EA02-025

FORD 10/27/03

APPENDIX N

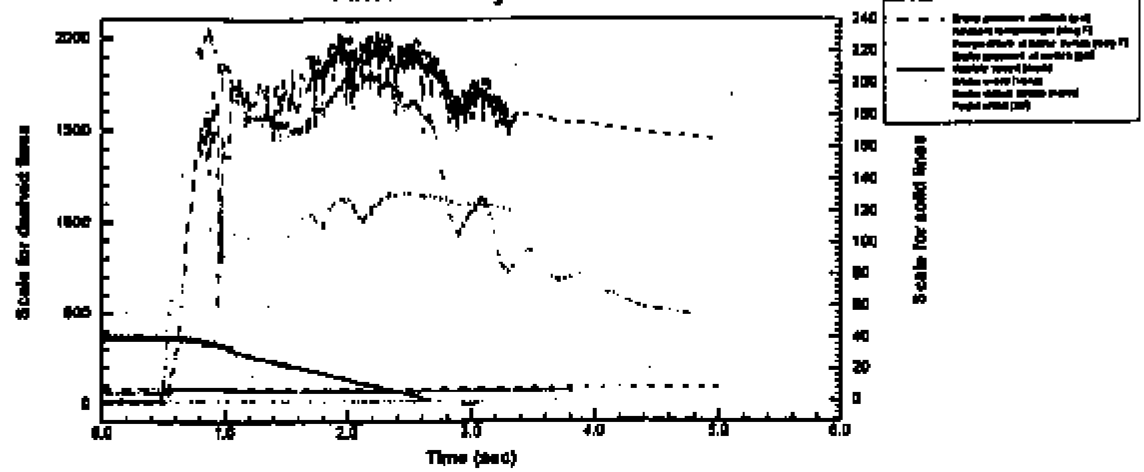
BOOK 34 OF 61

PART 4 OF 6

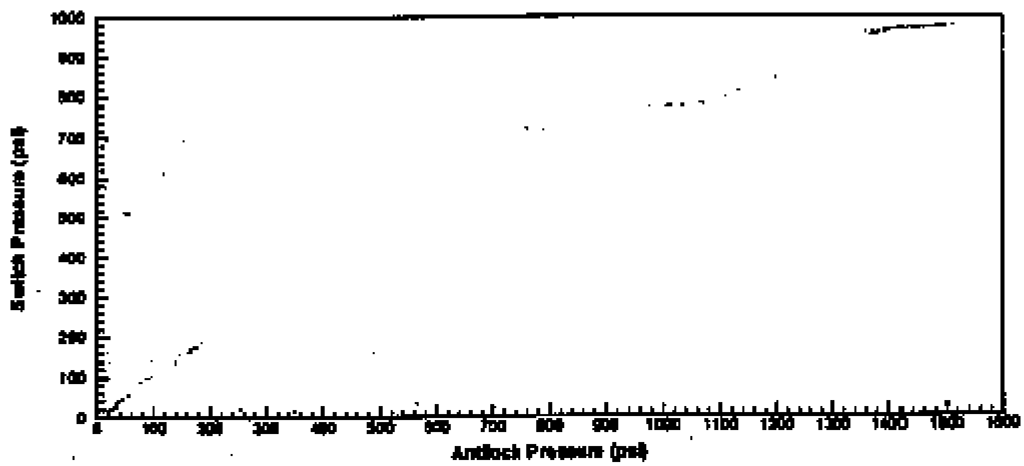
Porter
EXHIBIT NO. 44

40 mph panic/agressive ABS	Ford Test Data: Lincoln Towncar	File Name: lLincol2.023

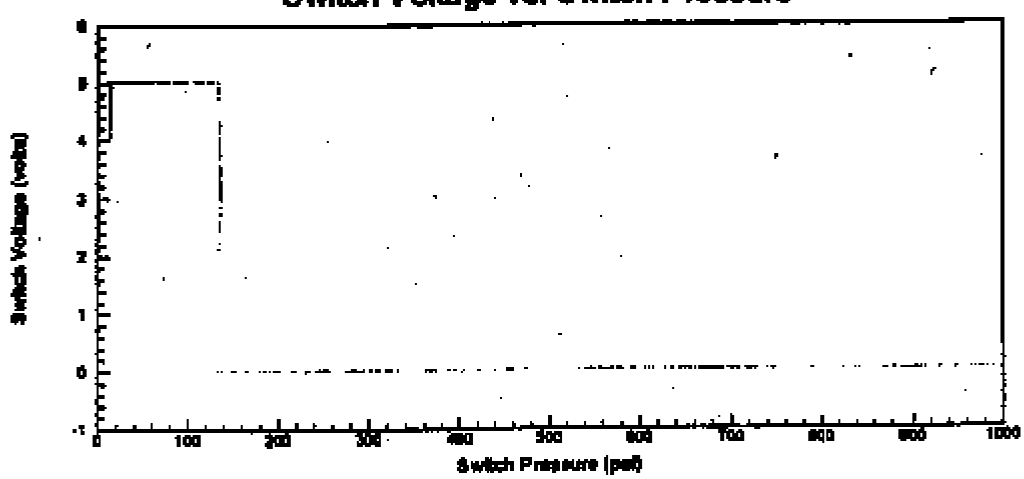
Time History Data



Switch Pressure vs. Antilock Pressure



Switch Voltage vs. Switch Pressure



Design Research Engineering

File Name: [illegible] at 15:58 on [illegible]

Design Failure Mode and [illegible] Analysis

1 of 1

Subsystem/Name: Speed Control [illegible] Pressure Switch
Design Responsibility: Stephen R. [illegible]
Other Areas Involved:

Suppliers and Plants Affected:
Model Year/Vehicle(s):
Engineering Release Date:

Prepared by: Texas Instruments
FMEA Date (Orig.): [illegible] (Rev.):

Part Name, Number & Description	Potential Failure Mode	Potential Effect(s) of Failure	S e v.	C l a s s	Potential Cause(s) of Failure	O c c.	Design Verification	D e t.	R. P. N.	Recommended Actions	Area/Individual Responsible & Completion Date	Actions Taken	S e v.	O c c.	D e t.	R. P. N.
DIAPHRAGM ([illegible]) Forms flexible element of fluid containment cavity. Transfers pressure from fluid to pressure-sensing element	Fails to contain fluid	Brake fluid leakage	9		Gradual rupture over life due to improper design of convolution elements. Gradual rupture over life due to [illegible] placement. Gradual rupture over life due to [illegible] caused by [illegible]. Chemical attack due to improper material specified. Inadequate thickness [illegible] of diaphragm material. Insufficient [illegible] of diaphragm	1	Burst, Impulse, and Thermal Cycle tests. Material mfg. recommendation. Confirmation of design with similar products	1	9	Note that the "Occ." ranking of 1 is based on a large amount of field experience on similar products, rather than [illegible] requirements.						
	Change in area of pressure transfer over life	Shift in actuation over life	7		Excessively tight diaphragm clamping. Diaphragm too stiff. Incorrect material specified	1	Life testing w/ [illegible] at intermediate points	1	7							
	Excessive change of pressure transfer area versus pressure	Excessively high pressure needed to adequately form pressure transfer area with [illegible] due to [illegible] at lower pressures	7		Diaphragm too stiff. Incorrect material specified	1	Force and pressure versus deflection testing to calculate effective area	1	7							

Porter
EXHIBIT NO. 45

TI 000464

EM82-025-A 13241

Occurrence, Continued

Occurrence Rating Table

The following table is used to estimate the failure rate and/or criteria to develop a rating for each cause.

PROBABILITY OF FAILURE	POSSIBLE FAILURE RATES	RANKING
Very High: Failure is almost inevitable.	≥ 1 in 2	10
	1 in 3	9
High: Repeated failures.	1 in 8	8
	1 in 20	7
Moderate: Occasional failures.	1 in 80	6
	1 in 400	5
	1 in 2,000	4
Low: Relatively few failures.	1 in 15,000	3
	1 in 150,000	2
Remote: Failure is unlikely.	≤ 1 in 1,500,000	1

1. The Criteria column may be augmented by the FMEA Team to meet local requirements only if:
   - The table is used consistently throughout the engineering offices.
   - Supporting rationale for changes are documented and attached to the FMEA.
   - Changes have been approved by local Ford Management and Quality Office.
2. The criteria for rating "1" cannot be changed without prior approval of Environmental & Safety Engineering.

Porter
EXHIBIT NO. 46

Document #: 503626

POTENTIAL
FAILURE MODE AND EFFECTS ANALYSIS
(PROCESS FMEA)

TI 0020960

PROCESS: AUTOMATED BASE ASSEMBLY

PROCESS RESPONSIBILITY: ROBERT GILDEA

PREPARED BY: MATT SELLERS

MODEL YEAR(S)/VEHICLE(S): 77/87PG

DSGN/QUAL/MFG RESPONSIBILITY: SEAN MULLIGAN / JIM WATT / MARY MILKEY

FMEA DATE (ORIG.) 4/29/98
FMEA REVISION: C

Item	Process Function/ Requirements	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Class	Potential Cause(s)/ Mechanism(s) of Failure	Occur	Current Process Controls	Detec	R.P.N.	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Actions Taken	Sev	Occ	Det	R.P.N.
1	FEED AND ASSEMBLE BASE TO NEST.	DOES NOT FEED	NO SUBSEQUENT ASSEMBLY PERMISSIBLE YIELD LOSS	5		MACHINE ERROR	1	PREVENTIVE MAINT. 100% PRESENCE CHECK VERIFY OPERATION OF CHECK PROBE	1	5							
		DOES NOT NEST PROPERLY	NO SUBSEQUENT ASSEMBLY PERMISSIBLE	5		DEBRIS IN NEST; MACHINE ERROR	1	PREVENTATIVE MAINT. 100% PRESENCE CHECK	1	5							
		LOADS MULTIPLE BASES	NO SUBSEQUENT ASSEMBLY PERMISSIBLE	5		MACHINE ERROR	1	PREVENTATIVE MAINT. 100% PRESENCE CHECK	1	5							
2	CONFIRM BASE PRESENCE.	FAIL TO IDENTIFY MISSING BASE	NO SUBSEQUENT ASSEMBLY PERMISSIBLE	6		SET-UP ERROR	1	PREVENTATIVE MAINT.	1	6							
3	CUT-OFF STATIONARY TERMINAL AND INSERT INTO BASE	CUT NOT CENTERED	WILL NOT SEAT INTO BASE. TERMINAL POSITION OUT OF SPEC.	6		MACHINE RAPID AIR. INDEX ERROR.	1	100% PILOT PROBE SENSOR. TERMINAL POSITION SPC	1	6							
		TERMINAL NOT FULLY INSERTED INTO BASE	TERMINAL HEIGHT OUT OF SPEC. FAILURE OF CALIBRATION	6		TOOL WEAR ON CUT OFF TOOL BREAKAGE ON CUT-OFF INSERTION PROBE WEAR INSERTION PROBE BREAKAGE	3	TERMINAL HEIGHT SPC. 100% PILOT PROBE SENSE. PREVENTIVE MAINT. 100% INSERTION DISTANCE SENSOR.	1	18							
4	BLANK SPRING.	HOLE LOCATIONS INCORRECT	WILL NOT ALLOW SUBSEQUENT OPERATION	5		TOOL BREAKAGE. SET-UP ERROR.	1	VISUAL INSPECTION DURING SPC SET-UP INSPECTION	1	6							
		HOLE LOCATIONS MISSING	WILL NOT ALLOW SUBSEQUENT OPERATION.	6		TOOL SEVERAGE. SET-UP ERROR.	1	VISUAL INSPECTION DURING SPC SET-UP INSPECTION.	1	6							
		TRANSFER PIN BUMP MISSING/ INCORRECT	REDUCED SPRING LIFE	6		TOOL SEVERAGE. SET-UP ERROR.	1	SET-UP INSPECTION BUMP HEIGHT SPC. VISUAL INSPECTION DURING SPC.	1	6							
5	RIVET SPRING TO MOVABLE TERMINAL STRIP.	INSUFFICIENT RIVETING	LOOSE SPRING	5		WORN DRIVER. BROKEN DRIVER. INCORRECT SET-UP HEIGHT	3	SPRING TORQUE SPC. RIVET HEIGHT SPC. SET-UP INSPECTION. PREVENTATIVE MAINT.	1	18							
		EXCESSIVE RIVETING	LOOSE SPRING DAMAGED SPRING	5		INCORRECT SET-UP HEIGHT.	3	SPRING TORQUE SPC. PREVENTATIVE MAINT. RIVET HEIGHT SPC. SET-UP INSPECTION	1	15							

Porter
EXHIBIT NO. 48

ER82-025-A 13244

PROCESS: AUTOMATED BASE ASSEMBLY

PROCESS RESPONSIBILITY: ROBERT GILDEA

MODEL YEAR(S)/VEHICLE(S): 77/07PS

DSGN/QUAL/MFG RESPONSIBILITY: SEAN MULLIGAN / JIM WATT / MARY MILKEY

FMEA DATE (ORIG.) 4/23/98
FMEA REVISION: C

Item	Process Function/ Requirements	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Class	Potential Cause(s)/ Mechanism(s) of Failure	Occur	Current Process Controls	Detec	R.P.N.	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Actions Taken	Sev	Occ	Det	R.P.N.
		RIVET MISSING	NO SPRING. DEVICE WILL NOT OPERATE.	3		MISFEED	4	100% PRESENCE SENSOR. 100% PRESENCE CHECK.	1	12	RIVETER RE-DESIGN PENDING	MECHANIZATION	RIVETER REDESIGN COMPLETE CAPABILITY ASSESSMENT COMPLETE	3	1	1	3
6	INSERT AND RIVET MOVABLE CONTACT TO SPRING	INSUFFICIENT ROLL	LOOSE CONTACT.	5		WORN ANVIL. BROKEN ANVIL. INCORRECT SET-UP HEIGHT	1	ROLL DIAMETER ON SPC. SET-UP INSPECTION PREVENTATIVE MAINT	1	5							
		EXCESSIVE ROLL	DAMAGED CONTACT. LOOSE CONTACT.	8		INCORRECT SET-UP HEIGHT.	1	ROLL DIAMETER ON SPC. PREVENTATIVE MAINT. SET-UP INSPECTION	1	8							
		CONTACT MISSING	CONTACT RESISTANCE INCREASES OVER LIFE.	8		MIS-FEED	2	100% PRESENCE CHECK.	1	16							
7	FORM SPRING ANGLE	ANGLE TOO HIGH	REDUCED SPRING LIFE. REDUCED DISC LIFE SHIFT IN SET-POINT OVER LIFE. DEVICE SHOP.	7	S I D	WORN/BROKEN TOOL. INCORRECT SET-UP.	1	ANGLE SPC. SET-UP INSPECTION. PREVENTATIVE MAINT. 100% POSITION SENSOR.	1	7			CRITICALITY OF FORM TOOL DIMENSIONS RECOGNIZED, ITERATIVE PROCESS COMPLETED AND DOCUMENTED				
		ANGLE TOO LOW	LOW CONTACT GAP. HIPOT FAILURE. SHORTED DEVICE	7	S I D	WORN TOOL. INCORRECT SET-UP	1	ANGLE SPC. SET-UP INSPECTION PREVENTATIVE MAINT 100% POSITION SENSOR.	1	7			CRITICALITY OF FORM TOOL DIMENSIONS RECOGNIZED, ITERATIVE PROCESS COMPLETED AND DOCUMENTED				
8	CUT-OFF MOVABLE TERMINAL AND INSERT INTO BASE.	CUT NOT CENTERED	WILL NOT SEAT INTO BASE. TERMINAL POSITION OUT OF SPEC.	6		MACHINE RAPID AIR INDEX ERROR.	1	100% PILOT PROBE SENSOR. TERMINAL POSITION SPC	1	6							
		TERMINAL NOT FULLY SEATED INTO BASE	TERMINAL HEIGHT OUT OF SPC. FAILURE AT CALIBRATION.	6		CUT-OFF TOOL WORN/BROKEN. INSERTION PROBE WORN/BROKEN	3	100% INSERTION DISTANCE SENSOR. PREVENTATIVE MAINT. TERMINAL HEIGHT SPC	1	18							
9	STAKE TERMINALS TO BASE.	INSUFFICIENT STAKE	LOOSE TERMINAL.	5		BROKEN TOOL. INSUFFICIENT HEAD PRESSURE.	1	SET-UP INSPECTION PUSHOUT STRENGTH SPC PREVENTATIVE MAINT.	1	5							
		STAKING TOOL CHANNELS IMPROPERLY POSITIONED	TERMINAL POSITION OUT OF SPEC.	6		INCORRECT SET-UP. TOOL WEAR/BREAKAGE	3	TERMINAL POSITION SPC SET-UP INSPECTION.	1	18							
10	CHECK FOR CONTACT ORIENTATION	FAILS TO DETECT OUT OF POSITION CONTACT	OUT OF RANGE BASE CALIBRATION	6		SET-UP ERROR	1	SET-UP INSPECTION WELD LOSS MONITORING	1	6							

PROCESS: AUTOMATED BASE ASSEMBLY

PROCESS RESPONSIBILITY: ROBERT GILDEA

MODEL YEAR(S)/VEHICLE(S): 77/67PS

DSGN/QUAL/MFG RESPONSIBILITY: SEAN MULLIGAN / JIM WATT / MARY MILKEY

FMEA DATE (ORIG.) 4/23/96
FMEA REVISION: C

Item	Process Function/ Requirements	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Class	Potential Cause(s)/ Mechanism(s) of Failure	Occur	Current Process Controls	Detec	R.P.N.	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Actions Taken	Sev	Occ	Det	R.P.N.
11	CALIBRATE BASE ASSEMBLY.	CALIBRATOR MISSES TARGET RANGE (HIGH)	REDUCED CYCLE LIFE CREEP ACTUATION SHIFT IN CALIBRATION	7		OPERATOR SET-UP. EXCESSIVE CALIBRATOR SIGMA.	1	100% SORT AT CHECK STATION. 100% FUNCTION TEST. CYCLING AUDITS PF [illegible]	1	7							
		CALIBRATOR MISSES TARGET RANGE (LOW)	CREEP RELEASE REDUCED CYCLE LIFE SHIFT IN CALIBRATION	7		OPERATOR SET-UP. EXCESSIVE CALIBRATOR SIGMA	1	100% SORT AT CHECK STATION. 100% FUNCTION TEST. CYCLING AUDITS PF [illegible]	1	7							
		DEVICE DOES NOT CALIBRATE	CREEP RELEASE REDUCED CYCLE LIFE SHIFT IN CALIBRATION	7		OPERATOR SET-UP.	1	100% SORT AT CHECK STATION. 100% FUNCTION TEST CYCLING AUDITS. PF [illegible]	1	7							
12	CHECK BASE ASSEMBLY CALIBRATION	CHECK STATION DRIFT LVDT MALFUNCTION	OUT OF RANGE CALIBRATION FAILURE PASSED AS GOOD	7		STATION WEAR LVDT/SOFTWARE ERROR. STATION BREAKAGE. INCORRECT LVDT SET-UP	1	OFF LINE SPC GAGES. 100% FUNCTION TEST CYCLING AUDITS-PILOTING. PREVENTATIVE MAINT	1	7							
13	WHERE APPLICABLE - UNLOAD LOW GAGE BASE ASSEMBLY.	HIGH GAGE BASE UNLOADED INTO LOW GAGE CHUTE	INSUFFICIENT SPRING PRELOAD. LOWER ACTUATION PRESSURE AT ELEVATED TEMPERATURE.	5		SOFTWARE ERROR. OPERATOR ERROR.	3	SET-UP INSPECTION P-CHART SPC. ELEVATED TEMPERATURE CONTINUITY CHECKS 100% FUNCTION TEST	1	15							
14	UNLOAD HIGH GAGE -OR- STANDARD GAGE BASE ASSEMBLY	LOW GAGE BASE UNLOADED INTO HIGH GAGE CHUTE	EXCESSIVE SPRING PRE-LOAD HIGHER ACTUATION PRESSURE AT LOWER TEMPERATURE.	5		SOFTWARE ERROR OPERATOR ERROR.	3	SET-UP INSPECTION P-CHART SPC. ELEVATED TEMPERATURE CONTINUITY CHECKS. 100% FUNCTION TEST.	1	15							
15	UNLOAD BAD CALIBRATION BASE ASSEMBLIES.	FAILS TO UNLOAD	YIELD LOSS	5		UNLOAD ERROR	1	YIELD LOSS MONITORING	1	5							
16	UNLOAD BAD PARTS BASE ASSEMBLIES.	FAILS TO UNLOAD	BASE LOADED ONTO OCCUPIED NEST.	5		UNLOAD FAILURE	1	EMPTY NEST PROBE	1	5							
17	CHECK EMPTY NEST.	FAILS TO IDENTIFY OCCUPIED NEST	BASE LOADED ONTO OCCUPIED NEST.	5		UNLOAD FAILURE	1	YIELD MONITORING	1	5							

TI 0020862

EM62-025-R 13245

Document #: 503827

POTENTIAL
FAILURE MODE AND EFFECTS ANALYSIS
(PROCESS FMEA)

PROCESS: AUTOMATED CRIMP RING CODE

MODEL YEAR(S)/VEHICLE(S): ALL HYDRAULIC PS

PROCESS RESPONSIBILITY: ROBERT GILDEA

DSGN/QUAL/MFG RESPONSIBILITY: SEAN MULLIGAN / JIM WATT / MARY MILKEY

PREPARED BY: MATT SELLERS

FMEA DATE (ORIG.) 04/28/98
FMEA REVISION: B

Item	Process Function/ Requirements	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Class	Potential Cause(s)/ Mechanism(s) of Failure	Occur	Current Process Controls	Detec	R.P.N.	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Actions Taken	Sev	Occ	Det	R.P.N.
1	LOAD CRIMP RING TO ROTARY TABLE NEST.	FAILS TO LOAD CRIMP RING	NO SUBSEQUENT ASSEMBLY PERMISSIBLE	5		MACHINE ERROR	1	PREVENTIVE MAINT.	1	5							
2	CODE PART NUMBER, DATE/LOT CODE	WRONG CODE	LOSS OF LOT TRACEABILITY. CUSTOMER MIXING.	5		SET-UP ERROR.	3	SET-UP CHECK	1	15							
		ILLEGIBLE CODE	LOSS OF LOT TRACEABILITY. CUSTOMER MIXING.	5		SET-UP ERROR. CODE WEAR OR DAMAGE. INSUFFICIENT CODE PRESSURE.	3	SET-UP CHECK	1	15							
		CRIMP RING DISTORTED	DIFFICULT INSTALLATION INTO CRIMP NEST. DIFFICULT INSERTION OF OF SENSOR ASSEMBLY.	5		EXCESSIVE CODE PRESSURE.	5	SET-UP CHECK	3	75	PROPOSE CRIMP SYSTEM SET-UP ENHANCEMENTS.	MECHANIZATION	INCREASE CODE FONT SIZE	5	1	1	5
		MISSING CODE	LOSS OF LOT TRACEABILITY. CUSTOMER MIXING.	5		SET-UP ERROR. CODE WEAR OR DAMAGE. INSUFFICIENT CODE PRESSURE.	3	SET-UP CHECK	1	15							
3	UNLOAD CODED CRIMP RINGS.	FAILS TO UNLOAD	RING LOADED ONTO OCCUPIED NEST	5		UNLOAD FAILURE	1	SET-UP	1	5							

TI 0020563

EM02-025-A 13247

DuPont Circleville
P.O. Box [illegible]
Circleville, OH [illegible]

DuPont

DuPont Circleville

Porter
EXHIBIT NO. 49

Brian Digg
34 Forest Street
Attleboro MA, 02703
Fax 508-236-3586

February 23, 1999

Dear Brian

I have checked our records and have not found any test data on Kapton® FN type film and break fluid exposure in our files.

I have also spoken to several colleagues and we are unaware of any issues with the Kapton® FN that has been used in automotive diaphragms.

Sorry we can not be of more help If you have any questions please call.

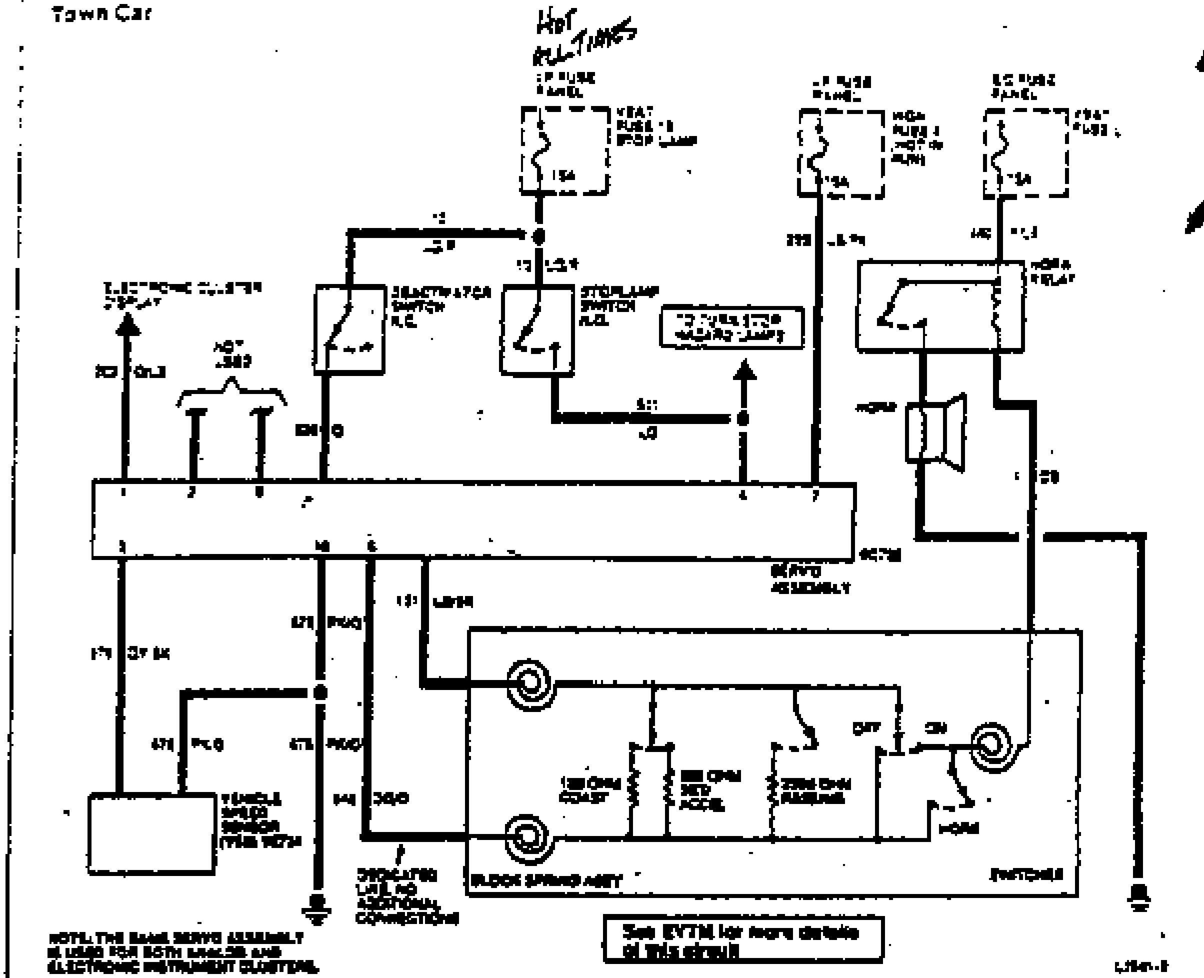
Regards,

Mark McAleer
Sr. Tech Service Rep Kapton®
740-474-0725

Post-it® Fax Note 7671	Date	# of pages ▸ 1
To Rick	From	
Co./Dept. Raumcon	Co.	
Phone #	Phone #	
Fax # 313-390-4185	Fax #	

DIAGNOSIS AND TESTING (Continued)

Town Car



Porter
EXHIBIT NO. 50

TI 0006242

ER02-025-R 13249

Porter
EXHIBIT NO. 51

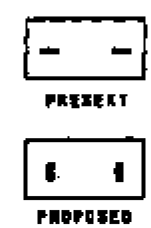
HIGHLIGHTS
Stephen B. Offiler
Week Ending 03/03/89

FORD MY92 CRUISE CONTROL PRESSURE SWITCH EX3423

OVERVIEW: We are presently working to build and test parts that will become customer samples. A "Design Validation" test plan has been worked out based on Ford's "Production Validation" spec. and our available time and resources. This will be communicated to Ford. Due to the lead time needed to stamp spring arms, our sample delivery schedule was forced to stretch by one week. Sample delivery date of 04/07/89 was approved by Gary Klingler.

SPRING ARM: Mfg. Eng. has decided to use Peck Spring for the required prototypes. They have a good track record, their volume quote is competitive, and they agreed to deliver soft-tooled parts ASAP. To meet a sample ship date of 03/31, we needed a minimum of 50 springs by 03/07. Peck is "shooting" for this date but committed to 03/14. This is one of the reasons for the one-week slip in our schedule.

CONNECTOR: Joe Schuck has visited Ron Froates, a connector guru at Ford. They've decided that a 57PS-type connector, with changes to tab locations and color, will suffice. This will require a new mating connector. Ford plans to meet with their supplier, United Technologies (UTC) to discuss this.



Per inputs from Mfg. Eng., it will be very beneficial from an automation standpoint if we can design our terminals as shown "Proposed." We'd like to relay this at the meeting between Ford and UTC.

SHORT CIRCUIT: Gary Klingler raised a concern about the possible damage to our device if a short-circuit were to take place; whereby our device would pass a fairly large current (magnitude TBD). Concerns focus on when/if our contacts would weld; and the possibility of brake fluid leakage if our device were to melt under heavy current. Joe has requested us to take a look at this and draft a one-page abbreviated FMEA. – where is it? what does it say?

CRIMP RINGS: R.W. Jacques delivered the first 50 crimp rings one day ahead of schedule. They are now at plating. Jacques will now build a piercing tool to streamline the build of 300 additional crimp rings. After DV testing, we will begin to pursue high-volume houses for this part.

TESTING/FIXTURES: Joe reports that our clutches are on the way to Attleboro, expected early next week. These will be used in testing as representative of the actual electrical load.

Plans seem to be in order for the construction of a dedicated cycler. Parts are presently being obtained. The hydraulic unit (expedited) is expected around 03/15. another reason for the one-week slip in schedule.

The one outstanding issue is the temperature cycle test. I spoke with Doug Strott, who did PV for the 57PS. He told me dedicated equipment was built and has since been dismantled. He also told me that the 57PS originally failed this test to highlight its significance. I have a couple of options: negotiate with other programs for use of a refrigerated chamber; or talk to the APT people since they already have equipment which performs a similar function.

Steve Offiler

TI 0009074

EA82-628-R 13256

Porter
EXHIBIT NO. 54

HIGHLIGHTS

Stephen B. Offiler
Week Ending 04/14/89

FORD MY92 CRUISE CONTROL PRESSURE SWITCH EX3423

OVERVIEW: Three parallel paths are being pursued to correct the gasket problem, to allow shipment of customer samples for 05/01. Ford and Surfaces (their proportioning-valve supplier) have requested Gantts to comprehend our sampling capabilities, for their own scheduling purposes. Joe Schuck reports that Ford Light Truck has moved a step closer to buying into this cruise control system, which would boost volume and justify Marketing projections.

SAMPLE REQUIREMENTS:	Quantity	Date
Texas police fleet test	50	04/28
Surfaces	75	04/28
Mustang build	50	04/28
Test units/spares	100	05/19

→ Leaks @ build !! NG

GASKET: The three paths being pursued are: 1) Iteration of the gasket design according to JBL recommendations and published info; (2) Elimination of the gasket, using the Teflon-coated Kapton as a seal; and 3) Placing a second piece of Kapton above the present gasket to prevent extrusion (this is a fall-back solution since it is not production-representative). Lead times at JBL and test equipment availability are pacing items.

1st ref to Kapton

TESTING: The dedicated cycler for this program is will be under construction for the next few weeks; hence it will not be available to do the testing required to validate the gasket design change. I have contacted Bob Bishop to borrow APT equipment again. He has to look at his schedule and will negotiate. I need the APT equipment for about 100 testing hours: Thermal Cycle (30 hrs) and Impulse test (70 hrs).

CONNECTOR: Carlo has calculated that the additional labor cost, if we do not rotate the terminal design (hence do not automate) will be 18 cents per device. This remains a significant issue with the customer. Also, at Ford's request, we have officially decided upon the color for the device: Black. Ford did not want Blue or White since these are 57PS brake-switch colors.

Steve Offiler

TI 0006068

EA02-025-A 13251

Porter
EXHIBIT NO. 53

HIGHLIGHTS
Stephen B. Offiler
Week Ending 05/05/89

FORD MY92 CRUISE CONTROL PRESSURE SWITCH EX3423

OVERVIEW: 57PS customer samples went out last week; true CCPS samples are still underway on the Impulse test. This time is being spent to organize with the new Mfg/Mkt team, to prepare the Design Validation test write-up, and to prepare for the Design Review.

CUSTOMER NEWS: Charlie Douglas had a meeting with Gary Klingler last week at Ford. Issues included: terminal rotation; updated sampling schedule; short-circuit test; and actuation tolerance information.

It looks like Ford needs to tool up a mating connector *anyway* due to the large volume projections, so we will probably get our terminals rotated after all. This area is receiving significant attention. The sample needs have swelled from 275 to 500, over the foreseeable future. Charlie and Joe are working to better define needs and dates. Inventory of component parts will need to be refreshed. Gary has expressed an interest in re-running the short-circuit test under a different set of conditions. I plan to contact him directly to completely define the test procedure. He's also interested in better understanding what our true tolerance capabilities are; is +/- 50 psi artificially too wide? We will explain to him that true, finished-part tolerances are affected by many variables and must be characterized statistically once we have production-representative parts and processes. Until then, we can only shoot for a given range.

CCPS SAMPLES: We had two lots of 10 undergoing the Impulse test - however, this test turned up significant leakers at about 80K cycles. Inspection revealed torn Kapton seals. New devices were built, using 2 and 3 pieces of Kapton. As a result, there are now four lots of 5 back underway on the Impulse test. To date, they have passed 100K cycles without problem. Passing this test will give me enough confidence to begin building sample quantities for the customer. Devices will not ship, however, until the Thermal Cycle test is completed too. Ship date still looks like 05/26 if all goes well. *

TESTING: We are still waiting for the completion of the Humidity test. I've spoken with George O'Lear and I expect this to be done soon. It is becoming increasing difficult to get cycler time for the Impulse test and the Thermal Cycle test; we have piggy-backed off an APT intensifier-cycler running another test, and have plumbed into a chamber borrowed from the AMPT. If all goes well, Don Ekberg will be able to complete our dedicated cycler by the end of May.

SBO. Off

Porter
EXHIBIT NO. 94

HIGHLIGHTS

Stephen B. Offiler
Week Ending 05/12/89

FORD MY92 CRUISE CONTROL PRESSURE SWITCH EX3423

OVERVIEW: CCPS samples continue to chug away on the Impulse test. They have now completed about 2/3 of the 500K test with no failure. We're gearing up to build a quantity for Ford by the end of May. Per the Program Review, a preliminary Design Review will be held ASAP.

CUSTOMER NEWS: As planned, I contacted Gary Klingler to discuss his requested Short Circuit test and acc/rel tolerances. Gary wants the Short Circuit test to help allay fears from others at Ford who are concerned with brake system failure modes. 5-6 weeks is okay with him. Between us we agreed upon a procedure: run devices at 125 °C ambient while pressure-cycling, and increase current to failure (contacts weld/contacts erode/leakage).

Joe will take the next step in the connector issue: to close with Diana Koenig regarding tooling a new connector. Charlie will begin to define steps needed to finalize our spec with Ford.

CCPS SAMPLES: Four different configurations, five of each, are being tested at present. These are: 80-duro gaskets w/ two or three Kapton seals; Kapton-backed 70-duro gaskets w/ two or three Kapton seals. In the event all pass, my preferred configuration is the 80-duro gasket with two seals (min parts count).

Short-term, we owe Gary Klingler 50 devices for the Northern Fleet Test. Diana does not need the balance of the short shipment we sent her. A little farther out (TBD) Ford needs a quantity of 300 parts for another fleet test.

DESIGN REVIEW: Charlie, Keith and I have agreed upon goals, agenda, date & time, and guest list. The review will cover two basic areas: status of the design, and status of the mfg. process. This review is considered preliminary in nature; inputs received will be used to revamp the schedule, prints, cost estimate, etc. which will be re-reviewed at a later date.

TESTING: Don Ekberg is making significant progress on the construction of the cycler for this program.

After chatting with Tony Sabetti, I've designed a worst-case experiment to explore the inductive spike that occurs when switching. The clutch is run at -40°C where Cu resistance is lowest and magnetic permeability (therefore inductance) is highest. We are monitoring voltage across the contacts and current flow in the circuit. We're also experimenting with diodes for arc suppression.

TI 0009064

EA02-025-A 13253

Porter
EXHIBIT NO. 55

HIGHLIGHTS
Stephen B. Offiler
Week Ending 08/25/89

FORD MY92 CRUISE CONTROL PRESSURE SWITCH EX3423

OVERVIEW: Based on conversation with the customer, it looks like siginficant effort on their part is required to arrive upon actuation and release specifications. Special samples are needed for test purposes. We shipped four emergency devices to Light Truck (J512 hexport), to be followed by 40 next week. We have completed our prototype of the twist-terminal concept.

CUSTOMER SAMPLES: We received an unexpected, urgent request from Ford Light Truck for a few samples ASAP. I contacted George Randall to clarify. It turns out the 6 "P.I.S.T." samples sent last week will not be used sequentially, but throughout a 69-vehicle build. The very first was a P.I.S.T. vehicle built on 08/24, but the next is a non-P.I.S.T. scheduled for 08/28 for which George needed a non-P.I.S.T. pressure switch. We sent four devices overnite to address this need. George also gave me a rundown of vehicle build dates to allow me to calculate when we must ship samples. Jeff has prepared another 40 devices which will go out Monday; this will suffice until mid-September.

SPECIFICATION: We also received a request for samples from Gary Klingler, needed ASAP. He has discovered an inconsistency between pass-car and light truck brake-light-switch actuation, which is causing harsh cruise control cancellation on light truck only. It looks like the light-truck version will need a higher actuation pressure than pass-car. He has requested a family of 57PS's which cover an actuation range of 150 psi to 250 psi for testing purposes. My own estimate is at least several weeks before we have a firm actuation and release specification(s).

TESTING: We completed an over-current test to failure as requested by Gary Klingler. The purpose was to allay any fears which may arise at Ford about hydraulic-system integrity in the event of a short circuit. This is not a Ford spec and no official procedure exists; Gary and I developed a test procedure over the phone. Two devices were run in the cycler at 121 C, switching at 6 cycles/min. One at a time, current was increased in 2 amp increments until something happened. One device was run to 34 amps; it finally experienced meltdown of the plastic housing and went short-circuit. The other began switching erratically at 28 amps and the test was aborted. Predictably, absolutely no damage was done to the hydraulic section of the switch. *

We are presently working on a disc life test to determine if the 0.003" disc support bump is necessary, or if we can use no bump which is easier to manufacture. Six devices will be run in the cycler for 500K cycles, 0-1450 psi, 121 C.

MFG ISSUES: During pin-gaging, we have begun to measure the amount of spring deflection before continuity loss. For measurement in production, Mechanization wishes to lightly probe to the spring, not to push down to the point of continuity loss. If the deflection is predictable and consistent, this won't be a problem.

The model shop has completed the parts to prototype the twist-terminal concept. The concept seems to work well. We've learned that the terminal design should include a selective weakening at the point of bend so it bends reliably at the same point every time.

Porter
EXHIBIT NO. 56

HIGHLIGHTS

Stephen B. Offiler
Week Ending 12/08/89

FORD MY92 CRUISE CONTROL PRESSURE SWITCH EX3423

PROGRAM ISSUES: Ford is very close to officially confirming the actuation specification of 250 +/- 50 psi. Release is inconsequential. This applies to the lead platform which is Econoline van; further work will be done ASAP at Ford to determine the actuation on passenger car. It is fair to assume the tolerance will be the same on pass-car.

Both truck and car brake engineers at Ford are looking into the proof specification. Our goal is to back off the 5000 psi spec, down to about 3500 psi. We should have some input on this from Ford soon.

Work is also ongoing at Ford to finalize the written specification. We have given Ford our rough draft based on a marked-up 57PS T'bird suspension-control specification, which will form the basis for discussion and negotiation of the final spec.

Changes to the envelope prints (different for truck and car) have been completed. This includes changes to the locking tabs, moving the polarity tab off-center to differentiate from the 57PS, and increasing the overall length slightly dictated by the APT hexport dimensions. Joe Schuck will be working to approve the polarity tab change with Ford and with their mating-connector supplier. If we end up using the 57PS sensor, further increases in overall length and width will have to be approved by Ford.

DESIGN ISSUES: We are presently working to get prototypes on test, using 57PS sensors with actuation around 350 psi, and CCPS switches with hand-modified terminals to provide the correct Normally-Closed logic. The model shop has provided spring arms using .006" and .008" BeCu mill-hard, and we're also running standard .010" springs as well. The devices were pinned to provide 100 grams contact force. A 500K Impulse test will be run, with 25K electrical cycles, at 2.25 Hz in order to complete the test by first thing Monday morning. The purpose is to determine spring life and any adverse effects on the disc.

Modifications to the base mold will be designed on a high priority basis in order to prototype the twist concept. Terminals will be wire-EDM'ed.

The model shop is working on the third (and hopefully final) iteration of the APT hexport design. Various tweaks have been made to the second iteration to improve the hydraulic ... These devices will be tested using two of our standard 150 psi incipient discs with ...ous lubricants. Dave Brown has developed a single disc with 250 psi actuation, using ..." 301SS, which will be life-tested independently. We have disc blanks made in the ...el shop (perfectly round) and blanks made by AFCC (vestige).

...have received our powder-metal slugs. These will be machined by the model shop into seats which are compatible with the old CCPS design (because it is generally a known ...tity) and life tested. For comparison sake, we can also run zinc parts representative ...e castings.

...e received crimp rings from Jacques, which are the newer, stepped design. Three parts ... at above 8200 psi.

T

(Ford) ENGINEERING SPECIFICATION

PART NAME	PART NUMBER
SWITCH ASSY-BRAKE PRESSURE SHOCK ABSORBER CONTROL	ES-E75C-2C283-AA

DATE	LET.	FR.	REVISIONS	DR.	CK.
			RELEASED		
4-23-87			CSH2-165950-C5	SS	

REFERENCE: ES-E53C-3N824-AA

PREPARED/APPROVED BY: [signature]

CHECKED BY

DETAILED BY: [signature]

CONCURRENCE/APPROVAL SIGNATURES

PRINCIPAL DESIGN ENGINEER: [signature]

DESIGN ENGINEERING SUPV.: [signature] 9-13-86

PRODUCT/MATERIAL ENGINEERING: K.P. [signature] 2-2-87

PED RELIABILITY ENGRG.: [signature] 3/18/77

MANUFACTURING ENGRG.

QUALITY CONTROL/SQA

PURCHASING

NUMBER ES-E75C-2C283-AA

REV

FRAME 1 OF 13

EXHIBIT NO. 57

3947-a1 (Previous editions may not be used)

TI-000232

EA02-025-A 13256

SWITCH ASSEMBLY - BRAKE PRESSURE SHOCK ABSORBER CONTROL

I. GENERAL

This specification covers the test requirements for the brake pressure switch (2C283) used in the automatically adjustable shock system. Design changes on the switch assembly or its components shall not be made without compliance to Section V of this specification and written approval from the releasing Production Engineering Office.

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

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

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

II. PRODUCTION VALIDATION AND IN-PROCESS TESTS

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

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

- In-Process Tests Phase 2 (IP-2) - IP-2 test program may be implemented only after process capability has been established. Tests must be completed with production parts on a continuing basis. Samples for these tests must be selected on a random basis to represent the entire production population as much as possible. In the event that any of the requirements in these tests is not met, the reaction plan specified in Ford Q101 Section III.E.3, "ES Test Performance Requirements" shall be invoked.

Tests Required for DV Test ?

Sample size ?

TABLE OF CONTENTS

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
Calibration	64	P90-.96	100%	All Must Pass	100%	All Must Pass
Voltage Drop	64	P90-.96	12/Mo.	P90-.84	4/Lot	" " "
Current Leakge	23	P90-.90	3/Mo.	P90-.56	4/Lot	" " "
Proof Test	64	P90-.96	12/Mo.	P90-.84	4/Lot	" " "
Burst	6	P90-.72	3/Mo.	P90-.56	4/Lot	" " "
Vibration	6	P90-.72	3/Mo.	P90-.56	10/6 Mo.	P60-.90
Terminal Strength	12	P90-.84	6/Mo.	P90-.72	4/Lot	All Must Pass
Vacuum	6	P90-.72	3/Mo.	P90-.56	6/6 Mos.	P90-.72
Temperature Cycle	6	P90-.72	3/Mo.	P90-.56	6/6 Mos.	P90-.72
Creep Check	64	P90-.96	12/Mo.	P90-.84	4/Lot	All Must Pass
Durability Tests						
Impulse	23	P90-.90	12/Mo.	P90-.84	3/3 Mo.	P90-.56
Humidity	6	P90-.72	3/Mo.	P90-.56	6/6 Mo.	P90-.72
Salt Spray	6	P90-.72	3/Mo.	P90-.56	6/6 Mo.	P90-.72

avall1085.1

ENGINEERING SPECIFICATION

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 ~~5-10~~ 750 mA 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.

ACTUATION : 150 ± 50 PSI
RELEASE : 100 PSI MIN

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 while conducting ~~5-10~~ 750 mA 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.

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 open.

(3) Between either lead and switch housing with the contacts closed.

? Is 13 ± 1 V representative of actual system voltage?

55E75C-2C283AA

4 15

TI-000235

III. TEST PROCEDURES AND REQUIREMENTS (continued)

C. Current Leakage

2. Acceptance Requirements

a. Nonconformance is defined as any leakage current in excess of one (1) milliampere.

D. Proof Test

1. Test Requirements

a. Proof test is to be conducted using brake fluid or equivalent as the pressure medium. Test pressure shall be 11.0 MPa. Test pressure shall be isolated from pressure source and held for not less than 30 seconds. PROOF : 5000 PSI

b. Check the switches to Section A using the procedure established in that section.

2. Acceptance Requirements — 25 PSI – NOT OBSERVABLE ON 5 K PSI GAGE

a. Nonconformance is defined as any evidence of fluid leakage, seepage, or drop in test pressure greater than 172 KPa, or any switch which does not meet the criteria in Section A.

b. If brake fluid is used for this test, the test samples must be destroyed after testing. Recommend 430 KPA (62 PSI) (SAME % AS 25 PSI / 8000 PSI 62 PSI / 5000 PSI)

E. Impulse

1. Test Requirements ~750 mA

a. Test the switch for a total of 500,000 cycles (see Item c. below), at ~~5-10~~ milliamps and 13 ± 1 volts D.C. using currently released brake fluid as the pressure medium.

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

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

Pressure Variation	Cycles
172 ± 172 K.Pa.G. (Low) 16,000 ± 345 K.Pa.G. (High)	500,000

2. Acceptance Requirements

a. Nonconformance is defined as any switch not meeting the criteria in sections B, C, D, or ~~E~~. Calibration settings after Impulse Test are to be as follows: Actuation Pressure ~~[illegible] KPa ± 345 KPa~~, Release Pressure ~~[illegible] KPa min.~~ ~~and Minimum Differential Pressure of 345 KPa~~. 50 PSI MIN 150 ± 70 PSI

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

NUMBER ES-E7SC-2C283-AA REVISED FRAME 5 OF 13

III. TEST PROCEDURES AND REQUIREMENTS (continued)

ES-E7SC-2C283-AA

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 ~~34.5 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) humidity cycles as follows:

(1) 8 hours of 38°C minimum at 90 to 100% relative humidity.

(2) Lower temperature to 24°C maximum over a 2 hour period.

(3) Raise temperature to 38°C minimum at 90 to 100% relative humidity over a two hour period.

2. Acceptance Requirements

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

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

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.

III. TEST PROCEDURES AND REQUIREMENTS (continued)

H. Salt Spray (continued)

1. Acceptance Requirements

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

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

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 345 + 172 kPa when the switch is in the ~~open~~ CLOSED position and 10,000 ± 172 kPa when the switch is in the ~~closed~~ 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, D, and ~~K~~ 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, D, or ~~K~~. Samples used for this test must be destroyed after all testing is completed.

III. TEST PROCEDURES AND REQUIREMENTS (continued)

J. Terminal Strength

1. Test Requirements

a. Mount the switch in the test port.

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

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

2. Acceptance Requirements

a. Check the switch to sections A, B, C, D, and M 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, D, or M.

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, D, and M using the procedure established in each section.

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

L. Temperature Cycle

1. Test Requirements

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

III. TEST PROCEDURES AND REQUIREMENTS (continued)

L. Temperature Cycle (continued)

1. Test Requirements

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/cycle. One cycle consists of a pressure variation from 172 ± 172 K.Pa.G to 10,000 ± 345 K.Pa.G. to 172 ± 172 K.Pa.G.

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, D, and M.

2. Acceptance Requirements

a. Nonconformance is defined as any evidence of switch fluid leakage, seepage, or not meeting the criteria of sections B, C, D, and M. Calibration settings must meet the performance criteria indicated in Section E.2, switch impulse testing. Samples used for this test must be destroyed after all testing is completed.

M. Creep Check

1. Test Requirements

a. Switches are to be creep checked at room temperature using ambient air, or equivalent.

b. The creep check is to be made after the switch has been cycled two or more times with ambient air, or equivalent to insure calibration stability. The voltage is to be 13.0 ± 1.0 volts D.C. at 5-10 milliamps.

c. As the switch pressure is increased, the positive disc snap must occur within 10 milliseconds of electrical continuity at the cut-in point. The rate of pressure rise at the creep check point is to be no greater than 70 K.Pa.G./second.

d. As the switch pressure is decreased, the negative disc snap must occur within 10 milliseconds of electrical discontinuity at the cut-out point. The rate of pressure decay at the creep check point is to be no greater than 70 K.Pa.G./second.

e. Other creep check methods may be used if approved by the releasing Product Engineering Office

2. Acceptance Requirements

a. Nonconformance is defined as any switch that has a time delay greater than 10 milliseconds between the electrical signal and the disc snap signal.

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FRAME 9 OF 19

REVISED

TI-000240

IV. STATISTICAL ANALYSIS METHODS

A. For all PV/IP-1 tests and IP-2 tests Sections III, G, H, I, K, and L, the notation Fc - R will be interpreted as minimum probability equal to R at a confidence C, e.g., F90 = .80 means a minimum probability of 80% at 90% confidence.

B. For IP-2 tests Sections III, A, B, C, D, F, J, and ~~M~~, all samples must pass (ASMP).

V. REVALIDATION REQUIREMENTS

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

RUNNING CHANGE REVALIDATION

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

WILL AN ORING REQUIRED ?

VIII. INSTRUCTIONS AND NOTES

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

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

Test port configuration is shown in Figure 3.

The O'ring shall be free from cuts, nicks, abrasion 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.

If product nonconformance occurs for test Sections II 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. Nonconformance shall be reported immediately to the releasing Product Engineering Office.

If nonconformance of the statistical acceptance criteria occurs for test Sections II G, H, I, K, and L, 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

WILL A SHIPPING CAP BE REQUIRED?

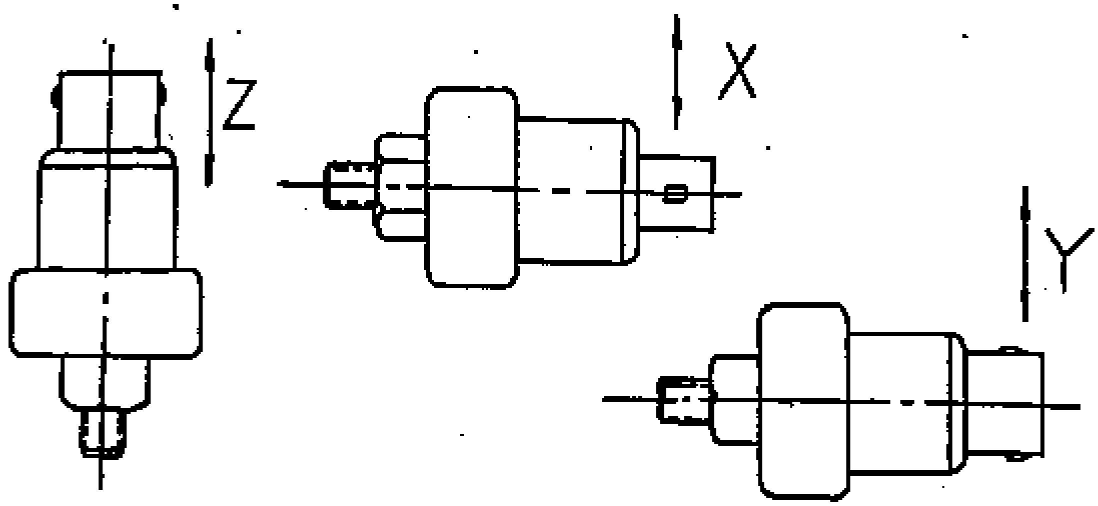
avu111885

E5-E7SC-2C283-AA

11 / 19

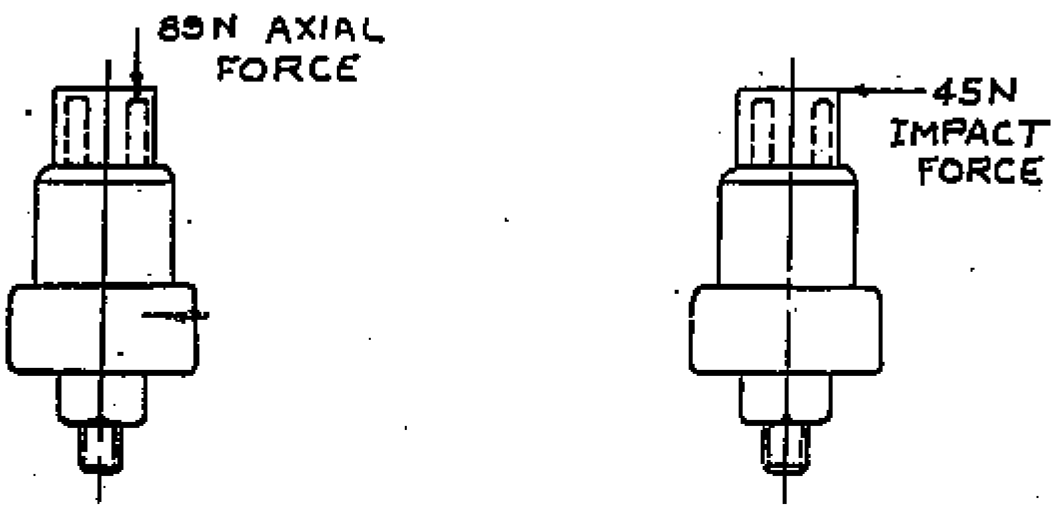
TI-000242

EA02-025-A 13208



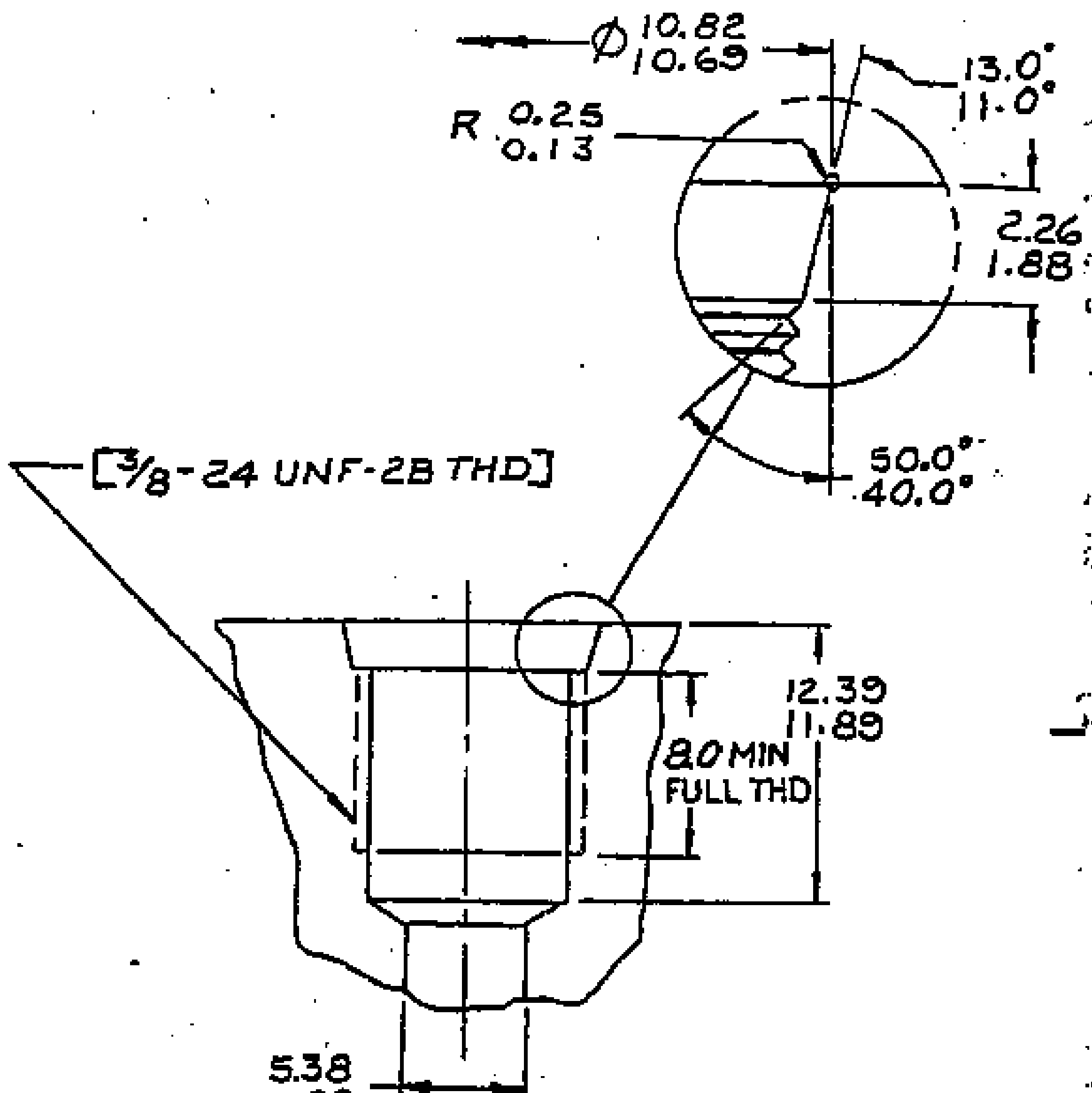
VIBRATION TEST - SWITCH ORIENTATION

FIGURE 1.



TERMINAL STRENGTH - LOAD ORIENTATION

FIGURE 2.



MATERIAL:
ES2-M1A100-CA STEEL

TEST FIXTURE PORT CONFIGURATION

FIGURE 3.

Porter
EXHIBIT NO. 58

HIGHLIGHTS

Stephen B. Offiler
Week Ending 02/02/90

FORD MY92 CRUISE CONTROL PRESSURE SWITCH EX3423

FINANCIAL NEWS: Marketing has drafted a letter to Ford Purchasing, formally requesting that the tooling money be released immediately. The letter summarizes the positive nature of our engagement to date, and highlights the significant schedule impact that the tooling money has created.

SPECIFICATIONS: Significant activity at Ford this week. Our proposed specification was finally scrutinized by the key players at both Pass-Car and Light Truck. Negotiating through Joe Schuck, we were able to win concessions in at least three areas of major importance to us: The proof spec. was lowered to 4K psi (from 5K); the humidity spec. was revised to follow MIL-STD-202F; and Ford's proposal to raise the pressure during the Temperature Cycle test (from present 1450 psi to 2K) was shot down.

One area where Ford maintained a relatively firm position is the Impulse test temperature spec., which was given as 107 C ambient and 135 C fluid temperature (+/- 14). We have been conducting all tests at 121 C ambient *and* fluid temperature, which is the intersection of the two spec's. We requested that the spec be changed to 121 +/- 14 for both ambient and fluid, but all Ford would do is change the ambient from "107 +/- 14" to "107 minimum". We have two choices: run the test at 135 C and accept the detrimental effects of the hotter ambient; or build a heater into the manifold to obtain the 135 C fluid temperature while maintaining a 107 ambient. We are now looking into a means to build an appropriate heater into the manifold.

The actuation and release spec's for Light Truck have been solified at 250 +/- 50 psi and 40 psi minimum, respectively. Pass-Car has not been solidified, although they are presently pushing for 125 +/- 25 psi and we are responding with 125 +/- 40 psi. Gary Klingler is doing some testing to determine what the real-world upper and lower limits should be. Pass-Car will also be using the 40 psi minimum spec. for release.

AUTOMATED SWITCH ASSEMBLY: The AFCC has been kicked-off to modify the single-cavity base mold to include all of the new features for automated assembly, as well as the 57PS style flange. They indicate that prototypes will be available in three weeks.

Working in conjunction with Mechanization, terminal bending (calibration) experiments were begun. This is to determine the optimum design, in terms of cal. issues such as springback. We are working with wire-EDM parts, and the model shop is modifying the stationary terminals to include stiffening ribs, bend notches, etc.

Mechanization is strongly in favor of eliminating the rivet which attaches the spring arm to the movable terminal. The technique involves piercing the terminal and leaving a large "burr", which is rolled over in the fashion of an eyelet. Precedence for this design can be found in a device built by TI-Italy. John Kourtesis is obtaining prints from Italy. We will be meeting with Bassler next Tuesday to discuss all these terminal issues.

57PSL5-2: (Light Truck device) Disc life testing was carried out to 1KK cycles, with no failures. Pin window experiments are being carried out. These discs can be used for customer samples which George Randall has unofficially requested (no PO yet). The model shop has modified standard 57PS hexports to include the SAE J512 inverted flare, which are expected back from Plating early next week. Keith Roberts is obtaining black 57PS bases (46412-1) which are out of production but available from the warehouse.

NEW BUSINESS OPPORTUNITY: On a low-priority basis, we are taking a look at an opportunity at GM Truck & Bus for a brake-light pressure switch to replace the brake-pedal mounted position switch. Prototypes are being built using production 58PS discs (17 psi act and 7 psi rel), 55/56/58-type bases, and the APT-Hexport packaging developed for the CCPS program. In-house prototypes will be thrown together, characterized, and cycled per the GM requirement of 100K cycles to 2200 psi and 900K cycles to 800 psi. This will allow us to gain an understanding of the design challenges. Initial volumes are only 25K-50K per year, but long-term potential could be 1KK.

Stephen Offiler 2/2/90

Porter

EXHIBIT NO. 59

HIGHLIGHTS

Stephen B. Offiler
Week Ending 03/23/90

FORD MY91.75 CRUISE CONTROL PRESSURE SWITCH EX3423

CUSTOMER ISSUES: Joe Schuck indicates that Pass-Car has finally accepted our proposed Engineering Test Specification. The Humidity spec. they've agreed to is a modified MIL-STD 202F. We will continue with our Humidity comparison test.

Light Truck steadfastly insists upon a sample size of 50 for the low-temperature drift test. We did 20 parts and presented initial results, which wasn't good enough for Ford. This test originally was supposed to be done in a quick-and-dirty manner until bureaucracy stepped in. However, I have resolved the issue of the mis-applied Cpk numbers with Joe Schuck and now feel more comfortable about completing the test on 30 more parts.

AUTOMATED SWITCH: The three outstanding issues at present are calibration, twist, and rivetless assembly. We are waiting for EDM parts and a special dial-indicator tip in order to proceed with the stationary terminal design for calibration. We are waiting for Mechanization to complete the twist tool in order to move forward with this concept. I have roughed out a test plan for the twist concept as soon as the tool arrives. Sketches are underway for the movable terminal with an eyelet for rivetless assembly, which the model shop will be able to form.

SENSOR: We have completed the test of the low-ratio-converter. Fifteen LRC test devices and 15 controls were built, stabilized, characterized, proofed, and cycled. Results are not encouraging. After the proof test (to 4000 psi) the LRC devices were found to have decreased in actuation by 13.3% while the controls decreased by 2.5%. Some LRC devices were disassembled and the free disc recharacterized. These discs were found to have decreased by 10.7%, indicating that the proof test actually deformed the discs. After cycling, the LRC sensor actuations had fallen by another 9.7% beyond proof (total 23.0%). However, we found that the discs had not changed further, which indicates this drift is probably related to the Kapton seal/converter button interface. Minimal changes were observed in the control group throughout this test. It appears necessary to design a positive stop into the converter to protect the disc during proof testing.

57PSL5-2: We have built a quantity of parts for the PIST/PIPC exercise. These production-built devices use black 57PS "L" bases, model-shop modified SAE J512 hexports, and special discs to produce 250 psi actuation. These have been transferred to Quality, and are expected to be ready to ship next Tuesday. This will allow us to just meet the deadline of 03/28/90.

GM TRUCK/BUS NBO:

We are in the process of building six prototypes, expected 03/28/90. We should be able to meet this if all goes well. A data sheet will accompany these parts, with information on actuation and release, contact current rating, and a brief summary of testing performed.

Steve Offiler 3/23/90

TI 0009017

EA02-028-A 13271

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3.10 IMPULSE

3.10.1 Devices tested: 157-15-01 thru -12 from Fluid Resistance test 3.9 and 157-15-67, -69 thru -74, -76 thru -80 virgin devices.

3.10.2 Procedure: Virgin devices were run separately, before the Fluid Resistance devices. In each case, the procedure given in the ES (frame 7 of 18, section III. E. 1.) was 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: All twenty-four 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.

Porter
EXHIBIT NO. 60

EXT LOT NO.	TEST		DEVICE
ATED BY			
PROVED BY	TEXAS INSTRUMENTS	MATERIALS & CONTROLS GROUP ATTLEBORO, MA 02703	DOC. TI-001097
TE			PAGE 11

Porter
EXHIBIT NO. 61

HIGHLIGHTS

Stephen B. Offiler
Week Ending 11/16/90

FORD MY'92 NEXT-GENERATION SPEED CONTROL DEACTIVATE PS

VALIDATION: The Light Truck ISIR package, due at Ford next Wednesday, is being pulled together today. The ES test report has been completed. We are dealing with minor difficulties such as the lack of an up-to-date envelope print released into Ford's system; and various dimensional discrepancies uncovered in the FAI. After discussion, we have reached a consensus on the definition of "production" parts as applied to the crimp ring and the hexport.

The Pass-Car validation testing is progressing according to schedule. George O'Lear is working next week, and our vibration test will be conducted at that time. Fortunately, no Fluid Resistance test actions are needed during shutdown next week.

SAMPLES: We again utilized the 57PS hand line to build customer samples with good results. 130 parts were owed to Kelsey-Hayes. We built 200 using a new disc lot to help center the distribution and improve yields over last week's build. Finished devices shipped without incident.

Our next sample requirement, the largest to date, is 650 parts to complete Hilite Industries' order for 800. This was originally due 11/28, but Charlie Douglas was able to push it out to 12/07. The reason for the delay is due to four factors: we've got to build 600+ rebump cups in the model shop; we need more discs; we need characters for part number coding; and most importantly we need to modify the software on the pressure tester to handle the Pass-Car spec of 90 - 160 psi actuation and 20 minimum release. Matt Sellers is working with Mechanization to get this done. I've spoken with Scott Martin and Terry (group leader on 57 line), who indicate that these can be done as soon as we're ready.

Problem w/ switches in Florida?

CUSTOMER ISSUES: I received a call on Tuesday from Bruce Pease. It seems that a three-car fleet on test in Florida was having speed control problems, and for no apparent reason Bruce was contacted rather than the correct person, Gary Klingler. No system debug has taken place yet; any blame directed to our switches is arbitrary and preliminary. Nonetheless, I overnited 3 replacement switches to Florida to placate them. Bruce will bring Klingler into the loop so the real problem can be determined, and ultimately our "questionable" switches will be returned to us.

HEXPORT (Miscellaneous Issues): We built and Impulse tested 24 devices for a disc life test, also using new Elco CNC hexports to test the hydraulic seal. All 24 worked well. As we continue to build samples with these hexports, we are checking them individually for quality problems based on last week's experience. A new one surfaced: we found a hexport that completely missed the thread rolling operation.

I received a call from Bob Hendershot, Applications Engineer at Elco. He had some questions about the -59 EX print, which is the one that shows the unfinished cold-headed blank. Rather than answer his detail questions (tolerances, etc) I tried to give him the bigger picture: simply tell us how much it will cost to purchase cold-headed blanks without any second-op's. He also mentioned a possible change in material, from C10L10 to "10B20". Costs were not discussed. He claims this material is generally easier to machine and slightly stronger as well. This change would effect all of our Elco hexports, meaning requalification.

TESTING: Jeff DiDomenico has completed modifications to the cycler. This includes aluminum manifolds equipped with thermocouples and heaters, and a controller for the heaters. Jeff has wired the controller in such a way that we can now automatically start the pump when the brake fluid reaches the required temperature. This alleviates the need for someone to come in after hours or on weekends just to hit the "start" button.

GM TRUCK & BUS NBO
We shipped six prototypes on-schedule. These use old-style CCPS free-disc parts, with production 58PS discs (17/7 act/rel). They were accompanied by a simple data sheet listing key data such as act, rel, contact current rating, and a summary of cycle testing performed.

Porter
EXHIBIT NO. 62

HIGHLIGHTS

Stephen B. Offiler
Week Ending 91-04-12

VACATION: Steve, Monday 91-04-15
Jeff, Friday 91-04-19

FORD MY'92 ELECTRONIC SPEED CONTROL DEACTIVATE PS

CUSTOMER ISSUES: The audible noise problem from switch snap on WIN88 was experienced by George Randall, alerting him to a potential problem on his vehicles (VN58 van, F-series trucks). He has discovered a couple of related issues: a "feel" in the brake pedal, and a audible resonance from the brake booster diaphragm, which are occuring simultaneously with our switch's actuation. I have had a couple of conversations with George, and at present we're leaning towards an incipient disc to address these issues. George has asked us for anything we can come up with (i.e. characteristics not necessarily within his spec.) so he can do some quickie testing. Jeff DiDomenico is presently working on an incipient disc, and after several iterations he is making very good progress. We are, of course, shooting for a disc that will yield a device within the truck spec. When we have a disc (mid-next week at the present rate) we plan characterizations and life-testing before shipping anything to George.

We plan to ship 100 samples of 77PSL2-3 (Truck) today. These use prototype switches from the AMI calibration iteration, which were Impulse, Powered Impulse, and Thermal Cycle tested to verify the functionality of this kluged design. Jeff has built sensors using the Elco CNC lathe hexports built to the original J512 spec. Production aluminum crimp rings and the production crimp equipment will be used. Final testing must be done in the lab; 77PS switches are too short to fit the production 57 tester.

We have received requests for engineering samples from Weatherhead and Kelsey-Hayes for the Ford-required verification of the modified J512 seal. We planned to get all three Tier-1's requirements before sending hexport jobs to the Model Shop, however Pitts is dragging their feet. When they finally give us their needs, they will be charged a higher piece-price.

Regarding the SREA's to relax terminal position from 0.30-.070 to 0.25-0.75, George has signed off but Bruce's supervisor (a new individual, not Frank Janosi) has raised the feared question: why have we been shipping out-of-spec 57PSF3-X's ? This subject will be relatively easy to dance around, since we have zero RMR's relating to terminals. We (QC) owe Ford a letter explaining the situation. Also, along with the SREA's, Bruce has asked for updated prints. The ECN for these has been filed.

PRODUCTION ISSUES: Elco's latest submission of 36900-1 hexports has been rejected for threads. We met with Mark Godbout in R.I. who demonstrated that the "go" gage required greater than the spec. of 4.5 in-lbs torque, but the tri-roll PD gage showed the parts near nominal. Careful inspection using an optical comparator with a thread template showed the initial threads to be damaged. With Stan Homol's inputs, we have determined that these threads were most likely damaged during plating. It looks like the same re-rolling operation that has become necessary on other 52/57 hexports will be needed here.

I have completed a set of tables for use with the TDR chamfer gages. Since the calculation of chamfer diameter and angle is very sensitive to gage ball diameter, separate tables were created for each anticipated ball diameter. For a given set of gage ball sizes, the tables tabulate the actual readings obtained from the gage for the larger and smaller ball, and provide a calculated diameter and angle. A set of tables for each gage has been reproduced from the originals, which I plan to keep. The tables are extremely important; without them the $3200/each gages are useless.

77PS DESIGN: During the above-mentioned 77PS prototype verification testing, we also piggybacked another test. During powered Impulse cycles, we ran half the switches at the spec. of 2 Hz, and the other half at 0.2 Hz. This was an attempt to determine if the relatively high and unrealistic 2 Hz had a negative effect on the contacts. All devices passed; the fast cycled contacts show marginally more wear but nothing significant. One device had a very high millivolt drop (131 mV versus about 10 for all others); we plan to analyze this further. Devices were purposely pinned at the extremes of the pin window, and the high mV device was one that was pinned high i.e. potential creep release and minimum contact gap.

ECN's are in the process of being placed for various 77PS components. We are going through the exercise of tweaking production tools and/or tweaking prints to match the parts. This includes 46515 (base), 27713 (rebump cup), 36900 (hexport), 36887 and 8 (terminals) and 36889 (spring). Of all of the above, the spring requires the most effort. I plan to submit the other 5 on an ECN, then spend significant time on the spring. We have learned from prototypes that the spring in reality does not deflect exactly as assumed when studied on paper. Effort must be spent to understand how well the prototype parts match the prototype prints, how well the prototype prints match the production prints, then determine how well the prototype assemblies match the production prints, then make tweaks as needed so the all the features of the production parts fall into the proper places.

HIGHLIGHTS

Stephen B. Offiler
Week Ending 91-08-16

EXHIBIT NO. 63
Porter

FORD MY'92 ELECTRONIC SPEED CONTROL DEACTIVATE PS

VALIDATION:

The Thermal Cycle test was successfully expedited in order to begin the important Impulse test as soon as possible. Half of the Impulse test is run on virgin devices, and the other half is to be run on parts which have completed the Fluid Resistance test. We are now running the virgin Pass Car and Light Truck parts simultaneously. A significant problem is occurring on the PC devices. We have had three failures to date (325K of 500K) due to fluid leakage. Autopsy of two (thus far) shows fatigued Kapton; no real evidence of foreign matter nor damage to the Kapton during assembly. Stan Homol is providing valuable assistance in failure analysis. Note that we are running AMI-built PC and LT side-by-side, with no failures of the LT parts, which is directing F/A toward the cup. We are continuing to run the test for two reasons: one, to attempt to complete the LT parts successfully; and two, to continue to fail PC parts to provide additional F/A clues. Hypotheses include: increased converter travel in the rebump design; extraordinarily tight sensor crimp as evidenced by the deformations where the Kapton layers overlap; very flat washers (unlike the norm, which is slightly cup-shape) which may also contribute to tight crimp. We are giving this matter top priority. At this point, it is safe to assume that the PC parts presently undergoing Fluid Resistance will also fail on Impulse. This means that after the problem is corrected, at the very least the Fluid Resistance test will need to be re-run, or at worst the entire validation will have to be re-run from scratch, which is about a nine-week process either way. We are now trying to determine how to best approach Ford with this news.

MECHANIZATION:

Mechanization has performed repeated measurements on the three AMI gage blocks and three switch assemblies, and Jeff has performed exactly the same measurements manually. The AMI calibrator (measure-only mode) and the check station produced commendable sigma's, although lack of agreement between the two requires more effort to understand. Jeff's measurements produced sigma's slightly worse than the automatic equipment. The good news is that it appears that a very good correlation exists between Jeff's manual measurements and the check station. We are planning a "pre-effectivity run" (a.k.a. "final debug run") of a few hundred switch assemblies, collecting all data on each piece and identifying each individually for later analysis. This will provide a statistically significant number of parts for check station vs. Jeff correlations, as well as allow Pareto analysis of problems which occur during the run.

Dave Peripoli has spent quite a bit of time working on the riveter on the Eastern Automation equipment. At present, we've got a hybrid of Milford and Thompson riveter parts, which seems to be running fairly well. However, for the long-term Mechanization is looking into elimination of the rivet. We are working with an ultrasonic welding firm, Stapla, who has provided very impressive samples. I am meeting with them today to provide actual springs and movable terminals, so we can do actual in-product performance and life tests.

Progress on the above items is presently impacted by lack of terminals. We have 27K movables and 45K stationaries from Bassler which were rejected for contamination. The sticky green substance has been identified as the environmentally-friendly cleaner/rustproofing product (Irmco 119) that Bassler uses to remove the EF stamping lube (Irmco 185).

TI-004324

Apparently he is not drying and/or removing this product correctly. Rick B. has determined that a phosphoric-acid tumbling product he uses regularly in-house will remove the green stains. We are having him expedite this cleaning process so we may continue with riveter work and the pre-effectivity run.

MISCELLANEOUS:
We have finally received the correct mating-connector terminals and wedges from UTA. The confusion was caused in part because this is a brand-new design and is not properly documented yet; additionally the correct individual who has knowledge of this product was out sick.

The hexport samples in 10B21 material have arrived. One has been sent to TSL for analysis of hardness, in the same fashion as done previously for a 10L10 part. This will allow direct comparison, in order to determine if the 10B21 is actually significantly harder. These parts, without re-roll, gaged very well - however, they were not plated in a 5K batch size, and they were packed individually for shipment. The hardness results, along with the quote, will help determine whether we will proceed with a full plating lot (5K).

IN THE CIRCUIT COURT OF JACKSON COUNTY, MISSISSIPPI

OUIDA CAMPBELL and JAMES R. CAMPBELL — PLAINTIFFS

VERSUS

FORD MOTOR COMPANY, D&L, INC. OF COLLINS f/k/a D&L, FORD, INC., WOOLWINE FORD LINCOLN-MERCURY, INC., Successor in Interest to D&L FORD, INC., E.I. DU PONT DE NEMOURS AND COMPANY, AND TEXAS INSTRUMENTS INCORPORATED — DEFENDANTS

CASE NO. CI-99-0211(3)

NOTICE OF INTENTION TO TAKE VIDEOTAPE DEPOSITION OF GARY KLINGLER

TO: Texas Instruments, Inc., by and through its attorneys of record, Joe R. Colingo, COLINGO, WILLIAMS, HEIDELBERG, STEINBERGER & MCELHANEY, P.A., Post Office Box 1407, Pascagoula, Mississippi 39568 AND Eric Mayer, SUSMAN GODFREY L.L.P., 1000 Louisiana Street, Suite 5100, Houston, Texas 77002.

Please take notice that defendants, Ford Motor Company and Regency Lincoln-Mercury, Inc. will take the testimony on oral deposition by videotape of Gary Klingler at 9:00 a.m. on Tuesday, December 5, 2000, at the offices of Jim Feeney, FEENEY KELLET WIENNER & BUSH, 35980 Woodward Avenue, Second Floor, Bloomfield Hills, Michigan, by a duly autorized court reporter; said deposition to continue from day to day until completed.

The deposition when taken may be used in evidence upon the trial of the above-entitled and numbered cause.

Respectfully submitted,

Philip W. Thomas
Mississippi State Bar No. 9667
BAKER, DONELSON, BEARMAN & CALDWELL
P.O. Box 14167
4268 I-55 North
Meadowbrook Office Park
Jackson, Mississippi 39236
601/351-2400 (Telephone)
601/351-2424 (Telecopier)

Klingler
EXHIBIT NO. 1
12-5-00

ER02-025-A 13260

And

Jim Feeney
Michigan State Bar No. P13335
FEENEY KELLET WIENNER & BUSH
35980 Woodward Avenue, Second Floor
Bloomfield Hills, MI 48304
248/594-0301 (Telephone)
248/258-0421

And

BROWN MCCARROLL & OAKS HARTLINE
111 Congress Avenue, Suite 1400
Austin, Texas 78701-4043
(512) 472-5456 (Telephone)
(512) 479-1101 (Telecopier)

By: [signature]
Jeffrey C. Manske
Texas State Bar No. 12956420

ATTORNEYS FOR DEFENDANT
FORD MOTOR COMPANY

AUS:[illegible]
[illegible]

CERTIFICATE OF SERVICE

This is to certify that a true and correct copy of the above and foregoing has been forwarded to the following counsel of records on this 28th day of November, 2000, as follows:

Via Certified Mail - Return Receipt Requested and Via Overnight

Eric J. Mayer
Johnny W. Carter
SUSMAN GODFREY, L.L.P.
1000 Louisiana Ave., Suite 5100
Houston, Texas 77002-5096

Joe R. Colingo
Stephen W. Burrow
COLINGO, WILLIAMS, HEIDELBERG, STEINBERGER & MCELHANEY, P.A.
Post Office Box 1407
Pascagoula, Mississippi 39568-1407

Via Regular Mail:

Robert W. Wilkinson
DOGAN & WILKINSON, PLLC
P.O. Box 1618
Pascagoula, Mississippi 39568-1618

Scott C. Taylor
SCOTT C. TAYLOR, P.A.
1126 Jackson Avenue
Suite 401A
P.O. Box 1729
Pascagoula, Mississippi 39568-1729

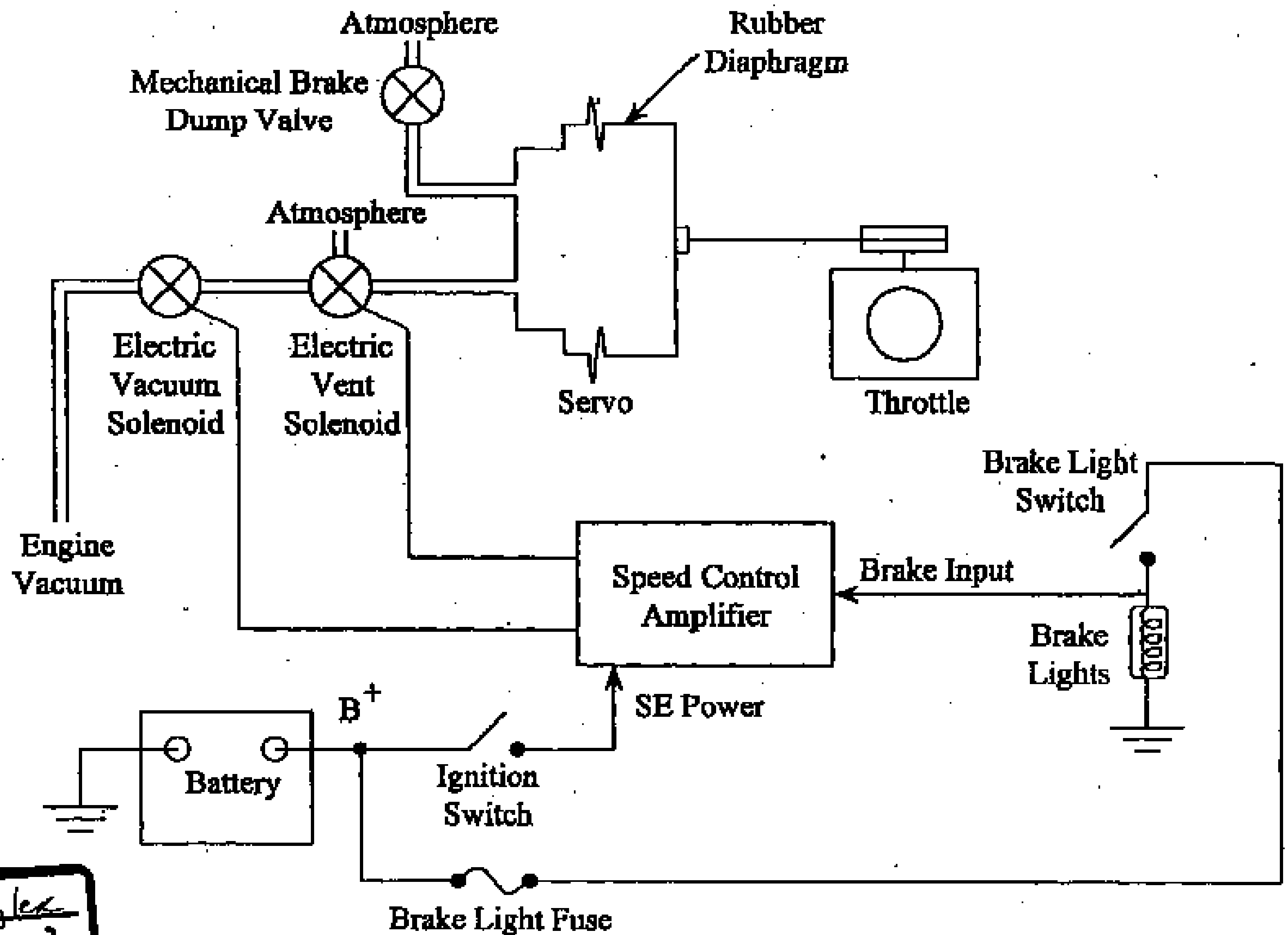
Michael Bruce Jolly
1018 Preston, Suite 450
Houston, Texas 77002

Monique M. Weiner
Terrence K. Knister
ABBOTT, SIMSES, KNISTER & KUCHLER
400 Lafayette Street, Suite 200
New Orleans, Louisiana 70130

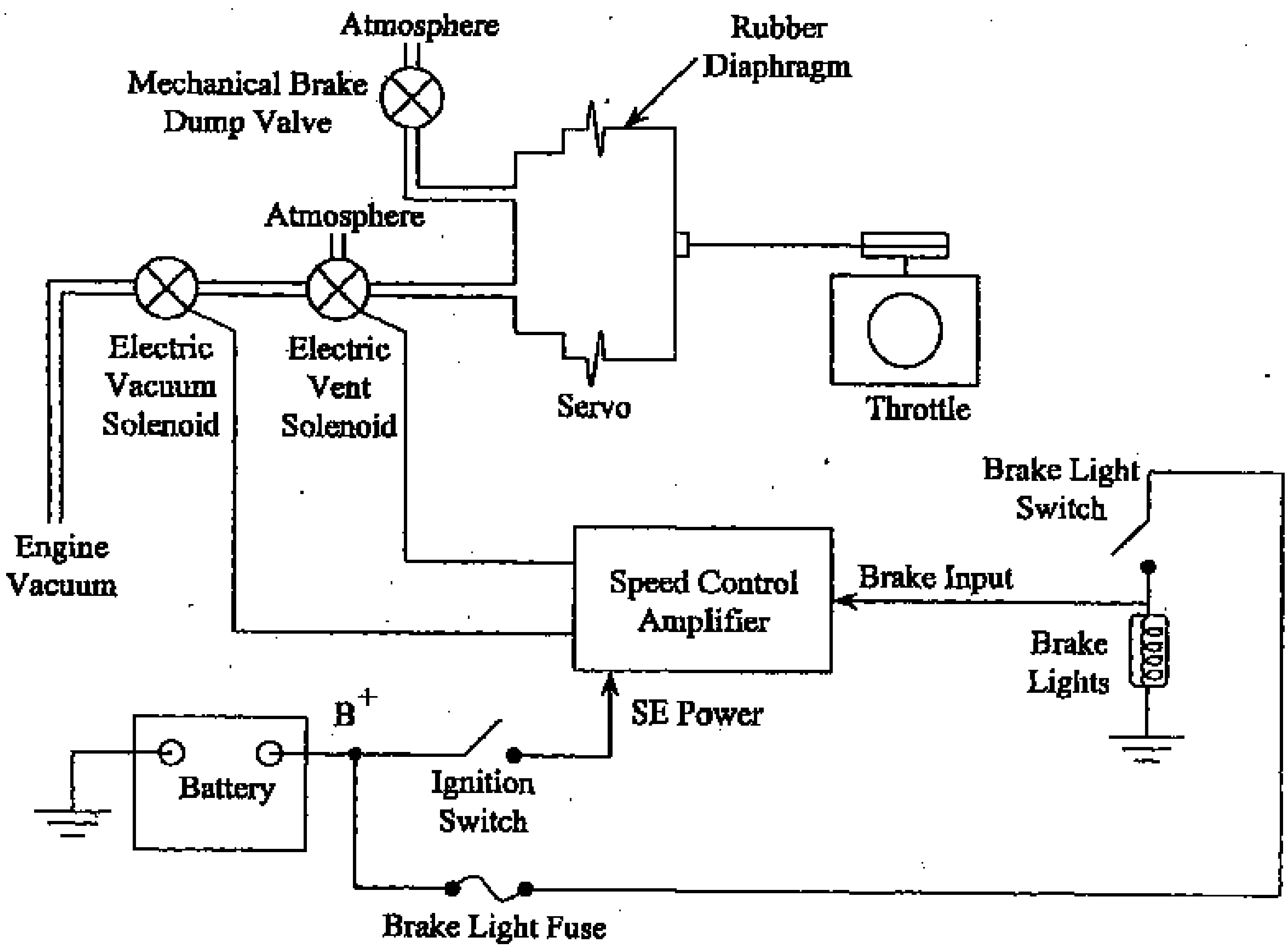
Jeffrey W. Manske

ATL:1842121.1
36615.21

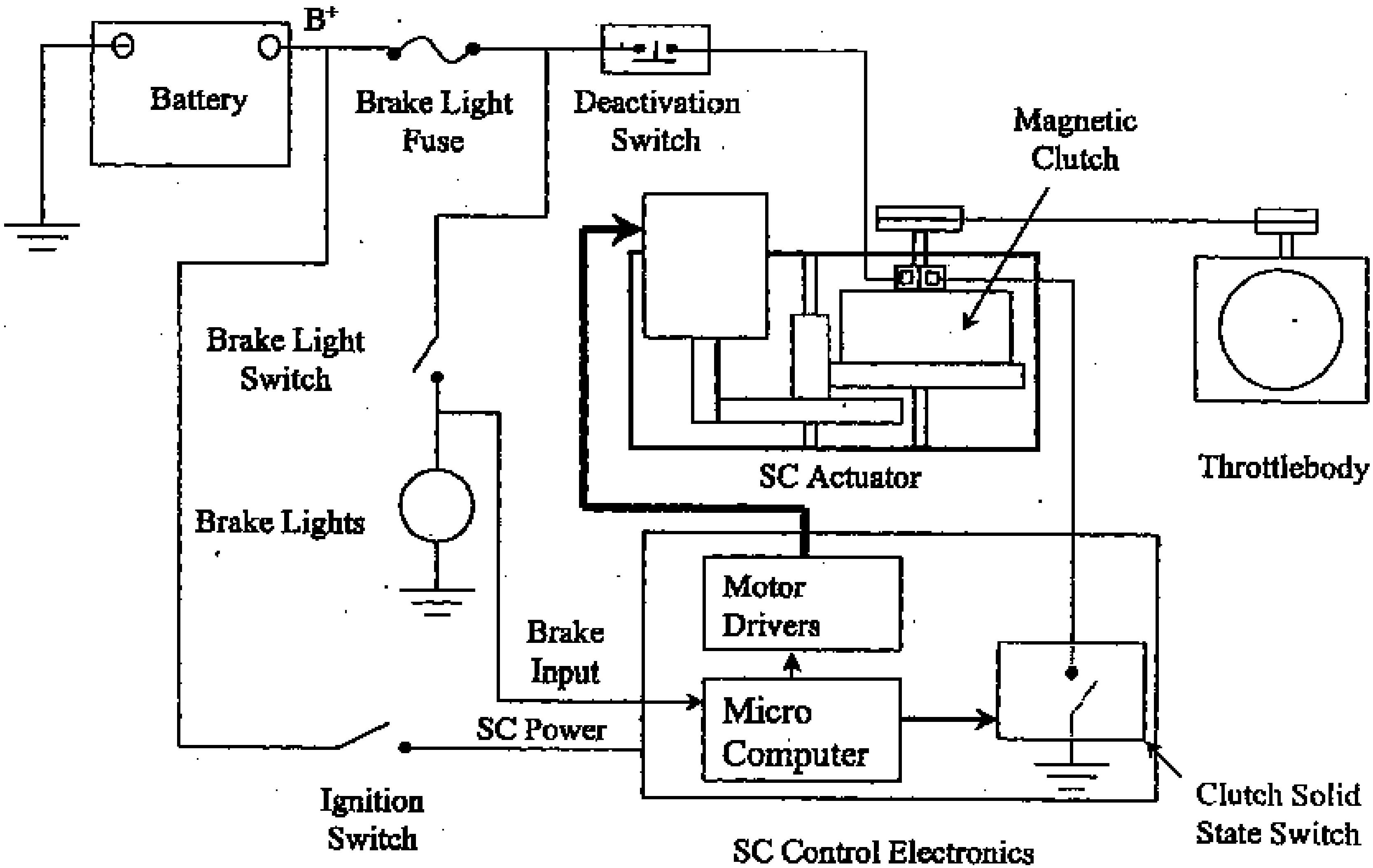
VACUUM SPEED CONTROL SYSTEM SCHEMATIC



VACUUM SPEED CONTROL SYSTEM SCHEMATIC

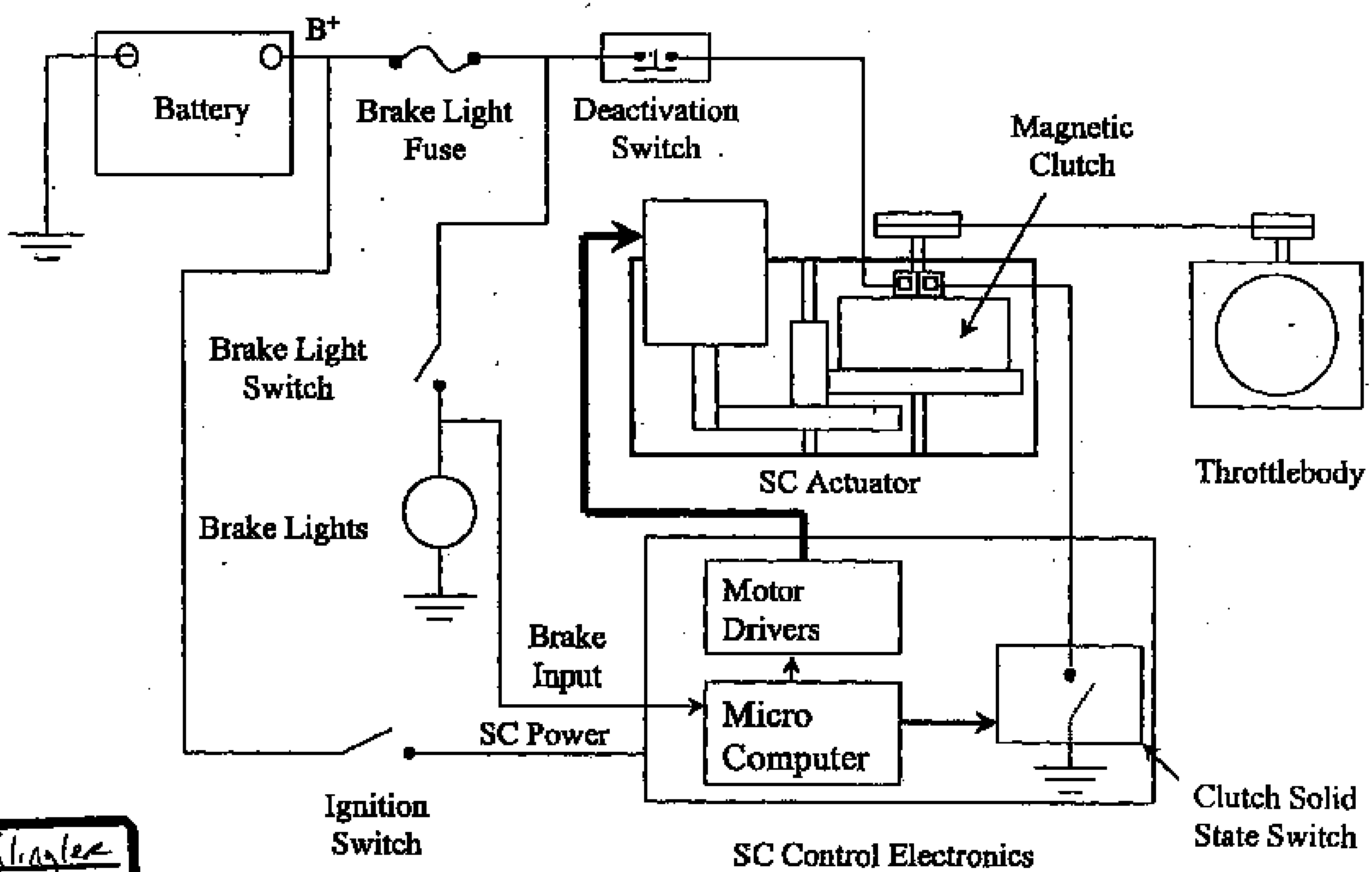


SIMPLIFIED SPEED CONTROL SYSTEM SCHEMATIC



Ex. 3A

SIMPLIFIED SPEED CONTROL SYSTEM SCHEMATIC



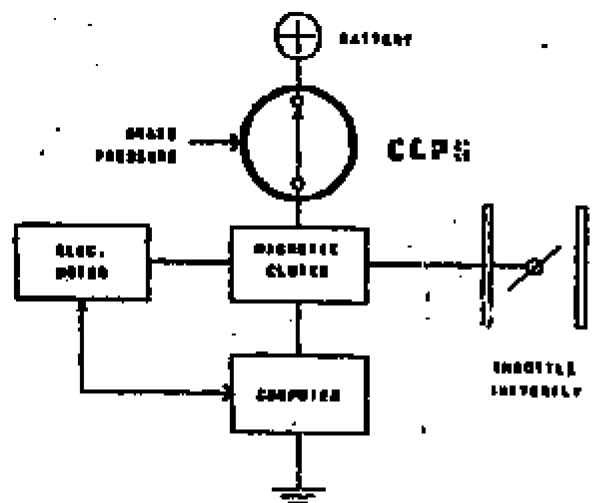
PRECISION CONTROLS DESIGN ENGINEERING
DESIGN REVIEW - 16 MAY 1989
MY92 CRUISE CONTROL PRESSURE SWITCH

OVERVIEW

THE CCPS IS A REDUNDANT SAFETY DEVICE IN A NEW, VACUUM-LESS, ELECTRONIC CRUISE CONTROL DESIGNED BY FORD.

FUNCTIONALLY, IT REPLACES THE PRESENT VACUUM DUMP VALVE BY DE-ENERGIZING A CLUTCH WHICH CONNECTS THE THROTTLE TO AN ELECTRIC ACTUATOR.

IT IS PLUMBED INTO THE BRAKE LINE. WHEN THE DRIVER APPLIES PRESSURE TO THE BRAKE PEDAL, THE NORMALLY-CLOSED SWITCH OPENS, DISCONNECTING THE ACTUATOR FROM THE THROTTLE BUTTERFLY.



SPECIFICATIONS:

ACTUATION:	150 PSI +/- 50
RELEASE:	100 PSI MIN.
BURST:	7000 PSI
CYCLES:	500K, 0 - 1450 PSI, 2 Hz
VOLTAGE:	BATTERY
CURRENT:	0.75 AMP

17 May 89 SBO 50-167

IN THE CIRCUIT COURT OF JACKSON COUNTY, MISSISSIPPI

OUIDA CAMPBELL and JAMES R. CAMPBELL,

Plaintiff,

vs Case No. CI-99-0211(3)

FORD MOTOR COMPANY, D&L, INC. OF COLLINS f/k/a D&L, FORD, INC., WOOLWINE FORD LINCOLN-MERCURY, INC., Successor in Interest to D&L FORD, INC., E.I. DU PONT DE NEMOURS AND COMPANY, AND TEXAS INSTRUMENTS, INCORPORATED,

Defendants.

_______________________________________/

DEPONENT: GARY KLINGLER

DATE: Tuesday, December 5, 2000

TIME: 9:30 a.m.

LOCATION: 35980 Woodward Avenue, Second Floor
Bloomfield Hills, Michigan

REPORTER: Denise M. Kizy, RPR/CSR-2466

VIDEO: Daniel S. Cady

APPEARANCES:

LAW OFFICE OF NORMAN JOLLY
By: Mr. Michael Bruce Jolly
1018 Preston, Suite 450
Houston, Texas 77002
(713) 237-8383
On behalf of the Plaintiff
(Did not appear)

FEENEY, KELLETT, WIENNER & BUSH
By: Mr. James P. Feeney
35980 Woodward Avenue, Second Floor
Bloomfield Hills, Michigan 48304-0934
(248) 258-1580
and
BROWN McCARROLL & OAKS HARTLINE, LLP
By: Mr. Jeffrey C. Manske
111 Congress Avenue, Suite 1400
Austin, Texas 78701-4043
(512) 479-9761
Appearing on behalf of the Defendant,
Ford Motor Company

ABBOTT, SIMSES, KNISTER & KUCHLER
By: Ms. Monique M. Weiner
400 Lafayette Street, Suite 200
New Orleans, Louisiana 70130
(504) 568-9393
Appearing on behalf of the Defendant,
E.I. DuPont De Nemours

SUSMAN GODFREY, LLP
By: Mr. Johnny W. Carter
1000 Louisiana St.
Houston, Texas 77002-5096
(713) 653-7818
Appearing on behalf of the Defendant,
Texas Instruments

ALSO PRESENT: Steven Beringhause

EXHIBITS

NUMBER	IDENTIFICATION	PAGE
No. 1	Notice of Intention to Take Videotape Deposition of Gary Klingler	5
No. 2	Vacuum Speed Control System Schematic	5
No. 2A	Vacuum Speed Control System Schematic	5
No. 3	Simplified Speed Control System Schematic	5
No. 3A	Simplified Speed Control System Schematic	5
No. 4	Setup Components	5
No. 5	Component Part	55
No. 6	Precision Controls Design Engineering Document	74

Bloomfield Hills, Michigan
Tuesday, December 5, 2000
At about 9:30 a.m.

* * *

(Marked for identification Deposition Exhibit No. 1, 2, 2A, 3A and 4.)

VIDEO OPERATOR: We are now on the record.

The time is 9:31 hours. This is tape one of the videotape deposition of Gary Klingler in the case of Ouida Campbell and James R. Campbell versus Ford Motor Company, et al., Case No. CI-99-0211 being taken at 35980 Woodward Avenue, Bloomfield Hills, Michigan.

Today is Tuesday, December 5, 2000. My name is Daniel S. Cady, legal videographer from Esquire Video Services.

If the attorneys will introduce themselves for the record, the reporter will then swear the witness.

MR. FEENEY: My name is Jim Feeney and I represent Ford Motor Company along with Jeff Manske in this matter.

MR. CARTER: My name is Johnny

Carter. I represent Texas Instruments, Incorporated, and I'm here with Texas Instruments corporate representative Steve Beringhause.

MS. WEINER: I'm Monique Weiner representing DuPont.

GARY KLINGLER

was thereupon called as a witness herein, and after having first been duly sworn to tell the truth, the whole truth, and nothing but the truth, was examined and testified as follows:

EXAMINATION

BY MR. FEENEY:

Q. Good morning, sir.

Would you tell us your full name and spell your last name for the record, please.

A. Okay. My name is Gary Michael Klingler, and it's K L I N G L E R.

Q. Mr. Klingler, would you tell the members of the jury what you do for a living and where you do it?

A. Okay. I'm an engineer for Visteon Corporation and I am currently located in Japan.

Q. How long have you been located in Japan, Mr. Klingler?

A. Six months.

Q. We're here in our offices in Michigan.

Have you come to Michigan at our request to give evidence in this matter?

A. Yes, I did.

Q. Mr. Klingler, from 1988 to 1992 by whom were you employed?

A. At that time I was employed by Ford Motor Company.

Q. And in that regard in your employment with Ford at that time did you have any involvement in the design, development and testing of the speed control system that was eventually placed on the 1992 Lincoln Town Car?

A. Yes, I was. I was the engineering supervisor responsible for the design of the components and system.

Q. And was that same system also place on the Grand Marquis and Crown Victoria models around that same time or perhaps a little later?

A. Yes, it was.

Q.. And all three of those models, are they referred to as the so-called Panther platform?

A. Yes, they are.

Q. I'm going to ask you some questions about your involvement in the design of the speed control system, but before I do that I'd like so that the jury has a little better idea of your background, if you will just tell us what your educational degrees are, where you went to school, that sort of thing.

A. Okay. I have a bachelor's degree in mechanical engineering from the University of Michigan. I have a master's degree in electronic engineering from the University of Michigan, and I also did some postgraduate work at University of Michigan in control systems.

Q. You have an undergraduate degree in mechanical engineering?

A. That's correct.

Q. What is mechanical engineering, could you explain that to members of the jury that may not be familiar with that --

A. Okay.

Q. -- course of study?

A. Okay. Mechanical engineering is involved usually with the design of physical parts, you know, designing gears, motors, that sort of thing.

Q. And you have a master's degree in electrical engineering.

What is the discipline of electrical engineering?

A. Okay. Electrical engineering involves several things. It involves the design of circuits. It also involves writing a software programming.

Q. And did you use both of these disciplines in connection with your work in the design and development of the speed control system that went on to the 1992 Lincoln Town Car?

A. Yes, I did.

Q. And what was your first significant employment upon graduation?

A. When I graduated in 1977 I was employed by International Business Machines.

Q. For how long?

A. For two years.

Q. And after that two-year stint did you join Ford?

A. Yes, I joined Ford Motor Company in 1979.

Q. And other than -- I know you now work for Visteon, but were you employed continuously for Ford from 1979 until the year 2000?

A. Yes, I have been.

Q. Let's explain at this point in time exactly what Visteon is, what it does and what its relationship in the past was to Ford, could you go ahead and do that please, Mr. Klingler?

A. Okay. Yeah, Visteon recently became an independent company of Ford I believe legally in July of this year, and essentially what Ford did was take all its components operations, and, you know, separate them into their own company.
Q. And is Visteon now a separate and independent company from Ford?
A. Yes, they are.
Q. Why did you leave Ford, sir?
A. Well, I was part of the component operation, okay, so I went with Visteon because that's where my job was.
Q. All right. And now you are a resident in Japan working for Visteon.
What's your current job for Visteon, I don't mean details, but what's your title?
A. Okay. I'm manager of Asia Pacific customer applications.
Q. Do you like it?
A. It's interesting.
Q. Okay. Let's talk about the speed control system that was placed on the 1992 Lincoln Town Car, all right.
Before 1992, I mean before you got involved in developing that speed control system,

did you become aware of the earlier versions of speed control that Ford was using in their products?

A. Yes, I was very familiar with the previous system. My first assignment at Ford in 1979 was introducing into production the speed control servo mechanism that was part of that system.

Q. And are you familiar enough with that system so that you can describe basically how it operated and what its benefits were and what if any problems there were with that system?

A. Yes, I can.

Q. And did you have that knowledge in 19 -- in the late 1980s at Ford?

A. Yes, I did.

Q. Are you aware of because of your job at Ford, are you aware of the reasons why Ford chose to develop a new speed control system for the 1992 Panther platform?

A. Yes, I am.

Q. And are you familiar with the benefits of that new system and how some of these earlier problems were solved by the new design?

A. Yes, I am.

Q. Are you able to explain how the new system functions?

A. Yes, I can.

Q. Can you tell us how, for example, it is activated?

A. Yes, I can.

Q. And can you tell us how it's deactivated?

A. Yes, I can.

Q. And is that true of both the old system and the new system?

A. Both systems are very similar as far as operation.

Q. Let's talk about the -- let's talk first about the old system.

Now you've got something behind you here that perhaps watching this video the jurors can see a red light behind your head.

What have you got here, sir?

A. Okay. This is a setup that it can demonstrate the operation of the previous Ford speed control system.

Q. I've put an exhibit sticker on that setup and I'm just going to refer to it as Exhibit 4 for now.

Do you have -- can you with reference to that system, and I'm not asking you to do it right now, but can you with reference to Exhibit 4 can you basically walk us through how the old, the earlier version of the speed control that Ford had on its models, how it functioned, how it worked?

A. Yes, I can.

Q. And in addition to that model did you bring with you any sort of a schematic or cause to be prepared any kind of a diagram of the circuitry of the system that may be of assistance in helping you?

A. Yes, I have a schematic of the prior Ford system to help explain how it works.

Q. There's some papers on the table.

Can you find that Ford schematic as part of those papers, sir?

A. Yes, this document.

Q. And what's the exhibit number on that document?

A. It is Exhibit No. 2.

Q. And what is the title?

A. Vacuum Speed Control System Schematic.

Q. All right. And behind you I've got some blowups I think of the document you just referred to.

Can you turn the document, the board over there that corresponds with that schematic?

And I think I put an exhibit sticker on that before we started, and what did I label that, sir?

A. I think it's called Exhibit 2A.

Q. Okay. Now I've got a pointer here and if you can, taking care to make sure that you're not obstructing the video camera and the other lawyers' view, if you could take this pointer and perhaps stand up or move out of the way, I'd like you with reference to the schematic take us through this diagram so that the jury orients itself in the first instance on the basic layout of the speed control system and then we'll go to the model; all right?

A. Okay.

Q. Let me hand you -- just press down on the red dot.

MR. FEENEY: Can you see the board all right? Do you want it moved?

VIDEO OPERATOR: I want it more perpendicular to the camera.

That's good right there.

MR. FEENEY: Okay. Very good.

Q. (BY MR. FEENEY) Now let me ask you in the first instance, Mr. Klingler, what is a speed control system?

A. Okay. A speed control system is something for customer convenience, and what the system does is it allows the driver to set his vehicle at a fixed speed, okay, and the system will maintain that speed independent of the driver having to control it.

Q. How long has Ford been offering vehicles for sale with some form of speed control?

A. I think the first Ford speed control system was introduced I think some time in the '60s.

Q. And have there been improvements and changes to the setup or the system along the way?

A. Yes, I think currently this is probably the fourth generation speed control system that Ford has had.

Q. How does the Ford system work, and by that I mean I'm talking about the system that was in place on vehicles before the new system was developed?

I mean could you describe with reference to Exhibit 2A basically how this works, and understand that we're not electrical engineers and I doubt that any member of the jury will be an electrical engineer, although possibly they will be, but can you in very brief terms explain how the old speed control system worked before you began to develop a new one?

A. Okay. Okay. What speed control does is essentially it controls the throttle of the engine which controls the power of the engine which in turn controls the speed of the vehicle.

Q. Now this what you've got here, it says throttle, Exhibit 2A. That doesn't look like any kind of throttle that I've ever seen.

A. Yeah, it's not a very good picture. I think maybe later when we look at the display there's an actual throttle in the display setup.

Q. My question is is it supposed to look like a throttle?

A. Yes, it is.

Q. Okay.

A. And to control the throttle, okay, you need some sort of actuator that can open and close the throttle, and for the system at this time they used what was called a vacuum actuator.

Q. What is that?

A. Okay. A vacuum actuator is a mechanism that consists of a rubber diaphragm, and this is called the chamber of the actuator, and what you would do is by controlling some electric valves you could let vacuum in and out of this actuator that would cause this diaphragm to move in and out opening and closing the throttle.

Q. Okay. When you use the term vacuum what do you mean by vacuum? Are you talking about a vacuum cleaner?

A. I guess something similar. A vacuum is a negative pressure. It's like, you know, sucking in. To suck in air you have to create a vacuum in your lungs.

Q. And how does air get sucked in or sucked out of that chamber under the old system?

A. Okay. In this system here the vacuum source is the actual engine of the vehicle, okay, and vacuum would get introduced into this chamber, okay, through a set of electric valves.

Q. And what would activate those electric valves?

A. The electric valves would be activated by what is called the speed control amplifier which is the set of control electronics for the speed control system.

Q. And what would activate the amplifier?

A. Okay. The amplifier as far as operation is controlled by a set of command switches which for the Ford system are on the steering wheel.

Q. And command switch on the steering wheel, would that indicate on or off?

A. Yeah. The steering wheel had I think three switches; one was on/off, the other one was set accel coast, and then there was a resume button.

Q. So take us through how a person would activate the system.

A person is driving along the highway at 50 miles an hour. He wants to set his speed control. You take it from there.

A. Okay. To engage the speed control system the driver would first have to hit the on switch, okay, and then when he was at his desired speed he would hit the set button and that would cause the system to engage.

Q. And would the set button then be the device that would send a signal of some kind to the amplifier that would then in turn signal these valves that are vents that you've got described there?

A. Yeah, correct. The amplifier then would by modulating these valves cause the throttle to move to the correct position to maintain that vehicle speed.

Q. Now suppose someone wanted to turn off the old system, or deactivate it, use a fancy term.
Were there more than one way that a driver could turn off or deactivate the system?
A. Yes. There's two ways that the driver could deactivate the system. One is by hitting the off switch on the steering wheel. The second means would be to hit the brake, tap the brake.
Q. Tap the brake. And what under the old system were the ways that -- how is it that by tapping the brake you would deactivate the system?
A. In the old system, okay, what you have on your brake pedal, you have an electrical switch, okay, and here is representing the brake lights of the vehicle, okay.
When you tap the brake what happens is this electrical switch closes, okay, which connects the brake lights to the battery voltage, okay, and the speed control amplifier would then read that signal and turn the speed control system off by turning these valves off.
Q. Was that the primary way that was relied upon under the old design to deactivate the speed control?
A. In a speed control system typically the

operators disengage a speed control system with their brake.

Q. And if I understood what you just said, that signal if you will to that speed control amplifier -- why don't you put the light on that -- came from the brake lights coming on?

A. That is correct.

Q. Now were there other ways to deactivate the old system?

A. There are two other means that the speed control system would deactivate. One is if your vehicle speed drops below 25 miles an hour, okay, the speed control system would deactivate itself.

Q. Just automatically?

A. Automatically. And the fourth way is if your vehicle speed for whatever reason drops 10 miles below the speed that it was set at the system will deactivate.

Q. Under the old system if you were let's say out west and climbing a steep hill, a steep grade for a long period of time and you started off at say 55 with the speed control on, were there any problems with the old system?

A. Yes, there were problems in that with the vacuum-based system you depended upon the vacuum in the engine, okay, as a source of power for the actuator to move the throttle in and out, and with the vacuum systems, due to changes and engine technology over the years, there's a situation when you were climbing hills the engine was running out of vacuum, okay, and there wasn't sufficient power to pull the throttle in, okay, and this would cause problems in performance of the speed control system.

Q. Was that one of the problems that Ford sought to eliminate or significantly improve upon with a new system?

A. Yes, that is one of the key reasons for the new system.

Q. Now you gave us several different ways that the system could be deactivated, the old system.

Was there a backup system, was there a redundant system available that would cause the system to be deactivated?

A. Yes. In this system, you know, there was a redundant system to protect against potential failures of the valves or the speed control electronics.

Q. And what was that backup system, Mr. Klingler?

A. Okay. In this system there was what was called a mechanical brake dump valve.

Q. How did that work?

A. Okay. This valve actually connected to the brake pedal, and in order for this system, okay, to open the throttle, okay, you would have to create a vacuum in this chamber, okay, and to create a vacuum in this chamber, okay, this mechanical brake dump valve would need to be closed, and the operation of this valve was set up such that if you weren't pushing the brake this valve was closed, okay.

If you depressed the brake it would open this mechanical dump valve, okay, which would not allow you to create a vacuum in this chamber here.

So what the system did is if this valve was open regardless of what these valves were doing here, the throttle would always be returned to idle.

Q. If -- for example, would you show us with the light where the brake light fuse is on the brake light circuit?

A. Okay. The brake fuse is right here.

Q. If for some reason the brake light fuse was blown, would that have any effect on the primary means that you described earlier to deactivate the speed control system?

A. Okay. Yes. One of the issues was if this brake light fuse was blown, okay, now you can no longer when you depress the brake turn the brake lights on and because of that there's no signal for the speed control amplifier to read, okay, so if you just tap the brakes, okay, the system would deactivate.

Q. And did that have anything to do with the desirability of having a redundant or backup system such as the one you've described?

A. Yes. In this system, okay, if you continue to depress the brake, okay, it would open this mechanical brake dump valve, okay, which would return the system to a safe mode, return the throttle back to idle.

Q. And that would be true even though the brake lights were not working?

A. That is correct.

Q. Now how common was it at least as of the late 1980s, how common was it for a brake light fuse to blow; in other words, how common was it for people to lose their brake light?

A. You know, blowing a brake light fuse is something that is not uncommon, you know, especially with people hooking trailers to the cars, wiring the brake lights for the trailers into the system. It wasn't uncommon to overload that circuit and blow a brake light fuse.

Q. By the late 1980s, was Ford aware of the possibility that through normal operations someone could blow a brake light fuse, not be aware of it, and continue to operate their vehicle not knowing that the brake lights were not operational?

A. That is something that could occur.

Q. And did that knowledge have anything at all to do with Ford's desire to have a backup or redundant system available to deactivate the speed control?

A. Yes, that is one of the primary reasons for the mechanical brake dump valve.

Q. Now what was wrong with, and I don't mean that in a pejorative, but how did the system as a designer, how could you see ways to improve this system that you've just described, both with respect to activating it and with respect to deactivating it?

A. Okay. Yeah, one of the issues with the situation we just talked about where the brake light fuse was blown, if you were going down the road with the speed control system engaged, okay, if you tap the brake, okay, and you didn't slow the vehicle down 10 miles below the set speed, okay, and then you took your foot off the brake, the system would reengage itself.

Q. Automatically?

A. Automatically.

Q. Did you want to try to do something about that?

A. That was an area that we wanted to improve upon when we designed the new system.

Q. And what you've just described, was that just a limitation of this mechanical brake dump valve?

A. That was a limitation of the system design.

Q. And were there other areas that you felt could be improved with a new system design?

A. Yes. One of our goals was to improve the reliability of the overall speed control system. You know, with the vacuum system the system is quite complicated with many separate components and vacuum hoses and lots of wiring.

Q. And what was the problem with that sort of complexity?

A. Typically the more parts you have in the system, the more potential problems you have.

Q. By the way, I didn't ask you this, but is there any federal motor vehicle safety requirement that pertains to the brake light circuit itself?

A. There is a federal motor requirement that says that the brake lights must always be operational, okay.

That's true whether you have your ignition on or when your ignition is off in the vehicle.

Q. And looking at this schematic does the schematic show to an engineer such as yourself, not me, but to an engineer such as yourself, does this schematic show how that Federal Motor Vehicle Safety Standard would be complied with in this particular system?

A. Yes. If you look at the schematic, okay, if you look at the brake light circuit, okay, it gets its power directly from the battery.

Q. I notice you just -- the light just went past something called a B plus.

Is this what you got on the

schematics, sir, a B plus, no one would give you an A for this?

A. Correct.

Typically battery voltage is designated with a B plus.

Q. So the circuit is wired directly to the battery and shown there on the diagram?

A. That is correct.

Q. Why don't you go ahead and put poster Exhibit 3A on the board and then after we describe that we'll look at the model that you have with you.

Now we put on the easel Exhibit 3A. This is entitled Simplified Speed Control System Schematic.

What is this, Mr. Klingler?

A. This is a schematic to explain the operation of Ford's current speed control system.

Q. And is this a schematic that pertains to the system that was placed in the 1992 Lincoln Town Cars and the Grand Marquis and the Crown Vics?

A. Yes, it is.

Q. And did you design and develop this system?

A. Yeah, I was the engineering supervisor responsible for the design of this system.

Q. So your team, this team that you supervised, designed this system that's on the board?

A. Yes, that is true.

Q. Okay. Now we've heard about how the old system functions, so some of this terminology is familiar to us, but let's just go back and do it the same way.

Can you tell us in the first place what was the basic difference between the system that was placed on -- that you designed on the '92 Town Car and the old, the vacuum system?

A. Okay. Yeah, one of the objectives of the new system was to design a system that was not dependent upon the engine vacuum, okay, so we needed another power source to be able open and shut the throttle and for that system -- for this system there is an electric motor.

In fact, it was called a stepper motor that was the power source.

Q. Why don't you go ahead and do you have a pen, Mr. Klingler, if you don't I've got one, but why don't you just write in there, in that box, stepper motor.

I think there's nothing in the box,

just so that we know what that is.

Okay. Now you said, I interrupted you, you said you needed a power source for the system because you weren't going to rely upon the engine as that power source or a vacuum created by the engine and you said the stepper motor.

Could you go ahead and explain what you mean by that.

A. Yeah, the stepper motor runs off of the electric system in the vehicle, so it uses the electrical power from the battery and the alternator system as its power source.

Q. Mr. Klingler, were there other significant differences between the system you designed and the earlier system?

A. You know, the other differences was that this was a much simpler system. You know, there was essentially one piece that replaced many separate components in the prior system.

Q. I see that you have on the drawing there something called a microcomputer. I don't remember seeing that on the earlier schematic.

What is the significance of that box, sir, what's that all about?

A. Okay. This box here represents the

control electronics for this speed control system, okay, and the microcomputer here is, you know, really the brains of the system, the thing that controls the operation of the speed control system.

Q. Was there a microcomputer on board the earlier models with the vacuum system?

A. The vacuum system was older technology. It had electronics, but it had what was called analog electronic control.

Q. Let's talk about how the simplified speed control system, how that would be activated in actual operation, and we'll go through the steps of that and we can explain that.

Once again we'll have our driver driving down the highway, 50 miles an hour. Now he wants to activate his speed control on his 1992 Lincoln Town Car. What does he do?

A. Okay.

Q. How does it work on the drawing?

A. Okay. Very similar, he would hit on and set buttons and for this system what would happen is, okay, first of all there's a clutch mechanism here, okay, and this clutch mechanism, what it does is mechanically connect or disconnect a spool, okay, from a gear train assembly.

Q. A spool is like what?

A. Like a threaded spool, okay, and the spool had a cable that you could wind up on it, so by the spool rotating back and forth, okay, it would open and shut the throttle.

Q. So he hits the on button, the command switch that says on, and that sends a signal to the -- to what?

A. Yeah, there's two things that happen here is, okay, the microcomputer gets the on command. He sends signals to the stepper motor, okay, to start turning to open the throttle, okay, but simultaneous with that he sends a signal to turn the electric clutch on to engage the spool to the drive train.

Q. And the net effect of those commands is what?

A. Okay. Is for the spool to turn and open the throttle.

Q. And it opens it and keeps it in the selected position?

A. That is correct.

Q. Okay. Now let's talk about deactivating the system.

The new system that you designed, how would a driver deactivate that system?

A. Okay. Very similar to the prior system, again he could hit the off switch to deactivate it or tap the brake to deactivate it.

Q. Now from the driver's standpoint he's basically doing or she's basically doing the same thing that they did on the old system, but from a design or engineering standpoint was the system the same in the way it reacted to that driver input?

A. Okay. In this system, okay, what would happen, again, you know, somewhat similar to the prior system, when you tap the brake, okay, you would turn the brake lights on.

The control electronics, okay, would read that the brake lights are on and it would do two things; one, it would send a signal to the motor to turn backwards to shut the throttle, okay, and as a redundant mechanism to make sure the throttle returned back to its idle position, it would turn the power off, okay, with a solid state switch to the electric clutch assembly.

Q. So the system that you designed by tapping the brakes, from a primary standpoint there were two separate signals that were sent, either one of which deactivated the system?

A. That is correct.

Q. One went to the stepper motor and basically it said -- well, you said -- what did you say the command was to hit?

A. The command was to cause the stepper motor to turn backwards to close the throttle.

Q. And also there was a separate signal that went to the clutch that stopped any power going to the clutch mechanism?

A. That is correct.

Q. Would either one of those be sufficient to deactivate the system?

A. Yes, they would.

Q. And did both of those depend upon the driver tapping the brakes?

A. That was the input to the electronics to cause those two actions to occur.

Q. And if the driver simply hit the off button was it the same signal that you've just described or was it a different signal?

A. Correct. If the driver hit the off button again the microcomputer would do the same two actions with the stepper motor and the clutch power.

Q. Okay. Now were there any other ways to deactivate the system?

A. Yes, there was.

There was a redundant system called a deactivation switch, okay, and with the deactivation switch also controlled power to this clutch assembly.

Q. Let's talk about the deactivation switch in just in a minute, but you mentioned this business on the old system that if for some reason the speed of the vehicle dropped more than -- or dropped below 25 miles an hour you could not command speed control.

A. Correct. Yeah, this system had similar shutoff modes, okay. If the speed dropped below 25 miles an hour, the system would disengage. Also if the vehicle speed for whatever reason dropped 10 miles below the set speed the system would disengage.

Q. Okay. From a performance standpoint, was this system an improvement over the old system in terms of maintaining a constant speed on a grade?

A. Yes, it was much improved. It eliminated the problem of the vacuum limitation that occurred in the prior system.

Q. Now let's talk about the so-called the deactivation switch.

Who supplied the deactivation switch

for the speed control system that you just described?

A. This deactivation switch is supplied by Texas Instruments.

Q. And what was the purpose of the deactivation switch?

A. Okay. The purpose of the deactivation switch was to provide a redundant means to deactivate the speed control system when you applied the brake.

Q. Redundant means backup or secondary or additional?

A. That is correct.

Q. All right. Now why don't you go ahead and tell us how that redundant backup system to deactivate the speed control worked.

A. Okay. The deactivation switch is a pressure controlled switch and this switch went into the brake hydraulic system, and in the brake hydraulic system when you aren't applying the brake, okay, your hydraulic pressure is essentially zero and then as you apply the brakes it causes the brake hydraulic pressure to increase.

Q. Hydraulic pressure, hydraulic is a reference to hydraulic fluid?

A. That is correct.

Q. And just again so that some people may not understand this, but a brake system will operate with brake lines with fluid in the lines?

A. That is correct.

Q. And the pressure of the liquid inside these lines will vary depending upon whether you are applying the brakes?

A. Correct.

Q. And how did the variance in pressure of the fluid, how did that then tie into this switch? I thought the switch was an electrical switch.

A. Okay. Yes, it is an electrical switch, and what this switch would do was when there was low pressure in the brake hydraulic system, okay, the switch contacts would be closed, okay, so you could get an electrical connection through them, and then as the pressure increased to a certain set level, okay, the contacts would open.

Q. Pressure would increase to that set level how?

A. By the driver applying the brakes.

Q. And when you say the contacts would open, what would the effect be of those contacts opening?

A. Okay. What would happen is if you look at this, this is our clutch assembly, okay, and the power is provided to this clutch through this deactivation switch, okay, which connects back to the battery, okay, so when you applied the brakes and the switch contact is open it would remove voltage power from the clutch causing the throttle to return to idle, you know, independent of what the stepper motor system was being requested to do.

Q. So the clutch was wired directly to the battery; is that right?

A. Yes, it is wired, okay, to the battery through the deactivation switch through a brake light fuse.

Q. And how did this backup system -- strike that.

Would the backup system work if in our earlier example someone had through adding a trailer or just normal operation, if that person's brake light fuse had blown so that they didn't have brake lights, how would -- would this system work in spite of the fact that that person had no brake light?

A. If you look at this system, okay, if the brake light fuse is blown, okay, we eliminate the electrical connection from the battery to the switch, okay, so there's no power to the clutch.

So if you blow the brake light fuse in this system it becomes inoperative.

Q. So that's different from, the system that you've designed was different from the earlier system where if you had a brake light fuse you could still activate the speed control?

A. Yes. Yes, this system, okay, was an improvement over the prior system.

Q. Why was this then a backup to the primary means of deactivating the system; what was it backing up?

A. Okay. What this switch does is it's intended to insure that the system always remains safe, okay, in case one of the other components in the system may fail.

Q. Such as what, what are the components?

A. Okay. For example, if something happened to your brake light switch, okay, such that when you press the brake, okay, it did not turn the brake lights on, okay, you could still disengage the system through the deactivation switch.

Q. So you could have a situation where the brake light fuse isn't blown, but let's say the brake light switch is inoperative for some reason, would this system back up the system and upon a brake application shut down the speed control?

A. Yes, it would.

Q. What other potential failures or inoperative components, I mean what other system failures might occur that this system was backing up?

A. Okay. Another system is the control electronics, the microcomputer itself. For some reason, you know, it could fail, okay, you know, commanding the throttle to stay open and by applying the brakes, okay, this system is designed, okay, such that it will remove power from this clutch, returning the throttle back to idle, you know, regardless of what this microcomputer may be commanding the motor to do.

Q. What about the -- any potential failure in this clutch solid state switch, if that failed, is it a backup for that?

A. Yes, if for some reason this clutch switch got stuck on, okay, this deactivator switch will also insure that the clutch is deactivated when you apply the brake.

Q. If you had one word to identify as the purpose of the deactivation switch in the speed control system, if you could choose one word and only one word for the purpose for that switch what would it be?

A. Is to improve the safety of the system.

Q. And can you still deactivate the system without the switch?

A. Yes. The system would operate correctly without this switch in the system.

Q. Now let's just -- let's take a break now for just a minute and we're going to reset up and I'm just going to have you go through the model so that we can just step through the model and explain with use of the real parts how the vacuum system worked, and do you have a means with some device there of showing us, I know this is not a model of the new system, but do you have a means of kind of showing us how the new system functions?

A. Yes, we have a setup that can show how the new system also functions.

MR. FEENEY: Okay. With everyone's permission we'll just go off the record now and we'll reset up so the camera can be moved so we can see the model.

VIDEO OPERATOR: We are going off the record. The time is 10:16 hours.

(Brief recess.)

VIDEO OPERATOR: We are back on the record.

Q. (BY MR. FEENEY) Okay. Mr. Klingler --

VIDEO OPERATOR: Excuse me. The time is 10:31.

Please continue.

MR. FEENEY: Thank you.

Q. (BY MR. FEENEY) Mr. Klingler, we took a few minutes and got reorganized here so that the video hopefully will pick up this model that you arranged to have here today.

By the way, did you bring this back with you on the plane from Japan?

A. No, I didn't fortunately.

Q. It looks like it wouldn't fit into the carry-on section.

A. Yes, I think it would be very difficult.

Q. We made arrangements to get this over here for you?

A. Yes, you did.

Q. Mr. Klingler, I put back up on the model the diagram Exhibit 2A, the vacuum speed control system schematic, just to reorient what we're talking about, again just for purposes of the record could you indicate to the jury what this model represents, is representative of?

A. Okay. This model here is representative of this vacuum speed control system, and maybe just to point out where the similar components are.

Q. Let's do that, but the vacuum system was the old system, the one that you were improving and redeveloping for the '92 Town Car?

A. That is correct.

Q. Okay. Why don't you go ahead and point out how the parts, the little boxes and squares and circles on the diagram, how that kind of all relates to the model, the real McCoy so to speak?

A. Okay. First of all, on the schematic we had the throttle, okay, and in our display this is a real throttle.

Q. Go slowly so that we can be sure and pick this up. I mean, if you'll indicate where the throttle is again.

A. Okay. On the schematic this was the picture of our throttle. In the display, okay, this is a real throttle system.

Q. Okay.

A. And this is a system that controls the power of the engine by opening and closing the throttle.

Q. Now is that a scale model or is that the real thing that you'd find in a, for example, a Town Car that had been made before 1992?

A. This is a real part from a vehicle.

Q. All right. Go ahead.

A. Okay. Then for our speed control servo actuator, this is that actual component, okay, and --

Q. And the purpose of that, you explained this, but that's basically where the air is sucked out and that causes the throttle linkage to move?

A. Correct.

What happens is you can see the speed control servo is connected to the throttle via a cable.

Q. And you've used the term servo a couple of times.

That's just a fancy word for motor; isn't it?

A. Yeah, for motor, yes.

Q. Okay.

A. So, you know, the way the system operates, okay, again as the vacuum is applied to this chamber here, okay, which causes this diaphragm to move, okay, which pulls the cable opening the throttle.

Q. All right. What else is part of the model?

A. Okay. We had the speed control amplifier, okay, and this is an actual speed control amplifier in our display.

Q. Okay.

A. Okay. We're showing brake lights.

Q. Right.

A. Okay. And we have actual brake lights on our model.

Q. All right.

A. Okay. The electric solenoid assembly shown on the schematic are actually contained inside the servo mechanism, okay.

We also, we have the brake system, okay, and so on our schematic we had the brake light switch, okay, which is on our brake system, this part here.

Q. Now that's a real brake?

A. Correct. This is a real brake assembly.

Q. Okay.

A. From a vehicle.

The other part, okay, was our mechanical brake dump valve.

Q. That was the backup or redundant system on the old version of this?

A. That is correct, okay, and again it is mounted on our brake assembly.

Q. Okay.

A. Okay. And to make the system work in place of a battery, okay, we have electric power supply, and in place of an engine to create vacuum we have a vacuum pump.

Q. Okay. Are you able to actually operate this model to demonstrate how the old vacuum speed control system worked?

A. Yes, we can.

Q. Okay. Let's take the diagram down and why don't you step us through that and show the jury how this model simulates how the old system actually worked.

A. Okay. Also on the display we have the command switch is for the speed control system. Again, in a vehicle the switches would be mounted on the steering wheel, okay, but these are the on/off switch, the set accel, the coast and the resume switches.

Q. Now you don't have an engine here so you don't an accelerator. You mentioned that you had a vacuum pump.

What takes the place of the engine -- or accelerator, let me put it that way?

A. One of the signals that is required for the speed control system to operate is a vehicle speed signal, okay, so to provide a vehicle speed signal what we do have here is an actual speed sensor from a vehicle, okay, but to drive that sensor, okay, we have an electric motor which really takes the place of the vehicle, okay, so we have a setup here which we can by cranking this dial, we can change the speed of this electric motor that's driving the speed sensor, okay, which causes the speed signal being provided to the speed control electronics to change, and then we can also read that on an instrument cluster that we have.

Q. Would you tell us first, and point to the various parts for the video record, would you tell us what you're going to do to activate the system, then I want you to go ahead and activate the system describing and narrating what you're doing so that the video record can be made of what you're doing.

So first go ahead and tell us what you're going to do to activate the system.

A. Okay. Well, the first thing will be to turn the ignition on, okay, and then speed control will only work if the vehicle speed is above 25 miles an hour, okay.

So I will adjust this dial to get our vehicle speed up to 50, 60 miles an hour, okay, and then to engage the system, okay, like an operator would in a car, I will hit the on switch, then I will hit the set switch, and what you will see the system do is you will see the speed control system engage, and you will see this throttle move, okay, to represent the speed control system taking over control of the vehicle speed.

Q. Would you put the yardstick on the position that the throttle is in right now just so the people that might be viewing this, the jury, can see, and the people viewing the video can see, and then would you indicate to us where that throttle is going to move to on the video?

A. Okay. Right now, okay, this throttle is in the closed position or idle position, okay. When the speed control system activates you will see it move partially open, so you will see this mechanism here move.

Q. Okay. Mr. Klingler, why don't you go ahead and do what you said you were going to do.

A. Okay.

Q. Now I hear a noise.

A. That's our vacuum pump running and again our vacuum pump is replacing the engine to provide the vacuum source for the system.

Q. All right. Make sure you keep your voice up so the reporter can record what you're saying. All right.

So you turn that on, the engine is running. What do you do next?

A. Okay. Next thing I will do is turn the ignition on, okay, and then I will get our vehicle speed up to 50 miles an hour as you can see on our speedometer here.

Q. Okay.

A. Okay. And now I will engage the system, okay, so I will hit the on switch, okay, and then I will hit the set switch, and the thing to watch again is the movement of the throttle here.

Q. So let's just make sure we get a close-up of the throttle so that the reporter can see this.

Okay. Go ahead and hit the set switch.

A. Okay. I'll reach over here and hit the set switch, okay, and you should see the throttle open.

Q. Okay. Cruise control is on?

A. Correct.

Q. Now how do you deactivate this?

A. Okay. There are several ways to deactivate it. We could hit, okay, the off switch, okay, and I will do that now and again the thing to watch is the throttle mechanism returning back to its idle position.

Q. All right. Go ahead and do that. Okay.

A. The system is disengaged.

Q. Now why don't you reset it, and show us another way to deactivate the system.

A. Okay. Alternate means to deactivate the system will be to tap the brake which will cause the brake lights to turn on, okay, so I will go ahead and do that.

Q. Go ahead and do it.

A. Okay.

Q. And if we look at the throttle it's returned to the --

A. The idle position.

Q. -- the idle position?

A. That is correct.

Q. Okay. Any other way to deactivate the system? Let me put it this way:

What if you wanted to deactivate the redundant backup system, how would you do that?

A. Okay. One of the things we can do here is we have an actual brake fuse in the system, okay, so can simulate that fuse being blown by removing that fuse from the system.

Q. And just to recall, one of the considerations under the old system was how do you provide a backup means of deactivating the system if the brake light fuse was blown?

A. That is correct.

Q. Now under the new system that was in the '92 Town Car you solved that problem a different way?

A. Correct.

Q. And we talked about that.

Why don't you go ahead though and take that fuse out to simulate a blown brake fuse.

A. Okay. Removed the fuse.

Q. Okay. Now why don't you just tap the brakes to show us what happens with the lights?

A. Okay. No brake lights.

Q. Okay. And with no brake lights you cannot -- can you deactivate the system with no brake lights relying on the primary means of deactivating, the old system?

A. Okay. In the old system relying on the primary means, no, you cannot by tapping the brake deactivate the system.

Q. Go ahead and set the cruise control so it's on.

A. Okay. We got it on, okay, and then I'll reach that and again the thing to watch is the throttle, okay, and you can see that it opened.

Q. All right.

A. Okay. So speed control is now controlling the speed of the vehicle.

Q. And you've got no brake light function?

A. Correct.

Q. And why don't you go ahead and tap the brakes and see what happens?

A. Okay. Okay. I tapped the brake.

Q. Let's take a look at the throttle setting.

Is it still in the open position?

A. The throttle is still open.

Q. So by tapping the brakes with no brake light function you've been unable to deactivate the system?

A. That is correct.

Q. Okay. Now I want you to go ahead and rely on the backup or the redundant system to deactivate the system.

A. Okay. If I push and hold the brake pedal down, what it is doing is opening the vacuum dump valve, okay, and that allowed the servo system to return the throttle back to its idle position.

Q. Okay. And that's basically the old system?

A. That is the old system.

Q. All right. Now you have some additional devices here.

Are they helpful in explaining, using this model, are they helpful in explaining how the new system works?

A. Yes, I can. I guess just to show one additional thing here.

Q. All right. Go ahead.

A. Okay. One of the -- the issue with the system, okay, with the blown brake fuse was that if I let back off the brake, okay, the system should have reengaged.

Let's try that again.

Q. Okay. You've got it engaged?

A. I've got it engaged.

Q. No brake light function.
A. Okay. So I hit the brakes, return the throttle back to idle, okay, but if I let back off the brake, the throttle would open again.
Q. And were you seeking to improve upon that as part of --
A. That is one of the functions that we wanted to improve with the new system.
Q. By the way, did you work with a bunch of suppliers in coming up with this speed control system?
A. You know, suppliers, there was a lot of suppliers involved in the individual components that they provided.
Q. All right. And did you, generally speaking, did you discuss with your suppliers the old system and how it functioned and the circuitry and what you were trying to improve upon?
A. You know, maybe in general terms we would have had those discussions.
Q. Okay. Now let's go on with this new -- with this additional device.
Why don't you turn that off.
What's the buzz?
A. That's the motor that drives the speed

sensor is still on because of this power supply is on here.

Q. Okay. Why don't you turn that off for just a minute so you can tell us what you're going to do.

A. Okay.

Q. All right.

A. The first thing maybe we can just take a look at is this is the new speed control system that we talked about with the stepper motor, and I'll open it up here so you can get a look at again the various pieces.

Q. Let me put the diagram, Exhibit 3A, up now and you mentioned that, you told us earlier that the stepper motor became the principal source of power for the actuator; is that right?

A. That is correct.

Q. Okay. Now what you're showing us is that motor?

A. That is correct.

Okay. In our schematic, okay, we had the stepper motor, okay, which in the actual part is this piece right here. We had the gear train assembly, okay, which again you can see in these pieces, okay, and we had the magnetic clutch, okay, which in our assembly is this piece, and then the spool, okay, that the cable wrapped around to open and shut the throttle -- I'll pick this up -- is this piece here in our assembly.

Q. And what you've got there, and I should probably just for identification purposes, let's put an exhibit sticker on that piece and we'll call this Exhibit 5.

(Marked for identification Deposition Exhibit No. 5.)

Q. This is an actual motor and actually it's the actuator, it's not just the motor, it's the magnetic clutch and the spool as well?

A. Correct.

Q. And this would be from a vehicle that like the Lincoln Town Car that had this speed control system?

A. That is correct.

Q. Okay.

A. Also we have here, okay, this is the control electronics that contains the microcomputer, okay, and for this system this also was the cover of our actuator assembly, so these two pieces go together to form the speed control system.

Q. Okay. Well, that's interesting. I mean if you look at the diagram you've got two separate boxes basically drawn there on the diagram.

Could you point to those with your yardstick?

A. Okay. This box here was the actuator assembly, okay, and then this box here was the control electronics, okay, which form the cover of our assembly.

Q. So actually they fit right together?

A. Correct.

Q. Now you described the microcomputer as the brains of the operation, so to speak?

A. That is correct.

Q. What do you mean by that?

Would you open it up and show on the camera what that thing looks like.

Why do you call that the brains?

A. This thing is -- I don't know how well you can see this, okay, but these are the control electronics, okay, and this microcomputer is actually one of these chips. It's this chip here on this circuit board is the actual microprocessor in this system.

Q. And basically what does this thing do?

A. Well, it executes a computer program that performs the speed control function.

Q. And in doing that is it communicating then with the other parts of the system?

A. That is correct. There is -- what the computer does is it's able to read various signals coming into the system, okay, like the brake lights being on, it can read that signal. Other signals would be like the command switches that are on the steering wheel.

Q. Now does this particular system here, I mean this brain, does this have anything to do with the operation of that deactivation switch that TI supplied?

A. No, it does not. They are independent systems.

Q. Okay. Now let's go ahead, and what else have you brought with you here, what else have you got?

A. Okay. We do have a setup that can show just the operation of this current speed control system.

Q. Can you show how it's deactivated?

A. Yes, we can.

Q. All right. What have you got here? Tell us what this control panel is.

A. I guess this is somewhat of a less fancy system than the setup that we had for the current speed control system.

Again, this is a box, okay, that can simulate the various inputs of the system, the command switch inputs. It has a button to simulate the brake light switch. It has another button to simulate the deactivator switch. It has some electronics inside that can provide a speed signal to our speed control system that I can change by changing this dial right here.

Q. And using that panel with some of the other parts that you have here, can you simulate the activation and the deactivation of the speed control system that was in the '92 Town Car?

A. Yes, I can.

Q. Okay. Why don't you go ahead and do the same, do that for that system then.

A. Okay. The thing to focus on in this system, okay, will be this spool moving, okay, and in the system as the spool rotates clockwise, okay, there would be a cable connected to it that would wrap around the spool, okay, and by rotating the spool back and forth, okay, moving the cable in and out it would open and shut the throttle.

Q. Okay. And you can demonstrate, just go back to the diagram and relate that to the diagram.

The spool that you're talking about is where?

A. This would be the spool here, okay, and there's a wire cable that's wrapped around the spool, okay, so again, okay, as the stepper motor rotates it rotates this spool through the gear train and clutch assembly causing the throttle to open and shut.

Q. Now for purposes of what we have here today, we don't have a wire and we don't have a throttle?

A. That is correct.

Q. Okay. But we will see this spool move as you give it commands from the panel?

A. That is correct.

Q. And that will either activate or deactivate the throttle?

A. That is correct.

Q. And we have a stepper motor here and we also have the microcomputer?

A. That's correct.

Q. All right. Now do we have a deactivation switch?

A. We have a switch in this box that simulates the deactivator switch.

Q. All right. Go ahead and show us how this thing works.

A. Okay. Power on.

Okay. So what I will do again I will turn the system on, okay, with the on switch, okay, and next I will hit the set switch and again the thing to watch is the movement of the spool. I seem to have -- there we go.

Q. Let's go back.

A. Okay. Let's go back and do that again, okay.

Okay. So I will come over, I will hit the on button to engage the system.

Q. That's the same thing as if you were hitting the on button on the steering wheel?

A. That is correct.

Q. Okay.

A. Okay. And then again I've set the signal for the speed sensor such that it's 50, 60 miles an hour, and now I will come over and hit the set button, okay, and what you saw was this output spool rotating which would open the throttle to the position to maintain that speed.

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Q. So now going back to the diagram the stepper motor has engaged this spool, it's rotated, and now the throttle body is left in the open position?

A. Yes.

Q. Whatever the selected speed is?

A. That is correct.

Q. Okay. Now would you show us how you would deactivate the system?

A. Okay.

Q. What happens when you deactivate it?

A. If the system is deactivated by tapping the brake, okay, and using the brake light switch, what happens is two things, is first the microcomputer, okay, will command the stepper motor to drive backwards to return the throttle back to idle, okay, and then after a short delay it will turn power off to this clutch, okay, providing a redundant means for the throttle to return back to idle.

Q. All right. And can you demonstrate that using this equipment?

A. Yes, I can.

Q. Okay. Go ahead and do that.

A. Okay. I'll reach over and this red button here simulates the brake switch, okay, and if you watched very closely you saw the spool return back to its idle position somewhat slowly.

Q. Well, we heard a noise.

Was that associated with the movement?

A. The last noise, okay, that you heard, the clicking, was the clutch being disengaged.

So do we want to try that one more time?

Q. Yeah, why don't you do that again.

So the spool will move back, the clutch will be disengaged, but the motor will also be turned off or returned to the normal -- to the original starting position I should say.

A. Actually what happens is, yeah, the motor will drive back first, okay, and the reason for the that is to try and return the throttle slowly so it doesn't snap back, and then when it gets close to the idle position it will release the clutch.

Q. Okay. Go ahead.

A. Okay. So we'll come over here, hit the set button again, okay, the spool rotated clockwise to open the throttle, and I will come over and I will hit the brake switch right now, okay, and what you saw was the motor driving it back to the idle position and then again the clutch opening.

Q. Now can you simulate a failure in the brake light switch or the microcomputer or some other place within the system so that the operator of the vehicle must rely upon the backup redundant system, the deactivation switch that TI supplied?

A. Yeah, with this system unfortunately we can't simulate a blown fuse like we could with the prior system, but what we can show is how the system would deactivate using this deactivation switch in the system.

Q. Okay. Go ahead.

A. Again, we'll come over and I will get set, okay, so the speed control system again has an open throttle, and now I will come over and hit the black button on this box which represents the deactivator switch, okay, and what you will see is that the throttle snaps back to its idle position, okay.

Q. Now that deactivator switch would be activated in normal operation if a brake application had been made; is that right?

A. That is correct.

Q. Now if there is no failure or breakdown of any of the other components of the system, does the deactivation switch operate in any way with a brake application?

A. Well, if you apply the brake the switch will still activate it, but it's not really performing any function in the system.

Q. Is it the device in the system that is basically disabling or deactivating the speed control under those circumstances?

A. No, it's not.

Q. Under those circumstances the setup in the system that's actually deactivating the system is what?

A. Would be the brake light switch, okay, closing, turning on the brake lights. The control electronics microcomputer --

Q. Okay. The videographer wants you to do the deactivation switch again. He's not sure that he got the spool going back, so let's do it one more time just to make sure.

A. Okay. We turned the system back on. We'll hit on.

Q. And I'll ask you now to simulate the deactivation of the system relying upon the deactivation switch supplied by TI.

A. Okay. So I'll reach over again hitting the black button which simulates the deactivation switch right now, okay, and again you saw the output spool snap back to its idle position.

Q. Now does that switch have any effect -- let's just go back to the diagram. You can turn that off.

Show us the circuitry path from the deactivation switch to the magnetic clutch.

A. Okay. The circuitry path starts, okay, at the battery, okay, where we get the voltage to activate the clutch. Okay, it goes through the brake light fuse, okay. It then goes through this deactivation switch which again these contacts are shut, okay, when the brakes aren't applied, okay, and that provides power into the clutch, okay, and then going through the clutch to make any electrical system work, okay, you need to apply the battery to one side and ground to the other side, okay, so coming from the battery the brake light fuse to the deactivation switch, that provides battery to one side of the clutch and then ground is supplied to the other side of the clutch, okay, through the control electronics, okay. There's a solid state switch that can connect that side of the clutch to ground.

Q. And by activating the switch, the deactivation switch, by activating it functionally what is the effect of that in terms of the clutch?

A. Okay. When this deactivation switch is activated its contacts open which removes the battery voltage from the clutch, okay, which causes it to disengage the spool from the gear train mechanism.

Q. Does it make any difference that the brake light fuse is blown in order for the deactivation switch to work?

A. Okay. Well, in this system, okay, if the brake light fuse is blown, okay, there is no way to get battery power to the clutch, okay, so in this system if the brake light fuse is blown the speed control system is inoperative.

Q. And is the magnetic clutch inoperative?

A. And the magnetic clutch is inoperative.

Q. So under those circumstances do you need a deactivation switch for a system that can't be activated?

A. In the case of -- in this case where the brake light fuse is blown, no.

Q. All right. Now you mentioned that the principal purpose or function of the deactivation switch is to improve and support the overall safety of the system?

A. That is correct.

Q. At the risk of stating the obvious, why is the deactivation switch a safety device, sir?

A. It is strictly there, okay, to provide a redundant means to disable the speed control system in case one of the other components in the system has failed.

Q. And why is it -- is it a good thing to be able to disable a speed control system?

A. Yeah, I would think the operator of the vehicle would always like to be confident, okay, that there is no way, okay, that the system could hold the throttle open when he didn't want it open.

Q. I think I've completed any questions I have at this point regarding the model, so why don't we go off the record then you can return to your seat.

I've got just a few more questions for you.

VIDEO OPERATOR: We are going off the record. The time is 11:04 hours.

(Brief recess.)

VIDEO OPERATOR: We are back on the

record. The time is 11:20 hours.
Please continue.
Q. (BY MR. FEENEY) Yes, Mr. Klingler, I've got probably just a few more minutes of questioning of you.
Let's talk for a minute about during the design and the development of the speed control switch, did you meet with representatives of TI?
A. We had many meetings with representatives of TI through the development of the system.
Q. And among the people that you dealt with at TI, who were the principal contacts that you had with that organization?
A. The primary people that I recall dealing with would have been Joe Schuck who I believe was the salesperson, and Steve Offiler who I believe was the program manager for this switch development.
Q. During your meetings and discussions with TI over the period of years that this system was developed, were there ever any discussions that centered on the circuitry of the system itself?
A. We would have had discussions on how their switch was being applied and used in the system, yes.
Q. And when I say the circuitry, could you

just indicate for the ladies and gentlemen of the jury with reference to the schematic what the circuitry of the speed control system is?

A. Okay. The circuitry of the system would be how the various components are hooked together so, you know, we would have discussed how the deactivator switch is, you know, connected to the clutch, and then how the clutch is connected through the control electronics, and then how the deactivation switch is connected into the rest of the vehicle wiring system, the brake light fuse, back to the battery.

Q. Now I don't want to get too overly technical about this, and we probably all as lay people have an understanding of what or we think we have an understanding of what electricity is or how a switch operates. We certainly come into contact with them everyday, but just to get some basic terms, what is voltage?

A. Okay. Voltage is it's an electric field and really what it is is a force to push electrons.

Q. And why is that helpful to gain an understanding of what electricity is?

A. Well, electricity, there is essentially two parts to electricity. One is voltage, okay, and the other is current, okay, and what current is is a measure of the rate that electrons flow, okay, through a wire, okay.

So electricity, what it really it is electrons moving and the thing that makes the electrons move is voltage. It's the force that pushes electrons.

Q. And current is you said it's a measure of how fast the electrons are moving?

A. Yeah, the rate, the quantity and how fast they move.

Q. Okay. What is the relationship between voltage and the rate that the electrons move through a wire?

A. Okay. As I increase voltage, okay, it will push the electrons harder and make them move faster, so as I increase voltage the rate of electron flow or the rate of current flow increases.

Q. What is the source of voltage for the deactivation switch in the system that you designed?

A. Okay. In this system it would be the battery and the charging system of the vehicle.

Q. And where does the -- in normal operation where does the current come from?

A. Okay. In normal operation, okay, the

current, okay, to have current flow you have to have a connection between a voltage source like a battery and ground, okay, and in this system that connection would be, okay, from the battery through the brake light fuse through the deactivator switch, okay, through the clutch, okay, and then the connection to ground would be made through a switch in the control electronics, okay, where the switch would be shut completing the circuit connection to ground.

Q. Now that switch you're talking about to create that ground which completes the circuit, so to speak, if the engine is turned off what happens to that switch?

A. Okay. When the engine is turned off, okay, the switch is open so there is no connection to ground in the circuit.

Q. And if there's no connection to ground in the circuit --

A. Then there can be no current flow, okay, through the clutch, through the deactivator switch, through the brake light switch -- or brake light fuse in this circuit.

Q. Now is voltage available to the switch even though there's no connection to ground?

A. Yes, even when this switch is open there's still voltage at this point.

Q. And why is that?

A. Because there's still a connection of the deactivator switch, okay, back to the battery through the brake light fuse.

Q. But will voltage do anything to the switch, I mean will the presence of voltage result in a buildup of heat and ultimately the potential for fire?

A. Okay. Yeah, voltage by itself, okay, will not create heat.

To create heat you need power, okay, and power is a function of both voltage and current.

Q. Is there a formula that electrical engineers use to express what you just said?

A. Yes. Well, you know, to calculate, you know, the heat that might be generated in a part, okay, you would need to know the resistance of the circuit that the current is flowing through, okay, and then the heat that would be generated would be the current squared; that is, the current times itself times the resistance of that element.

Q. There's a red marker there. Can you turn the page over on that pad and if you're not snagged by your microphone, could you just -- okay.

You can stand up and do this if you want, Mr. Klingler. Could you write that formula, please.

A. Okay. The power, and this is the power that would generate heat, okay, this power is equal to the current which we represent in electrical terms as just I, okay, that term squared, okay, times the electrical resistance, okay, of the element that that current is flowing through.

Q. And I stands for?

A. Current, electrical current.

Q. And the R stands for?

A. Electrical resistance.

Q. Okay. Now getting back to the deactivation switch, is power as you've just defined it, is power continuously available to the deactivation switch if the engine is shut off?

A. Okay. When the engine is shut off, okay, there is -- when the engine is shut off, okay, since we don't have this connection to ground, okay, there's no current flow through the deactivator switch, so without current flow there is no power going into the deactivator switch.

Q. Is there voltage available?

A. There is still voltage available at the switch.

Q. But is voltage enough to produce power?

A. Yeah, voltage by itself will not provide power in the switch.

Q. In your discussions with TI during the course of the design and development of the system and your deactivation switch, did you discuss with them the presence, the source, of the voltage necessary in order to activate the system, the switch?

A. Yes, you know, again, we talked about, you know, how the switch would be wired into the speed control system.

(Marked for identification Deposition Exhibit No. 6.)

Q. And let me show you, sir, what I've marked as Exhibit 6 and I've put this on a -- you should have a copy of it right over there. You don't have to look at this one, but let me just put it up on the easel so that the videographer can see that?

MR. FEENEY: Can you pick that up, Dan?

VIDEO OPERATOR: Yes, I can.

Q. (BY MR. FEENEY) All right. We've marked as Exhibit 6, and you've got one right in front of you there. You should have one right there. Maybe I didn't give you one.

Here's one.

This particular document was marked as Deposition Exhibit 42 in the deposition of Fred Porter and I've remarked it as Exhibit 6 in your deposition, Mr. Klingler.

The title of it is Precision Controls Design Engineering, Design Review, 18 May 1989, MY92 Cruise Control Pressure Switch.

Before I showed this document to you yesterday, had you ever seen this document before.

A. No, I have not.

Q. As an electrical engineer and the designer of the cruise control system that this pressure switch described in this document went into, can you evaluate this diagram and interpret it?

A. Yes, I can.

Q. Would you tell us what you observed in your review of this particular diagram?

A. Okay. This diagram is a schematic representation similar to the other diagram we looked at of the entire speed control system, okay, but again in the diagram, okay, what it's showing is, okay, the battery source, okay, and then it's showing this representation is the deactivation switch, okay, being conducted to the battery source, okay, and the other side of the deactivation switch, okay, going to the magnetic clutch assembly, okay, and then the other side of the magnetic clutch being connected to ground through another switch, a solid state switch.

Q. Now how does that compare with the simplified speed control system schematic that you had prepared for your examination here today, Exhibit 3A?

A. Okay. As far as how the switch is configured into the system electrically it is the same.

Q. And what does that mean to you, sir, as an electrical engineer and a designer of this system, the fact that those two documents are the same in the way they lay out the circuitry?

A. What I gain from this is that, you know, TI understood how this component was being used in our system electrically.

Q. Is Exhibit 6 a fair and accurate and correct description of how the component being supplied by TI was to be used in the system that you designed from a schematic standpoint?

A. Yes, it is.
Q. And does Exhibit 6 reveal the presence of a continuous source of voltage from the battery to the brake pressure switch?
A. Yes, it does.
Q. And does Exhibit 3A, the schematic you prepared, does that also reveal a continuous source of voltage from the battery to the brake pressure switch?
A. Yes, it does.
Q. In either schematic do both show that in the absence of a ground on the other side of the clutch there will be no current flowing through the deactivation switch?
A. Yes, that is correct.
Q. And in the absence of current is there any possibility for heat to build up?
A. No, there is not.
Q. And in the absence of current is there any possibility of a fire to be started?
A. No, there is not.
Q. Now are you familiar with the specification that was developed to govern the design of the deactivation switch?
A. Yes, I am.

Q. And what was your involvement in that specification?

A. Okay. In that specification our responsibility in our group would be to specify the electrical characteristics of that switch as it relates to its function in the speed control system.

Q. And did you do that?

A. Yes, we did.

Q. Now are you also -- given the fact that you were developing and inputting the electrical specifications, did you become familiar with the requirements of the specification that dealt with the testing of the switch, and specifically the evaluation of the switch's susceptibility to leakage of hydraulic fluid into the electrical side of the switch?

A. We would have been familiar with how that relates to the electrical requirements of the switch.

Q. Now are you a brake engineer?

A. No, I am not.

Q. Are you an expert in fluid mechanics?

A. No, I am not.

Q. Or hydraulic fluid?

A. No, I am not.

Q. Do you know that hydraulic fluid burns?
A. Yes, I do.
Q. Do you have to be an expert in brakes to know that?
A. No, you don't.
Q. Did you develop an understanding through your work on the system of what was expected in terms of performance regarding the potential for leakage of fluid into the electrical side of the switch?
A. Yes. We couldn't tolerate any electrical fluid into the electrical side of the switch.
Q. You say electrical fluid.
What do you mean?
A. I'm sorry, I mean hydraulic fluid into the electrical side of the switch.
Q. And why is that, sir?
A. Because brake fluid is corrosive. It could create corrosion in the switch, okay, which would create problems.
Q. And what kinds of problems could brake fluid if it leaked into the electrical side create?
A. Well, at first, you know, potentially you could get corrosion and worst case is that the brake fluid itself somehow could ignite.

Q. What about the issue of current, can the leakage of brake fluid create an unintended path of current?

A. Well, brake fluid, you know, I'm sure, you know, has some conductance to it, so it could create a leakage path from the switch contacts to the housing of the brake switch.

Q. In the absence of a leakage path or a conductive path into the switch producing current, if the engine is off, can you get a fire?

A. No, you can't.

Q. In the switch itself I mean?

A. No, you could not.

Q. And in designing this system, in wiring the switch in the manner that you did, in developing the system in the manner that you did, what, sir, did you assume with respect, if anything, with respect to the design of the switch insofar as its ability to prevent or prohibit any leakage of hydraulic fluid into the electrical side of the switch during the life of the vehicle?

A. Our assumption would be that there would be no hydraulic fluid on the electrical side of the switch.

Q. Did you at any time in the design and development of the system that you were responsible for, did you ever become aware up to the day that production was commenced that there was any problem with the deactivation switch insofar as the potential for leakage of hydraulic fluid into the electrical side of the system was concerned?

A. No, I was not aware of any issues.

Q. And in 1992 or some time thereafter did you leave your position at Ford as the design responsible engineer for the system?

A. Yes, I did.

Q. And after that time that you left and went on to other assignments, did you have any further involvement in or responsibility for the system or the deactivation switch or anything else that may have happened in the intervening years?

A. No, I was not involved after that point in time with the design of the speed control system.

Q. And you came here today or actually a few days ago at our request because we wanted to ask you questions about the system you designed?

A. Yes, that is correct.

Q. Have you done the best you could to remember what you did?

A. Yes, I have.

Q. I guess the other question, the one other question I had for you was in going through this whole design process did you ever consider any other alternative ways of providing backup for your -- for this speed control system and how it operated?

A. Yes, you know, we looked at, you know, several alternatives. You know, because this is an electronic system, you needed another electric switch in the system, okay, that would perform, you know, the same function as the deactivation switch that we talked about today, and alternatives that we considered were, one, was putting two electrical switches in the same package that contains the brake light switch today was one alternative.

Q. And did you incorporate that alternative?

A. No, we did not.

Q. Why not?

A. Okay. Well, the philosophy in designing the speed control system is to provide a redundant means to make sure the system is safe, okay, for a single point failure, okay, and by putting both sets of contacts into one package, okay, those two parts were still related somehow, okay, and we wanted to have totally independent systems.

Q. Had others -- did you research what the competition was doing so to speak or what they later did?

In other words, were there others out there, other automobile manufacturers, who did approach this problem doing exactly what you just said you considered and rejected?

A. Yes, we were aware that General Motors in their electronic speed control system, that was the way they implemented the system.

Q. And, sir, did you study that system and how it worked as part.of your work on developing the Ford system?

A. Yes, we did.

Q. And as a result of that study and as a result of your experience and education and basically all the work that you did in connection with the speed control system that was installed on the 1992 Lincoln Town Car, did you develop an opinion to a reasonable degree of engineering certainty as to whether the system that you just described on the GM vehicles was a safer alternative system to the Ford system?

A. Our belief was and still is that our solution was a safer, better solution, okay, because the two components, okay, were totally independent.

Q. And the value of having two separate and independent components in a redundancy, in a safety type system, then is what, sir, what's the value of that?

A. It just gives you more assurance, okay, that in case a component fails in the system, okay, that the speed control system can always be returned to a safe mode.

Q. And one final question.

Is the deactivation switch that's part of the speed control system, is that the only switch in a vehicle at that time that had available to it a continuous source of voltage even when the engine was in an off position in a vehicle?

A. There's, you know, many switches in a vehicle that have voltage applied to them when the ignition is off. You have a lot of light switches in the vehicle. You know, you can turn your overhead lights on, okay, when the ignition is off. You know, the brake light switch itself has power applied to it when the ignition is off.

Q. And is that true not only of Ford vehicles but just about every other manufacturer?

A. I believe that is true of all manufacturers.

Q. I don't believe I have any other questions for you, Mr. Klingler, but some others might have questions.

MR. FEENEY: Why don't we take just a couple minutes and we'll get this stuff down and then we'll get going.

MR. CARTER: I wouldn't mind leaving the schematic up there as we resume.

MR. FEENEY: That's fine.

VIDEO OPERATOR: Would you like to go off the record?

MR. FEENEY: Yeah, just give me a minute to get my notes organized.

VIDEO OPERATOR: We are going off the record. The time is 11:43 hours.

(Brief recess.)

VIDEO OPERATOR: We are back on the record. The time is 11:54 hours.

Please continue.

EXAMINATION

BY MR. CARTER:

Q. Mr. Klingler, my name is Johnny Carter. I represent Texas Instruments.

How are you today?

A. All right.

Q. Let's start with what you wrote on the sheet of paper up there.

You wrote to have -- it essentially looks to me like you said that in order to generate heat you need power; is that correct?

A. That is correct.

Q. Okay. Now you also said that there is no power available in this system which we've been discussing which is Exhibit 3 with the ignition off.

A. There is, yeah, no power going through the switch when the ignition is off.

Q. All right. Is there power going through any component in this system with the ignition off?

A. There is, yeah, no power that I can see right off going through any component when the ignition is off in the system.

Q. So is it your testimony that if someone says a fire started in this system with the ignition off that that just has to be wrong because there's no power available?

MR. FEENEY: Objection. No foundation that the witness has any expertise to testify to cause and origin of a fire.

Q. (BY MR. CARTER) You can answer.

A. I guess, you know, I wouldn't be aware.

There would have to be some specific cause, but as the system is designed if everything was operating correctly, no, there should not be.

Q. Okay.

MR. FEENEY: I withdraw the objection.

Q. (BY MR. CARTER) Did the system have anything in place to prevent current from flowing with the ignition off through the system?

A. With the system off there is no current demand from the system, so.

Q. What if something went wrong and there was a current demand through the system, what did the system have in place to prevent current from flowing?

A. Well, there would be no expectation that there should be current flowing with the system off, so there is nothing.

Q. Okay. Now you testified that -- I think you said that if there's one word that you would use to describe the importance of this system it would be safety; correct?

A. That is correct.

Q. And this system has a number of fail-safes as a matter of fact built into it; correct?

A. That is correct.
Q. So that a number of bad things could happen; for example, you don't want someone to be unable to deactivate the cruise control, that would be a bad thing that you don't want to have happen?
A. That is correct.
Q. All right. But I understand your testimony that you didn't even have I guess a backup plan in case something happened, the current did flow through the system, you didn't have any fail-safe to break current?
A. You're going to have to explain that in more detail.
Q. Well, you testified there's nothing in the system to prevent current from flowing through it with the ignition off; correct?
A. Correct.
Q. And yet you had no -- you designed in no fail-safe to prevent current from flowing through the system with the ignition off?
A. Right, there should be no reason to do that.
Q. And there should be no reason if everything is working properly; correct?
A. Correct.

Q. And under that reasoning you wouldn't even need a deactivation switch to turn off the cruise control; correct?

A. Correct.

Q. Because the rest of the system should work, you shouldn't have to fall back on that cruise control; correct?

A. Correct.

Q. You designed in a fail-safe for turning off cruise control; correct?

A. Correct.

Q. But you did not design in a fail-safe for preventing current from flowing through the system with the ignition off; correct?

A. That is correct.

Q. Okay. You work now for Visteon; correct?

A. That is correct.

Q. Visteon spun off of Ford earlier this year; correct?

A. That is correct.

Q. Were there any personnel changes associated, that you're aware of, that are associated with that spin-off?

A. I'm not sure what you're asking.

Q. I'm asking if you're aware of any changes to the -- I mean was anyone hired or fired, anything, any changes at Visteon that you're aware of other than the fact that it now has independent ownership?

A. Okay. Well, employees that were previously Ford employees became Visteon employees when the company was spun off.

Q. What are your areas that you are working on now, what's your work today?

A. Okay. Currently I'm responsible for designing power train control systems.

Q. Okay. Do you do any work on speed control now?

A. I do have responsibility for the application of speed control in my department, okay, for Mazda vehicles.

Q. How much current is necessary in order for the deactivation switch -- in order for the magnetic clutch to work?

A. You know, yeah, I don't recall exact numbers, you know. I know it's something less than an amp, probably less than half an amp.

Q. Okay. How much current is necessary for the brake light switch to work?

A. How much current for the brake light

switch to work?

Q. Yes.

A. The brake light switch will work with no current.

Q. Of all the components that are shown on this schematic for the speed control for the 1992 Town Cars and the Panther platform vehicles, which component needs the most current in order to function?

A. In this system it would probably -- I'm just guessing -- would be the brake light circuit.

Q. Okay. And how many amps do you think that the brake light circuit would have needed to operate?

A. I'm not an expert in brake lights, so I don't know.

Q. Would it have been less than an amp?

A. I don't know.

Q. Would it have been less than 10 amps?

A. I don't know.

Q. Now you said that in order for the clutch to work it would take probably less than a half an amp; correct?

A. Correct.

Q. Why was the wiring for that clutch

connected to a 15 amp fuse?

A. Because that same fuse provides electrical current to other circuits in the vehicle.

Q. Well, why didn't you just wire the magnetic clutch and deactivation switch into another place on the battery?

A. Okay. Well, the reason that the system was wired as it is, okay, was to insure that if the brake light fuse was blown that the speed control system would become inoperative.

Q. Let's suppose that the deactivation switch and magnetic clutch were wired in separately from the rest of the system, all right.

A. I'm not sure what you mean by that.

Q. Just suppose that. I mean just take this schematic and, you know, connect it at a different place in the battery.

A. So you're saying so it didn't go through the brake light fuse?

Q. That's right. Okay.

What would happen to your cruise control if your brake light fuse blew in that situation?

A. That the cruise control system, okay, would be operational, okay.

Q. Okay. And but if you had the cruise control on, it was operational, but the brake light fuse was blown.

A. Okay.

Q. And then you stepped on your brake wouldn't the deactivation switch deactivate the cruise control?

A. That is correct.

Q. So why was it necessary to wire the deactivation switch through the brake light fuse?

A. Okay. The failure mode that we were trying to protect against was the blowing of the brake light fuse, okay.

We wired it through the brake light fuse, okay, so if the brake light fuse is blown, okay, there can be no power applied to the clutch, so the speed control system becomes inoperative.

Q. Well, but if the brake light fuse blows and you apply your cruise control and then you step on the brakes, doesn't the magnetic clutch become inoperative because the deactivation switch opens?

A. Correct.

Q. So is anything, is any additional safety -- I guess my question is, my bottom line, is any additional safety factor added into the system by wiring the deactivation switch through the brake like fuse?

A. Absolutely.

Q. Okay. Explain to me in practical terms, and now let's just get away from the schematic, you know, what bad thing could happen as I'm driving and using my cruise control, that could happen if you wired in the deactivation switch and the magnetic clutch to the battery separately?

A. Okay. What would happen is if I had the speed control system engaged and I just lightly tapped my brake, okay, that the system would not deactivate.

Q. All right. Because you haven't tapped it hard enough to activate the deactivation switch?

A. That is correct.

Q. Now who did you work with in designing this speed control schematic?

A. It would have been, you know, the engineers in my group. It would have been engineers in other speed control systems group. It would have been electrical systems group within Ford Motor Company.

There would have been, you know, many activities involved in the involvement of that schematic.

Q. Who would have been some of the more central Ford employees involved in designing the speed control system?

A. In designing, when you say speed control system?

Q. Well, designing the system that's depicted on the schematic that's on Exhibit 3.

A. Okay. It was a long time ago and I cannot recall specific names. You know, I can recall the specific names of people that worked in my group.

Q. You can't remember the other groups?

A. But in the other groups I can't remember --

Q. Because you --

A. -- all the names.

Q. Okay. I'm sorry for interrupting.

Who were some of the employees who worked in your group?

A. You know, my key electrical engineer would have been a person by the name of Charlie Weber.

Q. Okay. Now at the time that you worked on, I guess participated in designing the speed control schematic, I guess what you're telling me is you didn't -- you're not the sole designer of this?

A. That is correct.

Q. It's multiple groups within Ford?

A. That is correct.

Q. At that time you were an employee of Ford?

A. That is correct.

Q. Your group was within Ford?

A. That is correct.

Q. And the other groups that you just referenced were within Ford?

A. Yes, they were.

Q. So it wasn't until very recently when Visteon spun off as a matter of fact that you became I guess not really an employee of Ford anymore?

A. That is correct.

Q. You work now in Japan?

A. Yes, I do.

Q. Whereabouts in Japan?

A. I work in Higashi-Hiroshima.

Q. And when are you planning to come to the United States next?

A. There's, you know, there's a potential that I could come in the middle of January.

Q. All right. And why would you come to the United States in the middle of January?

A. We have a program review at one of our