EA02-025

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

REQUEST NO. 7

BOX 8

PART A-U

PART E

MSG: No. 00045944 FR=JW02 TO=ZIZ SENT=02/22/93 08:16 AM
PR=009 ST=C DIV=0050 CC=00101 BY=JW02 AT=02/22/93 08:16 AM
WHL2 BCON,RCS2,MFPC.JW02,GJS1

Memorandum
February 22, 1993

TO:	Dick Garlacy	RWG3	Tom Burke	TEB7	
	Bruce Wright	MFPC	Dennis Natale	DJN1	
	Aziz Rahman	ZIZ	Dave Czarn	ZARN	
	Bill Congdon	BCON	Elaine Rose	GAMY	
	Andy McGuirk	FCOA	Matt Sellers	MJS2	
	Gary Snyder	GJS1	Charlie Douglas	CMP1	
	Bill Sweet	WS4	Norm Freda	WHL2	
	Rusty Struble	RCS2	Rick Conlin	RAC1	
	Lou Rocha	MAYR	John Kourtesis	JKOU	

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: Wednesday, 02/24/93

Time: 3:00 p.m.

Place: Bldg 12 Cafeteria

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

Ideas discussed from last meeting:

1. Evaluate current pressure decay specification during function testing to improve detection capability and assess potential alternative approaches .... Matt Sellers 02/24/93

2. Determination and assessment of 100% low pressure leak decay test in process ..... John Kourtesis 03/03/93

3. Evaluate & select possible fail-safe design changes to prevent improper assembly of internal parts. Aziz Rahman 03/05/93

4. Obtain ES test procedure from Pitts to determine test [illegible] pressure ..... Jim Watt 02/23/93

5. Test sensors for leak at sensor assembly. Assess testing at [illegible] location on the AMC machine. .... Lou Rocha 02/24/93

6. Explore potential for automated gasket location detector at [illegible] vision system. .... John Kourtesis 02/25/93

[illegible] were t

Regards,

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

-MSG M#= 45944 FR=JW02 TO=MJB2 SENT=02/22/93 08:16 AM
R#=126 ST=C DIV=0050 CC=00149 BY=JW02 AT=02/22/93 08:16 AM
WHLZ,BCON,RCS2,MFPC,JW02,GJS1

Memorandum
February 22, 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	PCGA	[redacted]	MJB2
	Gary Snyder	GJS1	Charlie Douglas	CMP1
	Bill Sweet	WS4	Norm Freda	WHLZ
	Rusty Struble	RCS2	Rick Conlin	RAC1
	Lou Rocha	MAYR	John Kourtesis	JKOU

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: * Reinstitute tally Sheet

* E-... feed / Check
Date: Wednesday, 02/24/93

* Reduce poss of misplacing subsequently. Bigger gland, thicker [illegible], etc
Time: 3:00 p.m.

* Improve detection capability - [illegible] leak check or Flow meter.
Place: Bldg 12 Cafeteria

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

Ideas discussed from last meeting: **TI-NHTSA 011597**

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1. Evaluate current pressure decay specification during function testing to improve detection capability and assess potential alternative approaches .... Matt Sellers 02/26/93

2. Determination and assessment of 100% low pressure leak decay test in process, ... John Kourtesis 03/05/93

3. Evaluate & select probable fail-safe product design changes to prevent incorrect assembly of internal gasket ..... Aziz Rahman 03/05/93

4. Obtain ES test procedure from Pitts to determine leak decay rate and line pressure, ,..... Jim Watt 02/26/93

5. Test sensors for leak at sensor assembly; assess testing approach, location on the AMI machine, ... Lou Rocha 02/26/93

6. Explore potential for automated gasket location detector at AMI machine, perhaps using vision system, ... John Kourtesis 02/26/93

7. Evaluate and select technical approach to detect misplaced gasket, ... John Kourtesis 03/05/93

77PS PRESSURE TESTER - LEAK TESTING - 02/24/93:LCR:77LEAK

60 second Hold + Delta

TEST PRESS	LEAK RATE (PSI/SEC) TEST 1 gasket leak	TEST 2	TEST 3	TEST 4	TEST 5	TEST 6
10	0.00	0.03	0.01	0.02	0.12	0.00
50	0.13	0.16	0.12	0.12	0.30	0.11
250	0.70	0.72	0.65	0.65	1.13	0.66
500	0.46	0.56	0.45	0.58	1.38	0.58

TEST 1 = 4 PLUGGED DEVICES
TEST 2 = 3 PLUGGED DEVICES, 1 MISPLACED GASKET
TEST 3 = 3 PLUGGED DEVICES, 1 NO GASKET
TEST 4 = 4 NO GASKET
TEST 5 = 4 MISPLACED GASKET
TEST 6 = 4 PLUGGED DEVICES

No pre-cycles during this test.

1.5 / 30

TI-NHTSA 011598

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	150	113		
376-03-10	2	8.9	145	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	466		
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

7796 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 Can disc.

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 77PSL-2 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	~~6~~ 4	MIN	2
9	~~6~~ 5	MAX	2
10	~~6~~ 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, [illegible] HZ, DEVICES [illegible] .
EVERY 24 HRS:
RECORD # OF CYCLES COMPLETED
CALIBRATE DEVICES
RUN CURVES ON SENSORS

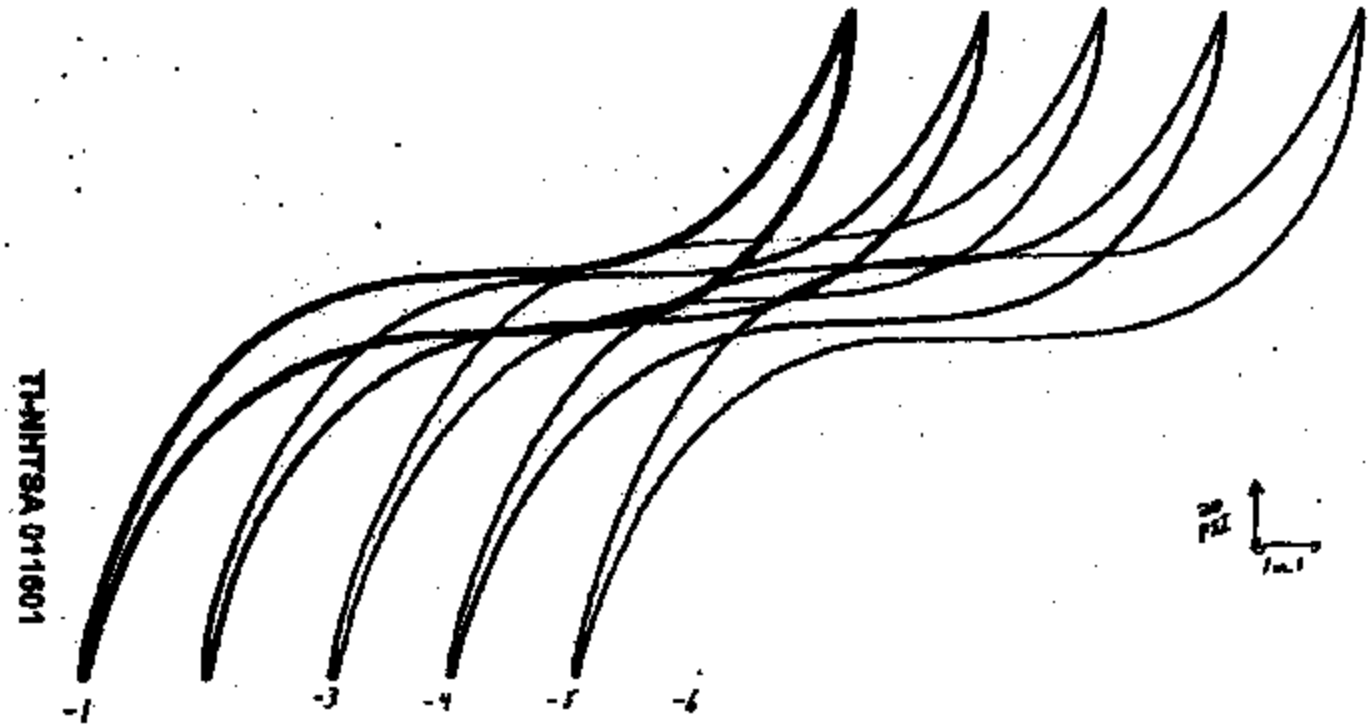
RUN IMPULSE TEST TILL EVERY SENSOR / DEVICE FAILS OR [illegible] MILLION CYCLES WHICHEVER COMES FIRST.

TI-NHTSA 011600

RANGES: 720.0mV 10.00V 2.400V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.000
POST-TRIG: 0.00
TRIGGER: MAN
08:11:30 04 FEB 93

JD

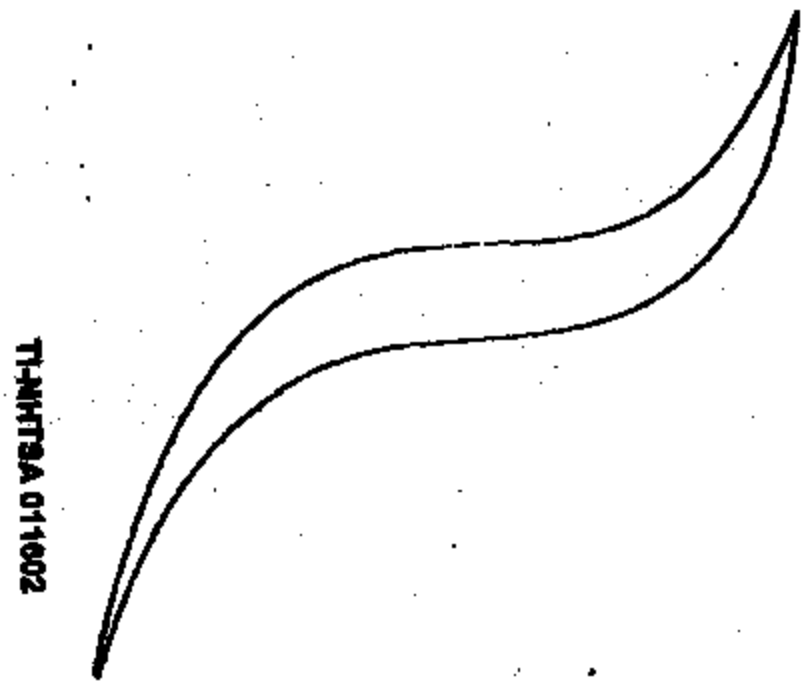
Test 376-03-30
23713-1 Cap
Ispacer
Sensor Style 2
Pre-Impulse

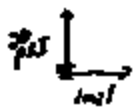


RANGES: 720.0mV 10.00V 2.400V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.000
POST-TRIG: 0.00
TRIGGER: MAN
10:00:11 08 FEB 93

JD

Test 371-03-30
37715-1 C-P
1 Spacer
Sensor Style 2
500 K impulses, 0-700 PSI

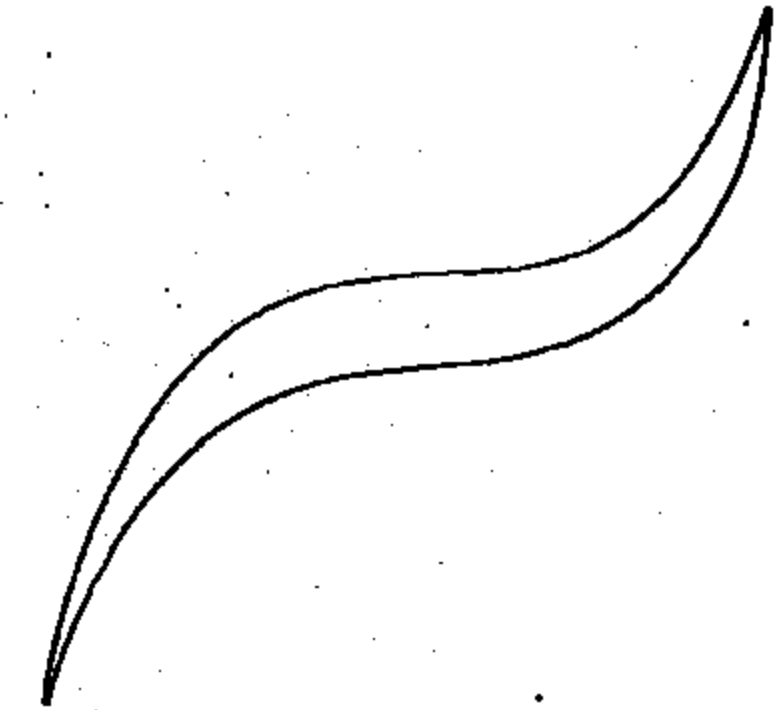




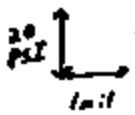
RANGES: 720.0mV 10.00V 2.400V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.000
POST-TRIG: 0.00
TRIGGER: MAN
08:38:04 11 FEB 93

JD

Test 376-03-26
3771-1 Cap
1 spacer
Sensor Style 2
500K impulse(s) 0-1000 PSI
500K impulse, 0-1450 PSI

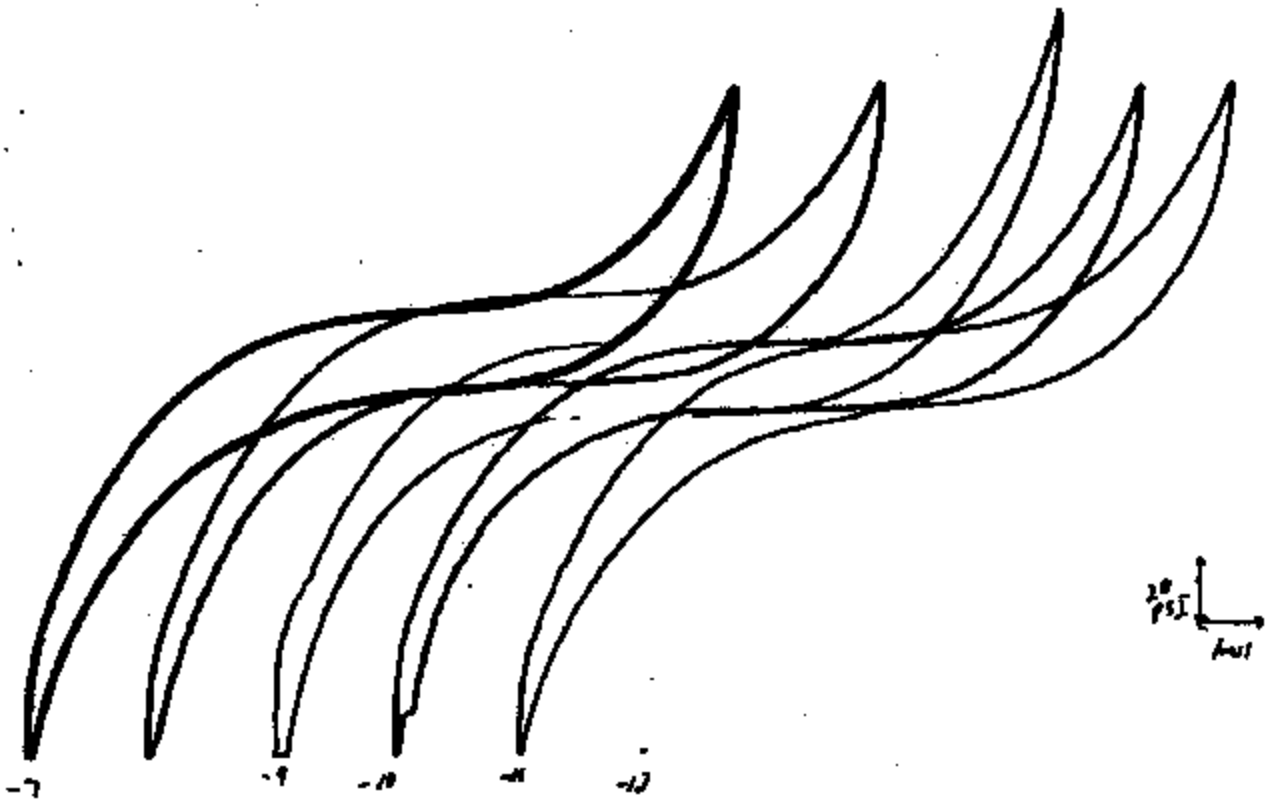


THHTSA 011803



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 776-03-30
22713-1 C=P
2 spares
Sensor style 2
pre-impulse

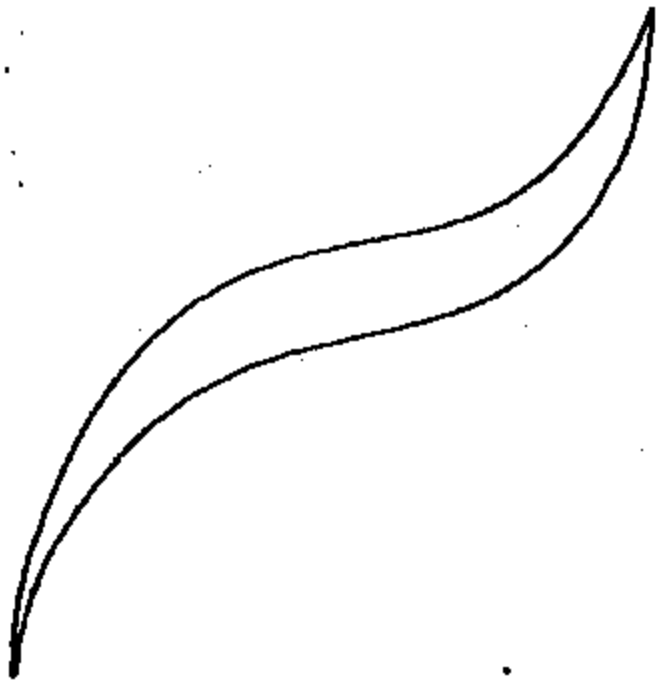


TI-NHTSA 011604

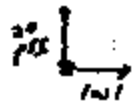
RANGES: 720.0mV 10.00V 2.450V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.00S
POST-TRIG: 0.0S
TRIGGER: MAN

JD

Test 376-03-30
37713-1 c.p
3 spacers
Sensor Style 2
500 K inp.lbs, 0-1000 PSI

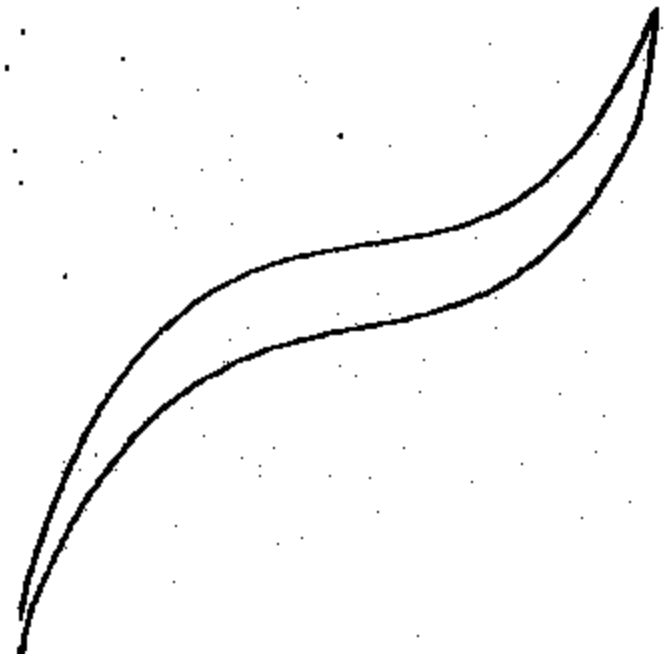


TI-NHTSA 011605



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 376-03-20
22713-1 cal
2 spacers
Sensor Style 3
500K Impeller, 0-1000 PSI
500K Impeller, 0-1450 PSI



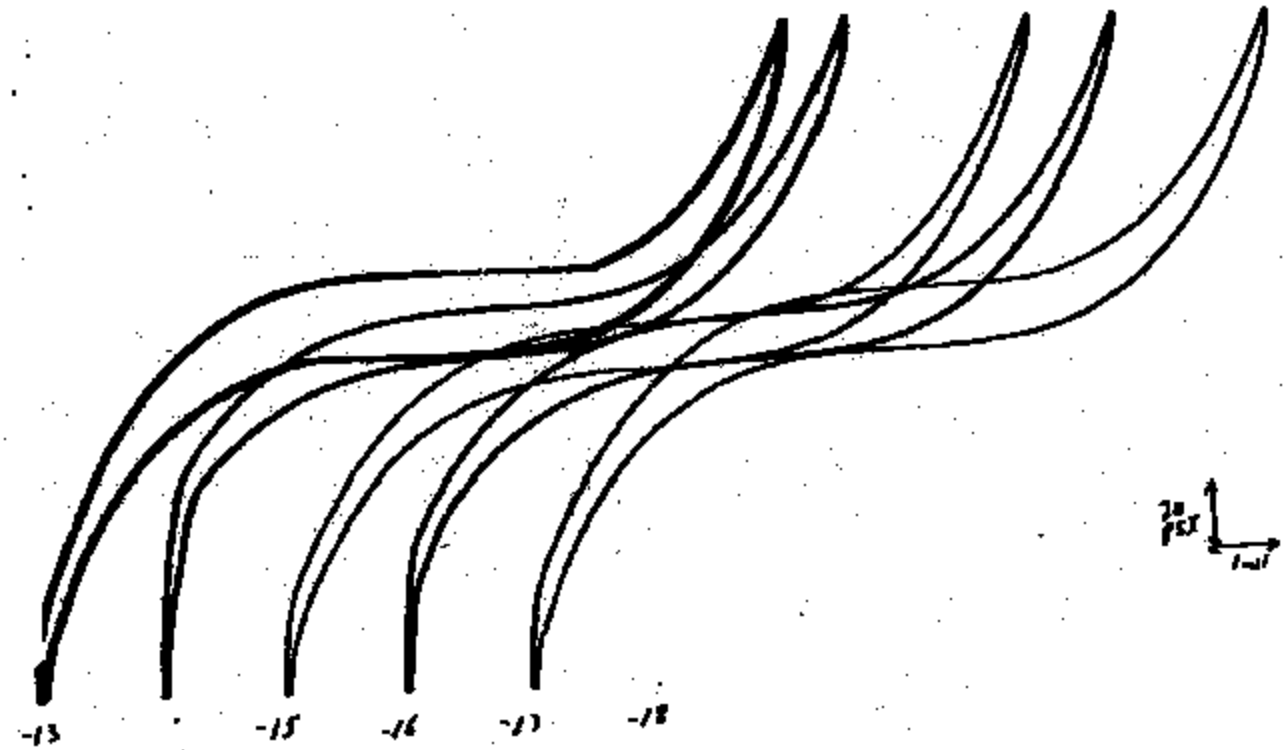
TI-NHTSA 011606

-11 -12

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

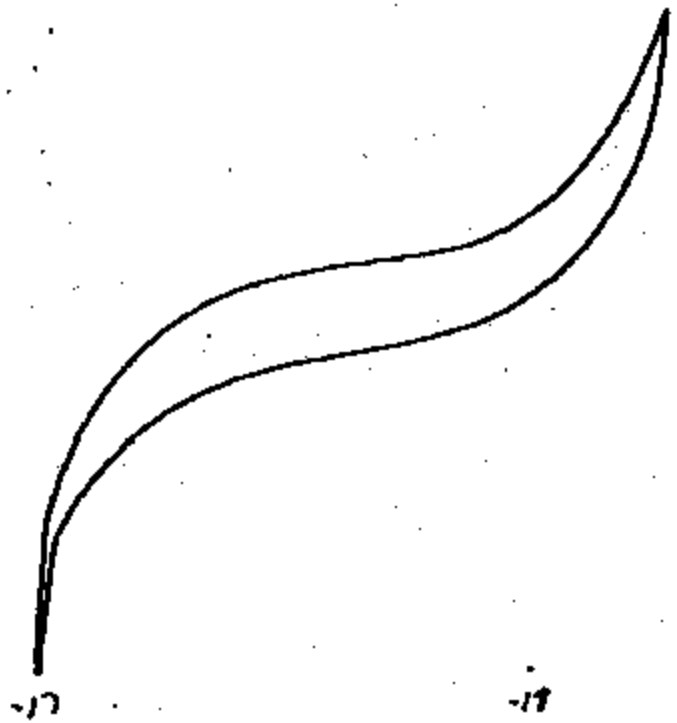


TAHITBA 011807

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 376-07-30
27713-2 cup
1 specif
Sensor Style 3
scan samples, 0-1000 PSI



TI-NHTSA 0:1808

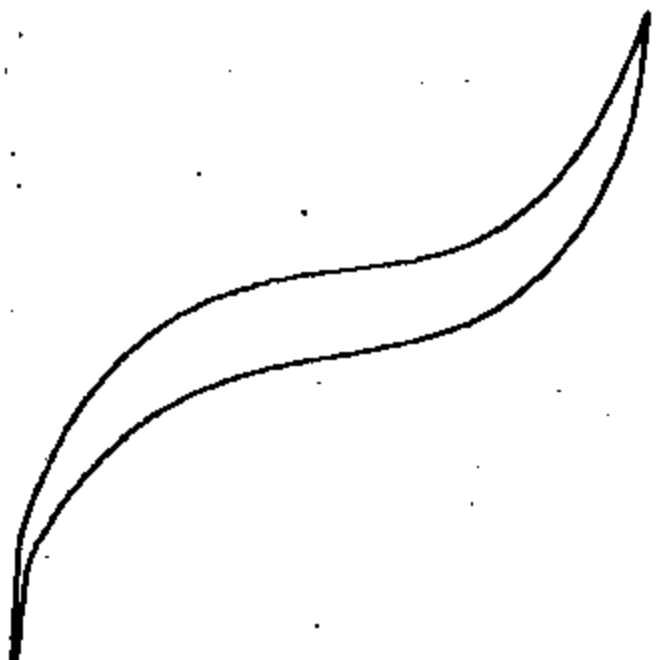
-17

-19

20 PSI
Inch

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 32-01-30
22713-2 cmp
1 spacer
Sensor Style 3
500 K impulses, 0-1000 PSI
100 K impulses, 0-1950 PSI



TI-NHTSA 011809

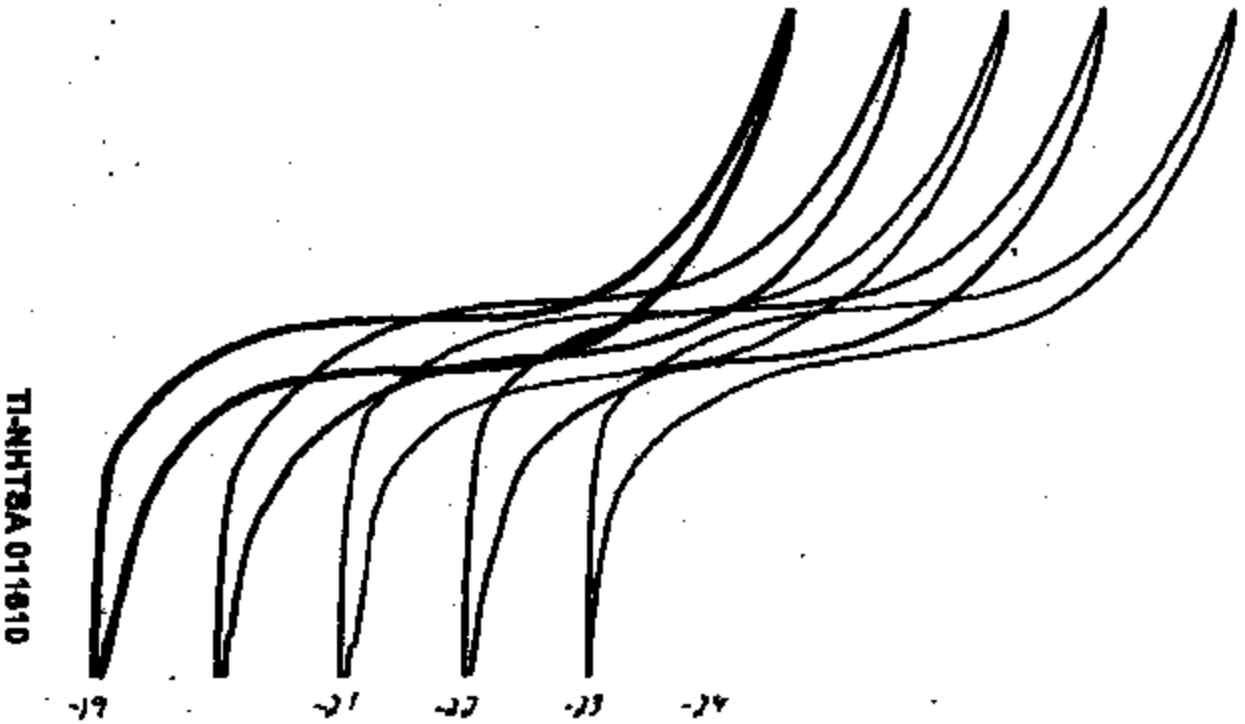
-17

-18

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

J D

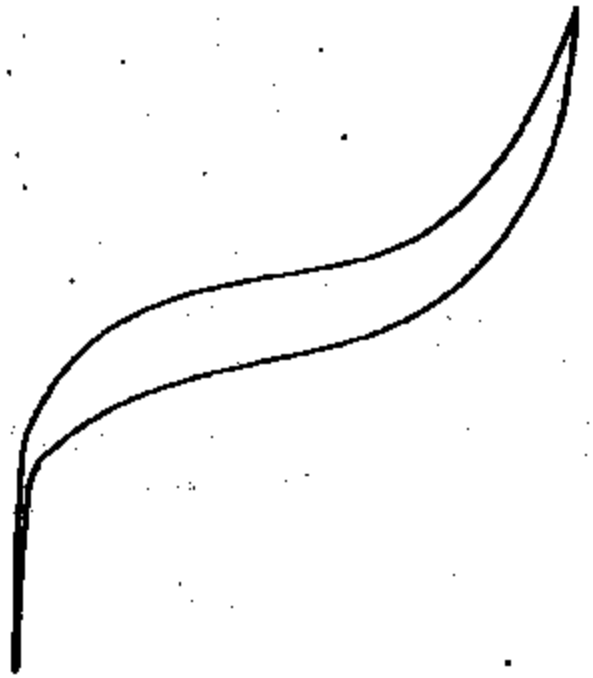
Test 371-03-30
27713-3 cap
3 spares
sensor style 4
pre-impulse



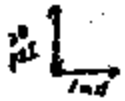
TI-NHTSA 011610

RANGES: 720.0mV 10.00V 2.450V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.00S
POST-TRIG: 0.0S
TRIGGER: MAN
10:19:50 09 FEB 99

Test 376-03-30
3773-2 Cup
3 spacers
Sensor style 4
600 # impulse, 0-1000 PSI



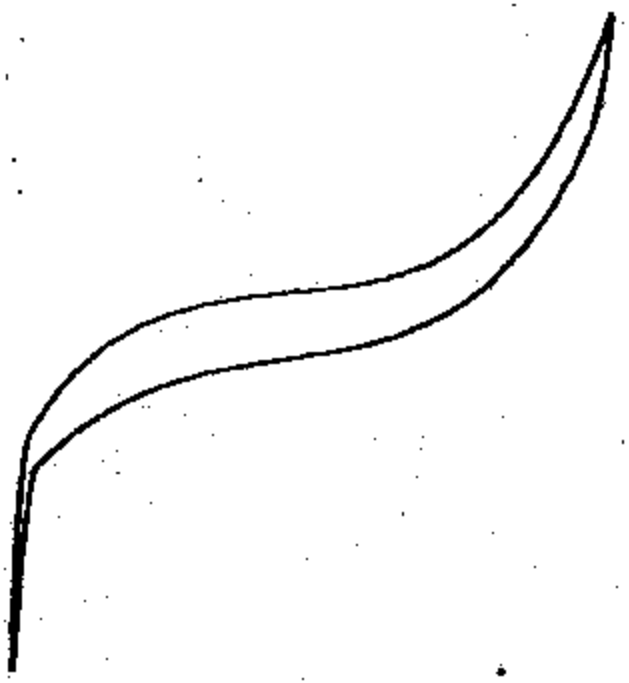
TI-NHTSA 011611



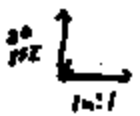
RANGES: 720.0mV 10.00V 2.450V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.00S
POST-TRIG: 0.0S
TRIGGER: MAN
10:30:09 11 FEB 93

JD

Test 92(-03-30
22717-2 C-P
2 spacers
Loader Style 4
500 K inputted, 0-1000 PSI
500 K inputting 0-1000 PSI



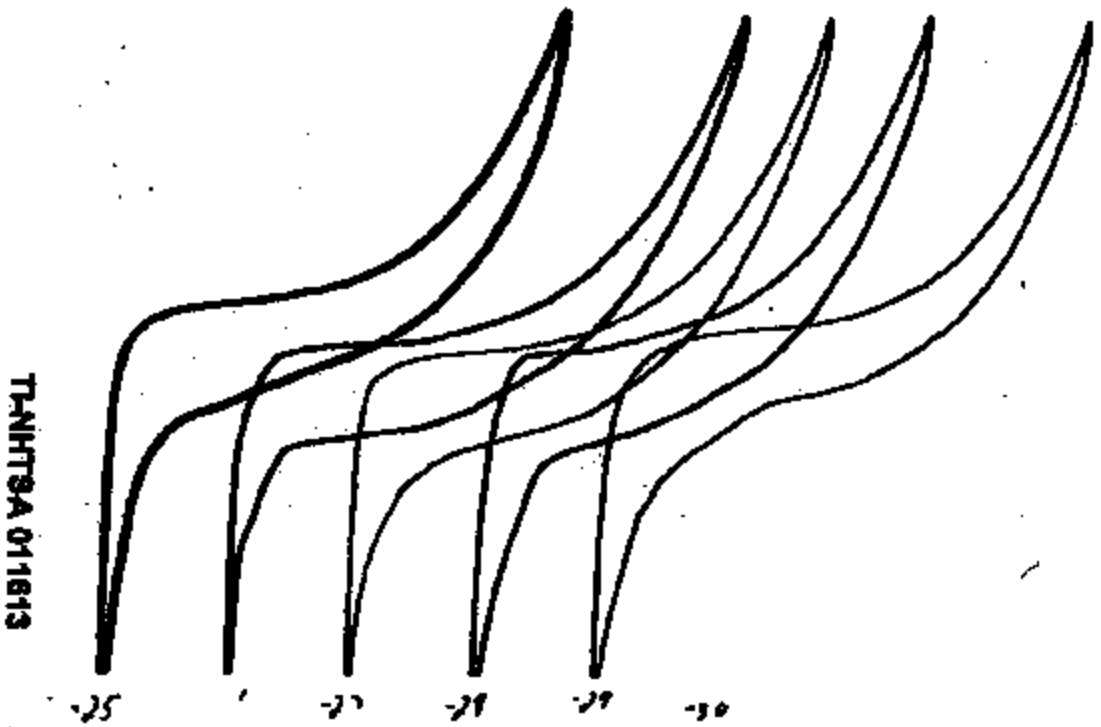
THINTRA 011812



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

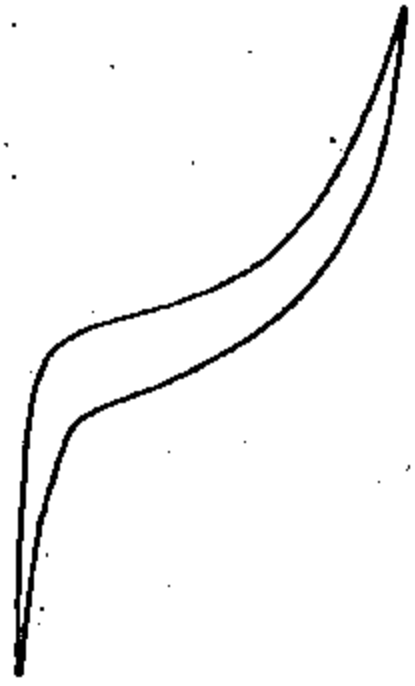
j 0

Test 371-03-7 0
2778-2 cap
3 spares
Sensor style 5
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
10:25:30 09 FEB 93

Test 376-03-30
37713-3 Cap
3 Spacers
Sensor Style 5
500 k impulses, 0-100 PSI

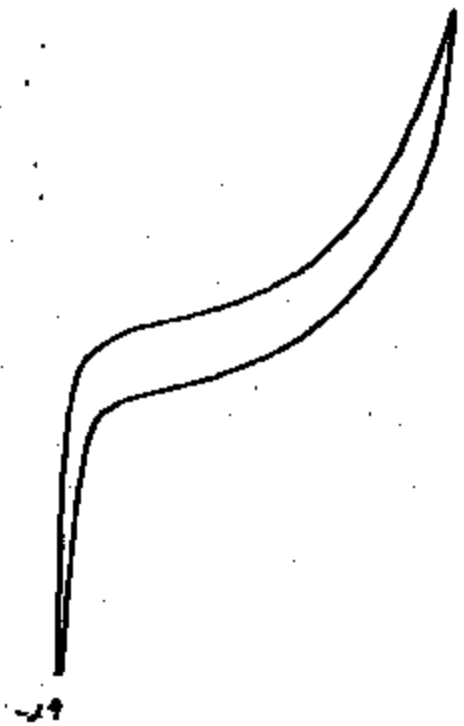


TLNHTBA 016614

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

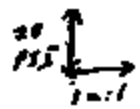
Test 376-03-16
37713-3 Cup
Sensor Style 5
3 spacers
500 K impellers, 0-1000 PSI
500 K impellers, 0-1470 PSI



TINHTBA 011815

-29

-30



PRESSURE SWITCH DATA Form 21605 TEST NO. 343-01-15

DEVICE	DATE REQUESTED	REQUESTED BY	REQUESTED COMPL. DATE
77PS		Amir Rahman	3/6/93

PERFORMED BY	DATE STARTED	DATE COMPLETED	APPROVED BY
Jeffrey DiAmenico	3/?/93		

PROJECT TITLE: Cruise Control

CUSTOMER:

PURPOSE OF TEST: Sample matrix for walker. Objective is to have Pass-car engineering approve launch calibration and eliminate walker.

PROCEDURE: Build device matrix calibrate and ship.

Device #	Style	Base	Cup	Lowest	act rel	ΔV drop			Label
343-01-01	3	L3-1	77395-1	Checked	257 177	4.3			77395 Style
-02	3				257 183	5.5			1
-03	3				257 185	5.0			1
-04	3				254 188	6.0			1
-05	3	↓	↓	↓	249 194	5.2			1
343-01-06	2	L3-1	77389-1	Coolbar	258 179	5.4			77382 Style 2
-07	2				254 186	5.5			2
-08	2				260 185	5.5			2
-09	2				251 191	6.2			2
-10	2	↓	↓	↓	262 192	5.2			2
343-01-11	3	L3-1	77317-1	Standard	190 107	4.8			77311 Style 3
-12	3				145 109	5.1			3
-13	3				141 106	5.6			3
-14	3				142 108	7.1			3
-15	3	↓	↓	↓	145 118	7.3			3

PRESSURE SWITCH DATA Form 21605 **TEST NO.** 395-15-19

DEVICE	DATE REQUESTED	REQUESTED BY	REQUESTED COMPL. DATE
CCPS	3/12/93	Aziz Rahman	

PERFORMED BY	DATE STARTED	DATE COMPLETED	APPROVED BY
Jeffrey D'Ambrosio	3/13/93		

PROJECT TITLE: Cruise Control

CUSTOMER:

PURPOSE OF TEST: Evaluate stainless steel diaphragms

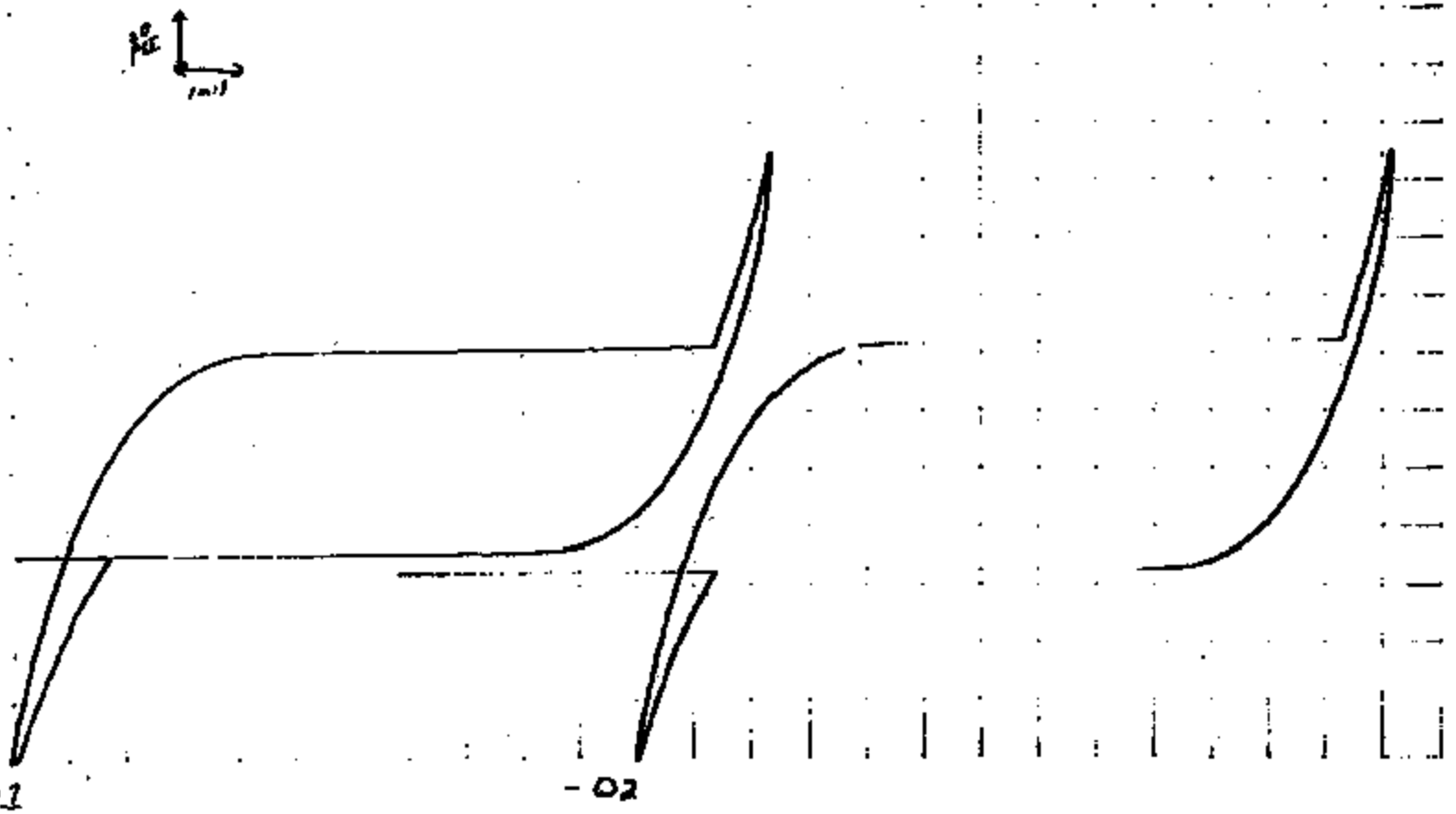
PROCEDURE: Build matrix of sensors with steel diaphragms. Use 27713-1 cups and case discs. Run old cruise impulse test.

* Test aborted at 29K cyc. We will rerun with thicker diaphragms

Device #	Steel	Thickness	Hardness	Kapton	[illegible] dia. width	[illegible] dia. width	Failure	Remarks	
395-15-01	301 SS	.002	annealed	0	44.6	44.5	5914 cyc		
-02	↓	↓	↓	0	44.2	44.1	12763 cyc		
-03	↓	↓	↓	1	44.5	44.4	16K cyc	center crack	[illegible]
-04	↓	↓	↓	1	44.9	44.9	29K cyc	Ruptured	diaphragm
-05	↓	↓	↓	2	44.8	44.9		Steel ruptured,	Kapton OK
-06	↓	↓	↓	2	44.9	43.6		Steel ruptured,	Kapton OK
-07	302 SS	.002	3/4 hard	0	43.8	43.0	3443 cyc		
-08	↓	↓	↓	0	44.1	44.1	3347 cyc		
-09	↓	↓	↓	1	44.4	44.8		Steel cr,	Kapton OK
-10	↓	↓	↓	1	44.3	44.1	16K cyc	steel cracked,	kapton [illegible]
-11	↓	↓	↓	2	43.3	43.2		Steel beginning	[illegible]
-12	↓	↓	↓	2	44.4	44.3		Ruptured	steel, kapton OK
-13	301 SS	.002	full hard	0	44.3	44.2	2959 cyc		
-14	↓	↓	↓	0	44.0	43.9	2594 cyc		
-15	↓	↓	↓	1	44.7	44.6		Steel & Kapton	OK
-16	↓	↓	↓	1	44.6	44.5		Steel & Kapton	in [illegible]
-17	↓	↓	↓	2	44.5	44.4		Steel ruptured,	Kapton [illegible]
-18	↓	↓	↓	2	44.8	44.9		Steel & Kapton	OK

RANGES: 720.0mV 10.00V 2.450V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.00S
POST-TRIG: 0.0S
TRIGGER: MAN
13:95:54 16 MAR 93

Test 785-15-19
Stainless steel substrate
321 SS
.002"
annealed
no Kapton

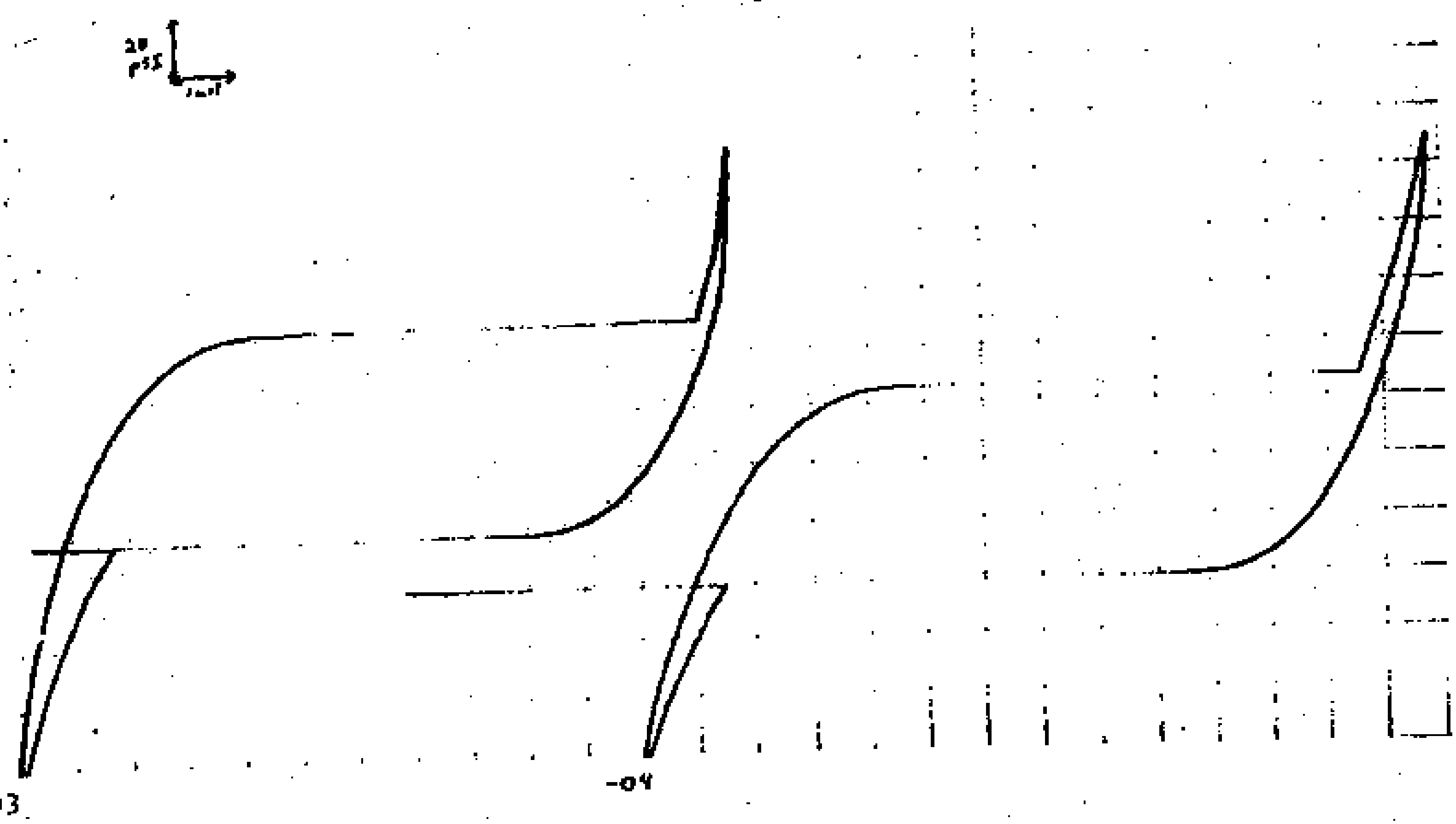


TI-NHTSA 011618

RANGES: 720.0mV 10.00V 2.490V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.00S
POST-TRIG: 0.0S
TRIGGER: MAN
13:45:41 16 MAR 99

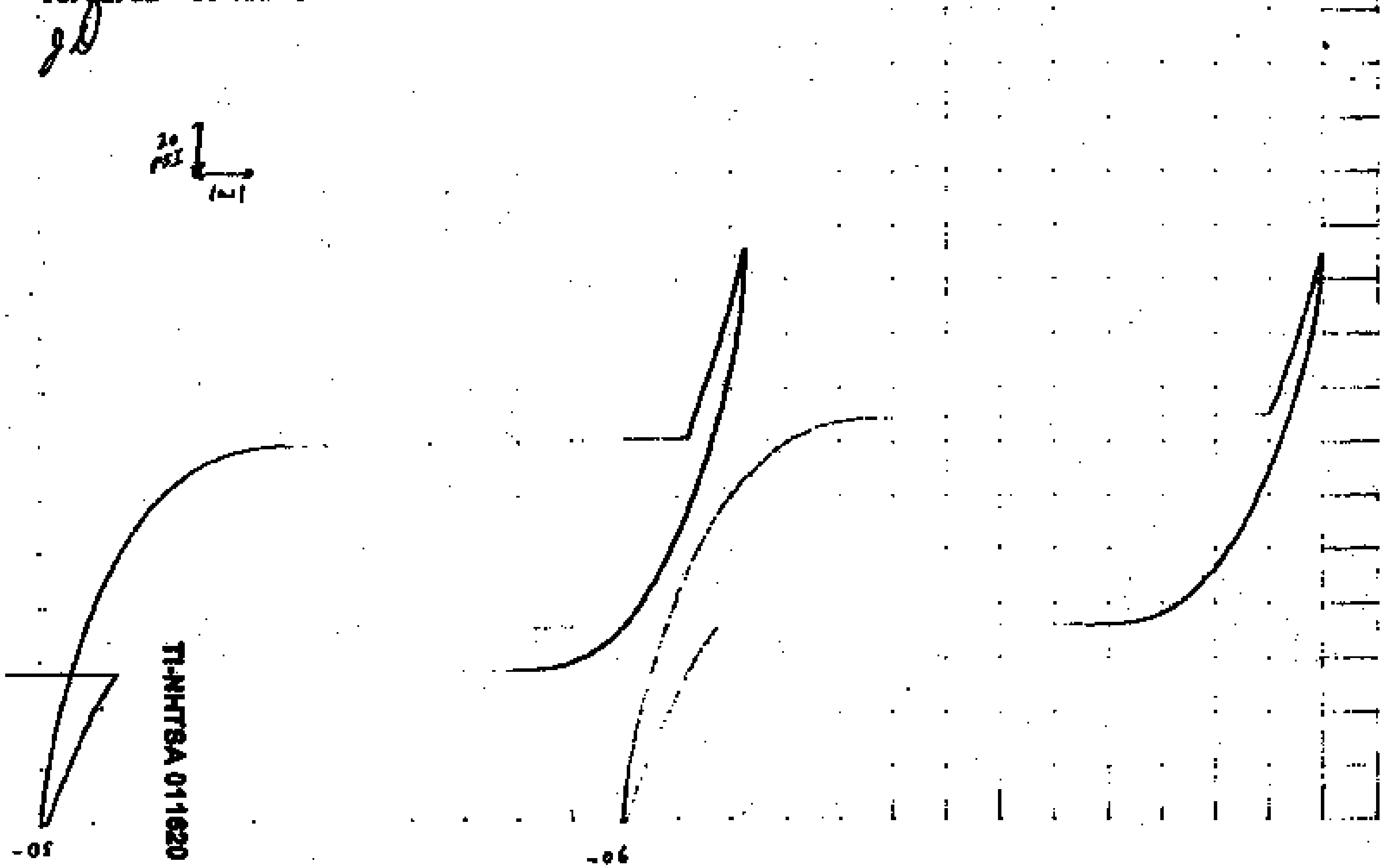
JD

Test 395-15-19
Stainless steel diaphragm
321 SS
.003"
annealed
1 Kapton



RANGES: 720.0mV 10.00V 2.450V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.00S
POST-TRIG: 0.0S
TRIGGER: MAN
13:52:32 16 MAR 93

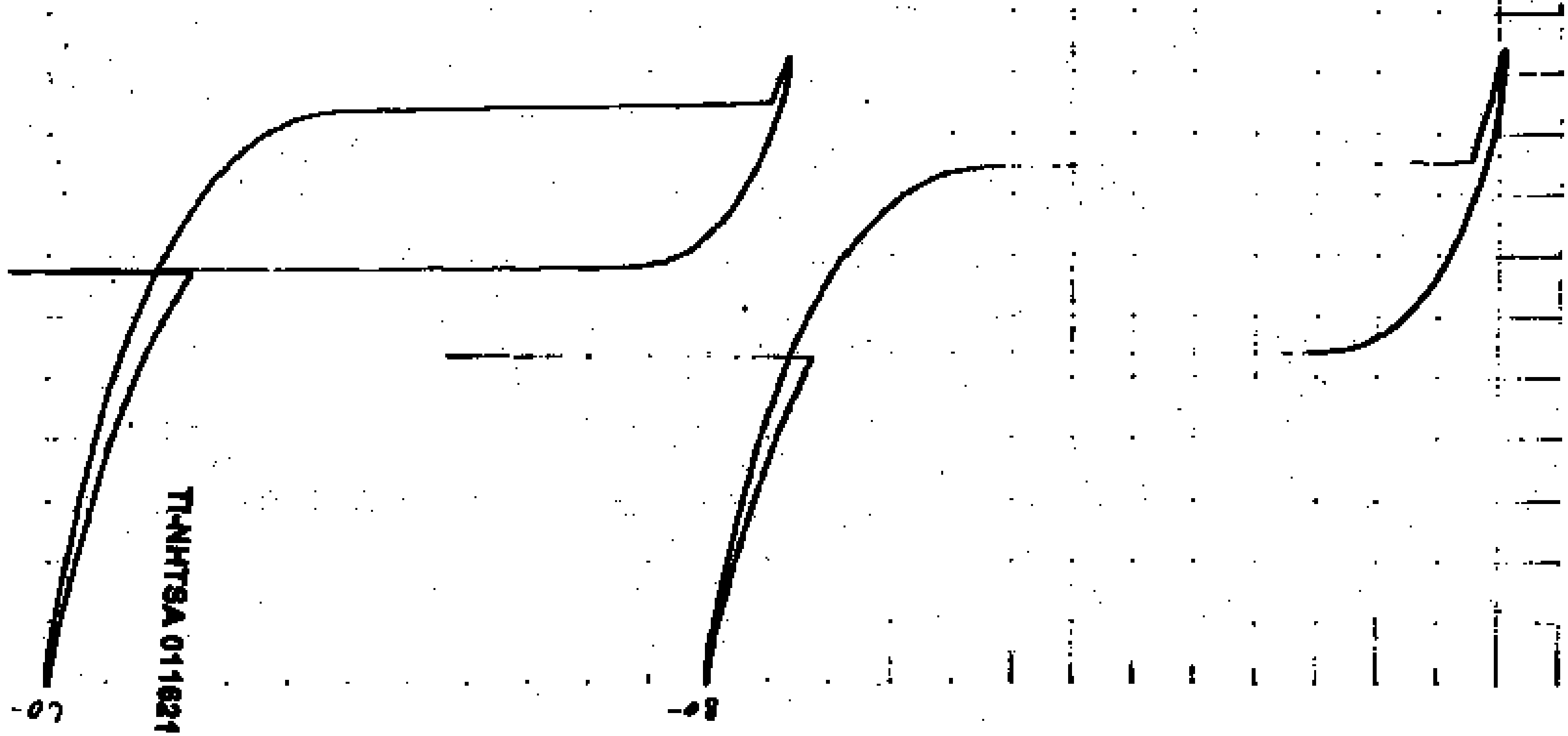
Test 375-15-19
stainless steel diaphragm
321 SS
.003"
annealed
2 Kaptons



TI-NHTSA 011620

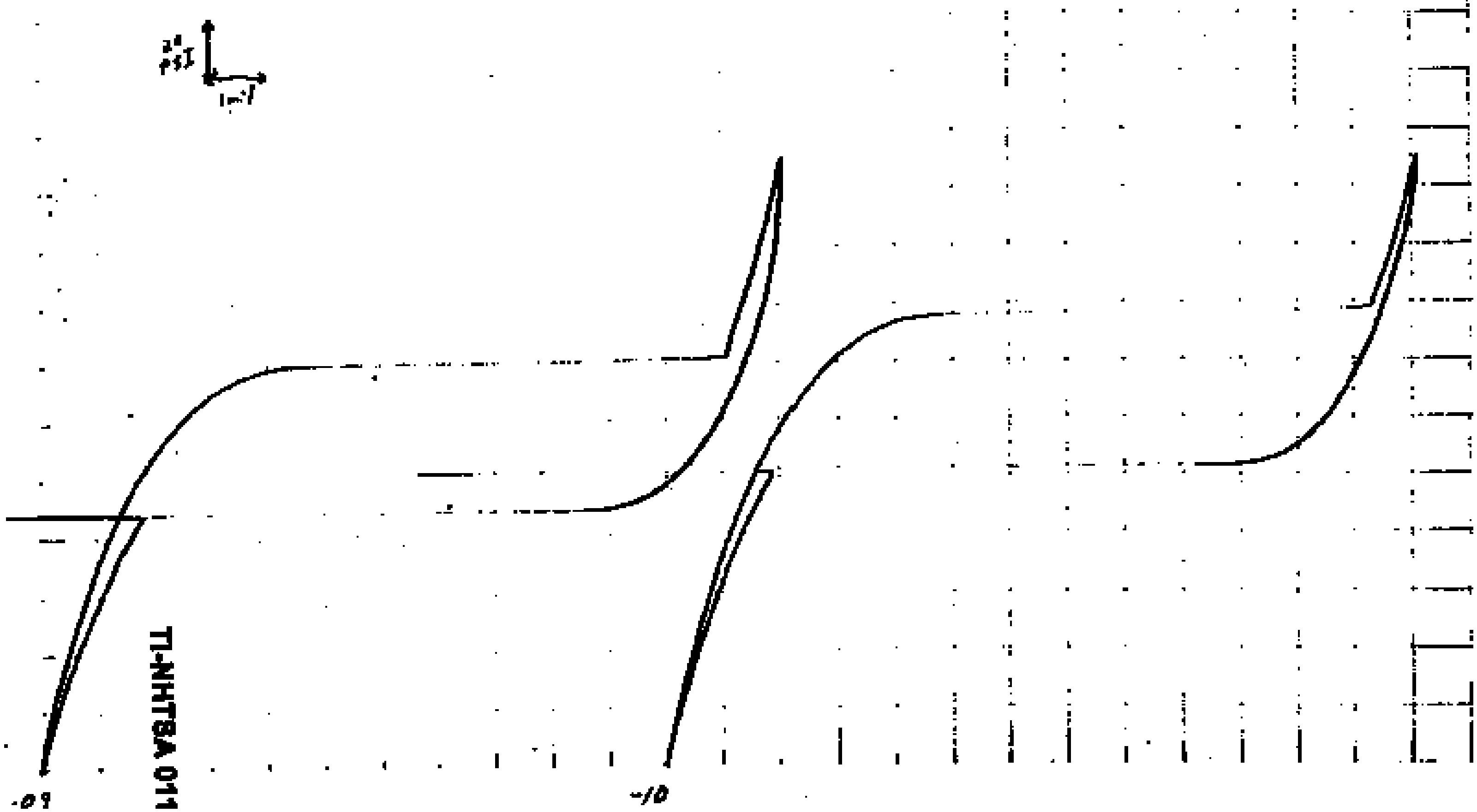
RANGES: 720.0mV 10.00V 2.450V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.00S
POST-TRIG: 0.0S
TRIGGER: MAN
15:44:27 16 MAR 93

Test # 395-15-18
stainless steel diaphragm
302 SS
.002 "
¼ hard
no Kapton



RANGES: 720.0mV 10.00V 2.450V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.00S
POST-TRIG: 0.0S
TRIGGER: MAN
15:50:30 16 MAR 93

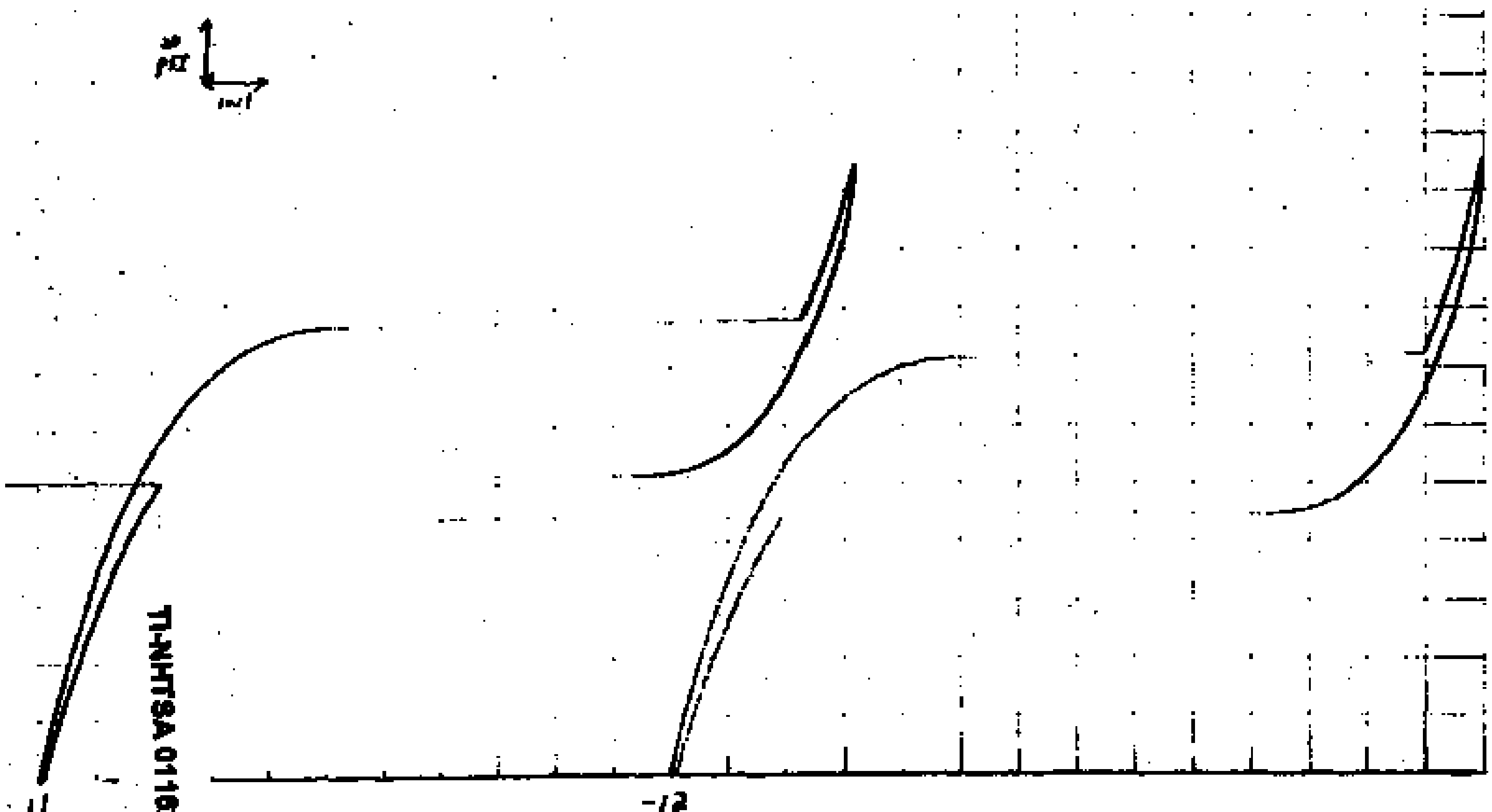
Test 385-15-18
Strip into Steel [illegible]
301 SS
3/4 hard
.001"
1 Kapton



TI-NHTSA 011622

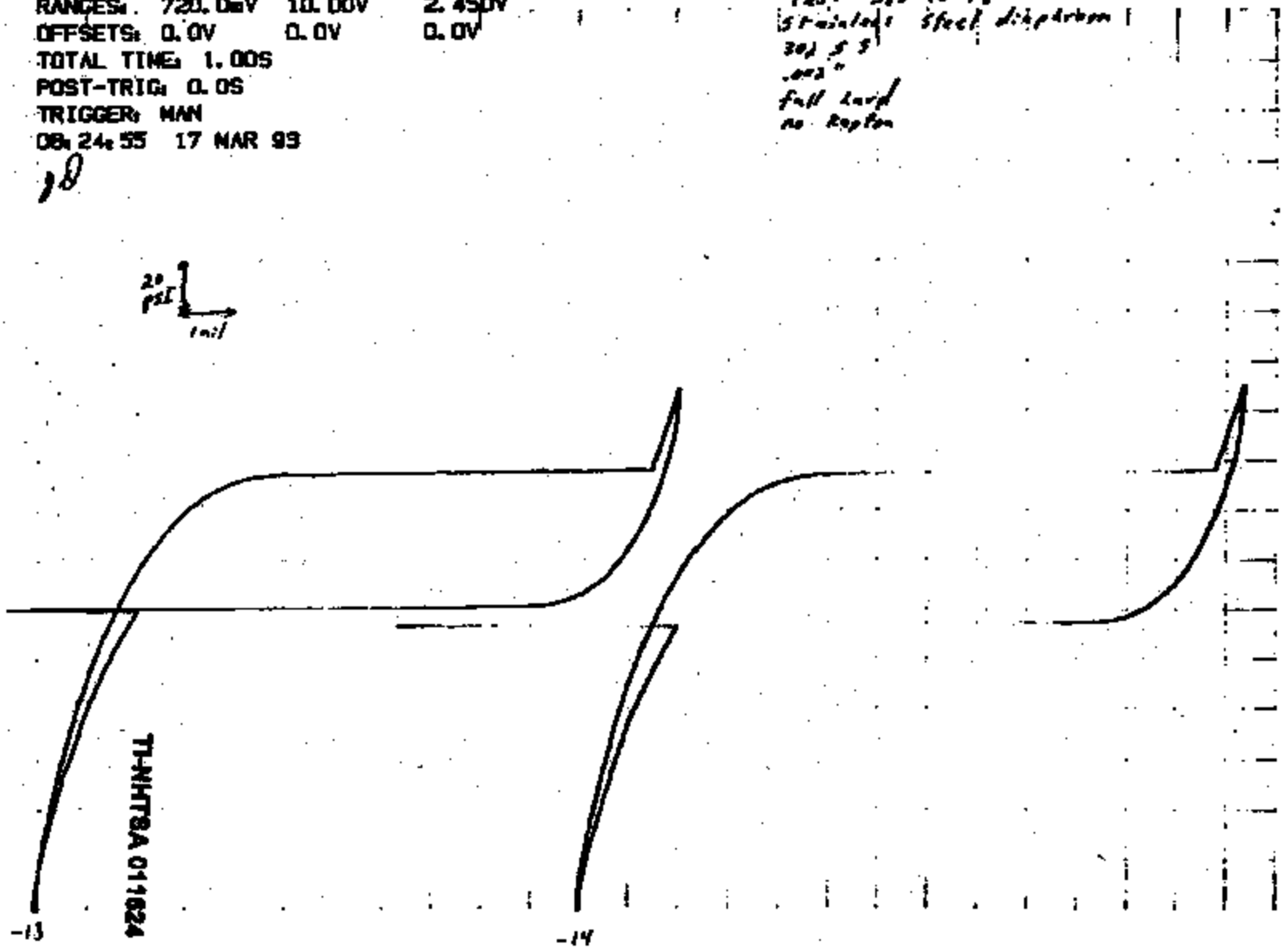
RANGES: 720.0mV 10.00V 2.450V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.00S
POST-TRIG: 0.0S
TRIGGER: MAN
08:17:17 17 MAR 93

Test # 395-15-18
stainless steel diaphragm
302 SS
.003"
3/4 hard



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: 24: 55 17 MAR 93

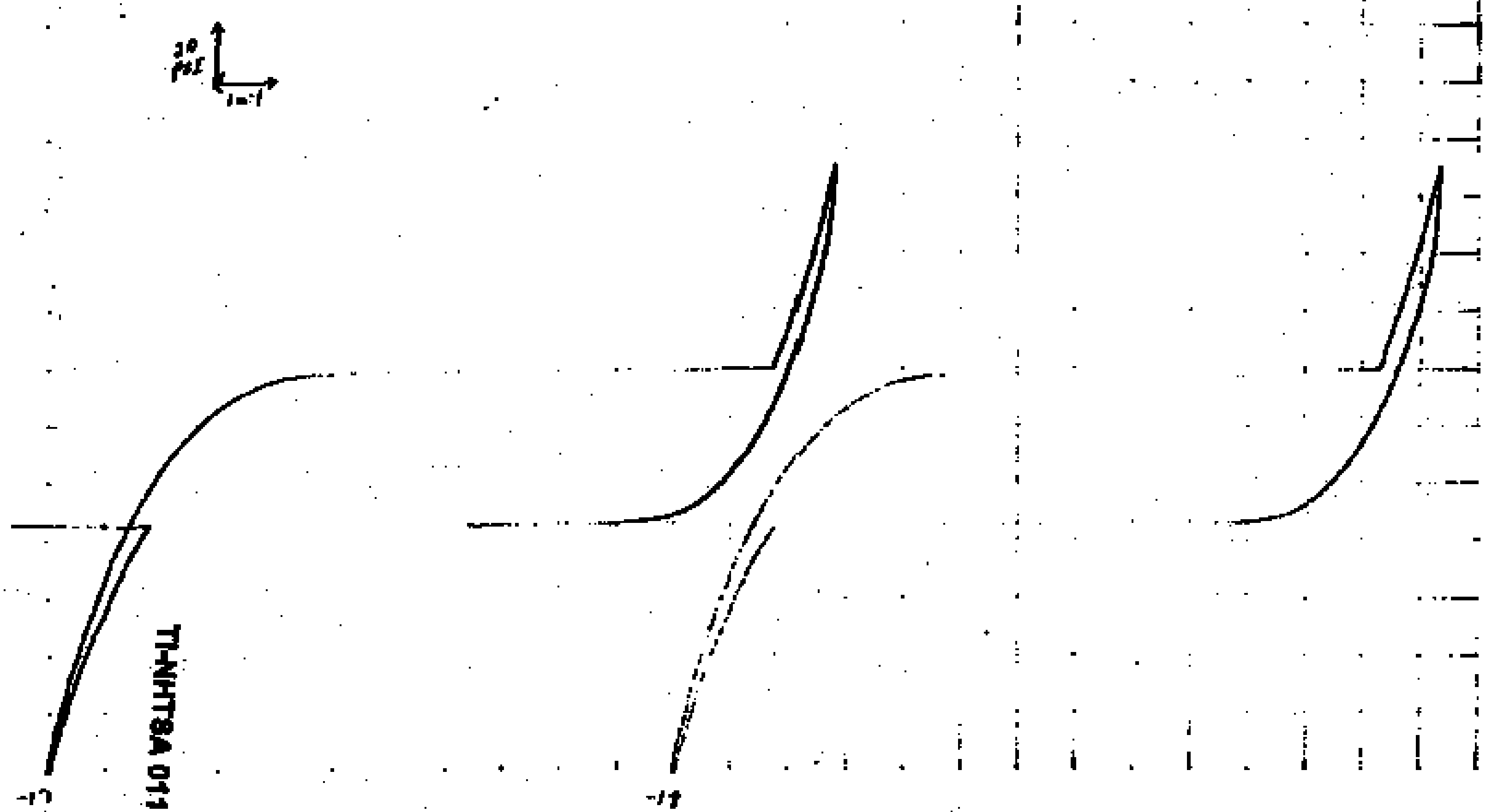
Test 395-15-18
Stainless steel diaphragm
304 S S
.002"
full load
no Kapton



RANGES: 720.0mV 10.00V 2.450V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.00S
POST-TRIG: 0.0S
TRIGGER: MAN
08:47:24 17 MAR 99

gD

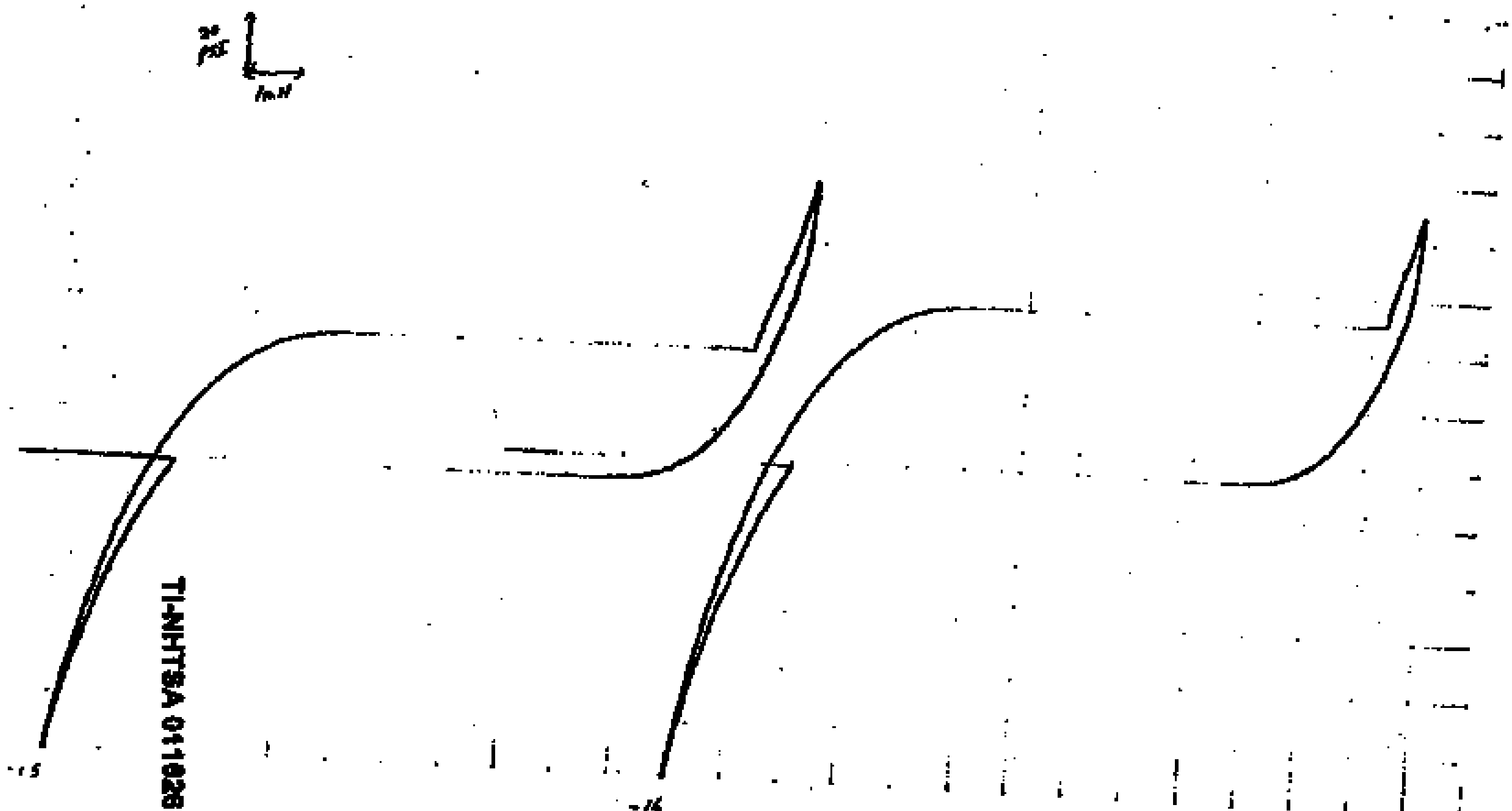
Test 395-15-18
stainless steel diaphragm
302 SS
.003"
full hard
2 Kapton



TI-NHTSA 011825

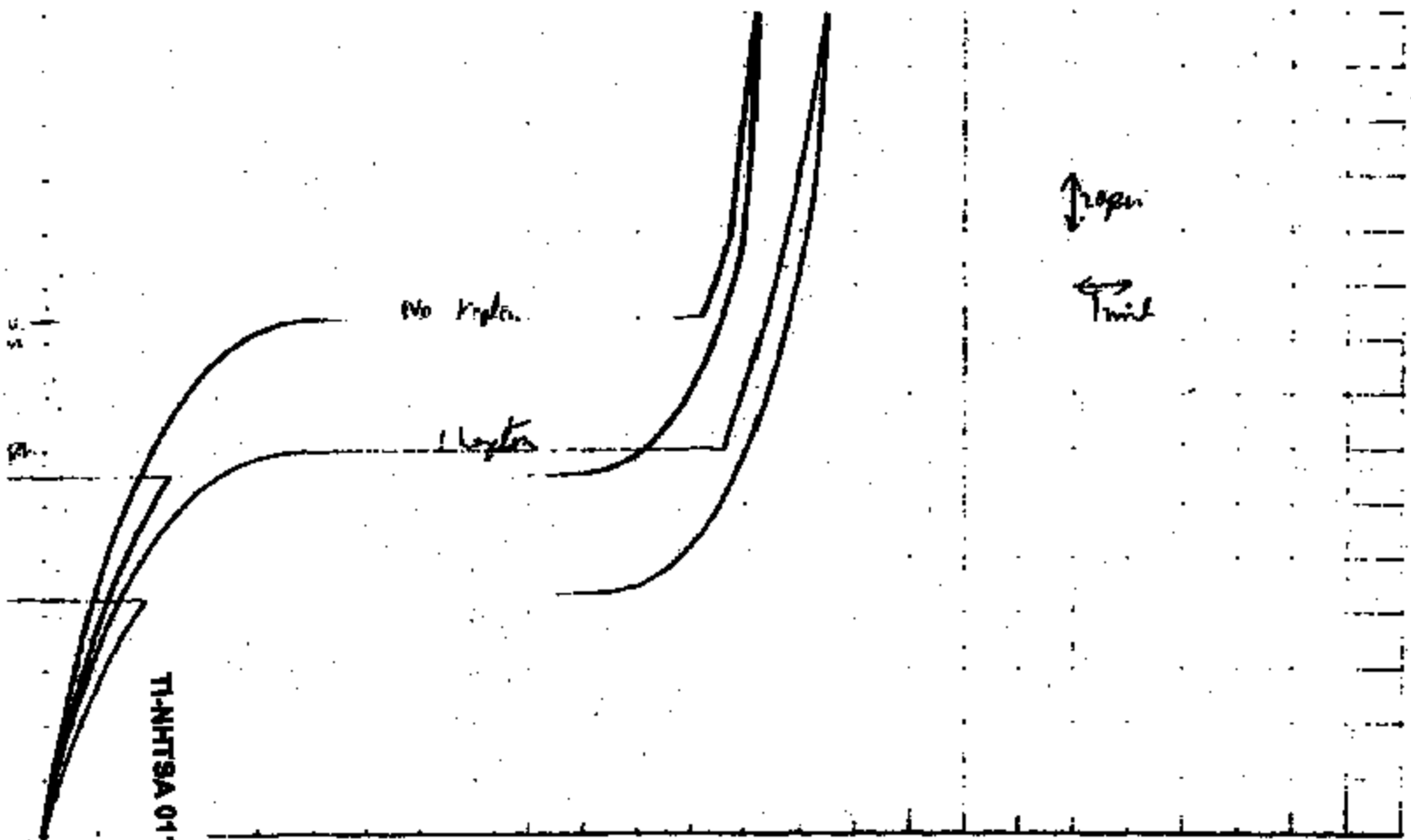
RANGES: 720.0mV 10.00V 2.450V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.00S
POST-TRIG: 0.0S
TRIGGER: MAN
08:40:48 17 MAR 93

Test 395-15-18
stainless steel diaphragm
302 SS
.003"
Full load
1 Kapton



RANGES: 720.0mV 10.00V 2.450V
OFFSETS: 0.0V 0.0V 0.0V
TOTAL TIME: 1.00S
POST-TRIG: 0.0S
TRIGGER: MAN
14:06:47 19 MAR 99

Heated SS diaphragm, .002" Thick,
9713-1 Cyl



TL-NHTSA 011827

High Temp Impulse Test (149 deg. C)

	Initial					Final				
Device #	Proof (4000 psi)	Act	Rel	mV drop	Current Leak	Proof (4000 psi)	Act	Rel	mV drop	Current Leak
258-03-01	Pass	229	167	3.2	Pass	Pass	231	169	18.3	Pass
258-03-02	Pass	246	182	3.1	Pass	Pass	242	176	35.2	Pass
258-03-03	Pass	242	177	2.5	Pass	Pass	235	170	27.2	Pass
258-03-04	Pass	245	179	2.5	Pass	Pass	243	176	33.9	Pass
258-03-05	Pass	223	164	2.7	Pass	Pass	217	160	35.5	Pass
258-03-06	Pass	245	182	3.2	Pass	Pass	244	178	21.7	Pass
258-03-07	Pass	232	173	2.3	Pass	Pass	236	173	32.7	Pass
258-03-08	Pass	228	170	3.0	Pass	Pass	232	167	18.9	Pass
258-03-09	Pass	247	178	2.8	Pass	Pass	239	176	20.9	Pass
258-03-10	Pass	217	162	3.0	Pass	Pass	217	160	22.9	Pass
258-03-11	Pass	237	174	2.8	Pass	Pass	232	166	32.5	Pass
258-03-12	Pass	239	176	2.6	Pass	Pass	234	171	13.1	Pass

Sheet1
JAD 3/14/83

PRESSURE SWITCH DATA Form 21605 TEST NO. 297-12-05

DEVICE	DATE REQUESTED	REQUESTED BY	REQUIRED COMPL. DATE
77PS	3-18-93	Aziz Rahman	

PERFORMED BY	DATE STARTED	DATE COMPLETED	APPROVED BY
Jeffrey D'Onofrio	3-19-93		

PROJECT TITLE: Lewis Center

CUSTOMER:

PURPOSE OF TEST: This disc test. Test of quiet discs made with .018" SS in an attempt to enlarge pin window

PROCEDURE: Build sensor with this discs
• 27213-1 cup
· run sensor curves
· Impulse test

* Sensor Curves showed no more disc than thicker discs. Test aborted

Device#									
297-12-01									
-02									
-03									
-04									
-05									

PRESSURE SWITCH DATA Form 21605 TEST NO. 399-01-07

DEVICE	DATE REQUESTED	REQUESTED BY	REQUESTED COMPL. DATE
7715	3-19-93	Aris Rahnan	
PERFORMED BY	**DATE STARTED**	**DATE COMPLETED**	**APPROVED BY**
Jeffrey L. Pennice	3-22-93		

PROJECT TITLE: Cruise Control

CUSTOMER:

PURPOSE OF TEST: Intake of misplaced gasket parts

PROCEDURE: Build sensor and intake
- 27717-1 cup
- 5 Hg, 125°C

Sensor #	Exc. to failure
399-9-01 -02 -03	Shut down cycles after 381 cycles Slow leak partially recovered immediately

TI-NHTSA 011630

IMPULSE 600 cycle

RETURN DEVICE ANALYSIS RDA #: ________

DEVICE TYPE	77PS62-3	DATE CODE	2217
VEHICLE #		MAKE/MODEL (Conversion)	E350 SUPER CLUB
MODEL YEAR	1993	MILEAGE	13969
REMOVAL DATE	2/15/93	REMOVED BY	SESSLER FORD, IL
ANALYSIS START	3/11/93	ANALYZED BY	[redacted]
ANALYSIS COMP.			

Rec'd at T.I 3/11/93

1. VISUAL INSPECTION SEE PICTURE

- HEXPORT	RUST	[YES	- CRIMP RING	DENTS	[YES
	THREADS	[O.K		TIGHTNESS	[O.K
	HEX	[O.K			
- BASE	TERMINALS	[O.K	Black PBT base		
	BASE RAD	[O.K			

Plating on J512 change intact! 9 not torqued properly??

2. CALIBRATION

ACTUATION ________ RELEASE ________ DIFF ________

ACT CREEP ________ REL CREEP ________

Hg DROP ________

→ Vacuum:

3. LEAK CHECK

PRESSURE ________ TIME ________

LEAK RATE ________

4. DE - CRIMP

5. VISUAL INSPECTION OF INTERNAL COMPONENTS

- ENV. SEAL - MOVABLE TERMINAL

- STAT. TERMINAL - TRANSFER ARM

- MOVABLE CONTACT [- STATIONARY CONTACT

- TERMINAL STAKE

TI-NHTSA 011632

6. MEASURE BASE HEIGHT _____

7. MEASURE SENSOR HEIGHT _____

8. MEASURE PIN HEIGHT _____

9. ACTUAL PRE-LOAD = _____

   DESIGN PRE-LOAD = _____

7. RUN SENSOR HATCHET CURVE

   ACTUATION _____

   RELEASE _____

   SNAP _____

8. DE-CRIMP SENSOR

9. VISUAL INSPECTION OF SENSOR COMPONENTS

   - KAPTON SEALS [ ] - CUP BUMP HT. _____
     BUMP TO TOP _____

   - CONVERTER [ ] - GASKET [ ]

   - WASHER [ ] - KAPTON DIAPHRAGM [ ]

10. RUN FREE DISC CURVE

    ACTUATION _____

    RELEASE _____

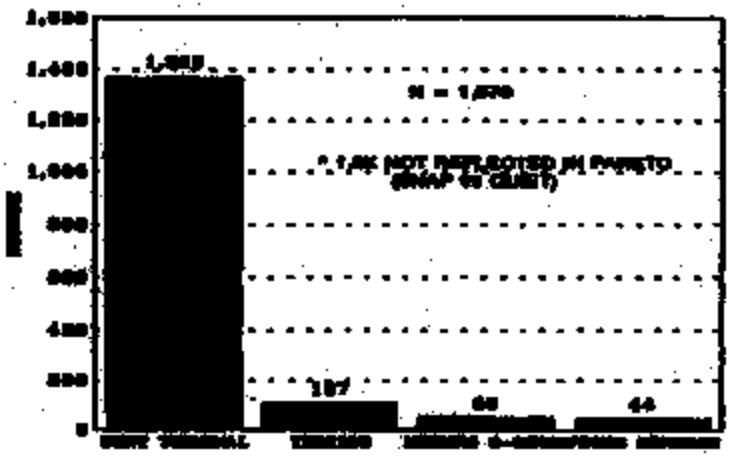
    SNAP _____

HYDRAULIC PRESSURE SWITCHES

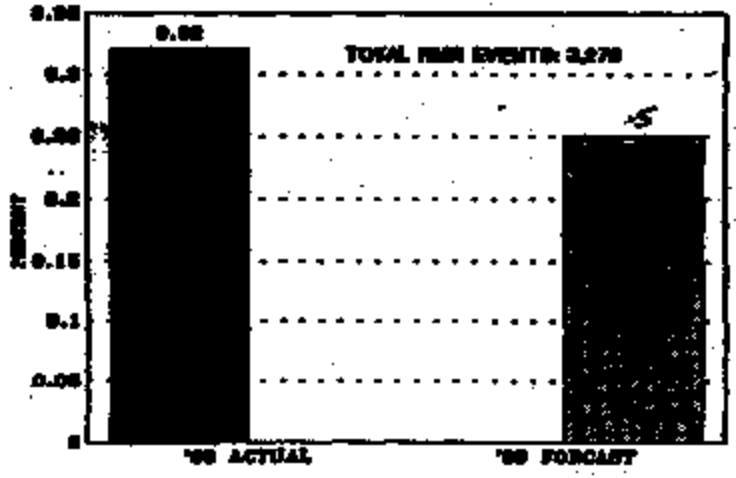
RMR OVERVIEW

1ST QTR '93

P/S RETURN PARETO



TOTAL RMRS



ISSUE	EIK	STATUS	ACTION	TIMING
BENT TERMINAL	CONT.	OPEN	57PS TERMINAL ALIGNMENT	ADDRESSING CAPABILITY 2Q
THREADS	CONT.	OPEN	57PS WORKING WITH K-H TO CONVERT PORT TAP SPEC.	2QTR93
MISSING O-RING	LCA	CLOSED	ORING INSTALLER COMPLETED MAR' REBUILT	
WRONG HOSING	CONT.	OPEN	K-H 57PSL11-3 VB 57PSL2-2 MIXED HOSA/HOSELINE	2QTR93

66% OF RMR 1ST QUARTER '93 WERE FOR BENT TERMINALS FROM PITTS.

MATING PART FOR 57PS SWITCHES WILL BE ASSESSED FOR 6H FIT; TO BE FANNED OUT TO PTG, ANCHOR SWAN, FORD UK, ETC.

O-RING INSTALLATION ASSEMBLY WAS REBUILT BY R&M IN MARCH '93

UPGRAD TO APT FUNCTIONAL TESTER TO BE TARGETED FOR 3RD QUARTER '93.

06APR93 050 149 ER/rkd

TI-NHTSA 011634

-MSG M#= 407192 FR=MJS2 TO=COPY SENT=04/15/93 09:58 AM
ST=C DIV=0050 CC=00134 BY=MJS2 AT=04/15/93 09:58 AM

TO: [redacted] EKAD
STEL

CC: [redacted] MAYR

FR: MATT SELLERS PCME

SJ: 57PS TESTER UPGRADE STATUS

GENTLEMEN,

I KNOW THAT LAST WEEK YOU WERE PUTTING TOGETHER A BUILD SCHEDULE FOR THE 57PS TESTER UPGRADE PROJECT. COULD YOU SHOOT ME A COPY WHEN YOU HAVE A CHANCE. ALSO, PLEASE INCLUDE ESTIMATED PRESSURE TESTER DOWNTIME. WE NEED TO WRAP MANUFACTURING INTO THE SCHEDULE SO THAT THIS DOWNTIME CAN BE SCHEDULED EFFECTIVELY.

ED . . . ANY ISSUES WITH MODIFICATIONS THAT CAME OUT OF THE LAST DESIGN REVIEW ON THIS PROJECT? I THINK SOME GOOD IDEAS CAME OUT OF THAT MEETING THAT WILL SIMPLIFY THE REQUIRED CHANGES FOR 57PS. SHOULD WE HOLD ANOTHER REVIEW WITH THE SHOP?

PLEASE CALL . . .

REGARDS . . . MATT
X1245

-MSG M#= 405293 FR=MJS2 TO=COPY SENT=04/15/93 09:27 AM
ST=C DIV=0050 CC=00134 BY=MJS2 AT=04/15/93 09:27 AM

TO: ANDRE CHARPENTIER ACHR

FR: MATT BELLERS PCME

SJ: 77PS FUNCTION TESTER UPDATES

ANDRE,

THERE ARE A FEW UPDATES NEEDED ON THE DEFAULT SETTINGS FOR THE FOLLOWING DEVICES.

CHANGE # 1

77PSL3-1
77PSL3-2
77PSL4-1
77PSL5-2
77PSL6-1

ON EACH DEVICE LISTED ABOVE PLEASE CHANGE:

1.) MAXIMUM DIFFERENTIAL FROM 50 PSIG TO 60 PSIG.

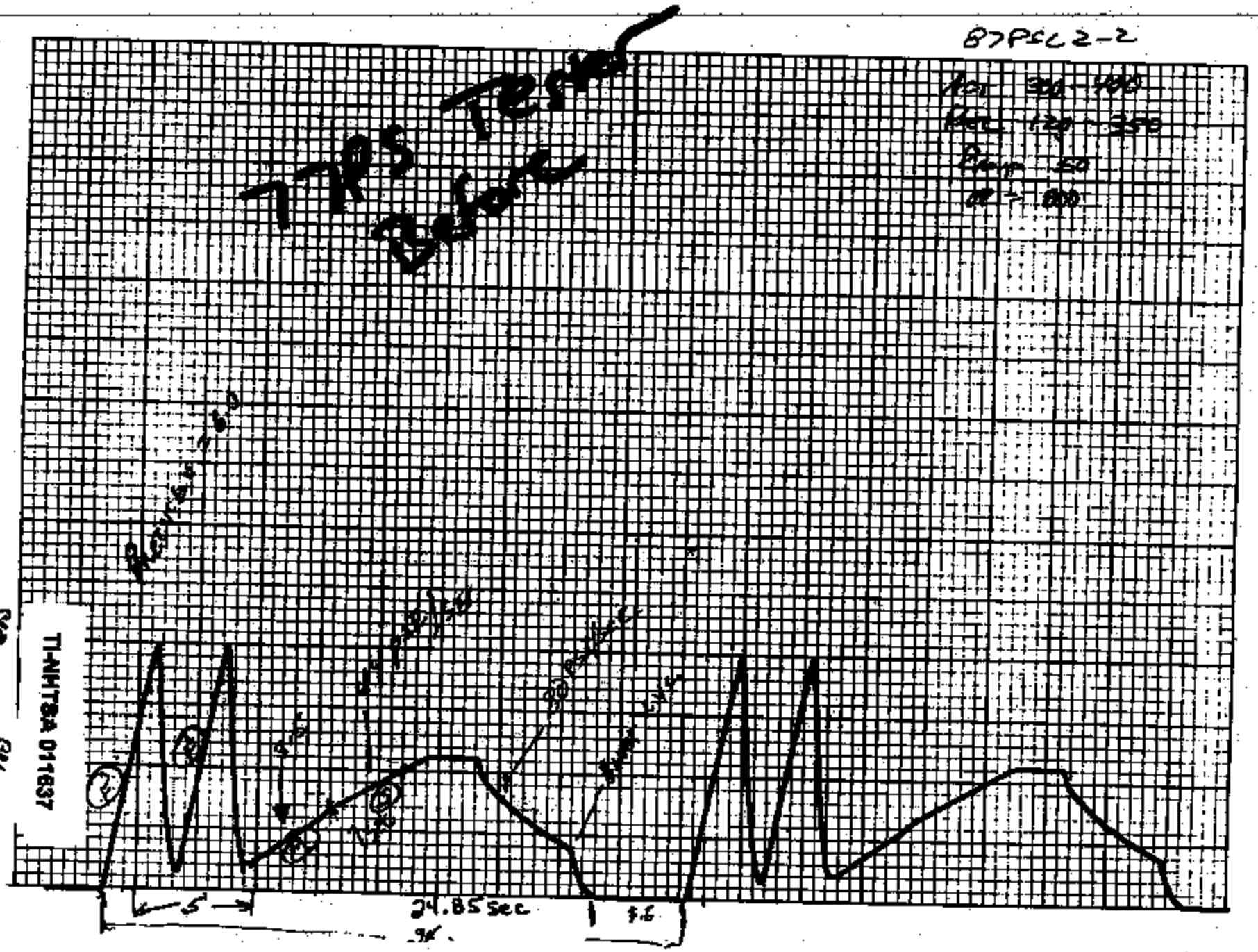
CHANGE # 2

77PSL3-3 (QUIET VERSION ONLY)

ON THE DEVICE LISTED ABOVE PLEASE CHANGE:

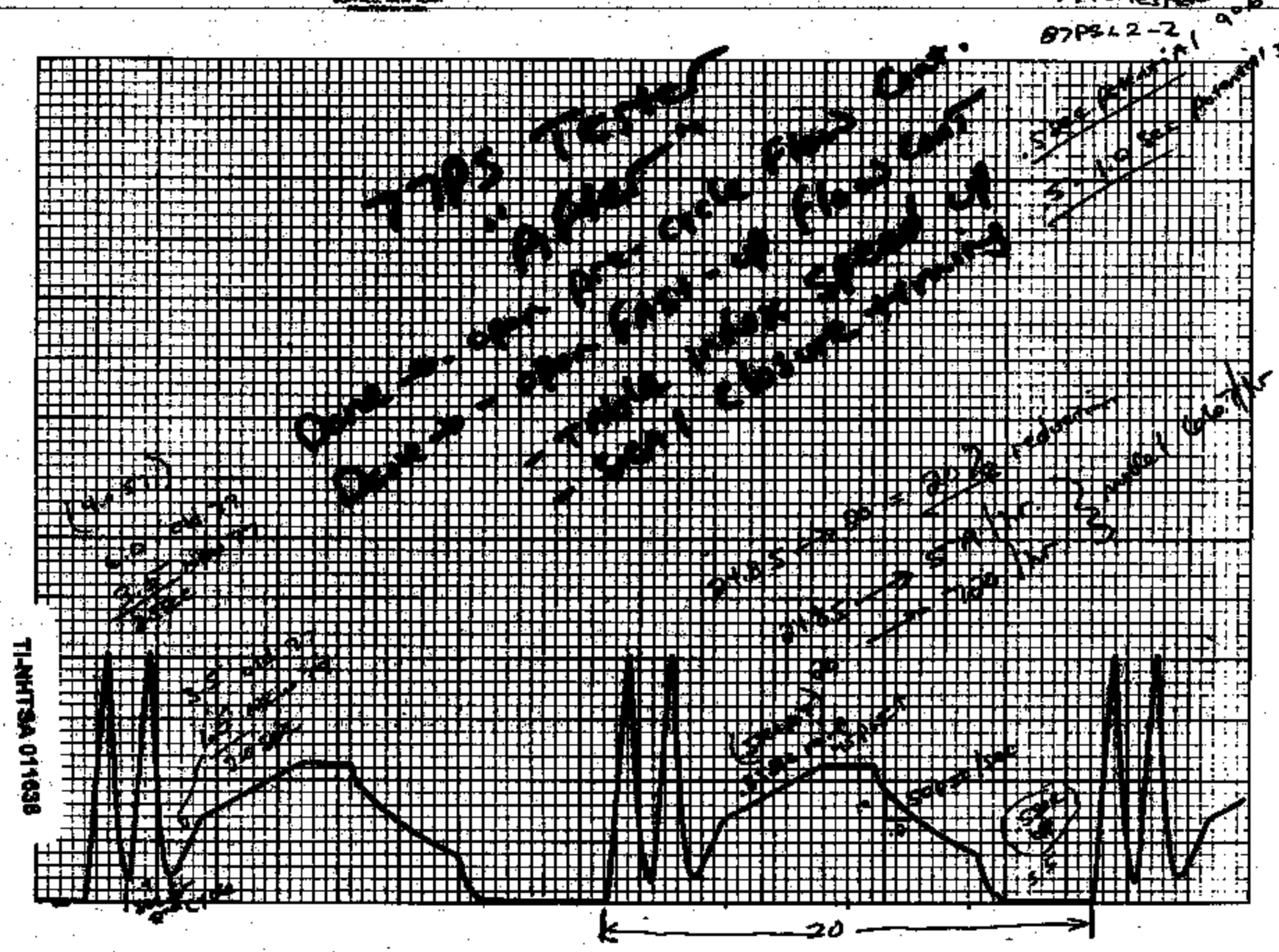
1.) MAXIMUM DIFFERENTIAL FROM 100 PSIG TO 110 PSIG.

REGARDS . . . MATT
X1245


87PSC2-2
TL-NHTSA 011837
24.85 Sec

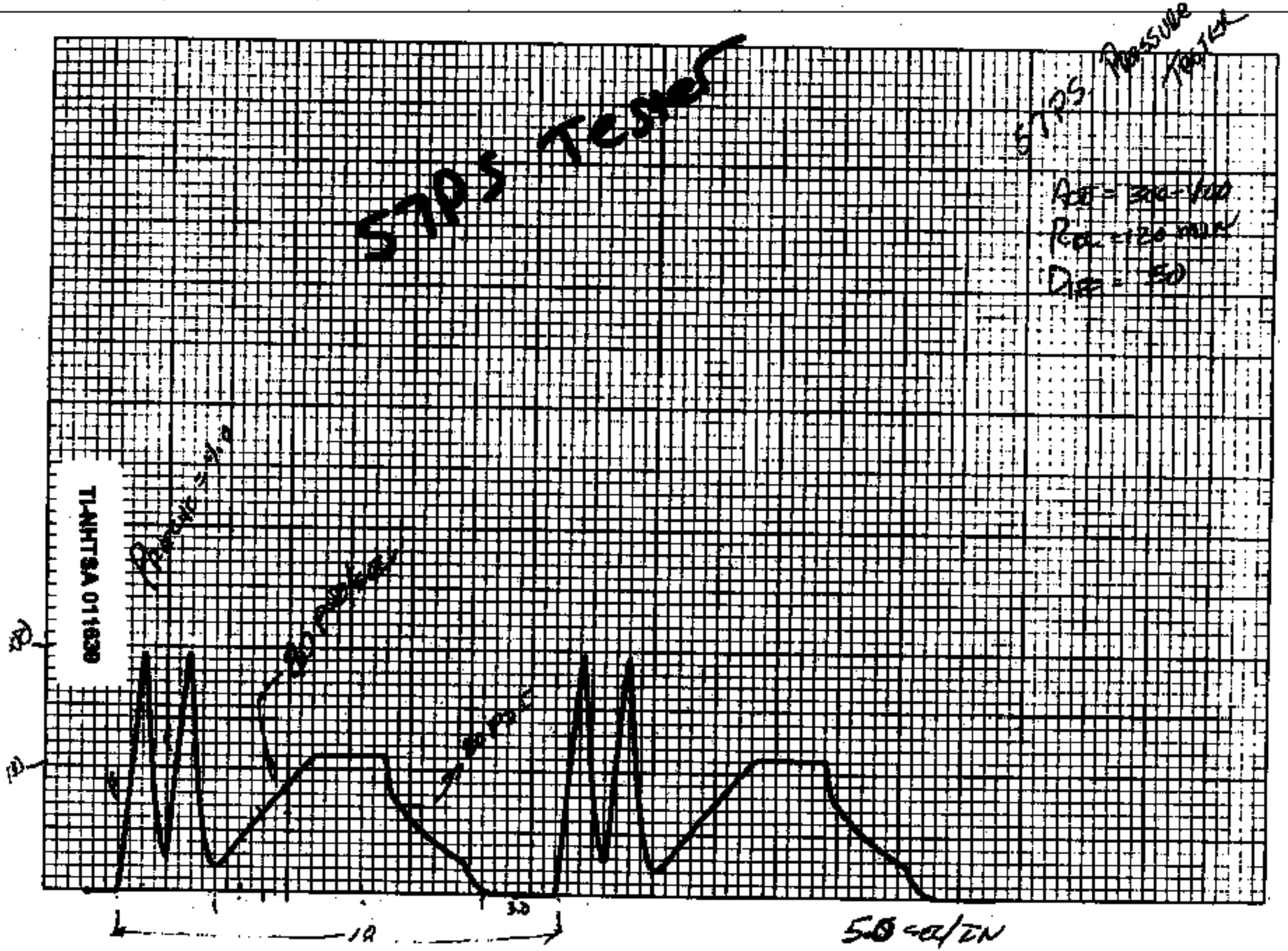
GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK

No. XY-1001 - SP 3



TI-NHTSA 011938

GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
PRINTED IN U.S.A.



-MSG M#= 439549 FR=MJ82 TO=COPY SENT=04/16/93 07:46 AM
ST=C DIV=0050 CC=00134 BY=MJ82 AT=04/16/93 07:46 AM

TO:	JIM WATT	JW02		
CC:	ELAINE ROSE	GAMY	DENNIS NATALE	DJN1
	BILL SWEET	WS4	DAVE CZARN	ZARN
	DICK GARIEPY	RWD3	AZIZ RAHMAN	ZIZ
FR:	MATT GELLERT	MJ82		

RE: 77PS/87PS IMPULSE TESTING

JIM,

AS I UNDERSTAND IT, THE 87PS AND 77PS ENGINEERING SPEC IP[redacted] REQUIREMENTS DICTATE THAT DURABILITY IMPULSE TESTING MUST [redacted] PERFORMED ON 3 DEVICES PER QUARTER IN A SPECIFIC ENVIRONM[redacted]CH IS ONLY ACHIEVABLE IN OUR DESIGN LAB. ie. ELEVATED TEMPERATURE, LOW CYCLE FREQUENCY, ETC. WE PRESENTLY PERFORM A T.I. DESIGNED IMPULSE TEST ON EVERY LOT WE INTEND TO SHIP. MUCH HIGHER FREQUENCIES THAN ARE REQUIRED FOR EXPEDIENCY SAKE ONLY.

I REQUEST THAT THE FOLLOWING CHANGES BE MADE TO OUR IMPULSE CYCLING PROGRAM FOR 77PS AND 87PS PRODUCTS BEGINNING NOW.

1.0 ALL POST IMPULSE TEST FUNCTIONAL EVALUATIONS PERFORMED ON PRODUCTION SUBMISSIONS OF 77PS AND 87PS LOTS SHOULD INCLUDE ONLY AN EVALUATION OF SPRING CONDITION/QUALITY. A SIMPLE OPEN AND CLOSE EVALUATION WOULD SUFFICE. ALL OTHER FUNCTIONAL CHARACTERISTIC EVALUATIONS ON IMPULSE SAMPLES SHOULD BE DISCONTINUED. THE FREQUENCY AND DURATION OF THE IMPULSE TEST SHOULD NOT CHANGE AS IT PROVIDES EARLY WARNING OF ANY POSSIBLE SPRING FORMING OR RIVETING DEFECTS.

2.0 FUNCTIONAL TESTING ON PRODUCTION SUBMISSIONS OF 77PS AND 87PS LOTS SHOULD BE PERFORMED ONLY ON NON-IMPULSE CYCLED DEVICES. 4/LOT AS IS PRESENTLY PERFORMED.

3.0 DURABILITY IMPULSE TESTING SHOULD BE CARRIED OUT IN ACCORDANCE WITH THE APPROPRIATE ENGINEERING SPECIFICATIONS. FOR 77PS AND 87PS THIS IS 3 SAMPLES EACH QUARTER. THEY MUST BE SUBMITTED TO DESIGN ENGINEERING TO BE CYCLED IN AN ENVIRONMENT CALLED FOR IN THE SPECIFICATION. POST FUNCTIONAL EVALUATIONS WILL BE PERFORMED ON THESE DEVICES.

PRODUCTION DURABILITY IMPULSE TESTING ON 77PS AND 87PS DEVICES IS CURRENTLY BEING PERFORMED TO PROVIDE INFORMATION REGARDING THE ENDURANCE CHARACTERISTICS OF THE L-SPRING ARM; NOT TO EVALUATE POST IMPULSE TEST FUNCTIONAL CHARACTERISTICS OF THE DEVICE. ELIMINATION OF THESE CHECKS WILL STREAMLINE THE INSPECTION AND PILOTING PROCESSES TO SOME EXTENT AND REDUCE INSPECTION LABOR.

PLEASE REVIEW THIS REQUEST AND REVISE YOUR DOCUMENTATION TO REFLECT THESE CHANGES ASAP. I'D LIKE TO REVIEW THE COMPLETED INSPECTION DOCUMENTATION PRIOR TO INSTALLING ON THE FLOOR. PLEASE CALL WHEN THEY ARE READY.

THANKS & REGARDS, MATT
EXT. 1245
MSG. MJ82

-MSG M#= 443582 FR=ACHR TO=PCME SENT=04/16/93 09:03 AM
R#=280 ST=C DIV=0050 CC=00197 BY=ACHR AT=04/16/93 09:03 AM

To: Matt Sellers PCME

From: Andre Charpentier ACHR

Subj: 77PS FUNCTION TESTER UPDATES

The changes requested in MSG# 00406293 have been completed.
Boot the computer when ready to load the new software.
The changes are listed below.

Regards,

Andre Charpentier ACHR/X3682

CHANGE # 1
==========
77PSL3-1
77PSL3-2
77PSL4-1
77PSL5-2
77PSL6-1

ON EACH DEVICE LISTED ABOVE PLEASE CHANGE:

1.) MAXIMUM DIFFERENTIAL FROM 50 PSIG TO 60 PSIG.

CHANGE # 2
==========
77PSL3-3 (QUIET VERSION ONLY)

ON THE DEVICE LISTED ABOVE PLEASE CHANGE:

1.) MAXIMUM DIFFERENTIAL FROM 100 PSIG TO 110 PSIG.

DRAWINGS AVAILABLE UPON REQUEST

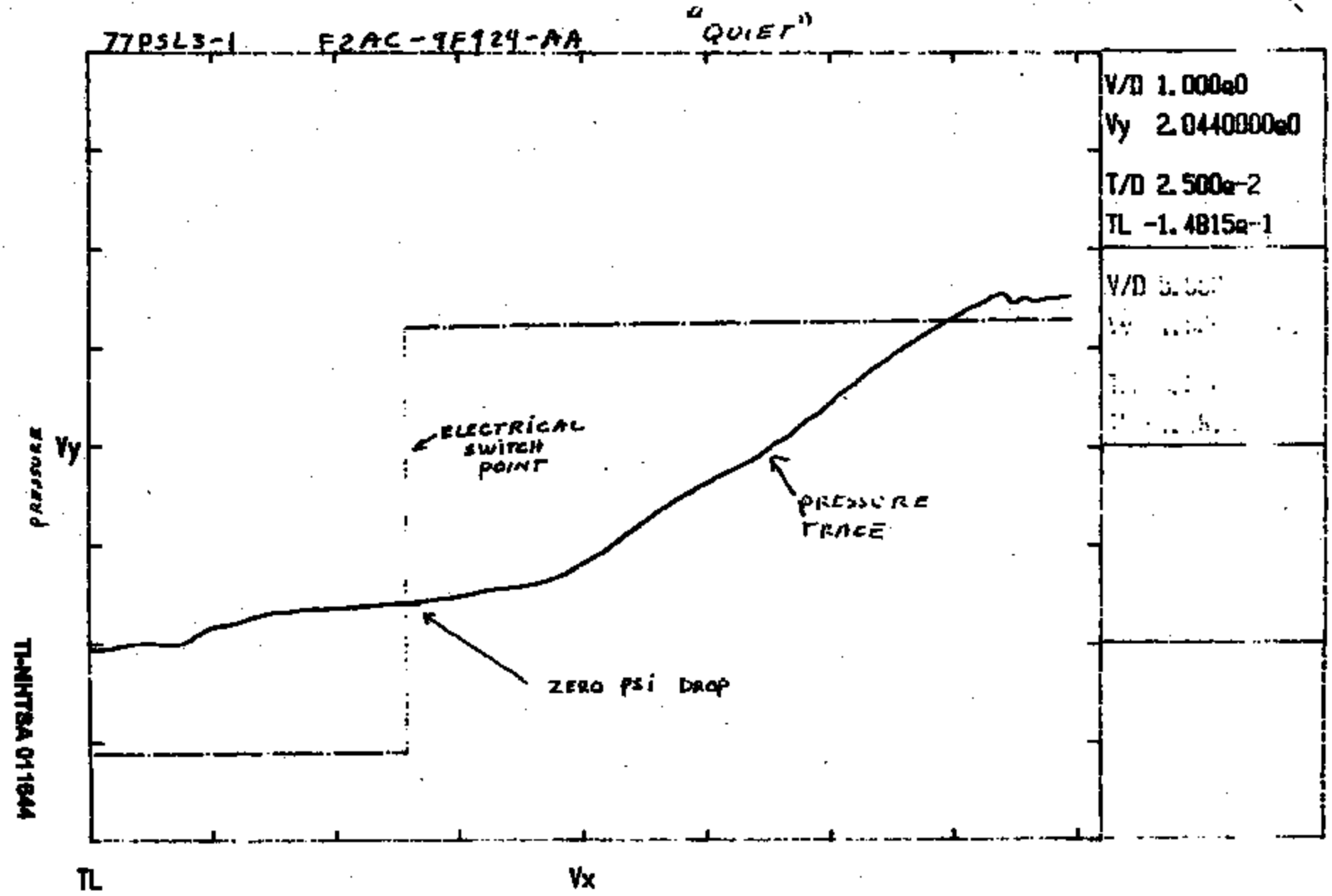

77PSL3-1
F2AC-9F129-AA
"QUIET"
V/D 1.000e0
Vy 2.0440000e0
T/D 2.500e-2
TL -1.4815e-1
V/D 5.000
ELECTRICAL SWITCH POINT
PRESSURE TRACE
ZERO PSI DROP
PRESSURE
Vy
TL
Vx
THHTSA 01894

FIGURE 3

Form 6618

ENVIRONMENTAL TEST LAB REQUEST FORM

(ONE TEST PER REQUEST)

DATE 920707

REQUESTED BY Jeffrey D. Domenico

REQUIRED COMPLETION DATE 920724

EXTENSION 3142 MS 12-29

DEVICE 77PSL 3-1

CHARGE DEPT. NO. 127 I.O. NO. 101058

REFERENCE SPEC. NO. ES-F2VC-9F524AA

SOURCE OF TEST SAMPLES Design Lab

QUANTITY OF TEST SAMPLES 6

REPORT NO. 0435-072

TESTED BY Lab

COMPLETION DATE 7-15-92

TEST REQUIREMENTS: (TO BE FILLED IN BY REQUESTOR)

See attached, Vibration

TEST PERFORMED:

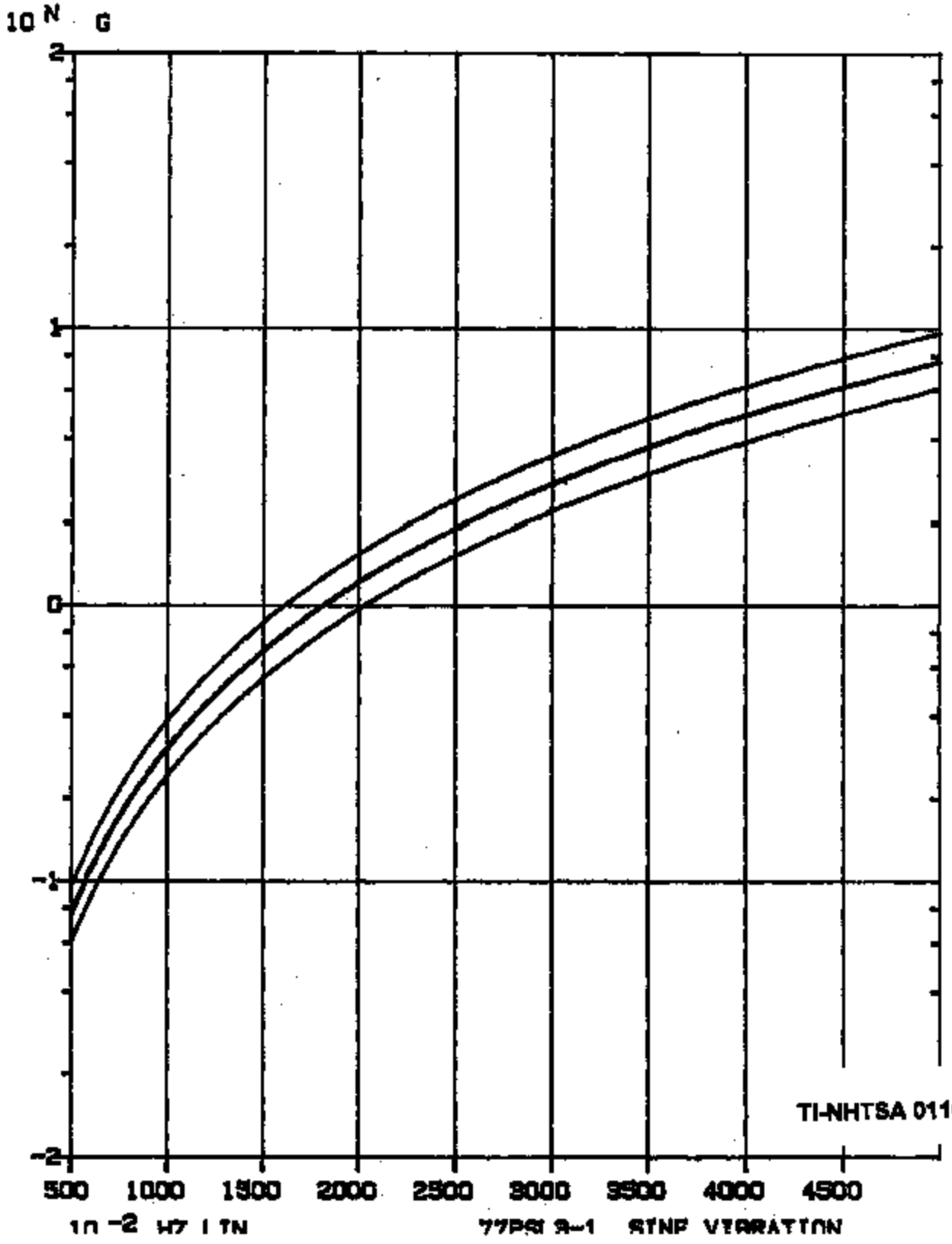
Per attached

TEST RESULTS:

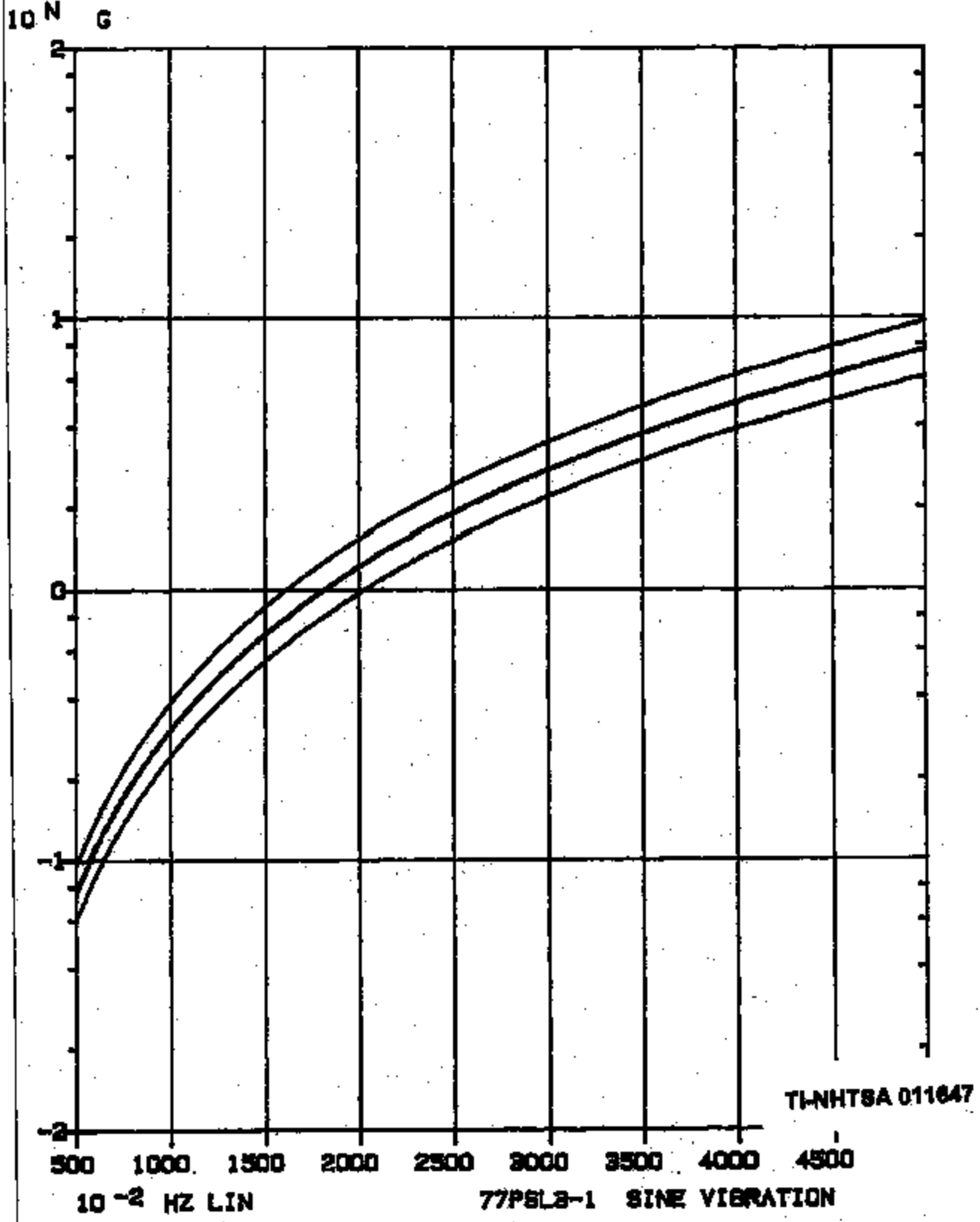
G=OK O=Rej.

EQUIPMENT USED: CALIBRATION DATE: NEXT DUE DATE:

EVT 0435-072 RUN 3 7-15-92 X-AXIS G=OK D=REJ DPB
POST TEST SWEEP # 192 DOWN

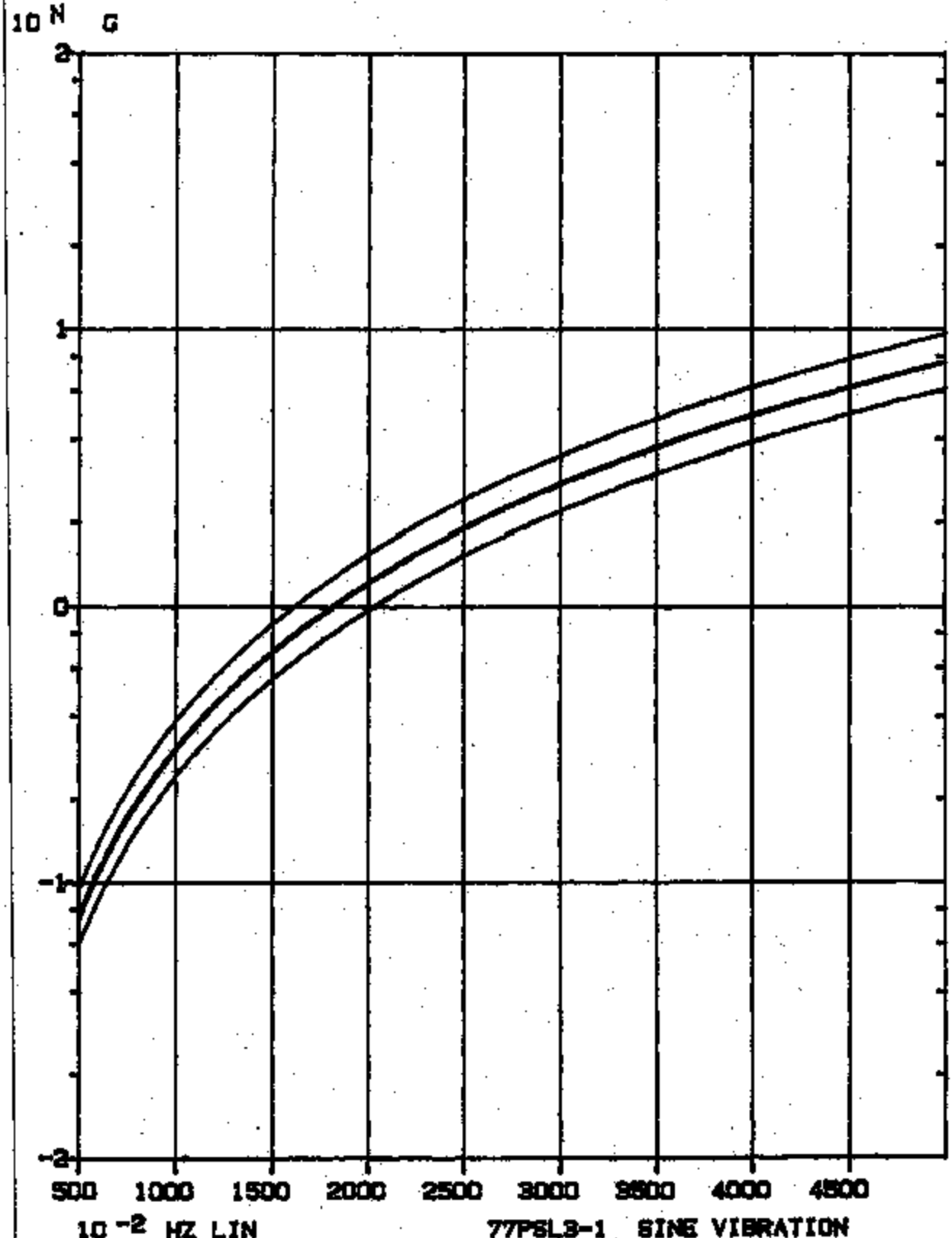


EVT 0485-072 RUN 2 7-14-92 Z-AXIS 8=OK 0=REJ DPB
POST TEST SWEEP # 192 DOWN



TI-NHTSA 011647

EVT 0435-072 RUN 1 7-14-92 Y-AXIS 8=OK 0=REJ HCM
POST TEST SWEEP # 192 DOWN



Form 6818

ENVIRONMENTAL TEST LAB REQUEST FORM

(ONE TEST PER REQUEST)

DATE 920616

REQUESTED BY Jeffrey DiDonatico

REQUIRED COMPLETION DATE 920701

EXTENSION 3149 MS 12-29

DEVICE 77PSL3-1

CHARGE DEPT. NO. 127 LO. NO. 101089

REPORT NO. 0320-062

REFERENCE SPEC. NO. ES-F2UC-9904-AA

TESTED BY Lab

SOURCE OF TEST SAMPLES Design Lab

COMPLETION DATE 6-22-92

QUANTITY OF TEST SAMPLES 6

TEST REQUIREMENTS: (TO BE FILLED IN BY REQUESTOR)

See attached, Salt Spray

Note Place devices in chamber as they are. No manifolds are necessary.

TEST PERFORMED: per attached spec.

On: 0800 6-19-92

Out: 0800 6-22-92

TEST RESULTS: to be determined by requestor.

EQUIPMENT USED: CALIBRATION DATE: NEXT DUE DATE:

Form 9515

ENVIRONMENTAL TEST LAB REQUEST FORM

(ONE TEST PER REQUEST)

DATE 920616

REQUESTED BY Jeffrey O. Deneweiler

REQUIRED COMPLETION DATE 920701

EXTENSION 3144 6/8 12-22

DEVICE 77PSL3-1

CHARGE DEPT. NO. 127 I.O. NO. 101088

REPORT NO. 0319-062

REFERENCE SPEC. NO. ES-P2UC-9914-AA

TESTED BY Lab

SOURCE OF TEST SAMPLES Design Lab

COMPLETION DATE 6-30-92

QUANTITY OF TEST SAMPLES 6

TEST REQUIREMENTS: (TO BE FILLED IN BY REQUESTOR)

See attached, humidity

note: Place devices in chamber as they are. No manifolds are necessary

TEST PERFORMED:

IN: 6-26-92 AT 0815

OUT: 6-29-92 AT 1615

TEST RESULTS:

EQUIPMENT USED: CALIBRATION DATE: NEXT DUE DATE:

Form No. 1888

TEST NO. 111714

TECHNICAL SERVICE LABS

TEST NO. 111714

[redacted]

REPORT OF RESULTS:

DATE RECEIVED 5/12/92 DATE OUT 6-12-92 EK/TB

TECHNICIAN			
HOURS WORKED			
PROCEDURE USED			

*PCC I.D.

MC=325	TM=431	JOCY=126	PACIL=514
PC=127	WIRE=432	CLKE=122	FACIL=521
VERS=166	EPD=421	CAN=954	FACIL=531
ARCC=465	PEP=422	AD DEV=666	STAFF=888
IMD=430	CSD=435	EMCD=877	

DISTRIBUTION: White and Yellow - Lab Pink - Requestor

TI-NHTSA 011651

PV OF 77PSL3-1 TEST 245 JAD 920812

DEVICE #	PRE-TEST PRE-PROOF ACT	PRE-TEST PRE-PROOF REL	PRE-TEST POST-PROOF ACT	PRE-TEST POST-PROOF REL	PRE-TEST DELTA %% ACT	PRE-TEST DELTA %% REL	POST-TEST PRE-PROOF ACT	POST-TEST PRE-PROOF REL	POST-TEST POST-PROOF ACT	POST-TEST POST-PROOF REL	POST-TEST DELTA %% ACT	POST-TEST DELTA %% REL
1245-15-019	138	107	140	107	1.4	0.0	131	104	128	100	-2.3	-3.8
1245-15-029	127	105	130	113	2.4	7.6	122	97	122	105	0.0	8.2
1245-15-039	132	111	130	115	-1.5	3.6	130	102	129	108	-0.8	5.9
1245-15-049	131	115	131	117	0.0	1.7	128	102	127	104	-0.8	2.0
1245-15-059	133	117	126	115	-5.3	-1.7	135	108	132	110	-2.2	1.9
1245-15-069	124	108	128	115	3.2	6.5	117	95	117	97	0.0	2.1
1245-15-079	125	117	134	118	7.2	0.9	130	103	128	106	-1.5	1.9
1245-15-089	123	107	118	103	-4.1	-3.7	124	99	122	103	-1.6	4.0
1245-15-099	124	108	128	114	3.2	5.6	129	96	123	105	-0.8	9.4
1245-15-109	131	115	129	116	-1.5	0.9	122	100	120	101	-1.6	1.0
1245-15-119	130	119	135	118	3.8	3.5	127	99	126	105	-0.8	6.1
1245-15-129	136	117	133	120	-2.2	6.0	125	102	125	108	0.0	2.9
1245-15-139	136	116	133	122	-2.2	5.2	130	109	130	115	0.0	5.5
1245-15-149	107	92	128	114	19.6	23.9	124	92	119	95	-4.0	3.3
1245-15-159	129	106	135	126	4.7	7.8	135	109	136	115	0.7	5.5
1245-15-169	129	111	129	111	-3.9	0.0	136	111	136	120	0.0	8.1
1245-15-179	125	108	133	128	6.4	18.5	134	107	132	116	-1.5	8.4
1245-15-189	126	116	128	116	1.6	0.0	131	99	132	105	0.8	6.1
1245-15-199	128	116	133	118	3.9	1.7	133	99	132	115	-0.8	16.2
1245-15-209	122	111	127	109	4.1	-1.8	132	97	130	111	-1.5	14.4
1245-15-219	134	121	141	128	5.2	5.8	142	110	140	122	-1.4	10.9
1245-15-229	121	105	128	115	5.8	9.5	132	104	132	112	0.0	7.7
1245-15-239	126	114	132	120	4.8	5.3	133	101	135	112	1.5	3.7
1245-15-249	119	98	123	117	3.4	19.4	135	103	136	114	0.7	10.7
1245-15-259	129	110	127	112	2.4	1.8	134	106	129	106	-3.7	1.0
1245-15-269	119	108	125	117	5.0	8.3	129	112	125	108	0.8	-3.6
1245-15-279	131	117	137	125	4.6	6.8	131	111	137	114	-0.7	-3.4
1245-15-289	131	120	136	119	3.8	-0.8	133	113	133	107	0.0	-5.3
1245-15-299	129	114	120	112	-3.2	-1.4	124	107	121	111	-2.4	3.7
1245-15-309	114	106	126	116	10.5	9.4	129	97	131	110	1.6	13.4
1245-15-319	129	114	127	118	-1.6	3.5	133	112	130	115	-2.3	0.9
1245-15-329	128	115	133	126	3.9	9.6	121	109	133	106	9.9	-2.8
1245-15-339	116	109	115	108	-0.9	1.0	115	91	120	97	4.3	-1.0
1245-15-349	136	119	138	122	1.5	2.5	137	115	138	118	0.7	2.6
1245-15-359	118	109	125	115	5.9	5.5	127	106	130	105	2.4	-0.9
1245-15-369	122	117	127	115	4.1	-1.7	132	101	128	108	-3.0	-1.0
1245-15-379	131	119	132	118	0.8	-0.8	125	112	123	102	-1.6	-8.9
1245-15-389	132	118	136	125	3.0	5.9	130	114	127	105	-2.3	-7.9
1245-15-399	134	125	135	126	0.7	0.8	126	112	126	108	0.0	-3.6
1245-15-409	124	112	128	120	4.8	7.1	131	113	128	110	-2.3	-2.7
1245-15-419	125	112	127	118	1.6	5.4	125	111	122	106	-2.4	-4.5
1245-15-429	116	106	130	118	12.1	11.3	126	112	126	107	0.0	-4.5
1245-15-439	117	106	127	117	8.5	10.4	127	113	124	108	-2.4	-4.4
1245-15-449	120	101	131	105	9.2	4.0	125	111	122	98	-2.4	-10.8
1245-15-459	134	126	140	131	4.5	4.0	138	123	135	115	-2.2	-6.5
1245-15-469	122	114	130	120	6.6	5.3	133	116	132	105	-0.8	-9.5
1245-15-479	129	117	133	118	3.1	0.9	131	117	127	105	-3.1	-10.3
1245-15-489	116	107	129	120	11.2	12.1	126	112	122	105	-3.2	-6.3
1245-15-499	124	112	137	115	10.5	2.7	127	98	126	98	-0.8	0.0
1245-15-509	132	121	135	129	2.3	7.5	129	100	129	100	0.0	0.0
1245-15-519	112	101	130	129	16.1	27.8	126	108	127	98	0.8	-9.3
1245-15-529	137	121	136	125	-0.7	3.3	130	105	130	101	0.0	-3.8

PV OF 77PSL3-1, [illegible] TEST 245 JAD 920412

1245-15-53	127	121	134	122	5.5	0.8	130	102	128	102	-1.5	0.0
1245-15-54	121	102	125	114	3.3	11.8	125	103	125	97	0.0	-5.8
1245-15-55	128	115	130	119	1.6	3.5	130	117	135	100	-2.2	-14.5
1245-15-56	126	114	128	118	1.6	3.5	132	120	130	115	-1.5	-4.2
1245-15-57	127	110	130	119	2.4	0.8	136	123	134	108	-1.5	-12.2
1245-15-58	122	111	130	120	6.6	8.1	135	121	131	113	-3.0	-6.6
1245-15-59	123	112	125	109	1.6	-2.7	130	118	127	124	-2.3	-3.4
1245-15-60	131	117	133	127	1.5	8.5	140	128	136	120	-2.9	-6.3
1245-15-61	127	119	134	120	5.5	0.8	134	117	134	120	0.0	2.6
1245-15-62	127	117	131	124	3.1	6.0	131	104	130	114	-0.8	9.6
1245-15-63	128	110	133	125	3.9	5.9	137	115	135	120	-1.5	4.3
1245-15-64	128	117	136	125	6.3	6.8	135	109	138	113	2.2	3.7
1245-15-65	121	112	126	110	4.1	5.4	127	107	130	104	2.4	-2.8
1245-15-66	118	107	127	115	7.6	7.5	128	105	128	110	0.0	4.8
1245-15-67	132	123	134	122	1.5	-0.8						
1245-15-68	126	117	132	122	4.8	4.3						
1245-15-69	128	123	130	128	1.6	0.0						
1245-15-70	119	108	128	120	8.4	10.1						
1245-15-71	128	120	133	124	3.9	3.3						
1245-15-72	125	119	136	126	8.8	5.9						
1245-15-73												
1245-15-74												
1245-15-75												
1245-15-76												
1245-15-77												
1245-15-78												
1245-15-79												
1245-15-80												
AVG.	126	113	132	119	4	5	130	108	129	108	-1	0
STD.	6.2	6.5	4.9	5.7	4.3	3.4	5.4	7.7	5.3	6.8	2.1	8.7

4.5% 5.5% 4.0%

1.83 4.77 1.97 5.79 1.05 3.80 1.95 4.44

[illegible]

TI-NHTSA 011663

PRESSURE SWITCH DATA Form 21605 | **TEST NO.** 245-15-80

DEVICE	DATE REQUESTED	REQUESTED BY	REQUESTED COMPLETION DATE
77PSL 3-1, 77PSL3-2	920413	Steve Offiler	
PERFORMED BY	**DATE STARTED**	**DATE COMPLETED**	**APPROVED BY**
Jeffrey DiDomenico	920413		

PROJECT TITLE: Speed Control — 3764 @ 4:40 PM

806 @ 4:18 PM
358 :22

CUSTOMER:

PURPOSE OF TEST: Production Validation — 124543 @ 7:38 AM

PROCEDURE: ▽ ES-F2VC-9C924-AA 1 Full ISR

Natural Nitryl Bases
ultra-low-diff discs.
Act 90-160
Rel 30 min

77PSL 3-1
INITIAL Characterizations

Device #	Act	Rel	Hz Drop	Gasket Leak	Thermal Proof	Act	Rel	Test	Complete	Test	Complete
245-15-01	118	107	4.1	✓	✓	140	107	Fluid Aging	✓	Impulse	✓
-02	127	105	3.1	✓	✓	128	113		✓		✓
-03	132	111	2.9	✓	✓	130	115		✓		✓
-04	131	115	6.9	✓	✓	131	117		✓		✓
-05	133	117	1.1	✓	✓	126	118		✓		✓
-06	124	103	4.7	✓	✓	132	115		✓		✓
-07	125	117	4.5	✓	✓	134	112		✓		✓
-08	123	107	4.3	✓	✓	119	102		✓		✓
-09	124	107	4.5	✓	✓	128	119		✓		✓
-10	131	115	3.3	✓	✓	129	116		✓		✓
-11	130	114	4.9	✓	✓	135	113		✓		✓
-12	136	117	4.2	✓	✓	133	124		✓		✓
-13	136	116	3.5	✓	✓	133	120		✓	Temp/Humidity	✓
-14	107	92	4.0	✓	✓	128	119		✓		✓
-15	129	111	2.4	✓	✓	135	125		✓		✓
-16	129	111	4.1	✓	✓	124	111		✓		✓
-17	125	108	3.9	✓	✓	133	128		✓		✓
-18	126	116	3.9	✓	✓	128	116		✓		✓
-19	128	116	5.9	✓	✓	133	118		✓		✓
-20	122	111	3.1	✓	✓	127	108		✓		✓
-21	134	121	3.9	✓	✓	131	128		✓		✓
-22	121	105	3.2	✓	✓	132	115		✓		✓
-23	126	181	2.9	✓	✓	132	120		✓		✓
-24	119	98	3.6	✓	✓	123	117		✓		✓
-25	124	110	5.1	✓	✓	122	118		✓	Humidity	✓
-26	119	103	3	✓	✓	125	117		✓		✓
-27	131	117	3	✓	✓	137	125		✓		
-28	131	120	3.2	✓	✓	126	110				

TI-NHTSA 0116

Device #	Act	Rel	Mu Drop	Current Leak	[illegible] Proof	Act	Rel	Test	Complete	Test	Complete
245-15-29	124	114	3.3	✓	✓	120	110	Fluid Res	✓	Humidity	✓
-30	114	106	2.8	✓	✓	126	116	↓	✓	↓	✓
-31	129	114	2.9	✓	✓	121	115	↓	✓		✓
-32	128	115	2.6	✓	✓	132	120	↓	✓	Salt Spray	✓
-33	116	104	2.8	✓	✓	115	108	↓	✓	↓	✓
-34	126	119	2.8	✓	✓	138	123	↓	✓	↓	✓
-35	118	109	2.9	✓	✓	125	115	↓	✓	↓	✓
-36	122	117	2.9	✓	✓	127	115	↓	✓	↓	✓
-37	131	119	3.1	✓	✓	132	118	Impulse	✓	None	✓
-38	132	118	2.6	✓	✓	136	125	↓	✓	↓	✓
-39	134	125	2.6	✓	✓	135	126	↓	✓	↓	✓
-40	124	112	2.7	✓	✓	129	120	↓	✓		
-41	125	112	2.8	✓	✓	127	118	↓	✓		
-42	116	106	2.7	✓	✓	130	118	↓	✓		
-43	117	104	2.7	✓	✓	127	117	↓	✓		
-44	120	101	2.7	✓	✓	131	105	↓	✓		
-45	134	126	3.7	✓	✓	140	131	↓	✓		
-46	123	114	3.4	✓	✓	130	120	↓	✓		
-47	129	117	2.7	✓	✓	123	118	↓	✓		
-48	116	107	2.7	✓	✓	129	120	↓	✓		
-49	124	112	3.7	✓	✓	137	115	T-Cycle	✓	None	✓
-50	132	121	2.9	✓	✓	135	124	↓	✓	↓	✓
-51	112	101	3.0	✓	✓	130	124	↓	✓	↓	✓
-52	137	121	3.2	✓	✓	136	125	↓	✓		
-53	127	121	3.0	✓	✓	129	121	↓	✓		
-54	121	102	3.8	✓	✓	125	114	↓	✓		
-55	128	115	3.0	✓	✓	130	119	Vacuum	✓		
-56	126	114	2.8	✓	✓	128	119	↓	✓		
-57	127	113	2.9	✓	✓	130	119	↓	✓		
-58	122	111	3.2	✓	✓	130	126	↓	✓		
-59	123	112	3.1	✓	✓	125	109	↓	✓		
-60	131	117	3.4	✓	✓	133	121	↓	✓		
-61	129	119	3.6	✓	✓	134	120	Vibration	✓		
-62	127	117	2.7	✓	✓	131	124	↓	✓		
-63	129	113	2.6	✓	✓	132	125	↓	✓		
-64	128	117	3.5	✓	✓	136	125	↓	✓		
-65	121	112	2.8	✓	✓	136	118	↓	✓		
-66	118	107	2.7	✓	✓	127	115	↓	✓		
-67	132	123	2.9	✓	✓	134	122	Burst	Pass		
-68	126	117	2.9	✓	✓	131	122	↓	Pass		
-69	123	129	2.7	✓	✓	130	124	↓	Pass		
-70	119	109	2.9	✓	✓	129	121	↓	Burst 7400		
-71	128	120	3.7	✓	✓	133	124	↓	Pass		
-72	125	119	2.8	✓	✓	136	126	↓	Pass		
-73	125	120	2.8	✓	✓	137	124	[illegible]			
-74	124	118	2.4	✓	✓	138	122	↓			
-75	119	112	3.4	✓	✓	136	117	↓			
-76	113	107	2.4	✓	✓	131	119	↓			
-77	120	109	3.1	✓	✓	126	118	↓			
-78	111	101	2.4	✓	✓	135	113	↓			
-79	112	103	2.9	✓	✓	127	117	↓			
-80	131	124	2.7	✓	✓	136	120	↓			

PRESSURE SWITCH DATA Form 21605 TEST NO. ____

DEVICE	DATE REQUESTED	REQUESTED BY	REQUESTED COMPL DATE

PERFORMED BY	DATE STARTED	DATE COMPLETED	APPROVED BY

PROJECT TITLE:

CUSTOMER:

PURPOSE OF TEST:

PROCEDURE:

77PSL3-1

Final Characterizations

Device #	act	rel	Mv Drop	Contact Leak	300 OFF Proof	rt. act - rel		
148-15-01	131	104	38.6 —	✓	✓	128-110	RT Act & Imp.	
-02	126	97	29.4 —	✓	✓	128-105		
-03	130	102	20.8 —	✓	✓	129-108		
-04	129	101	23.0 —	✓	✓	127-104		
-05	135	101	25.2 —	✓	✓	132-110		$\bar{x}$ 403
-06	117	95	72.1 —	✓	✓	117-99		σ 21.0
-07	130	103	45.6 —	✓	✓	128-105		Cpk =
-08	124	99	17.2 —	✓	✓	122-108		
-09	129	96	74.3 —	✓	✓	123-105		$\frac{200-403}{3(21)}$
-10	122	100	85.5 —	✓	✓	120-101		
-11	127	97	25.9 —	✓	✓	126-105		
-12	125	102	96.2 —	✓	✓	125-105		2.53
-13	[illegible]	109	4.3	✓	✓	138-116		
-14	124	92	2.7	✓	✓	119-95		
-15	125	109	2.8	✓	✓	136-115		
-16	136	112	2.9	✓	✓	136-120		
-17	134	107	3.6	✓	✓	132-116		
-18	131	99	2.2	✓	✓	132-105		
-19	133	99	2.7	✓	✓	132-115		
-20	132	97	3.5	✓	✓	130-111		
-21	138	90	4.7	✓	✓	140-108		
-22	132	104	5.1	✓	✓	132-113		
-23	133	109	3.6	✓	✓	135-112		
-24	135	103	3.5	✓	✓	136-114		
-25	139	105	2.0	✓	✓	139-116		
-26	134	113	5.0	✓	✓	135-119		
-27	138	118	3.1	✓	✓	137-114		
-28	133	113	3.4	✓	✓	[illegible]		

TI-NHTSA 011656

Device #	set rel	Mu Amp	Current leak	[illegible] Funct	set rel	
2VC-[illegible]-29	121 107	2.7	✓	✓	121 111	
-30	129 97	2.9	✓	✓	127 101	
-31	133 113	2.9	✓	✓	130 113	
-32	131 103	2.2	✓	✓	123 106	
-33	115 98	6.6	✓	✓	120 99	
-34	137 115	3.8	✓	✓	138 118	
-35	127 106	2.8	✓	✓	130 115	
-36	132 101	3.1	✓	✓	128 101	
-37	125-112	9.6	✓	✓	123-105	Imp
-38	130-114	6.8	✓	✓	127-105	
-39	124-112	19.7	✓	✓	106-108	
-40	131-113	8.0	✓	✓	128-110	
-41	125-111	7.2	✓	✓	123-106	
-42	124-112	5.6	✓	✓	126-107	
-43	127-113	5.9	✓	✓	124-108	
-44	125-111	5.5	✓	✓	122-99	
-45	135-123	7.7	✓	✓	135-115	
-46	133-116	7.0	✓	✓	132-105	
-47	121-117	8.0	✓	✓	127-105	
-48	124-112	4.5	✓	✓	132-105	
-49	127-98	.8	✓	✓	116 98	
-50	129-100	5.6	✓	✓	129 100	
-51	126-108	2.6	✓	✓	127 98	
-52	130-105	1.7	✓	✓	130 101	
-53	130-112	2.9	✓	✓	128 102	
-54	125-108	1.1	✓	✓	105 97	
-55	130-117	1.3	✓	✓	135-108	
-56	132-120	1.2	✓	✓	130-115	
-57	136-123	1.2	✓	✓	134-108	
-58	135-121	1.7	✓	✓	131-113	
-59	130-118	2.7	✓	✓	127-114	
-60	140-128	1.7	✓	✓	136-120	
-61	134-117	1.5	✓	✓	134-120	
-62	131-124	2.8	✓	✓	130-114	
-63	137-115	2.6	✓	✓	135-110	
-64	135-109	2.6	✓	✓	138-113	
-65	127-117	2.8	✓	✓	130-114	
-66	127-105	5.1	✓	✓	128-110	

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BY OF 77PSL3-1, 77PLS5-2 TEST 245 JAD 990812

	PRE-TEST						POST-TEST					
	PRE-PROOF		POST-PROOF		DELTA	DELTA	PRE-PROOF		POST-PROOF		DELTA	DELTA
DEVICE #	ACT	REL	ACT	REL	% ACT	% REL	ACT	REL	ACT	REL	% ACT	% REL
245-15-01	138	107	140	107	1.4 %	0.0 %	131	104	128	100	-2.3 %	-3.8 %
245-15-02	127	105	130	113	2.4 %	[redacted]	122	97	122	105	0.0 %	[redacted]
245-15-03	152	111	150	115	-1.5 %	3.6 %	130	102	129	108	-0.8 %	[redacted]
245-15-04	131	115	131	117	0.0 %	1.7 %	128	102	127	104	-0.8 %	2.0 %
245-15-05	135	117	126	115	[redacted]	-1.7 %	135	106	132	110	-2.2 %	1.9 %
245-15-06	124	108	128	115	3.2 %	[redacted]	117	95	117	97	0.0 %	2.1 %
245-15-07	125	117	134	118	[redacted]	0.9 %	130	103	128	105	-1.5 %	1.9 %
245-15-08	123	107	118	103	-4.1 %	-3.7 %	124	99	122	103	-1.6 %	4.0 %
245-15-09	124	108	125	114	0.2 %	[redacted]	124	96	123	105	-0.8 %	[redacted]
245-15-10	131	115	129	116	-1.5 %	0.9 %	122	100	120	101	-1.6 %	1.0 %
245-15-11	130	114	135	118	3.8 %	3.5 %	127	99	126	103	-0.8 %	[redacted]
245-15-12	136	117	133	124	-2.2	[redacted]	125	102	125	105	0.0 %	2.9 %
245-15-13	136	116	133	122	-2.2 %	[redacted]	128	109	126	115	0.0	[redacted]
245-15-14	107	92	126	114	[redacted]		124	92	119	95	-4.0 %	3.3 %
245-15-15	129	116	135	125	4.7 %	7.8 %	135	109	136	115	0.7 %	[redacted]
245-15-16	129	111	124	111	-3.9 %	0.0 %	136	111	136	120	0.0 %	[redacted]
245-15-17	125	108	133	128	[redacted]		134	107	132	116	-1.5 %	[redacted]
245-15-18	126	116	128	116	1.6 %	0.0 %	131	99	132	105	0.8 %	[redacted]
245-15-19	128	116	133	116	3.9 %	1.7 %	138	99	132	115	-0.8 %	[redacted]
245-15-20	122	111	127	109	4.1 %	-1.8 %	132	97	130	111	-1.5 %	[redacted]
245-15-21	134	121	141	126	[redacted]		142	110	140	122	-1.4 %	[redacted]
245-15-22	121	105	128	115	[redacted]		132	104	132	112	0.0 %	7.7 %
245-15-23	126	114	132	120	4.8 %	[redacted]	133	108	135	112	1.5 %	3.7 %
245-15-24	119	98	123	117	3.4	[redacted]	136	109	136	114	0.7 %	[redacted]
245-15-25	124	110	127	112	2.4 %	1.8 %	134	105	129	106	-3.7 %	1.0 %
245-15-26	119	108	125	117	[redacted]		124	112	125	108	0.8 %	-3.6 %
245-15-27	131	117	137	125	4.6 %	[redacted]	138	118	137	114	-0.7 %	-3.4 %
245-15-28	131	120	136	119	3.8 %	-0.8 %	133	113	133	107	0.0 %	-5.3 %
245-15-29	124	114	120	112	-3.2 %	-1.8 %	129	107	121	111	-2.4 %	3.7 %
245-15-30	114	106	126	116	[redacted]		129	97	131	110	1.6 %	[redacted]
245-15-31	129	114	127	118	-1.6 %	3.5 %	133	112	130	113	-2.3 %	0.9 %
245-15-32	128	115	133	126	3.9 %	9.6 %	121	109	133	106	[redacted]	-2.8 %
245-15-33	116	104	115	105	-0.9 %	1.0 %	115	98	120	97	4.3 %	-1.0 %
245-15-34	136	119	138	122	1.5 %	2.5 %	137	115	138	116	0.7 %	2.6 %
245-15-35	118	109	125	115	[redacted]		127	106	130	105	2.4 %	-0.9 %
245-15-36	122	117	127	115	4.1 %	-1.7 %	132	101	128	100	-3.0 %	-1.0 %
245-15-37	131	119	132	118	0.8 %	-0.8 %	125	112	133	102	-1.6 %	[redacted]
245-15-38	132	118	136	125	3.0 %	[redacted]	130	114	127	105	-2.3 %	[redacted]
245-15-39	134	125	135	126	0.7 %	0.8 %	126	112	126	108	0.0 %	-3.6 %
245-15-40	124	112	129	120	4.0 %	[redacted]	131	113	120	110	-2.3 %	-2.7 %
245-15-41	125	112	127	118	1.6	[redacted]	125	111	122	106	-2.4 %	-4.5 %
245-15-42	116	106	120	118	[redacted]		126	112	126	107	0.0 %	-4.5 %
245-15-43	117	106	127	117	8.5 %	[redacted]	127	113	126	103	-2.4 %	[redacted]
245-15-44	120	101	131	105	9.2 %	4.0 %	125	111	122	99	-2.4	[redacted]
245-15-45	134	126	140	131	4.5 %	4.0 %	139	128	125	115	-2.2 %	[redacted]
245-15-46	122	114	130	120	[redacted]		133	116	132	105	-0.8 %	[redacted]
245-15-47	129	117	133	118	3.1 %	0.9 %	131	117	127	105	-3.1 %	[redacted]
245-15-48	116	107	127	120	[redacted]		126	112	122	103	-3.2 %	[redacted]
245-15-49	134	112	137	115	[redacted]	2.7 %	127	98	126	98	-0.8 %	0.0 %

245-15-52	127	121	136	125	-0.7 %	3.8 %	130	105	130	101	0.0 %	-3.8 %

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245-15-53	127	121	134	122	[redacted]	0.8 %	130	102	128	102	-1.5 %	0.0 %
245-15-54	121	102	125	114	2.3 %	[redacted]	125	103	125	97	0.0 %	-5.8 %
245-15-55	128	115	130	119	1.6 %	3.5 %	138	117	133	100	-2.2 %	[redacted]
245-15-56	126	114	128	118	1.6 %	5.5 %	132	120	130	115	-1.5 %	-4.2 %
245-15-57	127	118	130	119	2.4 %	0.8 %	136	123	134	108	-1.5 %	-12.2 %
245-15-58	122	111	130	120	[redacted]	[redacted]	135	121	131	113	-4.0 %	[redacted]
245-15-59	123	112	125	109	1.6 %	-2.7 %	130	118	127	114	-2.3 %	-3.4 %
245-15-60	131	117	133	127	1.5 %	[redacted]	140	128	136	120	-7.9 %	[redacted]
245-15-61	127	119	134	120	[redacted]	0.8 %	134	117	134	120	0.0 %	2.6 %
245-15-62	127	117	131	124	3.1 %	[redacted]	131	104	130	114	-0.8 %	[redacted]
245-15-63	128	118	133	1254	3.9 %	[redacted]	137	115	133	120	-1.5 %	4.8 %
245-15-64	128	117	135	125	[redacted]	[redacted]	135	109	136	113	2.2 %	3.7 %
245-15-65	121	112	126	118	4.1 [redacted]	[redacted]	127	107	130	104	2.4 %	-2.8 %
245-15-66	118	107	127	115	[redacted]	[redacted]	128	105	128	110	0.0 %	4.6 %
245-15-67	132	124	136	122	1.5 %	-0.8 %						
245-15-68	126	117	132	127	4.6 %	4.3 %						
245-15-69	128	123	130	124	1.6 %	0.8 %						
245-15-70	119	109	129	120	[redacted]	[redacted]						
245-15-71	128	120	128	124	3.9 %	3.3 %						
245-15-72	125	119	136	126	[redacted]	[redacted]						
245-15-73												
245-15-74												
245-15-75												
245-15-76												
245-15-77												
245-15-78												
245-15-79												
245-15-80												
245-15-81	126	104	128	100	1.6 %	0.0 %	131	106	130	102	-0.8 %	-3.6 %
245-15-82	120	100	118	100	-1.7 %	0.0 %	125	98	121	98	-3.2 %	-3.1 %
245-15-83	122	108	124	106	1.6 %	2.9 %	130	102	129	102	-0.8 %	0.0 %
245-15-84	121	103	126	104	4.1 %	1.0 %	130	102	127	100	-2.3 %	-2.0 %
245-15-85	128	112	134	110	4.7 %	-1.8 %	134	104	131	102	-2.2 %	-1.9 %
245-15-86	124	110	127	105	2.4 %	-4.5 %	132	105	131	102	-0.8 %	-2.9 %
245-15-87	129	105	127	105	-1.6 %	0.0 %	129	102	126	96	-2.3 %	[redacted]
245-15-88	130	115	125	110	-3.8 %	-4.3 %	132	105	132	102	0.0 %	-2.9 %
245-15-89	127	108	128	108	0.8 %	0.0 %	128	106	136	108	-1.4 %	1.9 %
245-15-90	114	101	115	103	0.9 %	2.0 %	131	103	125	99	-4.6 %	-2.9 %
245-15-91	125	111	127	114	1.6 %	2.7 %	135	104	131	111	-3.0 %	[redacted]
245-15-92	114	99	113	100	-0.9 %	1.0 %	114	86	110	101	-3.5 [redacted]	[redacted]
245-15-93	117	99	122	104	4.1 [redacted]	[redacted]	126	99	123	106	-2.4 [redacted]	[redacted]
245-15-94	126	109	129	104	2.4 %	-4.6 %	136	106	131	118	-3.7 [redacted]	[redacted]
245-15-95	130	109	131	114	0.8 %	4.6 %	138	108	133	116	-3.6 %	[redacted]
245-15-96	118	101	118	97	0.0 %	-4.0 %	120	94	117	104	-2.5 [redacted]	[redacted]
245-15-97	124	105	125	106	0.8 %	1.0 %	131	104	131	112	0.0 [redacted]	[redacted]
245-15-98	127	110	130	108	2.4 %	-1.8 %	128	106	131	115	-1.5 %	[redacted]
245-15-99	126	110	137	106	0.7 %	-3.6 %	125	108	132	112	-2.2 %	[redacted]
245-15-100	122	100	124	101	1.6 %	1.0 %	131	108	138	118	-2.3 %	[redacted]
245-15-101	128	113	134	118	4.7 %	2.6 %	140	112	136	121	-2.9 %	[redacted]
245-15-102	123	109	126	94	2.4 %	[redacted]	131	104	126	112	-0.8 [redacted]	[redacted]
245-15-103	121	110	130	116	[redacted]	5.5 %	135	109	133	116	-1.5 [redacted]	[redacted]
245-15-104	132	104	134	105	1.5 %	1.0 %	137	108	133	114	-2.9 [redacted]	[redacted]
245-15-105	124	106	126	104	1.6 %	0.0 %	128	104	127	102	-0.8 %	-1.9 %

245-15-108	130	[illegible]	127	114	-0.8 %	0.0 %	[illegible]	119	[illegible]	107	0.8 [redacted]	[redacted]

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245-15-109	124	105	128	108	3.2 %	2.9 %	126	102	127	102	0.8 %	0.0 %
245-15-110	115	108	124	106	[redacted]	-1.9 %	127	110	126	101	-0.[redacted]	[redacted]
245-15-111												
245-15-112												
245-15-113												
245-15-114												
245-15-115												
245-15-116												
245-15-117												
245-15-118												
245-15-119												
245-15-120												
245-15-121												
245-15-122												
245-15-123												
245-15-124												
245-15-125												
245-15-126												
245-15-127												
245-15-128												
245-15-129												
AVG.	125	111	129	115	[illegible] %	[illegible] %	120	107	129	107	[illegible] %	1.[illegible] %
STD.	6.0	6.8	5.3	8.0	[illegible] %	[illegible]	[illegible].4	7.3	5.4	6.8	[illegible] %	[illegible] %

PRE/PRE POST PRE POST

3.2 3.6 -0.8 0

PRE POST

REPORT OF ISR TESTING
FORD PASSENGER CAR
ELECTRONIC SPEED CONTROL
DEACTIVATION PRESSURE SWITCH
PS/93/32

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

TEST LOT NO. 395-15-56	TEST VALIDATION TESTING	DEVICE TYPE A-1 PURPLE O-RING
TESTED BY J. VIDEMENTO		
APPROVED BY A. RAHMAN	TEXAS INSTRUMENTS MATERIALS & CONTROLS GROUP ATTLEBORO, MA 02703	DOC. PS/93/32
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1.0	**GENERAL**	
1.1	Customer:	Ford Motor Company
1.2	TI Part Number:	77PSL6-1, with purple o-ring
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:	April 28, 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:	395-15-36
1.9	TI Pressure Switch Test Report Number	PS/93/32

2.0 OBJECTIVE

This battery of tests was performed to demonstrate the ability of 77PSL6-1 installed with a purple colored o-ring 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. In addition to the ES tests, each switch was tested for fluid leaks using PBR (formerly BCIA) supplied test fixture.

All 36 switches under test passed all the test requirements and conformed to the specification. None of the switches leaked fluid when tested with the supplied fixture, either prior or after the tests.

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.

The leak test with the PBR fixture was conducted by applying 160 psig (1100 kPa.G) pressure to the switch installed in the fixture. The switch was checked for leaks by monitoring the pressure drop and also by visual observation of soapy water applied to the joint.

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, Proof and fluid leakage. 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: 395-15-01 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.

3.2 VOLTAGE DROP

3.2.1 Devices Tested: 395-15-01 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 5.4 millivolts, and the standard deviation was 0.1 mV. All values were significantly below the specification of 200 millivolts maximum.

3.2.4 Final results: The average voltage drop for 30 devices was 32.2 millivolts, and the standard deviation was 36.1 mV. All values were below the specification of 200 millivolts maximum.

3.3 CURRENT LEAKAGE

3.3.1 Devices Tested: 395-15-01 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.

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3.4 PROOF

3.4.1 Devices Tested: 395-15-01 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, resolvable 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 AIR LEAKAGE

3.5.1 Devices tested: 395-15-01 thru -36

3.5.2 Procedure: The switch was installed in the fixture supplied by PBR to a torque of 7.5 Nm and soapy water was applied to the joint. A pressure of 160 psig air was applied to the switch via the fixture and held for 5 minutes minimum. The pressure gage was observed for any drop in pressure. The soapy water was checked for any aeration which would indicate a leak.

3.5.3 Equipment: T.I. custom designed & built air pressure station. PBR supplied test fixture.

3.5.4 Results: There was no evidence of any pressure drop or soapy water aeration throughout the duration of the test.

3.5.5 Final Results: There was no evidence of any leakage.

3.6 BURST

3.6.1 Devices tested: 395-15-31 thru -36.

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

3.6.3. 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.

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

3.7 VACUUM

3.7.1 Devices tested: 395-15-07 thru -30

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

3.7.3 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.

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

3.8 IMPULSE

3.8.1 Devices tested: 395-15-07 thru -30

3.8.2 Procedure: 24 devices, previously exposed to the vacuum test as in section 3.7, were run. The parameters given in the ES (frame 7 of 18, section III. E. 1.) were modified as in section 1.4 above.

3.8.3 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.

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

TEST LOT NO.	TEST	DEVICE
TESTED BY		
APPROVED BY	TEXAS INSTRUMENTS — MATERIALS & CONTROLS GROUP, ATTLEBORO, MA 02703	DOC.
DATE 93-05-03		PAGE 14

FORM 8205

3.9 TEMPERATURE CYCLE

3.9.1 Devices tested: 395-15-01 thru -06.

3.9.2 Equipment: Same as in 3.8.3

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

Appendix A
Specification amendments correspondence

TEST LOT NO.	TEST	DEVICE
TESTED BY		
APPROVED BY	TEXAS INSTRUMENTS MATERIALS & CONTROLS GROUP ATTLEBORO, MA 02703	DSC.
DATE 93-03-12		PAGE

FORM 8305

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

Telefax Transmission

PAGE 1 OF 2

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

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

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 NAAO 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 S84DA-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-F2VC-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 ADDRESSEE'S PLEASE ADVISE CONCURRENCE WITH ABOVE TO ENABLE DRAWING TO BE REVISED ACCORDINGLY.

REGARDS.

Ford Motor Company of Australia Limited
A.C.N. 004 116 933

Rapitax 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 PECC.
DEPT.: CAPRI ENGRG
RAPIFAX No.: (052) 788109

DELIVERY: ☐ NORMAL ☐ RUSH-CALL FOR PICKUP

B/C: DATE: 22/12/9

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. 004 116 229

Rapifax Transmission

OUR REF.

PAGE 2 OF 2

TO:

FROM

DEPT.:

FAX:

RAPIFAX No.: 0925 0161

DELIVERY: ☐ NORMAL ☐ RUSH-CALL FOR PICKUP

B/C: DATE:

TO 58·5 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.	TEST	DEVICE
TESTED BY		
APPROVED BY	TEXAS INSTRUMENTS MATERIALS & CONTROLS GROUP ATTLEBORO, MA 02703	DOC.
DATE 93x02x12		PAGE

FORM 5292

Engineering Specification

PART NAME: SWITCH ASSEMBLY - SPEED CONTROL DEACTIVATE

PART NUMBER: ▽ ES-F2VC-9F924-AA

DATE	LET	FR	REVISIONS	DR	CK
901130			ADDED DATA TO COMPLETE SPEC. & RETYPED NCC/U100791790U2		[illegible]

REFERENCE

PREPARED/APPROVED BY: [illegible] 901130

CHECKED BY

DETAILED BY

CONCURRENCE/APPROVAL SIGNATURES

DESIGN ENGINEERING SUPERVISOR: [illegible]

DESIGN ENGINEERING MGT.

MANUFACTURING ENGRG.

QUALITY CONTROL: [illegible]

PURCHASING

SUPPLIER QUALITY ASSISTANCE: [illegible]

ELECTRONICS DIVISION: [illegible]

▽ CONTROL ITEM — THE ▽ SYMBOL ALSO IDENTIFIES PRODUCT ENGINEERING DESIGNATED CRITICAL CHARACTERISTICS. THESE AND ADDITIONAL CRITICAL CHARACTERISTICS IDENTIFIED BY PROCESS REVIEWS, MUST APPEAR ON THE Q-101 CONTROL PLANS WHICH REQUIRE PRODUCT ENGINEERING APPROVAL.

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

PD 3947-81 (Previous editions may NOT be used)

TI-NHTSA 011682

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.

QI 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 affected. 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.

Engineering Specification

FRAME 3 OF 18

NUMBER ES-F2VC-9F594-AA

SECTION III. TABLE OF TESTS

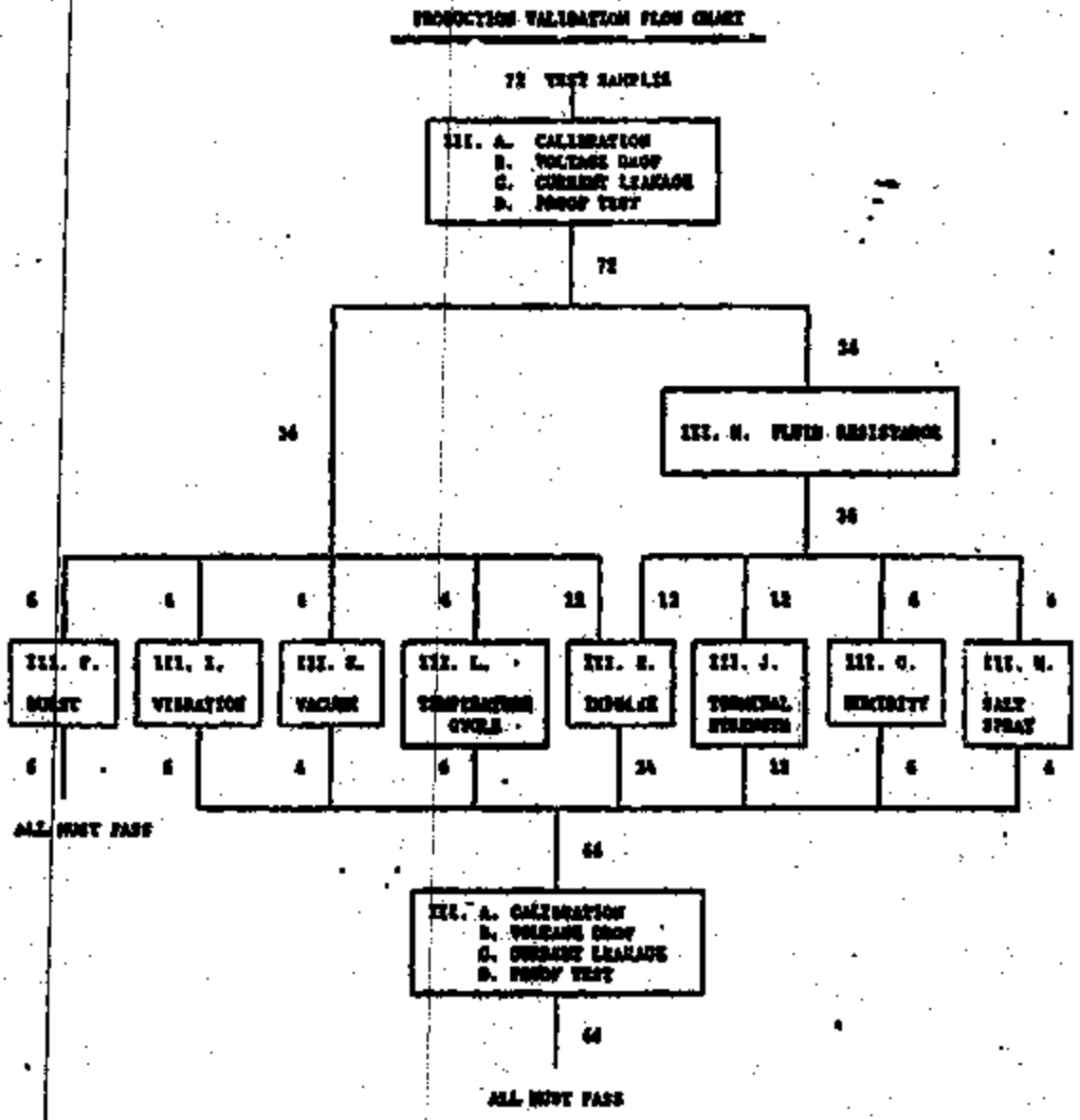
Item	Test Name Functional Tests	PRODUCTION VALIDATION Minimum Sample Size	PRODUCTION VALIDATION Statistical Test Acceptance Criteria	IN-PROCESS IP-1 Minimum Sample Size	IN-PROCESS IP-1 Statistical Test Acceptance Criteria	IN-PROCESS IP-2 Minimum Sample Size	IN-PROCESS IP-2 Statistical Test Acceptance 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	12	P9?-.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

PD 3947-82

TI-NHTSA 011694



FRAME 4 OF 18	REVISED		VES-V270-SV924-AA NUMBER

PD 3947-a2 (previous release 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-35°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) microampere.

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 90-95% relative humidity.

(2) Hold 3 hours at 65 +10/-2 °C at 90-95% relative humidity.

(3) Lower temperature to 25 +10/-2 °C over 2.5 hours; at 80-95% 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 part 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 @, 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.

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 3-4 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 switch's to the post immersion tests specified below:

III. H. 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 problem corrected. All production lots shall be served 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.

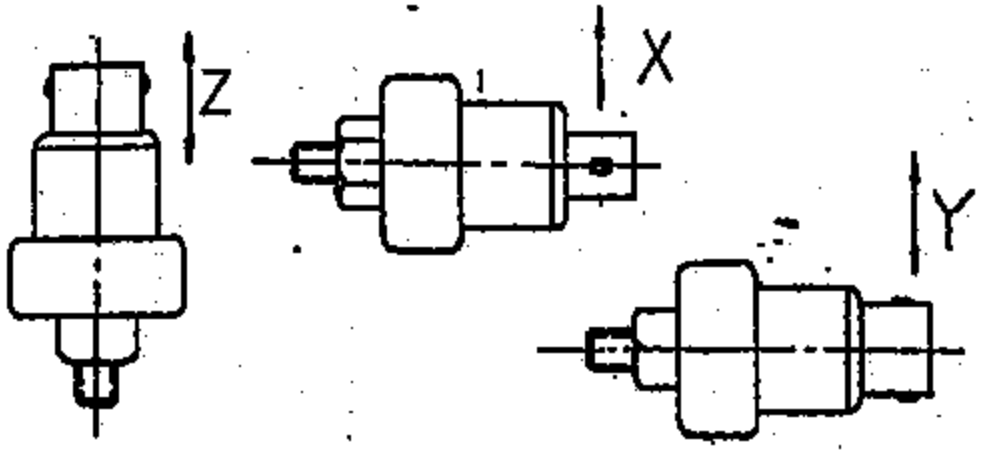
IX. COMPILATION OF REFERENCE DOCUMENTS

ASTM B-117, Salt Spray Testing

Ford Q-101, Quality System Standard - 1990 Edition

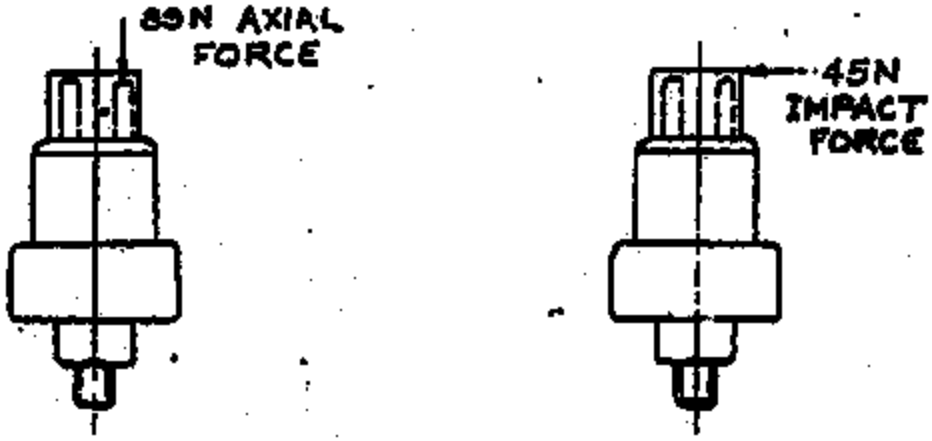
ES-F0EB-14A464-AA, Specification - ELV Assy - Wire Connector

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



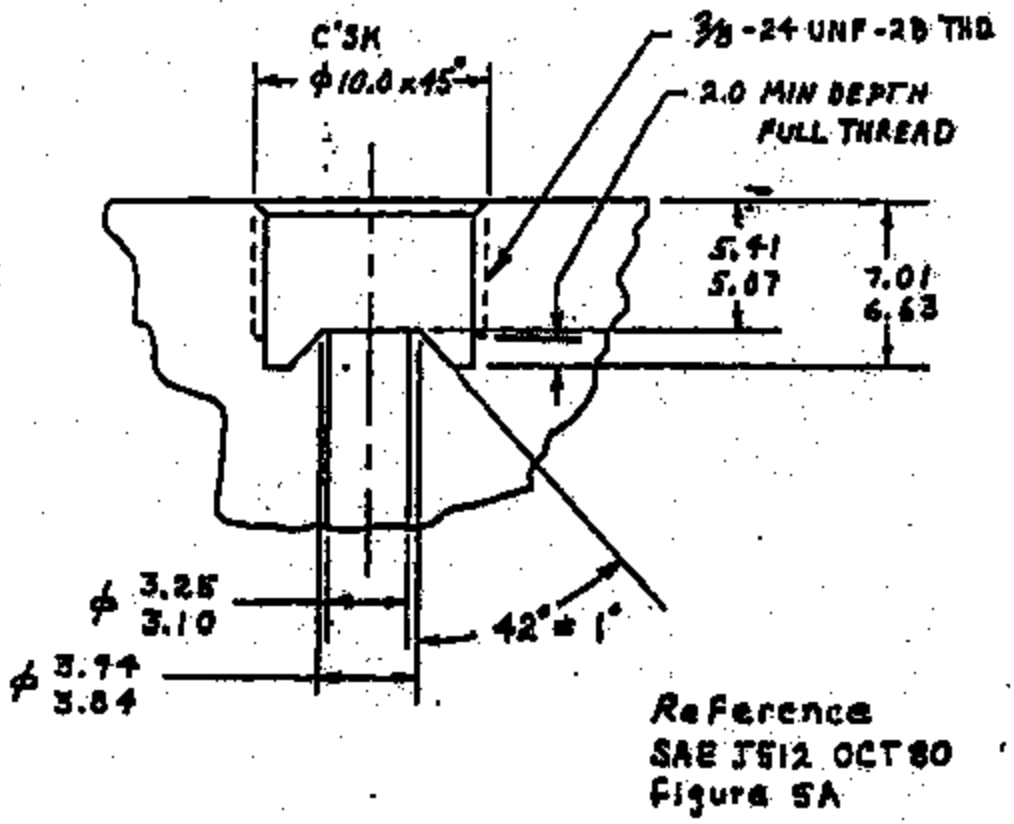
VIBRATION TEST - SWITCH ORIENTATION

FIGURE 1.



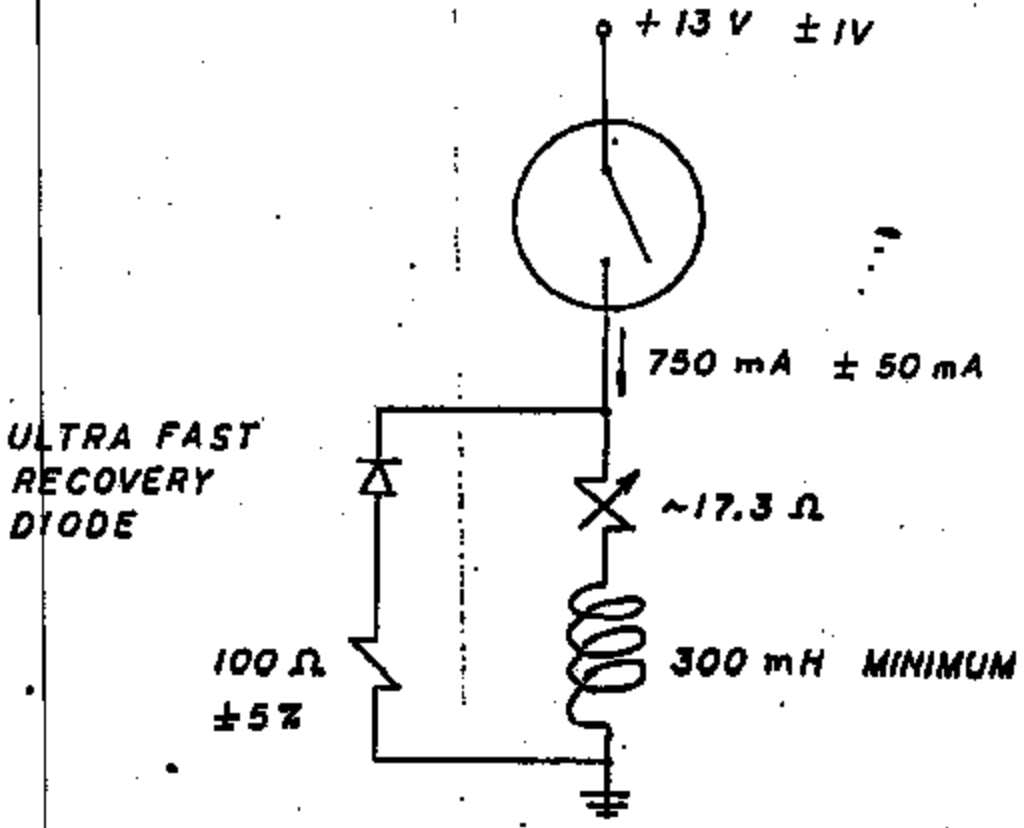
TERMINAL STRENGTH - LOAD ORIENTATION

FIGURE 2.



TEST FIXTURE PORT CONFIGURATION

FIGURE 3



DEACTIVATE SWITCH
TEST SET UP

FIGURE 4

Appendix C
Test Data

TEST LOT NO.	TEST	DEVICE
TESTED BY		
APPROVED BY	TEXAS INSTRUMENTS MATERIALS & CONTROLS GROUP ATTLEBORO, MA 02703	DOC.
DATE 99-02-12		PAGE

FORM 2256

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

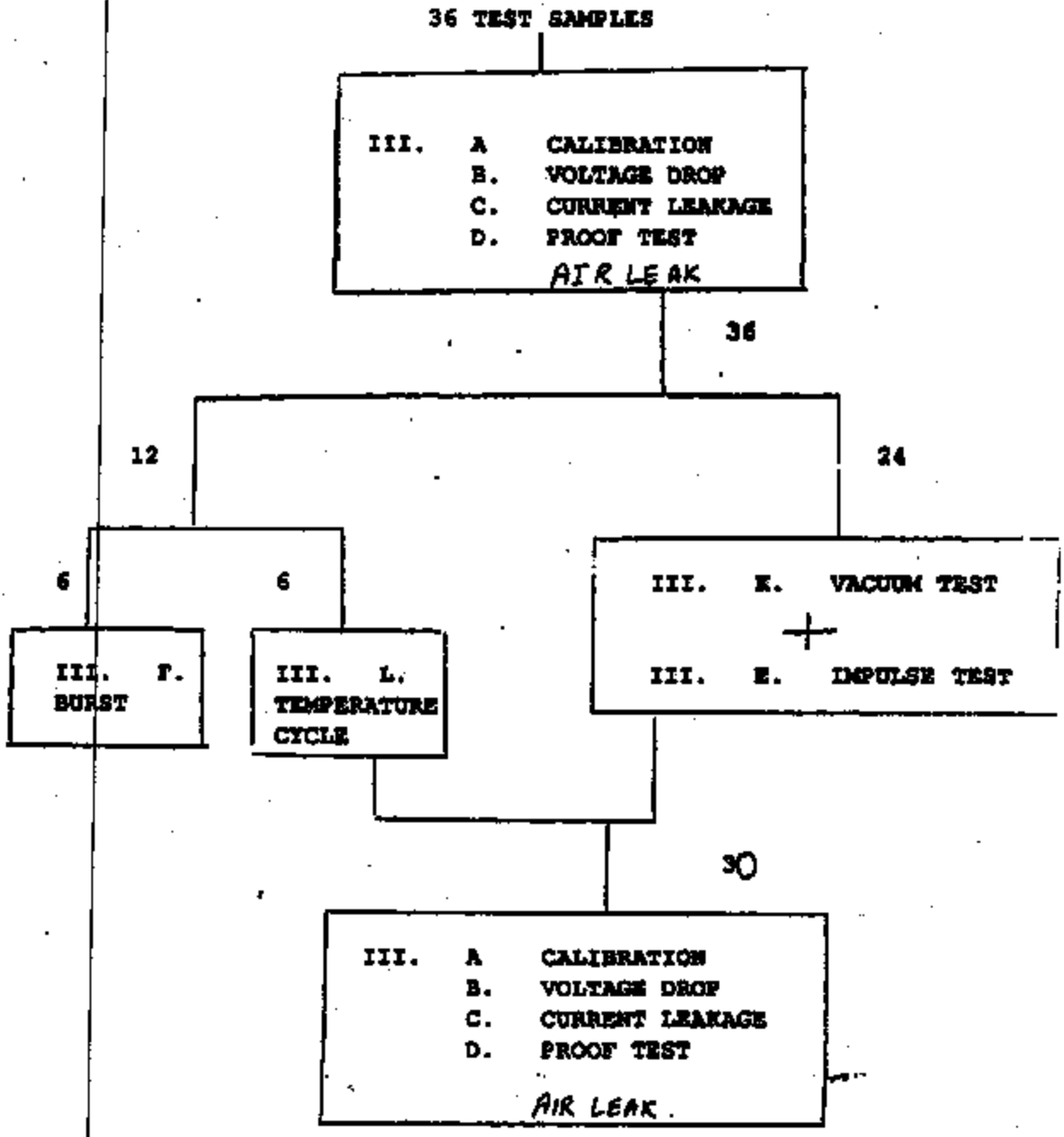
	INITIAL CHARACTERIZATION										FINAL CHARACTERIZATION							
DEVICE # 385-16	ACT psig	REL psig	mV DROP	CURR LEAK	PRF 3K PSIG	AIR LEAK	ACT psig	REL psig	TEST	ACT psig	REL psig	mV DROP	CURR LEAK	PRF 3K PSIG	ACT psig	REL psig	AIR LEAK
-01	119	84	4.7	< 100 mA	O.K	No Leak	119	84	Temp. Cycle	104	77	8.5	< 100 mA	O.K	104	78	No Leak
-02	120	86	5.7	"	"	"	119	81	"	107	80	7.5	"	"	107	78	"
-03	120	81	4.7	"	"	"	119	85	"	109	83	8.5	"	"	109	80	"
-04	125	88	4.8	"	"	"	121	79	"	110	81	9.3	"	"	111	80	"
-05	117	81	5.0	"	"	"	114	78	"	104	78	5.6	"	"	104	76	"
-06	118	83	5.0	"	"	"	118	80	"	106	80	5.2	"	"	107	78	"
-07	119	72	4.8	"	"	"	118	74	Vacuum + Impulse	105	78	17.0	"	"	105	74	"
-08	123	72	5.9	"	"	"	121	79	"	112	82	45.5	"	"	109	78	"
-09	119	78	6.2	"	"	"	118	77	"	111	79	170.8	"	"	108	77	"
-10	122	78	4.8	"	"	"	123	79	"	114	84	27.1	"	"	112	81	"
-11	127	81	5.5	"	"	"	127	83	"	115	89	59.8	"	"	115	86	"
-12	128	77	5.5	"	"	"	125	80	"	112	86	30.8	"	"	111	83	"
-13	118	78	5.5	"	"	"	120	77	"	108	79	16.0	"	"	108	76	"
-14	123	79	5.5	"	"	"	123	81	"	99	75	24.8	"	"	98	72	"
-15	113	75	5.4	"	"	"	114	73	"	109	79	29.8	"	"	109	76	"
-16	114	75	5.5	"	"	"	114	78	"	109	77	27.7	"	"	107	74	"
-17	117	74	6.2	"	"	"	117	76	"	99	74	25.5	"	"	98	70	"
-18	120	75	5.4	"	"	"	119	77	"	112	84	51.5	"	"	110	79	"
-19	117	72	5.6	"	"	"	116	74	"	105	78	66.1	"	"	102	74	"
-20	119	73	5.1	"	"	"	119	74	"	100	74	15.2	"	"	99	72	"
-21	129	83	5.5	"	"	"	125	71	"	110	81	81.5	"	"	108	78	"
-22	121	81	5.0	"	"	"	121	83	"	105	79	25.1	"	"	104	75	"
-23	125	79	5.1	"	"	"	124	71	"	114	88	88.8	"	"	113	81	"
-24	112	69	5.6	"	"	"	111	72	"	102	74	16.3	"	"	102	72	"
-25	1215	78	5.0	"	"	"	124	83	"	113	84	130.5	"	"	113	82	"
-26	124	79	4.8	"	"	"	124	76	"	115	88	21.2	"	"	113	83	"
-27	118	74	4.8	"	"	"	119	75	"	110	81	12.2	"	"	107	77	"
-28	113	73	5.1	"	"	"	114	74	"	92	70	13.6	"	"	91	67	"
-29	119	78	4.8	"	"	"	120	79	"	110	81	38.6	"	"	107	78	"
-30	118	78	4.8	"	"	"	118	78	"	106	78	11.3	"	"	105	75	"
-31	119	74	5.4	"	"	"	119	77	Burst								
-32	125	79	5.3	"	"	"	125	86	"								
-33	119	75	5.2	"	"	"	119	77	"								
-34	114	73	5.4	"	"	"	114	74	"								
-35	124	80	5.5	"	"	"	123	72	"								
-36	120	78	5.6	"	"	"	121	76	"								

Appendix D
Test Sequence Flow Chart

TEST LOT NO.	TEST		DEVICE
TESTED BY			
APPROVED BY	TEXAS INSTRUMENTS	MATERIALS & CONTROLS GROUP ATTLEBORO, MA 02703	DSC
DATE 93-02-12			PAGE

FORM 2316

PRODUCTION VALIDATION FLOW CHART



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. Vidomenico	TEXAS INSTRUMENTS MATERIALS & CONTROLS GROUP ATTLEBORO, MA 02703	DRG. PS/93/11
APPROVED BY A. Rahman		PAGE 1
DATE 93-03-12		

FORM 5255

TABLE OF CONTENTS

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. Rahmen		PAGE
DATE 95-02-22		

FORM 6286

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

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 93-02-10		

FORM 6966

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.

TEST LOT NO. 370-15-56	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 5208

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.

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. 370-15-54	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 5295

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. Vidomendez	TEXAS INSTRUMENTS MATERIALS & CONTROLS GROUP ATTLEBORO, MA 02703	DOC. PS/93/11
APPROVED BY A. Rahman		PAGE
DATE 09-09-96		

FORM 0205

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, resolvable 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.

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/95/11
DATE		PAGE

FORM 0355 [illegible]

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 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 93-08-10		

FORM 5269

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. 370-15-56	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 5266

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)

TI-NHTSA 011715

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/95/11
DATE [illegible]		PAGE [illegible]

FORM [illegible]

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)

TI-NHTSA 011716

TEST LOT NO. 370-15-26	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 8008 93-02-12

Appendix A
Specification amendments correspondence

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

FORM 5205 [illegible]

Ford Motor Company of Australia Limited
A.C.N. 004 116 329

RapidFax Transmission

PAGE 1 OF 2

FROM JOHN PECC.

DEPT.: CAPRI ENGRG.

RAPIFAX No.: (052) 788109

TO: DANNY O'DRISCOLL - TEXAS INSTRUMENTS.
PATRICK SAWYER/CATHY CAREY - BCIA.

FAX: cc. V. STOIOS/T. WORTHINGTON/P. ROBERTS/P. WILLIAMS.

B/C:

DELIVERY: ☐ NORMAL ☐ RUSH-CALL FOR PICKUP

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 NAAO 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 S84 DA-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-F2VC-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
FROM
DEPT.:
TO:
FAX:
RAPIFAX No.: (SEE OVER)
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-9E924-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 ADDRESSEE'S PLEASE ADVISE CONCURRENCE WITH ABOVE TO ENABLE DRAWING TO BE REVISED ACCORDINGLY.

REGARDS.

[signature]

TI-NHTSA 011719

Ford Motor Company of Australia Limited
A.C.N. 004 116 283

Rapifax Transmission

OUR REF.

PAGE 1 OF 2

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

FROM JOHN PECC.

DEPT.: CAPRI ENGRG

FAX: RAPIFAX No.: (052) 786109 (USE ONLY)

DELIVERY: ☐ NORMAL ☐ RUSH-CALL FOR PICKUP

B/C: DATE: 22/12/

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.

TI-NHTSA 011720

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

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.: (REC'D/ED)

DELIVERY: ☐ NORMAL ☐ RUSH-CALL FOR PICKUP

S/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. 376-15-36	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		
DATE		PAGE

FORM 8296 95-05-12

Engineering Specification

PART NAME	PART NUMBER
SWITCH ASSEMBLY - SPEED CONTROL DEACTIVATE	▽ ES-F2VC-9F924-AA

DATE	LET	FR	REVISIONS	DR	CK
			ADDED DATA TO COMPLETE		
			SPEC. & RETYPED		
9/11/92			NC(A)E)0079 79002		

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 REVIEW, MUST APPEAR ON THE Q-101 CONTROL PLANS WHICH REQUIRE PRODUCT ENGINEERING APPROVAL.

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

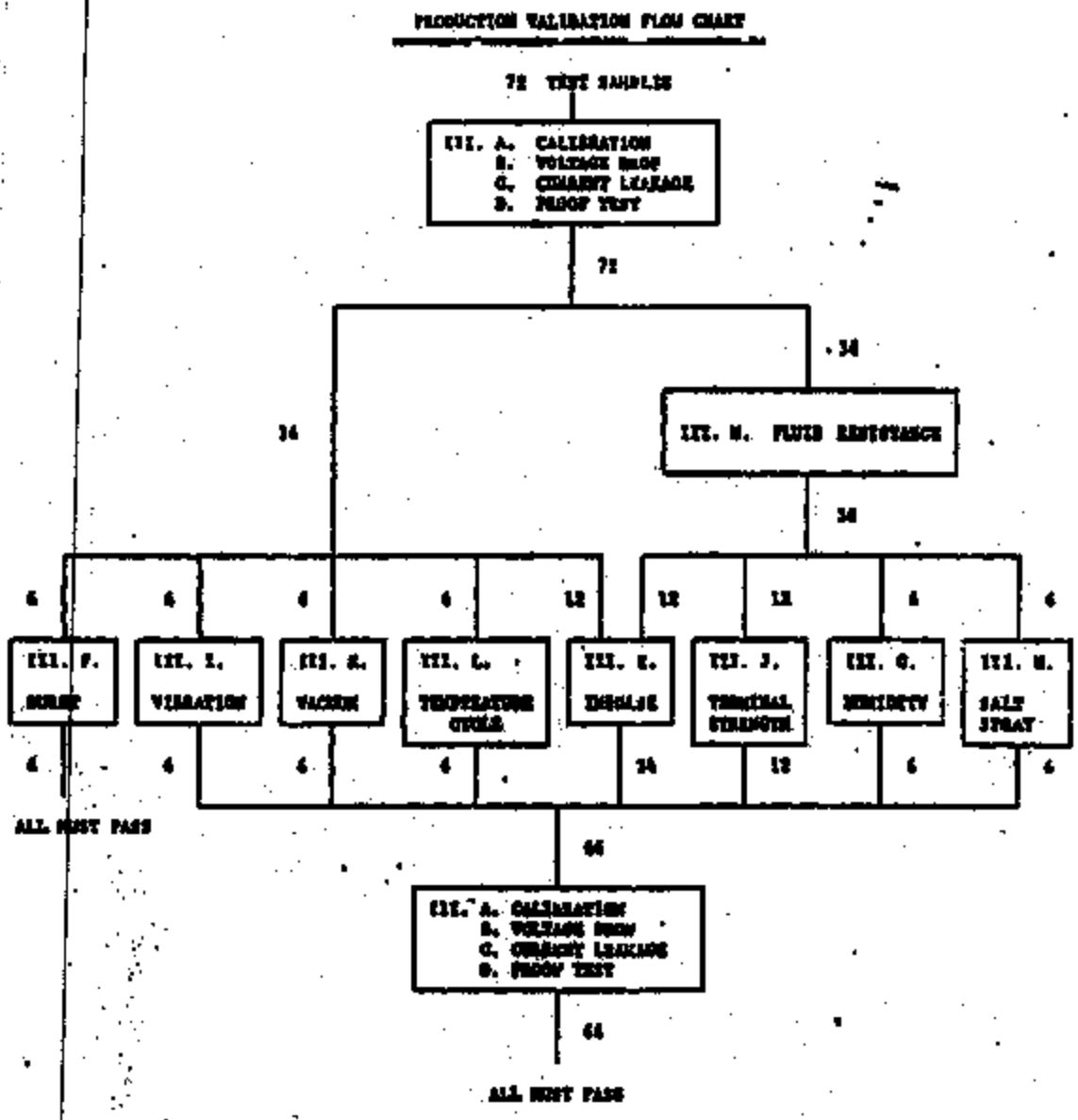
- Production Validation (PV) Tests must be completed satisfactorily with parts from production tooling (and processes where possible) before ISIR approval and authorization for shipment of production parts can be affected. Parts must be revalidated completely, or per Section V whenever any change is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



FRAME	18 OF	REVISED		VEE-V200-9F024-AA NUMBER

PD 3947-a2 (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-35°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 13.6 ± 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 13.6 ± 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 to 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) microampere.

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 48.1 MPa (7000 PSI) minimum and hold for 10 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/-1 °C over 2.5 hours; at 90-98% relative humidity.

(2) Hold 3 hours at 65 +10/-1 °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-M1C138-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. K. 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 in 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.

HOUSING 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 port 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.

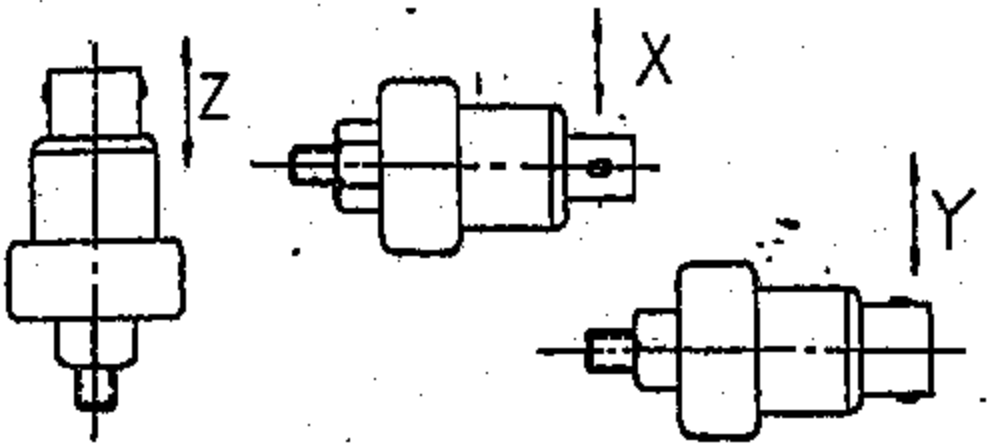
IX. COMPILATION OF REFERENCE DOCUMENTS

ASTM B-117, Salt Spray Testing

Ford Q-101, Quality System Standard - 1990 Edition

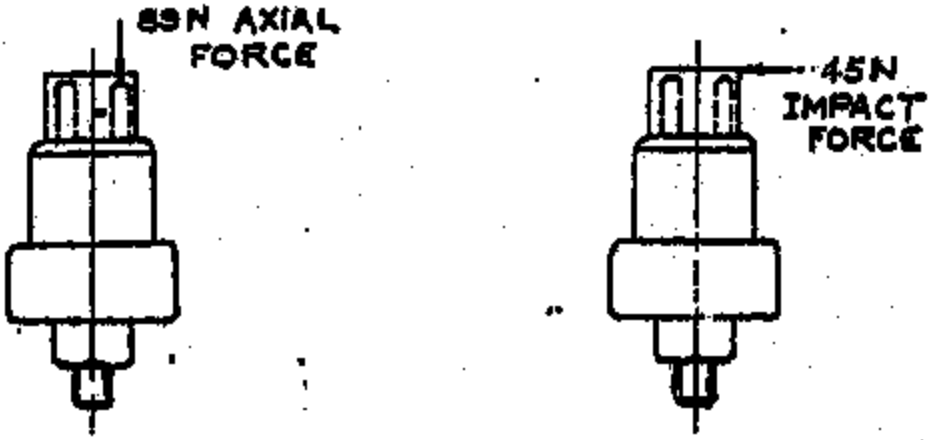
ES-F0ES-14A464-AA, Specification - SLV Assy - Wire Connector

ES-F2VF-9C753-AA, Specification - Servo Assembly Speed Control



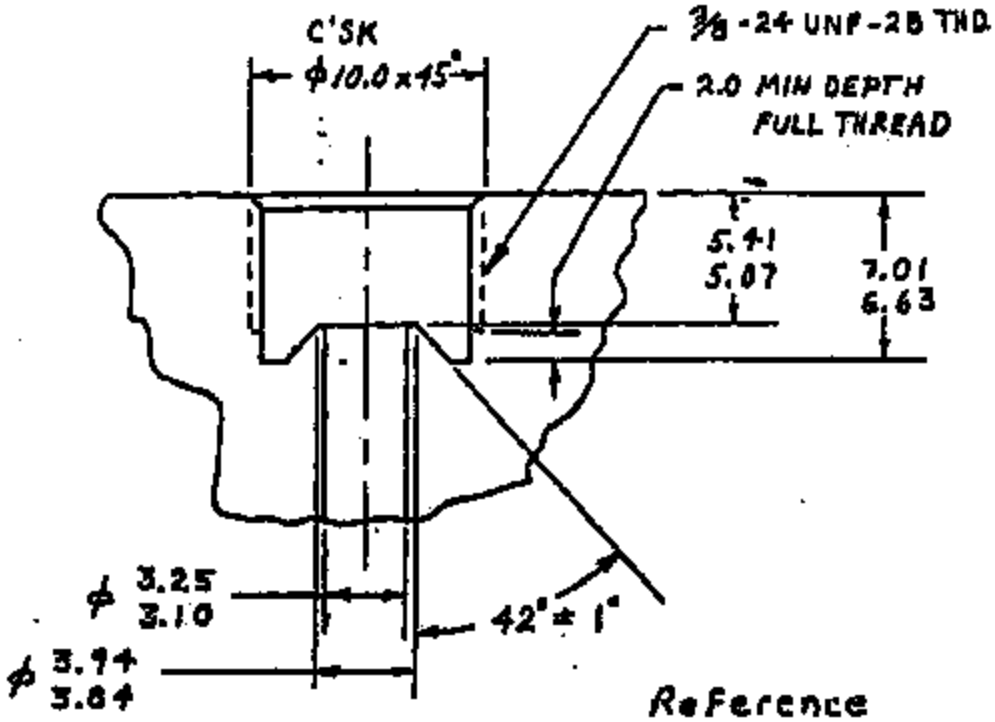
VIBRATION TEST - SWITCH ORIENTATION

FIGURE 1.



TERMINAL STRENGTH - LOAD ORIENTATION

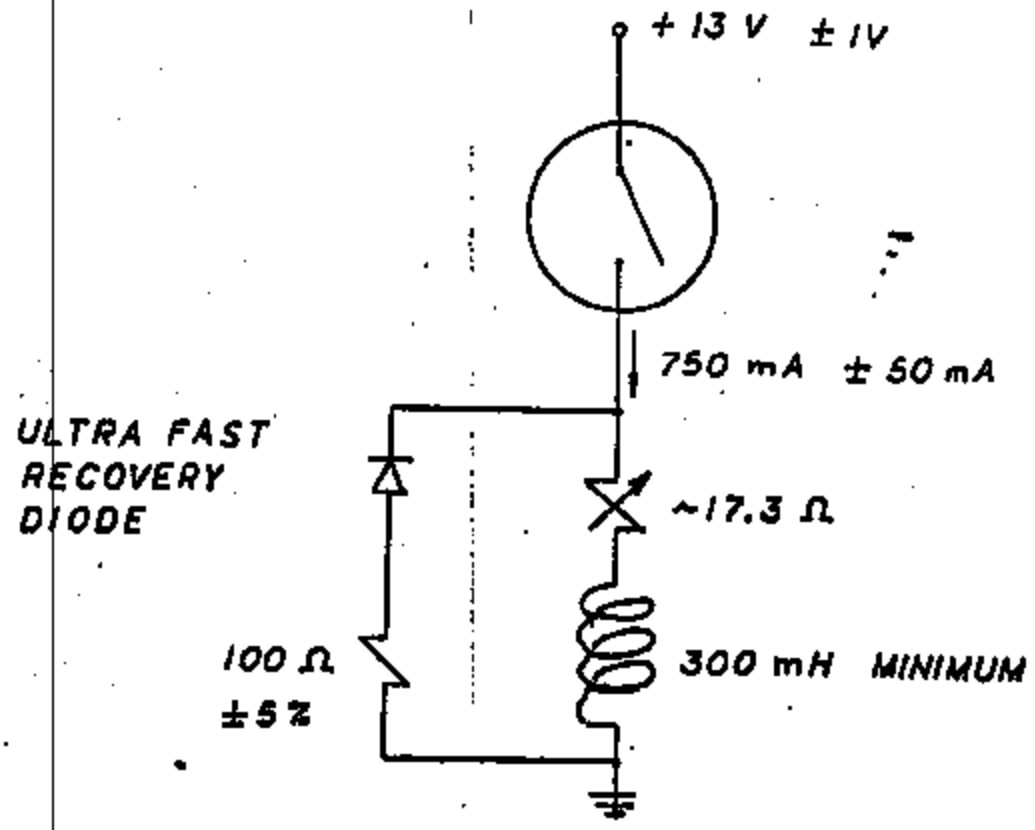
FIGURE 2.



TEST FIXTURE PORT CONFIGURATION

FIGURE 3

FRAME 17 OF 18	REVISED		▽ [illegible] NUMBER



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/93/11
APPROVED BY A. Rahman		PAGE
DATE		

FORM 0268 REVISED

77PSL8-1 ISR VALIDATION TEST DATA
FORD PART # 94JA-9F924-AB

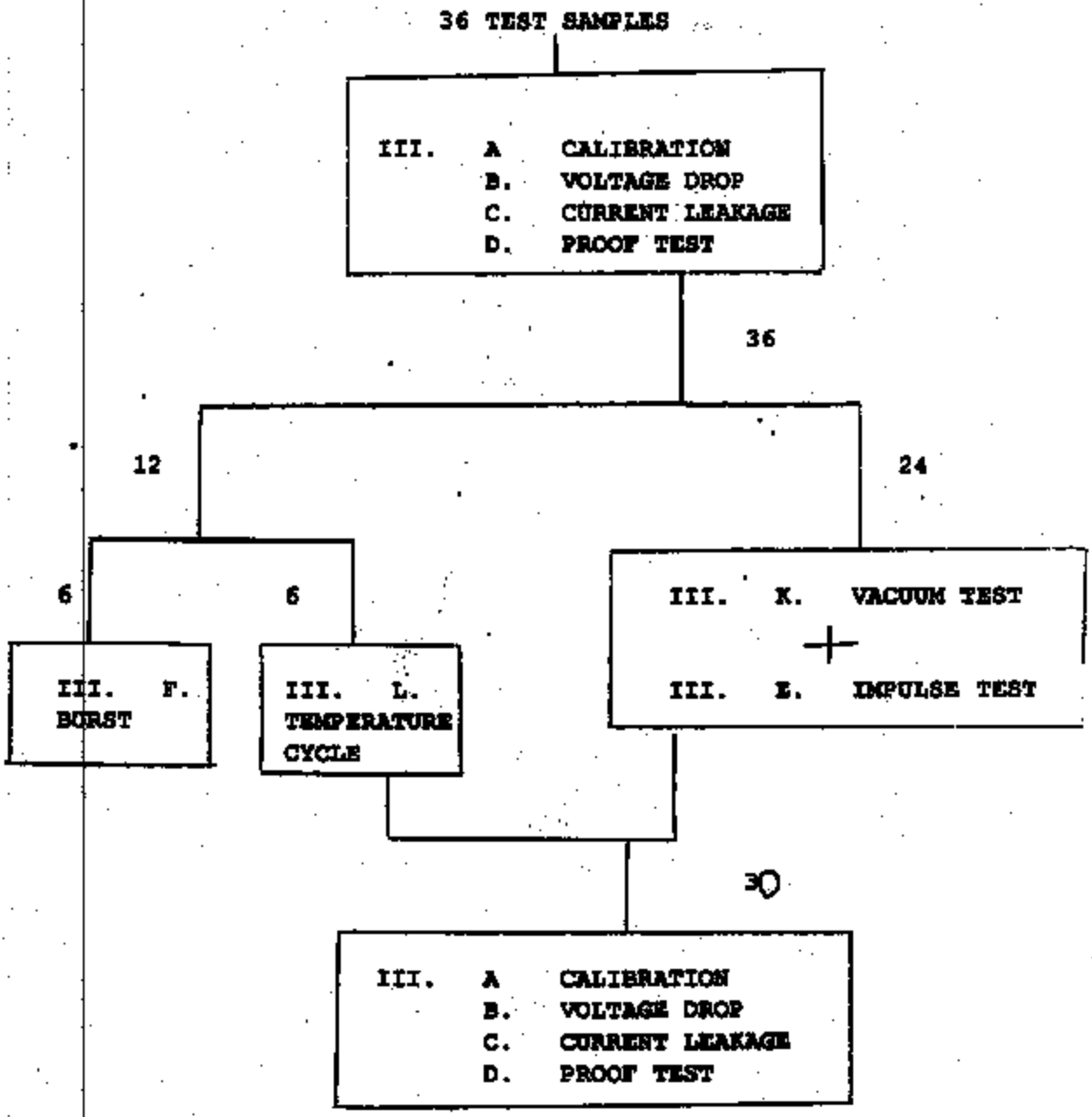
	INITIAL CHARACTERIZATION								FINAL CHARACTERIZATION						
DEVICE #	ACT psig	REL psig	mV DROP	CURRENT LEAKAGE	PROOF @ 3000 psig	ACT psig	REL psig	TEST	ACT psig	REL psig	mV DROP	CURRENT LEAKAGE	PROOF @9000 psig	ACT psig	REL psig
370-15-01	121	86	13.4	< 100 mA	O.K	127	72	Vacuum + Impulse	101	79	6.7	< 100 microamps	O.K	98	75
-02	129	96	16.5	"	"	120	88	"	117	89	12.4	"	"	115	87
-03	114	78	13.7	"	"	114	77	"	106	80	36.7	"	"	104	77
-04	130	91	13.3	"	"	122	85	"	111	86	16.2	"	"	108	83
-05	121	87	13.2	"	"	121	84	"	109	80	13.4	"	"	102	78
-06	119	81	13.1	"	"	109	80	"	102	79	16.0	"	"	101	76
-07	121	88	14.7	"	"	121	86	"	105	82	17.2	"	"	104	79
-08	124	84	13.4	"	"	125	89	"	113	88	28.6	"	"	111	86
-09	113	76	14.9	"	"	119	77	"	106	78	17.3	"	"	103	77
-10	120	80	13.1	"	"	120	81	"	110	84	88.2	"	"	105	82
-11	122	89	16.2	"	"	121	78	"	112	86	8.8	"	"	110	85
-12	128	91	14.1	"	"	125	84	"	116	91	8.4	"	"	115	89
-13	110	79	14.3	"	"	113	77	"	100	77	15.5	"	"	97	74
-14	116	87	14.2	"	"	116	82	"	104	80	67.0	"	"	101	78
-15	117	79	13.8	"	"	117	79	"	110	91	32.8	"	"	105	80
-16	119	82	13.9	"	"	117	82	"	108	87	12.4	"	"	107	86
-17	126	86	16.9	"	"	125	82	"	112	86	89.0	"	"	111	86
-18	114	77	12.9	"	"	113	76	"	97	76	11.9	"	"	96	74
-19	125	90	12.7	"	"	130	94	"	116	89	111.5	"	"	115	87
-20	124	85	13.5	"	"	124	84	"	114	88	16.6	"	"	113	89
-21	128	88	13.3	"	"	127	89	"	116	91	46.0	"	"	114	89
-22	116	84	17.7	"	"	116	80	"	107	82	12.7	"	"	104	80
-23	118	89	15.8	"	"	118	89	"	107	80	62.8	"	"	106	78
-24	117	84	14.3	"	"	116	89	"	103	79	84.6	"	"	102	78
-25	121	89	13.6	"	"	122	86	Temp. Cycle	111	87	8.8	"	"	110	84
-26	126	84	13.7	"	"	118	88	"	106	79	8.0	"	"	104	79
-27	119	83	12.9	"	"	119	88	"	108	84	4.4	"	"	109	86
-28	117	88	14.6	"	"	118	88	"	106	84	6.2	"	"	109	83
-29	121	86	15.6	"	"	120	87	"	112	87	6.4	"	"	111	86
-30	119	88	12.4	"	"	120	93	"	112	87	4.8	"	"	112	86
-31	119	84	15.8	"	"	119	84	Burst							
-32	124	89	15.0	"	"	123	89	"							
-33	121	88	14.4	"	"	121	89	"							
-34	121	86	12.5	"	"	125	91	"							
-35	123	89	13.6	"	"	124	92	"							
-36	121	86	13.9	"	"	121	84	"							

Appendix D
Test Sequence Flow Chart

TEST LOT NO. 370-15-36	TEST ISR TESTING	DEVICE 77PSL6-I
TESTED BY J. Didomenico	TEXAS INSTRUMENTS MATERIALS & CONTROLS GROUP ATTLEBORO, MA 02703	DOC. PS/93/11
APPROVED BY A. Rahman		PAGE
DATE 93-06-15		

FORM 5295

PRODUCTION VALIDATION FLOW CHART



HIGHLIGHTS

Stephen B. Offiler

Week Ending 93-05-28

EXTERNAL SHORT SOLUTIONS

The first-pass mV drop test has been drawn to a close. The test was run with a matrix of loose and tight rivets, unplated and ZnPhos coated. Parts went through a 100-hour hot soak and 42 thermal cycles. At the conclusion, the ZnPhos parts were somewhat worse than the unplated. The average mV drop for loose rivets was 107 versus 60, and for tight rivets was 8.6 vs 4.8. Notable was one ZnPhos-Tight Rivet part in particular, which showed a continuous increased during TC to a maximum of 32.3 mV .

Plans are in place to obtain 63PS brackets from Admiral w/ production ZnPhos process, and perform same battery of tests as 65PS. Parts expected late next week. ETL paperwork has been submitted to reserve a place in the vibration queue.

DFMEA's are planned for the nub retainer and ZnPhos brkt, along with production dwg updates which include the isolation resistance spec, SDR's for env dwg's, and P/L updates. Paul P. is working now on establishing new procedures & equipment to measure rivet SPC, found lacking during build of test parts.

RDA's

Working to streamline the report-generation process in order to increase thruput. Beginning to see results. Backlog was reduced to nine 63PS (zero Warranty/Plant Rtn) & seven 64PS (zero Warranty/Plant Rtn), down 3 from two weeks ago; however five 64PS (1 Warr/4 Plant) recv'd late yesterday. At present rate, feasible to reduce backlog to zero in about 6 weeks.

64PS w/ GUIDE RAILS

We have rec'd the first insulators from the single-cav mold modification. They generally look quite good; we're working w/ Deltar to resolve minor FAI issues which are actually unrelated to the current changes - one dim, a non-functional external radius, has always been out.

63 PS SDR #1499

Completed EX envelope dwg of 63PS w/ 64/65 guide-rail connector, and forwarded to GM. No feedback yet on their layout of the fit to the valve body. Also have completed first-pass EX of components, to be sent out for quote. Chg's to lead frame stamping, insulator mold, and bracket stamping may mean big tooling $.

FILTERED PSM

Dave W. has completed cold response tests on one 65PS built with filter, without vent. Pre-hot soak at 0 C averaged 38msec, versus post-hot soak at 0 C which averaged 111msec. Pre-hot soak at -20 C averaged 150msec, versus post-hot soak at -20 C post which averaged 580msec. It is also known that the filter material is not robust enough, breaking down after hot-soak. If a better material were located, these numbers may potentially be improved upon.

SAMPLES:

Rec'd request for 100 63PS @ $70 w/ semi-seal (EX3412-91), will co-ord w/ Mfg to produce these. Also, working on 5 samp's of 64PS for Steve Whitney w/ semi-seal and new retainer w/ nub & taper pins ($N/C) which will go out early next week.

HIGHLIGHTS

Stephen B. Offiler

Week Ending 93-05-14

63PS SDR #1499

Drafting has completed a 2D layout to define location of the 64PS connector w/ guide rails on the 63PS. We have centered the connector plastic relative to the adjacent VB bolts. This puts the connector pins quite close to their present position; however, leadframe changes are required regardless due to the pin spacing, which is 5.5mm on 63PS and 6.0mm on the new connector. The next steps required to generate the EX envelope dwg for GM include creation of an insulator EX and a bracket EX, the geometries of which come together to form the envelope dwg.

RDA's

Jon Andrews has recently completed about a dozen reports, from analyses conducted over the last couple Saturdays. This is helping significantly to knock down the backlog, which stands at eight 63PS (1 warr.) and eleven 64PS (2 warr. and 2 asm. plant).

Deltar completed their response on the sliver found shorting from the connector terminal to the bracket on DC3040. The fold was somehow (buildup or sing in tool?) made off-center, resulting in an oversize pin. Metalstamp has recently addressed this condition on 65PS by adding a sizing station to that tool, and the permanent corrective action here is to add the same station, and to the 63PS tool as well. Report for Tobin in Downey's hands.

ZINC PHOSPHATE BRACKETS

The ground-rivet mV drop test is underway. It uses 63PS brackets since we have them in-house, 6 ZnPhos plus 6 unplated controls. Three of each lot use "loose" rivets and three use "typical" rivets. Calculated max current of 28mA (1.2K pullup minus 5%, at 16.0VDC) is run thru the riveted ground straps attached as directly as possible to minimize effects of joints, connectors, etc. We have run 100hr hot soak in "dirty" fluid, about to begin thermal cycles, and will next run vibration. The "typical" rivets have exhibited no issues thus far, running 3-4mV consistently. The "loose" rivets are all over the place, with one (ZnPhos) showing a completely open circuit, and another (unplated) showing over 1000 mV drop, while some of the loose rivets remain in the same ballpark as the tight ones.

Paul has relayed information about Parker and Metal Clad to Admiral, who also has a supplier search ongoing. They are preparing to respond to the RFQ. On Monday we will work with Ken Andrews to get an order placed for 5K 64PS brackets to get the ball rolling.

We had a few 64PS brackets stripped in-house and treated by Acton Metal. These were used for customer show-and-tell samples (fully functional).

FILTERED PSM

To demonstrate reduction-to-practice, we're doing a response test on the filtered design without drilled bracket vents, which is forced to vent along the plane of the filter material. Dave Woodhams is conducting this work using 65PS due to convenience of equipment and technique. He's recorded 0 C readings which generally fall below 50 msec, and we're presently going down to -20 C. We also have 65PS data recorded previously which used a filtered-drilled-vent design, which will be useful for comparison.

HIPOT

Paul is working with Andre Charpentier to develop hardware and software costs to implement a better hipot scheme. I have supplied them with the circuit combinations which are presently untested. Of ten total, only nine are logical, and the present scheme manages to hit six of these nine in one shot. The modified scheme will require three shots (test time impact TBD) to hit all nine.