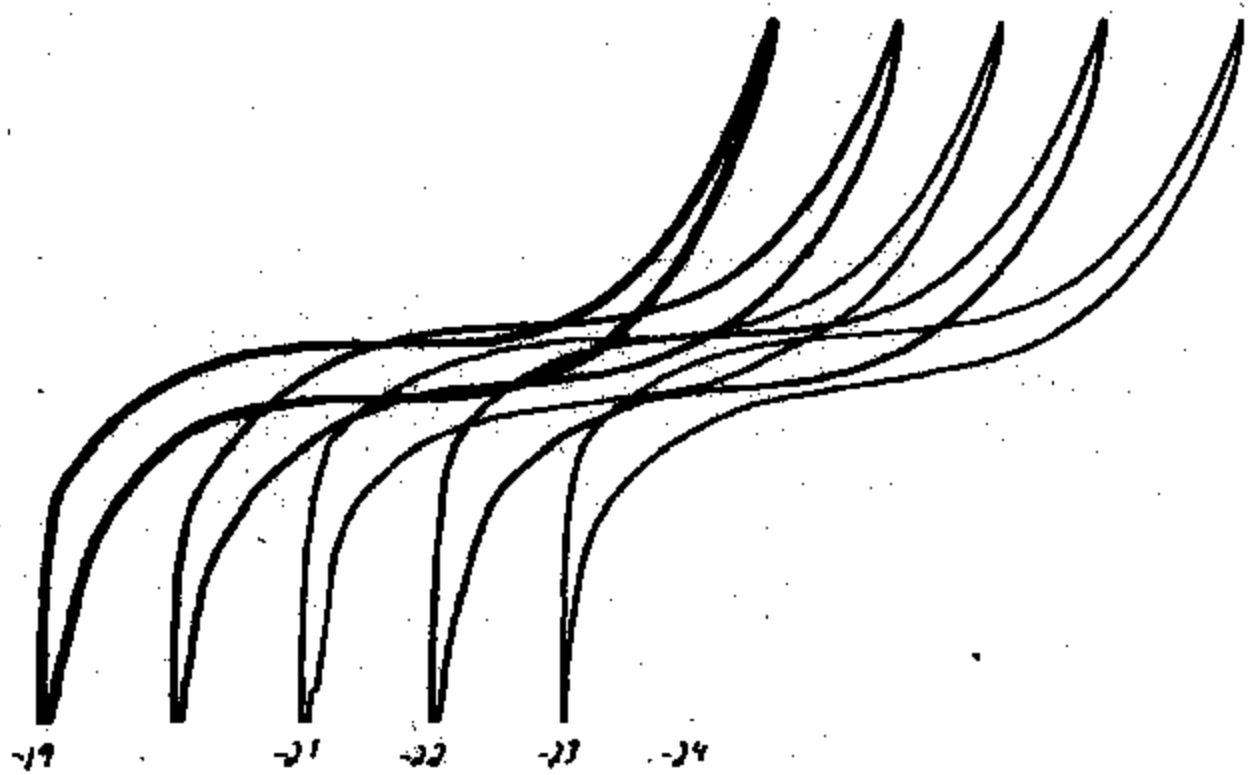
-17

-16

RANGES: 720.0mV 10.00V 2.450V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.00S
POST-TRIG: 0.0S
TRIGGER: MAN
10:40:19 04 FEB 93

J D

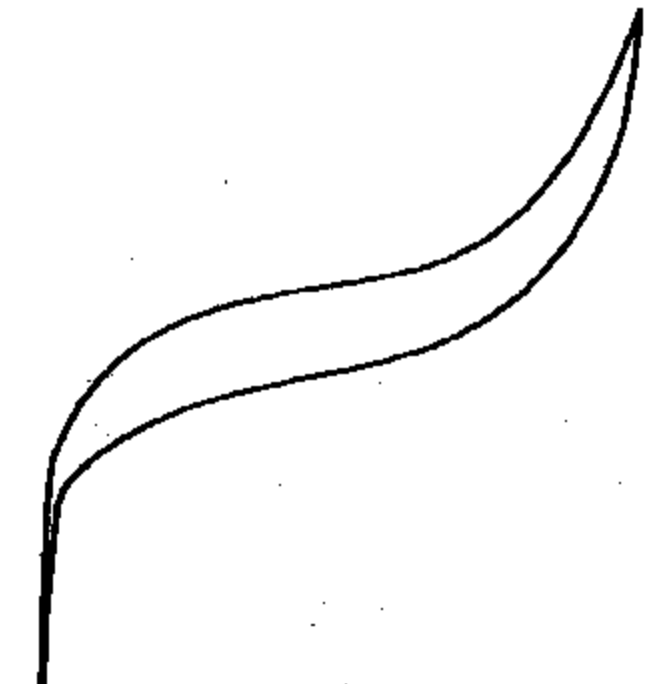
Test 376-03-30
27713-2 cap
2 spares
Sensor style 4
Pre-impact



TI-NHTSA 011513

RANGES: 720.0mV 10.00V 2.450V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.00S
POST-TRIG: 0.0S
TRIGGER: MAN
10:19:58 09 FEB 99

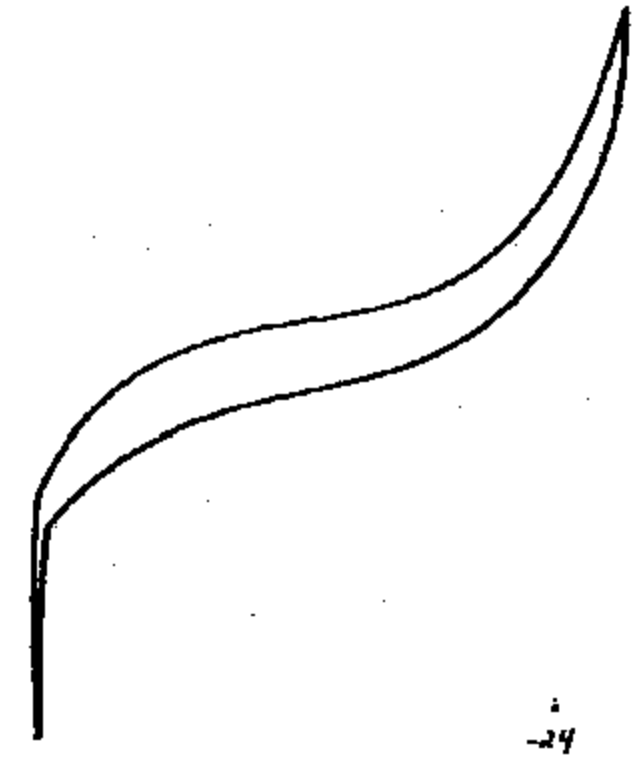
Test 378-03-3P
27713-2 Cap
3 spacers
Sensor style 4
500 K impulses, 0-1000 PSI

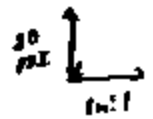


RANGES: 720.0mV 10.00V 2.450V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.00S
POST-TRIG: 0.0S
TRIGGER: MAN
10:30:09 11 FEB 99

JD

Test 371-01-10
27717-2 Cap
2 Spacers
Sensor Style 4
500 K impulses, 0-1000 PSI
500 K impulses, 0-1450 PSI

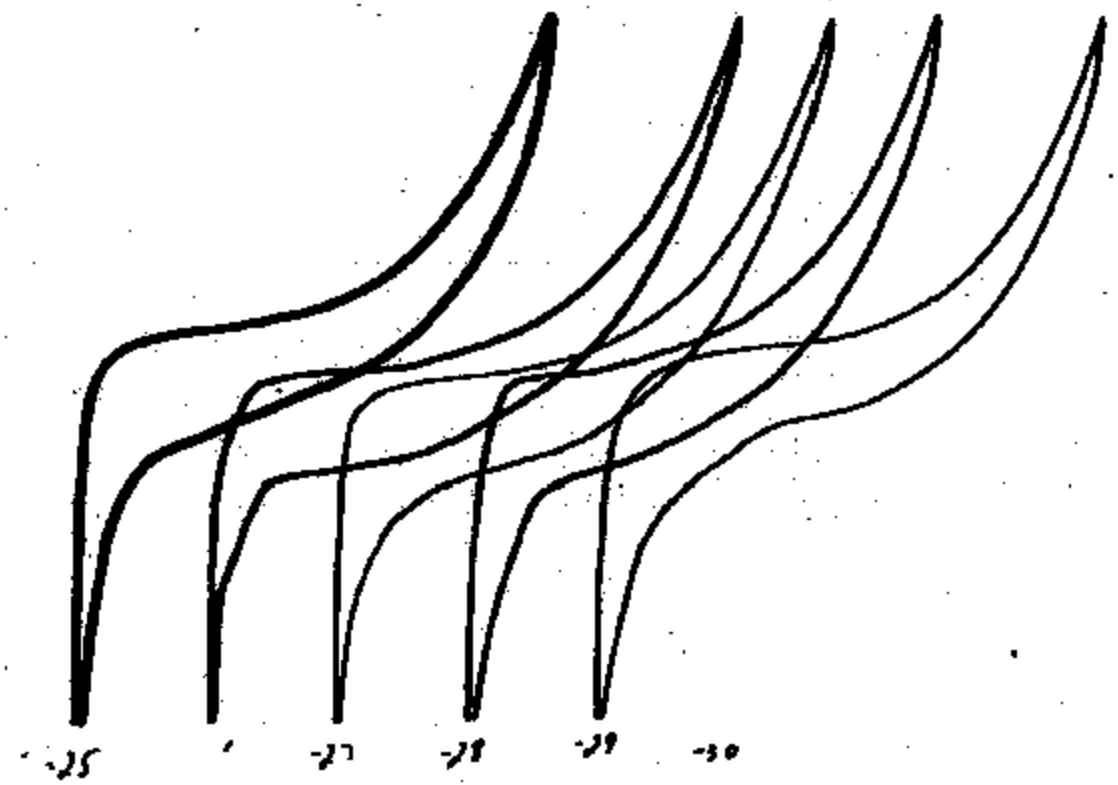




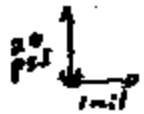
RANGES: 720.0mV 10.00V 2.450V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.00S
POST-TRIG: 0.0S
TRIGGER: MAN
11:17:40 04 FEB 99

10

Test 376-03-30
2778-2 cap
3 spacers
Sensor style 5
pre-impulse

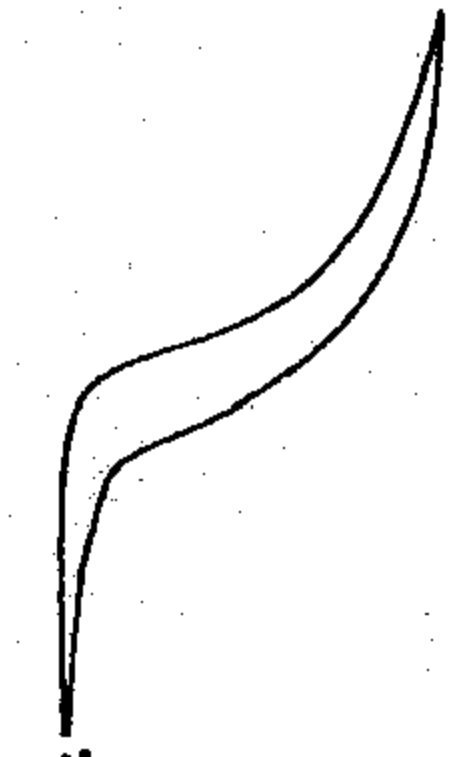


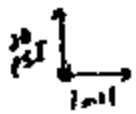
TH-NHTSA 011519



RANGES: 720.0mV 10.00V 2.450V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.00S
POST-TRIG: 0.0S
TRIGGER: MAN
10: 25: 30 09 FEB 93

Test 376-03-30
37713-3 Cal
3 Spacers
Sensor Style 5
500 # impulses, 0-1000 PSI



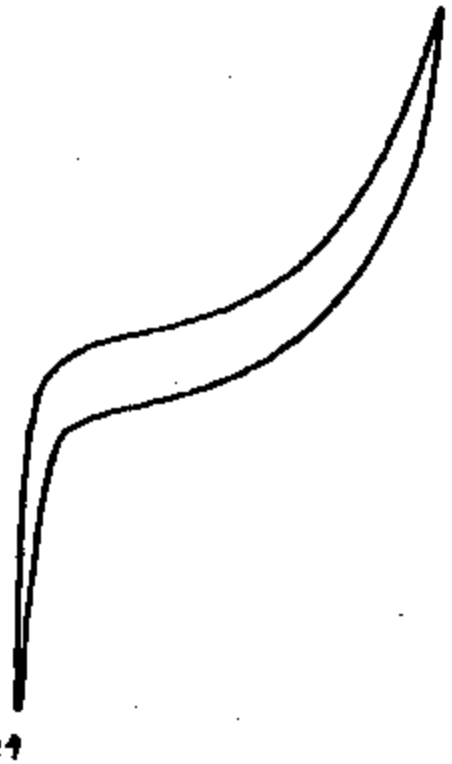


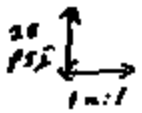
TI-NHTSA 011617

RANGES: 720.0mV 10.00V 2.450V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.00S
POST-TRIG: 0.0S
TRIGGER: NAN
10:37:31 11 FEB 93

JD

Test 976-03-10
27713-J Cap
Sensor Style 5
3 spacers
500 K impulses, 0-1000 PSI
500 K impulses, 0-1470 PSI





TI-NHTSA 011518

-29

-30

ACC II REPORT
AFTER HEAT TREAT

RAW DATA

DISC NUMB	CYCLE NUMB	PART STATUS	ACTUATE (psi)	RELEASE (psi)	DIFFERENTIAL (psi)	DISPLACEMENT (mils)
1	4	TEST PASS	24.1	23.1	1.1	10.8381
2	4	TEST PASS	23.8	22.7	1.2	10.2438
3	4	TEST PASS	23.2	22.1	1.1	11.0702
4	4	TEST PASS	23.1	22.0	1.1	17.1912
5	4	TEST PASS	23.9	22.9	1.1	12.1819
6	4	TEST PASS	23.6	21.6	1.1	10.7918
7	4	TEST PASS	24.3	23.2	1.1	10.1560
8	4	TEST PASS	23.1	22.0	1.1	11.0562
9	4	TEST PASS	24.0	22.9	1.1	10.4916
10	4	TEST PASS	23.3	22.2	1.1	10.6717

LOT SUMMARY

LOT START: 28-JAN-1993 10:08:07 LOT FINISH: 29-JAN-1993 10:10:27

PART NUMBER:	36656	RATING:	35	OPERATOR:	000161
COIL NUMBER:	88175	CUT NO:	A-A-2-7	REEL NO:	1 LOT NO:
LOT SIZE:	2600	PRESS NO:	259	HEAT TREAT:	600.0

CYCLE: 4	ACTUATE (psi)	RELEASE (psi)	DIFFERENTIAL (psi)	DISPLACEMENT (inch)
MEAN:	23.6	22.5	1.1	11.5139
SIGMA:	0.509	0.517	0.038	2.0214
MIN[MUM:	23.0	21.6	1.2	10.1560
MAX[MUM:	24.3	23.2	1.2	17.1912
LIMITS:	20.6/26.6	19.6/24.6	0.5 min 8.0	
CPK:	1.9	1.6		

600 °F - 15 HOUR Press 259

FREE DISC PRESSURES A-D-C -27

B. H. T.		4TH READING			
ACTUATION	RELEASE	ACTUATION	RELEASE	ACTUATION	RELEASE

PART NO. 36656-35

DATE 1-29-93

CLOCK NO. 80164

QTY 2600

LOT NO. 2-1

REEL NO. 1

S.S. 30/2.012.2

MIC. SETTINGS

A. 41.6

R. 39.3

MAT'L I.D. NO. 88175 - A-A-27

FORM 21133

RATING: 36656-35 DATE: 01 26 93

PREVIOUS SPECIFICATION

ACTUATION FOR -35 23.5 +/-2.0

QUANTITY: KANBAN

NEW SPECIFICATION

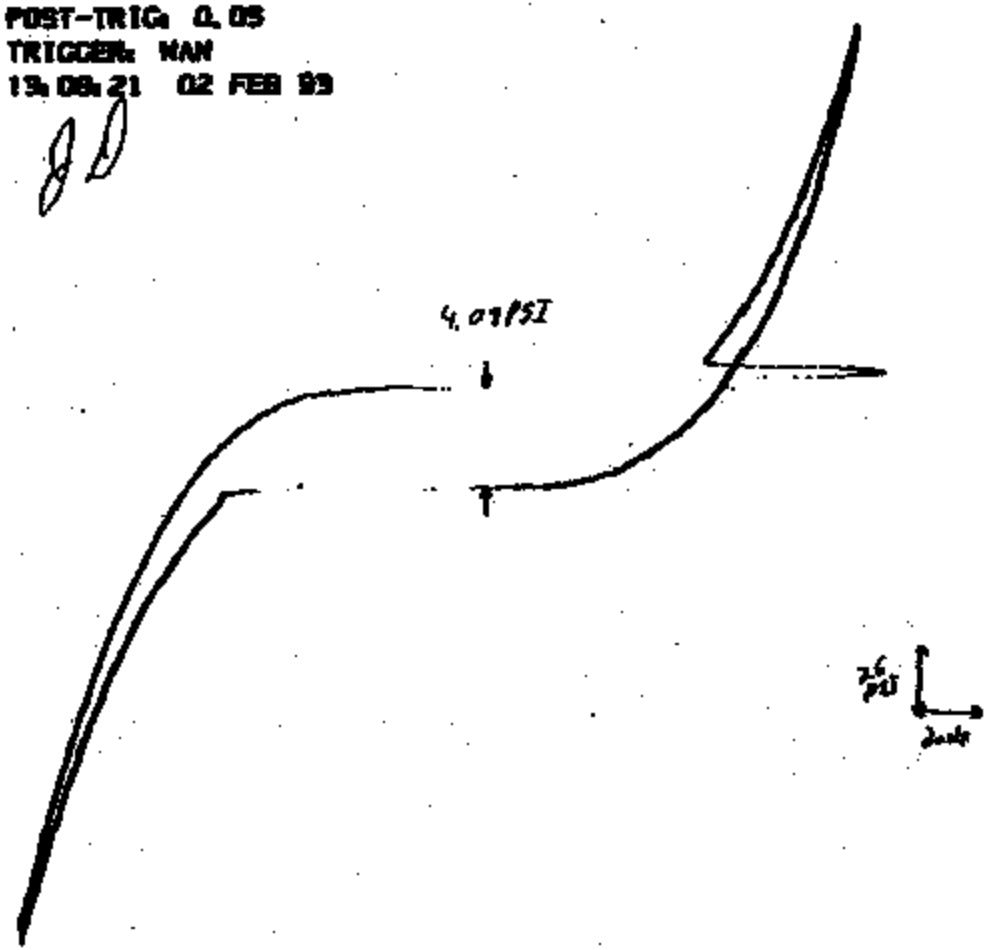
ACTUATION FOR -35 23.6 +/-1.0

QUANTITY: KANBAN

RANGES: 225.0mV 10.00V 4.900V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.00S
POST-TRIG: 0.0S
TRIGGER: MAN
13:08:21 02 FEB 99

JD

Curve "A"

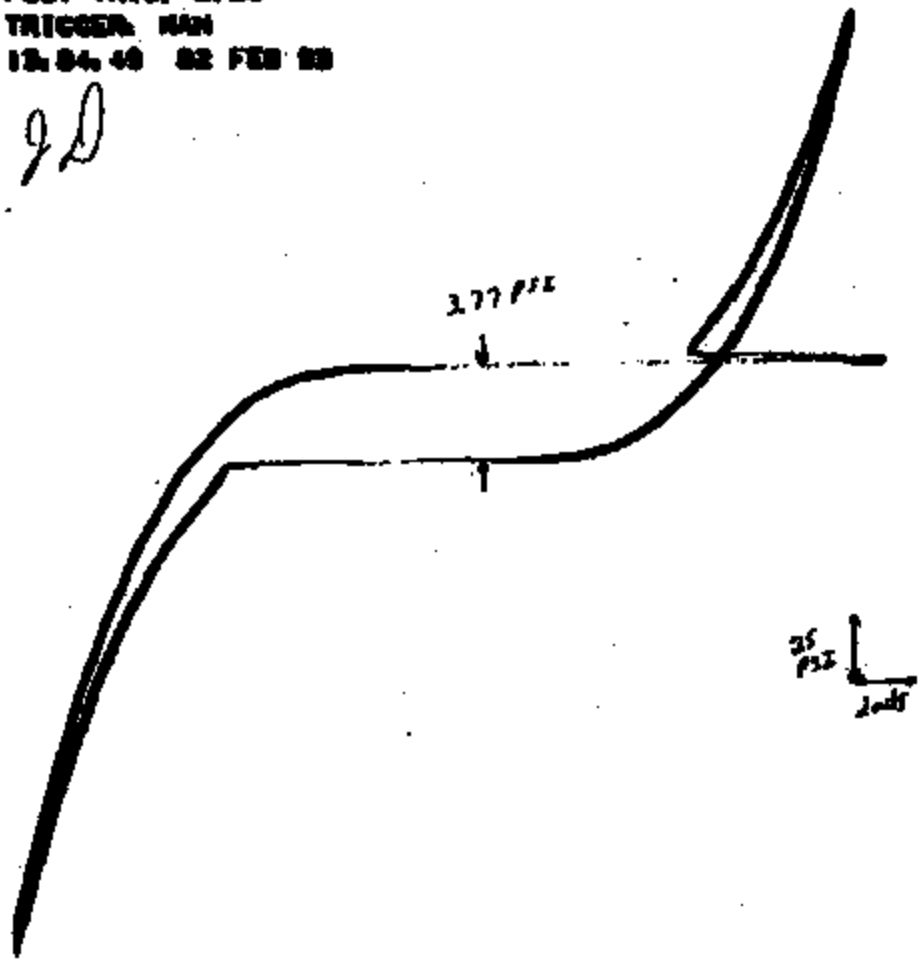


TI-NHTSA 011920

RANGES: 325.0mV 10.00V 4.000V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.000
POST-TRIG: 0.00
TRIGGER: RUN
13:04:40 02 FEB 93

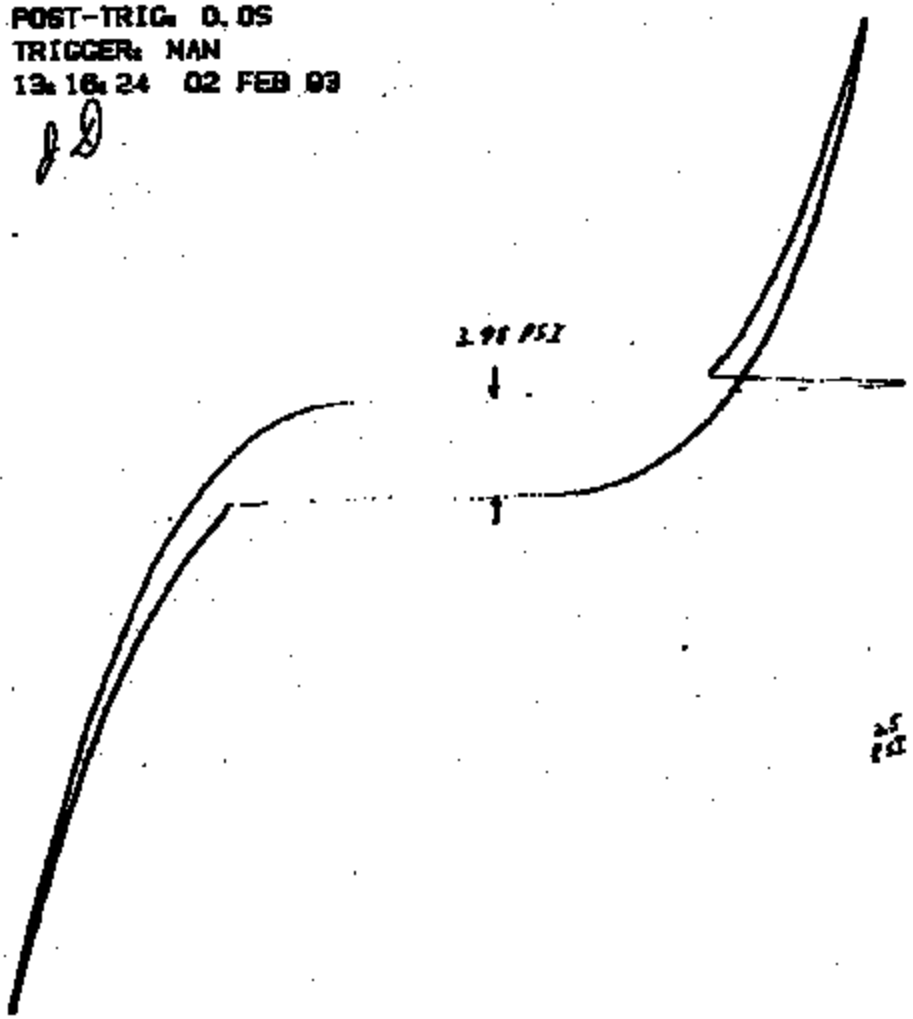
JD

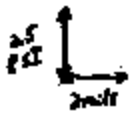
Curve "A"



RANGES: 225.0mV 10.00V 4.900V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.00S
POST-TRIG: 0.0S
TRIGGER: MAN
13: 16: 24 02 FEB 93

Curve "C"

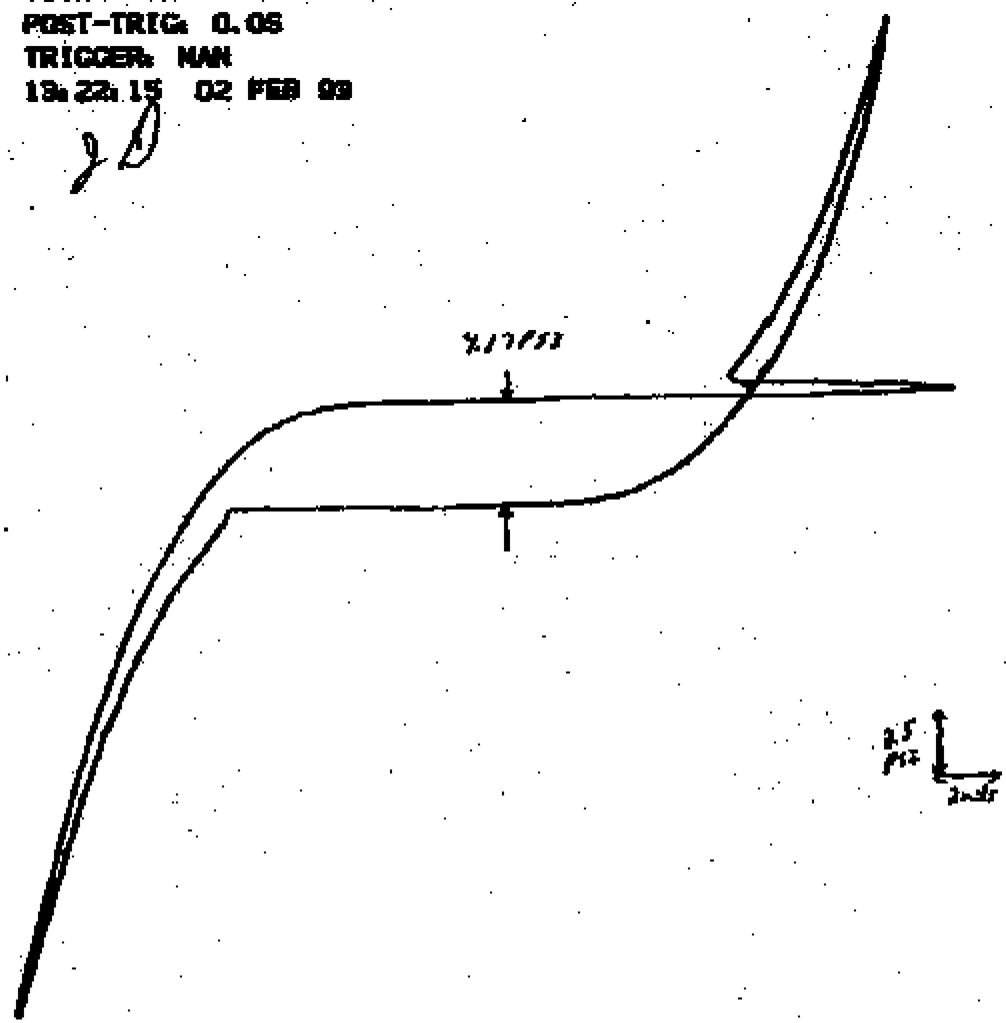




TI-NHTSA 011822

RANGES: 225.0mV 10.00V 4.900V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.00S
POST-TRIG: 0.0S
TRIGGER: MAN
19:22:15 02 FEB 93

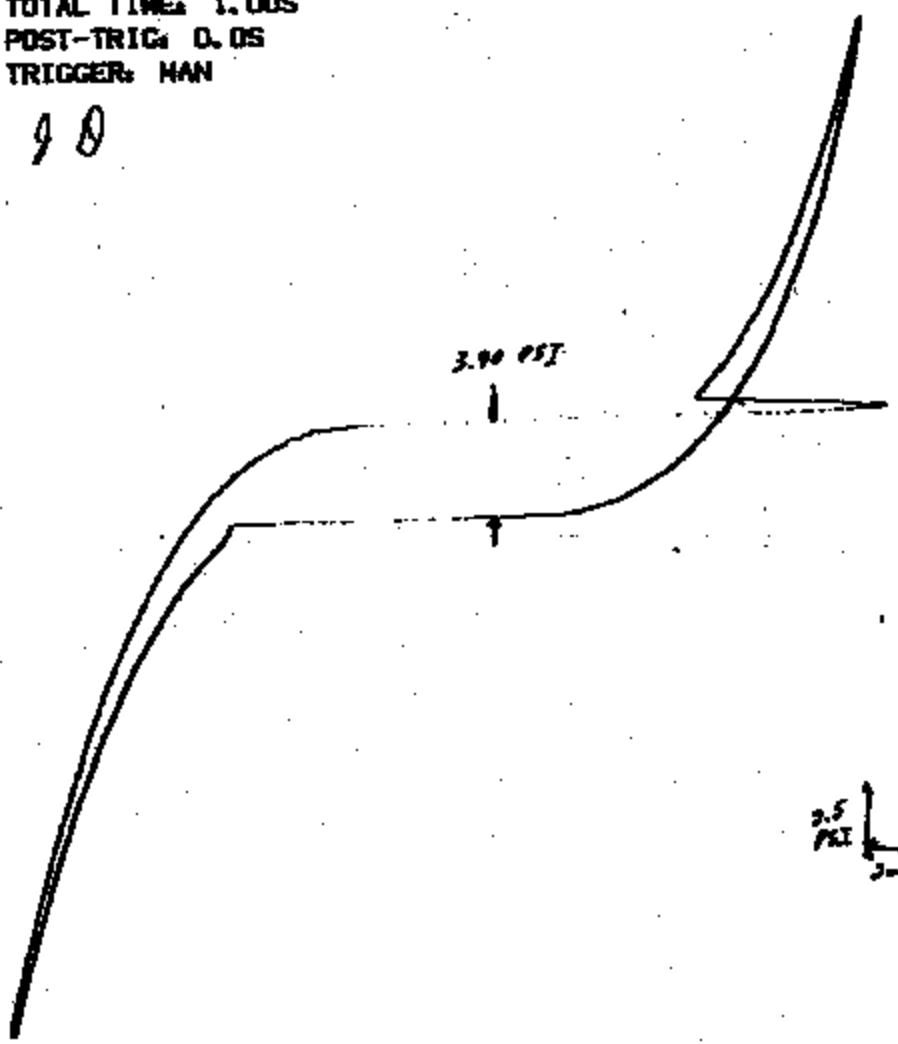
Curve "D"



RANGES: 225.0mV 10.00V 4.900V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.00S
POST-TRIG: 0.0S
TRIGGER: MAN

10

Curve "E"



2.5 PSI
1 sec

TI-NHTSA 011524

RESSURE SWITCH DATA Form 21605 TEST NO: 376-07-30

DEVICE	DATE REQUESTED	REQUESTED BY	REQUESTED COMPL. DATE
7 PS	930129	Alex Robert	

PERFORMED BY	DATE STARTED	DATE COMPLETED	APPROVED BY
Jeffrey D'Amico	930130		

ROJECT TITLE: Cruise Control

CUSTOMER:

PURPOSE OF TEST: To determine the effects of impulse on preloaded disc

PROCEDURE: Test stopped 1149K cycles

Device #	Sensor Style	Pre-Test Height	Post-Test Height	Preload	Pre-Set	Base	Pin	Act Val	Mv Ref
376-01	1	46.7	46.6	4.6	51.3	91.0	142.3	122 104	4.5
-02	1	46.9	46.9	4.6	51.0	91.4	142.9	120 102	5.7
-03	1	46.2	46.3	9.3	55.0	96.9	141.9	136 119	6.4
-04	1	46.4	46.4	9.3	57.0	96.7	143.5	165 147	5.0
-05	1	46.4	46.3	-	-				
-06	1	46.0	*46.0	-	-				
376-07	2	46.7	46.4	4.9	51.6	91.2	142.9	133 108	6.1
-09	2	46.3	46.0	4.9	51.2	91.2	142.4	124 100	5.5
-10	2	[redacted]	46.4	9.3	55.5	96.8	142.3	130 113	5.2
-10	2	46.8	46.8	8.9	55.7	93.2	143.4	142 124	4.9
-11	2	46.7	46.4	-	-				
-12	2	46.7	46.9	-	-				
376-13	3	47.1	46.9	4.3	51.4	91.7	143.1	128 105	5.2
-14	3	47.7	47.4	4.3	52.0	91.[illegible]	143.1	113 100	5.3
-15	3	47.1	46.9	9.3	56.4	96.9	142.3	130 119	4.8
-16	3	47.4	47.3	9.3	56.7	96.2	142.9	146 132	5.0
-17	3	46.7	46.7	-	-				
-18	3	47.2	47.1	-	-				
376-19	4	47.7	47.7	2.8	49.7	91.7	141.4	85 68	5.9
-20	4	47.8	47.7	2.0	49.6	91.9	141.4	111 93	5.7
-21	4	48.0	47.9	11.8	59.8	96.8	146.6	361 316	4.8
-22	4	48.3	48.3	11.9	60.7	96.6	147.3	>350 425	4.3
-23	4	48.7	48.6	-	-				
-24	4	50.6	50.4	-	-				

TI-NHTSA 011525

(OVER)

Device #	Sensor Style	Pre-vac height	Post-vac height	Pickup	Pin-Base	Base	Pin	act rel	Mv drop
376-03-25	5	51.2	51.3	3.7	54.4	96.7	141.3	121 90	5.
-26	5	51.1	51.0	3.2	54.3	96.6	140.9	107 84	6.0
-27	5	51.2	51.3	9.9	61.1	96.1	142.2	< 1000	9.8
-28	5	51.5	51.5	9.9	61.3	96.9	142.7	< 1000	6.9
-29	5	51.2	51.2	-	—				
-30	5	49.9	49.7	-	—				

Device #	3000 cyc act rel	125 mV drop	act rel	mV drop	Remarks
376-03-01	127 100	15.7	125 100	73.4	
-02	126 97	6.9	127 98	58.7	
-03	143 115	7.8	138 115	22.1	Leak 1199K
-04	164 135	17.1	157 129	71.7	
-05	sensor				
-06	control				
376-03-07	134 106	7.6	130 105	17.2	Leak: 1149K
-08	139 109	8.6	136 107	13.2	Leak: 1193K cyc
-09	134 109	9.6	132 109	53.0	
-10	141 116	21.9	131 107	24.3	
-11	sensor				
-12	control				
376-03-13	126 97	7.9	123 100	16.2	
-14	112 87	15.8	109 87	68.1	T-Shift
-15	130 106	13.8	125 104	35.8	
-16	143 121	36.8	138 115	39.7	
-17	sensor				
-18	control				
376-03-19	95 77	25.4	99 79	26.6	T-Shift
-20	116 90	18.0	113 91	20.5	
-21	307 264	17.1	277 240	63.7	
-22	438 363	24.2	390 341	34.6	
-23	sensor				Leak: 1170K
-24	control				
376-03-25	122 [illegible]	16.2	118 93	125.9	
-26	121 [illegible]	23.8	117 96	34.8	
-27	>1000	24.3	>1000	62.4	Leak: 1144K cyc
-28	>1000	20.3	>1000	61.7	
-29	sensor				
-30	control				

Device #	Sensor Style	Preload	Actuation	Release	Cyc. to fail	Remarks
376-03-01	1	4.6	122	104		
376-03-02	1	4.6	120	107		
376-03-03	1	8.8	136	119	1249 K	
376-03-04	1	8.8	165	147		
376-03-05	1	sensor only				
376-03-06	1	sensor only				
376-03-07	2	4.9	133	108	1187 K	
376-03-08	2	4.9	134	108	1143 K	
376-03-09	2	8.9	130	113		
376-03-10	2	8.9	143	124		
376-03-11	2					
376-03-12	2					
376-03-13	3	4.3	122	105		
376-03-14	3	4.3	113	100		Thermal shift
376-03-15	3	9.3	130	119		
376-03-16	3	9.3	146	133		
376-03-17	3	sensor only				
376-03-18	3	sensor only				
376-03-19	4	2.0	105	88		Thermal shift
376-03-20	4	2.0	111	93		
376-03-21	4	11.8	351	326		
376-03-22	4	11.8	~750	455		
376-03-23	4	sensor only			1170 K	
376-03-24	4	sensor only				
376-03-25	5	3.2	121	99		
376-03-26	5	3.2	108	84		
376-03-27	5	9.8	>1000		1144 K	
376-03-28	5	9.8	>1000			
376-03-29	5	sensor only				
376-03-30	5	sensor only				

TEST376.XLS
JAD 2/22/93

77PS DISC PRE-DEFLECTION STUDY

OBJECTIVE: TO DETERMINE EFFECT OF DISC PRE-DEFLECTION ON DEVICE LIFE.

NOTE: ALL CRIMPING TO BE DONE ON AMI/FAM

1. BUILD SENSORS PER THE FOLLOWING MATRIX Use quiet Ca dies

SENSOR STYLE	CUP	# OF SPACERS	# OF SENSORS
1	27713-1	1	6
2	27713-1	2	6
3	27713-2	1	6
4	27713-2	2	6
5	27713-2	3	6
6	27713-2	4	6

2. MEASURE SENSOR HT. PRE-POST VACUUM
3. RUN SENSOR CURVES ON ALL SENSORS
4. BUILD DEVICES PER FOLLOWING MATRIX

NOTE: DETERMINE MAX/MIN PIN PRE-LOAD FROM CHART ON PRODUCTION LINE. 77PSLS-2

DEVICE	SENSOR	PIN PRE-LOAD	# OF DEVICES
1	1	MAX	2
2	1	MIN	2
3	2	MAX	2
4	2	MIN	2
5	3	MAX	2
6	3	MIN	2
7	4	MAX	2
8	#4	MIN	2
9	#5	MAX	2
10	#5	MIN	2
11	6	MAX	2
12	6	MIN	2

5. CALIBRATE DEVICES FOR ACT/REL/MV DROP

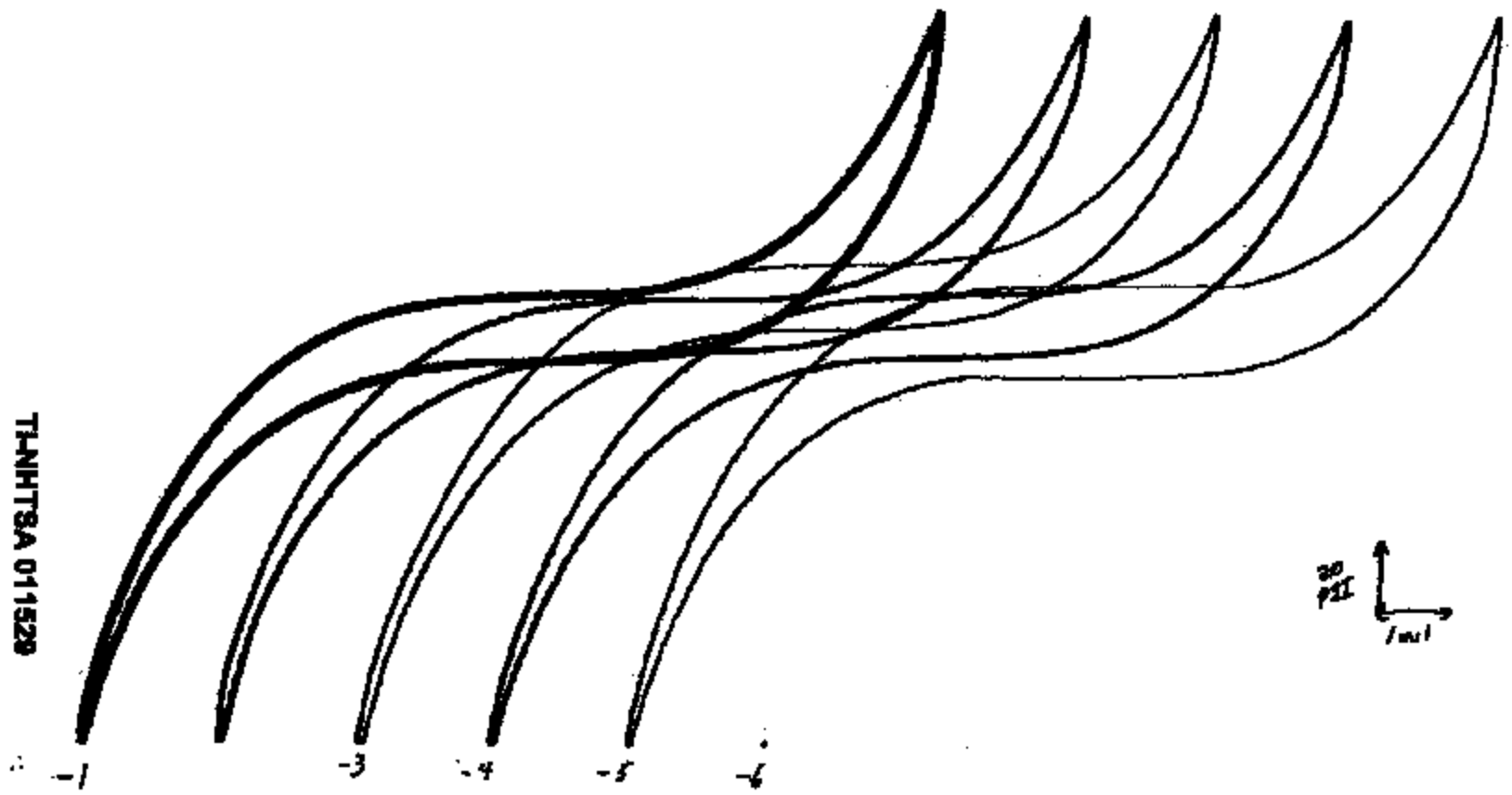
6. RUN IMPULSE TEST: 0-1450 PSI, 135 C, 3 HZ, DEVICES POWERED UP ?
   EVERY 24 HRS:
   RECORD # OF CYCLES COMPLETED
   CALIBRATE DEVICES
   RUN CURVES ON SENSORS

RUN IMPULSE TEST TILL EVERY SENSOR / DEVICE FAILS OR 3 MILLION CYCLES WHICHEVER COMES FIRST.

RANGES: 720.0mV 10.00V 2.450V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.00S
POST-TRIG: 0.0S
TRIGGER: MAN
09:11:29 04 FEB 92

9 D

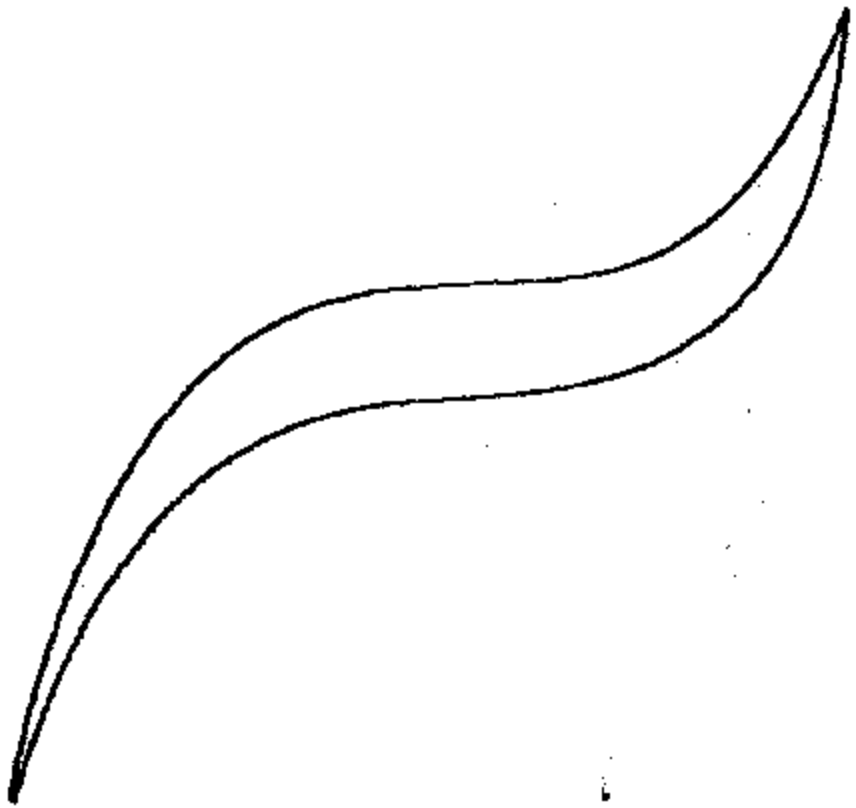
Test 376-03-30
22713-1 Cap
Spacer
Sensor Style 1
Pre-Impulse



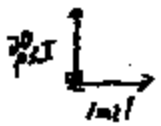
RANGES: 720.0mV 10.00V 2.458V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.00S
POST-TRIG: 0.0S
TRIGGER: MAN
10:02:11 09 FEB 93

JD

Test 576-03-30
22713-1 Cap
1 Spacer
Sensor Style 2
500 K impulses, 0-1400 PSI



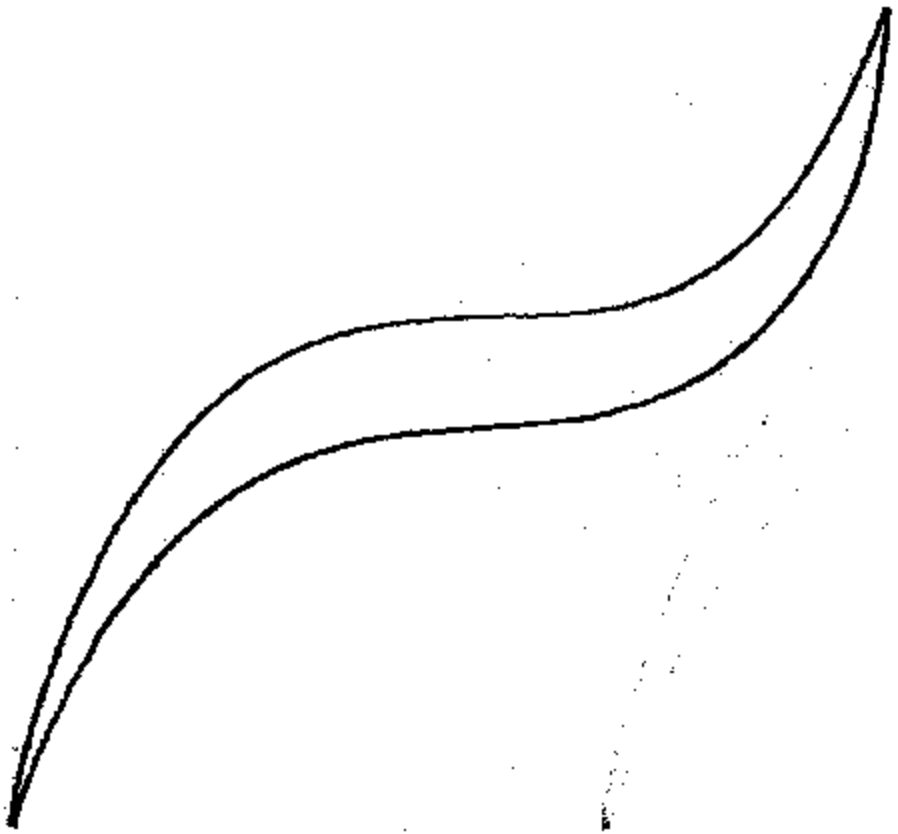
TI-NHTSA 011530



RANGES: 720.0mV 10.00V 2.400V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.000
POST-TRIG: 0.00
TRIGGER: MAN
08:58:04 11 FEB 93

JD

Test 376-03-26
22713-1 Cal
1 Spacer
Sensor Style 1
500K impulses, 0-1000 PSI
500K impulses, 0-1450 PSI



20 PSI
1 in

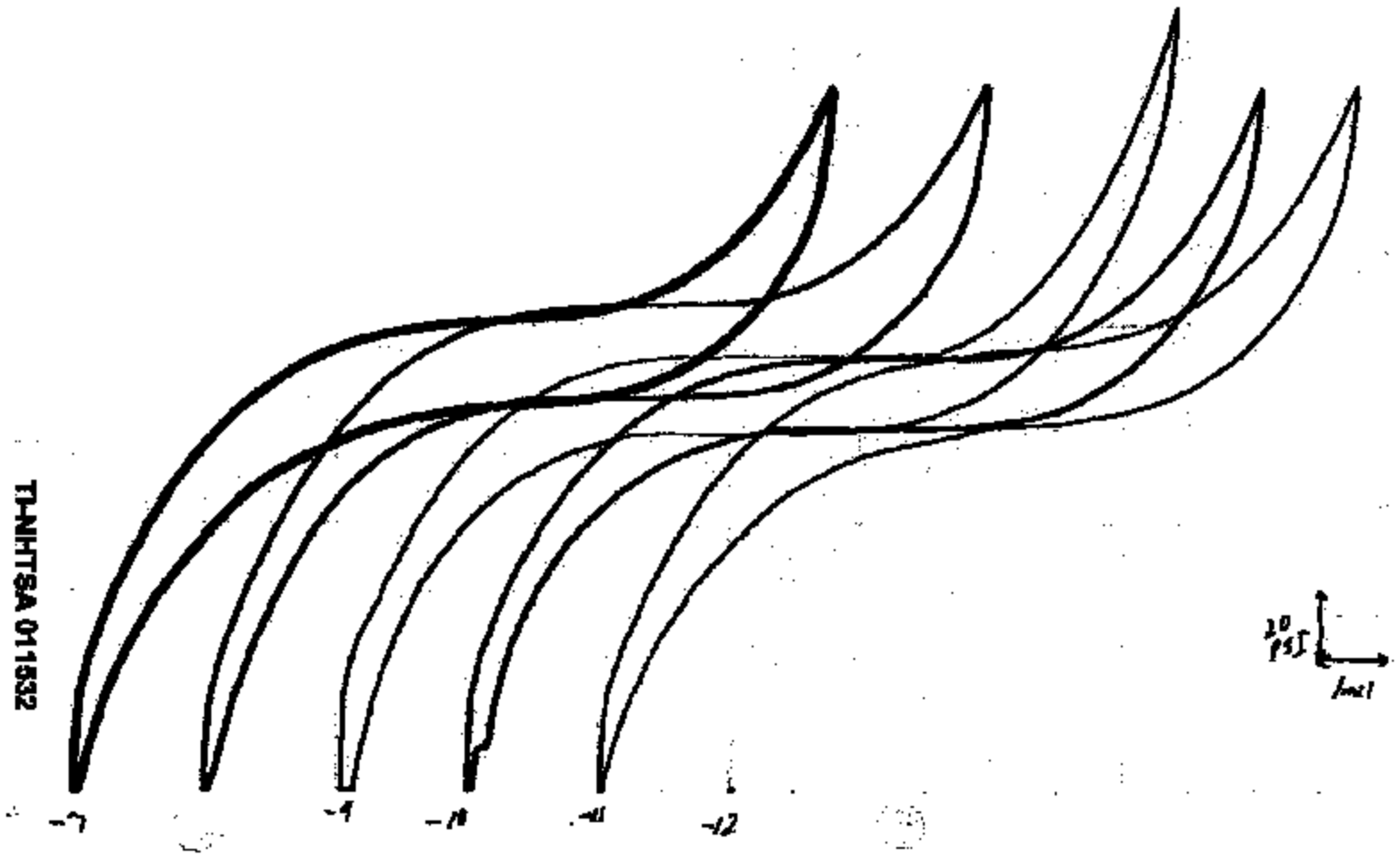
TI-NHTSA 011531

-5

-6

RANGES: 720.0mV 10.00V 2.450V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.00S
POST-TRIG: 0.0S
TRIGGER: MAN
09:49:05 04 FEB 99

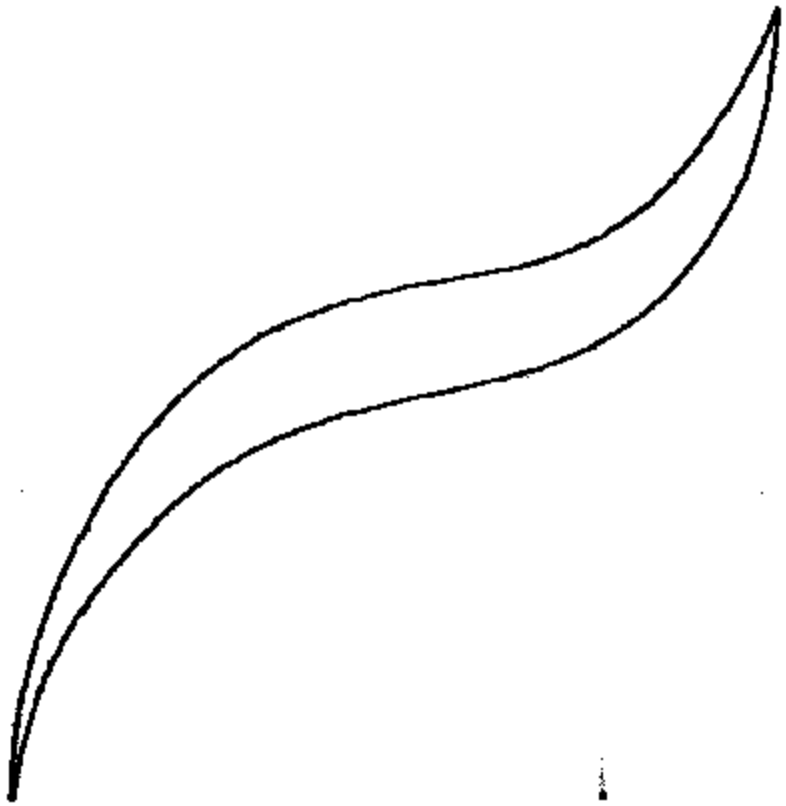
Test 376-03-30
22713-1 Cap
2 spaces
Sensor Style 2
pre-impulse

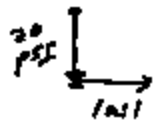


RANGES: 720.0mV 10.00V 2.450V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.00S
POST-TRIG: 0.0S
TRIGGER: MAN

JD

Test 376-03-30
27713-1 Cup
2 spacers
Season Style 2
500 K impulses, 0-1000 PSI

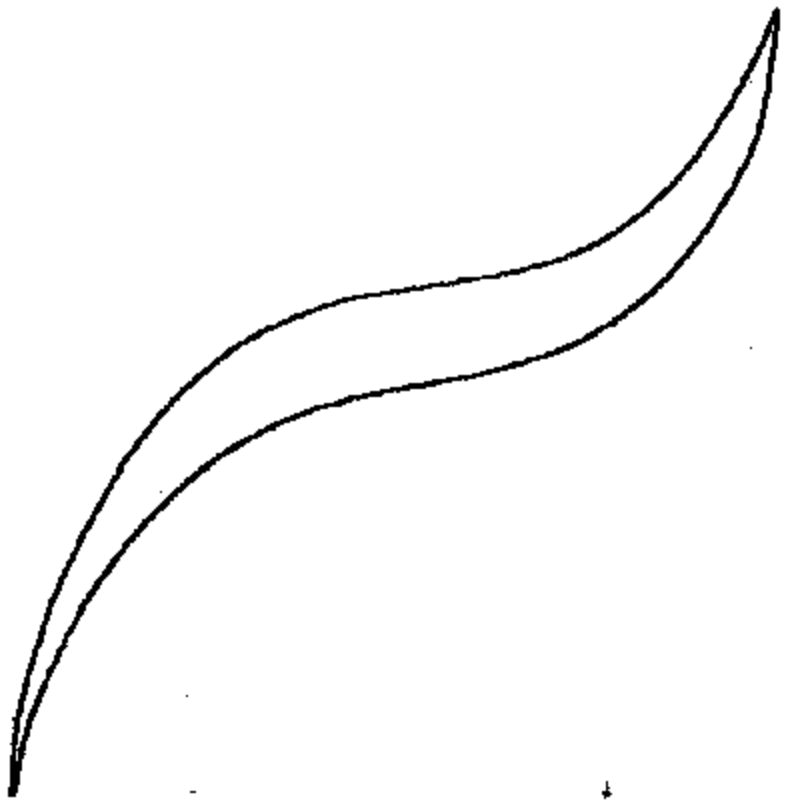




TI-NHTSA 011533

RANGES: 720.0mV 10.00V 2.450V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.00S
POST-TRIG: 0.0S
TRIGGER: MAN
10: 15: 42 11 FEB 93

Test 376-05-30
27913-1 cal
2 Spacers
Sensor Style 2
500K Impulses, 0-1000 PSI
500K Impulses, 0-1450 PSI

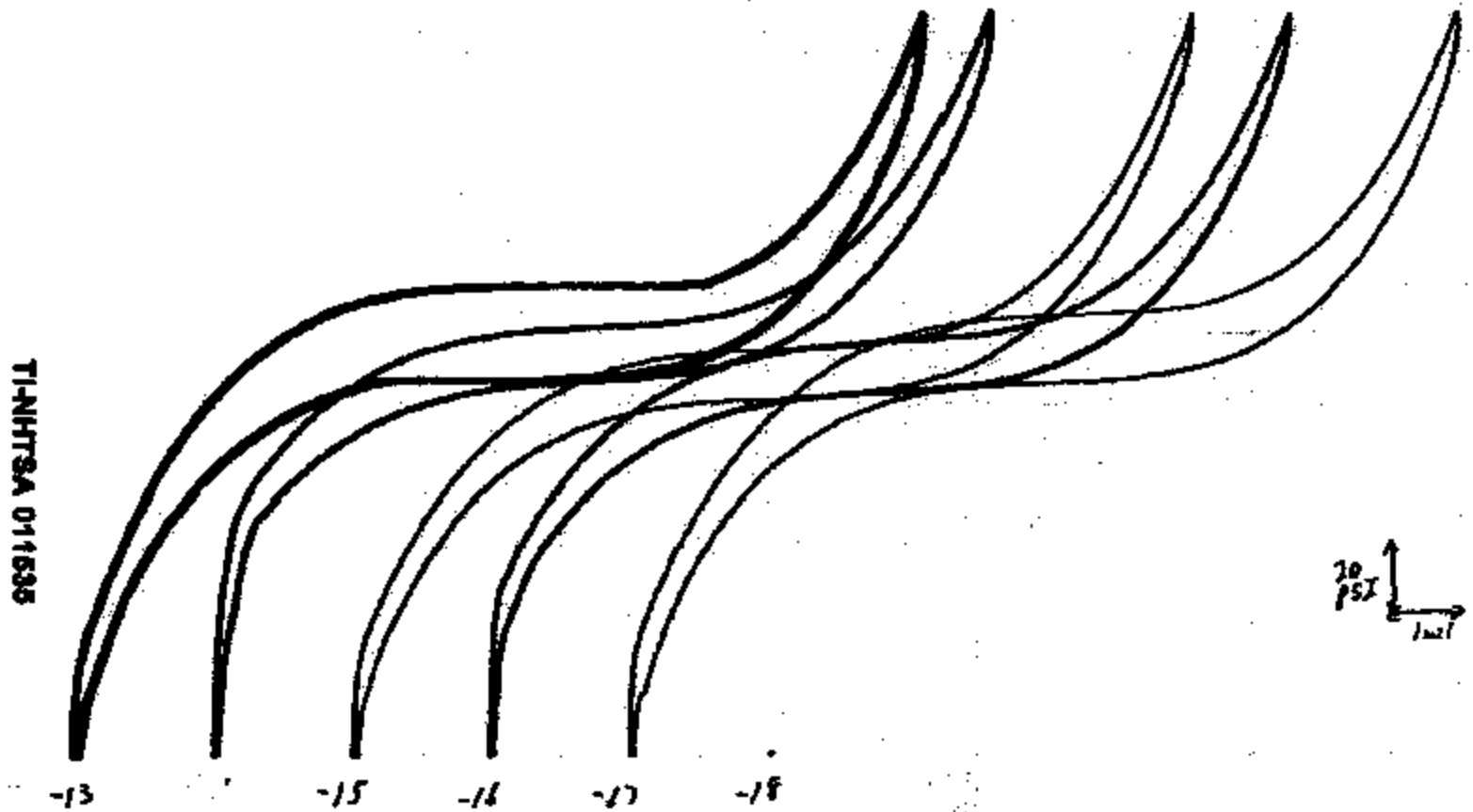


TI-NHTSA 011534

RANGES: 720.0mV 10.00V 2.450V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.00S
POST-TRIG: 0.0S
TRIGGER: NAN
10:17:34 04 FEB 99

Test 376-03-30
22713-2 cup
1 spacer
sensor style 3
pre-impulse

10

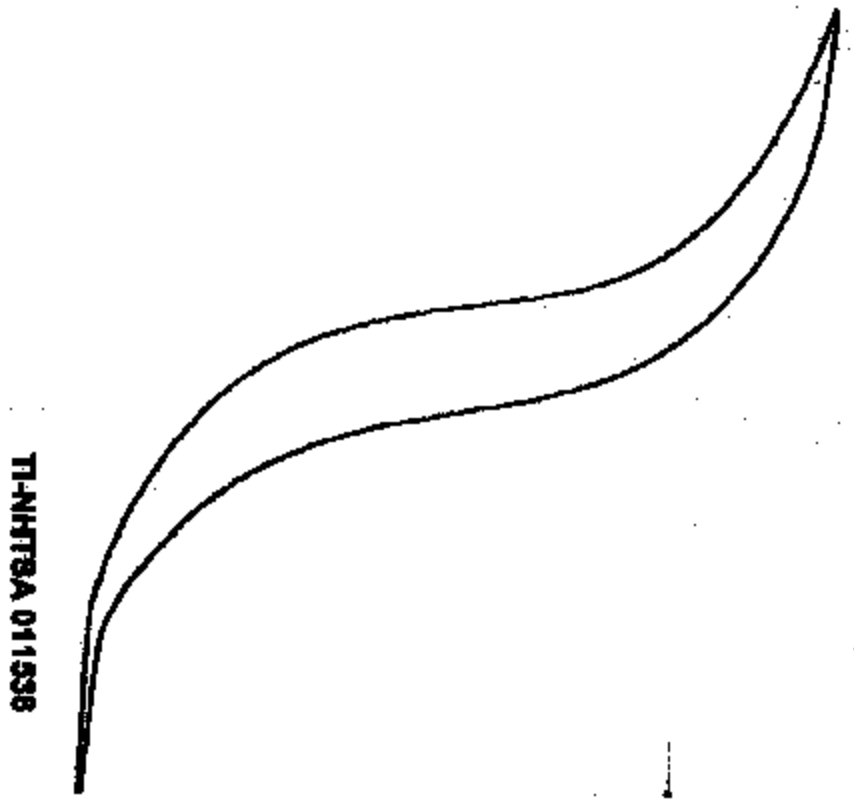


TI-NHTSA 011696

RANGES: 720.0mV 10.00V 2.450V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.00S
POST-TRIG: 0.0S
TRIGGER: MAN

JD

Test 376-03-30
27713-2 Cap
1 spacer
Sensor Style 3
500K ; 0-1000 PSI



TI-NHTBA 01538

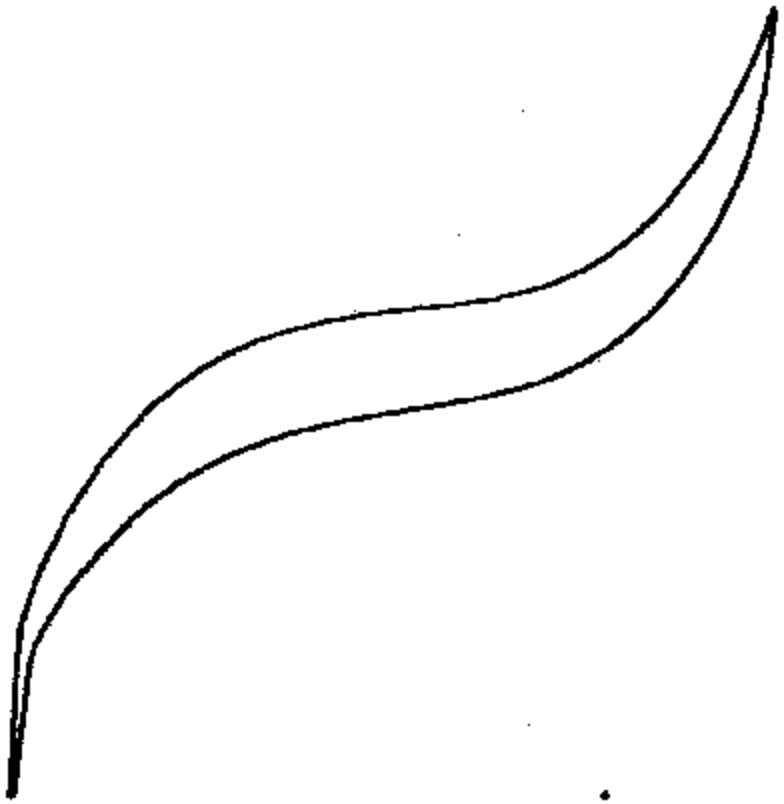
20 PSI
Init

-17

-19

RANGES: 720.0mV 10.00V 2.450V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.00S
POST-TRIG: 0.0S
TRIGGER: MAN
10:22:47 11 FEB 93

Test 326-03-30
27713-2 Cap
1 spacer
Sensor Style 5
500 K impulses, 0-1000 PSI
500 K impulses, 0-1950 PSI



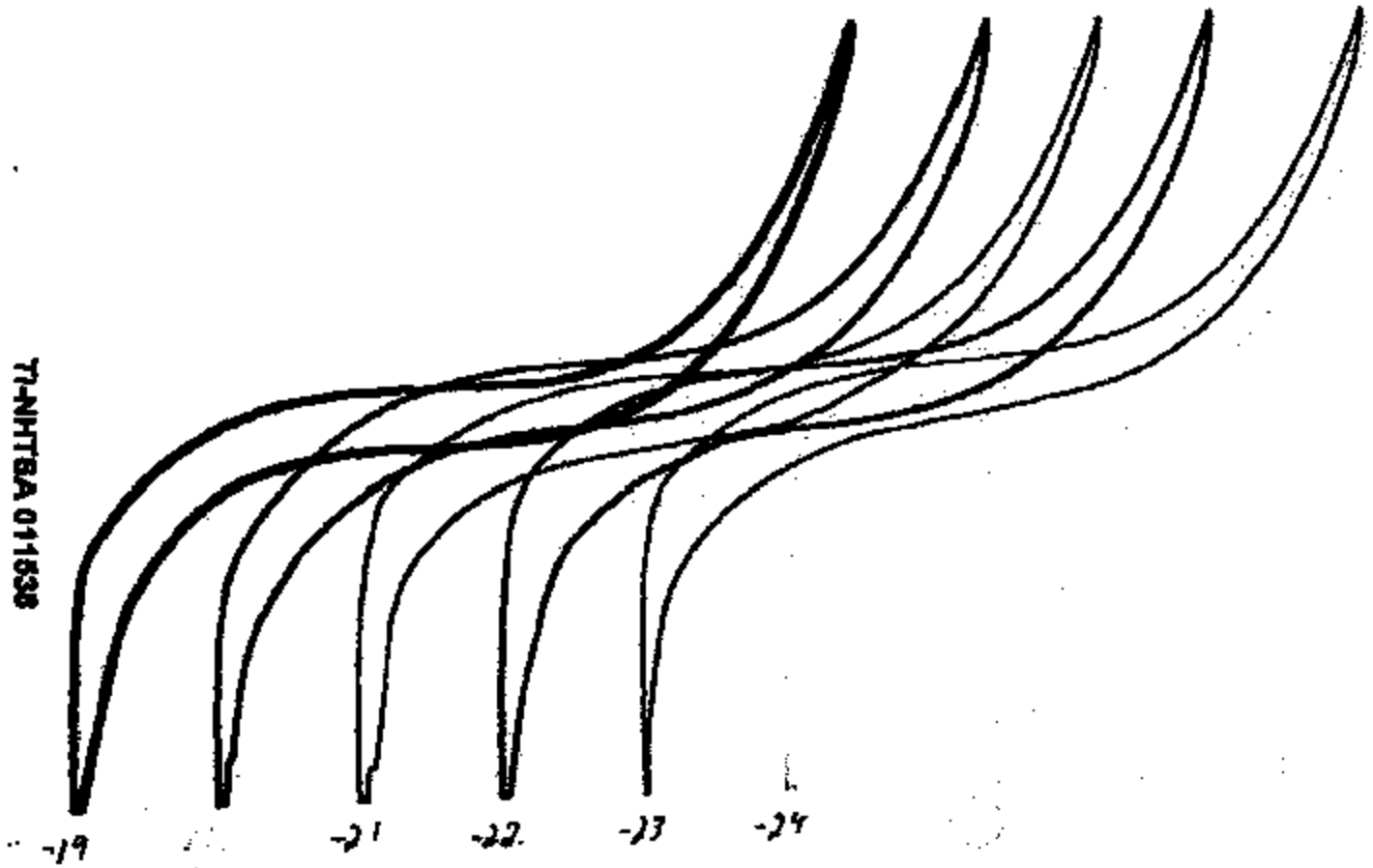
TMHTSA 011537

20 PSI
1 in.

RANGES: 720.0mV 10.00V 2.450V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.00S
POST-TRIG: 0.0S
TRIGGER: MAN
10:40:19 04 FEB 99

Test 376-03-30
27713-2 cup
2 spares
sensor style 4
pre-impulse

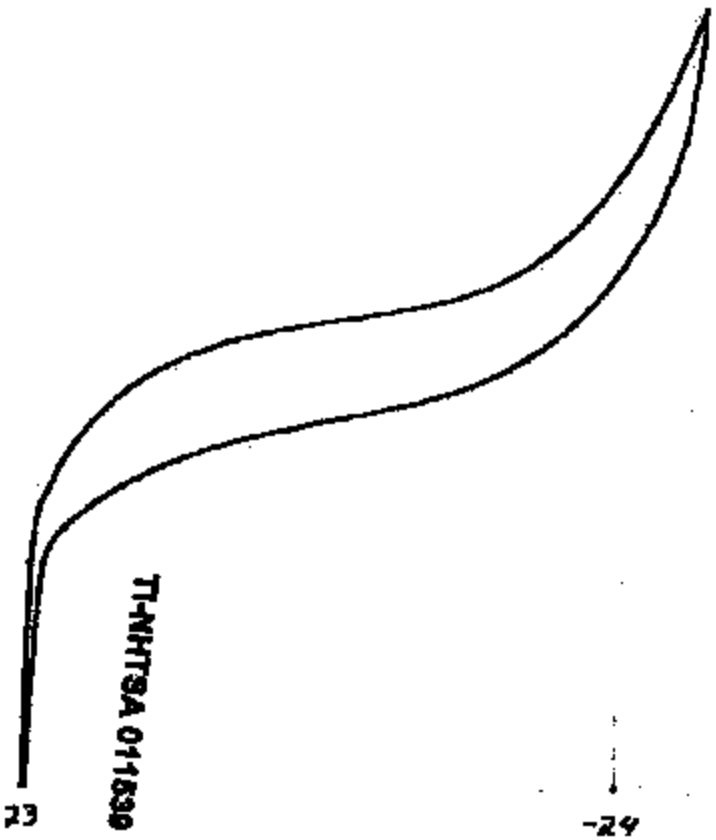
J D



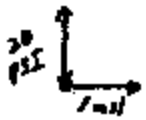
TI-NHTSA 011638

RANGES: 720.0mV 10.00V 2.450V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.00S
POST-TRIG: 0.0S
TRIGGER: MAN
10: 19: 58 09 FEB 99

Test 376-03-3#
27713-2 Cap
2 spacers
sensor style 9
600 K impulses, 0-1000 PSI



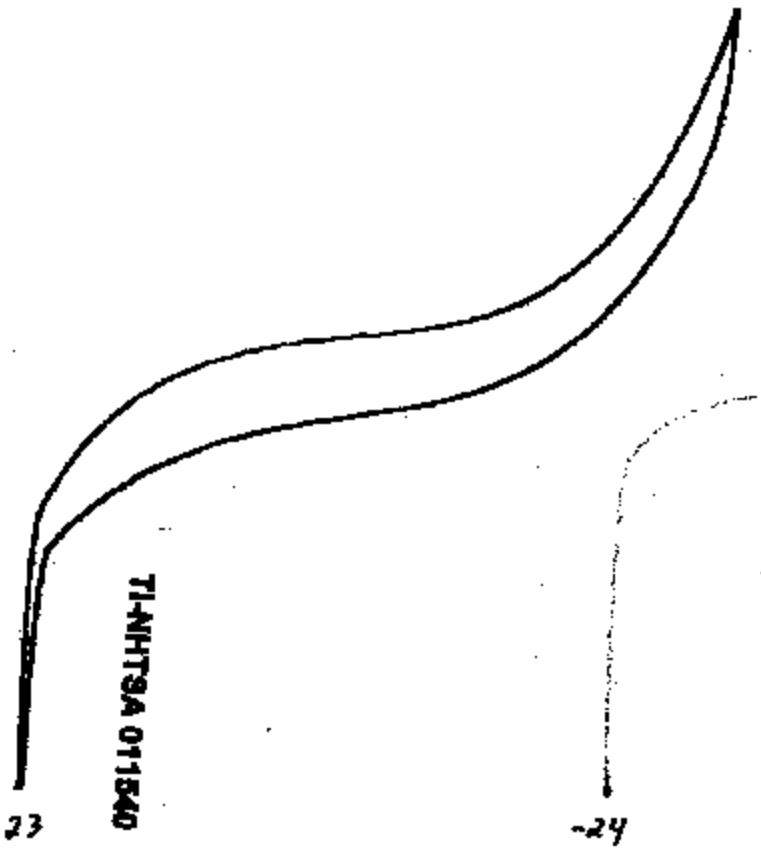
TI-NHTSA 011539



RANGES: 720.0mV 10.00V 2.450V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.00S
POST-TRIG: 0.0S
TRIGGER: MAN
10:30:03 11 FEB 93

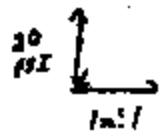
JD

Test 771-03-30
27713-2 Cap
2 Spacers
Sensor Style 4
500 K impulses, 0-4000 PSI
500 K impulses, 0-1450 PSI



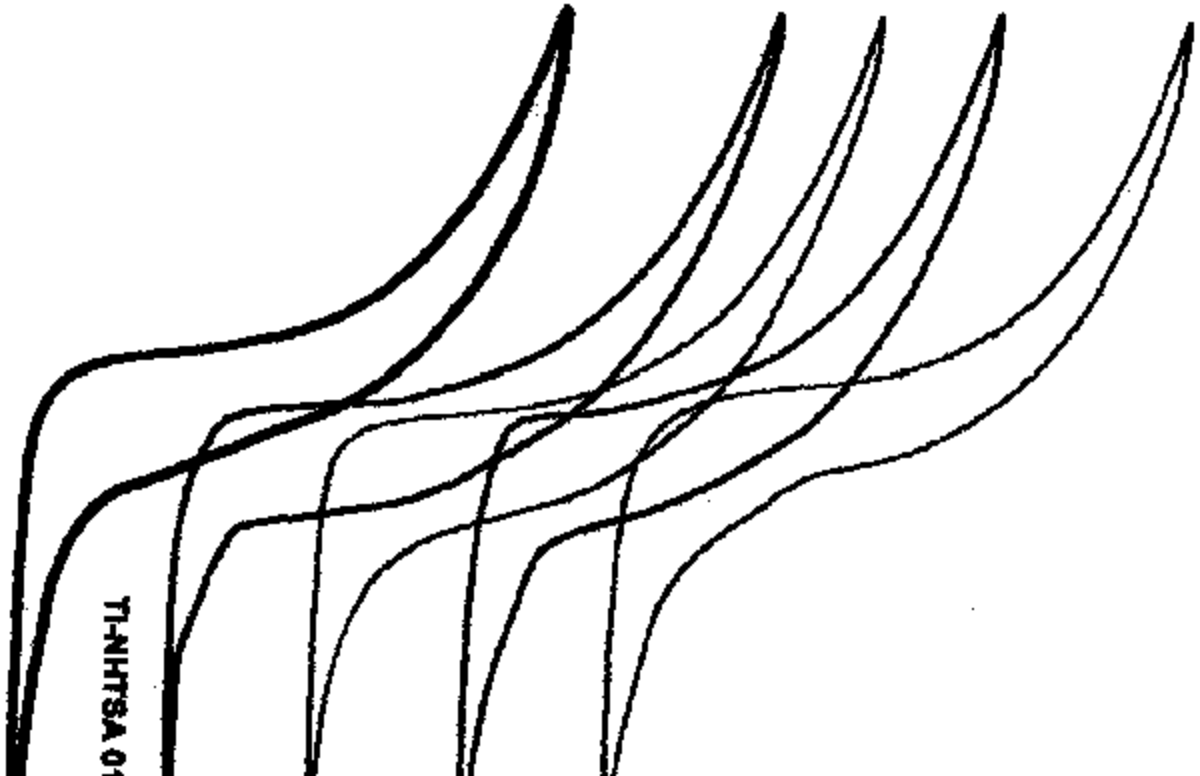
-23

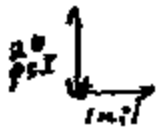
-24



RANGES: 720.0mV 10.00V 2.450V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.00S
POST-TRIG: 0.0S
TRIGGER: MAN
11:17:40 04 FEB 93

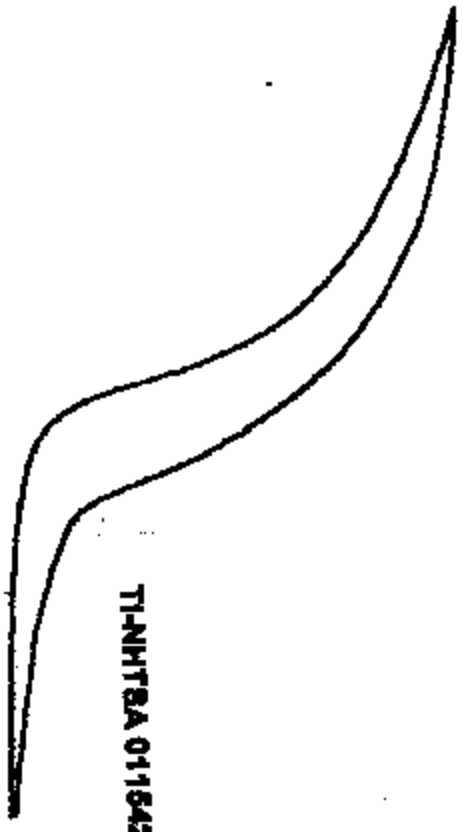
Test 376-03-30
22262-2 cap
3 spares
Sensor style 5
pre-impulse





Test 376-03-30
27713-3 Cal
3 spacers
Sensor Style 5
500 k impulses, 0-1000 PSI

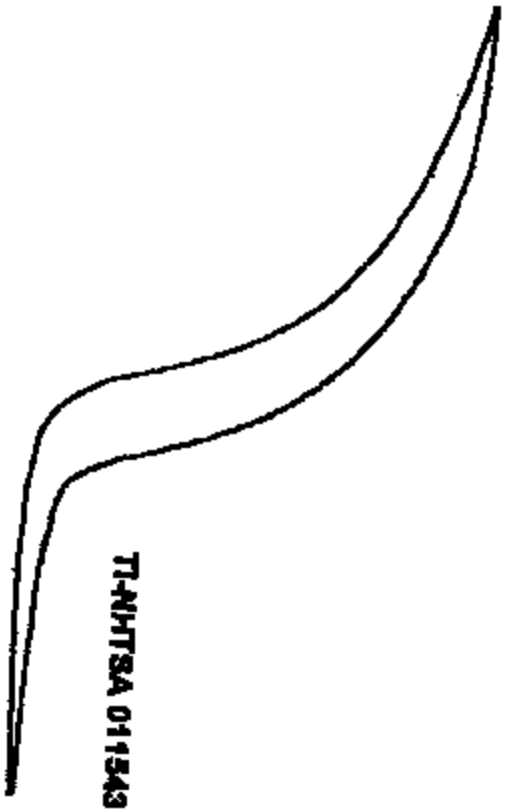
RANGES: 720.0mV 10.00V 2.450V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.00S
POST-TRIG: 0.0S
TRIGGER: MAN
10:25:30 09 FEB 93

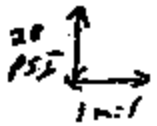


RANGES: 720.0mV 10.00V 2.450V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.00S
POST-TRIG: 0.0S
TRIGGER: MAN
10:37:31 11 FEB 93

JD

Test 376-03-10
27713-3 Cap
sensor Style 5
3 spacers
500 K impulses, 0-1000 PSI
500 K impulses, 0-1450 PSI





2/2/93

TEST # 381-15-10

77PS QUIET DISC 36856-35
ULTRA LOW DIFFERENTIAL DISCS
SENSOR CURVE STUDY

SEE ADC SHEET FOR DISC LOT DETAILS

DISC CURVES ARE O.K. FOR PILOTING.

MEMORANDUM

TO: DAVE CZARN

FR: AZIZ RAHMAN

RE: HIGHLIGHTS FOR WEEK ENDING 2/5/93

77PSLZ-1 PASS-CAR; SNAP

RECEIVED 2 DEVICES FROM PITTS FOR AIR LEAKS AT 6 PSI. CONFIRMED LEAKS IN LAB THROUGH SOAPY WATER BUBBLES. ONE DEVICE LEAKED AT THE CRIMP RING/HEXPORT INTERFACE AND THE OTHER DEVICE LEAKED THROUGH THE TERMINALS. LEAKS WERE NOT CAUGHT UPON TESTING ON THE PRODUCTION LINE TESTER. ROOT CAUSE WAS DETERMINED TO BE GROSSLY OUR OF PLACE GASKET IN THE HEXPORT. LEVEL OF CONCERN AT PITTS IS UNKNOWN. THEY TEST 100% OF THE SWITCHES FOR LEARS. AS A LONG TERM SOLUTION MFG. ENGG IS PURSUING GASKET PROBE MODIFICATIONS. TEAM IS MEETING TODAY TO DECIDE ON SHORT TERM ACTIONS. Q.C. NEEDS TO RESPOND BACK TO PITTS TODAY VIA 8-D REPORT.

77PSL5-2 SHO TAURUS; QUIET

LAST 4 PILOT/PRODUCTION LOTS WERE CHECKED IN THE LAB FOR SENSOR CURVES AND FOUND TO HAVE CONSIDERABLE AMOUNT OF PRE-DEFLECTION. 750K CYCLE IMPULSE TEST DID NOT SHOW ANY FUNCTIONAL PROBLEMS. WE ARE RUNNING A TEST IN THE LAB TO ESTABLISH WORST CASE ACCEPTABLE PRE-LOAD. TEST TO BE COMPLETED NEXT WEEK.

77PSL6-1; CAPRI

BCIA OBSERVED TEFLON PEELING OFF OF O-RINGS. AS IN INTERIM SOLUTION WE HAVE PROPOSED REVERTING BACK TO A BLACK O-RING. CHRIS IS LOOKING INTO OTHER MEANS OF COLORING/CODING THE O-RING TO AVOID PARTS MIXUP.

VALIDATION TEST IS RUNNING ON SCHEDULE. THERMAL CYCLE HAS BEEN COMPLETED. WE ARE PROJECTING COMPLETION OF REMAINING TESTS BY THE END OF NEXT WEEK, WELL IN TIME FOR ISW SUBMISSION TARGETED FOR MID-MARCH.

77PSL4-1; FALCON

M10 HEXPORT HAS NOT YET BEEN RELEASED DUE TO DELAYED RESPONSE FROM ELCO. WE HAVE REACHED CRITICAL PATH ON THIS COMPONENT, SINCE IT HAS BEGUN TO IMPACT VALIDATION TESTING SCHEDULE TARGETED TO BEGIN 4/20 IN ORDER TO MEET ISW SUBMISSION DATE OF 6/4. MFG. ENGG FOLLOWING UP.

80PS; HONDA

PRODUCTION DWGS ARE IN THE PROCESS OF BEING FINALIZED. OPEN DESIGN ITEMS STILL NEEDING CLOSURE ARE HEX SIZE, SPEC RESOLUTION AND ISW SUBMISSION REQUIREMENTS. WILL CLOSE WITH MITSUO TODAY TO FORM ACTION PLAN TO ADDRESS ALL OPEN ITEMS.

CYCLER: ALL REQUIRED MAJOR COMPONENTS HAVE BEEN ORDERED. ROGER HAS STARTED WORK ON THE HYDRAULIC PORTION OF THE SYSTEM. TARGET COMPLETION DATE IS 3/15.

MSG MBP 359717 FR=JW02 TO=MJS2 SENT=02/11/99 03:14 PM
R=P103 ST=C DIV=0050 CC=00149 BY=JW02 AT=02/11/93 03:14 PM
BCON.WHLZ,RCS2,MFPC,GJS1,JW02

Memorandum
February 11, 1993

TO:	Dick Gariepy	RWG3	Tom Burke	TEB7
	Bruce Wright	MFPC	Dennis Natale	DJN1
	Aziz Rahman	ZIZ	Dave Czarn	ZARN
	Bill Congdon	BCON	Elaine Rose	GAMY
	Andy McGuirk	PCQA	[redacted]	MJS2
	Gary Snyder	GJS1	Charlie Douglas	CMP1
	Bill Sweet	WS4	Norm Freda	WHLZ
	Rusty Struble	RCS2	Rick Conlin	RAC1

FROM: Jim Watt JW02

SUBJ: Update On 77PSL2-1 Leaking PS At Pitts Industries

Next update meeting on the 77PSL2-1 leaking switch from Pitts Industries:

Date: Friday, 02/19/93

Time: 1:30 p.m.

Place: Bldg 12 Cafeteria

The third leaker returned by Pitts has been confirmed to be a leaker, again caused by a misplaced gasket. So all three Field leaker returns from Pitts have been caused by a misplaced gasket.

Please bring a draft timeline to address the ideas discussed below. (This is a Ford 8D requirement to characterize each action with a plan).

Ideas discussed from last meeting:

1. Test sensors for leak at sensor assembly; assess testing approach, location on the AMI machine, ... (process)

2. Assess potential for automated gasket location detector at AMI machine. (process)

3. Assess alternative leak detection at final assembly machine. (process)

4. Assess differential probe potential at sensor assembly to detect out of position gasket. (process)

5. Discriminate height after assembly of sensor, but prior to crimp. ... (process)

6. Assess hexport serrations at sealing surface to create radial leak path to detect misplaced gasket. (design)

7. Design feature in hexport gland to create significant height differential in the event of misplaced gasket. (design)

[redacted]

REPORT OF ISA TESTING
FORD PASSENGER CAR
ELECTRONIC SPEED CONTROL
DEACTIVATION PRESSURE SWITCH
PS/93/11

[redacted]

[redacted]

TI-NHTSA 011547

REPORT OF ISR TESTING
FORD PASSENGER CAR
ELECTRONIC SPEED CONTROL
DEACTIVATION PRESSURE SWITCH
PS/93/11

TEXAS INSTRUMENTS INCORPORATED
CONTROL PRODUCTS DIVISION
PRECISION CONTROLS DEPARTMENT
34 FOREST STREET
ATTLEBORO, MA 02703
U.S.A.

TEST LOT NO. 170-15-36	TEST ISR TESTING	DEVICE 77PSL6-1
TESTED BY J. Didomenico	TEXAS INSTRUMENTS MATERIALS & CONTROLS GROUP ATTLEBORO, MA 02703	DOC. PS/93/11
APPROVED BY A. Rahman		PAGE
DATE 93-05-13		

FORM 8268

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TEST LOT NO. 370-15-36	TEST ISR TESTING	DEVICE 77PSL6-1
TESTED BY J. Vidomaleo	TEXAS INSTRUMENTS MATERIALS & CONTROLS GROUP ATTLEBORO, MA 02703	DOC. PS/93/11
APPROVED BY A. Rahman		PAGE
DATE		

FORM 9208

1.0 GENERAL

1.1	Customer:	Ford Motor Company
1.2	TI Part Number:	77PSL6-1
1.3	Customer Part Number:	94JA-9F924-AB
1.4	Specifications:	Ford Engineering Specification number (inv delta) ES-F2VC-9F924-AA except: delete sections III.E (Impulse Test) and III.K (Vacuum Test) and replace with a combined test consisting of a single vacuum cycle to 0.3 - 0.5 mm Hg followed by a 500,000 cycle impulse test to 6900 kPa +/- 350 kPa with the brake fluid temperature at 120°C. All other test conditions and acceptance criteria are to be applied.
1.5	Date of Completion:	February 10, 1993
1.6	Quantity of Units Tested:	36
1.7	Disposition of Tested Units	All devices are presently retained under quarantine, to be destroyed per the ES at a later date after full ISR approval is obtained.
1.8	TI test series number:	370-15-36
1.9	TI Pressure Switch Test Report Number	PS/93/11

2.0 OBJECTIVE

This battery of tests was performed to demonstrate the ability of 77PSL6-1 to conform to customer specifications, given in ES-F2VC-9F924-AA with amendments as noted in section 1.4 above, in fulfillment of the requirements of the Initial Sample Report. All 36 switches under test passed all the test requirements and conformed to the specification.

The pressure switch being tested here, is similar to other speed control deactivation pressure switches manufactured by TI for Ford Motor Company which are fully validated and are currently in volume production. These switches are:

Ford Part #	Ford Vehicle Platform
F2VC-9F924-AB	Passenger Car
F3TA-9F924-CA	Light Truck
F3DC-9F924-AA	SHO Taurus

The vehicle for which the switch is being tested here viz Ford of Australia: Capri platform, differs from the above in two areas. The first one is level of vacuum. The switch in the Capri platform is exposed to a vacuum of 0.5 - 0.3 mm Hg as opposed to the standard ES call out for a 6.0 - 3.0 mm Hg. Secondly, Ford Engineering has established that a maximum brake fluid temperature of 120°C during the Impulse test, will better simulate the Capri application, than the standard ES specification callout of 135°C.

In light of the above, TI and Ford of Australia had come to a consensus that the Fluid Resistance/Humidity/Salt Spray/Terminal Strength and Vibration tests from the ES will not be performed in view of similarity to existing pressure switches. It was also agreed that the Impulse and Vacuum tests will be combined as in section 1.4 above.

Correspondence, pertaining to the above discussion, between John Peck of Ford Australia, and TI is attached in Appendix A.

Units tested were built using fully qualified production components and production assembly equipment.

3.0 TEST PROCEDURES AND RESULTS

All switches were tested to Ford Engineering Specification ES-F2VC-9F924-AA as amended above. A copy of this ES is included in Appendix B. Procedural details are therefore omitted from the presentation of results in most cases. In those instances where the ES procedure methodology is modified, a complete explanation of the actual procedure is presented. For all tests, data is included in Appendix C.

A flow chart is included in the ES (frame 4 of 18), as follows: All test devices are to be subject to an initial characterization consisting of Calibration, Voltage Drop, Current Leakage, and Proof. Devices are then divided into groups per the flow chart and subject to the indicated tests in the indicated order. Finally, devices are subject to a final characterization. A modified flow chart is included in Appendix D which shows deviations from ES flow chart resulting from the changes in test plan as discussed in section 2.0 above.

3.1 CALIBRATION

3.1.1 Devices Tested: 370-15-01 thru -36

3.1.2 Procedure: Calibration is checked at room temperature using ambient air as the pressure medium. Calibration settings, as specified on the part drawing, are actuation (electrical contacts opening) at 90 - 160 psig, and release (contacts reclosing) at 20 psig minimum. For the purpose of stabilization, actuation values are recorded on the sixth cycle, after subjecting the switch to two (2) pressure cycles to 800 psig minimum and back to zero, followed by three (3) cycles to 1.1 times actuation pressure minimum and back to zero. The change in continuity is measured while conducting 750 +/- 50 milliamps at 13.0 +/- 1.0 volts DC.

3.1.3 Equipment: Custom TI designed and built pressure check station, using Heise Model CM96365 pressure gage calibrated on a regular quarterly schedule. Continuity change measured on custom TI designed and built equipment meeting the above electrical parameters.

3.1.4 Initial Results: All 36 original devices tested were found to be within specification.

3.1.5 Final Results: 30 original devices were found to be within specification. 6 were destroyed in Burst Test.

TEST LOT NO. 370-15-36	TEST ISR TESTING	DEVICE 77PSL6-1
TESTED BY J. Didomenico	TEXAS INSTRUMENTS MATERIALS & CONTROLS GROUP ATTLEBORO, MA 02703	DOC. PS/93/11
APPROVED BY A. Rahman		
DATE		PAGE

FORM 2268 93-02-12

3.2 VOLTAGE DROP

3.2.1 Devices Tested: 370-15-01 thru -36

3.2.2 Equipment: Fluke Model 8020B Digital Multimeter, calibrated quarterly, used in conjunction with the continuity equipment in 3.1.2.

3.2.3. Initial results: The average voltage drop was 14.05 millivolts, and the standard deviation was 1.11. All values were significantly below the specification of 200 millivolts maximum.

3.2.4 Final results: The average voltage drop for 30 devices was 29.05 millivolts, and the standard deviation was 30.96. All values were below the specification of 200 millivolts maximum.

TEST LOT NO. 370-15-36	TEST ISR TESTING	DEVICE 77PSL6-1
TESTED BY J. Didomenico	TEXAS INSTRUMENTS MATERIALS & CONTROLS GROUP ATTLEBORO, MA 02703	DOC. PS/93/11
APPROVED BY A. Rahman		PAGE
DATE		

FORM 5288 90-02-22

3.3 CURRENT LEAKAGE

3.3.1 Devices Tested: 370-15-01 thru -36

3.3.2 Equipment: Associated Research HyPot test unit used as power source for 500 VAC, 60 Hz test circuit. Fluke Model 8020B Digital Multimeter, calibrated quarterly, used to measure voltage drop across a series resistance of one megohm (+/- 5%).

3.3.3 Initial results: Measuring terminals to case with switch closed; measuring terminals to case with switch open; and measuring between the terminals: All values were below the specification of 100 microamps.

3.3.4 Final results: Same three measurements per device as 3.3.3. All current leakage values for 30 devices were consistent with initial results. All values were below the specification of 100 microamps.

TEST LOT NO. 370-15-36	TEST ISR TESTING	DEVICE 77PSL6-1
TESTED BY J. Oldenkott	TEXAS INSTRUMENTS MATERIALS & CONTROLS GROUP ATTLEBORO, MA 02703	DOC. PS/93/11
APPROVED BY A. Rahman		PAGE
DATE		

FORM 5206

3.4 PROOF

3.4.1 Devices Tested: 370-15-01 thru -36

3.4.2 Procedure: Calibration readings were recorded before and after proof testing. Test pressure was 3000 psig per the part drawing.

3.4.3 Equipment: Enerpak model P-392 hydraulic hand pump using Enerpak hydraulic fluid as the pressure medium. Hydraulic fluid is removed from the devices using a combination of vacuum and residue-free solvent Sprayon(TM) Hi-Tech 02002 TF Electrical Contact Cleaner. US Gauge #33714 reading to 5000 psig with 100 psi increments, resolvabie to 50 psi., calibrated quarterly. Custom TI designed and built safety enclosure.

3.4.4 Initial Results: No evidence of fluid leakage and no drop in test pressure was observed on any device.

3.4.5 Final Results: No evidence of fluid leakage and no drop in test pressure was observed on any device.

3.5 BURST

3.5.1 Devices tested: 370-15-31 thru -36.

3.5.2 Procedure: A pressure of 7000 psig was applied and held for 30 seconds minimum.

3.5.3. Equipment: same as 3.4.3., with the addition of Enerpak gauge reading to 10,000 psig with 100 psi increments, resolvable to 50 psi., calibrated quarterly.

3.5.4. Results: All six devices passed 30 seconds at 7000 psig without evidence of fluid leakage or drop in test pressure.

TEST LOT NO. 370-15-36	TEST TSR TESTING	DEVICE 77PSL6-1
TESTED BY J. Didomenico		
APPROVED BY A. Rahman	TEXAS INSTRUMENTS MATERIALS & CONTROLS GROUP ATTLEBORO, MA 02703	DOC. PS/93/11
DATE 93-05-10		PAGE 40

FORM 5286

3.6 VACUUM

3.6.1 Devices tested: 370-15-01 thru -24

3.6.2 Equipment: Kinney vacuum pump. Sensotec pressure transducer range 0-25 psia calibrated quarterly, with Fluke model 8020B Digital Multimeter readout, calibrated quarterly.

3.6.3 Procedure: 24 devices were run. The parameters given in the ES (frame 10 of 18, section III. K. 1.) were modified as in section 1.4 above.

3.6.3 Immediately after vacuum exposure, all 24 devices were put on the Impulse test as described in the following section.

TEST LOT NO. 370-15-36	TEST ISR TESTING		DEVICE 77PSL6-1
TESTED BY J. Didomenico			
APPROVED BY A. Rahman	TEXAS INSTRUMENTS	MATERIALS & CONTROLS GROUP ATTLEBORO, MA 02703	DOC. PS/93/11
DATE			PAGE

FORM 5265

3.7 IMPULSE

3.7.1 Devices tested: 370-15-01 thru -24

3.7.2 Procedure: 24 devices, previously exposed to the vacuum test as in section 3.6, were run. The parameters given in the ES (frame 7 of 18, section III. E. 1.) were modified as in section 1.4 above.

3.7.3 Equipment: Thermotron model S-4 Mini-Max environmental chamber capable of -55 C to +200 C, humidity uncontrolled. Custom TI designed and built cycler, utilizing Enerpak integrated hydraulic pressure source, TI315 Programmable Logic Controller, Moog servovalve and controller, Simpson signal generator, and opposing-piston fluid isolators, to produce a hydraulic-fluid flow-type primary with a brake-fluid dead-end-type secondary terminated with a 24-station manifold equipped with internal heaters. Capability to 5 Hz at 0-1450 psig cycle. Custom TI designed and built 24 station Switch Monitor Circuit which automatically stops the cycler in the event of abnormal switch action, defined as continuity change which does not track the signal from the signal generator. Thermocouple readouts calibrated quarterly.

3.7.4 Results: All 24 devices met the acceptance criteria in ES (frame 7 of 18; section III.E.2)

TEST LOT NO. 370-15-36	TEST ISR TESTING	DEVICE 77PS16-1
TESTED BY J. Didomenico	TEXAS INSTRUMENTS MATERIALS & CONTROLS GROUP ATTLEBORO, MA 02703	DOC. PS/93/11
APPROVED BY A. Rahman		PAGE
DATE 93-02-26		

FORM 6086

3.8 TEMPERATURE CYCLE

3.8.1 Devices tested: 370-15-25 thru -30.

3.8.2 Equipment: Same as in 3.7.3

3.8.3 Results: All six devices met the acceptance criteria in ES (frame 11 of 18; section III. L.2)

TEST LOT NO. 370-15-36	TEST ISR TESTING	DEVICE 77PSL6-1
TESTED BY J. Didomenico	TEXAS INSTRUMENTS MATERIALS & CONTROLS GROUP ATTLEBORO, MA 02703	DOC. PS/93/11
APPROVED BY A. Rahman		PAGE
DATE		

FORM 8308 93-05-12

Appendix A
Specification amendments correspondence

TEST LOT NO. 370-15-14	TEST ISR TESTING	DEVICE 77PSL6-1
TESTED BY J. DiDomenico	TEXAS INSTRUMENTS MATERIALS & CONTROLS GROUP ATTLEBORO, MA 02703	DOC. PS/93/11
APPROVED BY A. Rahman		PAGE
DATE 01-05-93		

FORM 5265

Ford Motor Company of Australia Limited
A.C.N. 004 116 223

Rapifax Transmission

OUR REF.

PAGE 1 OF 2

TO: DANNY O'DRISCOLL - TEXAS INSTRUMENTS.
PATRICK SAWYER/CATHY CAREY - BCIA.
cc. V. STOIOS/T. WORTHINGTON/P. ROBERTS/P. WILLIAMS.

FROM: JOHN PECC.
DEPT.: CAPRI ENGRG.
RAPIFAX No.: (052) 788109 (INC CNTRY)

DELIVERY: ☐ NORMAL ☐ RUSH-CALL FOR PICKUP

B/C:

DATE: 6/11/92

SUBJECT - SWITCH ASY - SPEED CONTROL DEACTIVATE
94JA-9F924-AB

FOLLOWING DISCUSSIONS WITH DANNY O'DRISCOLL RE REQUIREMENTS OUTLINED IN MY RAPIFAX TO PATRICK SAWYER, DATED 30/10/92, IT IS APPARENT THAT THE [redacted] REPRESENTS A MARGINAL PERFORMANCE REQUIREMENT, WHICH IS NOT ACCEPTABLE TO TEXAS INSTRUMENTS.

REVIEW OF THE NMO IMPULSE TEST (III.K) SHOWS THE REQUIREMENTS FOR PRESSURE PULSE (1450 PSI), AND TEST FLUID TEMPERATURE (135°C) TO BE FAR MORE SEVERE THAN CAPRI FIELD REQUIREMENTS, AND OF THE REQUIREMENTS OF SB4DA-2140-AA CYLINDER ASY - BRAKE MASTER, AS APPLIED TO THE CAPRI BRAKE MASTER CYLINDER (1000 PSI AND AT ROOM TEMPERATURE RESPECTIVELY).

I AM THEREFORE PROPOSING THAT THE DRAWING 94JA-9F924-AB BE REVISED TO INCLUDE THE NOTE - "REQUIREMENTS OF ES-F2UC-9F924-AA REVISED TO DELETE SECTIONS III.E (IMPULSE TEST) AND III.K (VACUUM TEST) [redacted] ALL OTHER TEST CONDITIONS AND ACCEPTANCE CRITERIA INCLUDED IN III.E/III.K ARE TO BE APPLIED".

INTENT IS THAT THE CURRENTLY RELEASED SWITCH ASY - 94JA-9F924-AB BE RETAINED, AND THAT ALL VENDOR RIG TESTING BE COMPLETED TO SUPPORT A FOTS SUBMISSION OF T-ASY, BRAKE MASTER CYL TUBE 94JA-2C267-AB, TO FORD, PRIOR

Ford Motor Company of Australia Limited
A.C.N. 004 116 223

Rapifax Transmission

OUR REF.

PAGE 2 OF 2

TO:

FROM

DEPT.:

FAX:

RAPIFAX No.:

DELIVERY: ☐ NORMAL ☐ RUSH-CALL FOR PICKUP

B/C: DATE:

TO PCB MRD (14/4/93). WHERE APPLICABLE IT IS ANTICIPATED THAT TESTING ALREADY CONDUCTED AND ACCEPTED FOR NAAO' PRESSURE SWITCH WILL BE CARRIED OVER INTO 94JA-9F924-AB, AND THAT THE ONLY UNIQUE FOA REQUIREMENTS WILL APPLY TO ABOVE TEST REQUIRENTS, AND TO DIMENSIONAL CHARACTERISTICS OF EXTERNAL (IMPERIAL) THREAD AND TO 'O'-RING 3.903.

WOULD PRIME ADDRESSEES PLEASE ADVISE CONCURRENCE WITH ABOVE TO ENABLE DRAWING TO BE REVISED ACCORDINGLY.

REGARDS.

Ford Motor Company of Australia Limited
A.C.N. 004 116 233
Raptrax Transmission

OUR REF.

PAGE 1 OF 2

TO: DANNY O'DRISCOLL/PETER BURNER - TEXAS INSTR.
cc. C. CAREY/P. SAWYER/R. DOUTHIE - BCIA.
FAX: cc. V. STOIOS/T. WORTHINGTON/A. GAGE - PED

FROM JOHN PELC.
DEPT.: CAPRI ENGRG
RAPIFAX No.: (052) 788109

DELIVERY: ☐ NORMAL ☐ RUSH-CALL FOR PICKUP

B/C: DATE: 22/12/92

SUBJECT - CRUISE CONTROL DEACTIVATION SWITCH

YOUR FAX RE ABOVE WAS NOT RECEIVED UNTIL THIS MORNING OWING TO MY ABSENCE FROM THE OFFICE. SORRY TO HEAR THAT YOU ARE ABANDONING SHIP DANNY; IT WAS NEWS TO ME. BEST OF LUCK IN YOUR FUTURE VENTURES.

IF TEXAS INSTRUMENTS BELIEVE THEY WILL HAVE DIFFICULTY IN COMPLYING WITH THE PROPOSED COMBINED VACUUM/IMPULSE TEST AT 135°C AS REQUESTED IN MY FAX. OF NOVEMBER 11TH, THEN FORD WILL ACCEPT A LOWER TEMPERATURE (120°C), AS WE BELIEVE THAT 120° CELCIUS IS IN EXCESS OF ANY TEMPERATURES THAT WILL BE EXPERIENCED BY THE SWITCH WITHIN ACCEPTED VEHICLE OPERATING CONDITIONS. DRAWING 94JA-9F924-AB WILL THUS BE FURTHER AMENDED TO SPECIFY IMPULSE TESTING AT 120°C.

YOUR REQUEST FOR SIMILARITY OF :-
FLUID RESISTANCE/HUMIDITY/SALT SPRAY/TERMINAL STRENGTH/VIBRATION ARE AGREED, AS PER EARLIER DISCUSSIONS, AND WE EXPECT ALL TESTING FOR BURST/VACUUM/THERMAL CYCLING/IMPULSE TO BE COMPLETED IN TIME TO SUPPORT AN SIR SUBMISSION BY BCIA PRIOR TO 14/4/93. WOULD YOU PLEASE ADVISE CONFIRMATION OF T.I. ABILITY TO SUPPORT ABOVE REQUIREMENTS AND TIMING.

DRAWING OF 94JA-9F924-AB WILL ALSO BE REVISED TO REFLECT CHANGE IN LENGTH DIMENSION FROM 58.0 MM

Ford Motor Company of Australia Limited
A.C.N. 004 116 233

Rapifax Transmission

OUR REF.

PAGE 2 OF 2

TO:

FROM

DEPT.:

FAX:

RAPIFAX No.: (NEW ORDER)

DELIVERY: ☐ NORMAL ☐ RUSH-CALL FOR PICKUP

B/C: DATE:

TO SB·5 MM. MAX, AND 'O'-RING COLOUR RED, AS REQUESTED IN YOUR FAX OF DEC. 18TH.

SUBJECT TO CONFIRMATION OF ABOVE FROM TEXAS INSTRUMENTS BY JAN 11TH. 93, REVISED DRAWING OF 94JA-9F924-AA WILL BE ISSUED FROM PEO BY FEB 5, 93.

BEST WISHES AND A HAPPY CHRISTMAS TO ALL.

REGARDS

Appendix B
Engineering Specification (inv delta) ES-F2VC-9F924-AA

TEST LOT NO. 370-15-36	TEST ISR TESTING	DEVICE 77PSL6-1
TESTED BY J. Didomenico		
APPROVED BY A. Rahman	TEXAS INSTRUMENTS MATERIALS & CONTROLS GROUP ATTLEBORO, MA 02703	DOC. PS/93/11
DATE		PAGE

FORM 6286 93-02-12

Engineering Specification

PART NAME: SWITCH ASSEMBLY – SPEED CONTROL DEACTIVATE

PART NUMBER: ▽ ES-F2VC-9F924-AA

LET																			
PR																			
LET																			
PR																			

DATE	LET	PR	REVISIONS	DR	CK
			ADDED DATA TO COMPLETE		
			SPEC. & RETYPED		
90/11/30			NCC#N100797179002		

REFERENCE

PREPARED/APPROVED BY

CHECKED BY | DETAILED BY

CONCURRENCE/APPROVAL SIGNATURES

DESIGN ENGINEERING SUPERVISOR

ENGINEERING MGT.

MANUFACTURING ENGRG.

QUALITY CONTROL

PURCHASING

SUPPLIER QUALITY ASSISTANCE

ELECTRONICS DIVISION

▽ CONTROL ITEM — THE ▽ SYMBOL ALSO IDENTIFIES PRODUCT ENGINEERING DESIGNATED CRITICAL CHARACTERISTICS. THESE AND ADDITIONAL CRITICAL CHARACTERISTICS IDENTIFIED BY PROCESS REVIEWS MUST APPEAR ON THE C-271 CONTROL PLANS WHICH REQUIRE PRODUCT ENGINEERING APPROVAL.

FRAME 1 OF 18 | REV | ▽ ES-F2VC-9F924-AA

PD 3947-a1

SWITCH ASSEMBLY - SPEED CONTROL, DEACTIVATE

I. General

This specification covers the test requirements for the speed control deactivate switch -9F924- used in the electronic speed control system. Design changes on the switch assembly or its components shall not be made without compliance to Section V of this specification and written approval from the releasing Production Engineering Office.

This engineering specification is a supplement to the released drawing on the above part, and all requirements herein must be met in addition to all other requirements of the part drawing. Minimum measures necessary for demonstrating compliance to these requirements are given in each section.

The engineering tests, sample sizes, and test frequencies contained within this engineering specification reflect the minimum requirements established to provide a regular evaluation of conformance to design intent. The engineering test program is intended as a supplement to normal material inspections, dimensional checking and in-process controls, and should in no way adversely influence other inspection operations.

Q1 suppliers may implement different test sample sizes and frequencies providing these changes have been included in an alternate Control Plan approved by the design responsible Product Engineering Office and concurred in by SQA.

II. PRODUCTION VALIDATION AND IN-PROCESS TESTS

- Production Validation (PV) Tests must be completed satisfactorily with parts from production tooling (and processes where possible) before ISIR approval and authorization for shipment of production parts can be effected. Parts must be revalidated completely, or per Section V whenever any change is made which could possibly affect part function or performance.

- In-Process Test Phase 1 (IP-1) - IP-1 tests are used to demonstrate process capability and must be completed using initial production parts from production tooling and processes prior to first production shipment approval. IP-1 tests are to continue in effect until process capability is demonstrated.

- In-Process Tests Phase 2 (IP-2) - IP-2 test program may be implemented only after process capability has been established. Tests must be completed with production parts on a continuing basis. Samples for these tests must be selected on a random basis to represent the entire production population as much as possible. In the event that any of the requirements in these tests is not met, the reaction plan specified in Ford Q101 Sect. 3.5, "Engineering Specification (ES) Test Performance Requirements" shall be invoked.

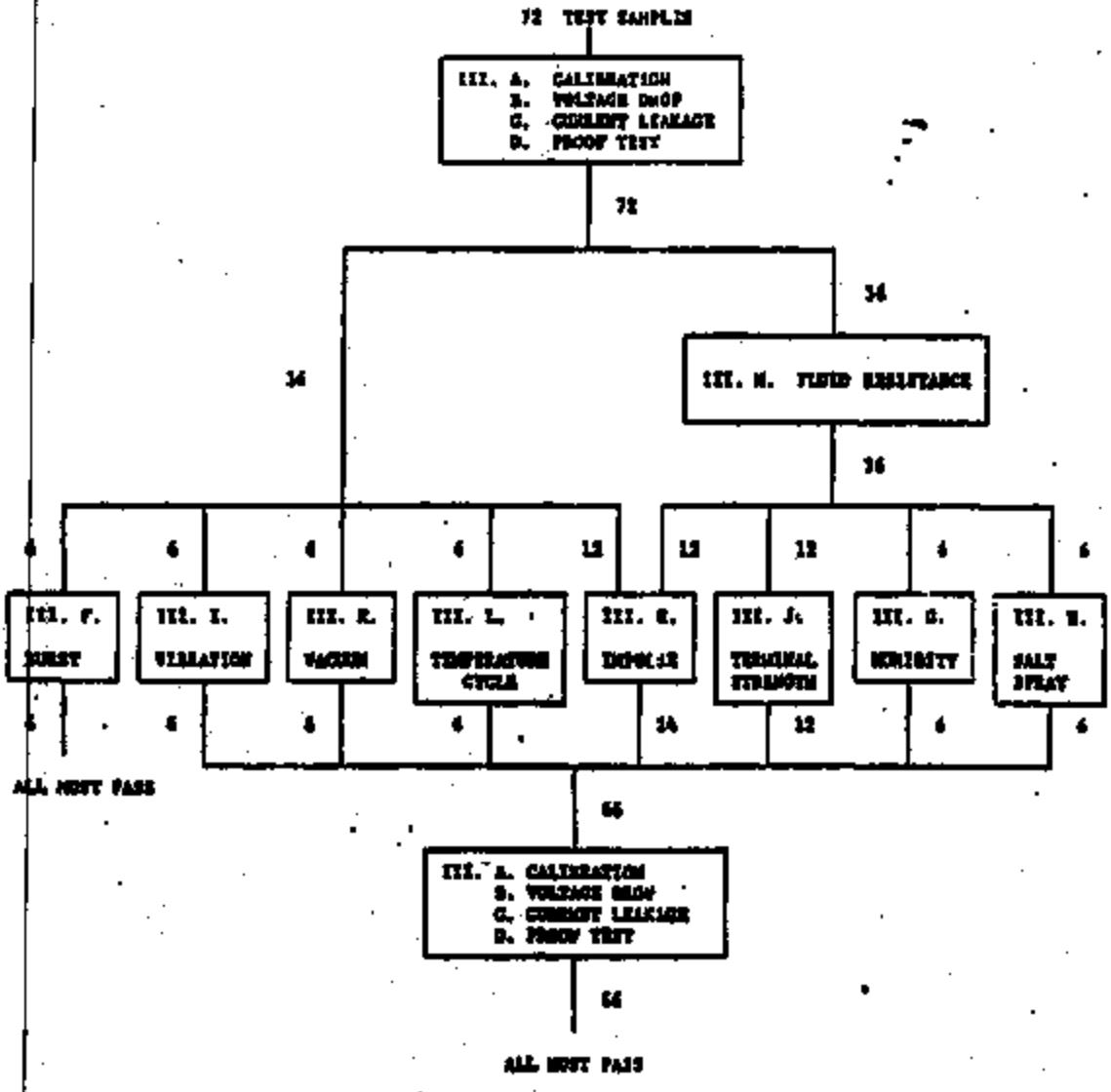
SECTION III. TABLE OF TESTS

Item	Test Name Functional Tests	PRODUCTION VALIDATION Minimum Sample Size	PRODUCTION VALIDATION Statistical Test Acceptance Criteria	IN-PROCESS IP-1 Minimum Sample Size	IN-PROCESS IP-1 Statistical Test Acceptance Criteria	IN-PROCESS IP-2 Minimum Sample Size	IN-PROCESS IP-2 Statistical Test Acceptance Criteria
III.							
▽ A	Calibration	72	P90-.96	100%	All Must Pass	100%	All Must Pass
B	Voltage Drop	72	P90-.96	12/Mo.	P90-.84	4/Lot	" " "
C	Current Leakage	72	P90-.96	3/Mo.	P90-.56	4/Lot	" " "
D	Proof Test	72	P90-.96	12/Mo.	P90-.84	4/Lot	" " "
F	Burst	6	P90-.72	3/Mo.	P90-.56	4/Lot	" " "
I	Vibration	6	P90-.72	3/Mo.	P90-.56	6/6 Mo.	P90-.72
J	Terminal Strength	12	P90-.84	6/Mo.	P90-.72	4/Lot	All Must Pass
K	Vacuum	6	P90-.72	3/Mo.	P90-.56	6/6 Mo.	P90-.72
L	Temperature Cycle	6	P90-.72	3/Mo.	P90-.56	6/6 Mo.	P90-.72
M	Fluid Resistance	36	P90-.94	36/12Mo	P90-.94	36/12Mo.	P90-.94

Durability Tests

Item	Test Name	PV Minimum Sample Size	PV Criteria	IP-1 Minimum Sample Size	IP-1 Criteria	IP-2 Minimum Sample Size	IP-2 Criteria
III.							
E	Impulse	24	P90-.90	12/Mo.	P90-.84	3/3 Mo.	P90-.56
G	Humidity	6	P90-.72	3/Mo.	P90-.56	6/6 Mo.	P90-.72
H	Salt Spray	6	P90-.72	3/Mo.	P90-.56	6/6 Mo.	P90-.72

PRODUCTION VALIDATION FLOW CHART



FRAME 4 OF 18	REVISED		VES-V270-SP529-AA NUMBER

FORM PD 3947-82 (Previous editions may NOT be used)

III. TEST PROCEDURES AND REQUIREMENTS

▽ A. Calibration

1. Test Requirements

a. Switch calibration is to be checked at room temperature (16°C-25°C) using ambient air or equivalent.

b. Calibration settings shall be specified on the part drawing with the settings checked after 2 or more pressure cycles with ambient air, or equivalent. Pressure cycle range is to be determined by the manufacturer to insure switch calibration stability. The cut-in and differential set points are to be measured while conducting 750 ± 50 milliamperes while 13.0 ± 1.0 volts D.C. is applied. The cut-in point is to be checked with increasing pressure.

c. The cut-out point is to be checked with decreasing pressure, and the differential set point is to be calculated using the cut-in pressure minus the cut-out pressure.

2. Acceptance Requirements

a. Nonconformance is defined as any switch point which falls outside the tolerance band specified on the part drawing.

B. Voltage Drop

1. Test Requirements

a. Voltage drop is to be measured after 2 or more cycles with ambient air or equivalent from 0 to 10,000 ± 172 KPa (1450 ± 25 PSI) while conducting 750 ± 50 milliamps and 13.0 ± 1.0 volts D.C. is applied to the switch. Under these conditions with the switch closed the voltage drop is to be measured. Millivolt connection interface terminals to be less than 10 millivolts.

2. Acceptance Requirements

a. Nonconformance is defined as a voltage drop in excess of 200 millivolts.

III. TEST PROCEDURES AND REQUIREMENTS (cont'd)

C. Current Leakage

1. Test Requirements

a. Current leakage is to be checked with 500 volts, 60 Hz alternating current.

b. Current leakage is to be checked:

(1) Between the switch leads with the contacts open.
(2) Between the lead and the switch housing with contacts closed.
(3) Between either lead and switch housing with the contacts open.

2. Acceptance Requirements

a. Nonconformance is defined as any leakage current in excess of one hundred (100) microamperes.

D. Proof Test

1. Test Requirements

a. Subject sample switches to Section A to establish their initial switching pressures.

b. Proof test is to be conducted using brake fluid or equivalent as the pressure medium. Test pressure shall be as specified on the part drawing. Test pressure shall be isolated from pressure source and held for not less than 30 seconds.

c. Recheck the switches to Section A.

2. Acceptance Requirements

a. No evidence of fluid leakage, seepage, or drop in test pressure greater than 430 KPa.(62 PSI) is permitted.

b. A change in cut-in and cut-out pressures greater than ± 5% from the initial value is not permitted.

c. The test samples must be destroyed after testing.

III. TEST PROCEDURES AND REQUIREMENTS (cont'd)

E. Impulse

1. Test Requirements

a. Test the switch for a total of 500,000 cycles. Cycle pressure between (low) 0-276 KPa (0-40 psi) and (high) 10,000 ± 345 KPa (1450 ± 50 psi).

1) 0 - 475,00 cycles: 13 ± 1 volts, trace current to monitor function.

2) 475,001 - 500,000 cycles: 13 ± 1 volts D.C., 750 ± 50 ma., per figure 4.

b. Brake fluid temperature to be 135 ± 14°C and ambient temperature to be 107°C min.

c. Cycle rate is to be 110-130 cycles per minute.

d. Switch must open and close each cycle.

2. Acceptance Requirements

a. After impulse test check to sections A, B, C, & D using the procedure established in each section.

b. Nonconformance is defined as any switch not meeting the criteria in sections A, B, C, & D.

c. Samples used for this test must be destroyed after all testing is completed.

F. Burst

1. Test Requirement

a. Burst strength is to be checked using brake fluid or equivalent as the pressure medium.

b. Pressurize the switch to 48.3 MPa (7000 PSI) minimum and hold for 30 seconds minimum.

2. Acceptance Requirements

a. Nonconformance is defined as any evidence of fluid leakage or seepage from the switch or threads. Samples used for this test must be destroyed after testing is completed.

G. Humidity

1. Test Requirements

a. Mount the switch in the test port in a humidity chamber. Currently released mating electrical connector must be installed before start of test.

b. Subject the switch to ten (10) continuous humidity cycles as follows:

(1) Raise temperature to 65 +10/-2 °C over 2.5 hours; at 90-98% relative humidity.

(2) Hold 3 hours at 65 +10/-2 °C at 90-98% relative humidity.

(3) Lower temperature to 25 +10/-2 °C over 2.5 hours; at 80-98% relative humidity.

2. Acceptance Requirements

a. Within 15 minutes after completion of the tenth humidity cycle check the switch to sections A, B, C, D, using the procedure established in each section.

b. Nonconformance is defined as any switch not meeting the criteria in sections A, B, C, or D.

H. Salt Spray

1. Test Requirements

a. Mount the switch in the test port in a salt spray chamber. The currently released mating electrical connector and wiring must be installed prior to start of test.

b. Expose the switch assembly to 72 hours of salt spray per ASTM B-117.

2. Acceptance Requirements

a. After exposure, check the switch to sections A, B, C, D, using the procedure established in each section.

b. Nonconformance is defined as any switch not meeting the criteria in sections A, B, C, or D. Samples used for this test must be destroyed after all testing is completed.

III. TEST PROCEDURES AND REQUIREMENTS (cont'd)

I. Vibration

1. Test Requirements

a. Mount the switch in the test port and attach the currently released mating electrical connector before start of test.

b. Switches are to be vibrated in all 3 planes with electrical continuity being monitored during the entire test. See Figure 1 for switch orientation in the 3 planes. Vibration tests are to be conducted at room temperature using brake fluid, ambient air, or equivalent as the pressure medium.

c. Internal pressure shall be maintained at 0 KPa G, when the switch is in the closed position and 1.1 times max actuation pressure shown on print when the switch is in the open position.

d. Vibrate the switch at 1.5 mm displacement (peak-to-peak) while varying the frequency uniformly from 5 to 50 to 5 Hz over a 5 minute period.

e. Vibrate the switch in alternate one-hour periods in the open and closed positions for a total of 8 hours in each plane. (Total test time is 24 hours).

2. Acceptance Requirements

a. After the entire vibration sequence check the switches to sections A, B, C, or D using the procedure established in each section.

b. Nonconformance is defined as any evidence of leakage or any change in electrical continuity/discontinuity during the vibration cycles, or any switch not meeting the criteria in sections A, B, C, or D. Samples used for this test must be destroyed after all testing is completed.

III. TEST PROCEDURES AND REQUIREMENTS (cont'd)

J. Terminal Strength

1. Test Requirements

a. Mount the switch in the test port.

(1) Apply a 89 ± 9 N axial force to each terminal.

(2) With a pendulum apply a 45 ± 5 N impact force to the switch housing at the connector end, perpendicular to the centerline axis of the switch. See Figure 2 for force application point and direction.

2. Acceptance Requirements

a. Check the switch to sections A, B, C, and D using the procedures established in each section.

b. Nonconformance is defined as any terminal or housing fracture, or any switch not meeting the criteria in sections A, B, C, or D.

K. Vacuum

1. Test Requirements

a. Mount the switch in the test port. Vacuum tests are to be conducted at room temperature using ambient air as the pressure medium.

b. Subject the switch to 5 cycles of vacuum from atmospheric pressure (760 mm Hg) to an absolute pressure of 3-6 mm Hg. Maintain the vacuum for a minimum of 60 seconds.

2. Acceptance Requirements

a. Check the switch to sections A, B, C, and D using the procedure established in each section.

b. Nonconformance is defined as any switch not meeting the criteria in sections A, B, C, and D.

III. TEST PROCEDURES AND REQUIREMENTS (cont'd)

L. Temperature Cycle

1. Test Requirements

a. Mount switches in test ports; test to be run using currently released brake fluid.

b. Repeat the following procedure 25 times.

(1) Lower the switch and fluid temperature to at least -40°C.

(2) Cycle the switches ten times at 10 seconds/cycles. One cycle consists of a pressure variation from 0 - 276 KPa.G (0-40 psi) to 10,000 ± 345 KPa.G (1450 ± 50 PSI). Note: Switch must open and close each cycle.

(3) Raise switch and fluid temperature to 38°C minimum.

(4) Repeat Step 2.

c. At completion of Step b, check switches per sections A, B, C, and D.

2. Acceptance Requirements

a. Nonconformance is defined as any evidence of switch fluid leakage, seepage, or not meeting the criteria of sections A, B, C, and D.

M. Fluid Resistance

1. Test Requirements

a. Mount the switch in the test port and orient as installed in the vehicle.

b. Install the currently released mating electrical connector (with wire leads) to the switch.

c. Sequentially, immerse the switch into each of the specified fluids, at a temperature of 23 ± 2 °C, for 5 ± 1 second. Remove the switch and drain and store the switch for the specified time at room temperature, prior to immersing into the next fluid.

III. TEST PROCEDURES AND REQUIREMENTS (cont'd)

Fluid	Drain Time	Storage Time
Reference Fuel C ASTM D471	60 ± 5 min.	none
10W40 Engine Oil	24 ± 1 hour	14 days
Ethylene Glycol/ Water 50/50 by Volume	24 ± 1 hour	24 ± 1 hour
Brake Fluid DOT 3	24 ± 1 hour	48 ± 1 hour
Automatic Transmission/ Power Steering Fluid (same) ESP-M2C138-CJ	24 ± 1 hour	14 days
Isopropyl Alcohol/ Water 50/50 by Volume	24 ± 1 hour	none
Reference Fuel C, ASTM D471 with Methyl Alcohol 85/15 by Volume	24 ± 1 hour	none

d. For the Flow Chart, subject the prescribed number of immersed switches to the post immersion tests specified below:

III. E. Impulse
III. G. Humidity
III. H. Salt Spray
III. J. Terminal Strength

Acceptance Requirements

a. Switches must fully meet the requirements of the specified post immersion test.

b. Nonconformance is defined as any switch not meeting the criteria in sections A, B, C, or D. Samples used for this test must be destroyed after all testing is completed.

IV. STATISTICAL ANALYSIS METHODS

A. For PV, IP-1 and IP-2 tests, all samples tested must pass. Having all the required sample size pass will provide data to support the conclusion that the switch has a minimum reliability R, at a given confidence of C. The notation Pc-R is interpreted as minimum reliability equal to R, at a confidence C; thus P90-.80 means a minimum reliability of 80% at 90% confidence.

B. All samples must pass is the statistical test acceptance criteria stated for tests with 100% frequency; or samples from lots, which could have a variable size.

V. REVALIDATION REQUIREMENTS

A. No change in design, material, process or component supplier shall be made without prior approval from the releasing Product Engineering Office. As part of approving a change, the releasing Product Engineering Office will establish the portion of the Product Validation tests required to be run to revalidate the switch. The following table is to be used as a guide in determining the type of tests required for revalidation requirements.

RUNNING CHANGE REVALIDATION

Component	Process or Material Change or New Supplier
1. Terminals, Contacts, or Connector	III, B, C, E, G, H, I, J, L, M.
2. Case or Housing	All Tests
3. Disc or Diaphragm	III, A, D, E, F, I, K, L.
4. Fitting or Fluid Connection	III, D, E, F, H, I, M.

B. Annual revalidation is not required on carryover switches.

VI. LOT DEFINITION

A lot is defined as no more than eight (8) hours of production up to 4,000 pieces. If shifts extend beyond eight (8) hours, or more than 4,000 pieces are produced in a shift, the product must be separated into at least two lots.

VII. RECORD RETENTION

A. Recording and record retention shall conform with Ford Q-101.

B. Production Validation test results and analysis are to be forwarded to the releasing Product Engineering Office before approval for shipment of production parts can be granted.

C. In-Process test results shall be available at the supplier's manufacturing facility for the releasing Product Engineering Office and Ford SQA or its representatives to review on request.

VIII. INSTRUCTIONS AND NOTES

All switches are to be identified with the Ford part number, supplier identification, and a date code indicating final assembly.

All test equipment and test procedures for testing to this specification must be approved by the releasing Product Engineering Office and no change in equipment or procedure may be made without their written concurrence.

Test part configuration is shown in Figure 3.

O-rings, if used in the design, shall be free from cuts, nicks, abrasions or any other damage which would result in a fluid leak.

All switches must have a shipping cap installed over the port threads to prevent contamination. All shipping caps must be approved by the releasing Product Engineering Office prior to production incorporation.

All switches that do not pass the calibration test are to either be readjusted and rechecked, or scrapped. (Salvage of component parts permitted with 100% reinspection).

If product nonconformance occurs for test Sections III. B, C, D, E, F, and J, production shall be stopped and the problems corrected. All production lots shall be sorted 100% prior to shipment. Suspected nonconformance of any shipped parts shall be reported immediately to the releasing Product Engineering Office.

If nonconformance of the statistical acceptance criteria occurs for test Sections III. G, H, I, K, L and M, a cause to recall the subject weeks production and to stop production may result.

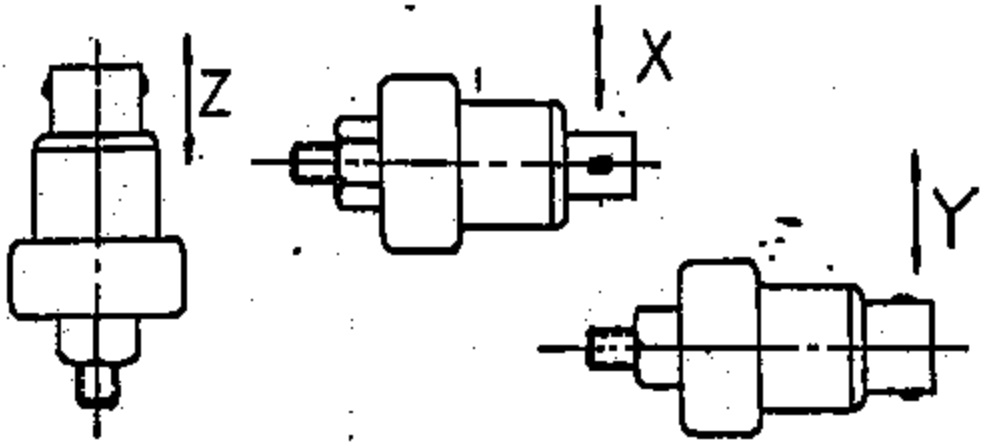
IX. COMPILATION OF REFERENCE DOCUMENTS

ASTM B-117, Salt Spray Testing

Ford Q-101, Quality System Standard - 1990 Edition

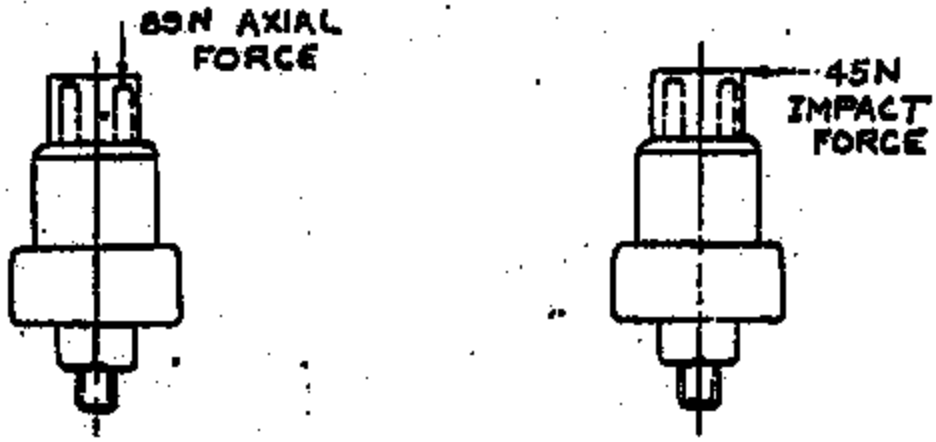
ES-F6EB-14A464-AA, Specification - SLV Assy - Wire Connector

ES-F2VF-9C735-AA, Specification - Servo Assembly Speed Control



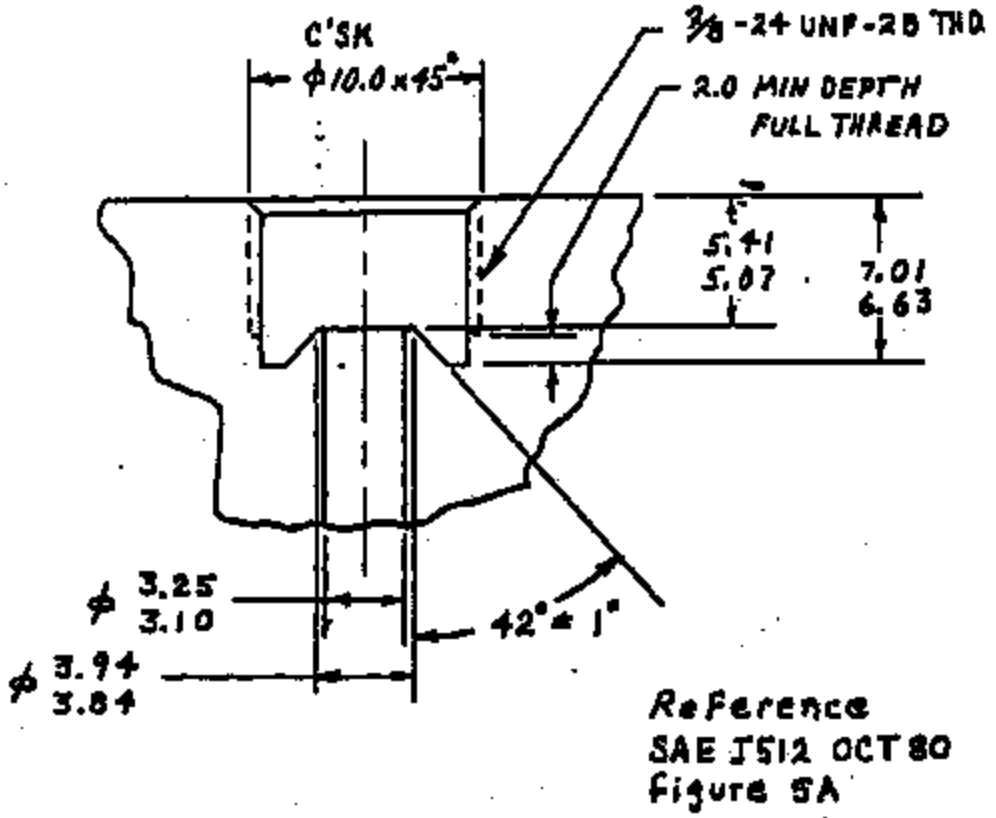
VIBRATION TEST - SWITCH ORIENTATION

FIGURE 1.



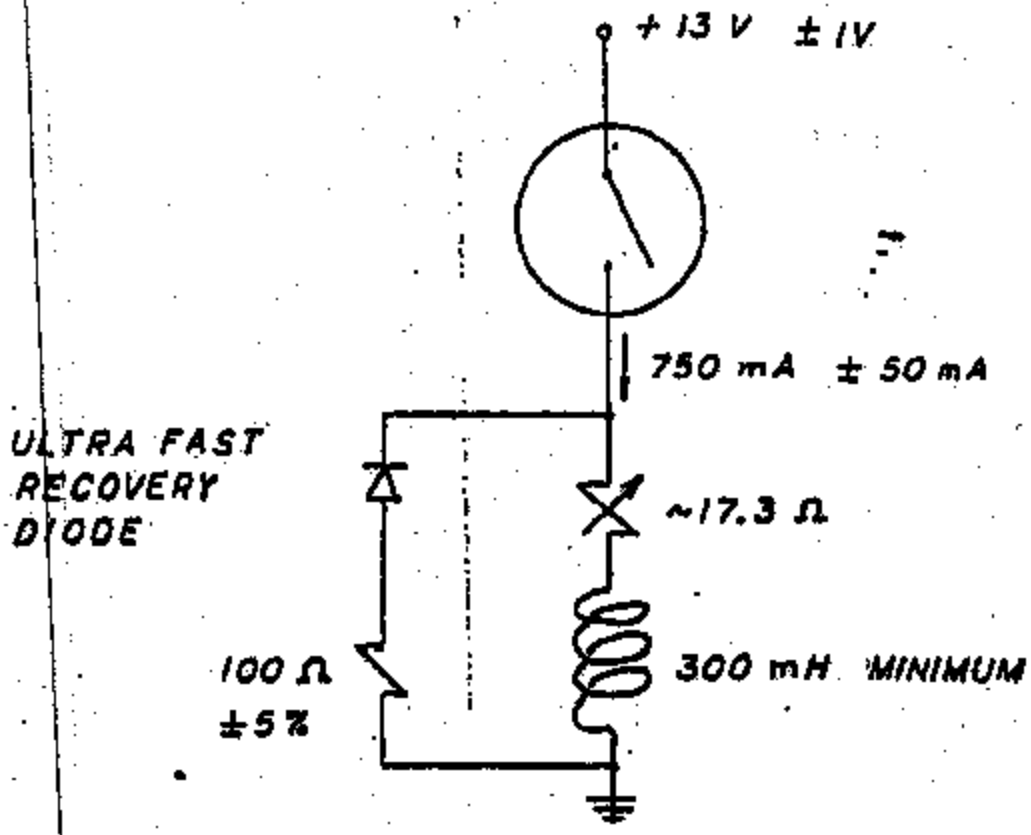
TERMINAL STRENGTH - LOAD ORIENTATION

FIGURE 2.



TEST FIXTURE PORT CONFIGURATION

FIGURE 3



DEACTIVATE SWITCH
TEST SET UP

FIGURE 4

Appendix C
Test Data

TEST LOT NO. 370-15-36	TEST ISR TESTING	DEVICE 77PSL6-1
TESTED BY J. Didomenico	TEXAS INSTRUMENTS MATERIALS & CONTROLS GROUP ATTLEBORO, MA 02703	DOC. PS/95/11
APPROVED BY A. Rahman		PAGE
DATE		

FORM E-108

77PSL6-1 ISR VALIDATION TEST DATA
FORD PART # 94JA-9F924-AB

	INITIAL CHARACTERIZATION								FINAL CHARACTERIZATION						
DEVICE #	ACT psig	REL psig	mV DROP	CURRENT LEAKAGE	PROOF @ 3000 psig	ACT psig	REL psig	TEST	ACT psig	REL psig	mV DROP	CURRENT LEAKAGE	PROOF @3000 psig	ACT psig	REL psig
970-16-01	131	85	13.4	< 100 mA	O.K	127	78	Vacuum + Impulse	101	78	6.7	< 100 microamps	O.K	98	75
-02	139	95	16.3	"	"	129	88	"	117	88	12.4	"	"	116	87
-03	114	78	13.7	"	"	114	77	"	106	82	35.7	"	"	104	77
-04	120	81	13.2	"	"	122	82	"	111	85	18.2	"	"	109	83
-05	121	87	13.2	"	"	121	84	"	103	80	13.4	"	"	102	78
-06	119	81	13.1	"	"	100	68	"	102	79	18.0	"	"	101	76
-07	121	88	14.7	"	"	121	85	"	106	82	17.2	"	"	104	79
-08	134	94	13.4	"	"	135	93	"	119	89	29.6	"	"	111	85
-09	113	76	14.9	"	"	113	77	"	106	78	17.3	"	"	103	77
-10	120	80	13.1	"	"	120	81	"	110	84	89.2	"	"	108	82
-11	122	83	16.2	"	"	121	78	"	112	86	8.8	"	"	110	83
-12	128	91	14.1	"	"	128	94	"	118	91	8.4	"	"	115	89
-13	110	79	14.3	"	"	113	77	"	100	77	16.5	"	"	97	74
-14	116	87	14.2	"	"	116	82	"	104	80	87.0	"	"	101	78
-15	117	79	13.8	"	"	117	79	"	110	81	32.8	"	"	105	80
-16	119	82	13.9	"	"	117	82	"	108	87	12.4	"	"	107	86
-17	126	86	15.8	"	"	123	82	"	112	86	83.0	"	"	111	86
-18	114	77	12.9	"	"	113	76	"	97	75	11.8	"	"	96	74
-19	133	90	12.7	"	"	130	84	"	116	89	111.5	"	"	115	87
-20	134	89	13.5	"	"	134	84	"	114	88	16.8	"	"	113	88
-21	128	86	13.3	"	"	127	88	"	115	91	49.0	"	"	114	89
-22	116	84	17.7	"	"	115	80	"	107	82	12.7	"	"	104	80
-23	116	80	15.5	"	"	119	80	"	107	80	62.8	"	"	106	78
-24	117	84	14.3	"	"	116	80	"	103	79	64.8	"	"	102	78
-25	121	89	13.8	"	"	122	86	Temp. Cycle	111	87	8.8	"	"	110	84
-26	125	94	13.7	"	"	116	88	"	110	79	8.0	"	"	104	79
-27	116	89	12.9	"	"	119	89	"	106	84	4.4	"	"	106	85
-28	117	89	15.8	"	"	116	83	"	109	84	6.2	"	"	109	83
-29	121	86	15.6	"	"	125	87	"	112	87	6.4	"	"	111	86
-30	119	88	13.4	"	"	120	89	"	112	87	4.8	"	"	112	86
-31	119	84	13.8	"	"	119	84	Burst							
-32	134	88	15.0	"	"	128	83	"							
-33	121	82	14.4	"	"	121	83	"							
-34	121	86	12.5	"	"	125	91	"							
-35	125	83	13.6	"	"	124	82	"							
-36	121	86	13.5	"	"	121	84	"							

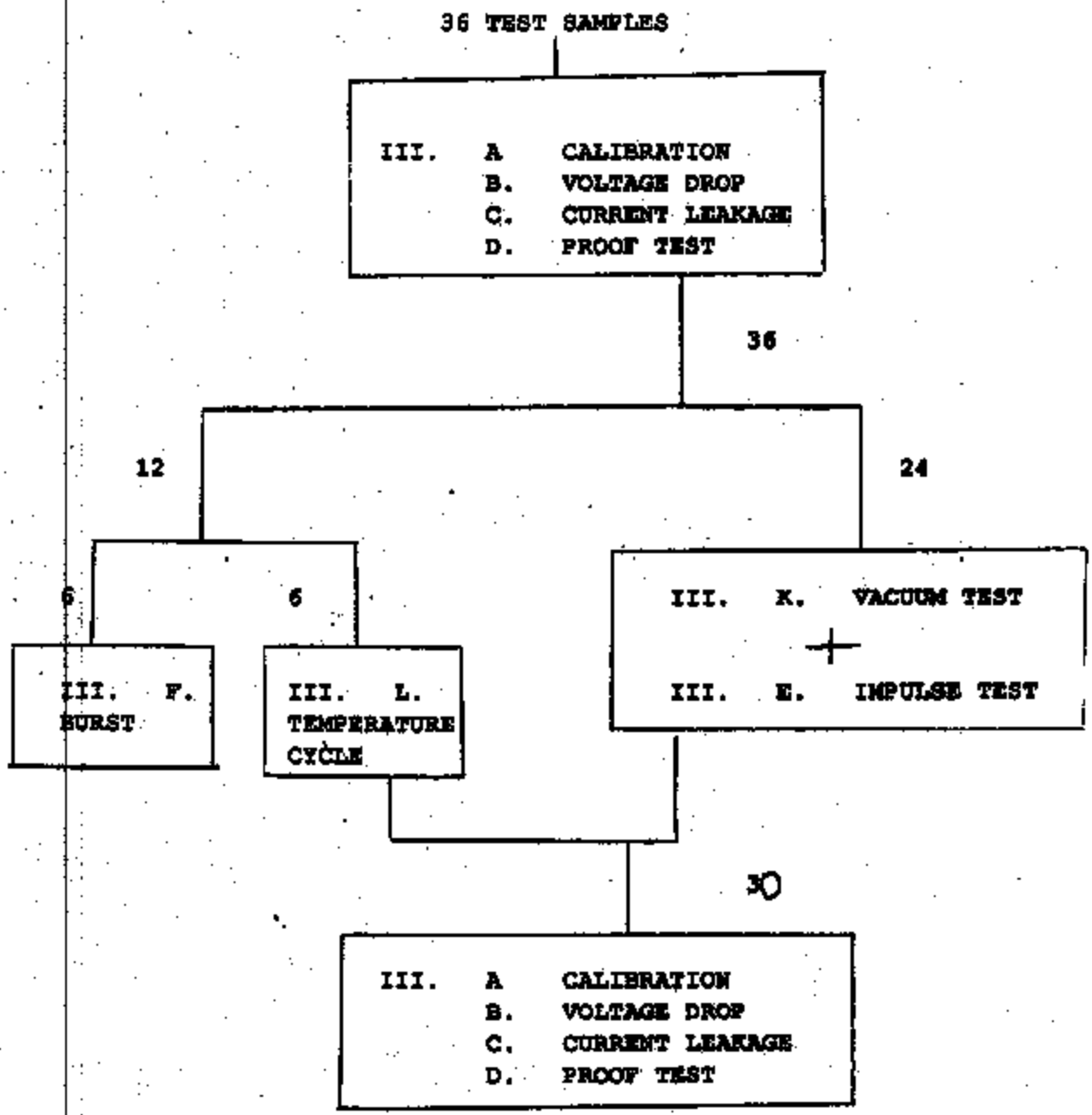
TI-NHTSA 011586

Appendix D
Test Sequence Flow Chart

TEST LOT NO. 570-15-36	TEST ISR TESTING	DEVICE 77PSL6-1
TESTED BY J. Vldoumlec	TEXAS INSTRUMENTS MATERIALS & CONTROLS GROUP ATTLEBORO, MA 02703	DOC. PS/93/11
APPROVED BY A. Rahman		PAGE
DATE		

FORM 5206

PRODUCTION VALIDATION FLOW CHART



-MBX M#= 448457 FR=JW02 TO=MJS2 SENT=02/15/93 03:11 PM
R#=113 ST=C DIV=0050 CC=00149 BY=JW02 AT=02/15/93 03:11 PM
SCON,RCS2,MFPC,JW02

Memorandum
February 15, 1993

TO:	Dick Gariepy	RW03	Tom Burke	TEB7
	Bruce Wright	MFPC	Dennis Natale	DJN1
	Aziz Rahman	ZIZ	Dave Czarn	ZARN
	Bill Congdon	SCON	Elaine Rose	GAMY
	Andy McGuirk	PCQA	Matt Sellers	MJS2
	Gary Snyder	GJ61	Charlie Douglas	CMP1
	Bill Sweet	W84	Norm Freda	WHLZ
	Rusty Strubla	RCS2	Rick Conlin	RAC1
FROM:	Jim Watt	JW02		

SUBJ: Update On 77PSL2-1 Leaking PS At Pitts Industries

George Comisky, Pitts SQA representative, reported a fourth leaker received, and being airshipped back to TI-A for analysis and corrective action.

Next update meeting on the 77PSL2-1 leaking switch from Pitts Industries:

Date: Friday, 02/19/93

Time: 1:30 p.m.

Place: Bldg 12 Cafeteria

The third leaker returned by Pitts has been confirmed to be a leaker, again caused by a misplaced gasket. So all three field leaker returns to date from Pitts have been caused by a misplaced gasket.

Please bring a draft timeline to address the ideas discussed below. (This is a Ford 8D requirement to characterize each action with a plan).

Ideas discussed from last meeting:
---

1. Test sensors for leak at sensor assembly, assess testing approach, location on the AMI machine, ... (process)

2. Assess potential for automated gasket location detector at AMI machine. (process)

3. Assess alternative leak detection at final assembly machine.(process)

4. Assess differential probe potential at sensor assembly to detect out of position gasket. (process)

5. Discriminate height after assembly of sensor, but prior to crimp, ... (process)

7. Design feature in hexport gland to create significant height differential in the event of misplaced gasket. (design)

Regards,

Jim Watt MSG: JW02 Ext: 1719 M/S: 12-27

MEMORANDUM

TO: DAVE CEARN

FR: AZIZ RAHMAN

RE: HIGHLIGHTS FOR WEEK ENDING 2/19/93

77P8L2-1 PASS-CAR; SNAP

RECEIVED 2 MORE DEVICES FROM PITTS FOR LEAKS. THIS MAKES 4 CONFIRMED LEAKERS SO FAR. ROOT CAUSE ON THESE WAS ALSO MISPLACED GASKETS. LEVEL OF CONCERN HAS BEEN RAISED SIGNIFICANTLY, SINCE THIS FAILURE MODE COULD BE PRESENT IN ALL SENSORS BUILT ON THE AMI. FROM A DESIGN POINT OF VIEW WE ARE LOOKING AT FEATURES IN THE GASKET GLAND WHICH WILL INCREASE THE LIKELIHOOD OF AN OUT OF PLACE GASKET BEING CAUGHT BY THE PROBE. MODEL SHOP HAS ALREADY STARTED WORK ON SOME SAMPLES. TEAM IS MEETING TODAY TO FORM DETAILED ACTION PLAN. FORD DOES NOT HAVE ANY VISIBILITY TO.THIS SO FAR, SINCE PITTS DOES 100% LEAK CHECK, BUT IT IS JUST A MATTER OF TIME BEFORE PITTS RAISES A FLAG AT FORD. WE PLAN TO CAREFULLY BRING UP THIS ISSUE WITH FORD SHORTLY.

77P8L6-1; CAPRI

VALIDATION TESTING WAS SUCCESSFULLY COMPLETED ON SCHEDULE FOR ISW SUBMISSION. REPORT AND UPDATED FMEA WAS SENT TO T.I. AUSTRALIA.

AN ACTION PLAN WAS FORMULATED TO ADDRESS THE COLORED O-RING ISSUE. CHRIS AND I ARE LOOKING AT STANDARD COLORED O-RINGS FROM VARIOUS SUPPLIERS. PARKER HAS A STANDARD PURPLE EP O-RING. HAVE CONTACTED REP FOR SAMPLES. GOAL IS TO HAVE APPROVED COMPOUND COLORED O-RING IN-HOUSE BY 3/15.

77P8L4-1; FALCON

HEXPORT WAS RELEASED WITH ELCO LAST WEEK. WILL NEED TO EXPEDITE BY 2-3 WEEKS TO REMAIN ON TARGET FOR 6/4 ISW SUBMISSION.

SOPS; HONDA

COMPLETED ANALYSIS ON STRESS LEVELS FOR 14 MM HEXPORT. THEORETICALLY, THERE WILL BE SERIOUS STRESS PROBLEMS WITH A 14MM HEX. THE MINIMUM REQUIRED IS A 16 MM. HOT STILL WANTS TO TEST SOME 14 MM SAMPLES TO BE SHIPPED NEXT WEEK.

RELIABILITY TESTING HAS BEGUN ON SAMPLE PARTS. THE S-N TEST SET-UP IS COMPLETE AND TEST WILL BE STARTED TODAY. HONDA HAS UPPED THE TEST REQUIREMENT TO INCLUDE -40 C AND 100 C.

HAVE STARTED WORK ON ENVELOPE DWG. SOME OPEN QUESTIONS EXIST RELATING TO LOGISTICS OF PRINT CONTROL ON HONDA DWG (AS IN SATURN), INCORPORATING JAPANESE INTO THE DWG ETC. WILL CLOSE WITH MR. KINOSHTA AT HRAO EARLY NEXT WEEK.

CYCLER: ON SCHEDULE FOR TARGET COMPLETION DATE OF 3/15.

77PSL2-1 LEAK ISSUE PITT'S IND.
ACTIONS TAKEN TO DATE

2/19/93

ROOT CAUSE:

* THE AMI # 2 INTERNAL GASKET CHECK PROBE WAS FOUND TO BE PULLING THE GASKET OUT OF PLACE AFTER CHECKING FOR IT'S PRESENCE AND CORRECT PLACEMENT. DEFECT LEVELS ARE LOW.

CAUSE FOR ESCAPE:

AFTER PASSING THE GASKET CHECK PROBE, THERE IS NO SUBSEQUENT CHECK OTHER THAN FUNCTION TESTING AND Q.C. BURST AUDITS THAT WILL PROVIDE THE OPPORTUNITY TO DETECT A MIS-PLACED INTERNAL GASKET.

Q.C. BURST AUDITS ARE PERFORMED AT A SAMPLE FREQUENCY, AND ARE DESTRUCTIVE. ALTHOUGH THIS AUDIT WILL DETECT A MIS-PLACED GASKET - THE TEST FREQUENCY, WHEN COMBINED WITH THE LOW DEFECT LEVELS, MAKES DETECTION UNLIKELY.

FUNCTION TESTING, PERFORMED ON 100% OF DEVICES PACKED, CONTAINS A PRESSURE DECAY TEST AT HIGH ACTUATION PLUS 10%. THIS HIGHER PRESSURE LEVEL IS ORDERS OF MAGNITUDE GREATER THAN THOSE APPLIED AT PITT'S PRESSURE DECAY OPERATION, AND IS APPARENTLY NOT 100% RELIABLE FOR DETECTING THIS DEFECT.

AN OUT OF PLACE GASKET WILL NOT NECESSARILY CAUSE AN ACTUATION OR RELEASE FAILURE.

IMMEDIATE CONTAINMENT ACTIONS:

IMPLEMENT GASKET CHECK PROBE P.M. MASTERS	COMP	DATE
IMPLEMENT 100% OPERATOR VISUAL INSPECTION AT AMI GASKET CHECK STATION. DIS-CONNECT CHECK STATION CAUSING DEFECTS.	COMP	2/15/93
EVALUATION OF ALTERNATE CHECK PROBE TIPS TO ELIMINATE PULLING OF GASKET.	COMP NO GO	2/17/93

PERMANENT CORRECTIVE ACTIONS:

REVISION TO CURRENT PRESSURE DECAY SPECIFICATION DURING FUNCTION TESTING TO IMPROVE DETECTION CAPABILITY.	SELLERS	NEED DATE.
DEVELOPMENT AND INSTALLATION OF NON-CONTACT GASKET CHECK STATION. PRODUCTION VALIDATION.	MECH	NEED DATE
DEVELOPMENT AND INSTALLATION OF 100% LOW PRESSURE LEAK DECAY TEST.	MECH	NEED DATE.
DEFINE PROBABLE FAIL-SAFE PRODUCT DESIGN CHANGES TO PREVENT INCORRECT ASSEMBLY OF INTERNAL GASKET.	RAHMAN	NEED DATE.

MJS 2/19/93 L2-1LEAK.XLS

-MSG M#= 8325 FR=VAGS TO=COPY SENT=02/19/93 11:48 AM
ST=C DIV=0050 CC=00134 BY=VAGS AT=02/19/93 11:48 AM

To: Bill Sweet
Fm: Matt Sellers
Re: Highlights for W/E 2/19/93

77PSL2-1 Leak RMR - Pitt's: A fourth leak test failure has been reported by Pitt's. Root cause is again determined to be AMI#2 pick & place/check failure. Latest efforts by mechanization to upgrade the probe have failed. It's been determined that the AMI gasket check probe is actually pulling the gasket out of place after calling it good. Alternate probe designs have not yet solved the problem.
Non-contact systems are the main focus now. Short term fix has been to install an inspection operator instead of the faulty check probe.

Actions underway:

Dis-connect AMI#2 gasket check station. Begin 100% visual inspection by second operator.	Team	Comp
Design engineering feedback on feasibility of fail-safe design change.	Rahman	2/19 1:30pm
Team meeting to update 8D plans.	Team	2/19 1:30pm
Mechanization prototype of non-contact system.	Rocha/ Mccooey	need date
Installation of low-level leak check on function tester unload belt.	Mech	TBD
Response to Pitt's/Ford with 8D plans.	Watt	Week of 2/22

Matt

- Problem Cause Analysis - Process description / Cause For Escape
- Timeline discussion/Review
- Pull team together

TI-NHTSA 011594