Appendix. 4.2.1
Initial and Final Characterization

TEST LOT NO.	TEST	DEVICE
TESTED BY		
APPROVED BY	TEXAS INSTRUMENTS — MATERIALS & CONTROLS GROUP, ATTLEBORO, MA 02703	DOC.
DATE 91-08-20		PAGE 19

FORM 5298

PRESSURE SWITCH DATA Form 21605 c TEST NO. 156-IC-184

DEVICE	DATE REQUESTED	REQUESTED BY	REQUESTED COMPL. DATE
77PSL2-1			
PERFORMED BY	**DATE STARTED**	**DATE COMPLETED**	**APPROVED BY**
Jeffrey D. Devereux	6/24/91		

PROJECT TITLE: Ford MY'92 Electronic Speed Control Deactivate PS

CUSTOMER: Ford-Cav

PURPOSE OF TEST:

Refer to Ford ES

PROCEDURE:

Current leakage

Device #	Act/Rel	mV Drop -37	closed resistance to ground	open resistance to ground	power over current	Proof	Tests
1C6-IC-81	127/46	4.9	1.88 mA	1.93 mA	1.93 mA	Good	Electrical & Impulse
82	127/61	4.7	2.16	1.49	1.50		Electrical & Impulse
83	129/51	4.9	1.78	1.33	1.62		Electrical & Impulse
84	128/52	4.4	1.67	1.32	1.77		Electrical & Impulse
85	124/59	3.1	1.71	1.29	1.49		Electrical & Impulse
86	130/53	3.2	1.72	1.33	1.59		Electrical & Impulse
87	124/77	3.2	2.29	1.61	1.60		Electrical & Impulse
88	126/61	3.5	2.00	1.49	1.97		Electrical & Impulse
89	132/52	3.0	1.98	1.48	1.97		Electrical & Impulse
90	118/41	5.5	1.99	1.53	1.71		Electrical & Impulse
91	122/54	3.9	1.38	1.33	1.35		Electrical & Impulse
92	126/49	4.1	1.35	1.42	1.51		Electrical & Impulse
93	130/52	4.2	1.42	1.39	1.66		Electrical & Term. Strength
94	129/55	4.0	1.76	1.32	1.35		Electrical & Term. Strength
95	121/46	4.5	1.32	1.48	1.62		Electrical & Term. Strength
96	129/51	4.7	1.37	1.32	1.70		Electrical & Term. Strength
97	127/43	3.9	1.98	1.38	1.84		Electrical & Term. Strength
98	133/52	3.0	1.86	1.43	1.59		Electrical & Term. Strength
99	132/56	3.7	1.97	1.44	1.83		Electrical & Term. Strength
100	127/50	5.0	1.76	1.35	1.70		Electrical & Term. Strength
101	127/53	4.2	1.78	1.32	1.79		Electrical & Term. Strength
102	133/59	4.3	1.94	1.49	1.67		Electrical & Term. Strength
103	132/57	3.3	1.33	1.36	1.62		Electrical & Term. Strength
104	134/62	4.8	1.83	1.39	1.63		Electrical & Term. Strength
105	120/48	4.1	1.67	1.27	1.64		Electrical & Humidity
106	124/52	5.8	1.72	1.29	1.71	Good	Electrical & Humidity
107	123/46	4.2	1.60	1.25	1.63		Electrical & Humidity
108	121/45	4.9	1.64	1.23	1.72		Electrical & Humidity

Current leakage

Device #	Act/Ref	ΔV Prof				Prof	Tests			
1st-out	123/49	2.7	1.46	1.39	1.44	Good	Physical	& Humidity		
29	129/50	4.5	1.46	1.25	1.36		Physical	& Humidity		
31	135/36	4.9	1.45	1.24	1.31		Physical	& Salt Spray		
32	139/47	3.8	1.62	1.23	1.48		Physical	& salt Spray		
34	121/53	5.2	1.54	1.34	1.38		Physical	& Salt Spray		
36	145/55	3.2	1.70	1.38	1.47		Physical	& salt spray		
35	121/51	3.4	1.67	1.27	1.37		Physical	& Salt Spray		
37	123/44	3.8	1.73	1.38	1.51		Physical	& Salt Spray		
38	125/52	3.1	1.58	1.49	1.53		Burst			
39	119/49	3.5	1.52	1.32	1.52		Burst			
40	120/48	3.5	1.46	1.31	1.43		Burst			
41	128/53	4.3	1.59	1.37	1.51		Burst			
42	127/52	3.3	1.69	1.23	1.51		Burst			
43	111/45	3.5	1.63	1.24	1.46		Burst			
44	121/40	3.8	1.68	1.23	1.64		Vibration			
45	127/47	5.7	1.60	1.30	1.45		Vibration			
46	117/43	3.6	1.59	1.23	1.45		Vibration			
47	123/49	3.4	1.63	1.21	1.43		Vibration			
48	155/58	8.3	1.65	1.24	1.43		Vibration			
49	103/38	4.1	1.49	1.32	1.49		Vibration			
50	1158/45	3.5	1.41	1.21	1.43		Vacuum			
51	117/45	3.3	1.55	1.23	1.47		Vacuum			
52	Refuse									
53	107/43	19.5	1.69	1.33	1.69	Good	Vacuum			
54	138/53	5.8	1.61	1.25	1.55		Vacuum			
55	133/50	5.0	1.62	1.29	1.63		Vacuum			
56	129/42	9.7	1.62	1.28	1.69		Vacuum			
57	127/47	5.7	1.63	1.28	1.53		Temp.	Cycle		
58	132/52	6.1	1.70	1.29	1.56		Temp.	Cycle		
59	131/45	5.2	1.69	1.31	1.55		Temp.	Cycle		
60	129/46	6.4	1.72	1.28	1.49		Temp.	Cycle		
61	120/50	6.8	1.73	1.28	1.52		Temp.	Cycle		
62	1148/41	5.1	1.76	1.29	1.46		Temp.	Cycle		
63	133/56	9.2	1.78	1.34	1.42		Temp/Hum		Stopped @	155 K
64	124/39	4.8	1.66	1.34	1.44		Temp/Hum		Leak @	350 K
65	128/53	5.2	1.69	1.35	1.41		Temp/Hum		Stopped @	395 K
66	132/55	7.9	1.68	1.35	1.44		Temp/Hum		Leak @	395 K
67	129/52	9.7	1.72	1.33	1.45		Temp/Hum		Stopped @	395 K
68	115/51	6.0	1.76	1.31	1.46		Temp-Hum		Stopped @	395 K
69	116/41	6.0	1.75	1.30	1.48		Temp/Hum		Leak @	235 K
70	134/43	10.0	1.78	1.34	1.45		Temp/Hum		Leak @	345 K
71	130/46	7.3	1.74	1.29	1.44		Temp/Hum		Leak @	395 K
72	133/45	8.7	1.78	1.26	1.43		Temp/Hum		Leak @	395 K
73	134/56	6.1	1.71	1.27	1.43		Temp/Hum		Leak @	290 K
74	138/59	3.9	1.69	1.33	1.47		Temp/Hum		Leak @	275 K
75	140/43	7.6	1.71	1.27	1.46					
76	138/59	5.3	1.73	1.29	1.50					
77	130/53	7.1	1.71	1.33	1.49					
78	139/52	7.2	1.75	1.30	1.47					
79	137/52	6.6	1.73	1.30	1.47					
80	124/42	5.4	1.76	1.29	1.49					
81	127/55	5.1	1.75	1.31	1.43					

710 K

Rebuild of Impulse parts/Post Cycle

Device #	Proof	Act/Rel	Hy Dep	Current Leakage					
156-15-91	OK	108/53	91	1.81	1.53	1.62			
-93	"	111/54	110	1.96	1.60	1.67			
-95	"	113/54	107	2.05	1.64	1.78			
-97	"	108/55	97	2.14	1.76	1.76			
-85	"	110/60	91	1.96	1.56	1.69			
-91	"	108/64	76	1.88	1.56	1.80			
-99	"	112/58	97	1.89	1.54	1.71			
-81	"	110/53	114	1.81	1.56	1.70			
-89	"	110/54	59	1.97	1.59	1.75			
-93	"	108/55	92	1.93	1.58	1.74			
-4	"	112/57	90	2.07	1.69	1.72			
-93	"	110/60	92	2.03	1.58	1.66			
-41	"	111/58	96	2.01	1.60	1.66			
-89	"	109/56	95	2.18	1.64	1.68			
-91	"	114/55	69	1.97	1.67	1.69			
91	"	115/57	125	1.86	1.60	1.74			
-93	"	110/53	111	2.20	1.69	1.78			
95	"	112/60	104	1.75	1.52	1.73			
-97	"	110/56	122	1.92	1.64	1.75			
100	"	109/57	86	1.93	1.60	1.69			
101	"	115/56	108	1.78	1.47	1.73			
113	"	103/58	93	2.05	1.61	1.76			
-105	"	113/53	98	2.16	1.63	1.76			
107	↓	112/52	132	2.17	1.65	1.73			
				Final Check					
	Test			Pinch	Act/Rel	Hy/Dep	Current Leakage		
156-15-01	Fluid Res. & Tapeke				Aborted				
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737	Fluid Res. & Tapeke								
739	Fluid Res. & Tapeke								
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743	Fluid Res. & Tapeke								
745	Fluid Res. & Tapeke								
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915	Fluid Res. & Tapeke								
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991	Fluid Res. & Tapeke								
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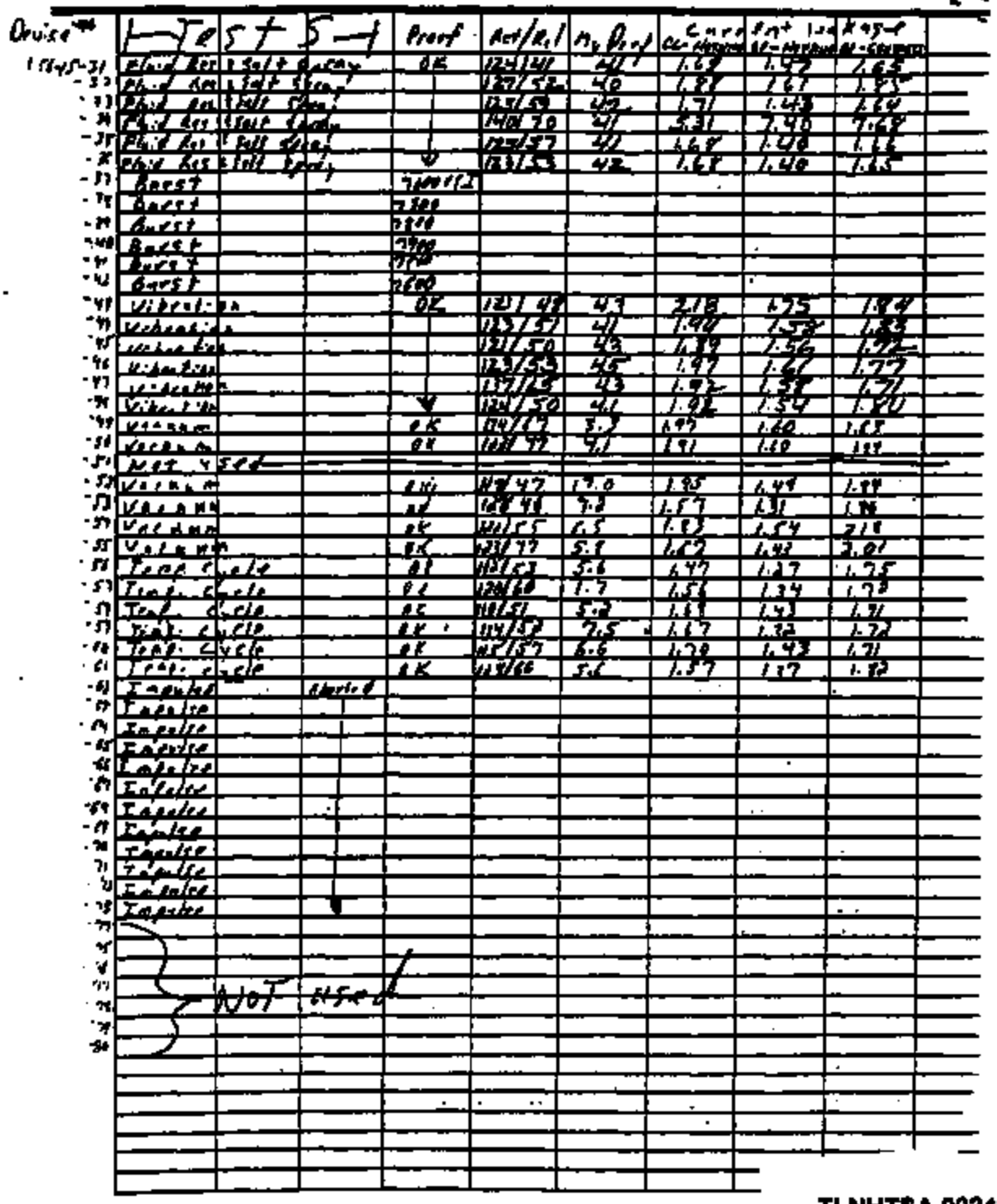
995	Fluid Res. & Tapeke								
997	Fluid Res. & Tapeke								
999	Fluid Res. & Tapeke								



Appendix 4.2.2
Burst data and Weibull

TEST LOT NO.	TEST	DEVICE
TESTED BY		
APPROVED BY	TEXAS INSTRUMENTS MATERIALS & CONTROLS GROUP ATTLEBORO, MA 02703	DOC.
DATE 91-08-20		PAGE 44

FORM 5266

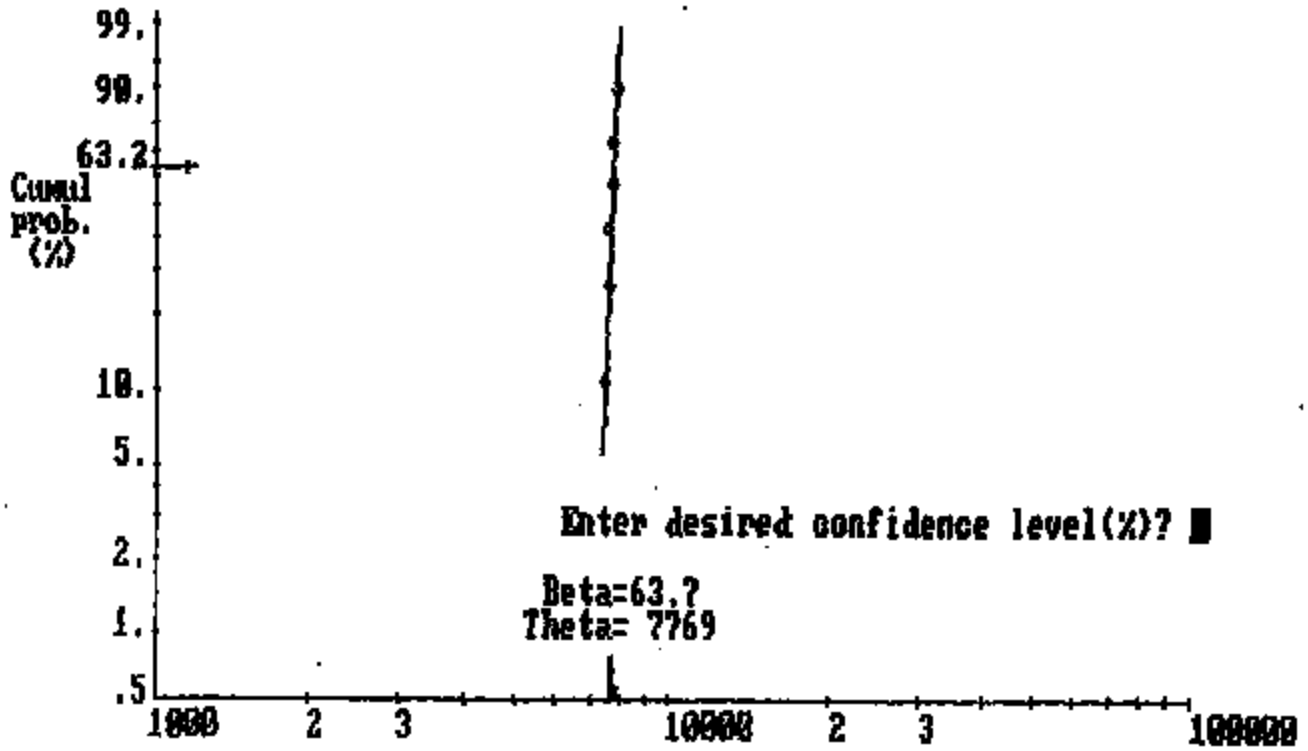
ESTIMATE AND TWO SIDED 90 % CONFIDENCE
INTERVALS FOR DISTRIBUTION PARAMETERS
****

SHAPE(BETA) PARAMETER :	63.735
LOWER LIMIT :	31.505 ← LOW EXTREME @ 90%
UPPER LIMIT :	%128.9330291748047
SCALE(THETA) PARAMETER:	7768.737
LOWER LIMIT :	7680.740 ← LOW EXTREME @ 90%
UPPER LIMIT :	7857.741

[redacted] VALUES FOR SPECIFIED LEVELS OF RELIABILITY — USING LOW VALUES FOR β AND θ FROM ABOVE
****

* WEIBULL SLOPE :31.50
* CHARACTERISTIC LIFE : 7680.74

NO.	RELIABILITY(%)	[redacted]
1	72	7414.0954



Appendix 4.2.3
Vibration

TEST LOT NO.	TEST	DEVICE
TESTED BY		
APPROVED BY	TEXAS INSTRUMENTS	DOC.
DATE 91-09-26	MATERIALS & CONTROLS GROUP ATTLEBORO, MA 02703	PAGE 47

FORM 6295

ENVIRONMENTAL TEST LAB REQUEST FORM
(ONE TEST PER REQUEST)

DATE 8/5/91

REQUIRED COMPLETION DATE Thrght 8/9/91*

DEVICE [illegible], 77PSL2-3

CHARGE DEPT. NO. 127 I.O. NO. 101960

REFERENCE SPEC. NO. ES-F2VC-9C937-AA

SOURCE OF TEST SAMPLES Design Lab

QUANTITY OF TEST SAMPLES [illegible] 12

REQUESTED BY Jeffrey D. Domenico

EXTENSION 3144 M/S 12-27

REPORT NO. 0887-081

TESTED BY Lab

COMPLETION DATE 9-3-91

TEST REQUIREMENTS: (TO BE FILLED IN BY REQUESTOR)

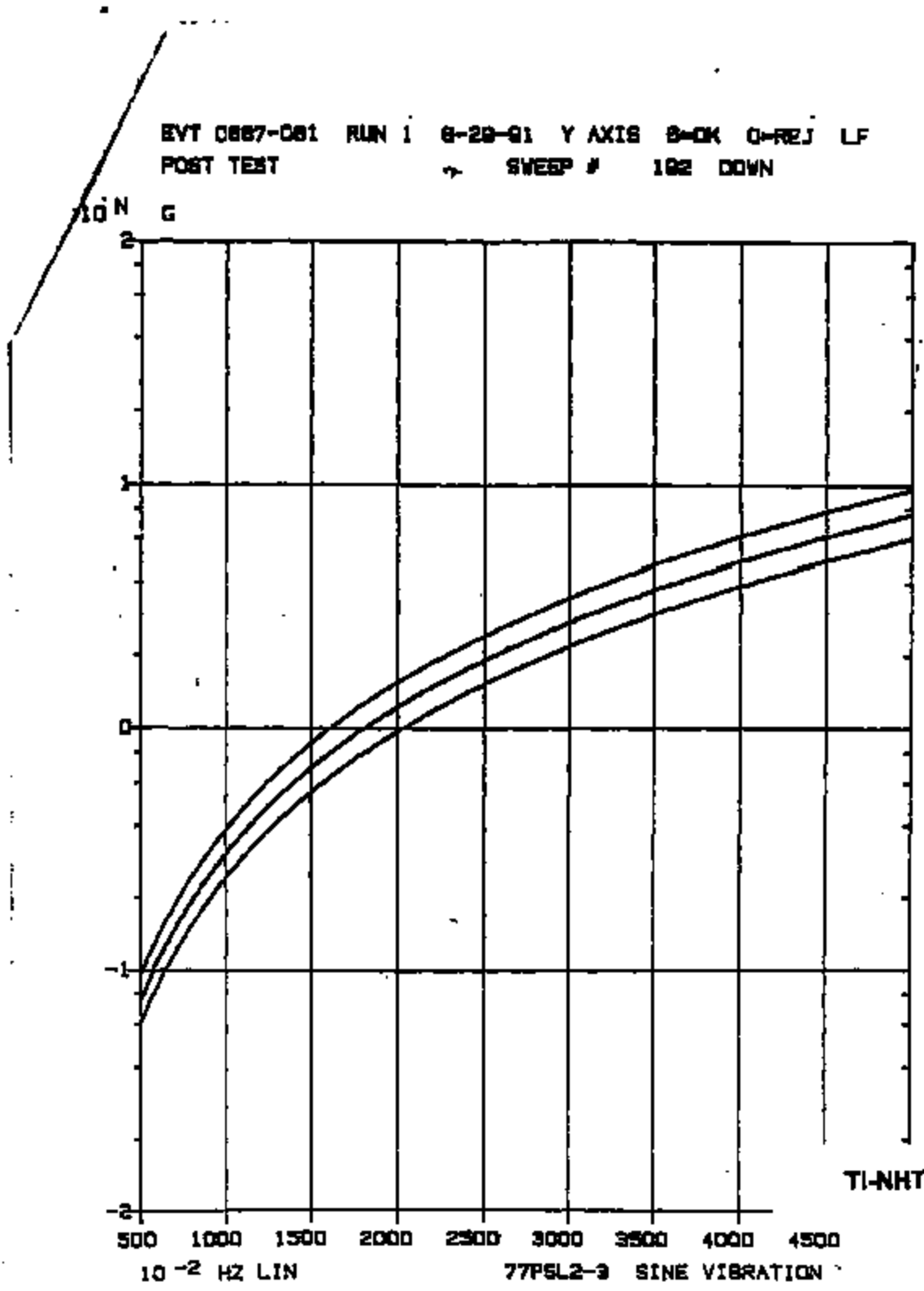
See attached, Vibration.

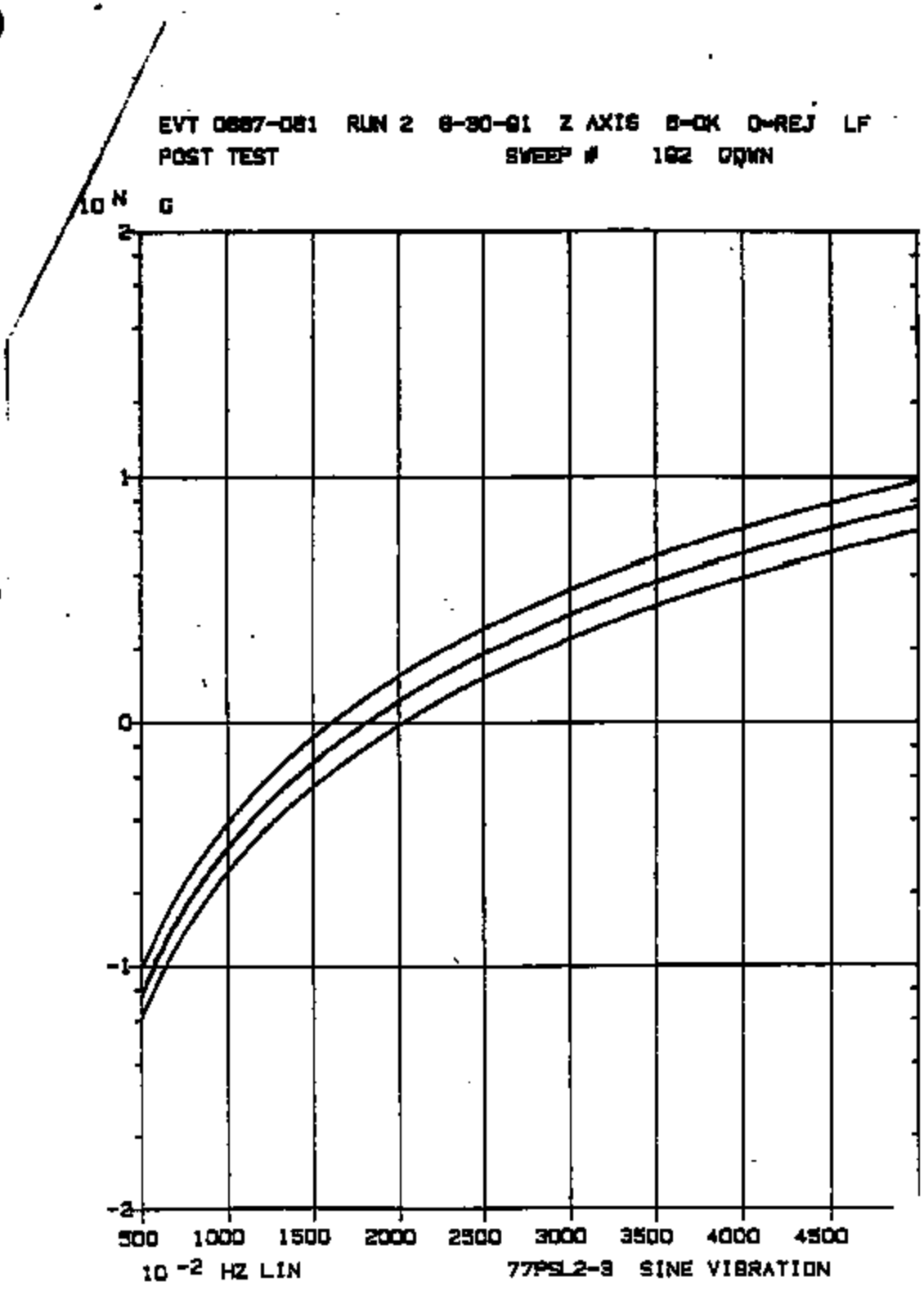
TEST PERFORMED: per attached specification.

TEST RESULTS:

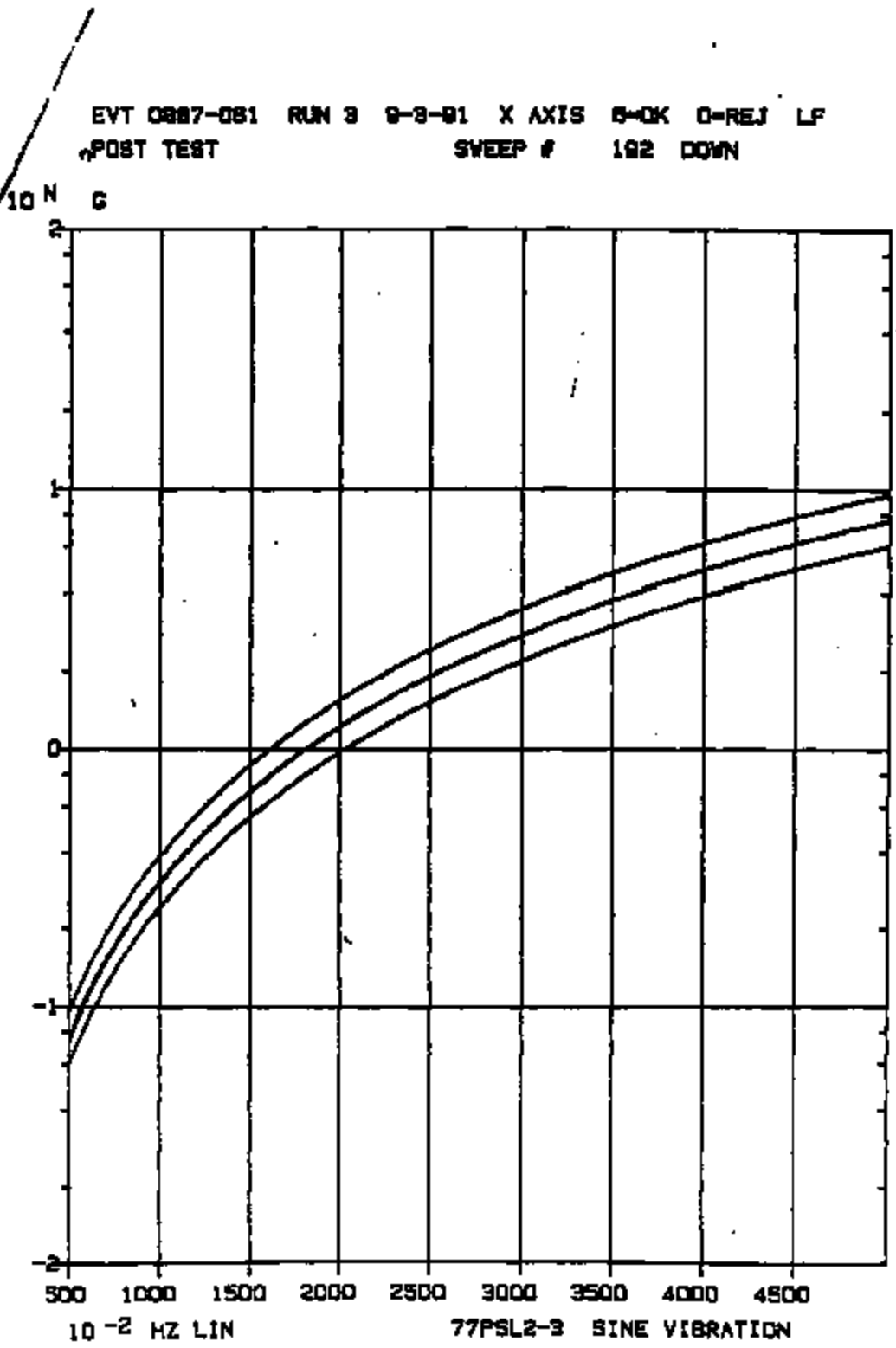
See attached sheets.

EQUIPMENT USED: CALIBRATION DATE: NEXT DUE DATE:





TI-NHTSA 002487



Appendix 4.2.4
Thermal Cycle Day/Time/Temp

TEST LOT NO.	TEST	DEVICE
TESTED BY		
APPROVED BY	TEXAS INSTRUMENTS — MATERIALS & CONTROLS GROUP, ATTLEBORO, MA 02703	DOC.
DATE 91-06-20		PAGE 52

FORM 6295

77 PS Validation Testing

Temp. Cycle Test

(LOW SETPT -42°C)

	1 Chamber Temp	2 Ambient Temp	3 Time	4 Date	5	6 Chamber Temp	7 Ambient Temp	8 Time	9 Date	10	11	12	13
Cycle 1	+40	+43	11:45	8/7/91		-43	-45	4:35	8/7/91				
2	43	43	1:05	"		-40	-46	2:10	"				
3	42	42	3:45	"		-42	-44	4:10	"				
4	40	40	7:35	"		-43	-44	9:15P	"				
5	41	40	7:35A	8/8/91		-41	-47	8:45	8/8/91				
6	39	41	9:20	"		-41	-44	10:15	"				
7	43	43	11:45	"		-42	-44	12:50	"				
8	41	42	1:30	"		-42	-44	3:00P	"				
9	40	43	3:30	"		-40	-45	4:40P	"				
10	42	43	5:05P	"		-42	-44	6:30P	"				
11	42	43	7:35P	"		-43	-44	9:35P	"				
12	40	43	7:50A	8/9/91		-42	-44	9:05	8/9/91				
13	42	42	9:30A	"		-40	-44	10:40	"				
14	42	43	11:15A	"		-42	-44	12:40	"				
15	42	42	1:10P	"		-42	-44	2:25	"				
16	41	43	3:45	"		-40	-44	4:00	"				
17	40	43	4:25	"		-40	-44	5:35	"				
18	41	42	11:40A	8/10/91		-43	-44	2:55P	8/10/91				
19	41	42	3:00P	"		-42	-44	4:35	"				
20	40	42	5:20P	"		-42	-44	7:15P	"				
21	43	42	8:40A	8/11/91		-43	-44	4:50P	8/11/91				
22	43	42	5:15	"		-41	-44	6:45	"				
23	40	42	7:30	8/12/91		-40	-44	9:05	8/12/91				
24	40	43	9:50	"		-40	-45	11:05	"				
25	41	43	11:50	"		-40	-44	1:05	"				
26													
27													
28													
29													
30													
31													

Appendix 4.2.5
Fluid Resistance Test

TEST LOT NO.	TEST	DEVICE
TESTED BY		
APPROVED BY	TEXAS INSTRUMENTS MATERIALS & CONTROLS GROUP ATTLEBORO, MA 02703	DOC.
DATE 91-09-20		PAGE 54

FORM 8388

FORM NO. [illegible]

TEST NO. 107831 **TECHNICAL SERVICE LABS** TEST NO. 107831

8/27/91

[illegible]	
[illegible]	
REQUESTOR	
MAIL STATION	[illegible]
EXTENSION	[illegible]
DATE REQUIRED	9/5/91
NO. OF SAMPLES	72
COMPOSITION	[illegible]

REPORT OF RESULTS:

complete

DATE RECEIVED 8/28/91 DATE OUT 9-5

EMPLOYEE NO.									
JOB NO.									
NO. ANALYZED									
HOURS WORKED									

Appendix 4.2.6
Humidity

TEST LOT NO.	TEST	DEVICE
TESTED BY		
APPROVED BY	TEXAS INSTRUMENTS — MATERIALS & CONTROLS GROUP, ATTLEBORO, MA 02703	DOC.
DATE 91-05-20		PAGE 56

FORM 5295

Form 6010

ENVIRONMENTAL TEST LAB REQUEST FORM
(ONE TEST PER REQUEST)

DATE 9/6/91

REQUIRED COMPLETION DATE 9/11/91

DEVICE 77F5LB-1; 77F5L2-3

CHARGE DEPT. NO. 132 I.O. NO. 101060

REFERENCE SPEC. NO. ES-F3VL-9F924-AA

SOURCE OF TEST SAMPLES Ford Lab

QUANTITY OF TEST SAMPLES 12

REQUESTED BY Jeffrey DiBenedetto

EXTENSION 2144 - MS 11-29

REPORT NO. 0933-091

TESTED BY Lab

COMPLETION DATE 9-20-91

TEST REQUIREMENTS: (TO BE FILLED IN BY REQUESTOR)

Please run humidity test per attached.

TEST PERFORMED:

START 9-16-91 16:00 CHAMBER MALFUNCTION-(SHUT DOWN)
RESTART 9-18-91 0830 HOURS
STOP 9-20-91 1630 HOURS

TEST RESULTS:

EQUIPMENT USED: CALIBRATION DATE: NEXT DUE DATE:

Appendix 4.2.7
Salt Spray

TEST LOT NO.	TEST	DEVICE
TESTED BY		
APPROVED BY	TEXAS INSTRUMENTS MATERIALS & CONTROLS GROUP ATTLEBORO, MA 02703	DOC.
DATE 93-09-20		PAGE 48

FORM 0295

Form 9018

ENVIRONMENTAL TEST LAB REQUEST FORM
(ONE TEST PER REQUEST)

DATE 9/6/91
REQUESTED BY Jeffrey A. Lamaire
REQUIRED COMPLETION DATE 9/11/91
EXTENSION 3149 MS H-29
DEVICE 77PSL1-1 ; 77PSL1-3
CHARGE DEPT. NO. 166 I.O. NO. 101060
REPORT NO. 0934-091
REFERENCE SPEC. NO. CS-FJUC-9F124-AA
TESTED BY Lab
SOURCE OF TEST SAMPLES Design Lab
COMPLETION DATE 9-9-91
QUANTITY OF TEST SAMPLES 11

TEST REQUIREMENTS: (TO BE FILLED IN BY REQUESTOR)

Please run salt Spray Test per attached.

TEST PERFORMED:

IN: 1430 9-6-91
Out: 1430 9-9-91

TEST RESULTS:

to be determined by requester.

EQUIPMENT USED: CALIBRATION DATE: NEXT DUE DATE:

Appendix 4.2.8
Light Truck F3TA-9F924-AA Data

TEST LOT NO.	TEST	DEVICE
TESTED BY		
APPROVED BY	TEXAS INSTRUMENTS — MATERIALS & CONTROLS GROUP, ATTLEBORO, MA 02703	DOC.
DATE 91-09-30		PAGE 60

FORM 5293

PRESSURE SWITCH DATA Form 21605 TEST NO. 152-15-100

DEVICE	DATE REQUESTED	REQUESTED BY	REQUESTED COMPL. DATE
7795 J-3			
PERFORMED BY	**DATE STARTED**	**DATE COMPLETED**	**APPROVED BY**
Jeffrey A. Pecenico	6/24/91		

PROJECT TITLE: Ford MY'92 Electronic Speed Control Deactivate PS

CUSTOMER: LT

PURPOSE OF TEST:

Later to Ford ES

PROCEDURE:

Current Ratings

Device	Act/Rel	cy Drop	Closing @ Inrush	Opening @ Inrush	Steady State	Visual	Tests		
152-15-01	201/194	4.5	1.65 mA	1.32 mA	164 mA	Good	Fluid Res	Temp Rise	
02	263/186	4.9	1.60	1.31	1.41		Fluid Res	Temp Rise	
03	206/171	4.2	1.68	1.33	1.49		Fluid Res	Temp Rise	
04	201/193	4.6	1.65	1.35	1.47		Fluid Res	Temp Rise	
05	209/187	4.3	1.62	1.31	1.45		Fluid Res	Temp Rise	
06	259/191	5.0	1.60	1.23	1.46		Fluid Res	Temp Rise	
07	262/189	4.0	1.57	1.28	1.47		Fluid Res	Temp Rise	
08	263/185	5.2	1.76	1.29	1.50		Fluid Res	Temp Rise	
09	204/176	4.1	1.49	1.42	1.58		Fluid Res	Temp Rise	
10	267/199	4.7	1.52	1.37	1.50		Fluid Res	Temp Rise	
	258/190	4.5	1.75	1.26	1.40		Fluid Res	Temp Rise	
12	242/175	3.6	1.76	1.27	1.42		Fluid Res	Temp Rise	
13	MD/Failed								
14	230/178	3.9	1.85	1.39	1.53	Good	Fluid Res	Temp Rise	
15	208/181	2.1	2.00	1.52	1.64		Fluid Res	Temp Rise	
16	259/196	4.9	1.90	1.45	1.65		Fluid Res	Temp Rise	
17	245/175	5.3	1.78	1.31	1.50		Fluid Res	Temp Rise	
18	263/208	4.7	1.61	1.31	1.57		Fluid Res	Temp Rise	
19	209/187	5.5	1.76	1.29	1.46		Fluid Res	Temp Rise	
20	245/185	5.3	1.85	1.36	1.48		Fluid Res	Temp Rise	
21	265/190	4.1	1.79	1.29	1.45		Fluid Res	Temp Rise	
22	206/193	5.2	1.93	1.38	1.55		Fluid Res	Temp Rise	
23	217/183	3.4	1.91	1.35	1.50		Fluid Res	Temp Rise	
24	256/192	4.2	1.63	1.37	1.37		Fluid Res	Temp Rise	
25	259/184	4.8	1.65	1.37	1.60		Fluid Res	Temp Rise	
26	261/190	4.4	1.99	1.42	1.66	Good	Fluid Res	Temp Rise	
27	258/192	4.6	1.91	1.32	1.57		Fluid Res	Temp Rise	
28	270/195	4.7	1.69	1.29	1.63		Fluid Res	Temp Rise	

Continued Leakage

Vehicle #	Act/Rel	Δ V Day	Change in Leakage Rate in Inches	Leakage Rate in Inches	Pressure Reading in mm Hg	Proof	Tests			
1	266/193	5.6	1.82 mA	1.36 mA	1.54 mA	Good	Fluid Act & Humidity			
2	263/196	4.6	1.76	1.34	1.58		Fluid Act & Humidity			
3	261/179	4.8	1.79	1.32	1.51		Fluid Act & Humidity			
4	267/199	6.2	1.76	1.36	1.64		Fluid Act & Salt Spray			
5	268/171	4.3	1.65	1.29	1.61		Fluid Act & Salt Spray			
6	263/193	6.1	1.69	1.31	1.64		Fluid Act & Salt Spray			
7	259/195	5.2	1.75	1.34	1.62		Fluid Act & Salt Spray			
8	Not used									
9	260/191	6.1	1.74	1.32	1.73	Good	Fluid Act & Salt Spray			
10	268/111	7.7								
11	262/188	3.9	1.67	1.27	1.65	Good	Fluid Act & Salt Spray			
12	254/194	4.8	1.95	1.63	1.61		Humid			
13	259/185	5.6	1.76	1.32	1.65		Humid			
14	268/179	4.7	1.69	1.29	1.60		Humid			
15	Not used									
16	258/176	4.7	1.73	1.38	1.66	Good	Humid			
17	260/195	4.4	1.67	1.27	1.60		Humid			
18	261/182	6.0	1.75	1.32	1.67		Humid			
19	262/197	6.1	1.72	1.33	1.62		Vibration			
20	264/194	7.5	1.77	1.38	1.59		Vibration			
21	269/191	3.5	1.77	1.35	1.63		Vibration			
22	263/188	11.0	1.90	1.28	1.79		Vibration			
23	Not used									
24	268/184	6.1	1.65	1.29	1.64	Good	Vibration			
25	264/181	6.1	1.73	1.31	1.62	Good	Vibration			
26	Not used									
27	257/196	5.1	1.79	1.33	1.56	Good	Vacuum			
28	258/179	5.5	1.77	1.33	1.49		Vacuum			
29	268/182	7.4	1.78	1.26	1.49		Vacuum			
30	266/191	7.9	1.80	1.35	1.49		Vacuum			
31	268/186	5.0	1.64	1.36	1.44		Vacuum			
32	259/165	9.5	1.82	1.29	1.62		Vacuum			
33	258/189	5.1	1.82	1.38	1.49		Temp Cycle			
34	268/190	6.0	1.92	1.36	1.49		Temp Cycle			
35	262/199	4.7	1.85	1.28	1.50		Temp Cycle			
36	268/180	5.8	1.88	1.41	1.52		Temp Cycle			
37	268/189	9.0	1.83	1.37	1.51		Temp Cycle			
38	262/188	9.3	1.91	1.35	1.45		Temp Cycle			
39	254/197	3.9	1.90	1.35	1.49		Temperature			
40	Not Used									
41	258/179	5.0	1.83	1.26	1.46	Good	Impulse			
42	249/186	4.6	1.80	1.32	1.45		Impulse			
43	259/197	4.0	1.83	1.41	1.50		Impulse			
44	262/189	4.0	1.83	1.37	1.46		Impulse			
45	254/192	5.6	1.81	1.36	1.45		Impulse			
46	261/194	4.3	1.86	1.41	1.51		Impulse			
47	Not used									
48	258/181	7.4	1.84	1.41	1.51	Good	Impulse			
49	267/199	3.1	1.76	1.34	1.47		Impulse			
50	257/192	3.4	1.78	1.35	1.48		Impulse			
51	258/193	5.1	1.79	1.39	1.49		Impulse			
52	2757/199	4.9	1.79	1.33	1.48		Impulse			

TI-NHTSA 002499

Final Characteristics

Device	TESTS		Proof	Act/Rel	Hy Drop			
1	Fluid Res & Temp	Stoneall	OK	237/190	6.5	1.91	1.47	
2	Fluid Res & Temp	Stoneall	OK	248/192	4.8	1.41	1.39	
3	Fluid Res & Temp	Stoneall	OK	238/193	44.3	1.14	1.38	
4	Fluid Res & Temp	Stoneall	OK	241/193	47.2	1.53	1.31	
5	Fluid Res & Temp	Stoneall	OK	238/191	2.5	1.73	1.41	
6	Fluid Res & Temp	Stoneall	OK	241/190	6.3	1.75	1.44	
7	Fluid Res & Temp	Stoneall	OK	240/195	2.5	1.72	1.38	
8	Fluid Res & Temp	Stoneall	OK	239/192	2.3	1.48	1.38	
9	Fluid Res & Temp	Stoneall	OK	237/190	2.4	1.54	1.35	
10	Fluid Res & Temp	Stoneall	OK	240/193	2.2	1.53	1.37	
11	Fluid Res & Temp	Stoneall	OK	238/191	2.2	1.49	1.37	
12	Fluid Res & Temp	Stoneall	OK	238/191	2.3	1.49	1.38	
13	Not Used							
14	Fluid Res & Temp	Stoneall	OK	250/180	41	1.86	1.07	
15	Fluid Res & Temp	Stoneall		253/196	41	1.68	1.43	
16	Fluid Res & Temp	Stoneall		236/194	42	1.65	1.41	
17	Fluid Res & Temp	Stoneall		248/176	42	1.65	1.01	
18	Fluid Res & Temp	Stoneall		245/202	40	1.74	1.03	
19	Fluid Res & Temp	Stoneall		258/192	42	1.66	1.39	
20	Fluid Res & Temp	Stoneall		245/190	40	1.76	1.37	
21	Fluid Res & Temp	Stoneall		240/181	42	1.64	1.38	
22	Fluid Res & Temp	Stoneall		258/185	41	1.63	1.39	
23	Fluid Res & Temp	Stoneall		244/184	41	1.72	1.40	
24	Fluid Res & Temp	Stoneall		250/192	40	1.72	1.35	
25	Fluid Res & Temp	Stoneall		247/188	41	1.54	1.31	
26	Fluid Res & Temp	Stoneall	OK	247/191	6.3	2.13	1.70	
27	Fluid Res & Temp	Stoneall		241/181	4.8	2.18	1.78	
28	Fluid Res & Temp	Stoneall		238/188	4.1	2.08	1.61	
29	Fluid Res & Temp	Stoneall		238/189	6.7	1.66	1.45	
30	Fluid Res & Temp	Stoneall		239/188	5.8	2.00	1.65	
31	Fluid Res & Temp	Stoneall		239/189	5.9	2.00	1.85	
32	Fluid Res & Salt	Spray		241/194	40	306.00	4.39	
33	Fluid Res & Salt	Spray		234/183	40	2.18	4.13	
34	Fluid Res & Salt	Spray		240/193	40	310.00	4.4.00	
35	Fluid Res & Salt	Spray		238/200	40	310.00	307.00	
36	NOT USED							
37	Fluid Res & Salt	Spray	OK	234/183	40	39.6	37.4	
38	NOT USED							
39	Fluid Res & Salt	Spray	OK	232/182	40	307.00	306	
40	Res		Fluid					
41	Dyn		2268					
42	Dyn		5406					
43	NOT USED							
44	Dyn		4500					
45	Dyn		5400					
46	Dyn		5100					
47	Vib Res		OK	238/193	11.6	1.25	1.26	
48	Vib Res		OK	243/189	4.5	1.14	1.40	
49	Vib Res		OK	245/191	3.7	1.47	1.22	
50	Vib Res		OK	252/192	11.5	1.17	1.15	
51	NOT USED							
52	Vib Res		OK	253/195	6.5	1.15	1.19	
53	Vib Res		OK	262/196	3.3	1.37	1.19	
54	NOT USED							
55	Vib Res		OK	243/194	6.4	1.37	1.41	
56	Vib Res		OK	243/193	5.3	1.69	1.49	
57	Vib Res		OK	242/196	6.3	1.59	1.46	

Device	TEST		Proof	Actual	H. Drop			
1F1-B-C3	Vacuum		OK	281/183	9.9	1.69	1.46	
8	Vacuum		OK	263/171	8.5	1.82	1.69	
10	Vacuum		OK	252/170	7.9	1.74	1.62	
11	Temp. Cycle		OK	291/192	5.3	1.53	1.34	
12	Temp. Cycle		OK	294/194	5.2	1.53	1.33	
13	Temp. Cycle		OK	303/197	5.9	1.59	1.37	
14	Temp. Cycle		OK	291/178	6.8	1.61	1.39	
15	Temp. Cycle		OK	296/193	4.8	1.49	1.29	
16	Temp. Cycle		OK	298/192	13.3	1.58	1.39	
17	Impulse		Fail	270/171	1.5	1.34	1.19	
18	N.S. Weld							
19	Impulse		Fail	285/179	3.7	1.53	1.36	
20	Impulse		Fail	298/181	2.0	1.66	1.49	
21	Impulse		Fail	294/194	1.3	1.37	1.19	
22	Impulse		Fail	280/185	2.0	1.51	1.29	
23	Impulse		Fail	298/188	1.9	2.11	1.92	
24	Impulse		Fail	282/181	1.7	2.10	1.91	
25	N.S. Weld							
26	Impulse		Fail	259/194	1.3	1.39	1.19	
27	Impulse		Fail	282/182	1.7	1.74	1.56	
28	Impulse		Fail	278/181	1.8	1.59	1.39	
29	Impulse		Fail	271/189	1.9	1.82	1.67	
30	Impulse		Fail	285/179	1.5	1.61 - A	1.42	

REPORT OF ISA TESTING
FORD PASSENGER CAR
ELECTRONIC SPEED CONTROL
DEACTIVATION PRESSURE SWITCH
PS/91/49

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

TEST LOT NO.	TEST	DEVICE
TESTED BY		
APPROVED BY	TEXAS INSTRUMENTS — MATERIALS & CONTROLS GROUP, ATTLEBORO, MA 02703	DOC.
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TABLE OF CONTENTS

1.0 **GENERAL**

1.1 Customer: Ford Motor Company, Passenger Car Brake Systems Engineering

1.2 TI Part Number: 77FSL2-1

1.3 Customer Part Number: F2VC-9F924-AB

1.4 Specifications: Ford Engineering Specification number (delta) ES-F2VC-9F924-AA

1.5 Date of Completion: 910920

1.6 Quantity of Units Tested: 104

1.7 Disposition of Tested Units:

1.7.1 Devices 156-15-37 thru -42 were destroyed in Burst testing (3.5)

1.7.2 All other devices are retained under quarantine.

1.8 TI test series number: 156-15-104

1.9 TI Pressure Switch test report number: PS/91/49

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2.0 OBJECTIVE

This battery of tests was performed to demonstrate the ability of 77PSL2-1 to conform to customer specifications given in (delta) ES-F2VC-9F924-AA, in fulfillment of the requirements of the Initial Sample Report. 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 (delta) ES-F2VC-9F924-AA. A copy of this ES is included in Appendix 4.1. 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, raw data is included in Appendix 4.2.1.

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. However, it became necessary to deviate from this exact procedure as described below. We believe that this alternate procedure still meets the intent of the ES.

During the first phase of Impulse (3.10) testing (12 virgin devices) it was discovered that the pressure-sensing assemblies were improperly built, resulting in a reduction in life of the diaphragm. During investigation of the root cause of diaphragm problems, it was learned that the final crimp station on the automatic assembly equipment experiences this problem only on this particular part; all other devices built on this equipment are not subject to this. Witness the good results obtained with the Light Truck (F3TA-9F924-AA) version of this test (see data in Appendix 4.2.7), built on the automatic assembly equipment, as supporting evidence.

3.0 TEST PROCEDURES AND RESULTS, CONTINUED

While analysis and permanent corrective actions are ongoing, it was also learned that the manual assembly equipment which performs the final crimp produces pressure-sensing assemblies which have acceptable life. This equipment was used 4Q90 during validation of F2VC-9F924-BB (TI P/N 57P8L5-3) which uses exactly the same pressure sensing assembly, as well as to produce the rebuilt Impulse devices (157-15-81 thru -104) and will continue to be used until such time as the permanent corrective actions are in place on the automatic equipment and re-validation is completed.

To expedite completion of the switch validation, 12 of the rebuilt parts were not subjected to the Fluid Resistance test (3.9). However, this will not affect the results of the Impulse test in any way, since the various fluids do not come into contact with the diaphragm. Invoking similarity with the Light Truck (F3TA-9F924-AA) version of this test which was run simultaneously, all devices undergoing Fluid Resistance in this test easily passed their subsequent Impulse test.

3.1 CALIBRATION

3.1.1 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 200 - 300 psig, and release (contacts reclosing) at 40 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.

3.1.2 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.

3.1.3 Initial Results: All 72 original devices tested were found to be within specification.

3.1.4 Final Results: 42 surviving original devices were found to be within specification. 6 were destroyed in Burst (3.5), 24 were aborted from Impulse (3.10). 24 additional devices which underwent Impulse but had no initial characterization were also found to be within specification at the completion of testing.

3.2 VOLTAGE DROP

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

3.2.2. Initial results: The average voltage drop was 4.9 millivolts, and the standard deviation was 1.9. All values are significantly below the specification of 200 millivolts maximum.

3.2.3 Final results: The average voltage drop was 6.4 millivolts, and the standard deviation was 3.5.

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3.3 CURRENT LEAKAGE

3.3.1 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%).

3.3.2 Initial results: Measuring terminals to case with switch closed; measuring terminals to case with switch open; and measuring between the terminals: the maximum current leakage observed was 2.3 microamps. All values are significantly below the specification of 100 microamps.

3.3.3. Final results: Same three measurements per device as 3.3.2. All current leakage values were consistent with initial results. All values are significantly below the specification of 100 microamps.

3.4 PROOF

3.4.1 **Procedure:** Calibration readings were recorded only after proof testing. Test pressure was 3000 psi per the part drawing.

3.4.1 **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.

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

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

3.5 BURST

3.5.1 Devices tested: 156-15-37 thru -42.

3.5.2 Procedure: A pressure of 7000 psig was applied and held for 30 seconds minimum. Pressure was then increased slowly until failure. Failure is typically signalled by a sudden drop in test pressure of several hundred psi, which corresponds with the first point at which some internal component reaches irreversible plastic deformation and causes an increase in internal volume. The peak pressure attained as this occurs is defined as the bursting point.

3.5.3. Equipment: same as 3.4.1., 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. The failure point defined in 3.5.2 was recorded, and a Weibull plot generated. See data section 4.2.2. Using the statistical acceptance criteria from the ES (frame 3 of 18), a minimum Weibull slope (beta) of 31.5 and a minimum Characteristic Life (theta) of 7680.7 psi was calculated at 90% confidence. The 0.72 reliability at 90% confidence is 7414 psi. Thus, the parts exceed the burst specification of 7000 psig by 414 psi at the Ford-specified confidence and reliability levels.

3.6 VIBRATION

3.6.1 Devices tested: 156-15-43 thru -48.

3.6.2 Equipment: Vibration table, Ling, model A395 with Hewlett-Packard model 5427 controls. Air tank with 350 psig minimum pressurized Nitrogen used to actuate devices with at least 1.1 times maximum actuation specification on part drawing; 300 psig * 1.1 = 330 psi minimum.

3.6.3 Results: All six switches met the acceptance criteria in the ES (frame 9 of 18; section III. I. 2.).

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3.7 VACUUM

3.7.1 Devices tested: 156-15-49, -50, -52 thru -55.

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 Results: All six devices met the acceptance criteria in the ES (frame 10 of 18; section III. K. 2.).

3.8 TEMPERATURE CYCLE

3.8.1 Devices tested: 156-15-56 thru -61.

3.8.2 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.

3.8.3 Results: All six devices met the acceptance criteria in ES (frame 11 of 18; section III. L. 2.). Data sheet in section 4.2.4 shows actual fluid and ambient temperatures attained at each cycle.

3.9 FLUID RESISTANCE

3.9.1 Devices tested: 156-15-01 thru -36.

3.9.2 Equipment: Fluids as called out in ES table (frame 12 of 18); appropriate beakers and storage apparatus; vented hood.

3.9.3 Results: The 36 devices were divided into groups as follows for subsequent testing. Results of these tests are reported below.

3.9.3.1 Impulse (3.10), -01 thru -12

3.9.3.2 Terminal Strength (3.11), -13 thru -24.

3.9.3.3 Humidity (3.12), -25 thru -30.

3.9.3.4 Salt Spray (3.13), -31 thru -36.

3.10 IMPULSE

3.10.1 Devices tested: 156-15-81 thru -104.

3.10.2 Procedure: 24 virgin devices were run as opposed to 12 virgins and 12 from Fluid Resistance. This is discussed in detail in section 3.0. The parameters given in the ES (frame 7 of 18, section III. E. 1.) are followed explicitly.

3.10.3 Equipment: same as 3.8.2 with the addition of a 12-station inductive load bank, per the schematic found in the ES (frame 18 of 18; figure 4.) used in the last 25K cycles.

3.10.4 Results/Discussion: Pre-characterization was not performed. After completion of the 500K cycles, all 24 devices passed the acceptance criteria found in the ES (frame 7 of 18, section III. E. 2).

This test may be regarded as the one of the most rigorous. This test is run at elevated temperature (135 C fluid), elevated pressure (1450 psig, 2 Hz), and total cycles (applying brakes 5 times per mile for 100,000 miles) which exceed conditions typically found in actual motor vehicles.

3.11 TERMINAL STRENGTH

3.11.1 Devices tested: 156-15-13 thru -24.

3.11.2 Equipment: Custom TI designed and built fixtures for gaging terminal movement after force application and for application of impact via a pendulum. This equipment is regularly used on the 57PS/77PS assembly lines in testing to TI Quality Assurance Specifications.

3.11.3 Results: All twelve devices passed the acceptance criteria found in the ES (frame 10 of 18; section III. J. 2.).

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3.12 HUMIDITY

3.12.1 Devices tested: 156-15-25 thru -30.

3.12.2 Equipment: Humidity chamber RK model 5S.

3.12.3 Results/Discussion: Please note that performing a full characterization per the ES consists of actuation, release, millivolt drop, current leakage, and proof. This battery of tests when performed on six (6) devices takes approximately 2 hours to complete. Therefore "Within 15 minutes..." called out in the ES (frame 8 of 18, section III. G. 2. a.) is an acceptance requirement that is physically impossible to meet. Every effort is made to complete final characterization within the two hour period stated above.

All six devices passed the acceptance criteria found in the ES (frame 8 of 18; section III. G. 2.).

3.13 SALT SPRAY

3.13.1 Devices tested: 156-15-31 thru -36.

3.13.2 Equipment: Harshaw salt spray chamber.

3.13.3 Results: All six devices passed the acceptance criteria found in the ES (frame 8 of 18, section III. H. 2.).

Appendix 4.1
Ford Engineering Specification
(delta) ES-F2VC-9F924-AA

TEST LOT NO.	TEST	DEVICE
TESTED BY		
APPROVED BY	TEXAS INSTRUMENTS — MATERIALS & CONTROLS GROUP, ATTLEBORO, MA 02703	DOC.
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Engineering Specification

PART NAME	PART NUMBER
SUTION ASSEMBLY - SPEED CONTROL DEACTIVATE	▽ E8-F2VC-9F924-AA

LET																		
FR																		
LET																		
FR																		

DATE	LET	FR	REVISIONS	DR	CK

REFERENCE

PREPARED/APPROVED BY

CHECKED BY | DETAILER

CONCURRENCE/APPROV SIGNATURES

DESIGN ENGINEERING SUPE

DESIGN ENGINEERING M

MANUFACTURING ENGR

QUALITY CONTROL

PURCHASING

SUPPLIER QUALITY ASSIST.

ELECTRONICS DIVIS

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 effected. Parts must be revalidated completely, or per Section V whenever any change is made which could possibly affect part function or performance.

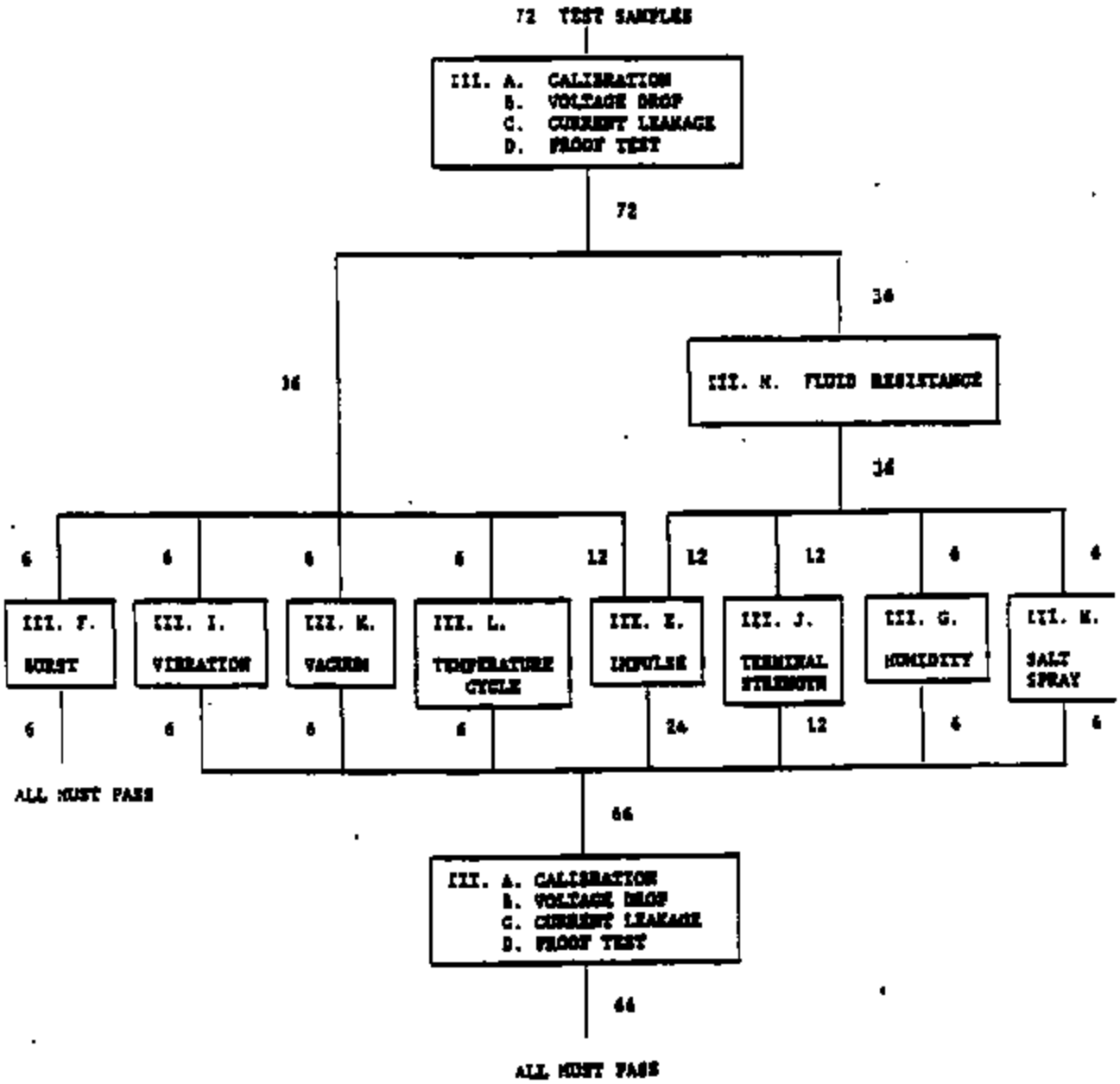
- In-Process Test Phase 1 (IP-1) - IP-1 tests are used to demonstrate process capability and must be completed using initial production parts from production tooling and processes prior to first production shipment approval. IP-1 tests are to continue in effect until process capability is demonstrated.

- In-Process Tests Phase 2 (IP-2) - IP-2 test program may be implemented only after process capability has been established. Tests must be completed with production parts on a continuing basis. Samples for these tests must be selected on a random basis to represent the entire production population as much as possible. In the event that any of the requirements in these tests is not met, the reaction plan specified in Ford Q101 Section III.E.3, "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.							
I	Impulse	24	P90-.90	12/Mo.	P90-.84	3/3 Mo.	P90-.56
;	Humidity	6	P90-.72	3/Mo.	P90-.56	6/6 Mo.	P90-.72
N	Salt Spray	6	P90-.72	3/Mo.	P90-.56	6/6 Mo.	P90-.72

PRODUCTION VALIDATION FLOW CHART



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 at 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 90-98% relative humidity.

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

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

2. Acceptance Requirements

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

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

H. Salt Spray

1. Test Requirements

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

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

2. Acceptance Requirements

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

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

III. TEST PROCEDURES AND REQUIREMENTS (cont'd)

I. Vibration

1. Test Requirements

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

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

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

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

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

2. Acceptance Requirements

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

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

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 and, 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.

3 mm Hg = 0.058 psi ≈ 0.400 K Pa

6 mm Hg = 0.116 psi ≈ 0.800 K Pa

III. TEST PROCEDURES AND REQUIREMENTS (cont'd)

L. Temperature Cycle

1. Test Requirements

a. Mount switches in cast 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. Per the Flow Chart, subject the prescribed number of immersed switches to the post immersion tests specified below:

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

Acceptance Requirements

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

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

IV. STATISTICAL ANALYSIS METHODS

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

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

V. REVALIDATION REQUIREMENTS

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

DESIGN 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 1.

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.

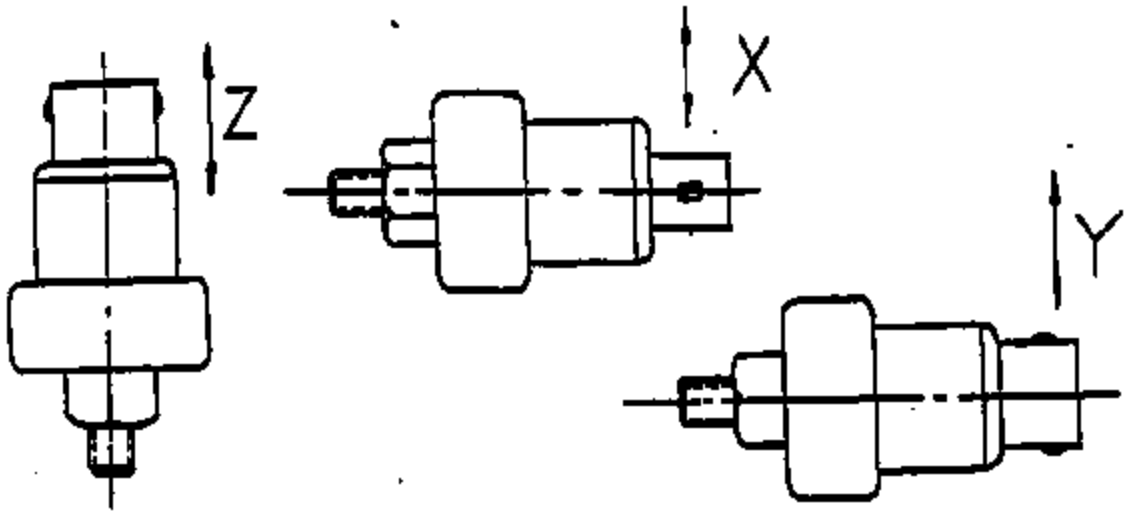
IX. COMPILATION OF REFERENCE DOCUMENTS

ASTM B-117, Salt Spray Testing

Ford Q-101, Quality System Standard - 1983 Edition

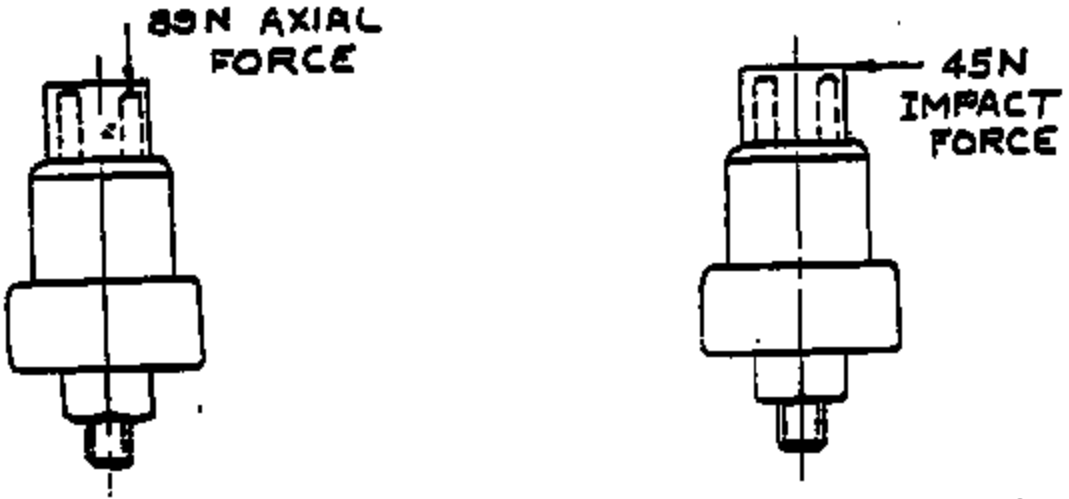
ES-F0EB-14A464-AA, Specification - SLV Assy - Wire Connector

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



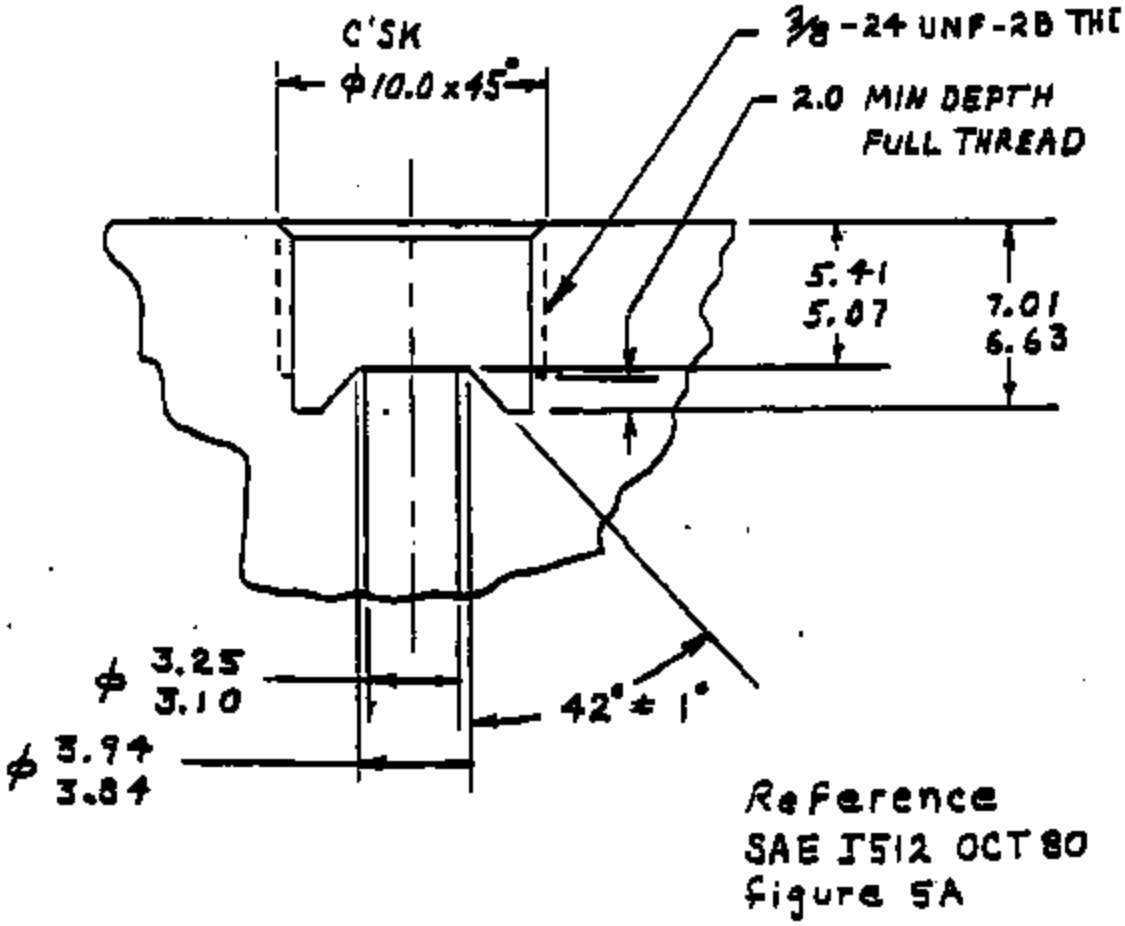
VIBRATION TEST - SWITCH ORIENTATION

FIGURE 1.



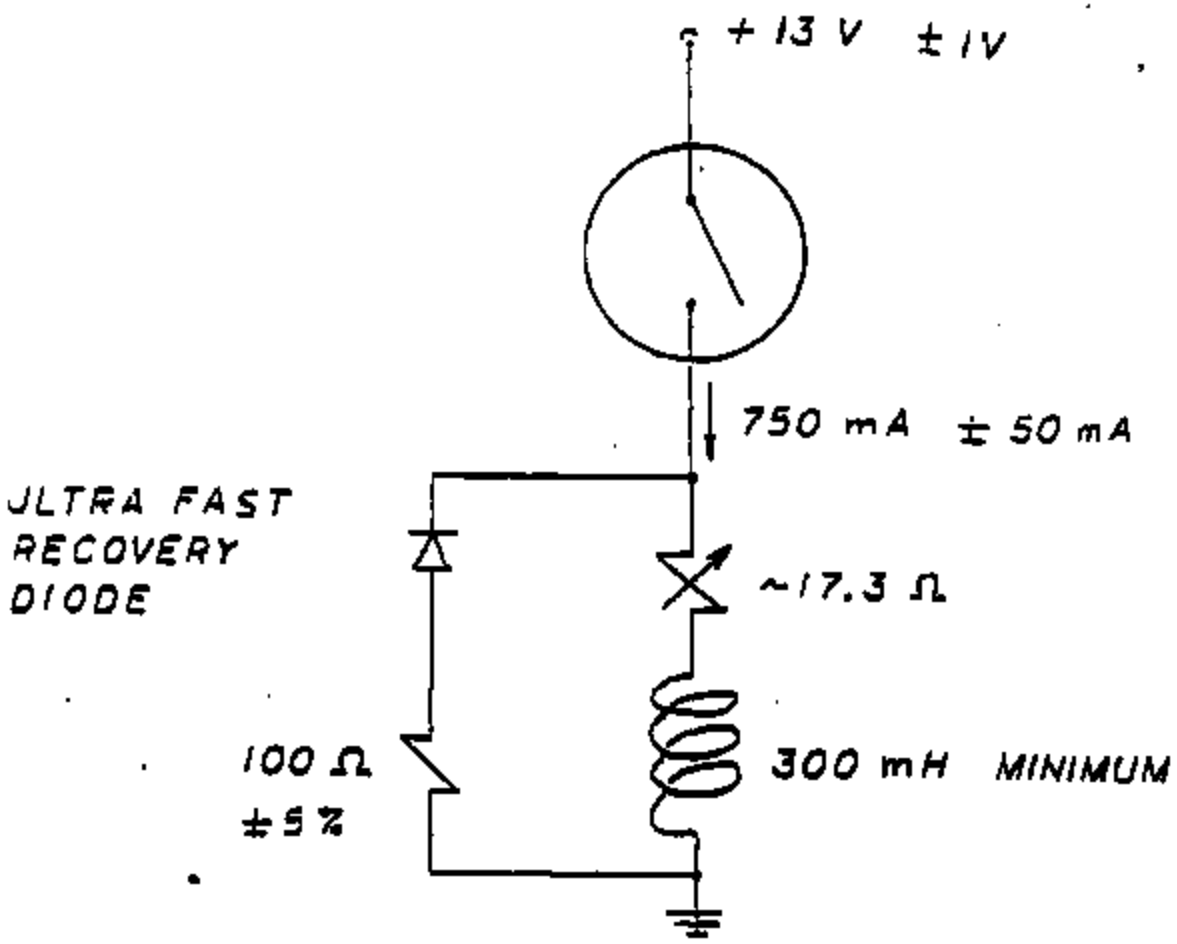
TERMINAL STRENGTH - LOAD ORIENTATION

FIGURE 2.



TEST FIXTURE PORT CONFIGURATION

FIGURE 3



DEACTIVATE SWITCH
TEST SET UP

FIGURE 4

Appendix. 4.2.1
Initial and Final Characterisation

TEST LOT NO.	TEST	DEVICE
TESTED BY		
APPROVED BY	TEXAS INSTRUMENTS MATERIALS & CONTROLS GROUP ATTLEBORO, MA 02703	DOC.
DATE 01-03-10		PAGE 18

FORM 6286

PRESSURE SWITCH DATA Form 21605 TEST NO. 156-PC-184

DEVICE	DATE REQUESTED	REQUESTED BY	REQUESTED COMPL. DATE
77PSL2-1			

PERFORMED BY	DATE STARTED	DATE COMPLETED	APPROVED BY
Jeffrey D. Deavenport	6/14/91		

PROJECT TITLE: Ford MY'92 Electronic Speed Control Reactivate PS

CUSTOMER: Ford-Cav

PURPOSE OF TEST:

Refer to Ford ES

PROCEDURE:

TI-NHTSA 002541

Current leakage

Device #	Act/Rel	ΔV Disp	to device	to housing	other contact	Proof	Tests	
PC-15-01	127/46	4.9	1.88mA	1.43mA	1.97mA	Good	Fluid resist	Tap/Ice
01	127/51	4.7	2.16	1.49	1.50		Fluid resist	Tap/Ice
02	128/52	4.8	1.79	1.33	1.82		Fluid resist	Tap/Ice
03	128/52	4.9	1.87	1.32	1.79		Fluid resist	Tap/Ice
04	124/57	5.1	1.71	1.29	1.98		Fluid resist	Tap/Ice
05	130/53	5.2	1.72	1.53	1.59		Fluid resist	Tap/Ice
06	124/47	7.2	2.29	1.61	1.60 -		Fluid resist	Tap/Ice
07	128/51	5.6	2.00	1.59	1.92		Fluid resist	Tap/Ice
08	133/53	5.0	1.78	1.78	1.97		Fluid resist	Tap/Ice
09	118/41	5.5	1.89	1.53	1.71		Fluid resist	Tap/Ice
10	122/53	5.9	1.90	1.93	1.95		Fluid resist	Tap/Ice
11	130/54	4.9	1.85	1.42	1.71		Fluid resist	Tap/Ice
12	131/52	4.2	1.62	1.38	1.66		Fluid resist	Term. Strength
13	137/55	4.0	1.76	1.37	1.85		Fluid resist	Term. Strength
14	126/46	4.5	1.80	1.48	1.82		Fluid resist	Term. Strength
15	123/51	4.7	1.82	1.43	1.76		Fluid resist	Term. Strength
16	129/43	3.7	1.80	1.38	1.84		Fluid resist	Term. Strength
17	133/52	3.0	1.81	1.43	1.88		Fluid resist	Term. Strength
18	138/51	3.7	1.87	1.44	1.92		Fluid resist	Term. Strength
19	129/50	5.0	1.76	1.35	1.70		Fluid resist	Term. Strength
20	133/53	4.2	1.78	1.37	1.79		Fluid resist	Term. Strength
21	133/53	4.3	1.84	1.49	1.87		Fluid resist	Term. Strength
22	138/57	3.3	1.79	1.36	1.83		Fluid resist	Term. Strength
23	134/57	4.9	1.83	1.49	1.75		Fluid resist	Term. Strength
24	125/49	4.1	1.87	1.37	1.84		Fluid resist	Humidity
25	124/52	5.9	1.78	1.29	1.71	Good	Fluid resist	Humidity
26	123/46	4.2	1.60	1.15	1.63		Fluid resist	Humidity

Current leakage

Device #	Act/Rel	-3V Vref	Initial leakage current in microamps	1 hr leakage current in microamps	24 hr leakage current in microamps	Comments	Tests			
1gr-11-2	123/47	2.7	1.41 mA	1.39 mA	1.44 mA	Good	Moisture	@	Humidity	
30	129/50	4.8	1.46	1.25	1.46		Moisture	@	Humidity	
31	135/36	4.9	1.45	1.29	1.41		Moisture	@	Salt Spray	
32	129/47	3.9	1.43	1.23	1.46		Moisture	@	Salt Spray	
33	121/53	5.2	1.39	1.34	1.38		Moisture	@	Salt Spray	
34	145/55	3.2	1.30	1.30	1.47		Moisture	@	Salt Spray	
35	121/51	3.4	1.47	1.27	1.37		Moisture	@	Salt Spray	
36	123/44	3.8	1.33	1.39	1.41		Moisture	@	Salt Spray	
37	125/52	3.1	1.30	1.45	1.59		Burst			
38	119/44	3.5	1.32	1.42	1.53		Burst			
39	134/50	3.5	1.46	1.31	1.58		Burst			
40	126/53	4.9	1.39	1.39	1.56		Burst			
41	130/52	3.3	1.49	1.33	1.51		Burst			
42	116/45	3.5	1.47	1.34	1.46		Burst			
43	121/40	3.8	1.43	1.23	1.49		Vibration			
44	127/47	5.7	1.40	1.30	1.46		Vibration			
45	117/43	3.6	1.56	1.23	1.45		Vibration			
46	123/49	3.4	1.59	1.21	1.49		Vibration			
47	135/48	6.8	1.45	1.24	1.42		Vibration			
48	123/45	4.7	1.49	1.33	1.49		Vibration			
49	134/45	3.5	1.41	1.21	1.43		Vacuum			
50	117/45	3.3	1.58	1.33	1.47		Vacuum			
51	Not used									
52	117/43	19.5	1.54	1.37	1.44	Good	Vacuum			
53	130/43	5.8	1.41	1.25	1.55		Vacuum			
54	133/50	5.0	1.43	1.29	1.43		Vacuum			
55	123/42	4.7	1.42	1.39	1.49		Vacuum			
56	127/47	5.7	1.43	1.38	1.32		Temp.	Cycle		
57	132/52	6.1	1.30	1.39	1.56		Temp.	Cycle		
58	131/35	5.2	1.49	1.31	1.55		Temp.	Cycle		
59	128/46	6.9	1.32	1.38	1.49		Temp.	Cycle		
60	120/50	6.8	1.33	1.28	1.37		Temp.	Cycle		
61	140/61	5.1	1.36	1.23	1.46		Temp.	Cycle		
62	133/54	9.2	1.34	1.34	1.42		Temp/Hum		Stopped @	1550
63	134/39	7.0	1.46	1.34	1.49		Temp/Hum		Leak @	1550 h
64	128/53	5.2	1.43	1.35	1.41		Temp/Hum		Stopped @	1599 h
65	132/55	7.3	1.48	1.25	1.34		Temp/Hum		Leak @	1550
66	124/52	9.7	1.32	1.23	1.45		Temp/Hum		Stopped @	1599
67	115/51	6.0	1.36	1.31	1.46		Temp/Hum		Stopped @	1599
68	116/41	6.8	1.35	1.30	1.49		Temp/Hum		Leak @	735 h
69	134/47	10.0	1.38	1.39	1.45		Temp/Hum		Leak @	769 h
70	130/46	7.3	1.34	1.29	1.44		Temp/Hum		Leak @	735
71	133/45	8.7	1.38	1.26	1.43		Temp/Hum		Leak @	769
72	134/56	6.1	1.31	1.27	1.43		Temp/Hum		Leak @	2.99K
73	139/59	3.7	1.43	1.27	1.47		Temp/Hum		Leak @	2.99K
74	132/42	4.6	1.31	1.27	1.46					
75	128/59	5.3	1.33	1.28	1.58					
76	130/53	7.1	1.31	1.29	1.49					
77	130/52	7.2	1.35	1.30	1.47					
78	139/62	6.6	1.33	1.30	1.42					
79	124/42	5.4	1.36	1.29	1.45					
80	122/52	5.1	1.35	1.31	1.43					

710 K

Rebuild of Impulse parts/Post Cycle

Device #	Proof	Act/Rel	Hy Drop	Current leakage					
156-15-01	OK	103/53	51	1.81	1.53	1.50			
-02		111/51	60	1.90	1.60	1.77			
-03		113/54	101	2.05	1.64	1.78			
-04		108/55	47	2.14	1.66	1.76			
-05		110/60	91	1.96	1.56	1.69			
-06		120/64	56	1.88	1.56	1.80			
-07		112/56	57	1.89	1.59	1.81			
-08		110/53	114	1.81	1.56	1.70			
-09		110/54	59	1.87	1.57	1.83			
-10		108/55	42	1.95	1.58	1.74			
-11		112/57	40	2.27	1.60	1.72			
-12		116/60	42	2.03	1.58	1.66			
-13		111/58	76	2.01	1.60	1.86			
-14		120/56	45	2.18	1.64	1.85			
-15		118/55	49	1.92	1.67	1.79			
-16		115/57	125	1.86	1.60	1.79			
-17		118/59	111	2.20	1.64	1.78			
-18		112/60	109	1.75	1.92	1.73			
-19		119/62	178	1.96	1.64	1.75			
-20		108/57	86	1.93	1.60	1.79			
-21		115/56	164	1.96	1.67	1.75			
-22		117/58	97	2.05	1.61	1.76			
-23		113/53	98	2.16	1.63	1.76			
-24		112/52	132	2.17	1.65	1.73			

Device #	Proof	Act/Rel	Hy Drop	Current leakage					
156-15-01	Fluid Tech.	Impulse							
-02	Fluid Tech.	Impulse							
-03	Fluid Tech.	Impulse							
-04	Fluid Tech.	Impulse							
-05	Fluid Tech.	Impulse							
-06	Fluid Tech.	Impulse							
-07	Fluid Tech.	Impulse							
-08	Fluid Tech.	Impulse							
-09	Fluid Tech.	Impulse							
-10	Fluid Tech.	Impulse							
-11	Fluid Tech.	Impulse							
-12	Fluid Tech.	Impulse							
-13	Fluid Tech.	Impulse							
-14	Fluid Tech.	Impulse							
-15	Fluid Tech.	Impulse							
-16	Fluid Tech.	Impulse							
-17	Fluid Tech.	Impulse							
-18	Fluid Tech.	Impulse							
-19	Fluid Tech.	Impulse							
-20	Fluid Tech.	Impulse							
-21	Fluid Tech.	Impulse							
-22	Fluid Tech.	Impulse							
-23	Fluid Tech.	Impulse							
-24	Fluid Tech.	Impulse							

Device #	Proof	Act/Rel	Hy Drop	Current leakage					
156-15-01	Fluid Tech.	Impulse	OK	128/51	40	2.07	1.42	1.61	
-02	Fluid Tech.	Impulse		135/62	41	1.62	1.32	1.57	
-03	Fluid Tech.	Impulse		125/53	45	1.71	1.36	1.57	
-04	Fluid Tech.	Impulse		131/58	44	1.83	1.38	1.55	
-05	Fluid Tech.	Impulse		125/49	43	1.62	1.34	1.54	
-06	Fluid Tech.	Impulse		132/61	45	1.81	1.56	1.55	
-07	Fluid Tech.	Impulse		133/60	46	1.90	1.43	1.54	
-08	Fluid Tech.	Impulse		133/58	47	1.70	1.38	1.72	
-09	Fluid Tech.	Impulse		137/59	43	1.81	1.64	1.58	
-10	Fluid Tech.	Impulse		131/62	45	1.84	1.47	1.60	
-11	Fluid Tech.	Impulse		135/64	48	1.87	1.56	1.60	
-12	Fluid Tech.	Impulse		135/63	46	1.90	1.60	1.66	
-13	Fluid Tech.	Impulse		130/56	41	1.19	1.55	1.78	
-14	Fluid Tech.	Impulse		133/62	5.0	2.03	1.58	-1.71-	
-15	Fluid Tech.	Impulse		131/59	5.5	2.07	1.65	-1.71-	
-16	Fluid Tech.	Impulse		128/51	10.1	2.16	1.91	1.82	
-17	Fluid Tech.	Impulse		133/66	5.9	1.97	1.56	-1.73-	
-18	Fluid Tech.	Impulse		136/60	7.1	1.92	1.71	1.89	

TI-NHTSA 002543

Device	Test		Proof	Act/Rel	% Proof	Current @ Hydrostatic	Pressure @ Hydrostatic	Pressure @ Current
1545-31	Fluid Res	Salt Spray	OK	124/41	41	1.68	1.47	1.65
33	Fluid Res	Salt Spray		127/52	40	1.99	1.61	1.85
93	Fluid Res	Salt Spray		125/59	49	1.71	1.43	1.64
94	Fluid Res	Salt Spray		140/70	50	2.31	1.96	2.09
35	Fluid Res	Salt Spray		129/57	44	1.68	1.48	1.66
36	Fluid Res	Salt Spray	↓	123/53	43	1.62	1.46	1.65
37	Burst		7400 PSI					
38	Burst		7300					
39	Burst		7350					
40	Burst		7390					
41	Burst		7450					
42	Burst		7600					
43	Vibration		OK	121/48	43	2.18	1.75	1.84
44	Vibration			123/51	41	1.96	1.58	1.83
45	Vibration			121/50	43	1.89	1.56	1.72
46	Vibration			123/53	45	1.97	1.61	1.77
47	Vibration			119/48	43	1.92	1.58	1.76
48	Vibration		↓	124/50	41	1.92	1.54	1.70
49	Vibration		OK	119/47	39	1.92	1.60	1.83
50	Vibration		OK	120/49	41	1.91	1.60	1.77
51	Mat'l Set							
52	Vacuum		OK	118/47	40	1.93	1.49	1.89
53	Vacuum		OK	119/43	37	1.87	1.51	1.76
54	Vacuum		OK	121/45	38	1.93	1.54	2.19
55	Vacuum		OK	123/47	39	1.92	1.48	2.01
56	Temp Cycle		OK	121/53	44	1.97	1.57	1.75
57	Temp Cycle		OK	120/50	42	1.96	1.54	1.78
58	Temp Cycle		OK	118/51	43	1.95	1.53	1.71
59	Temp Cycle		OK	114/52	45	1.89	1.50	1.72
60	Temp Cycle		OK	116/50	43	1.90	1.53	1.71
61	Temp Cycle		OK	119/48	40	1.97	1.57	1.82
62	Impulse	Aborted						
63	Impulse							
64	Impulse							
65	Impulse							
66	Impulse							
67	Impulse							
68	Impulse							
69	Impulse							
70	Impulse							
71	Impulse							
72	Impulse							
73	Impulse							
74								
75								
76								
77								
78								
79								
80								

Not used

TI-NHTSA 002544

Appendix 4.2.2
Burst data and Weibull

TEST LOT NO.	TEST	DEVICE
TESTED BY		
APPROVED BY	TEXAS INSTRUMENTS — MATERIALS & CONTROLS GROUP, ATTLEBORO, MA 02703	DOC.
DATE 91-08-28		PAGE 44

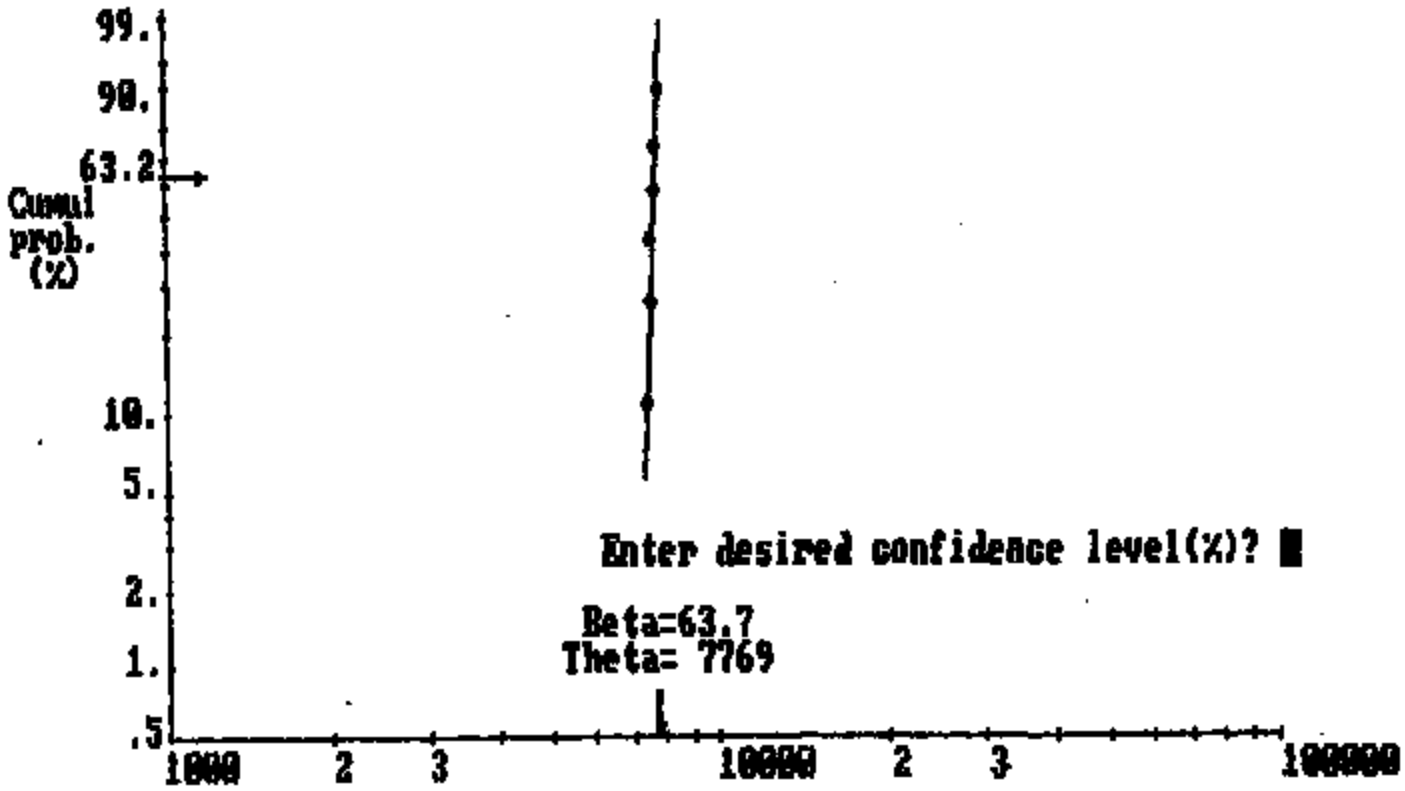
FORM 8298

ESTIMATE AND TWO SIDED 90 % CONFIDENCE
INTERVALS FOR DISTRIBUTION PARAMETERS
****

SHAPE(BETA) PARAMETER	:	63.735
LOWER LIMIT	:	31.505 ← LOW EXTREME @ 90%
UPPER LIMIT	:	%128.9330291748047
SCALE(THETA) PARAMETER	:	7768.737
LOWER LIMIT	:	7680.740 ← LOW EXTREME @ 90%
UPPER LIMIT	:	7857.741

[redacted]
[redacted] VALUES FOR SPECIFIED LEVELS OF RELIABILITY — USING LOW VALUES FOR β AND θ FROM ABOVE
****
* WEIBULL SLOPE : 31.50
* CHARACTERISTIC LIFE : 7680.74

NO.	RELIABILITY(%)	[redacted]
1	72	7414.0854



Appendix 4.2.3
Vibration

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

FORM 5744

ENVIRONMENTAL TEST LAB REQUEST FORM
(ONE TEST PER REQUEST)

DATE 8/5/91

REQUESTED BY Jeffrey DiBenedetto

REQUIRED COMPLETION DATE 9/6/91 8/9/91*

EXTENSION 3147 M/S 12-22

DEVICE [redacted], 77PSL2-3

CHARGE DEPT. NO. 127 I.O. NO. 101068

REFERENCE SPEC. NO. ES-F2UC-9F727-AA

SOURCE OF TEST SAMPLES Design Lab

QUANTITY OF TEST SAMPLES [redacted] 12

REPORT NO. 0887-081

TESTED BY Lab

COMPLETION DATE 9-3-91

TEST REQUIREMENTS: (TO BE FILLED IN BY REQUESTOR)

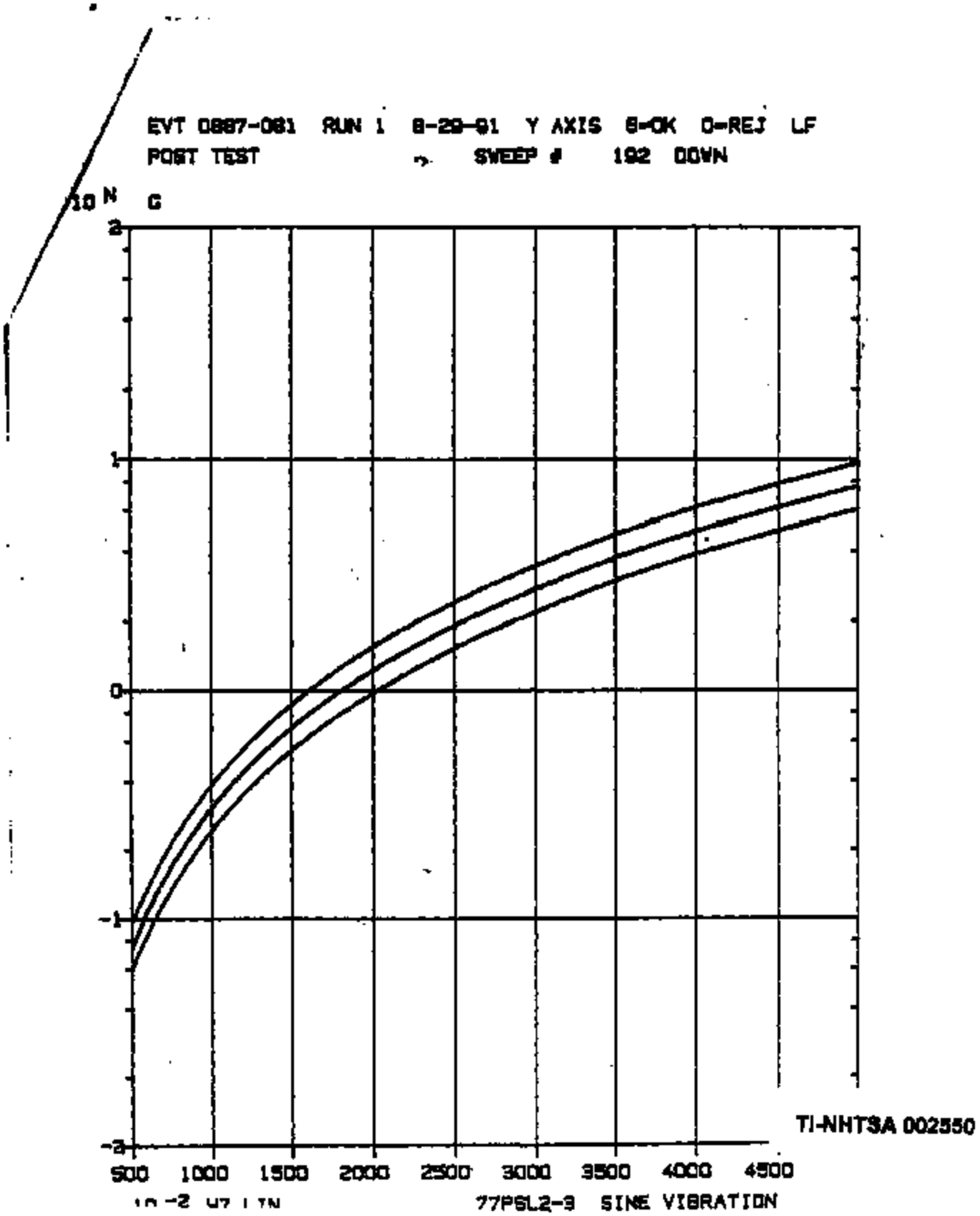
See attached, Vibration.

TEST PERFORMED: per attached specification.

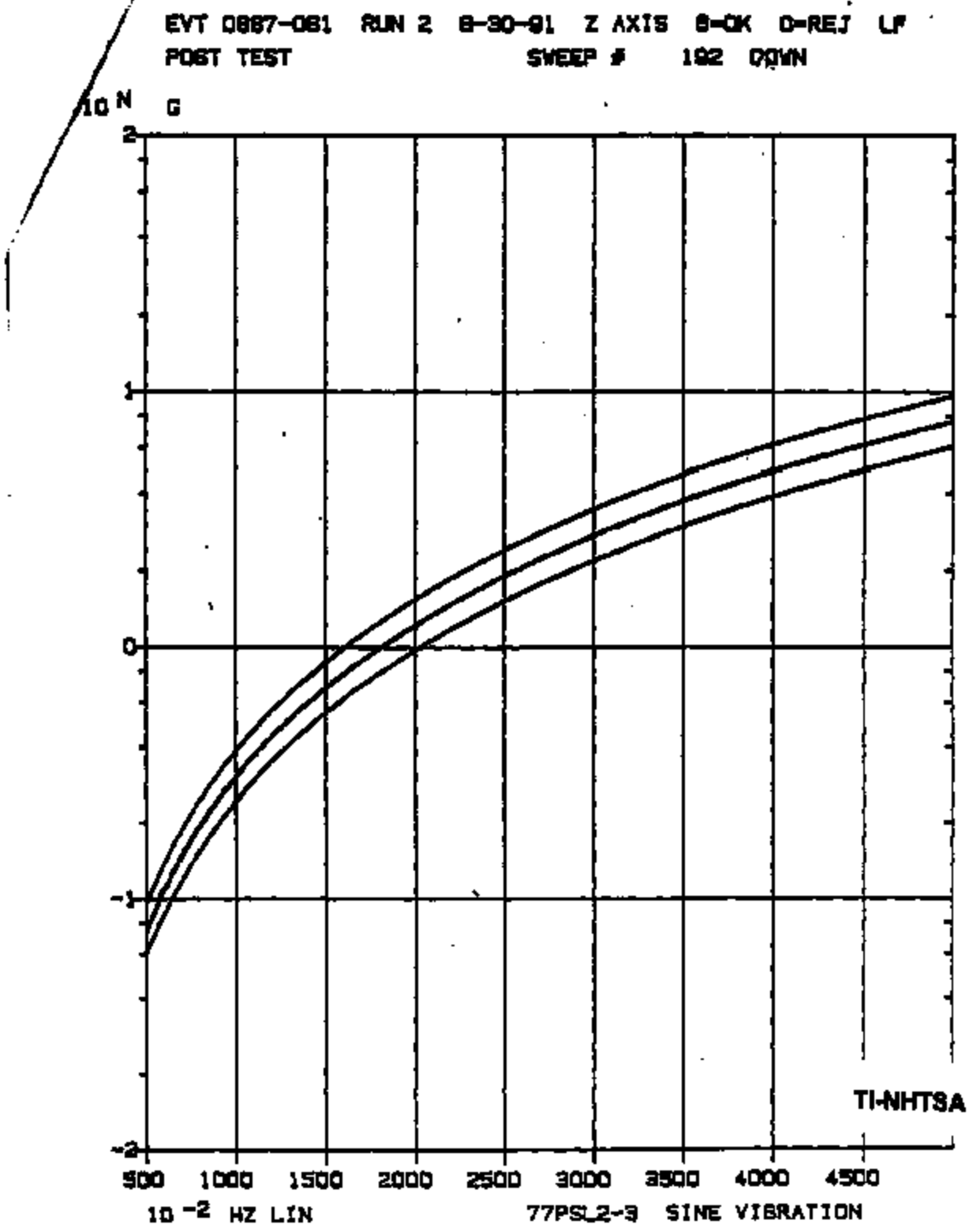
TEST RESULTS:

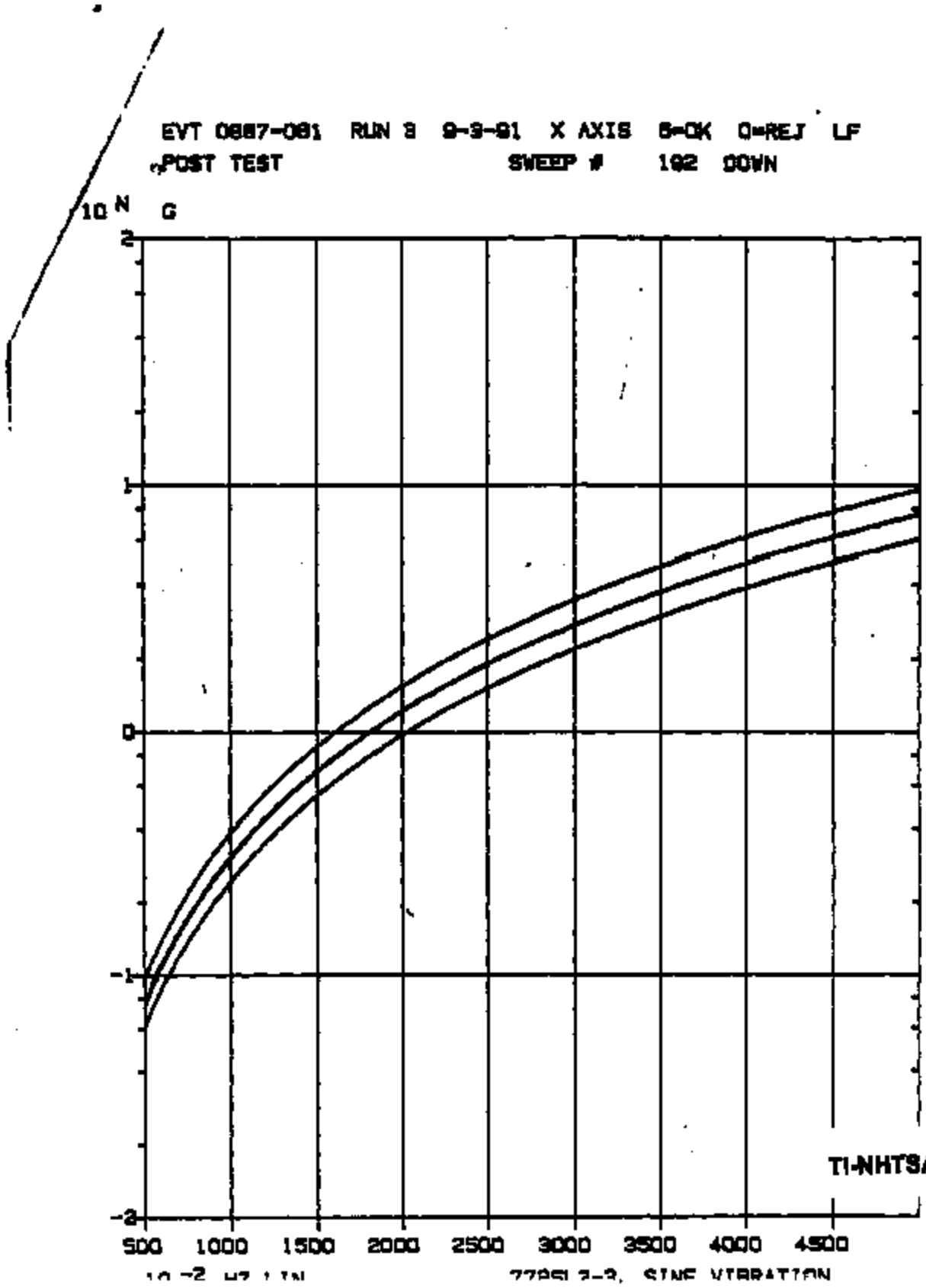
See attached sheets.

EQUIPMENT USED: CALIBRATION DATE: NEXT DUE DATE:



TI-NHTSA 002550





Appendix 4.2.4
Thermal Cycle Day/Time/Temp

TEST LOT NO.	TEST	DEVICE
TESTED BY		
APPROVED BY	TEXAS INSTRUMENTS MATERIALS & CONTROLS GROUP ATTLEBORO, MA 02703	DOC.
DATE 91-08-30		PAGE 37

FORM 8295

77 PS Validation Testing

Temp. Cycle Test

(Low Setpt -42°C)

	1 Ambient Temp	2 Engine Temp	3 Time	4 Date	5	6 Ambient Temp	7 Engine Temp	8 Time	9 Date	10	11	12	13
Cycle 1	+40	+43	10:45	8/7/91		-43	-45	8:35	8/7/91				
2	43	43	1:05	"		-40	-46	2:10	"				
3	42	42	3:45	"		-42	-44	4:10	"				
4	40	41	7:35	"		-43	-44	9:15P	"				
5	41	40	7:35A	8/8/91		-41	-47	8:45	8/8/91				
6	39	41	9:30	"		-41	-44	10:15	"				
7	43	45	11:45	"		-42	-44	12:50	"				
8	41	42	1:30	"		-42	-44	3:00P	"				
9	40	43	3:30	"		-40	-45	4:40P	"				
10	42	43	5:05P	"		-42	-44	6:30P	"				
11	42	43	7:35P	"		-43	-44	9:35P	"				
12	40	43	7:50A	8/9/91		-40	-44	9:05	8/9/91				
13	42	42	9:30A	"		-40	-44	10:40	"				
14	42	43	11:15A	"		-42	-44	2:40	"				
15	42	42	1:10P	"		-40	-44	3:25	"				
16	41	43	3:25	"		-40	-44	4:00	"				
17	40	43	4:25	"		-40	-44	5:35	"				
18	41	42	11:40A	8/10/91		-43	-44	2:35P	8/10/91				
19	41	42	3:00P	"		-42	-44	4:35	"				
20	40	42	5:20P	"		-42	-44	7:15P	"				
21	43	42	8:40A	8/11/91		-43	-44	4:50P	8/11/91				
22	43	42	5:15	"		-41	-44	6:45	"				
23	40	42	7:50	8/12/91		-40	-44	9:05	8/12/91				
24	40	43	9:50	"		-40	-45	11:05	"				
25	41	43	11:50	"		-40	-44	1:05	"				
26													
27													
28													
29													
30													
31													

Appendix 4.2.5
Fluid Resistance Test

TEST LOT NO.	TEST	DEVICE
TESTED BY		
APPROVED BY	TEXAS INSTRUMENTS	MATERIALS & CONTROLS GROUP ATTLEBORO, MA 02703
DATE 91-04-26		DOC.
		PAGE 54

FORM 6295

TEST NO. 107831

TECHNICAL SERVICE LABS

8/27/91

TEST NO. 107831

REQUESTOR	[redacted]
MAIL STATION	[redacted]
EXTENSION	[redacted]
DATE REQUIRED	9/5/91
NO. OF SAMPLES	72
COMPOSITION	[redacted]

REPORT OF RESULTS:

complete

DATE RECEIVED 8/28/91 DATE OUT 9-5

EMPLOYEE NO.									
JOB NO.									
NO. ANALYZED									
HOURS WORKED									

Appendix 4.2.6
Humidity

TEST LOT NO.	TEST		DEVICE
TESTED BY			
APPROVED BY	TEXAS INSTRUMENTS	MATERIALS & CONTROLS GROUP ATTLEBORO, MA 02703	DOC.
DATE 91-03-20			PAGE 56

FORM 5256

Form 8018

ENVIRONMENTAL TEST LAB REQUEST FORM
(ONE TEST PER REQUEST)

DATE 9/6/91

REQUESTED BY Jeffrey DiBenedetto

REQUIRED COMPLETION DATE 9/16/91

EXTENSION 2424 - MS 11-21

DEVICE 77F5L2-1; 77F5L2-3

CHARGE DEPT. NO. 127 I.O. NO. 101060

REPORT NO. 09.33-091

REFERENCE SPEC. NO. ES-F2VC-1F929-AA

TESTED BY LAB

SOURCE OF TEST SAMPLES Design Lab

COMPLETION DATE 9-20-91

QUANTITY OF TEST SAMPLES 12

TEST REQUIREMENTS: (TO BE FILLED IN BY REQUESTOR)

Please run humidity test per attached.

TEST PERFORMED:

START 9-16-91 16:00 CHAMBER MALFUNCTION (SHUT DOWN) JW

RESTART 9-18-91 0830 HOURS

STOP 9-20-91 1630 HOURS

TEST RESULTS:

EQUIPMENT USED: CALIBRATION DATE: NEXT DUE DATE:

Appendix 4.2.7
Salt Spray

TEST LOT NO.	TEST		DEVICE
TESTED BY			
APPROVED BY	TEXAS INSTRUMENTS	MATERIALS & CONTROLS GROUP ATTLEBORO, MA 02703	DOC.
DATE 93-08-26			PAGE 14

FORM 5298

Form 6016

ENVIRONMENTAL TEST LAB REQUEST FORM
(ONE TEST PER REQUEST)

DATE 9/6/91

REQUESTED BY Jeffrey D. Romaine

REQUIRED COMPLETION DATE 2/10/91

EXTENSION 3149 MD M-J

DEVICE 77PSLJ-1 ; 77PSLJ-3

CHARGE DEPT. NO. 112 I.O. NO. 101060

REPORT NO. 0934-091

REFERENCE SPEC. NO. ES-F2VC-1F124-AA

TESTED BY Lab

SOURCE OF TEST SAMPLES Design Lab

COMPLETION DATE 9-9-91

QUANTITY OF TEST SAMPLES 12

TEST REQUIREMENTS: (TO BE FILLED IN BY REQUESTOR)

Please run salt Spray Test per attached.

TEST PERFORMED:

IN: 1430 9-6-91

Out: 1430 9-9-91

TEST RESULTS:

to be determined by requestor.

EQUIPMENT USED: CALIBRATION DATE: NEXT DUE DATE:

Appendix 4.2.8
Light Truck F3TA-9F924-AA Data

TI-NHTSA 002561

TEST LOT NO.	TEST	DEVICE
TESTED BY		
APPROVED BY	TEXAS INSTRUMENTS MATERIALS & CONTROLS GROUP ATTLEBORO, MA 02703	DOC.
DATE 97-03-20		PAGE 40

FORM 8298

PRESSURE SWITCH DATA Form 21605 **TEST NO.** 15-7-15-160

DEVICE	DATE REQUESTED	REQUESTED BY	REQUESTED COMP DATE
7755L2-3			

PERFORMED BY	DATE STARTED	DATE COMPLETED	APPROVED BY
Jeffrey A. Genovese	6/24/91		

PROJECT TITLE: Ford MY'92 Electronic Speed control deactivate PS

CUSTOMER: LT

PURPOSE OF TEST:

later to Ford ES

PROCEDURE:

TI-NHTSA 002562

Coolant leakage

Device	Act/Bal	eV Drop	Clockwise in. lbs.	Counterclockwise in. lbs.	Average	Proof	Tests		
15-7-15-01	251/194	4.5	1.65 mA	1.22 mA	1.64 mA	Good	Fluid Res	to	Engine
02	252/195	4.9	1.60	1.31	1.42		Fluid Res	to	Engine
03	260/197	4.7	1.60	1.33	1.49		Fluid Res	to	Engine
04	263/199	4.2	1.69	1.25	1.47		Fluid Res	to	Engine
05	249/187	4.3	1.63	1.21	1.43		Fluid Res	to	Engine
06	257/191	4.0	1.60	1.33	1.46		Fluid Res	to	Engine
07	263/199	4.0	1.57	1.30	1.47		Fluid Res	to	Engine
08	261/185	5.2	1.76	1.23	1.48		Fluid Res	to	Engine
09	254/176	4.1	1.59	1.48	1.58		Fluid Res	to	Engine
10	263/199	4.7	1.62	1.37	1.50		Fluid Res	to	Engine
	258/190	4.5	1.75	1.26	1.40		Fluid Res	to	Engine
11	246/175	3.6	1.76	1.27	1.42		Fluid Res	to	Engine
12	No Failed								
13	250/191	4.9	1.95	1.39	1.53	Good	Fluid Res	to	Temp Sens
14	256/191	5.1	2.00	1.52	1.64		Fluid Res	to	Temp Sens
15	258/196	4.9	1.98	1.75	1.65		Fluid Res	to	Temp Sens
16	245/175	5.3	1.73	1.31	1.50		Fluid Res	to	Temp Sens
17	263/208	4.7	1.61	1.21	1.52		Fluid Res	to	Temp Sens
18	260/197	5.5	1.76	1.29	1.46		Fluid Res	to	Temp Sens
19	247/189	5.2	1.93	1.36	1.48		Fluid Res	to	Temp Sens
20	263/196	4.1	1.79	1.29	1.43		Fluid Res	to	Temp Sens
21	260/193	4.2	1.93	1.39	1.55		Fluid Res	to	Temp Sens
22	253/195	3.4	1.91	1.35	1.59		Fluid Res	to	Temp Sens
23	252/193	4.2	1.62	1.27	1.77		Fluid Res	to	Temp Sens
24	259/199	4.0	1.65	1.27	1.60		Fluid Res	to	Temp Sens
25	261/190	4.9	1.99	1.41	1.55	Good	Fluid Res	to	Temp Sens
26	259/192	4.6	1.91	1.42	1.67		Fluid Res	to	Temp Sens

Current leakage

Unit #	Act / Rel	mV Drop	[illegible] to Inner	[illegible] to Inner	[illegible]	Proof	Test			
69	266/193	5.6	1.62 mA	1.61 mA	1.59 mA	Good	Fluid Rec + Humidity			
70	263/196	4.5	1.76	1.74	1.69		Fluid Rec + Humidity			
71	241/179	6.8	1.79	1.72	1.51		Fluid Rec + Humidity			
72	267/199	7.2	1.76	1.36	1.64		Fluid Rec + Salt Spray			
73	248/171	4.3	1.65	1.29	1.61		Fluid Rec + Salt Spray			
74	267/199	7.4	1.69	1.31	1.64		Fluid Rec + Salt Spray			
75	259/195	5.2	1.75	1.34	1.62		Fluid Rec + Salt Spray			
76	Not used									
77	260/199	7.4	1.79	1.32	1.73	Good	Fluid Rec + Salt Spray			
78	240/111	7.7								
79	262/189	5.3	1.67	1.27	1.65	Good	Fluid Rec + Salt Spray			
80	254/194	4.8	1.95	1.62	1.11		Burst			
81	259/185	5.6	1.76	1.32	1.65		Burst			
82	268/209	4.7	1.69	1.29	1.60		Burst			
83	Not used									
84	252/175	4.7	1.73	1.35	1.66	Good	Burst			
85	266/195	4.4	1.67	1.27	1.60		Burst			
86	261/192	5.0	1.75	1.34	1.67		Burst			
87	262/197	6.1	1.72	1.32	1.62		Vibration			
88	264/194	2.5	1.77	1.38	1.53		Vibration			
89	267/191	3.5	1.77	1.35	1.62		Vibration			
90	262/190	11.0	1.90	1.38	1.72		Vibration			
91	Not used									
92	268/194	5.1	1.65	1.29	1.54	Good	Vibration			
93	264/191	5.1	1.73	1.31	1.62	Good	Vibration			
94	Not used									
95	257/198	5.1	1.79	1.33	1.56	Good	Vacuum			
96	265/199	5.5	1.77	1.35	1.48		Vacuum			
97	248/192	3.4	1.78	1.32	1.49		Vacuum			
98	261/191	7.8	1.80	1.35	1.45		Vacuum			
99	256/196	6.0	1.84	1.36	1.44		Vacuum			
100	269/202	4.5	1.82	1.39	1.62		Vacuum			
101	250/189	5.1	1.82	1.39	1.49		Temp Cycle			
102	268/198	6.0	1.83	1.36	1.49		Temp Cycle			
103	262/199	4.7	1.85	1.38	1.50		Temp Cycle			
104	258/190	5.5	1.88	1.41	1.52		Temp Cycle			
105	265/202	7.0	1.89	1.37	1.51		Temp Cycle			
106	262/193	8.3	1.91	1.35	1.45		Temp Cycle			
107	254/197	3.7	1.80	1.36	1.48		Torque			
108	Not used									
109	258/198	5.0	1.82	1.36	1.45	Good	Torque			
110	248/186	4.6	1.80	1.33	1.45		Torque			
111	267/197	4.0	1.82	1.41	1.50		Torque			
112	262/188	4.0	1.83	1.37	1.46		Torque			
113	264/192	4.6	1.81	1.37	1.45		Torque			
114	261/194	4.3	1.86	1.41	1.51		Torque			
115	Not used									
116	261/191	3.4	1.84	1.41	1.51	Good	Torque			
117	267/199	5.1	1.76	1.34	1.47		Torque			
118	263/193	3.4	1.78	1.35	1.48		Torque			
119	264/193	5.1	1.78	1.34	1.43		Torque			
120	272/199	4.0	1.79	1.35	1.46		Torque			

Final Clarifications

Date	TESTS			Proof	Act/Rel	Pkg Drop		
11-27-01	Fluid Res & Tensile			OK	237/180	6.5	1.91	1.47
02	Fluid Res & Tensile			OK	237/178	4.3	1.61	1.37
03	Fluid Res & Tensile			OK	238/183	44.3	1.64	1.39
04	Fluid Res & Tensile			OK	241/182	44.3	1.59	1.39
05	Fluid Res & Tensile			OK	233/181	2.9	1.79	1.41
06	Fluid Res & Tensile			OK	240/180	6.3	1.78	1.44
07	Fluid Res & Tensile			OK	250/185	2.5	1.78	1.38
08	Fluid Res & Tensile			OK	237/179	2.3	1.48	1.38
09	Fluid Res & Tensile			OK	237/180	2.4	1.59	1.35
10	Fluid Res & Tensile			OK	240/183	8.2	1.52	1.32
11	Fluid Res & Tensile			OK	238/177	2.0	1.47	1.31
12	Fluid Res & Tensile			OK	238/179	3.3	1.49	1.28
13	Not Used							
14	Fluid Res & Tens		Strength	OK	250/180	4.1	1.86	1.47
15	Fluid Res & Tens		Strength		258/186	4.1	1.68	1.43
16	Fluid Res & Tens		Strength		236/184	4.2	1.65	1.41
17	Fluid Res & Tens		Strength		246/176	4.2	1.65	1.41
18	Fluid Res & Tens		Strength		245/202	4.0	1.74	1.43
19	Fluid Res & Tens		Strength		238/192	4.2	1.66	1.39
20	Fluid Res & Tens		Strength		245/190	4.0	1.76	1.37
21	Fluid Res & Tens		Strength		260/186	4.2	1.60	1.38
22	Fluid Res & Tens		Strength		268/185	4.1	1.63	1.39
23	Fluid Res & Tens		Strength		262/188	4.1	1.75	1.40
24	Fluid Res & Tens		Strength		268/192	4.0	1.72	1.35
25	Fluid Res & Tens		Strength		247/188	4.1	1.54	1.31
26	Fluid Res & Tens		Hand Set	OK	267/186	6.3	2.11	1.30
27	Fluid Res & Tens		Hand Set		261/191	4.5	2.10	1.70
28	Fluid Res & Tens		Hand Set		273/188	4.1	2.08	1.61
29	Fluid Res & Tens		Hand Set		271/189	6.7	1.98	1.45
30	Fluid Res & Tens		Hand Set		279/198	6.9	2.08	1.65
31	Fluid Res & Tens		Hand Set		249/199	5.9	2.00	1.65
32	Fluid Res & Salt		Spray		264/184	40	306.00	4.39
33	Fluid Res & Salt		Spray		254/183	40	2.18	1.72
34	Fluid Res & Salt		Spray		260/193	40	310.00	4/4.00
35	Fluid Res & Salt		Spray		274/205	40	310.00	307.00
36	NOT USED							
37	Fluid Res & Salt		Spray	OK	259/183	40	39.6	37.4
38	NOT USED							
39	Fluid Res & Salt		Spray	OK	257/182	40	307.00	306
40	Rec'd			Fluor				
41	Rec'd			Fluor				
42	Rec'd			Fluor				
43	NOT USED							
44	Rec'd			Fluor				
45	Rec'd			Fluor				
46	Rec'd			Fluor				
47	Fluid Res			OK	248/182	11.6	1.53	1.28
48	Fluid Res			OK	243/179	4.5	1.64	1.40
49	Fluid Res			OK	252/178	3.7	1.49	1.23
50	Fluid Res			OK	250/183	11.5	1.39	1.15
51	NOT USED							
52	Fluid Res			OK	258/189	6.5	1.38	1.19
53	Fluid Res			OK	262/186	7.0	1.39	1.19
54	NOT USED							
55	Fluid Res			OK	262/189	6.4	1.37	1.21
56	Fluid Res			OK	258/188	5.7	1.65	1.49
57	Fluid Res			OK	253/186	6.3	1.89	1.46

Device	TEST		Proof	Actual	Min. Prop	[illegible]	[illegible]	[illegible]
11-8-83	Vacuum		OK	281/199	9.9	1.69	1.96	1
64	Vacuum		OK	263/191	9.5	1.66	1.94	1.93
68	Vacuum		OK	254/170	7.9	1.71	1.97	1.91
61	Temp. Cycle		OK	248/182	5.3	1.59	1.84	1
62	Temp. Cycle		OK	234/174	4.2	1.57	1.83	1.
63	Temp. Cycle		OK	253/187	5.9	1.59	1.87	1.
64	Temp. Cycle		OK	244/178	6.8	1.66	1.89	1.
65	Temp. Cycle		OK	245/183	9.5	1.69	1.92	1.
66	Temp. Cycle		OK	246/182	12.3	1.69	1.89	1.
67	Tensile		Fail	253/183	1.9	1.34	1.39	1
68	Not Used							
69	Tensile		Fail	235/177	3.1	1.52	1.76	1
70	Tensile		Fail	248/181	2.0	1.56	1.79	1
71	Tensile		Fail	242/194	1.9	1.37	1.69	1
72	Tensile		Fail	260/185	2.0	1.85	1.87	2
73	Tensile		Fail	242/196	1.9	2.11	1.72	1
74	Tensile		Fail	242/181	1.9	2.18	1.71	2
[illegible]	Not Used							
[illegible]	Tensile		Fail	259/194	1.9	1.39	1.79	1
[illegible]	Tensile		Fail	248/188	19.1	1.76	1.86	1
[illegible]	Tensile		Fail	248/181	5.3	1.54	1.57	1
[illegible]	Tensile		Fail	251/184	1.9	1.88	1.87	1
81	Tensile		Fail	283/214	1.9	88J - A	76.9	3

ADDENDUM TO:
REPORT OF IER TESTING
FORD PASSENGER CAR
ELECTRONIC SPEED CONTROL
DEACTIVATION PRESSURE SWITCH
PS/91/49-A

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

TEST LOT NO.	TEST	DEVICE
TESTED BY		
APPROVED BY	TEXAS INSTRUMENTS — MATERIALS & CONTROLS GROUP, ATTLEBORO, MA 02703	DOC.
DATE 91-12-18		PAGE 1

FORM 9289

TABLE OF CONTENTS

1.0 GENERAL

1.1 Customer: Ford Motor Company, Passenger Car Brake Systems Engineering

1.2 TI Part Number: 77PSL2-1

1.3 Customer Part Number: F2VC-9F924-AB

1.4 Specifications: Ford Engineering Specification number (delta) ES-F2VC-9F924-AA

1.5 Date of Completion : 911218

1.6 Quantity of Units Tested: 48

1.7 Disposition of Tested Units:

1.7.1 All devices are retained under quarantine.

1.8 TI test number: 172-15-24
173-15-24

1.9 TI Pressure Switch test report number: PS/91/49-A

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

FORM 5295

2.0 OBJECTIVE

The original battery of tests reported in TI test report number PS/91/49 dated 910920 was performed to demonstrate the ability of TI P/N 77PSL2-1 to conform to customer specifications given in (delta) ES-F2VC-9F924-AA, in fulfillment of the requirements of the Initial Sample Report. During these original tests, problems were noted with diaphragm life during the Impulse test. It was discovered that these problems were related to the automatic pressure sensor assembly crimper, and furthermore that devices assembled on the manually-loaded crimper had no difficulty with diaphragm life. In the interest of meeting strict ISR deadlines, the Impulse portion of the test was successfully re-run using devices assembled on the manually-loaded crimper. However, these devices did not undergo the Fluid Resistance test due to time constraints. A 90-day Alert, # A10166193, was issued on 911002 (see Appendix 4.1). During this 90-day period, efforts to understand and correct the discrepancies of the automatic equipment have been made. The objective of this addendum is to report on the successful completion of the tests (Fluid Resistance and Impulse) which were compromised in the original ISR, using devices built both on the automatic equipment and the manually-loaded equipment. Crimp dies from the manually-loaded equipment were transferred to the automatic equipment in order to produce the successful test devices. The permanent corrective action will be to produce exact duplicates of these crimp dies for the automatic line.

3.0 TEST PROCEDURES AND RESULTS

All switches were tested to Ford Engineering Specification (delta) ES-F2VC-9F924-AA, sections III. M. (Fluid Resistance) and E. (Impulse), with initial and final characterizations consisting of III. A. (Calibration), B. (Voltage Drop), C. (Current Leakage), and D. (Proof). Raw data is included in Appendix 4.2 and 4.3.

TEST LOT NO.	TEST	DEVICE
TESTED BY		
APPROVED BY	TEXAS INSTRUMENTS MATERIALS & CONTROLS GROUP ATTLEBORO, MA 02703	DOC.
DATE 8/12/94		PAGE 5

FORM 8266

3.1 CALIBRATION

3.1.1 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.

3.1.2 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.

3.1.3 Initial Results: All 48 devices tested were found to be within specification.

3.1.4 Final Results: All 48 devices tested were found to be within specification.

TEST LOT NO.	TEST	DEVICE
TESTED BY		
APPROVED BY	TEXAS INSTRUMENTS — MATERIALS & CONTROLS GROUP, ATTLEBORO, MA 02703	DOC.
DATE 01-12-18		PAGE 6

FORM 5288

3.2 VOLTAGE DROP

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

3.2.2. Initial results: The average voltage drop was 4.5 millivolts, and the standard deviation was 1.5. All values are significantly below the specification of 200 millivolts maximum.

3.2.3 Final results: The average voltage drop was 14.3 millivolts, and the standard deviation was 22.7. All values are significantly below the specification of 200 millivolts maximum.

TEST LOT NO.	TEST	DEVICE
TESTED BY		
APPROVED BY	TEXAS INSTRUMENTS — MATERIALS & CONTROLS GROUP, ATTLEBORO, MA 02703	DOC.
DATE 91-12-19		PAGE 7

FORM 8358

3.3 CURRENT LEAKAGE

3.3.1 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%).

3.3.2 Initial results: Measuring terminals to case with switch closed; measuring terminals to case with switch open; and measuring between the terminals: the maximum current leakage observed less than 2 microamps. All values are significantly below the specification of 100 microamps.

3.3.3. Final results: Same three measurements per device as 3.3.2. All current leakage values were consistent with initial results. The maximum observed was 2.7 microamps. All values are significantly below the specification of 100 microamps.

TEST LOT NO.	TEST	DEVICE
TESTED BY		
APPROVED BY	TEXAS INSTRUMENTS MATERIALS & CONTROLS GROUP ATTLEBORO, MA 02703	DOC.
DATE 91-12-18		PAGE 8

FORM 2288

3.4 PROOF

3.4.1 Procedure: Calibration readings were recorded only after proof testing. Test pressure was 3000 psi per the part drawing.

3.4.1 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.

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

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

3.5 FLUID RESISTANCE

3.5.1 Devices tested: 172-15-01 thru -12
173-15-01 thru -12.

3.5.2 Equipment: Fluids as called out in ES table (frame 12 of 18); appropriate beakers and storage apparatus; vented hood.

3.5.3 Results: The 24 devices were subject to the Impulse test following completion of Fluid Resistance.

3.6 IMPULSE

3.6.1 Devices tested: 172-15-01 thru -24
173-15-01 thru -24.

3.6.2 Procedure: 172-15-13 thru -24 and 173-15-13 thru -24 were run together on the Impulse test per the ES. Devices 172-15-01 thru -12 and 173-15-01 thru -12 were subject to the Fluid resistance test first, then run together on the Impulse test.

3.6.3 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. 12-station inductive load bank, per the schematic found in the ES (frame 18 of 18; figure 4.) used in the last 25K cycles.

3.6.4 Results: All devices passed.

ALLIED SIGNAL P/N 2234330
MATERIAL ANALYSIS
PARTS LIST INDEX

PART NAME	PART NUMBER	CERTIFIED
BASE	40610-3	YES
STA. TERMINAL	30088-1	YES
MOV. TERMINAL	30087-1	YES
RIVET	74016-1	YES
SPRING ARM MAT'L	27718-1	YES
MOV.CONTACT	74408-1	YES
HEXPORT	39000-1	YES
GASKET	74353-1	YES
CUP	27713-1	YES
KAPTON STRIP	27225-1	YES
WASHER	27039-1	YES
CONVERTER	27408-1	YES
KAPTON TAPE	74224-1	YES
CRIMP RING	74707-1	YES
TRANSFER PIN	74078-SEL	YES
ENVIO. SEAL	74247-4	YES

dw/11-04

TI-NHTSA 002578

Product Quality Documentation CERTIFICATE OF COMPLIANCE

Base PN 4615-3

Number	Customer Part Number	Order/Release Number	Material, Grade and Color	
	2700-497		NORYL	GTX830 111

Number	Qty. Shipped	U/M	Shipped From	Date Shipped	Shipper's Number
941141	2,820	LB	MSI SELKIRK	08/02/94	02044185

It is hereby certified that the product indicated above conforms to our standard internal specifications for the designated material. This certification is subject to our standard conditions of sale applying to products sold by the General Electric Company.

Specification

Specification Originator
NORYL

Specification Comments

TEST	REFERENCE	REQUIREMENT	(ENGLISH)	(METRIC)
LOT DATA:				
HDT @264 PSI - 1/4"	ASTM D648	400.0 DEG F MINIMUM	407.0 DEG F	236 DEG C
NOTCHED IZOD IMPACT-1/8"	ASTM D256	1.6 FT-LB/IN MINIMUM	2.0 FT-LB/IN	107.0 J/M
% ELONGATION	ASTM D638	4 % MINIMUM	12 %	
TENSILE YIELD	ASTM D638	20,000 PSI MINIMUM	23,820 PSI	162.7 MPA
FLEXURAL MODULUS	ASTM D790	1,000,000 PSI MINIMUM	1,186,000 PSI	8,240.4 MPA
FLEXURAL STR @ YIELD	ASTM D790	28,000 PSI MINIMUM	37,470 PSI	258.2 MPA
FILLERED GLASS ANALYSIS	ASH/X-RAY	27.00-33.00 %	28.80 %	
SPECIFIC GRAVITY	ASTM D792	1.31-1.35 G/CC		1.32 G/CC
PRODUCT AUDIT DATA:			DATE OF LAST AUDIT: 07/94	
FLAMMABILITY, .100" THICK	FMVSS 302	4.00 IN/MIN MAXIMUM	SELF-EXTINGUISHING W/NO BURN RATE	
% MOISTURE CONTENT	KARL FISCHER	0.50 % MAXIMUM	0.06 %	

Post-it® Fax Note 7671	Date 10-5	# of pages ▶ 1
To Elaine Rose	From Rea Botelho	
Co./Dept.	Co.	
Phone #	Phone #	
Fax # 3153	Fax # 3141	

RECEIVED
SEP - 6 1994

2520

ROBERT O. MATTHEWS
Quality Manager

BARRY GIBBS
Manufacturing Manager

If you have any questions concerning this, please contact:

GARY CHICHESTER

1-518-475-5595

TEXAS INSTRUMENTS
MAT'LS & CONTROLS WAREHOUSE
CREDIT & FORECASTING MAIL
BLDG 18, DOOR 18 SUFFOLK ROAD
HANSFIELD MA 02048 1305

May 10, 1993

To: Elaine Rose 12-27

From: Beth Kill 10-16

Subject: GP-3 Material Confirmation
TSL Request # 110864

Sample Description:

P/N 36886-1 Stationary Terminal CDA 260 Brass 1/2 Hard

Results:

	P/N 36886-1	Spec. CDA 260
Cu (wt%)	70.8%	68.5 - 71.5%
Fe	0.017	0.05 max
Pb	0.006	0.07 max
Zn	balance	balance
Hardness	73 RB	60 - 77 RB

Results confirm the terminal is made of CDA 260 brass, 1/2 hard.

Regards,

Beth X3089

May 10, 1993

To: Elaine Rose 12-27

From: Beth Kill 10-16

Subject: GP-3 Material Confirmation
TSL Request # 110864

Sample Description:

P/N 36867-1 Moving Terminal CDA 260 Brass 1/2 Hard

Results:

	P/N 36867-1	Spec. CDA 260
Cu (wt%)	71.3%	68.5 - 71.5%
Fe	0.026	0.05 max
Pb	0.008	0.07 max
Zn	balance	balance
Hardness	82.5 RB	60 - 77 RB

Results confirm the terminal is made of CDA 260 brass, and slightly above 1/2 hard.

Regards,

Beth X3089

BIGELOW COMPONENTS CORPORATION
74 DIAMOND ROAD
SPRINGFIELD, NEW JERSEY 07081-3190
201-467-2100 FAX: 201-912-9397

MATERIAL CERTIFICATION/CONFORMANCE

Texas Instruments, Inc.
Materials & Controls
34 Forest Street
Attleboro, MA 02703-2481

Shipped to: Component Whse Bldg 16
Suffolk Rd - M&C Door 16
Mansfield, MA 02048-1105

Your P.O. No.	-	500127521
Your Part No.	-	74916-1 Rev. F
Quantity Shipped	-	275,000
Shipment Date	-	09-29-94

We certify that all the items shipped on this order meet the requirements of the Texas Instruments purchase order and Texas Instruments drawing specifications.

We Certify that the parts shipped were made of CDA 260 Brass material in accordance with Texas Instruments drawing specifications.

Sincerely,

C. Brett Harman
CBH:ss

BRUSHWELLMAN
ENGINEERED MATERIALS

BRUSH WELLMAN INC. 180 PASSAIC AVE FAIRFIELD NJ 07004 201-227-2552

CERTIFICATE OF MATERIAL QUALITY

TEXAS INSTRUMENT
MATERIALS AND CONTROLS
COMPONENTS WAREHOUSE BLDG. 16
SUFFOLK ROAD DOOR 16
MANSFIELD MA 02048

OUR ORDER NO: FA6712 CUSTOMER NO: 897852
OUR ITEM NO: 01 SHIPMENT NO: 015
YOUR P.O. NO: 500015587 08/18/94
YOUR SPEC NO:
YOUR PART NO: 27716-1 REV.B

3372808	STRIP	190 17200	HM TM04	27576	0.005 0.183	+0.0002 +0.002	-0.0002 -0.002	" "	THI WID COI

SHIPMENT NBR 015 = 95.0 LBS
HEAT NUMBER 27576 = 95.0 LBS

***** CHEMICAL COMPOSITION (PERCENT) *****

1.91 BE	.22 CO	.06 NI	.05 FE	.10 SI	.05 AL
.009 SN	.01 ZN	.005 CR	.003 PB		

REMAINDER: CU

***** AS SHIPPED PROPERTIES *****

TENSILE	(KSI)	142.7	- 144.8
YIELD	(KSI)	121.8	- 125.0
ELONGATION	% IN 2"	13.0	- 13.0
HARDNESS-1	HV	302.0	- 305.0
CONDUCTIVITY	% IACS	19.6	
GRAIN SIZE	(MM)	.015	- .015

******* PC / LOT OR COIL NUMBER ******

95- 8

P = PASSED F = FAILED

Paul J. Freund
QUALITY ASSURANCE MANAGER

8/18
DATE

[redacted]

TI-NHTSA 002583

The
[redacted]
Milford Connecticut 06460
Phone : 203-878-4631
Fax : 203-878-8071

ATTENTION QUALITY ASSURANCE

CERTIFICATE OF COMPLIANCE

1. The Milford Group Certifies that the Purchase Order referenced on the packing slip for the part number and quantity called out on the same packing slip was processed in accordance with, and to conform to; Your part number, revision, material, and process specifications as called out by your Purchase Order.

2. THE MILFORD GROUP

[redacted]

TI-NHTSA 002584

November 1, 1994

To: Elaine Rose 12-27

From: Beth Kill 10-16

Subject: Material Confirmation
TSL Request # 110995

Sample Description:

P/N 36900-1 Hexport C10L10 Steel
Zinc plate with chromate

Results:

	P/N 36900-1	Spec. C10L10 Steel
C (wt%)	0.110%	0.08 - 0.13% max.
Mn	0.494	0.30 - 0.60
P	0.014	0.040 max.
S	0.019	0.050 max.
Pb	0.190	0.15 - 0.35

Plate Thickness	Hex 0.000377	Per spec. 0.0003 inches min.

Results show the case to be made of C10L10 Steel. The plating is confirmed as zinc with chromate at the specified thickness.

Regards,

Beth X3069

EK94-036

) T74202I5

TEXAS INSTRUMENTS, INC.
BUILDING 11-16
34 FOREST STREET
ATTLEBORO, MA 02703

PARKER HANNIFIN CORPORATION
JBL DIVISION
WEST CROFT CIRCLE
SPARTANBURG, S.C. 29302
TELEPHONE (803) 579-7332

J.B.L. Division of Parker Seal certifies that the material used to produce the product in this shipment, namely EPDM/E7104. Conforms to TI drawing and TI purchase order requirements.

PART TITLE... GASKET

CUST P/N... 74353-1 REV H DATE SHIPPED P/O... 5000088T9

J.B.L. P/N.. 202151 5-8-84 R/E... 26256

COMPOUND... E7104 QUANTITY.. 60,400

J.B.L. Division

HAROLD C. SIGER LAB MANAGER
DANIEL T. JOHNSON Q.A.

PREPARED BY

VALENTINE TOOL & STAMPING, INC.

171 WEST MAIN ST. NORTON, MASS. 02766
(508) 285-8911

MATERIAL CERTIFICATION

DATE : TUESDAY SEPTEMBER 27, 1994

CUSTOMER : TEXAS INSTRUMENTS INC

CUSTOMER P.O. NO : 505219617 SUPPLIER INVOICE NO.: 86914

PART DESCRIPTION : 27713-1 CUP REV.D

SUPPLIER PJO NO. : 19823

QUANTITY SHIPPED : 44,000

SHIPMENT DATE : 09/27/94

WE CERTIFY THAT THE MATERIAL USED
TO PRODUCE THE PRODUCT IN THIS
SHIPMENT, NAMELY
[C1006]
CONFORMS TO T.I. DRAWINGS AND
T.I. PURCHASE ORDER REQUIREMENTS.

SIGNED _____
Supplier Representative

Jeanne LaFlamme Quality Assurance Manager

TI-NHTSA 002587

E. I. DU PONT DE NEMOURS & COMPANY
CIRCLEVILLE, OHIO 43113

NO: KC-11
Effective Date: 04/15/93

MATERIAL CERTIFICATION

DATE: September 20, 1994

CUSTOMER: TEXAS INSTRUMENTS, ATTLEBORO

CUSTOMER ORDER NO. 500016923-1

CUSTOMER PART NO. & REV. 27225-1 (REV. E)

QUANTITY THIS SHIPMENT 67.40

SHIPMENT DATE September 20, 1994

We certify that the material used to produce the product in this shipment, namely 500FN131 Kapton*, 3/4" wide, conforms to TI drawing and TI purchase order requirements on file with the HPF Group of the Dupont Company.

Khadijah Smith
SUPPLIER REPRESENTATIVE
ENGINEER - QUALITY CONTROL - TITLE

DIEMASTERS MANUFACTURING, INC.

MATERIAL CERTIFICATION

DATE: 09-23-94

CUSTOMER: TEXAS INSTRUMENTS

SUPPLIER PURCHASE ORDER: BL-4762

CUSTOMER PURCHASE ORDER: 5000169G2-01

PART NUMBER: 27639-1 REV/ECO: D

PART DESCRIPTION: WASHER

QUANTITY THIS SHIPMENT: 67,000

SHIPMENT DATE: 09-23-94

TRACEABLE LOT NUMBER: TI- 897

HEAT NUMBER: D8R016

TYPE OF MATERIAL: CRS 1050

****

WE CERTIFY THAT THE MATERIAL USED TO PRODUCE THE PRODUCT IN THIS SHIPMENT. NAMELY (SPECIFIC NAME/NUMBER OF MATERIAL), CONFORMS TO TI DRAWING AND TI PURCHASE ORDER REQUIREMENTS.

****

SIGNED: Allen Green

QUALITY ASSURANCE REPRESENTATIVE

TITLE: Q/A Inspector

TEST NO. 129251 **TECHNICAL SERVICE LABS** LOG NO. 545

TEST NO. 129251

[redacted]

REPORTED

1. 514-529-551=
2. 548-[illegible]-527=
3. 557-526-[illegible]388=
4. [illegible]-[illegible]-375
5. 560-554-553=
6. 538-538-[illegible]542=
7. 527-540-540=
8. 572-[illegible]-571=
9. 496-501-[illegible]491=
10. 565-568-568=
11. 550-558-587=
12. 517-519-522=
13. 581-584-594=

Ave 552 - RC 50-51

DATE RECEIVED 9/29/94 DATE OUT 9/30/94 Barbara

TECHNICIAN			
HOURS WORKED			
PROCEDURE USED			

*PCC I.D.

MC=625	TM=431	CLKE=122	FACIL=514
PD=127	WIRE=432	CAN=654	FACIL=521
VEHS=188	EPD=621	AD DEV=286	FACIL=531
APCC=489	PEP=622	EMCD=677	STAFF=665
IMD=430	CSD=635		

DISTRIBUTION: White and Yellow - 1 st Pink - Requestor

K. F. BASSLER COMPANY, INC.
PRECISION TOOLING & METAL STAMPINGS
45 John Willem St. • Attleboro, MA 02703 • (508) 222-1051 • Fax (508) 226-1605
EST. 1946

ELEMENT: 4.8 (Product Identification and Traceability)		Page 1 of 1
TITLE: Material Certification	FORM: 3.0	REVISION:

CUSTOMER: TEXAS INSTRUMENTS INC. (ATTLEBORO)

CUSTOMER ORDER NO.: 505223524

CUSTOMER PART NO.: 27406-1

PART REVISION: F

QUANTITY THIS SHIPMENT: 23,000

LOT NO(S). THIS SHIPMENT: 253

SHIPMENT DATE: 8/26/94

K.F. Bassler Co., Inc. certifies that the material used to produce the product in this shipment, namely, AK 1008 CR.S, conforms to H3 drawing and purchase order requirements.

AUTHORIZED SIGNATURE: Kathleen A. Penkala

Kathleen A. Penkala
Customer Service Manager

TI-NHTSA 002591

PMA

NO: KC-13
Effective Date: 3/06/92
Expiration Date: 3/06/93
Page 1 of 1

CIRCLEVILLE PLANT
P.O. Box 89
Circleville, OH 43113

MATERIAL CERTIFICATION

DATE: 2-16-93

CUSTOMER: TEXAS INSTRUMENTS, ATTLEBORO

CUSTOMER ORDER NO. 5000 85060

CUSTOMER PART NO. & REV. 74224-1 (REV. F)

QUANTITY THIS SHIPMENT 5410 #

SHIPMENT DATE 2-16-93

We certify that the material used to produce the product in this shipment, namely 200HN Kapton®, 15/16" wide, conforms to TI drawing and TI purchase order requirements on file with the HPF Group of the Dupont Company.

SUPPLIER REPRESENTATIVE
ENGINEER - QUALITY CONTROL - TITLE

dkh/smart no. 389

VALENTINE TOOL & STAMPING, INC.

171 WEST MAIN ST. NORTON, MASS. 02766
(508) 285-6911

MATERIAL CERTIFICATION

DATE : MONDAY OCTOBER 3, 1994

CUSTOMER : TEXAS INSTRUMENTS INC

CUSTOMER P.O. NO : 505212250 SUPPLIER INVOICE NO.: 86944

PART DESCRIPTION : 74797-1 CRIMP RING REV.B

SUPPLIER PJO NO. : 19779

QUANTITY SHIPPED : 25,200

SHIPMENT DATE : 10/03/94

WE CERTIFY THAT THE MATERIAL USED
TO PRODUCE THE PRODUCT IN THIS
SHIPMENT, NAMELY
[5052 AL]
CONFORMS TO T.I. DRAWINGS AND
T.I. PURCHASE ORDER REQUIREMENTS.

SIGNED Joanne LaBlanc
(Supplier Representative)

Joanne LaBlanc Quality Assurance Manager

"Paratech, Inc.

MINIATURE TECHNICAL CERAMICS

15940 MINNESOTA AVENUE • P.O. BOX 718 • PARAMOUNT, CALIFORNIA 90723
TELEPHONE (213) 633-2045 • FAX (213) 633-5907

MATERIAL CERTIFICATION

DATE: 9-26-94

TEXAS INSTRUMENTS, INC.

ORDER NO.: 5052196 26

PART NO : 74078-146 REV. NO.: G

QUANTITY THIS SHIPMENT: 34,000

SHIPMENT DATE: 9-26-94

PART DESCRIPTION: PIN

WE CERTIFY THAT THE MATERIAL USED TO PRODUCE THE PRODUCT IN THIS SHIPMENT, NAMELY PIN / STEATITE - L3, CONFORMS TO T.I. DRAWING AND T.I. PURCHASE ORDER REQUIREMENTS.

PRODUCTION MANAGER

TEXAS INSTRUMENTS, INC.
MATERIALS & CONTROLS CORP WEST
SUFFOLK ROAD M & C DOOR 16
HAVERHILL MA 01835-1126

PARKER HANNIFIN CORPORATION
JOHN D. DIVISION
WEST CROFT CIRCLE
SPARTANBURG, S.C. 29302
TELEPHONE (803) 573-7302

J.D.D. Division of Parker Seal certifies that the material used to produce the product in this shipment, namely SILICONE/ S7613. Conforms to TI drawing and TI purchase order requirements.

PART TITLE... ENVIRONMENTAL SEAL

CUST P/N... 74247-4 REV J

J.D.D. P/N..163905

SILICONE COMPOUND... S7613

DATE SHIPPED

8-26-94

P/O...4500127615

W/O...31217-74247

QUANTITY...100,000

HAROLD C. KEGLER LAB MANAGER
BENITA T. JOHNSON Q.A. MANAGER

J.D.D. Division

PREPARED BY

REPORT OF PARTIAL ISR TESTING
FORD PASSENGER CAR
ELECTRONIC SPEED CONTROL
DEACTIVATION PRESSURE SWITCH
PS/92/62

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

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

TABLE OF CONTENTS

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

1.0 GENERAL

1.1 Customer: Ford Motor Company, Passenger Car Brake Systems Engineering

1.2 TI Part Number: 77PSL3-1

1.3 Customer Part Number: F2AC-9F924-AA

1.4 Specifications: Ford Engineering Specification number (delta) ES-F2VC-9F924-AA

1.5 Date of Completion : 920413

1.6 Quantity of Units Tested: 36

1.7 Disposition of Tested Units:

1.7.1 All devices are retained under quarantine.

1.8 TI test number: 241-11-12
242-03-24

1.9 TI Pressure Switch test report number: PS/92/62

2.0 OBJECTIVE

See Memorandum in Appendix 4.1 which explains the scope, extent, and intention of this partial ISR. A full battery of ES tests is planned in the near future to complete a full ISR submission.

3.0 TEST PROCEDURES AND RESULTS

All switches were tested to Ford Engineering Specification (delta) ES-F2VC-9F924-AA, sections III. E. and J., with initial and final characterizations consisting of III. A. Raw data is included in Appendix 4.2 and 4.3.

TEST LOT NO.	TEST	DEVICE
TESTED BY		
APPROVED BY	TEXAS INSTRUMENTS MATERIALS & CONTROLS GROUP	DOC.

3.1 CALIBRATION

3.1.1 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.

3.1.2 Equipment: Custom TI designed and built pressure check station, using Reise 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.

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

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

3.2 VOLTAGE DROP

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

3.2.3 Final results: Performed on the Impulse devices only, as a check of degradation of the electrical contacts during the powered portion of the Impulse cycles. All values are significantly below the specification of 200 millivolts maximum.

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

3.3 IMPULSE

3.3.1 Devices tested: 242-03-01 thru -24

3.3.2 Procedure: Twenty four devices were run on the Impulse test as specified in the ES, with the exception that no devices were run on the Fluid Resistance test due to time constraints. The cycle rate used was actually 163 cycles per minute, again due to time constraints. All other parameters were as specified in the ES.

3.3.3 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. 12-station inductive load bank, per the schematic found in the ES (frame 18 of 18; figure 4.) used in the last 25K cycles.

3.3.4 Results: All devices passed.

3.4 TERMINAL STRENGTH

3.4.1 Devices tested: 241-11-01 thru -12

3.4.2 Equipment: Custom TI designed and built fixtures for gaging terminal movement after force application and for application of impact via a pendulum. This equipment is regularly used on the 57PS/77PS assembly lines in testing to TI Quality Assurance Specifications.

3.4.3 Results: All twelve devices passed the acceptance criteria found in the ES.

TEST LOT NO.	TEST	DEVICE
TESTED BY		
APPROVED BY	TEXAS INSTRUMENTS MATERIALS & CONTROLS GROUP	DOC.
		PAGE

Appendix. 4.1
Memorandum

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

M E M O R A N D U M
9 April 1992 - Page 1 of 3

To: Bruce Maeroff Ford Motor Co. Fax: 313-323-1924

CC: Dave Czarn TI Design Eng. Supv.
Norm Freda TI Field Sales Fax: 313-553-1673
Elaine Rose TI QRA

Fr: Steve Offiler TI Design Eng.

RE: EN53 PARTIAL ISR / VALIDATION PLAN FOR F2AC-9F924-AA

Bruce, it is my understanding that we'll be pulling together an ISR package for your perusal during your visit to our plant on Monday, 13 April. This package will be essentially based upon similarity to the F2VC-9F924-AB ISR, since only two components will be changing. Those two components are the pressure-sensing disc and the molded plastic base (switch housing). The base will undergo a First Article Inspection (FAI) which is a detailed study of all print dimensions, and material certifications from the manufacturer will be included. Below you will find detail of the ES tests which will/will not be completed for the Partial ISR (from ES F2VC-9F924-AA):

III. A. Calibration, B. Voltage Drop, C. Current Leak, D. Proof.

Only the Calibration test will be performed on the 24 devices undergoing the Impulse test (E.) below.

III. E. Impulse.

A complete 500,000 cycle Impulse test will be performed per the ES, with the exception that no devices will undergo the Fluid Resistance Test (M.) beforehand. The Impulse test is an excellent test of the ability of the entire device to withstand mechanical (pressure) cycles combined with electrical loads at elevated temperatures, and is a key test to validate the pressure-sensing disc.

III. F. Burst.

Changes to the base and disc should have no effect on burst performance.

III. G. Humidity, M. Fluid Resistance.

The new base material, General Electric Noryl GTX 830, has been tested previously by TI per Ford ES F3AH-19D594-AA along with a host of other engineering plastics. This CCD ES includes Humidity, and Fluid Resistance tests which are similar to the tests called out in ES F2VC-9F924-AA. Noryl was found to pass all tests.

III. H. Salt Spray.

It has been deemed unlikely that changes to the base and disc would have any effect on salt spray performance. Bear in mind that the Fluid Resistance test invoked above included a saturated salt solution, helping to prove that chemical attack will not be an issue; furthermore the environmental sealing system has not been changed in any way providing confidence that salt ingress during salt spray testing will not be an issue either.

III. I. Vibration.

Changes to the base and disc should have no effect on vibration performance.

III. J. Terminal Strength.

The terminal strength test will be performed per the ES, with the exception that no devices will undergo the Fluid Resistance Test (M.) beforehand.

III. K. Vacuum.

Changes to the base and disc should have no effect on vacuum performance.

III. L. Temperature Cycle.

Extensive thermal characterizations have been performed on several materials recently, including the Celanex 4300 PBT material presently used on F2VC-9F924-AB, as well as Ultem, Noryl, and Fortron. While these results are presently undocumented officially, the consistently higher performance of Noryl in terms of dimensional stability relative to Celanex during these tests gives high confidence that changes to the base should have no effect on Thermal Cycle performance.

921409

Appendix 4.2
Data # 242

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

PRESSURE SWITCH DATA Form 21605 TEST NO. 242-03-24

DEVICE	DATE REQUESTED	REQUESTED BY	REQUESTED COMPL. DATE
77PSL3-1	920410	Steve Official	
PERFORMED BY	**DATE STARTED**	**DATE COMPLETED**	**APPROVED BY**
Jeffrey D. Domenico	920410	920413	

PROJECT TITLE: Speed Control

CUSTOMER:

PURPOSE OF TEST: Partial ISR of 77PSL3-1

PROCEDURE: Impulse test, see Ford ES of 24 production devices

Device #	Init Act - Rel		Post Act - Rel	Mv drop					
242-03-01	119 - 102	I	91 - 89	10.3 ✓					
-02	133 - 119		126 - 110	9.6					
-03	136 - 101	M	124 - 102	5.6					
-04	135 - 114	P	127 - 110	3.6					
-05	129 - 116	6	123 - 107	15.9					
-06	132 - 103	+	129 - 103	3.3					
-07	126 - 116		119 - 109	6.3					
-08	127 - 113	)	132 - 110	21.5					
-09	121 - 118	e	114 - 107	0.5					
-10	134 - 122		123 - 105	9.7					
-11	140 - 121	T	140 - 104	7.5					
-12	132 - 109	5	129 - 105	9.2					
-13	128 - 115		126 - 105	9.2					
-14	121 - 117	T	125 - 107	10.3					
-15	124 - 109		123 - 108	9.7					
-16	129 - 113		127 - 111	9.8					
-17	125 - 118		119 - 111	9.7					
-18	125 - 110		127 - 109	9.8					
-19	125 - 102		126 - 107	5.6					
-20	116 - 103		115 - 107	7.0					
-21	119 - 113		120 - 113	6.9					
-22	115 - 103		133 - 103	15.1					
-23	112 - 103		120 - 103	6.6					
-24	117 - 101		122 - 101	6.1					

Appendix 4.3
Data # 241

TEST LOT NO.	TEST	DEVICE
TESTED BY		
APPROVED BY	TEXAS INSTRUMENTS — MATERIALS & CONTROLS GROUP, ATTLEBORO, MA 02703	DOC.
DATE -- -- --		PAGE 11

PRESSURE SWITCH DATA Form 21605 TEST NO. 241-11-12

DEVICE	DATE REQUESTED	REQUESTED BY	REQUESTED COMPL. DATE
77PS	920409	Steve Caffrey	
FORMED BY	**DATE STARTED**	**DATE COMPLETED**	**APPROVED BY**
Rich Diercks	920409	920410	

PROJECT TITLE: Speed Control

CUSTOMER:

PURPOSE OF TEST: Part of Noryl base/silent disc validation

PROCEDURE: Production build 77PS with natural Noryl bases and 1st "P" silent discs. Characterize in pressure tester. Run standard typical strength tests per Ford ES and recharacterize.

Device #	Act/Rel	Final Act/Rel
241-11-01	114 - 102	114 - 103
-02	117 - 95	110 - 95
-03	119 - 96	127 - 90
-04	114 - 100	126 - 101
-05	114 - 95	126 - 97
-06	131 - 101	132 - 103
-07	132 - 101	132 - 103
-08	120 - 93	129 - 96
-09	113 - 102	117 - 107
-10	124 - 97	124 - 101
-11	129 - 95	128 - 100
-12	131 - 101	131 - 108

Appendix 4.1
Alert

TEST LOT NO.	TEST	DEVICE
TESTED BY		
APPROVED BY	TEXAS INSTRUMENTS MATERIALS & CONTROLS GROUP ATTLEBORO, MA 02703	DOC.
DATE 91-12-19		PAGE --

FORM 5201

ALERT DETAIL

PRINT DATE/TIME: 91/10/11 09:39
PAGE: 1

ALERT NUMBER
A10146193

TYPE: (U) USE PPH
DATE: 91/10/02
PHONE: 32-37055
NOTICE NO:

ORIGIN ACTIVITY: HC00 CHASSIS PRO (LHCH)
ORIGINATOR: PEASE, R. F.
CPSC: 868605

STATUS: A
LOCATION: RA 3001, BLD005, D
RESOLVING NOTICE:

ALERT DESC: PERMIT TEXAS INSTRUMENTS TO SHIP SPEED CONTROL REDUNDANT DEACTIVATION SWITCH, F2VC-9F924-AB, WITH EXCEPTION TO THE INTENDED MANUFACTURING/ASSEMBLY PROCESS CONSISTING OF

PRODUCTS AFFECTED: 1992 LINCOLN TOWN CAR, CROWN VICTORIA, GRAND MARQUIS WITH NEW GENERATION SPEED CONTROL.

MODEL CODES: CVFA CVFH CVV8
PLANTS AFFECTED: AA17
MFG CONCERN CNTRL:
PROGRAM:
QTY:
EST INCRM VAR COST: -0.92
EST INCRM VAR COST:
UNIT MEASURE:
SUPP DOCS:

MODEL YEAR: 92

ENG CONCERN CNTRL:
EFFECTIVE IN:
TIME: 900 EMISSION CODE: 000
EST INCRM TOOL COST: 0
EST INCRM FAC COST: 0
APPEARANCE:

INVALID:
ONT: T
DISP: W
EST INCRM LSR COST: 0.00
VT EFFECT: 0.0000

---------- AFFECTED PARTS ----------

AFF PART NO:
CPSC: 868605
ACT: INTER:
AFF PART DESC:
NOTICE:
SUPPLY/LOCAL: AVAIL:
SUPPLIER:
AGL ENG: N
FUNC REQD:

---------- FURTHER DESCRIPTION/ALERT RESOLUTION/REASON FOR REJECTION ETC. ----------

USERID: RFP2489 ACTIVITY: HC00 ENTRY DATE: 91/10/02
ALERT DESC:
USING A MANUALLY LOADING SENSOR CRIMPING MACHINE VERSUS THE AUTOMATIC IN LINE LOADED CRIMPER. THE AUTOMATIC CRIMPER HAS BEEN DETERMINED TO HAVE A YET TO BE DEFINED DEFICIENCY THAT RESULTS IN PART FAILURE TO MEET THE REQUIRED NUMBER OF CYCLE IN THE IMPULSE TEST. THE SUPPLIER IS GIVEN A 90 DAY PERIOD TO RESOLVE THE ISSUE. THE MANUALLY CRIMPED PARTS PASS THE ES TEST. THIS DEVIATION PERMITS INCORPORATION OF THE -AB LEVEL SWITCH AND DELETION OF THE INTERIM -BB SWITCH FOR A COST REDUCTION OF 0.92. THE -AB SWITCH IS PIA TO END ITEM

USERID: RFP2489 ACTIVITY: HC00 ENTRY DATE: 91/10/03
ALERT DESC:
PROPORTIONING VALVES F2AC-2B091-BA, F2VC-2B091-CC, AND JUNCTION BLOCK F2AC-2C320-CB.

USERID: LA20684 ACTIVITY: HC00 ENTRY DATE: 91/10/04
ALERT DESC:
OK. SUPVR. APPROVAL REQ'D. IF PAVED IS AFFECTED. LAZ

USERID: BJN5368 ACTIVITY: HC00 ENTRY DATE: 91/10/04
ALERT DESC:

-MORE-

ALERT DETAIL

PRINT DATE/TIME: 91/10/11 09:39
PAGE: 2

ALERT NUMBER
A101641?5

ORIGIN ACTIVITY: MC00 CHASSIS PER (LMC6)
ORIGINATOR: PEASE, B. F.
CPSC: 840409

TYPE: (U) USE PPM
DATE: 91/10/02
PHONE: 32-37955
NOTICE NO:

STATUS: A
LOCATION: RM 3001, BLDG05, 0
RESOLVING NOTICE:

---------- FURTHER DESCRIPTION/ALERT RESOLUTION/REASON FOR REJECTION ETC. ----------

USERID: BJM3348 ACTIVITY: MC00 ENTRY DATE: 91/10/04
ALERT DESC:
PAVES NOT AFFECTED BJM

USERID: JLS1824 ACTIVITY: MC00 ENTRY DATE: 91/10/07
ALERT DESC:
NOTED J SIMMONS 32-37976

---------- APPROVALS ----------

REGION	DEPARTMENT	USERID	ACTIVITY	APPROVER'S NAME	DATE APPROVED	APPROVAL
N	K8647	BFP2409	MC00	PEASE, B. F.	91/10/02	
N	K8647	JLS1824	MC00	SIMMONS, J.L.	91/10/07	Y
N	K8645	LAZ6484	MC00	ZIELINSKI, L.A.	91/10/04	Y
N	K8647	BJM5366	MC00	HAERUFF, B.J.	91/10/04	Y
N	K8648	VSD0370	MC00	BERRAZIA, V.S. (DEPT	91/10/09	Y
N	K8615	AJV6169	MC00	TUHAS, A.J.	91/10/04	Y
N	K8615	RATL	MC00	CHASSIS RATL GATEKEE	91/10/04	Y
N	K8611	PPMALRT	MC00	PPM GATEKEEPER-CHASS	00/00/00	
N	K8647	BFP2409	MC00	PEASE, B. F.	91/10/03	
N	K8678	JGV6164	MC00	VANDERKOOI, J.G. (D	00/00/00	

TI-NHTSA 002612

-END-

Appendix. 4.2
Data # 172

EST LOT NO.	TEST	DEVICE
TESTED BY		
APPROVED BY	TEXAS INSTRUMENTS — MATERIALS & CONTROLS GROUP, ATTLEBORO, MA 02703	DOC.
DATE		PAGE

FORM 1205

PRESSURE SWITCH DATA Form 21605 **TEST NO.** 172-11-34

DEVICE	DATE REQUESTED	REQUESTED BY	REQUESTED COMPL. DATE
7791SL 2-9	11/1/91	Steve Cuff. low	
PERFORMED BY	**DATE STARTED**	**DATE COMPLETED**	**APPROVED BY**
Jeffrey D. Brooning	11/1/91		

PROJECT TITLE: Ford MY'91 Electronic Speed Control Development ES

CUSTOMER:

PURPOSE OF TEST: Review of Validation testing which failed the first time

PROCEDURE: Impulse and Fluid Pressure Test per Ford ES Tests Crimped or hand-held

Pressure	Cycle Time	Hrs/Cyl	Hr Prod	Cust A	Cust B	Cust C	Final		
172.11.34	91 PSI	103/42	5.9	1.57-A	1.50-A	1.46-A	Pass		
35		116/41	6.9	1.55	1.46	1.40			
36		118/41	6.9	1.52	1.44	1.38			
37		108/45	4.6	1.51	1.42	1.37			
38		115/43	4.7	1.53	1.43	1.38		Fluid Pressure and Impulse	
39		120/48	4.2	1.52	1.51	1.41			
40		124/42	5.9	1.55	1.51	1.40			
41		113/44	5.1	1.57	1.47	1.42			
42		125/41	5.6	1.50	1.45	1.41			
43		120/43	5.7	1.51	1.49	1.46			
44		113/50	4.3	1.51	1.48	1.41			
45		114/42	5.5	1.51	1.47	1.41			
172.11.17	91 PSI	117/42	5.7	1.58	1.54	1.49	Pass		
18		111/42	4.5	1.61	1.57	1.52			
19		125/45	5.7	1.58	1.53	1.48			
20		111/42	4.4	1.59	1.55	1.50			
21		118/51	4.7	1.59	1.54	1.46			
22		124/43	5.1	1.63	1.61	1.55			
23		108/53	5.3	1.65	1.57	1.52		Impulse	
24		126/43	5.4	1.63	1.59	1.56			
25		110/47	5.6	1.61	1.56	1.55			
26		124/42	5.2	1.63	1.61	1.59			
27		109/45	4.7	1.52	1.49	1.49			
28		109/43	5.4	1.54	1.45	1.49			

(OVER)

Final Clay

	Proof	Mel/Rel	% Ret	ρ	b	c				
(12-11-17)	Proof	105/54	12.2	1.61	1.25	1.92				
-16		114/52	2.4	1.63	1.36	1.60				
-03		106/56	11.6	1.60	1.05	2.72				
-04		117/58	3.2	1.65	1.37	1.63				
-05		108/56	4.6	1.63	1.40	1.72				
-06		118/57	14.8	1.62	1.33	1.75				
-07		111/55	3.6	1.58	1.32	1.72				
-09		107/58	1.7	1.60	1.34	1.75				
-09		111/56	2.3	1.63	1.36	1.91				
-10		114/58	2.5	1.62	1.39	1.74				
-11		106/60	1.4	1.57	1.33	1.90				
-12	↓	109/56	2.3	1.61	1.35	1.69				
(12-11-17)	Proof	105/58	4.9	1.60	1.25	1.68				
-13		110/59	3.1	1.48	1.24	1.46				
-14		119/62	3.3	1.47	1.25	1.80				
-15		111/58	4.2	1.62	1.27	1.75				
-16		113/59	6.1	1.57	1.27	1.70				
-17		111/60	7.1	1.52	1.28	1.65				
-18		113/57	3.7	1.64	1.36	1.74				
-20		111/62	3.2	1.57	1.37	1.61				
-21		110/59	2.8	1.61	1.33	1.75				
-22		110/59	5.9	1.59	1.29	1.75				
-23		111/59	3.4	1.63	1.30	1.69				
-24	↓	111/58	5.2	1.59	1.32	1.69				

Appendix 4.3
Data # 173

TEST LOT NO.	TEST		DEVICE
TESTED BY			
APPROVED BY	TEXAS INSTRUMENTS	MATERIALS & CONTROLS GROUP ATTLEBORO, MA 02703	DOC.
DATE 01-10-90			PAGE 16

FORM 5256

PRESSURE SWITCH DATA Form 21605 TEST NO. 193-15-24

DEVICE	DATE REQUESTED	REQUESTED BY	REQUESTED COMPL. DATE
7785L3-1	11/1/91	Steve Gaffney	
PERFORMED BY	**DATE STARTED**	**DATE COMPLETED**	**APPROVED BY**
Jeffrey D. Brown	11/2/91		

PROJECT TITLE: Ford MY '91 Electronic Speed Control Production PS

CUSTOMER:

PURPOSE OF TEST: Repeat of Validation testing which failed the first time

PROCEDURE: Ingoke test and Shinkos/Ingoke test set Ford ES. All parts ground to MMT

Device #	Switch Points	Act/Rel	Hysteresis	A	B	C	Pass		
193-15-01	3110	121/117	3.7	1.96	1.88	1.92	yes		
-02		119/113	6.3	1.92	1.87	1.92			
-03		123/118	5.3	1.84	1.82	1.79			
-04		123/117	6.3	1.96	1.89	1.79			
-05		119/113	5.6	1.88	1.82	1.77			
-06		120/114	6.1	1.93	1.80	1.79		End	Res
-07		121/115	6.4	1.93	1.82	1.75			
-08		126/119	6.1	1.92	1.88	1.79		end	Ingoke
-09		123/118	5.3	1.84	1.80	1.75			
-10		123/117	5.0	1.96	1.81	1.78			
-11		121/114	6.8	1.88	1.82	1.83			
-12		115/108	6.2	1.92	1.78	1.78			
193-15-13	3110	121/115	5.7	1.78	1.76	1.79	Case		
-14		122/117	5.4	1.90	1.84	1.76			
-15		118/111	6.3	1.80	1.86	1.81			
-16		125/119	6.0	1.75	1.96	1.84			
-17		123/117	6.1	1.78	1.91	1.69			
-18		118/112	5.9	1.89	1.84	1.83			
-19		129/123	6.5	1.87	1.92	1.80		Ingoke	
-20		124/118	5.7	1.87	1.90	1.80			
-21		123/117	5.9	1.89	1.88	1.79			
-22		118/111	6.8	1.79	1.89	1.75			
-23		117/110	6.7	1.87	1.89	1.82			
-24		119/112	6.8	1.88	1.88	1.80			

(OVER)

Final Clot

	Prod #	Batch/Lot	Inv Dep	Comp A	Comp B	Comp C				
7/23-11-01	Pace	111/60	6.3	2.07**	1.52	1.69				
-02		112/59	2.3	1.55	1.28	1.56				
-11		113/57	2.0	1.92	1.41	2.69				
-09		116/58	1.9	1.60	1.37	1.67				
-05		117/60	5.9	1.91	1.42	1.61				
-04		115/56	3.0	1.75	1.45	1.61				
-07		114/62	20.5	1.86	1.38	1.65				
-08		110/59	1.9	1.53	1.30	1.69				
-09		118/57	4.2	1.58	1.27	1.61				
-10		119/59	24.2	1.95	1.55	1.71				
-11		120/58	4.5	1.60	1.34	1.68				
-12	▼	109/57	9.6	1.64	1.35	1.78				
7/24-45-11	Pace	122/59	2.0	1.60	1.27	1.75				
-10		123/60	29.2	1.69	1.42	1.59				
-07		126/58	4.5	1.61	1.27	1.70				
-06		121/54	23.6	1.45	1.25	1.96				
-13		125/56	5.9	1.56	1.25	1.71				
-11		124/57	2.3	1.55	1.29	1.93				
-14		129/59	23.6	1.99	1.28	1.77				
-01		127/61	1.8	1.58	1.26	1.79				
-02		128/58	24.4	1.72	1.47	1.78				
-03		130/55	27.2	1.58	1.28	1.75				
-04		131/56	4.03	1.75	1.46	1.70				
-05	▼	132/55	25.1	1.61	1.29	1.69				

Appendix 4.4
Fluid Resistance

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

FORM 5305

TEST NO. 109832

TECHNICAL SERVICE LABS

11/4/91

TEST NO. 109832

	129
	101
	060
	L. OFFILLER
	12-29
	1382
	3604
	91-11-04
	91-12-12
	14
	MIXED

STATE YOUR PROBLEM/SAMPLE DESCRIPTION

SAMPLES ARE 7795 PASSENGER SWITCHES WITH LEADS & END PLUGS

INFORMATION DESIRED: 3548

PLEASE PERFORM FLUID RESISTANCE - TEST PER FORD MOTOR CO. SPEC ES-FIVE-9F924-AA (ATTACHED)

REPORT OF RESULTS:

DATE RECEIVED 11/5/91 DATE OUT 12-12

TECHNICIAN			
HOURS WORKED			
PROCESSING LABS			

*PCC I.D.

MC=325	TM=431	JCCY=126	FACL=514
PC=127	WIRE=438	CLKE=122	FACL=531
VERS=168	EPD=821	CAN=854	FACL=531
AFCC=483	PEP=662	AD DEV=396	STAFF=855
MID=430	CSD=835	EMCO=477	

DISTRIBUTION: White and Yellow - Lab Pink - Requester

-MSG M#= 174460 FR=GAMY TO=COPY SENT=11/03/94 09:13 AM
ST=C DIV=0050 CC=00149 BY=GAMY AT=11/03/94 09:06 AM

To: SHAWN MURDOCH

From: Elaine Rose

Subj: CAPABILITY STUDIES

THE FOLLOWING PAGES ARE ON THE BASE LOCKING TABS "SC" DIM. 8.30-8.72 2X. PLEASE NOTICE HALFWAY DOWN THE PAGE IS A NOTE SECTION, IN IT I HAVE IDENTIFIED THE CAVITY LETTER AND WHETHER IT IS THE GATE OR THE VENT SIDE OF EACH.

I HOPE THIS EXPLAINS EVERYTHING,PLEASE FEEL FREE TO CALL ME IF YOU HAVE ANY QUESTIONS ON THESE.

REGARDS,

ELAINE ROSE
(508) 236-1907

-MSG M#= 174460 FR=GAMY TO=GAMY SENT=11/03/94 09:13 AM
R#=194 ST=C DIV=0050 CC=00149 BY=GAMY AT=11/03/94 09:06 AM

To: SHAWN MURDOCH

From: Elaine Rose GAMY

Subj: CAPABILITY STUDIES

THE FOLLOWING PAGES ARE ON THE BASE LOCKING TABS "SC" DIM. 8.30-8.72 2X. PLEASE NOTICE HALFWAY DOWN THE PAGE IS A NOTE SECTION, IN IT I HAVE IDENTIFIED THE CAVITY LETTER AND WHETHER IT IS THE GATE OR THE VENT SIDE OF EACH.

I HOPE THIS EXPLAINS EVERYTHING,PLEASE FEEL FREE TO CALL ME IF YOU HAVE ANY QUESTIONS ON THESE.

REGARDS,

ELAINE ROSE
(508) 236-1907

-MSG M#= 460590 FR=1SKW TO=KERN SENT=10/14/94 06:43 AM
R#=187 ST=C DIV=0050 CC=00102 BY=1SKW AT=10/14/94 06:43 AM

To: Jim kern KERN

From: SWALTERS 1skw

Subj: CAPABILITY STUDY

-MSG M#= 182270 FR=GAMY TO=1SKW SENT=10/06/94 10:25 AM
R#=011 ST=C DIV=0050 CC=00102 BY=GAMY AT=10/06/94 10:18 AM

To: Steve Walters 1SKW

Copy: Jim Watt JW02 Andrew McQuirk ACM1

From: Elaine Rose GAMY

Subj: CAPABILITY STUDY

DUE TO THE FACT THAT THE LOCKING TAB IS CONSIDERED A SIGNIFICANT CHARACTERISTIC TO FORD, COULD YOU PLEASE PROVIDE ME WITH THE FOLLOWING:

BASE # 46515-3 SPEC. .327-.343

50 PCS. PER CAVITY 2X EACH

I WILL NEED THIS BY 10/21/94.

THANK YOU
REGARDS,
ELAINE X:1907 ms 12-27

TEXAS INSTRUMENTS

PAGE 1 OF 2

SAMPLE REPORT

REASON FOR REPORT	VENDOR	P.O.	PART NO.	REV.
NEW PART			16575-3	F
REPLACEMENT TOOL	REPORT REC. BY	DATE	INSPECTED BY	DATE
CORRECTED TOOL	ELAINE ROSE		67210	10-18-79
REPAIRED TOOL				
REVISED				
OTHER				

G- GATE
V- VENT

THE DIMENSIONS INDICATED BELOW REPRESENT TEXAS INSTRUMENTS' FINDINGS REGARDING THE ACTUAL VALUES FOR ALL CHARACTERISTICS MEASURED. IN CASES WHERE ACTUAL VALUES DEVIATE FROM THE SPECIFIED DIMENSIONS, THE DISPOSITION MUST INDICATE THE REQUIRED ACTION FOR EACH NON-CONFORMANCE IN THE APPROPRIATE COLUMN.

SPECIAL VERNIER

	CIRCLE ALL OUT OF TOLERANCE DIMENSIONS						DISPOSITION			
	.329-.343	A G ✓	A V ✓	B G	B V	C G	C V ✓	D G	D V ✓
1		.337	.336	.337	.336	.335	.334	.335	.335
2		.335	.337	.336	.337	.335	.336	.335	.336
3		.334	.335	.334	.337	.336	.336	.336	.337
4		.336	.337	.336	.338	.336	.338	.335	.335
5		.337	.336	.337	.336	.335	.337	.335	.336
6		.336	.338	.335	.335	.336	.337	.334	.335
7		.334	.336	.336	.338	.336	.336	.335	.335
8		.335	.339	.335	.337	.337	.338	.336	.335
9		.336	.335	.335	.337	.335	.337	.336	.334
10		.336	.336	.335	.338	.335	.337	.335	.336
11		.335	.337	.334	.336	.335	.337	.337	.337
12		.337	.335	.334	.335	.336	.338	.338	.336
13		.336	.338	.336	.338	.335	.335	.335	.336
14		.335	.337	.334	.334	.337	.336	.335	.336
15		.337	.336	.335	.337	.335	.336	.335	.335
16		.335	.337	.337	.336	.335	.336	.336	.337
17		.336	.337	.337	.336	.335	.335	.336	.338
18		.338	.337	.334	.336	.335	.336	.335	.336
19		.337	.335	.336	.337	.336	.338	.334	.338
20		.335	.338	.335	.337	.336	.339	.334	.336
21		.336	.337	.336	.337	.336	.337	.334	.336
22		.334	.338	.336	.338	.336	.337	.336	.338
23		.337	.335	.337	.336	.338	.337	.336	.338
24		.337	.337	.335	.336	.338	.336	.336	.337
25		.336	.337	.335	.336	.336	.339	.335	.334

REMARKS AND/OR INSTRUCTIONS:

DISPOSITION: TOOL APPROVED FOR PROD.	RESUBMISSION REQ'D
PE. ENG.:	QRA ENG.:
	PURCH. AGENT:

TI-NHTSA 002824

TEXAS INSTRUMENTS

SAMPLE REPORT

REASON FOR REPORT		VENDOR	P.O.	PART NO.	REV.
NEW PART				4685-3	P
REPLACEMENT TOOL		REPORT REC. BY / DATE	INSPECTED BY	DATE
CORRECTED TOOL		BLAZAK Rost	6210	10-18-77
REPAIRED TOOL				
REVISED		THE DIMENSIONS INDICATED BELOW REPRESENT TEXAS INSTRUMENTS' FINDINGS REGARDING THE ACTUAL VALUES FOR ALL CHARACTERISTICS MEASURED. IN CASES WHERE ACTUAL VALUES DEVIATE FROM THE SPECIFIED DIMENSIONS, THE DISPOSITION MUST INDICATE THE REQUIRED ACTION FOR EACH NON-CONFORMANCE IN THE APPROPRIATE COLUMN.			
OTHER					
G- GATE		SPECIAL VERNIERS			
V- VENT					

	(CIRCLE ALL OUT OF TOLERANCE DIMENSIONS) ✓					✓ DISPOSITION			
	.327-.349	A G	A V	B G	B V	C G	C V	D G	D V
26		.335	.334	.337	.336	.336	.336	.337	.337
27		.336	.337	.334	.336	.335	.335	.335	.335
28		.334	.336	.335	.337	.337	.337	.337	.337
29		.336	.338	.335	.337	.337	.337	.336	.336
30		.337	.338	.336	.337	.337	.338	.337	.335
31		.335	.337	.336	.335	.335	.336	.336	.337
32		.338	.335	.335	.335	.338	.339	.336	.336
33		.336	.336	.336	.337	.336	.337	.336	.338
34		.336	.335	.336	.336	.336	.336	.337	.337
35		.336	.334	.336	.336	.337	.337	.335	.336
36		.335	.336	.335	.336	.337	.337	.336	.336
37		.336	.338	.336	.338	.335	.337	.336	.337
38		.336	.336	.339	.335	.337	.337	.336	.336
39		.337	.337	.335	.336	.337	.336	.336	.338
40		.336	.336	.336	.336	.336	.336	.337	.337
41		.335	.335	.336	.337	.336	.337	.335	.336
42		.335	.337	.335	.335	.336	.335	.336	.337
43		.336	.336	.337	.337	.337	.336	.336	.335
44		.335	.337	.335	.335	.337	.336	.336	.336
45		.335	.337	.336	.336	.337	.335	.336	.337
46		.336	.337	.335	.336	.336	.336	.337	.336
47		.337	.336	.336	.336	.337	.338	.337	.337
48		.336	.338	.336	.337	.337	.337	.337	.338
49		.335	.337	.336	.335	.335	.337	.337	.338
50		.335	.338	.336	.335	.335	.336	.336	.335

REMARKS AND/OR INSTRUCTIONS:

DISPOSITION: TOOL APPROVED FOR PROD.		RESUBMISSION REQ'D	
PD. ENG.:		QRA ENG.:	
		PURCH. AGENT:	

PART SETTINGS

PART,CHR,CHR CODE
1 1 101

CHR CODE 101
46515-3
[1] 1

101	1	0.337
101	2	0.335
101	3	0.334
101	4	0.336
101	5	0.337
101	6	0.336
101	7	0.334
101	8	0.335
101	9	0.336
101	10	0.336
101	11	0.335
101	12	0.337
101	13	0.336
101	14	0.335
101	15	0.337
101	16	0.335
101	17	0.336
101	18	0.338
101	19	0.337
101	20	0.335
101	21	0.336
101	22	0.334
101	23	0.337
101	24	0.337
101	25	0.336

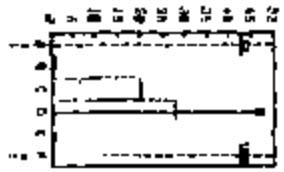
CHR 101
X̄ 0.33588
R 0.00400
TIME10/20/94 08:57

CHR CODE 101
46515-3
L 01 2

101	1	0.335
101	2	0.336
101	3	0.334
101	4	0.336
101	5	0.337
101	6	0.335
101	7	0.335
101	8	0.336
101	9	0.336
101	10	0.334
101	11	0.335
101	12	0.336
101	13	0.336
101	14	0.337
101	15	0.336
101	16	0.335
101	17	0.335
101	18	0.336
101	19	0.335
101	20	0.335
101	21	0.336
101	22	0.337
101	23	0.336
101	24	0.335
101	25	0.335

CHR 101
X̄ 0.33548
R 0.00400
TIME10/20/94 09:01

CHR CODE 101
46515-3
SUBGROUP NO.
1~ 2
MAXIMUM
0.338
MINIMUM
0.333



LSL
0.32700
X̄
0.33568
USL
0.34300

A	~	0.3314	0
B		0.3315~	1
C		0.3335~	20
D		0.3355~	28
E		0.3375~	1
F		0.3395~	0
		TOTAL	50

CHR CODE 101
46515-3
SUBGROUP CHART
X̄ R
SAMPLE SIZE
2
SUBGROUP NO.
1~ 2
NUMBER OF DATA
50
MAXIMUM
0.339
MINIMUM
0.333
RANGE
0.005
MEAN
0.33568
STANDARD DEV(σ)
0.00301
Cp
2.620
Cpk
2.397
Cm
2.560
Cmk
2.348
DEFECT (%)
0.000 %
ENT,DEFECT (%)
0.000 %

Cav A
Gate

TL-NHT8A 002026

PART SETTINGS

PART,CHR,CHR CODE
1 2 101~102

CHR CODE 102
46515-3
[1] 1

102	1	0.336
102	2	0.337
102	3	0.335
102	4	0.337
102	5	0.336
102	6	0.338
102	7	0.336
102	8	0.339
102	9	0.335
102	10	0.336
102	11	0.337
102	12	0.335
102	13	0.338
102	14	0.337
102	15	0.336
102	16	0.337
102	17	0.337
102	18	0.337
102	19	0.335
102	20	0.338
102	21	0.337
102	22	0.338
102	23	0.335
102	24	0.337
102	25	0.337

CHR 102
X̄ 0.33664
R 0.00400
TIME10/20/94 09:17

CHR CODE 102
46515-3
[0] 2

102	1	0.338
102	2	0.337
102	3	0.336
102	4	0.338
102	5	0.338
102	6	0.337
102	7	0.335
102	8	0.336
102	9	0.338
102	10	0.334
102	11	0.336
102	12	0.338
102	13	0.336
102	14	0.337
102	15	0.336
102	16	0.335
102	17	0.337
102	18	0.336
102	19	0.337
102	20	0.337
102	21	0.337
102	22	0.336
102	23	0.338
102	24	0.337
102	25	0.338

CHR 102
X̄ 0.33672
R 0.00400
TIME10/20/94 09:20

CHR CODE 102
46515-3
SUBGROUP NO.
1~ 2
MAXIMUM
0.339
MINIMUM
0.334

LSL
0.32700
X̄
0.33668
USL
0.34300

A	~	0.3324	0
B		0.3325~	1
C		0.3345~	19
D		0.3365~	29
E		0.3385~	1
F		0.3405~	0
		TOTAL	50

CHR CODE 102
46515-3
CONTROL CHART
X̄-R
SAMPLE SIZE
25
SUBGROUP NO.
1~ 2
NUMBER OF DATA
50
MAXIMUM
0.339
MINIMUM
0.334
RANGE
0.005
MEAN
0.33668
DEVIATION σ(R)
0.00181
Cp
2.620
Cpk
2.070
Cm
2.432
Cmk
1.921
DEFECT (*)
0.000 *
EST,DEFECT (*)
0.000 *

CAV A
Vent

PART SETTINGS

PART,CHR,CHR CODE
1 3 101-103

CHR CODE 103
46515-3
[1]]

103	1	0.337
103	2	0.336
103	3	0.334
103	4	0.336
103	5	0.337
103	6	0.335
103	7	0.336
103	8	0.335
103	9	0.335
103	10	0.335
103	11	0.334
103	12	0.334
103	13	0.336
103	14	0.334
103	15	0.335
103	16	0.337
103	17	0.337
103	18	0.334
103	19	0.336
103	20	0.335
103	21	0.336
103	22	0.336
103	23	0.337
103	24	0.335
103	25	0.335

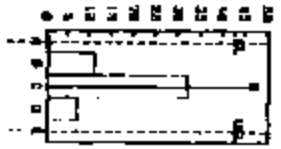
CHR 103
X̄ 0.33548
R 0.00300
TIME10/20/94 09:29

CHR CODE 103
46515-3
I 01 2

103	1	0.337
103	2	0.334
103	3	0.335
103	4	0.335
103	5	0.336
103	6	0.336
103	7	0.335
103	8	0.336
103	9	0.336
103	10	0.336
103	11	0.335
103	12	0.336
103	13	0.333
103	14	0.335
103	15	0.334
103	16	0.336
103	17	0.335
103	18	0.337
103	19	0.335
103	20	0.334
103	21	0.335
103	22	0.334
103	23	0.336
103	24	0.336
103	25	0.334

CHR 103
X̄ 0.33524
R 0.00400
TIME10/20/94 09:32

CHR CODE 103
46515-3
SUBGROUP NO.
1~ 2
MAXIMUM
0.337
MINIMUM
0.333



LSL
0.32700
X̄
0.33536
USL
0.34300

A	~	0.3324	0
B		0.3325~	11
C		0.3345~	32
D		0.3365~	7
E		0.3385~	0
		TOTAL	50

CHR CODE 103
46515-3
CONTROL CHART
X̄-R
SAMPLE SIZE
25
SUBGROUP NO.
1~ 2
NUMBER OF DATA
50
MAXIMUM
0.337
MINIMUM
0.333
RANGE
0.004
MEAN
0.33536
DEVIATION σ(R)
0.00089
Cp
2.995
Cpk
2.880
Cm
2.600
Cmk
2.483
DEFECT (%)
0.000 %
EST,DEFECT (%)
0.000 %

Ken B Gate

TI-NHTSA 002828

PART SETTINGS

PART,CHR,CHR CODE
1 4 101-104

CHR CODE 104
46515-3
[1] 1

104	1	0.338
104	2	0.337
104	3	0.337
104	4	0.338
104	5	0.336
104	6	0.335
104	7	0.338
104	8	0.337
104	9	0.337
104	10	0.338
104	11	0.336
104	12	0.335
104	13	0.338
104	14	0.334
104	15	0.337
104	16	0.336
104	17	0.336
104	18	0.336
104	19	0.337
104	20	0.337
104	21	0.337
104	22	0.338
104	23	0.336
104	24	0.336
104	25	0.338

CHR 104
X 0.33656
R 0.00400
TIME10/20/94 09:59

CHR CODE 104
46515-3
[0] 2

104	1	0.338
104	2	0.335
104	3	0.337
104	4	0.337
104	5	0.337
104	6	0.335
104	7	0.335
104	8	0.337
104	9	0.336
104	10	0.338
104	11	0.338
104	12	0.338
104	13	0.335
104	14	0.336
104	15	0.338
104	16	0.337
104	17	0.335
104	18	0.337
104	19	0.335
104	20	0.336
104	21	0.336
104	22	0.336
104	23	0.337
104	24	0.335
104	25	0.335

CHR 104
X 0.33604
R 0.00300
TIME10/20/94 10:06

CHR CODE 104
46515-3
SUBGROUP NO.
1~ 2
MAXIMUM
0.338
MINIMUM
0.334

LSL
0.32700
X
0.33630
USL
0.34300

A	~	0.3334	0
B		0.3335~	11
C		0.3355~	33
D		0.3375~	6
E		0.3395~	0
		TOTAL	50

CHR CODE 104
46515-3
CONTROL CHART
X-R
SAMPLE SIZE
25
SUBGROUP NO.
1~ 2
NUMBER OF DATA
50
MAXIMUM
0.338
MINIMUM
0.334
RANGE
0.004
MEAN
0.33630
DEVIATION σ[R]
0.00069
Cp
2.995
Cpk
2.508
Cm
2.680
Cmk
2.244
DEFECT (x)
0.000 x
EST.DEFECT (x)
0.000 x

Can B
Vent

TI-NHTSA 002628

PART SETTINGS

PART,CHR,CHR CODE
1 5 101-105

CHR CODE 105
46515-3
[11] 1

105	1	0.333
105	2	0.335
105	3	0.336
105	4	0.336
105	5	0.335
105	6	0.336
105	7	0.336
105	8	0.337
105	9	0.335
105	10	0.335
105	11	0.335
105	12	0.336
105	13	0.335
105	14	0.337
105	15	0.335
105	16	0.335
105	17	0.335
105	18	0.335
105	19	0.336
105	20	0.336
105	21	0.336
105	22	0.336
105	23	0.338
105	24	0.338
105	25	0.336

CHR 105
x̄ 0.33522
R 0.00500
TIME10/20/94 10:23

CHR CODE 105
46515-3
[0] 2

105	1	0.334
105	2	0.335
105	3	0.337
105	4	0.337
105	5	0.337
105	6	0.335
105	7	0.338
105	8	0.336
105	9	0.336
105	10	0.337
105	11	0.337
105	12	0.335
105	13	0.337
105	14	0.337
105	15	0.336
105	16	0.336
105	17	0.334
105	18	0.337
105	19	0.337
105	20	0.337
105	21	0.336
105	22	0.337
105	23	0.337
105	24	0.335
105	25	0.335

CHR 105
x̄ 0.33620
R 0.00400
TIME10/20/94 10:27

CHR CODE 105
46515-3
SUBGROUP NO.
1~ 2
MAXIMUM
0.338
MINIMUM
0.333

LSL
0.32700
x̄
0.33596
USL
0.34300

A	~	0.3314	0
B		0.3315~	1
C		0.3335~	12
D		0.3355~	29
E		0.3375~	8
F		0.3395~	0
		TOTAL	50

CHR CODE 105
46515-3
CONTROL CHART
x̄-R
SAMPLE SIZE
25
SUBGROUP NO.
1~ 2
NUMBER OF DATA
50
MAXIMUM
0.338
MINIMUM
0.333
RANGE
0.005
MEAN
0.33596
DEVIATION σ(R)
0.00114
Cp
2.329
Cpk
2.049
Cm
2.452
Cmk
2.158
DEFECT (x)
0.000 x
EST,DEFECT (x)
0.000 x

Cav C
Gate

TI-NHTBA 002830

PART SETTINGS

PART,CHR,CHR CODE
1 8 101-106

CHR CODE 106
46515-3
[1] 1

106	1	0.334
106	2	0.336
106	3	0.336
106	4	0.338
106	5	0.337
106	6	0.337
106	7	0.336
106	8	0.338
106	9	0.337
106	10	0.337
106	11	0.337
106	12	0.338
106	13	0.335
106	14	0.336
106	15	0.336
106	16	0.336
106	17	0.335
106	18	0.336
106	19	0.338
106	20	0.339
106	21	0.337
106	22	0.337
106	23	0.337
106	24	0.336
106	25	0.339

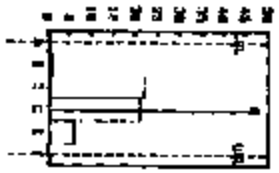
CHR 106
X̄ 0.33672
R 0.00500
TIME10/20/94 10:37

CHR CODE 106
46515-3
[01] 2

106	1	0.336
106	2	0.335
106	3	0.338
106	4	0.337
106	5	0.338
106	6	0.336
106	7	0.339
106	8	0.339
106	9	0.336
106	10	0.339
106	11	0.339
106	12	0.337
106	13	0.337
106	14	0.336
106	15	0.336
106	16	0.337
106	17	0.335
106	18	0.336
106	19	0.336
106	20	0.335
106	21	0.336
106	22	0.338
106	23	0.337
106	24	0.338
106	25	0.336

CHR 106
X̄ 0.33688
R 0.00400
TIME10/20/94 10:40

CHR CODE 106
46515-3
SUBGROUP NO.
1~ 2
MAXIMUM
0.339
MINIMUM
0.334



LSL
0.32700
X̄
0.33688
USL
0.34300

A	~	0.3324	0
B		0.3325~	1
C		0.3345~	22
D		0.3365~	21
E		0.3385~	6
F		0.3405~	0
		TOTAL	50

CHR CODE 106
46515-3
CONTROL CHART
X̄-R
SAMPLE SIZE
25
SUBGROUP NO.
1~ 2
NUMBER OF DATA
50
MAXIMUM
0.339
MINIMUM
0.334
RANGE
0.005
MEAN
0.33688
DEVIATION σ(n)
0.00114
Cp
2.329
Cpk
1.805
Cm
2.141
Cmk
1.659
DEFECT (z)
0.000 x
EST,DEFECT (z)
0.000 x

Cav C
Vent

TI-NHTSA 002631

PART SETTINGS

PART,CHR,CHR CODE
1 7 101-107

CHR CODE 107
46515-3
[1] 1

107	1	0.335
107	2	0.335
107	3	0.336
107	4	0.335
107	5	0.335
107	6	0.334
107	7	0.335
107	8	0.336
107	9	0.336
107	10	0.335
107	11	0.337
107	12	0.338
107	13	0.335
107	14	0.335
107	15	0.335
107	16	0.336
107	17	0.336
107	18	0.335
107	19	0.334
107	20	0.334
107	21	0.334
107	22	0.336
107	23	0.336
107	24	0.336
107	25	0.335

CHR 107
X 0.33536
R 0.00400
TIME10/20/94 10:

CHR CODE 107
46515-3
[0] 2

107	1	0.337
107	2	0.335
107	3	0.337
107	4	0.336
107	5	0.337
107	6	0.338
107	7	0.336
107	8	0.336
107	9	0.337
107	10	0.335
107	11	0.336
107	12	0.336
107	13	0.336
107	14	0.336
107	15	0.337
107	16	0.335
107	17	0.335
107	18	0.336
107	19	0.336
107	20	0.336
107	21	0.337
107	22	0.337
107	23	0.337
107	24	0.337
107	25	0.336

CHR 107
X 0.33620
R 0.00200
TIME10/20/94 10:53

CHR CODE 107
46515-3
SUBGROUP NO.
1~ 2
MAXIMUM
0.338
MINIMUM
0.334

LSL
0.32700
X
0.33578
USL
0.34300

A	0.3334	0
B	0.3335~	13
C	0.3355~	30
D	0.3375~	1
E	0.3395~	0
	TOTAL	50

CHR CODE 107
46515-3
CONTROL CHART
X-R
SAMPLE SIZE
25
SUBGROUP NO.
1~ 2
NUMBER OF DATA
50
MAXIMUM
0.338
MINIMUM
0.334
RANGE
0.004
MEAN
0.33578
DEVIATION σ(R)
0.00076
Cp
3.494
Cpk
3.153
Cm
2.860
Cmk
2.581
DEFECT (ppm)
0.000 ppm
EST,DEFECT (ppm)
0.000 ppm

Cav D
Gate

PART SETTINGS

PART,CHR,CHR CODE
1 8 101-108

CHR CODE 108
46515-3
[1] 1

108	1	0.335
108	2	0.336
108	3	0.337
108	4	0.335
108	5	0.336
108	6	0.335
108	7	0.335
108	8	0.335
108	9	0.334
108	10	0.336
108	11	0.337
108	12	0.336
108	13	0.336
108	14	0.336
108	15	0.335
108	16	0.337
108	17	0.338
108	18	0.336
108	19	0.338
108	20	0.336
108	21	0.336
108	22	0.338
108	23	0.338
108	24	0.337
108	25	0.334

CHR 108
X̄ 0.33608
R 0.00400
TIME10/20/94 11:00

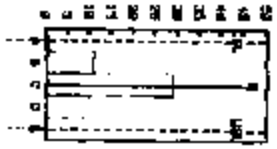
TI-NHTSA 002633

CHR CODE 108
46515-3
[0] 2

108	1	0.337
108	2	0.338
108	3	0.338
108	4	0.338
108	5	0.335
108	6	0.337
108	7	0.338
108	8	0.336
108	9	0.337
108	10	0.338
108	11	0.336
108	12	0.337
108	13	0.336
108	14	0.338
108	15	0.337
108	16	0.336
108	17	0.337
108	18	0.335
108	19	0.336
108	20	0.337
108	21	0.336
108	22	0.337
108	23	0.338
108	24	0.338
108	25	0.335

CHR 108
X̄ 0.33668
R 0.00300
TIME10/20/94 11:04

CHR CODE 108
46515-3
SUBGROUP NO.
1~ 2
MAXIMUM
0.338
MINIMUM
0.334



LSL
0.32700
X̄
0.33638
USL
0.34300

A	0.3334~	0
B	0.3335~	21
C	0.3355~	29
D	0.3375~	10
E	0.3395~	0
	TOTAL	50

CHR CODE 108
46515-3
CONTROL CHART
R-R
SAMPLE SIZE
25
SUBGROUP NO.
1~ 2
NUMBER OF DATA
50
MAXIMUM
0.338
MINIMUM
0.334
RANGE
0.004
MEAN
0.33638
DEVIATION σ(R)
0.00089
Cp
2.995
Cpk
2.478
Cm
2.374
Cmk
1.965
DEFECT (%)
0.000 %
EST.DEFECT (%)
0.000 %

Can D
Vent

TEXAS INSTRUMENTS

PAGE ____ OF ____

SAMPLE REPORT

REASON FOR REPORT		VENDOR		P.O.	PART NO.	REV.
NEW PART					77PS42-1	
REPLACEMENT TOOL.		REPORT REC. BY	DATE	INSPECTED BY		DATE
CORRECTED TOOL.				Bob Wiley		9-20-7
REPAIRED TOOL.						
REVIEW						
OTHER						

THE DIMENSIONS INDICATED BELOW REPRESENT TEXAS INSTRUMENTS' FINDINGS REGARDING THE ACTUAL VALUES FOR ALL CHARACTERISTICS MEASURED. IN CASES WHERE ACTUAL VALUES DEVIATE FROM THE SPECIFIED DIMENSIONS, THE DISPOSITION MUST INDICATE THE REQUIRED ACTION FOR EACH NON-CONFORMANCE IN THE APPROPRIATE COLUMN.

	CIRCLE ALL OUT OF TOLERANCE DIMENSIONS	1	2	3	4	DISPOSITION 5	6
①	11.92 - 11.60	~~11.64~~ 11.67	~~11.64~~ 11.68	~~11.64~~ 11.69	~~11.64~~ 11.69	~~11.60~~ 11.70	~~11.60~~ 11.69
②	1.45 - 1.29	1.43	1.48	1.89	1.33	1.26	1.31
③	19.81 - 19.45	19.64	19.62	19.64	19.64	19.60	19.66
④	16.76 - 16.56	16.63	16.62	16.64	16.64	16.64	16.65
⑤	3.05 - 2.84	2.93	2.91	2.91	2.91	2.91	2.90
⑥	11.90 - 11.40	11.79	11.76	11.79	11.78	11.77	11.78
⑦	3.10 - 2.79	2.83 2.84	2.84 2.85	2.83 2.84	2.84 2.85	2.86 2.86	2.89 2.85
⑧	8.30 - 8.02	8.45 8.27	8.43 8.36	8.54 8.57	8.45 8.31	8.31 8.35	8.30 8.31
⑨	Color Brown	✓	✓	✓	✓	✓	✓
⑩	2.08 - 1.85	2.685	2.695	2.685	2.660	2.705	2.685
~~⑪~~	No Flash or Burrs						
⑫	2.21 - 1.80	1.98	1.83	2.02	1.82	1.80	1.80
⑬	40°-50° Chamfer	40°					

REMARKS AND/OR INSTRUCTIONS:

Also PP3

DISPOSITION: TOOL APPROVED FOR PROD. | RESUBMISSION REQ'D

MFG. ENG.: | ORA ENG.:

PURCH. AGENT:

TI-NHTSA 002634

HIGHLIGHTS

Stephen B. Offiler
Week Ending 91-09-20

FORD MY'92 ELECTRONIC SPEED CONTROL DEACTIVATE PS

VALIDATION:

Rough drafts of both the Pass Car and Light Truck ISR reports are complete; final reports are being slightly delayed by the Humidity test. This should have completed yesterday (Thurs.), however, the chamber in ETL was hit by an electrical disturbance during a thunderstorm Tuesday night and shut down. We had completed three full cycles at this point, so another seven were required after re-start. This will complete this afternoon at 4:30pm. Jeff has been scheduled to work until 6:30 tonight to finish final characterization on these devices so the reports can be finalized.

Unfortunately, problems occured in both the Car and Truck devices during the testing; the ES states "all devices must pass." Car is worse, due to the significant difficulties encountered with Kapton life, and the reaction plan which finally led to running 24 manual-built devices on an emergency test without any initial characterizations and without subjecting 12 to Fluid Resistance. It is likely that Pass Car will grant conditional approval at best, or no approval at all, until we straighten out the Kapton problems and re-run the test "by the book". Problems encountered with Truck are much less severe, and hopefully will not prevent approval. The difficulty we had was salt spray failures, where 4 of 6 devices filled with salt solution which caused extremely high current leakage. However, careful scutiny of these devices showed the leak path was via the mating connector, and we have blamed the design of this connector in the writeup.

We plan to fax the final versions of the reports to Joe Schuck so he may prepare for telecon's with Bruce Pease and John Pelkey on Monday morning. The actual finished product will be bound in TI Test Report standard format for inclusion with the rest of the ISR package, and shipped early next week.

KAPTON LIFE:

Now that the CCPS cycler has been freed up by completion of validation, we plan to continue with the various test-lots for Kapton failures. Testing includes devices with limited converter travel (via modified washers); devices with modified hexports to control Kapton clamping and move it outward; and devices with switches versus without switches, which the data strongly suggests as a variable.

SPRING AND STATIONARY TERMINAL BREAKAGE:

When Q.C. ran their QAS pilot test procedure on LT 77's off of the effectivity runs, spring breakage was noted on parts cycled at 640/min on the production cycler. This had never previously been an issue, although until this time all parts have typically been run only in the CCPS cycler at under 130/min. A comparison test was started, using parts picked at random from the effectivity runs, running on the production cycler and the CCPS cycler in parallel. This time, the production cycler turned up not only broken springs, but also broken stationary terminals. Parts on the CCPS cycler have not been completely analyzed, but we do not suspect any problems with these parts. We've cut windows in a couple of devices and took high-speed video of the spring action on both cyclers. This footage will be analyzed as soon as possible to attempt to determine the differences between the cyclers. As far as stationary

HIGHLIGHTS
Stephen B. Offiler
Week Ending 91-09-20

cc: Elaine B.
FYI/PC/LT

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terminal breakage, we've discovered that they were not cut off strip symmetrically on the AMI, and the calibrator was deforming them improperly. Both these issues are being addressed. A toolmaker is presently working to modify the spring bending station on the EA equipment to bring it closer to the spec, which should help minimize bending stresses and breakage.

SAMPLES:
We had an order for 12 parts for Ford Australia which was due to ship on 910917. However, correspondence via fax with the brake engineer, Brent Franks, made it clear that an M10 x 1.0 thread is required. Previous samples used M10 x 1.25, and we have no hexports with the correct thread. I sent a lengthy memo to Brent, copying TI Australia Field Sales and Engineering, explaining the confusion over the thread spec and the schedule slip it has caused. At this point, we need to have hexports made on CNC lathe in order to complete the order.

We have received an urgent request from Hilite Industries / Pitts' head of purchasing for 300 Pass-Car 77's for their validation. They want these devices next Friday. We should be able to meet this need if we crimp sensors on the manual line and correct the problems with the springs and stationary terminals.

-MSG M#= 107979 FR=CZRN TO=PCQA SENT=09/20/91 07:03 AM
R#=095 ST=C DIV=0050 CC=00101 BY=CZRN AT=09/20/91 07:03 AM

SEPTEMBER 19, 1991

TO:	RUSTY STRUBLE	RCS2	CC:	TOM CHARBONEAU	TC
	MIKE DeMATTIA	PCQA		JOHN KOURTESIS	MDES
	CHARLIE DOUGLAS	CPPC		STEVE MAJOR	WHLS
	DICK GARIEPY	MFPC		ANDY McGUIRK	PCQA
	PAUL KOTCH	PRK1		ED O'NEILL	EJON
	JOE LAZARE	JML8		JOE SCHUCK	WHLS
	STEVE OFFILER	SBO1		GARY SNYDER	CPPC
	MATT SELLERS	PCME		MARTHA SULLIVAN	CPPC
	BILL SWEET	PCME		RAY TOURANGEAU	PCME
	JIM WATT	PCQA		BILL CONGDON	MFPC
	TOM BURKE	MFPC		STEVE MCCOOEY	MDES
	CLAIRE BALTHAZAR	PSWT		ELAINE ROSE	PCQA
	MARGA GARANITO	MFPC			

FR: DAVE CZARN ZARN

SJ: FORD CRUISE CONTROL PRESSURE SWITCH START-UP MEETING:
09/19/91 MEETING MINUTES

MEETING

THE NEXT MEETING IS SCHEDULED FOR:

DATE: 09/26 (THURSDAY)
TIME: 10:00 - 11:30 AM **********
PLACE: T.I.P. ROOM *****PLEASE NOTE CHANGE*****
****

PLEASE CALL ME IF YOU ARE NOT ABLE TO ATTEND

---

* = ITEMS THAT ARE NEW OR HAVE BEEN REVISED OR COMPLETED SINCE PREVIOUS MEETING

57 L/T (L5-2)	WHO	WHEN	
Hexport:			
. REPORT ON ELCO ISSUES FROM 7/22 VISIT - 10B21 STEEL/.00015" MIN. PLATE/J512 $/ THREAD CHAMF. ANGLE/THREAD CAP	KOTCH	ONGOING	
* REVISED HEXPORT PRINT W/ RADIUS ON DOGPOINT DIAMETER	OFFILER	07/11	ORIG.
		09/12	REV.
		09/12	COMP.
57 P/C (L5-3)			
Environmental Seal:			
. RECEIVE BLUE P/C GASKETS	SELLERS	TBD	
* DEFINE GAGING TORQUE SPEC W/WEATHERHEAD & K-H	WATT	ON HOLD	
77PS			
Production Issues:			
. PROD. LINE SET-UP (RTE CARDS, ETC)	BALTHAZAR	ONGOING	
. UPDATE PRODUCTION PLANS FOR ALL SWITCHES	DOUGLAS	ONGOING	
. REPORT ON WEEKLY MFG. START-UP MTGS.	SELLERS	ONGOING	

* IS CALIBRATION ACCURACY ACCEPTABLE W.R.T. DEVICE PERFORM. AND MFG. YLDS ?	OFFILER/ SELLERS	08/08 09/26	ORIG. REV.
. UPDATE PARTS LISTS TO ADD AMI-PRODUCED SPACER AS ALTERNATE	OFFILER	10/10	
* LAB IMPULSE TEST LOT W/FAILED SPRINGS	OFFILER	09/20	
* IMPULSE TEST SWITCHES W/CORRECTED STAT. TERM. CUT-OFF	ROSE	TBD	
* REDUCE PIN LENGTH & DEFLECTION REQ'D TO SET STATIONARY CONTACT HEIGHT	SELLERS	TBD	
PV Testing/ISR:			
. COMPLETE TESTING AND REPORT	OFFILER	09/16 09/20	ORIG. REV.
* FAI ON 6 L/T AND 6 P/C SWITCHES	WATT	09/12 09/20	ORIG. REV.
* PROVIDE PROCESS INFO FOR FAI	SELLERS	09/12 09/12	ORIG. COMP.
* GAGE R&R STUDIES	WATT	07/15 09/20	ORIG. REV.
. COMPLETE ISR PACKAGE FOR 09/20 DELIVERY	WATT	09/19	
Manufacturing Equipment:			
* EQUIP. MOVE TO B12	SELLERS	09/12 09/30	ORIG. REV.
* COMPLETE B.A.M. STAKER MODIFICATION	SELLERS/ MCCOOEY	07/31 09/12 09/19	ORIG. REV. COMP.
* MAKE QC P-TESTER COMPAT. W/77'S	KOURTESIS	10/10	
* CHARACTERIZE H-L AND AMI CRIMPERS	SELLERS	09/26	
* REVISE 3rd KAPTON CHK. STATION	KOURTESIS	09/26	
* DOCUMENT PROCEDURE TO DETERMINE IF KAPTON CHK. STATION IS WORKING	SELLERS	09/23	
* DOCUMENT PROCEDURE FOR H-L P/C SENSOR BUILD	SELLERS	09/23	
Miscellaneous:			
. IDENTIFY SWITCH MOUNTING LOCATIONS & SIZE REQMTS FOR FUTURE PLATFORMS	SCHUCK	10/10	
. 57 TO 77 CONVERSION: PHASE 1 TESTING	HOMOL	05/30 09/--	ORIG. REV.
* COMPLETE DESIGN FMEA	OFFILER	04/18 09/26	ORIG. REV.
* COMPLETE PROCESS FMEA	SELLERS	07/01 09/26	ORIG. REV.

DISCUSSION

.

WE AGREED THAT ALL 77 SENSORS WILL BE BUILT ON 1ST SHIFT ONLY, UNTIL THE KAPTON CHECK STATION CAN RELIABLY DETECT WHEN THE THIRD DIAPHRAGM IS MISSING. THE UPGRADE TO THIS STATION NEEDS TO BE GIVEN A HIGH PRIORITY (JOHN K.).

MATT WILL IMPLEMENT AN INTERIM PROCEDURE TO VERIFY THAT THE KAPTON CHECK STATION IS WORKING. EACH 1/2 HOUR, THE 3RD KAPTON STATION WILL BE DISABLED, SO AT LEAST TWO CONSECUTIVE PARTS ARE BUILT WITHOUT THE 3RD PIECE OF KAPTON. IF THE AMI DETECTS THE MISSING

KAPTON, PRODUCTION WILL RESUME. IF NOT, THE PREVIOUS 1/2 HOUR'S PARTS WILL NEED TO BE SCRAPPED/SALVAGED.

WE'VE HAD FAILURES DURING IMPULSE TESTING ON THE PRODUCTION EQUIPMENT, WHICH CYCLES AT 12 hz AT R.T.. CONTACT ARM FRACTURE HAS BEEN ATTRIBUTED TO SURFACE DAMAGE OF THE SPRING ARM WHEN FEDTHROUGH THE SPRING/ TERMINAL ASM. EQUIPMENT. ADDITIONALLY, THE SPRING ANGLE DOES NOT MEET PRINT. ALSO, THE PRESENT CALIBRATION TARGET REQUIRES SIGNIFICANT DEFLECTION OF THE STATIONARY TERMINAL, AND LEAVES THE SPRING AT A LESS-THAN-HORIZONTAL POSITION WITH CLOSED CONTACTS; THIS CREATES ADDITIONAL STRESS AT THE POINT WHERE THE BENDING (AND FRACTURE) OCCURS. THE EQUIPMENT ISSUES ARE BEING CORRECTED, AND A CHANGE TO THE CALIBRATION TARGET - SO THE ARM IS CLOSER TO HORIZONTAL W/CLOSED CONTACTS - IS UNDER EVALUATION.

A SECOND FAILURE MODE WAS FOUND - FRACTURE OF THE "BRIDGE" OF THE STATIONARY TERMINAL. THIS HAS BEEN ATTRIBUTED TO THE AMOUNT OF DEFLECTION (COLD WORK) REQ'D TO MEET THE CURRENT CALIBRATION TARGET DIMENSION. ADDITIONALLY, THE TERMINAL CUT-OFF STATION - WHICH CREATES THE FINAL DIMENSION FOR THE LEGS THAT SUPPORT THE BRIDGE - DOESN'T PRODUCE CONSISTENT FINISHED DIMENSIONS. BOTH ISSUES ARE BEING ADDRESSED; CORRECTIVE ACTIONS NEED TO BE COMPLETED BEFORE WE BUILD ADDITIONAL PRODUCTION SWITCHES.

PARTS THAT FAILED THE IMPULSE TESTER ARE ALSO BEING TESTED IN THE LAB, UNDER SLOWER CYCLING CONDITIONS TO DETERMINE IF THE PRODUCTION CYCLER'S PARAMETERS ARE CONTRIBUTING TO THE FAILURES.

MILESTONES	PLANNED	ACTUAL
57 L/T ISIR	11/21/90	11/21/90
57 L/T JOB 1	09/03/91	
57 P/C ISIR	01/15/91	01/15/91
57 P/C JOB 1	06/03/91	
77PS ISIR	09/01/91 ORIG.	
	09/20/91 REV.	
77PS SOP (TI)est.	08/91	

PRODUCTION PLAN BY MONTH (THOUSANDS)

	P/C 57PSL5-3	L/T 57PSL5-2	P/C 77PSL2-1	L/T 77PSL2-3
JUL	0	2.3	0	0
AUG	0	2.3	0	0
SEP	25	9.3	15	12.4
	equipment move to B12 starting last week of September			
OCT	0	7	0	0
NOV	0	0	25	13
DEC	0	0	25	13

REGARDS,
DAVE CZARN \38-FORD

MILESTONES	PLANNED	ACTUAL
57 L/T ISIR	11/21/90	11/21/90
57 L/T JOB 1	09/03/91	
57 P/C ISIR	01/15/91	01/15/91
57 P/C JOB 1	06/03/91	
77PS ISIR	09/01/91 ORIG.	
	09/20/91 REV.	
77PS SOP (TI)est.	08/91	

PRODUCTION PLAN BY MONTH (THOUSANDS)

	P/C 57PSL5-3	L/T 57PSL5-2	P/C 77PSL2-1	L/T 77PSL2-3
APR	0	0	0	0
MAY	2 (COMP.)	2	0	0
JUN	0	0	0	0
JUL	0	2.3	0	0
AUG	0	2.3	0	0
SEP	25	9.3	15	12.4
equipment move to B12 starting last week of September				
OCT	0	7	0	0
NOV	0	0	25	13
DEC	0	0	25	13

REGARDS,
DAVE CEARN \37-FORD

PROCESS POTENTIAL AND QUALITY INDEXES SUMMARY DATA SHEET

PART #: F3TA-9E924-AA
SUPPLIER: Texas Instruments
CODE: T-991K
ADDRESS: 34 Forest St. Attleboro, Mass. 02703
SUPPLIER CONTACT: Jim Wolff
CONTACT PHONE: 508-699-1719
PART DESCRIPTION: Dual Generation Serial Control, Deactivate Pressure Switch
SQA CODE:
VEHICLE BUILD (CIRCLE ONE): EP VP (FP) OTHER (DEFINE)

CHARACTERISTIC TYPE

▽ = FORD CRITICAL CHARACTERISTICS S.C. = FORD OR SUPPLIER SIGNIFICANT CHARACTERISTICS

NUMBER OF CRITICAL AND/OR SIGNIFICANT CHARACTERISTICS:

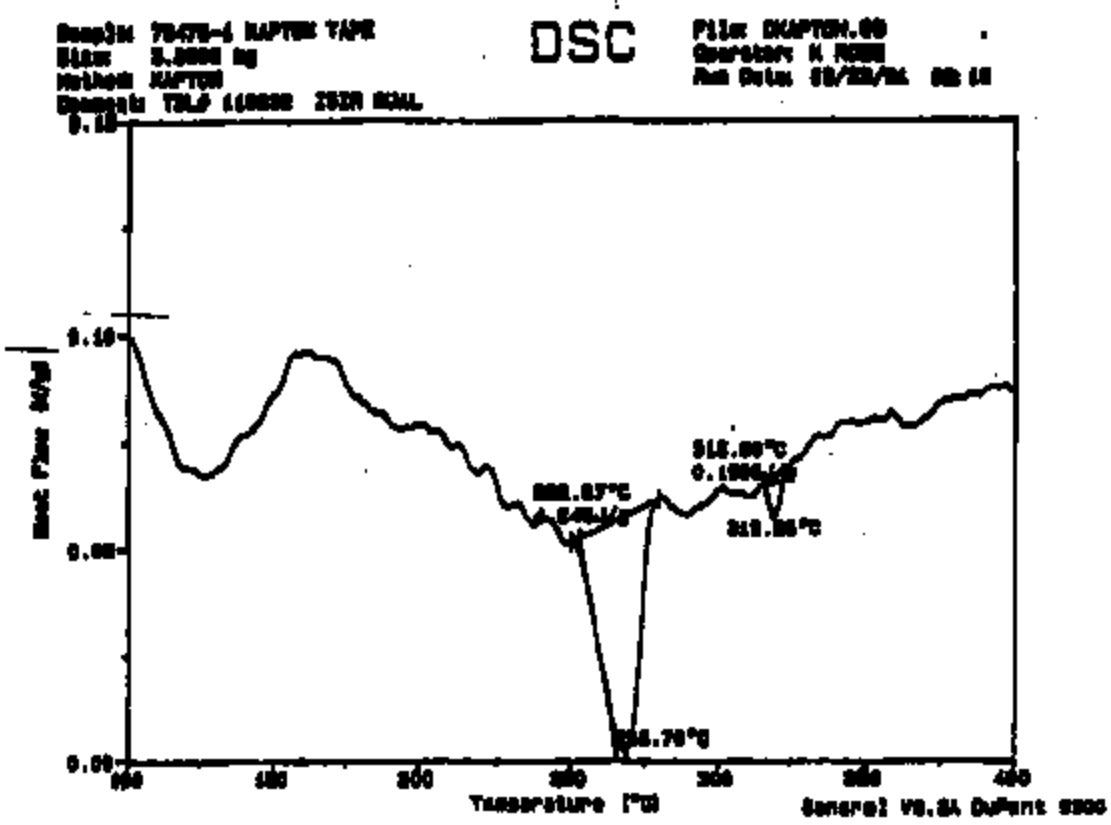
1: Activation Pressure	TYPE: SC 3	Cp = 1.8	Cpk = 1.2
2: Release Pressure	TYPE: SC	Cp = 5.2	Cpk = 1.8
3: 3/8-24 UNF-2A Thread	TYPE: SC	Cp =	Cpk = meets Go
4:	TYPE:	Cp =	Cpk = Qual Gage
5:	TYPE:	Cp =	Cpk =
6:	TYPE:	Cp =	Cpk =
7:	TYPE:	Cp =	Cpk =
8:	TYPE:	Cp =	Cpk =
9:	TYPE:	Cp =	Cpk =
10:	TYPE:	Cp =	Cpk =
11:	TYPE:	Cp =	Cpk =
12:	TYPE:	Cp =	Cpk =
13:	TYPE:	Cp =	Cpk =
14:	TYPE:	Cp =	Cpk =
15:	TYPE:	Cp =	Cpk =

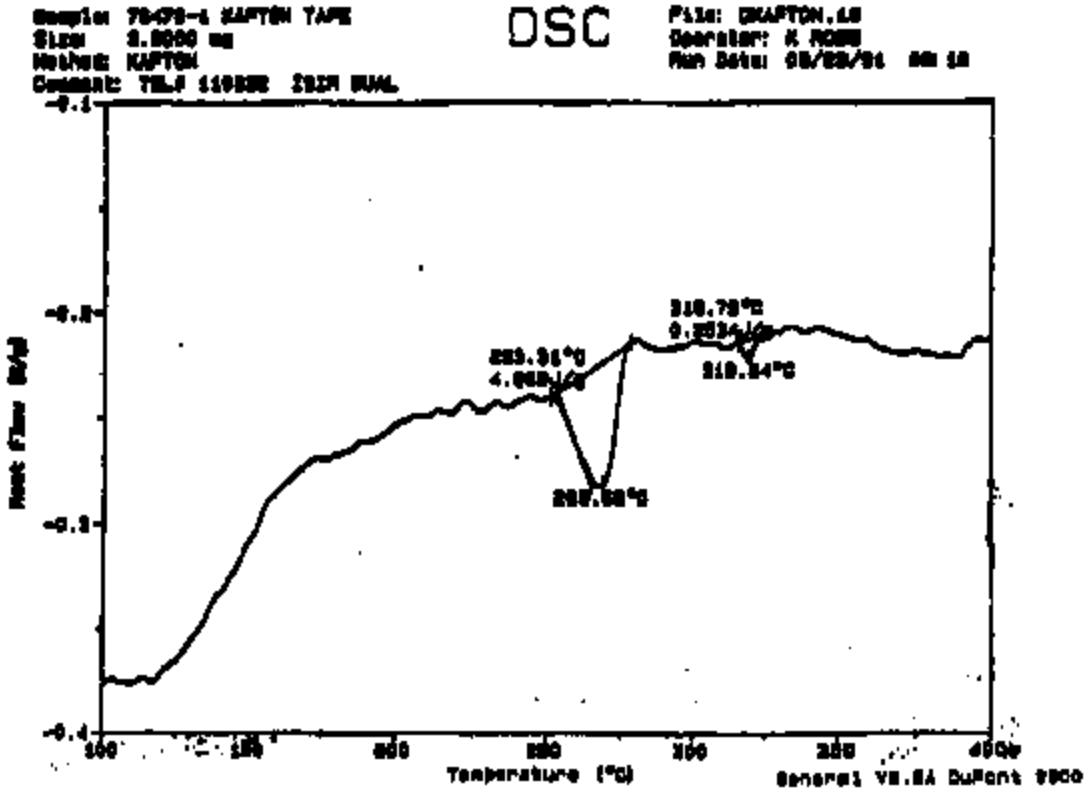
PIST = 13/13 x 100 = 92.8 %

$PIPC_{Cp}$ = 1/1 x 100 = 100 % $PIPC_{Cpk}$ = 2/2 x 100 = 100 %

COMMENTS:
1 Cp Index not calculatable on unilateral tolerance

PREPARED BY: Elaine Rose DATE: 9-20-91


DSC
Heat Flow W/g
Temperature (°C)
General V8.8A DuPont 9900


DSC
Heat Flow W/g
Temperature (°C)
General V8.8A DuPont 9900

PRESSURE SWITCH DATA Form 21605 TEST NO. 160-C)-36

DEVICE	DATE REQUESTED	REQUESTED BY	REQUESTED COMPL. DATE
7795	9/30/91	Steve Officer	
PERFORMED BY	**DATE STARTED**	**DATE COMPLETED**	**APPROVED BY**
Jeffries, DiDomenico	10/11/91		

PROJECT TITLE: Ford MY '92 Electronic Speed Control Deactivate PS

CUSTOMER:

PURPOSE OF TEST: Improve Kapton life in loss-coil parts

PROCEDURE: Impulse test – standard procedures

1 – 12 : Started at 0 cycles RANK 4+5

43 – 60 : Started with 591 K cycles complete RANK 1,2,3

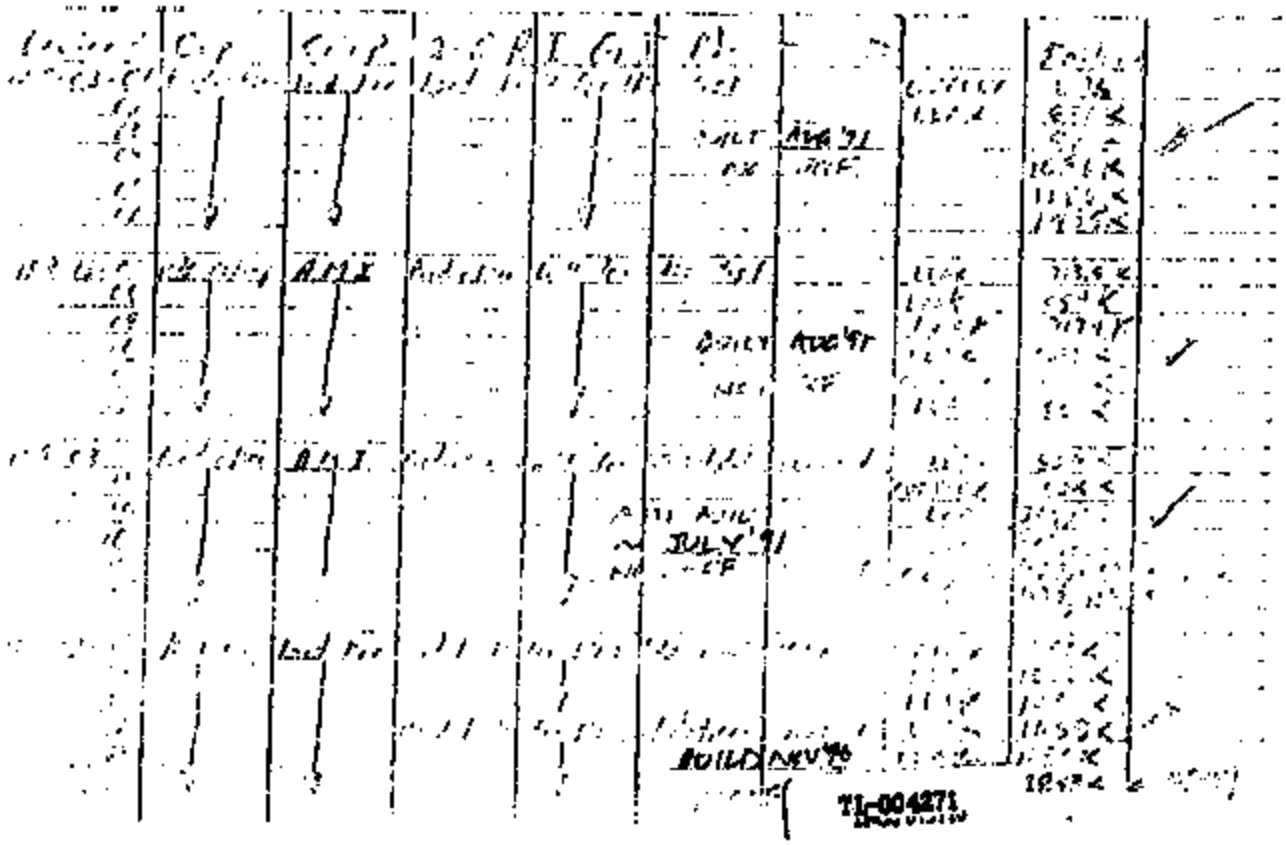
91 – 96 : Started with 500 K cycles complete RANK 6

* All devices DMI criteria AC passing, unless otherwise stated under cycles

Device #	ORIGIN			Act/Rel		Fail			
160-C1-01	Special Hermetic: 001"								
-02	socket to modify								
-03	Kapton clamp					402 K			
-04	clamp existing					243 K			
-05						402 K			
-06									
160-C1-07	control group for								
-08	1-6 All standard								
-09	socket								
-10									
-11						913 K			
-12						536 K			
160-C1-43	control lot for			133 / 66					
-44	43-48, All standard			134 / 60					
-45	Parts Non 591K			133 / 55		Leak @	799 K		
-46	as rel. per 160-C1-24			98 / 63					
-47				199 / 63		Leak	939 K		
-48				194 / 62		Leak @	701 K		
160-C1-49	Socket Lid/base reduced			93 / 77		Leak @	839 K		
-50	by .005" Higher leak			89 / 50					
-51	rate 591K in			119 / 43		Leak	911 K		
-52	Ref 160-C1-24			121 / 59					
-53				133 / 97		Leak @	95 K 706		
-54				117 / 49					

TI 004269

Device #	ORIGIN			Zero Act/Req		Fail			
HA-42-55	.005" step in wedge			43/44			998K		
-51	anode/nickel disc			41/44					
-53	Ann 581 K in test			120/41		LEAKED	810K		
-54	#ic9-83-14			40/41					
-59				121/52		Leak @	951K		
-60				110/51		972K			
HA-61-71	Crimped on lead-bar					925K			
-81	bare-die validation								
-83	parts successfully					798K			
-87	metal cook #4								
-95	VBI test					1045K			
-96						1003K			



TI-004271

REPORT OF ISA TESTING
FORD PASSENGER CAR
ELECTRONIC SPEED CONTROL
DEACTIVATION PRESSURE SWITCH
90/91/49

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

TABLE OF CONTENTS

1.0 GENERAL

1.1 Customer: Ford Motor Company, Passenger Car Brake Systems Engineering

1.2 TI Part Number: 77PSL2-1

1.3 Customer Part Number: F2VC-9F924-AB

1.4 Specifications: Ford Engineering Specification number (delta). ES-F2VC-9F924-AA

1.5 Date of Completion: 910920

1.6 Quantity of Units Tested: 104

1.7 Disposition of Tested Units:

1.7.1 Devices 156-15-37 thru -42 were destroyed in Burst testing (3.5)

1.7.2 All other devices are retained under quarantine.

1.8 TI test series number: 156-15-104

1.9 TI Pressure Switch test report number: PS/91/49

2.0 OBJECTIVE

This battery of tests was performed to demonstrate the ability of 77P8L2-1 to conform to customer specifications given in (delta) ES-F2VC-9F924-AA, in fulfillment of the requirements of the Initial Sample Report. 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 (delta) ES-F2VC-9F924-AA. A copy of this ES is included in Appendix 4.1. 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, raw data is included in Appendix 4.2.1.

A flow chart is included in the ES (frame 4 of 10), 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. However, it became necessary to deviate from this exact procedure as described below. We believe that this alternate procedure still meets the intent of the ES.

During the first phase of Impulse (3.10) testing (12 virgin devices) it was discovered that the pressure-sensing assemblies were improperly built, resulting in a reduction in life of the diaphragm. During investigation of the root cause of diaphragm problems, it was learned that the final crimp station on the automatic assembly equipment experiences this problem only on this particular part; all other devices built on this equipment are not subject to this. Witness the good results obtained with the Light Truck (F3TA-9F924-AA) version of this test (see data in Appendix 4.2.7), built on the automatic assembly equipment, as supporting evidence.

1.0 TEST PROCEDURES AND RESULTS, CONTINUED

While analysis and permanent corrective actions are ongoing, it was also learned that the manual assembly equipment which performs the final crimp produces pressure-sensing assemblies which have acceptable life. This equipment was used 4Q90 during validation of F2VC-9F924-BB (TI P/N 57PSL5-3) which uses exactly the same pressure sensing assembly, as well as to produce the rebuilt Impulse devices (157-15-81 thru -104) and will continue to be used until such time as the permanent corrective actions are in place on the automatic equipment and re-validation is completed.

To expedite completion of the switch validation, 12 of the rebuilt parts were not subjected to the Fluid Resistance test (3.9). However, this will not affect the results of the Impulse test in any way, since the various fluids do not come into contact with the diaphragm. Invoking similarity with the Light Truck (F3TA-9F924-AA) version of this test which was run simultaneously, all devices undergoing Fluid Resistance in this test easily passed their subsequent Impulse test.

3.1 CALIBRATION

3.1.1 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 200 - 300 psig, and release (contacts reclosing) at 40 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.

3.1.2 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.

3.1.3 Initial Results: All 72 original devices tested were found to be within specification.

3.1.4 Final Results: 42 surviving original devices were found to be within specification. 6 were destroyed in Burst (3.5), 24 were aborted from Impulse (3.10). 24 additional devices which underwent Impulse but had no initial characterization were also found to be within specification at the completion of testing.

3.2 VOLTAGE DROP

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

3.2.2. Initial results: The average voltage drop was 4.9 millivolts, and the standard deviation was 1.9. All values are significantly below the specification of 200 millivolts maximum.

3.2.3 Final results: The average voltage drop was 6.4 millivolts, and the standard deviation was 3.5.

3.3 CURRENT LEAKAGE

3.3.1 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%).

3.3.2 Initial results: Measuring terminals to case with switch closed; measuring terminals to case with switch open; and measuring between the terminals: the maximum current leakage observed was 2.3 microamps. All values are significantly below the specification of 100 microamps.

3.3.3. Final results: Same three measurements per device as 3.3.2. All current leakage values were consistent with initial results. All values are significantly below the specification of 100 microamps.

3.4 PROOF

3.4.1 Procedure: Calibration readings were recorded only after proof testing. Test pressure was 3000 psi per the part drawing.

3.4.1 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.

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

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

3.5 BURST

3.5.1 Devices tested: 156-15-37 thru -42.

3.5.2 Procedure: A pressure of 7000 psig was applied and held for 30 seconds minimum. Pressure was then increased slowly until failure. Failure is typically signalled by a sudden drop in test pressure of several hundred psi, which corresponds with the first point at which some internal component reaches irreversible plastic deformation and causes an increase in internal volume. The peak pressure attained as this occurs is defined as the bursting point.

3.5.3. Equipment: same as 3.4.1., 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. The failure point defined in 3.5.2 was recorded, and a Weibull plot generated. See data section 4.2.2. Using the statistical acceptance criteria from the ES (frame 3 of 10), a minimum Weibull slope (beta) of 31.5 and a minimum Characteristic Life (theta) of 7660.7 psi was calculated at 90% confidence. The 0.72 reliability at 90% confidence is 7414 psi. Thus, the parts exceed the burst specification of 7000 psig by 414 psi at the Ford-specified confidence and reliability levels.

3.4 VIBRATION

3.6.1 Devices tested: 156-15-43 thru -48.

3.6.2 Equipment: Vibration table, Ling, model A395 with Hewlett-Packard model 5427 controls. Air tank with 350 psig minimum pressurized Nitrogen used to actuate devices with at least 1.1 times maximum actuation specification on part drawing; 300 psig * 1.1 = 330 psi minimum.

3.6.3 Results: All six switches met the acceptance criteria in the ES (frame 9 of 18; section III. I. 2.).

3.7 VACUUM

3.7.1 Devices tested: 156-15-49, -50, -52 thru -55.

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 Results: All six devices met the acceptance criteria in the ES (frame 10 of 18; section III. K. 2.).

3.8 TEMPERATURE CYCLE

3.8.1 Devices tested: 156-15-56 thru -61.

3.8.2 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.

3.8.3 Results: All six devices met the acceptance criteria in ES (frame 11 of 18; section III, L. 2.). Data sheet in section 4.2.4 shows actual fluid and ambient temperatures attained at each cycle.

3.9 FLUID RESISTANCE

3.9.1 Devices tested: 156-15-01 thru -36.

3.9.2 Equipment: Fluids as called out in ES table (frame 12 of 18); appropriate beakers and storage apparatus; vented hood.

3.9.3 Results: The 36 devices were divided into groups as follows for subsequent testing. Results of these tests are reported below.

3.9.3.1 Impulse (3.10), -01 thru -12

3.9.3.2 Terminal Strength (3.11), -13 thru -24.

3.9.3.3 Humidity (3.12), -25 thru -30.

3.9.3.4 Salt Spray (3.13), -31 thru -36.

3.10 IMPULSE

3.10.1 Devices tested: 156-15-81 thru -104.

3.10.2 Procedure: 24 virgin devices were run as opposed to 12 virgins and 12 from Fluid Resistance. This is discussed in detail in section 3.0. The parameters given in the ES (frame 7 of 18, section III. E. 1.) are followed explicitly.

3.10.3 Equipment: same as 3.8.2 with the addition of a 12-station inductive load bank, per the schematic found in the ES (frame 18 of 18; figure 4.) used in the last 25K cycles.

3.10.4 Results/Discussion: Pre-characterization was not performed. After completion of the 500K cycles, all 24 devices passed the acceptance criteria found in the ES (frame 7 of 18, section III. E. 2).

This test may be regarded as the one of the most rigorous. This test is run at elevated temperature (135 C fluid), elevated pressure (1450 psig, 2 Hz), and total cycles (applying brakes 5 times per mile for 100,000 miles) which exceed conditions typically found in actual motor vehicles.

3.11 TERMINAL STRENGTH

3.11.1 Devices tested: 156-15-13 thru -24.

3.11.2 Equipment: Custom TI designed and built fixtures for gaging terminal movement after force application and for application of impact via a pendulum. This equipment is regularly used on the 57PS/77PS assembly lines in testing to TI Quality Assurance Specifications.

3.11.3 Results: All twelve devices passed the acceptance criteria found in the ES (frame 10 of 18; section III. J. 2.).

3.12 HUMIDITY

3.12.1 Devices tested: 156-15-25 thru -30.

3.12.2 Equipment: Humidity chamber RK model 5S.

3.12.3 Results/Discussion: Please note that performing a full characterization per the ES consists of actuation, release, millivolt drop, current leakage, and proof. This battery of tests when performed on six (6) devices takes approximately 2 hours to complete. Therefore "Within 15 minutes..." called out in the ES (frame 8 of 18, section III. G. 2. a.) is an acceptance requirement that is physically impossible to meet. Every effort is made to complete final characterization within the two hour period stated above.

All six devices passed the acceptance criteria found in the ES (frame 8 of 18) section III. G. 2.).

3.13 SALT SPRAY

3.13.1 Devices tested: 156-15-31 thru -36.

3.13.2 Equipment: Harshaw salt spray chamber.

3.13.3 Results: All six devices passed the acceptance criteria found in the ES (frame 8 of 18, section III. H. 2.).

Appendix 4.1
Ford Engineering Specification
(delta) ES-F2VC-9F924-AA

ES Testing

72 devices tested

6 - destroyed in burst

66 - PASSED

72 - CAI.
72 MVD
72 current leakage
72 [illegible]

396
+66×4 = 264 + 396 = 660

see flow chart
in test prog.

TI 0024345

Do not count
#29 + 35 in
PEST data

Make note that
these need to
be done on
blanket-like
liquid threads

Dim.'s

38 X 6 = 228 + 2 = 230

7 X 6 = 42 + 5 = 47

12 X 6 = 72 + 13 = 85

31 X 6 = + 10 = 196

558

~~82~~

PIST

PRESSURE SWITCH DATA Form 21605 TEST NO. 160-03-36

DEVICE	DATE REQUESTED	REQUESTED BY	REQUESTED COMPL. DATE
77P5	9/10/91	Steve Officer	
PERFORMED BY	**DATE STARTED**	**DATE COMPLETED**	**APPROVED BY**
Jeffrey D'Ponenico	9/11/91		

PROJECT TITLE: Ford MY '91 Electronic Speed Control Deactivate PS

CUSTOMER:

PURPOSE OF TEST: Reverse Kapton life in loss-Cor parts

PROCEDURE: Impulse test – standard parameters

1 – 12 : Started at 0 cycles BANK 4 & 5

43 – 60 : Started with 591 K cycles complete BANK 1, 2, 3

81 – 96 : started with 500 K cycles complete BANK 6

* all devices AMI crimp, no preceding, unless otherwise stated under origin

COUNTER RESET @ 933K

	Device #	ORIGIN	Cnt Act/Rel	Fail		
BANK 4	160-03-01	Special Harness used		561 K		
	-02	socket to modify		1040 K		
	-03	Kapton clamp		402 K		6/6 COMPLETE 9/19/91
	-04	characteristic		263 K		
	-05	- Sensors only, Hand built		429 K		
	-06	- Build Date 910921		959 K		
BANK 5	160-03-07	control group for		1197		
	-08	1-6 all standard		1170 K		
	-09	parts		1093 K		6/6 COMPLETE
	-10			612 K		
	-11	- Sensor only, Hand Built		413 K		
	-12	- Build date 910921		536 K		
BANK 1	160-03-43	control lot for	137 / 66		1268 K	
	-44	43-60 All Standard	139 / 60		1514 K	
	-45	Parts Add FAIK	133 / 65	Leak @	789 K	
	-46	as test # 159-03-88	141 / 63		1159 K	6/6 COMPLETE
	-47	Sensor only, Hand Built CRIMP	149 / 59	Leak	939 K	
	-48	910905	144 / 62	Leak @	951 K TOH	
BANK 2	-49	Vendor Thickness reduced	103 / 97	Leak @	879 K	
	-50	by vendor, Higher cycle	101 / 52		1260 K	
	-51	Ran 591K as test	119 / 48	Leak	911 K	6/6 COMPLETE 9/19/91
	-52	# 159-03-88	121 / 54		1209	
	-53	Sensor only, Hand Built CRIMP	133 / 97	Leak @	951 K TOH	
	-54	910905	117 / 49		1531 K	

TI-NHTSA 002673

(OVER)

MODEL-SHOP LOTS (EACH QTY 6) WASHERS

I. .006" REDUCED THIS OVERALL
II. .003" STEP
III. .005" STEP

- VIEW RECEIPT FROM M/S, PRE-KIT INTO 3 LOTS OF SENSORS. USING, PL CUPS, PL DISCS, TELAYED KAPTON, ETC, INCL. A CONTROL LOT.

- EYED ON AMI - HAND-LOAD ONTO BUCKS. CAREFULLY (NO PRE-CRIMP)

- CHAR. EACH DEVICE IN EACH LOT. THIS WILL SERVE THE FOLLOWING PURPOSES:

  1) HELP FIND OUT WHAT EFFECT A HIGH BUTTON HAS ON RATIO (CONTAINING LOT I W/ CONTROLS)

  2) FIND OUT IF ANY OF LOTS II OR III ARE PRE-SNAPPED.

NOTE: LOTS II & III ARE STEPPED, WHICH HAS THE EFFECT OF REDUCING THE AMOUNT OF SPACE BETWEEN BUMPS FOR THE DISC. IT IS POSSIBLE THAT THE SPACE WILL BE REDUCED SO MUCH THAT THE DISC WILL SNAP THRU DURING CRIMP (AND STAY THERE). OF COURSE LOT III (.005) IS MORE LIKELY TO DISPLAY THIS THAN LOT II (.003). EVEN IF SOME .005'S ARE PRESNAPPED, IF WE HAVE 6 GOOD ONES WE'LL USE THIS LOT. OTHERWISE WE'LL USE THE .003'S. IF WE DON'T WIRE BOND 6 OF THESE, SEE ME.

- AFTER CHAR, PUT 3 LOTS OF 6 ONTO MANIFOLDS ASAP (CONTROL LOT; HIGH BUMP LOT; PRE DEPL. LOT)

- CAREFULLY STABILIZE & CHAR ONE OF THE LEFTOVER LOT I'S THEN HAVE PETE S. DO AN F/A

- DO A HAIGHT CURVE ON ONE OF THE LEFTOVER LOT II/III (WHICHEVER LOT IS ACTUALLY USED)

DIAPHRAM LIFE TEST 160-03-36 JAD 911016

DEVICE #	ORIGIN	ACT / REL	CYCLES TO FAILURE
160-03-01	MODIFIED HEXPORTS. .003" RELIEF		561K
160-03-02	TO CHANGE KAPTON CLAMP		1040K
160-03-03	CHARACTERISTICS. HAND BUILT.		402K
160-03-04			263K
160-03-05	SENSORS		428K
160-03-06	BUILD DATE: 910921		933K
160-03-07	CONTROL GROUP FOR 1 - 6.		1197K
160-03-08	ALL STANDARD PARTS.		1170K
160-03-09	HAND BUILT.		1093K
160-03-10			612K
160-03-11	SENSORS		413K
160-03-12	BUILD DATE: 910921		526K
160-03-43	CONTROL LOT FOR 49 - 60.	137 / 66	1268K
160-03-44	ALL STANDARD PARTS. HAND KIT FOR	138 / 60	1514K
160-03-45	AMI CRIMP. RAN 581K ON 159-03-66.	133 / 65	784K
160-03-46		130 / 63	1159K
160-03-47	SENSORS	144 / 59	938K
160-03-48	BUILD DATE: 910905	144 / 62	751K
160-03-49	REDUCED CONVERTER TRAVEL. WASHER	123 / 47	879K
160-03-50	THICKNESS REDUCED BY .006".	119 / 52	1220K
160-03-51	HAND KIT FOR AMI CRIMP. RAN 581K	119 / 43	911K
160-03-52	ON 159-03-66	121 / 54	1703K
160-03-53	SENSORS	133 / 47	751K
160-03-54	BUILD DATE: 910905	117 / 48	1531K
160-03-55	REDUCED CONVERTER TRAVEL. .005"	117 / 48	998K
160-03-56	STEP IN WASHER TO PRE-DEFLECT	113 / 44	1307K
160-03-57	DISC. RAN 581K ON 159-03-66.	122 / 47	810K
160-03-58		120 / 47	1268K
160-03-59	SENSORS	129 / 52	751K
160-03-60	BUILD DATE: 910905	110 / 51	879K
160-03-81	PASS-CAR VALIDATION PARTS.		928K
160-03-82	SOOK COMPLETED SUCCESSFULLY.		1250K
160-03-83	HAND-LINE CRIMPED		798K
160-03-84			1130K
160-03-85	DEVICES		1045K
160-03-86	BUILD DATE: 910913		1003K

MANUFACTURING ENGINEERING PRECISION CONTROLS

52/57/77PS SENSOR ASSEMBLY AMI
ATTACHMENT TO PROCESS SPECIFICATION

OPER	726
LK	5509
STD	5509

UNTIL FURTHER NOTICE, THE FOLLOWING CHECK MUST BE PERFORMED WHENEVER THREE KAPTON DEVICES ARE ASSEMBLED. THIS CHECK MUST BE PERFORMED AT SET-UP, AND EVERY ONE-HALF HOUR THEREAFTER. PRODUCT MUST BE SEGREGATED BETWEEN EACH CHECK.

1. DISABLE THIRD KAPTON STATION FOR TWO MACHINE INDEXES. THIS WILL SIMULATE TWO KAPTON MISFEEDS IN A ROW.

2. ALLOW THE AMI TO DETECT THE TWO MISSING THIRD PIECES.

3. THE AMI MUST HALT THE PROCESS ON THE SECOND MISSING PIECE, AND INFORM THE OPERATOR OF THE KAPTON FEED FAILURE.

4. IF THE AMI DETECTS THE MISSING KAPTON - PROCEED WITH PRODUCTION.
IF IT DOES NOT DETECT THE MISSING KAPTON - HALT THE PROCESS, NOTIFY YOUR SUPERVISOR AND R&M, AND SCRAP OR SALVAGE THE LAST ONE-HALF HOUR'S PRODUCTION.

9/24/91

23 SEP 91 MJS/dee 50-0134

-MSG M#= 153761 FR=DAH2 TO=PCQA SENT=09/23/91 09:19 AM
R#=137 ST=C DIV=0050 CC=00149 BY=DAH2 AT=09/23/91 09:19 AM

Memorandum

September 23, 1991

TO:	Dave Czarn	EARN	Steve Offiler	SBO1
	Charlie Douglas	CPPC	Joe Schuck	WHLN
	Elaine Rose	PCQA	Gary Snyder	CPPC
CC:	Dick Gariepy	NFPC	Mike DeMattia	PCQA
FM:	Jim Natt	PCQA		

SJ: 77PS Ford Cruise Control Pressure Switch ISW

The following Initial Sample Warrant (ISW) numbers are assigned to the Ford L/T & P/C switches for our submission:

Style Switch	T.I. P.N.	Ford P.N.	ISW Number
Light Truck	77PSL2-3	F3TA9F924-AA	112383
Pass Car	77PSL2-1	F3VC-9F924-AB	112384

Regards,

Jim ext. 1719 msg: PCQA

-MSG M#= 163252 FR=VAGS TO=PCQA SENT=09/23/91 12:33 PM
R#=156 ST=C DIV=0050 CC=00134 BY=VAGS AT=09/23/91 12:33 PM

TO:	STEVE McCOOEY	MDES	DICK GARIEPY	MFPC
	DAVE PERIPOLI	PCNE	RUSTY STRUBLE	RCS2
	RUSS JOHNSON	STEL	RAY SMITH	MDES
	CLAIRE BALTHAZAR	PSWT	WAYNE CARLSON	MDES
	LOUISE SAVARD	PSWT	STEVE RODKEY	MDES
	LOU CAMARA	AMSD	TOM BURKE	MFPC
	ELAINE ROSE	PCQA	GENE GRAIKO	GRAI
	JIM WATT	PCQA	ED SMITH	PCQA
	MARGA GARANITO	MFPC	BOB BASSILIER	ELTL
CC:	TED BREDIKIN	MFPC	JOE LAZARZ	JML8
	STEVE OFFILER	SBO1	DAVE CZARN	ZARN
	ED KADISEVSKIS	MDES	MIKE DEMATTIA	PCQA
	RAY TOURANGEAU	RGT2	BILL SWEET	PCNE
	JOHN KOURTESIS	MDES		
	ANDRE CHARPENTIER	MDES		
FR:	MATT SELLERS	MJS2		

SJ: EFFECTIVITY MEETING MINUTES

NEXT MEETING IS MONDAY 9/23 AT 3:30PM IN BLDG. 20 FIRST FLOOR BREAK AREA. PLEASE PLAN TO ATTEND. IF YOU CANNOT MAKE IT PLEASE SEND SOMEONE TO REPRESENT YOU. WE WILL UPDATE THE FOLLOWING PRIORITY ACTIONS.

EQUIPMENT RELATED ITEMS

B.A.M.

STATIONARY AND MOVABLE TERMINAL CUT-OFF PROBLEMS. BEEF UP PILOT PINS, AND ADD SENSORS TO ENSURE PINS INSERT FULLY 100% OF THE TIME. — STEVE M.

STATIONS 4 & 10 TERMINAL PRESENCE SENSORS. IMPROVEMENTS TO CUT-OFF PILOT PINS MAY FIX THE PROBLEM WITH THESE PRESENCE SENSORS. IF NOT STEVE WILL EVALUATE ALTERNATE METHODS. — STEVE M.

CALIBRATOR FORM TOOL GEOMETRY. 15 DEGREE ANGLE TO 30 DEGREE. — COMPLETE

NO-CONTACT SENSOR. SHORT TERM FIX TO BE IMPLEMENTED IS SENSOR ON AMI. MECHANIZATION TO IMPLEMENT SHIFT REGISTER SYSTEM TO CUT-OFF AND DOUBLE INDEX ON AMI TO REDUCE YIELD LOSS. — STEVE R.

TERMINAL STAKER BACKUP TOOLS. UPPER ANVIL BACK-UPS ARE COMPLETE. MATERIAL ORDERED FOR BOTTOM TOOL TO ARRIVE NEXT WEEK. RUSS WILL THEN FAB BACK-UP BOTTOMS LESS THE CHANNEL SLOTS. — RUSS

OUT OF NEST PROBE NEEDS TO BE PROGRAMMED TO KEEP ERROR EFFECTIVE UNTIL OPERATOR PHYSICALLY CLEARS OUT OF NEST CONDITION. — STEVE R.

WORK OUT PHANTOM DATA BUGS IN REPORT GENERATION. SEE MATT TO REVIEW DATA COLLECTIONS. — STEVE R.

OVERHEAD MONITORS FOR B.A.M. AND F.A.M. B.A.M. IS

COMPLETE. NEED MONITOR ORDERED FOR F.A.M.	STEVE M.
SUBMIT SPARE PARTS ORDERS TO DICK G. FOR APPROVAL	BOB B.
MEET WITH K.F.BASSLER TO REVIEW WINDOW GEOMETRY. MODEL SHOP WORK TO EVALUATE ALTERNATE WINDOW GEOMETRIES. NEED COMP DATE.	MATT/ STEVE O.
EFFECTIVITY RUNS. SET UP SCHEDULE TO COMPLETE 5 RUN SERIES AFTER EQUIPMENT TRANSFER TO BLDG. 12. MECHANIZATION NEEDS TO MAKE PLANS FOR EQUIPMENT SUPPORT DURING RUNS.	MATT
E.A. EQUIPMENT ERROR CODE DISPLAY ON B.A.M. SOFTWARE/ HARDWARE ACCOMMODATIONS.	STEVE R.

E.A. MACHINE (S.M. SPECIAL)

SPRING SKEWING. TWO SIDE PINS AFTER CONTACT INSERTER ARE SUSPECT. NEEDS CORRECTION.	STEVE M.
BRING SPRING ANGLE TO 98 +/-4 DEGREES.	STEVE M.
ELIMINATE SCORING OF BECU SPRING. ORDER SPARE DRIVERS/JAWS TO SUPPORT EFFECTIVITY RUNS	STEVE M.
TRACK-JAW IMPROVEMENTS TO ELIMINATE RIVET FEED PROBLEMS	STEVE M.
AUTOMATE ON-OFF CYCLE OF E.A. MACHINE. NEED SYSTEM DEVELOPED AND IMPLEMENTED ASAP. STEVE TO REVIEW WITH MIKE GIOIA AND BOB BASSILIER.	STEVE M.
ERROR CODE DISPLAY ON B.A.M. MACHINE SCREEN. LOU TO COMPLETE BY 9/16.	LOU
INSTALL TOWNSEND DRIVERS. IMPROVEMENT TO RIVET HEAD EDGE CONDITION.	COMPLETE

F.A.M.

RING BOWL LINEAR TRACK VIBRATOR WILL BE SHIPPED TO HENDRICKS FOR REPAIR WHEN EQUIPMENT IS BROKEN DOWN FOR TRANSFER. NEED TO OBTAIN RAPID TURN-AROUND COMMITMENT FROM HENDRICKS TO ENSURE NO DOWN TIME.	STEVE M.
SEAL LOADER UPGRADES. NEED TO ESTABLISH A PLAN FOR IMPROVEMENT.	STEVE M.
JAW RE-DESIGN OF UNLOAD STATIONS NECESSARY. LACK OF HOLDING POWER IS THE PROBLEM. LOU/RUSS ARE WORKING ON A JAW RE-DESIGN. STATION # 17 HAS BEEN DETERMINED TO BE THE HIGHEST STATION AND IS TO BE USED FOR PICK AND PLACE JAW HEIGHT.	RUSS/LOU
F.A.M. SOFTWARE STILL NOT COMPLETE. LOU TO FINISH BY 9/17. ALSO, A PRINTER NEEDS TO BE SET-UP.	LOU

DEVICE/PART RELATED ITEMS

REPORT ON STATUS OF TEST ANOMALIES. REPORT DUE FRIDAY	

ON DESIGN TESTER CYCLING. POSSIBLE CALL IN EXPERTS TO EVALUATE SPRING-TERMINAL DYNAMICS.	*STEVE O.*
COORDINATE ALL MANUFACTURING RELATED ITEMS. OPERATOR FOR PRESSURE TESTER, MATERIAL KITING, MATERIAL MOVEMENTS, PACKING, ETC. . . .	*DICK G.*
SUE, FROM 57PS, WILL BE OUR DEDICATED PILOT MAKER NEXT WEEK. TOM BURKE WILL COORDINATE SUE'S TIME TO COMPLETE PILOTS TIMELY.	*TOM*
CODE ALUMINUM CRIMP RINGS AS REQUIRED.	*SUE/ DAVE*
Q.C. AUDIT REQUIREMENTS TO ALLON FINAL PACKING. JIM SAY'S ED SMITH WILL CORR. NEED TO TEST EACH LOT FOR DISC CRACKING.	*JIM/ELAINE*
MODIFICATIONS TO FORCE GAGE TO TEST BENT ARMS	*DAVE*
CUSTOMIZE SURPLUS TEST STATION TO ALLON OFF-LINE BASE GAGING	*DAVE*
MODIFICATIONS TO Q.C. PRESSURE TESTER. JIM WATT WORKING WITH BOB ROBICHAUD.	
ENSURE ALL REQUIRED PREPARATIONS ARE MADE TO ALLON FACILITIES TO TRANSFER EQUIPMENT BEGINNING 9/30	*STEVE M.*
EQUIPMENT TRANSFER TO BEGIN 9/30/91	*GENE GRAIKO*

REGARDS . . . MATT
X1245

-MSG M#= 1053402 FR=WHLS TO=PCQA SENT=09/24/91 02:01 PM
R#=007 ST=C DIV=0050 CC=00777 BY=WHLS AT=09/24/91 02:01 PM

September 23, 1991

cc = Elwick
FYI/Ret

To: ~~Steve Offiler~~
Jim Watt

Cc: Charlie Douglas
Dave Czarn
Steve Major

Fm: Joe Schuck

Sj: Ford CCPS ISIR

Mark Scholler, SQA Engineer, gave me the following direction as it relates to the above:

PASSCAR

Bruce Pease needs to write an alert on the 77PS with manual line/24 virgin impulse tested parts. I'll then hand carry this to Mark. He will input a 90 day extension.

We need to ISIR the 77PS (automated crimp/impulse tested) within 90 days.

The inverted delta needs to be part of the product stamped part number.

Did Bruce or TI complete a written significant characteristic sign off sheet?

Product and process FMEA's along with control plans are due now!

LIGHT TRUCK

Why isn't Lt Truck using the new large United Technologies connector vs the E.P.C. (poor salt spray performer) connector.

If Ford Lt Truck stays with the EPC connector, John Pelkey or Ron Frosts (Body Elec) needs to issue an alert or spec change.

If they go to Utag, Mark wants a full re-ISIR completed. I don't agree.

Objectively, with data, why did the E.P.C. connector fail salt spray vs. Utag connector.

We will have to nurse this one through.

Regards,
Joe (WHLS) 313-553-1557