# EA02-025

TEXAS INSTRUMENTS, INC.'S

9/10/03

REQUEST NO. 7

BOX 10

PART A – I

PART C

2 OF 3

vehicles?
A. Yes.
Q. And sold to people who buy cars with those switches on it?
A. Yes.
Q. Okay. You know how many were initially produced and shipped to Ford in that first shipment?
A. No, I don't.
Q. Okay. So if we go back to Exhibit Number 1 --
A. Uh hum.
Q. -- on the pages I had previously identified, there are some -- well, at the very top it says Ford MY'92 NEXT GENERATION. What does that mean?
A. MY means model year, '92. And Next Generation is 'cause this was Ford's next generation speed control module.
Q. Now --
(Discussion off the record.)
Q. Now, do you take that to mean that this document has to do with the development of the 77PS switch that we're talking

about today?
A. The early development.
Q. Right.
A. Before it was defined as 77PS, but, yes.
Q. Right. Before it was defined as 77PS, but this was the beginnings of it?
A. Yes.
Q. And it may have begun before this, right, the developmental stages?
A. Yes, there was probably some work done before this.
Q. Okay. On this page, which is Bates stamped 4386, there's a heading, that's where it's in italics and it's capitalized, it says *HEXPORT*?
A. Yes.
Q. And there's a bunch of technical information there about its dimensions and stuff and who's going to be making it and that kind of thing. That's normal, right?
MR. CARTER: Objection, form.
Q. For these -- this kind of information in,

in Highlights?

A. There's some -- some engineers would put details around the part that they're designing in Highlights.

Q. Okay. And I guess if an engineer's going to discuss a specific item, he may highlight it like, like Steve did here? He highlighted by italicizing and, and capitalizing *HEXPORT*, because that was the subject matter of the couple of paragraphs that, that followed that, right?

MR. BURROW: Object to the form. Calls for speculation.

Q. All right. And then below the couple of paragraphs that discuss hexport is a paragraph entitled, *REBUMP CUP*?

A. Yes.

Q. What does that mean?

A. That bumps in the cup would, would be the bumps that we talked about before that helps that actuation pressure.

Q. Yeah, that's the bump that we labeled on, on Exhibit Number 2, right, that was on

the cup? That they -- you called the bump?

A. Yes. Labeled bump, right here.

Q. Why do, why do they call it rebump cup? Do you know?

A. I assume we're moving the bumps on the cup.

Q. Who's Valentine? Do you know? It's men -- that person's name is mentioned in the first sentence, right after *REBUMP CUP*?

A. Valentine is a company that stamps and draws metal components.

Q. Was that the supplier of the -- or is that the ultimate supplier of the cup?

A. I'm not sure if Valentine's the ultimate supplier or not.

Q. But at any rate, Valentine, the company, was doing work on trying to make a cup for the 77PS switch?

A. Yes.

Q. And this is in the development stages? They're just trying to get things right, correct?

A. Well, what do you mean by trying to get

things right?

Q. Well, so that they fit the specifications that were provided to you by Ford?

A. The --

Q. Provided to TI by Ford?

A. TI's trying to design the cup to have the bumps in the correct location.

Q. So you get the right actuation pressures and that kind of thing that Ford requested?

A. Yes.

Q. All right. Okay. And then below the *REBUMP CUP, REBUMP CUP* paragraph, there's a paragraph entitled *REVALIDATION*, and it says, "The Light Truck validation testing is progressing on schedule."

A. Uh hum.

Q. Light truck, is, is that discussing pressure switches?

A. Light truck --

Q. For light truck?

A. Light truck would refer to the vehicle platform.

Q. Okay. And -- but they're pressure

switches, brake fluid type pressure switches, just like the 7728? Not just like it, but similar?

A. We were designing brake -- speed control deactivation switches for Ford for both passenger cars and light trucks --

Q. All right.

A. -- at the same time.

Q. Okay.

A. And there was differences between those parts.

Q. But if the light truck speed control deactivation switch is in what, I guess TI calls it here a revalidation, what does that mean?

A. It would mean we were running validation testing a second time, I would imagine.

Q. For the light truck speed control deactivation switches?

A. Yes. I would expect that that what's Steve's referring to.

Q. Do, do you -- have you looked at any of the differences between the light truck speed control deactivation switch, which

is mentioned here on Exhibit Number 1, and, and the 77PS, which was eventually installed on the -- which was eventually developed and installed on the Panther platform vehicles? Or was there any real diff -- differences between those two switches?

A. I'm not sure what the configuration of the design for the light truck part was at this point, in October of '90.

Q. Okay. So for the light truck design and development to be at the stage of validation or revalidation, would it be safe to assume that the light truck speed control deactivation switch which TI was developing and to produce for Ford, that had already been through most of its developmental stages and was almost ready for production?

A. Not necessarily, no.

Q. Well if it did pass validation, then it -- would it have been ready for production?

A. Again, not necessarily.

Q. Okay. Why not?
A. For example, I'm talking hypothetically here, the validation may have been tested off soft prototype tools, and the part would not be ready for production till it was completely val -- validated off production tools.
Q. Okay. So you mean -- what does soft production tools mean?
A. Soft prototype tools?
Q. Yes, Sir.
A. That, for example, it might be a one cavity mold for a plastic part versus an eight cavity tool might be planned for production. It may have been assembled off the sample line rather than a production line. During the development of program, we'll do validation testing pretty much constantly through the program.
Q. Okay. So based on what you read about this revalidation, it may not be the end of the line for the development of the light truck speed control deactivation

switch? This may have just been a validation or a revalidation done in the middle of the development of the light truck speed control deactivation switch?

A. Yes.

Q. Okay. Texas Instruments performs numerous testing throughout the developmental stages of all of its pressure switches, doesn't it?

A. Yes.

Q. To make sure that when they go -- when Texas Instruments starts producing, it's going to produce the switch that the customer asked for?

A. To make sure that we give out the switch correctly, so ultimately when we're in production, we produce the switch the customer has asked for.

Q. All right. And throughout all these testing and validation and, and so forth that TI does during the development of a typical pressure, if TI comes across problems or issues related to the achievability of engineering

specifications for the customer, TI informs the customer about those problems or issues, correct?

A. It depends on where we are in the program and the situation of the program.

Q. But --

A. For example, we may be developing a part and want to -- we're trying to decide how to design the part, and we may take four different designs and put them through different testing. And some designs may meet specifications, some don't. We wouldn't necessarily provide all that information to Ford or whoever the customer is. The customer would not want us telling them every day, telling them everything.

Q. How, how things are going in the development of the switch?

A. Well, not, not to tell them every last detail.

Q. Uh hum.

A. There will be periodic communication between TI and the customer on the

development and how the development is going.

Q. Uh hum. So a customer like Ford would leave it up to TI as -- and let TI do as it saw fit on a, on a numerous -- on -- for numerous tests and validation type testing that TI thought it may need to do in order to properly make the switch which the customer ordered?

MR. CARTER: Objection to form.

A. No, no, that's --

MR. BURROW: Objection to form.

A. -- that's, that's not what I'm saying. Ford would define the specification that TI is trying to meet. There are defined periods during the development program that Ford defines where TI needs to have parts that, that meet different requirements and are tested and measured to those requirements. Besides those minimal points, there are updates to Ford in terms of how the development is going

and, and what issues are being seen and, and things like that.

Q. Okay. Turn to page, in Exhibit Number 1, TI Bates stamp number 4384, which is the week ending October the 12th, -1990? Up there at the top it's got the same heading, FORD MODEL YEAR '92 NEXT GENERATION SPEED CONTROL DEACTIVATION PRESSURE SWITCH. At the top there's another paragraph entitled *HEXPORT*. About the third line down, down it talk, it talks -- it mentions a guy named Bruce Pease. Did you ever meet or talk to Bruce Pease?

A. No, I did not.

Q. Have you ever talked to him at all?

A. No, I have not.

Q. It appears that Bruce may be the point man for Ford for the development of the 77PS switch. Would that be fair to say?

A. There were sev -- there were several people at Ford involved with TI defining the specification and development of the switch. Bruce Pease would have been one

of the individuals.

Q. Okay. And then in that same week, I guess it looks like there's some rebump cup information included there, right?

A. Yes.

Q. At the, the last paragraph of the rebump cup section, there is a -- let's see, the, the end of the second line in the last paragraph, there's a sentence that's in parenthesis that starts, "The other problem this bending creates is that it widens the gasket gland, reducing compression." And before that it talks about a paper that studies highlights of bending. Do you know -- have you ever read the paper that this, that this mentions?

A. No, I have not.

Q. It says that there's an issue the "paper study highlights in the bending of the washer that takes place during crimp, which has the effect of reducing the available room for the discs -- the disc." Is that the, the, the disc that's

bent across here like this?
A. Yes.
Q. Is that what they're talking about?
A. Yes, that's the disc.
Q. The -- then it says, "The other problem this bending creates is that it widens the gasket gland," just like I said. I've already that. Then the next sentence after that, it says, "For simplicity my paper study assumed a flat washer. The reason that the washer bends is because the three square pieces of .005" Kapton have a full .015" thickness at the center, which tapers to .010" at some radius and to .005" at the outermost." This issue about the thickness of the Kapton across the, the cup, was this ever resolved?
MR. CARTER: Objection, form.
A. There is no issue with the thickness of the Kapton.
Q. Well, why is he talking about a problem? It says, "the other problem," about

bending?
A. What Steve's referring to is that during the crimping process, because of the way the structure of the device is set up, there's some bending of the washer, and we need to take into account that bending in the full design of the product.
Q. Okay. So when, when he -- is he talking about the, the crimp that's made by bend number 1 that's identified on Exhibit 2?
A. Yes, he is.
Q. When that bend is created, or made, crimped, there's some compressive force applied to the material that's stacked up within the cup?
A. Yes.
Q. All right. And he's saying that there's some unequal force of that crimp across the face of the cup, or can you explain that to us somehow?
A. He's saying that when the device is crimped, the loading in this area --
Q. Okay. And you're pointing to the outside perimeter?

A. Between the washer and the hexport.
Q. Okay, and they'd be --
A. Okay.
Q. -- a location near the outside perimeter?
A. Near the outside perimeter. As those two are drawn together --
Q. Okay.
A. -- since there's less material thickness on the outside than on the inside, where the washer also mates with the hexport, that there will be some bending of the washer.
Q. All right. And so what's the idea of that bending in the washer? The engineering needs to take into account that bending and change in dimension?
A. Yeah, we need to take into account that, that bending, that change in dimension around the disc and the change in dimension around the elastomer.
Q. All right. And anything that effects that dimension change, like crimping pressure or the crimping mechanism itself?

A. The crimp, the crimp would be set up to, to a certain specification. For example, for crimp height, certain range to make sure that -- and we would make sure that as we were in that range, we were making the device consistently and getting the, for example, right actuation pressures out of the device.

Q. Okay. So when the crimp is made, bend number 1, is made on the cup, the amount of that bend or the amount that it's compressed has something to do with the forces that are applied to the Kapton?

A. I'm not sure what you mean by the forces applied to the Kapton. Steve was referring more to it could reduce some area for the disc and, and it could reduce the compression on the elastomer.

Q. Well, between the, between the washer and the hexport is the Kapton, correct?

A. Yes.

Q. And if the washer is squeezed with more force, it's sort of a relative term, the more force that's applied to the crimp,

then the more force that's applied to the Kapton which is placed between the two?

A. Yes.

Q. Is that fair to say?

A. Yes.

Q. So you get -- you got to get a good crimp with just the right amount of force so that you don't damage the Kapton, number one, and so that you have a good seal internally within the, the components of the switch?

A. I haven't seen us damage Kapton from having excessive crimp pressure or low crimp pressure, or anything like that.

Q. I didn't, I didn't mean to imply that, but if you had applied too much force, it could damage the Kapton, correct?

A. I'm not sure, 'cause the Kapton's going to compress.

Q. All right.

A. I mean, it's only so much it's going to compress.

Q. Okay. But there's a certain amount of compression that TI wants when they do

the crimp that's on -- that's bend number 1, right?

A. Certain amount of compression of the elastomer, not the -- the compression of the Kapton doesn't matter that much.

Q. Okay. Let's go back to the Highlights, and let's go to the next week then, week ending October the 18th, 1990, TI Bates stamp 4383. And, and I'm not going to say much about this. It talks a little bit more about the rebump cup. But it does talk about some just different configurations of the rebump cup, doesn't it?

A. Uh hum.

Q. So to guess what's going on here is they're just trying to find the location of where the bump ought to be and the height of it and that kind of thing, right?

A. Right. Trying to define the dimensions of the cup that will allow us to produce a design that meets the Ford specification.

Q. And at this point in time, you guys at TI have not made any 77PS switches yet for distribution to Ford, right?
A. We have not made switches -- production switches. We were not in production providing switch --
Q. Right.
A. -- switches to Ford at this point. I, I'm not sure -- I'm sure some samples were already given to Ford, and I'm not sure of the exact configuration of those samples.
Q. So you think that at this point in time that samples may have been already given to Ford for testing?
A. I think it's possible.
Q. Okay. That, that -- is that something that may be mentioned in the Highlights somewhere?
A. It might be.
Q. At the bottom, it talks about validation of the light truck pressure switches, doesn't it?
A. Yes.

Q. What is that second sentence under *VALIDATION*, the first line, it says, "Gating item on Passenger -- on Pass Car." What is pass car, a passenger car?

A. Passenger car, yes.

Q. Is that, is that the 77 -- was that the ultimate -- or was that what the 77PS switches were called initially? Passenger car switches?

A. The development for Ford in the beginning was broken down into two developments, a pass -- a development for passenger car and development for light truck. The first platform application for passenger car was the Panther platform.

Q. All right. If you were having trouble, or if TI was having trouble with the light truck pressure switches, with an, an item that's common between the light truck pressure switch and the 77PS pressure switch, would TI use that information to help change or alter or prevent the same problem from occurring --

MR. CARTER: Objection to form.

Q. -- between the two switches?

A. What --

Q. Just hypothetically?

A. What do you mean by problem? What type of problem?

Q. Just a hypothetical problem, having to do with anything within the pressure switch between the light truck type pressure switch and the 77PS pressure switch?

A. It's in the design of the pressure switch?

Q. Yeah. Either the design or TI's attempt to, to get into production or to meet validation, or anything like that? Would it use that information to help prevent that same kind of problem occurring in the 77 pressure switch style?

MR. CARTER: Objection, form.

A. TI's going to use any information available to provide a design that meets specification.

Q. Right. And that's an efficient thing to do, isn't it? At Texas Instruments? If you learn something while you're making the switch for a light truck, and then if a lot of the components of the light truck switch are identical or the same as another switch that TI is going to make, then you want to use your information and overlap it over to the new switch, correct?

A. Yes --

MR. CARTER: Objection, form.

A. -- if the information is applicable.

Q. Right.

A. You might use it, yes.

Q. Okay. That's a common thing to do, isn't it, at TI, Texas Instruments?

MR. BURROW: Objection to form.

MR. CARTER: Objection, form.

Q. Let's go to 10/26/90, the week ending 10/26/90. TI Bates stamped 4382. It

looks like light truck part pressure -- the pressure switches for the light trucks are still in the validation testing, correct?

A. Can you tell me where you're referring to?

Q. Let's make sure we're on the right page. Yeah. About it the middle. It just says *VALIDATION*.

A. The section on validation?

Q. Yeah.

A. Okay.

Q. It says light truck is still on schedule for validation, correct?

A. "Is still progressing on schedule," yes.

Q. It says the, "The Light Truck parts have completed the fluid resistance test and have been delivered to the appropriate subsequent tests: Humidity, Salt Spray, Thermal Strength, and Impulse." Right?

A. Terminal Strength.

Q. Yeah, Terminal Strength. Now, those kinds of tests, do you -- are you familiar with where those kinds of tests

would take place during the developmental stages of a pressure switch?

A. Yes.

Q. Would this be a test that would be conducted near the end of the developmental stage?

A. I, I -- when you said place, I assumed you meant location of the -- where the tests would be run.

Q. Oh, I'm sorry. I misspoke. These tests, the humidity, salt spray, thermal strength and impulse --

A. Yes.

Q. These tests, these would take place --

A. Time-wise?

Q. Time-wise during a time period that would be at the beginning of development of the switch, or near the end of development of the switch, if you know?

A. Depending on the development, they would happen at several different points during the development of the switch.

Q. But these specific type tests, humidity, salt spray, terminal strength and

impulse?
A. They would happen at least twice during the development. And may happen more.
Q. Is that --
A. It may happen very early, may happen later.
Q. What is the purpose of a humidity test?
A. To --
Q. And are, are you familiar with the humidity test?
A. Yes, I can't tell you the exact specifics in the humidity tests defined by Ford, but I'm familiar with the types of humidity tests that our customers require us to run. The humidity test, the purpose of that is, is to prove the device will work in the humidity environment they see in the application.
Q. Well, TI conducts the humidity tests, correct, on the pressure switch?
A. Yes.
Q. And this Highlight we're talking about is humidity test conducted by Texas Instruments on the light truck pressure

switch, correct?
A. Yes.
Q. And then there's a salt spray test. What's a salt spray test for?
A. We spray the outside of the part with a, a salt fog, a salt spray, to prove that it meets the performance and corrosion requirements after that type of environmental exposure.
Q. Okay. Do you -- are you familiar with that type of test, the salt spray test that TI conducts on pressure switches?
A. Yes.
Q. And tell us how that test is set up, and what are the typical parameters of the test?
A. There's a chamber, and the parts are placed in the chamber, and the chamber sprays salt water on to the parts intermittently. There's a defined period of time. There's a defined salt content in the water.
Q. Does TI provide those specifics as far as salt content and time?

A. We calibrate the chamber to make sure it's meeting the specification. All, all of these tests are defined in the Ford specification, and we were running those tests to the Ford specification.

Q. Okay. So Ford tells TI to, to build a, a chamber of some type and, and insert it -- insert a pressure switch in the, in the chamber and spray salt water on it?

MR. CARTER: Objection, form.

A. Ford, Ford tells TI what tests need to be run to validate the part. In this case, salt spray testing was included.

Q. Yeah.

A. Ford defined, in this case, a standard ASTM test to run salt spray.

Q. All right.

A. So TI ran that, that test. We have a chamber that can run that test.

Q. Did -- do you remember if the salt spray tests; the pressure switch, is it pressurized with brake fluid?

A. During the salt spray test?

Q. Yes, Sir.
A. I do not believe that it is.
Q. Did it have electrical power supplied to its terminal?
A. I do not think electrical power is applied during the salt spray test.
Q. Is there a, a terminal plug fitted on to the terminal?
A. The mating connector is --
Q. Oh, the mating connector.
A. -- is placed on the, on the base during the salt spray test.
Q. Okay. And why is that done, to test the seal?
A. To, to -- if we didn't put the mating connector on the part, since the mating connector provides the seal into the base of the switch, the base would fill with salt.
Q. Okay. So you're testing the seal of the mating connector with the electrical base?
A. In, in effect, we are. The purpose of our test and validation is to validate

the switch, not to validate the mating connector.

Q. All right. And part of the validation of the switch was to test to see if salt spray, the salt spray test, would result in salt water getting into the electrical side of the switch?

A. Or getting into any area of the switch or providing too much corrosion on the outside of the switch.

Q. Okay. And there's a set temperature that the, the test is run at?

A. Yes. There's a set temperature, set percentage salt. Other things, I'm sure.

Q. The angle of the switch within the chamber? Is that determined by anybody?

A. I don't remember if Ford specifies the exact position of the part in the chamber. I don't think they do. The chamber's set up with spray coming at many different angles.

Q. All right. But you don't remember if the test specifies what orientation the switch ought to be aligned at?

A. I don't think it does, but I'm not a hundred percent positive.
Q. Do you remember if the test requires that there be a wire or an exemplary type wire going to the mating connector?
A. What do you mean by a wire? You mean part of the --
Q. There's a mating connector, correct?
A. Yeah, yeah.
Q. Is there a wire coming out of it? Not necessarily hooked up to anything, but at least a wire coming out of the mating connector, similar to what it would be once the switch and connector were on the vehicle?
A. They would need to be, or the holes in the mating connector grommet for the wire would allow salt water to come in. So some wire or something would need to be in that hole.
Q. So it's either got a wire coming out of that mating connector, or maybe that --
A. Plugged with something.
Q. -- is plugged with something?

A. It's possible.
Q. But you don't know, one way or the other?
A. Usually it's run with a wire.
(Discussion off the record.)
A. Usually it's run with a wire. Usually the mating connectors are provided from the customer.
Q. Okay.
A. That's for that test.
(Discussion off the record.)
Q. Okay. But you're -- are you pretty sure about that on these salt spray tests, that there is a wire provided to the mating connector, or is it plugged?
A. I'm pretty sure it's a wire.
Q. Okay. But you're not sure about the orientation, the angle of the switch when it's installed in the chamber?
A. I'm not sure.
Q. For the test? And are you -- have any idea about the, the direction or angle of the wire that comes out of the mating connector during the switch?
A. Typically it's set up with a drip loop.

Q. A drip loop?
A. Yes.
Q. Okay. In other words, it, it will -- the wire comes down and it dips down?
A. Yeah. And then comes out of the chamber at the top.
Q. Okay. And is that the way the salt test done -- was done on the 77PS and the 57PS?
A. It would have done -- been done in -- matching the requirements of the Ford specification and the ASTM specification called out there.
Q. Okay. Terminal strength. Tell us what that has to do with, that test?
A. To make sure that the terminals can't be pushed into the device or pulled out of the device within a certain force limit.
Q. Okay. Are we talking about terminals which I'm point to you right here --
A. Yes, the terminals in the base.
Q. Why don't you draw a line to that and label that terminal? It's just not labeled on that drawing.

A. Actually, it is. There's a movable terminal label, then the stationery terminal label.
Q. Oh, okay. It just is labeled before it goes through. What's this section of the switch called right here? Of the base?
A. I don't think we have a name for it. It's just part of the base.
Q. Okay. Is it -- what do you do in the terminal strength test with regard to terminal strength? How do, how do you conduct that test at TI?
A. Typically, you apply a force pushing the terminal to see what force the terminal will start to move and, and, and then you'll pull on the terminal and see what force the terminal starts to move. Usually the test's written as a certain requirement, so you'd push on that requirement and then re -- remeasure it to make sure the terminal has not moved.
Q. Okay. And then what is the impulse test?
A. The impulse test is the pressure cycling test, where we would apply zero to

fourteen hundred and fifty psi five hundred thousand cycles.

Q. Zero to fourteen hundred and fifty?

A. Fourteen hundred and fifty psi, yes.

Q. Was -- is that -- was that the pressure requirements for the light truck pressure switch?

A. Yes, that's what's written in Ford's specification.

Q. For the light truck and also the, the passenger car --

A. Yes.

Q. -- the 77PS?

A. Yes.

Q. Same pressure test, impulse test, criteria?

A. Yes.

Q. For both of those switches?

A. Yes.

Q. That TI was developing for Ford?

A. Yes.

Q. Okay. Says those tests are going to be -- get under way, and I guess we'll read about those in here in a minute when we

get to them. Turn to the next page, which is the next week, the 11/2/90 --

A. Uh hum.

Q. -- Bates stamped 4381, and it's written in hand?

A. Yes.

Q. By Steve, and I guess maybe his secretary was on vacation or something?

A. No, engineers would have written their own highlights. I assume he had difficulty getting computer access that morning.

Q. I see. The first paragraph is labeled, labeled *HEXPORT*?

A. Yes.

Q. Right after that we have the, the *REBUMP CUP* paragraph again. And it looks like at this point, there's been a production part number assigned to the rebump cup of 277137

A. Has been reserved.

Q. Has been reserved --

A. It's been reserved.

Q. But just because there's a number, that

doesn't mean that it's ready to go?
A. That's correct.
Q. Okay. The cup could still go through some changes?
A. Changes, yes.
Q. Okay. And it mentions light truck is still progressing on schedule for validation?
A. Yes.
Q. At this point, any distribution of light truck pressure switches from TI to Ford, if you know?
A. I don't know.
Q. Any samples for light truck --
A. I don't know.
Q. -- pressure switches? And you don't know if there's been any samples delivered by TI to Ford for the passenger car pressure switches, either?
A. I'm not sure at this point. I would imagine probably some samples were.
Q. Okay. All right. And let's go to the next day -- next week. That's 11/9/90, Bates stamped 4379. And it mentioned

*REBUMP CUP* again. I guess they're still working on that. Hang on just a second. Down to the bottom paragraph, it, it starts out, "The bad news." And just read, read over that paragraph for me real quick, because I want to talk to you about it a little bit.

A. Read the entire paragraph?

Q. Yeah. Just to yourself. You don't have to read it out loud. Because I'm going to ask you some questions about it. Okay. I've just been given a note that we have four minutes left on the video, so we're going to go off the record just a second while she changes the video.

THE VIDEOGRAPHER: This is the video reporter. The time is 11:15. We are going off the record. We are at the end of tape number one.

(Recess.)

THE VIDEOGRAPHER: This is the video reporter. The time is 11:18. We are back on the record. This is the beginning of tape number two, deposition

of Steven Beringhause.

Q. Okay. Before we go to that last paragraph that -- it mentions the bad news, let's go up here to where it says *SAMPLES*, it's just two paragraphs above that?

A. Uh hum.

Q. It says, "A total of 215 parts are due today, 11/09, to three different customers as follows: 20 to Ford WIN88." What does that mean? W-I-N-88?

A. That's the platform name for the Winstar.

Q. Okay. "To complete a partial shipment; 15 to Weatherhead." Who's Weatherhead? Do you know?

A. I'm not sure.

Q. And then, "also to complete a partial shipment." Oh, that's for Weatherhead. "And 180 to Hilite Industries with -- together -- which together with 20 previously shipped represent 25% of their order of 800 parts for ISIR use." Who is Hilite?

A. Hilite Industries is a company. In, in

this case, they make the proportional valve that the switch is mounted to.

Q. Okay. So they're involved with the, the passenger car switches?

A. Yes.

Q. They're the, they're the middle man, I guess. They put the switch on the proportioning valve, right?

A. Right.

Q. And then they deliver that assembled unit to Ford?

A. Yes.

Q. As far as you know?

A. Yeah. They may be doing other things, as well, that I'm not --

Q. Okay.

A. -- I'm not aware of.

Q. But TI delivers the samples? I guess these are samples, right?

A. Yes.

Q. To Hilite. Eight hundred samples are going to go? This is only twenty five percent of the order?

A. Uh hum.

Q. What does ISIR mean?
A. That's Ford terminology.
Q. You know what that means? Is it --
A. Typically, it, it refers to different specific submissions along the development path that, that Ford has.
Q. Okay. So is -- do you think that this is the first time -- well, first off, did these one hundred and eighty switches that to go Hilite, and the ultimate eight hundred, were those switches, the pressure switches for the passenger car, pressure switches that we're here about today?
A. I would expect that they were. I, I don't know a hundred percent for sure, 'cause we may have been sampling Hilite for other applications at Ford.
Q. All right. But these one hundred and eighty or so switches that TI delivered to Hilite, they were samples made by Texas Instruments to test, I guess, by either Hilite or Ford during the development stages of the pressure

switch?
A. Right.
Q. For the Panther platform, which was -- is ultimately going to be the 77PS switch?
A. Most likely the Panther platform. Again, I'm not a hundred percent sure, but most likely.
Q. Okay. Do you think this is probably the first shipment of any samples for the development of the 77PS switch?
A. Judging by the quantities, they were probably earlier samples.
Q. Okay. Oh, yeah, it says twenty were previously shipped, right?
A. Yes.
Q. Okay. Go down to "The bad news." It's -- I mean, it may not be bad news. I don't know. And that, that's what it says. And you've read that. What is that -- what does all this mean about the Kapton placement of the three Kapton pieces and the splaying? Now, you talked about earlier that Texas Instruments has a sensor on their line to -- on, on the

assembly line which will identify improper placement?

A. Uh hum.

Q. Did that sensor and the improper placement mechanism on the assembly line, did that resolve this problem, as mentioned at the bottom of the document?

A. On the 57PS hand line, the three Kapton layers are stacked, they're not splayed.

Q. Okay.

A. And on the 77PS production line, they are splayed so we can contact the points and confirm that all three layers of Kapton are present.

Q. Okay. This paragraph that says the bad news, does this talk about 57PS switches or the 77PS switches?

A. I think it's referring to the samples built for Hilite.

Q. Okay. It says we -- that "We discovered that, on the line." What does that mean, on the line?

A. Where are you reading?

Q. The first line.

A. Okay. I assume he's referring to the hand line for the 57P8 line, which he refers to above in the section titled the good news.

Q. Well, it says -- if you read the whole sentence, "We discovered that, on the line, the three pieces of Kapton are not carefully splayed in a twelve-point configuration as they are when we hand-assemble."

A. Right.

Q. So you're saying that, that on the line means they were hand assembled or not hand, or --

A. No. Hand assembled would be referring to in the lab, the design lab.

Q. Okay.

A. Samples built in the design lab.

Q. All right. So this sentence talks about some that were built in, in the design lab, right?

A. When -- this paragraph says that when we build the parts in the design lab, we're splaying the Kapton --

Q. Properly.

MR. CARTER: Objection, form.

A. I, I don't think it's properly or not properly, it's just the way that those parts are being built.

Q. All right.

A. That they're being splayed on a hand line. And on the 57Ps line, production line, the three layers are stacked.

Q. Okay. And does he, whoever writes this -- I guess it's Stephen, right, who is writing this?

A. Steve Offiler.

Q. Does he mention that there may be a problem with the way this stacking is?

A. He says there's a difference in terms of the actuation pressure, depending on how the Kapton is stacked.

Q. Uh hum. What's the, what's the differences in wetted area mean?

A. The Kapton needs to wet to the washer and the converter.

Q. Okay.

A. And depending on how it's stacked may effect how it wets to the washer and the converter.
Q. Does that have anything to do with Kapton life or failure, the wetting area?
A. It has, it has much more to do with drift.
Q. What is drift?
A. Actuation pressure drift over time.
Q. What do you mean over time? Over time of the life of the switch or --
A. Yeah.
Q. -- time of production of the switch.
A. The life of the switch.
Q. Okay. Are you saying that over the life of the switch, the actuation pressure may change?
A. It may shift, yes.
Q. Because of changes in the internal dimensions of the switch, or what?
A. Changes in the switch and, and how the switch actuates.
Q. Okay. And if you turn to the second page of that week, Bates stamp 4380, there's

a section entitled *DISCS*, does that talk about the Kapton disc, or is that talking about the, the other disc that has to do with -- well, I guess it's that metal disc? That's what I'm going to call it.

A. It's referring to the stainless steel --

Q. Okay.

A. -- disc.

Q. They're talking about the life of that disc, that stainless steel disc --

A. Uh hum.

Q. -- but in the middle -- let me see. There's a long first sentence. And then the second sentence starts out, "We are now performing," "We are now performing a standard disc life test on these. In addition, half of each disc lot will be -- will use splayed Kapton and the other half stacked Kapton, and all devices will be using the new Elco hexports to further test the integrity of the seal." Are you saying that the, the splaying, or either the half stack or the splaying of the Kapton, changes the disc life, the

stainless steel disc life? Is that what this test was about?

MR. CARTER: Objection, form.

A. That test is, is being set up to run with half splayed Kapton, half stacked Kapton to make sure that the disc life is acceptable in both configurations. I'm not sure exactly why Steve decided to, to run both configurations or not.

Q. So, I guess that way that he was trying to determine whether or not stacking of Kapton or splaying of Kapton had anything to do with the stainless steel disc life, right?

MR. BURROW: Objection.

MR. CARTER: Objection, form.

A. It, it's possible that that's what he was trying to understand. I'm not sure. I don't think you can tell from reading this.

Q. Okay. Let's just go, then, to the next week, which is 11/16/90, Bates stamped

4378. And just skip down to the -- wait, wait just a second. Yeah, just skip down to the *CUSTOMER ISSUES* paragraph. It's capitalized and in italics. Says, "I received a call on Tuesday from Bruce... It seems that the three car fleet in Florida has -- was having speed control problems... For no apparent reason Bruce was contacted rather than the correct person, Gary Klingler." Who's Gary Klingler?

A. He works for Ford.

Q. Okay.

A. Or he did at this time.

Q. All right. "No, no system debug has taken place yet; any blame directed to our switches is arbitrary and preliminary." And the last, "I overnited 3 replacement switches to Florida to placate them. Bruce will, Bruce will bring Klingler into the loop so the real problem can be determined, and ultimately our 'questionable' switches will be returned to us." What are they talking

about in this customer issue? What is Stephen talking about here? Can you tell?

A. Yes. There's a fleet test in Florida, where Ford was probably running a test to test the system out, that there was some system issues initially. For whatever reason, they felt the switch might be the cause of the problems. Bruce Pease was contacted, and Bruce is going to contact Gary Klingler, 'cause he has more system knowledge of the full speed control system, so Ford can diagnose the issue and determine what the problem is or is not. We sent replacement switches so they'd be able to test to see if the vehicles -- if the problem went away with the replacement switches, and we asked for the switches back to us so if there was any issues with the switches, we'd be able to evaluate the switches and understand what that issue might be.

Q. All right. So this is about a year before Texas Instruments delivers any --

about a year before TI delivers any production switches to Ford for the 77P9 switches, right?

A. Yes.

Q. And it's, it's not very clear, and it doesn't really say anything about what the problem is, does it?

A. I think at this point, Steve didn't know what the issue was.

Q. Okay. Let's go, then, to the next week. 11/30/90. My Bates stamp number is missing on this one, so --

MR. BURROW: It's 004377.

MR. JOLLY: Yeah, it just got cut off on the bottom. Thanks.

Q. It looks like Bruce Pease, if you look down about the middle, *MISCELLANEOUS SAMPLES*, has provided Texas Instruments, or I think he has, I can't tell by reading this, with the mating connectors, offset key mating connectors. Is that the electrical mating connector he's talking about?

A. Yes. That would be the mating connector

that would attach to this end of the switch.

Q. Okay. Not a whole lot going on there. Let's -- and then go to the next week. December the 7th, 1990, Bates stamped 4375. Looks like Texas Instruments reports that -- or Steve reports through Texas Instruments here, that he's completed a six hundred and fifty piece order of the samples for -- to deliver to Hilite, correct?

A. Yes.

Q. He mentions something in the second paragraph called "creep releases," C-R-E-E-P. What does that mean?

A. The way the switch is designed, it's designed so that there's very little movement of the disc until the correct actuation pressure is achieved, and then the disc snaps through. So it becomes a very quick snap through. Creep is defined as when the disc is slowly moving through with pressure being applied, rather than in one instant, when the

right pressure is applied, snapping completely full -- completely through.

Q. Okay. So the creep release talks about the movement from, I guess, a unreleased position to a released position?

A. Creep release would refer to creep during the release process, when, when the pressure is applied and you rea -- get's high enough, the switch actuates. If the pressure drops below a small enough point, the, the disc snaps and -- snaps back. So --

Q. Is he talking about --

A. -- creep release would be talking about the operation where the disc snapped back.

Q. Oh, the -- when it's coming back --

A. When it's coming back.

Q. -- to its position?

A. Right.

Q. Which would be the position it would be in if there weren't actuation pressure?

A. There was no pressure applied.

Q. Okay. But is it talking about that

movement back to that position with the pressure still applied, or the pressure released?

A. You have an actuation pressure. You have a tolerance around an actuation pressure where the switch needs to actuate.

Q. It pops? The disc pops?

A. The disc snaps.

Q. Yeah, snaps. Okay.

A. And then at a lower pressure, the disc would snap back.

Q. Okay.

A. And that's called release.

Q. All right. Okay, so the creep release is a descriptive of pressure being released?

A. Pressure being dropped, not necessarily zero.

Q. Right.

A. But pressure dropped.

Q. Okay. And it just goes back slowly instead of snapping back?

A. Yes.

Q. Okay. Slower than what you -- what TI would want it to?

A. Right.
Q. And those are called -- that's called creep release?
A. Right.
Q. Okay. The second paragraph of that -- of the document we're talking about now talks about some creep release switches? Looks like they were pressure tested, and they were re-checked in the lab, and I guess uncovered a few little problems here, right?
MR. CARTER: Object to the form.
Q. This is just typical stuff that goes on during, during the developmental era, right?
MR. CARTER: Object to the form.
A. We're just analysing any fall out from our pressure testing to understand what the fall out is.
Q. Right.
A. And if any design changes are necessary.
Q. Right. This is a year -- more than -- a

little less than a year before TI goes into production of the switches, so TI's just trying to get the bugs worked out, right?

MR. CARTER: Objection to form.

A. TI's just trying to understand what any fall out might be when the, when the part's built and what might be causing that fall out.

Q. Okay. Can you tell at this point, though, if this testing is done with a hand -- solely hand produced switches, or is this to a point where we've got some automated equipment in place and you're testing that also?

A. No, as Steve says in the Highlights that the automatic pressure tester was used to test the parts. So I think we're in the stage where we're moving towards production equipment for testing devices.

Q. Okay. The automatic pressure tester? Is that something that's on the line?

A. Yes.

Q. And as a switch comes off the line put together, then there's some kind of an automatic pressure tester that hooks up to it and pressures the switch up and --

A. It's actually a separate piece of equipment, but essentially the switch is placed into that equipment and the pressure test switch checks the actuation release.

Q. Uh hum.

A. Things like that.

Q. Okay. Let's go to the week after that, and that's 12/14/90, Bates stamp 4373. The second page of that, which is Bates stamped 4374, the last italicized paragraph talks about 77PS and miscellaneous parts. It says, "we received the next iteration of 77PS prototype bases." Is that the -- that's the electrical base, right?

A. This is the base.

Q. Okay. And there are some changes that were incorporated into it, correct?

A. Yes.

Q. "After Karl's Volvo switch." Who's Karl?

(Discussion off the record.)

Q. Yeah, with a "K".

A. I assume he would be another engineer in the pressure switch group.

Q. And he's probably the guy working with Volvo or something?

A. Yes.

Q. And it says the change better positions the stake and terminals -- better position and stake the terminals? You know what those changes were?

A. I don't know specifically what those changes were, no.

Q. Okay. Okay. And let's go to the week after that. It looks like -- it's 12/21/90, Bates stamp 4372. *CUSTOMER ISSUES* paragraph, it looks like something called, "the complete matrix of envelope prints has been updated." What are, what are the envelope, envelope prints?

A. An envelope print is the, the drawing that shows the final device that's shipped from TI to our customer.

Q. And it talks about a connector internal dimension changing from 11.4 to 11.9 up from 11.63, 11.84. Do you know what that dimension has to do with? That connector internal dimension?

A. I'm not sure exactly. It could be the, the, the depth of the hole from the top of the plastic down. It could be the height of the terminal. I'm not sure.

Q. Well, that's the base, isn't it? This is the base, this plastic part? The connector connects to the base?

A. Yeah. Sometimes we'll refer to this as a connector.

Q. I see. You don't, you don't think this may mean the internal diameter of the connector that goes on to the, on to the base, that plugs on to the base that's provided by UTA?

A. It might be. It might be. I'm not sure. It's not clear.

Q. Did you ever talk to anyone at -- over at TI or, or Stephen or anything -- anyone having to do with the -- any changes made

to the connector? Any dimensional changes made to the connector during, during the development of the 77PS switch?

A. No.

Q. Okay. At this point in time -- well, we're talking about January 11th, '91, the beginning of the -- of '91, does TI have from Ford all of its engineering specifications that it expects the switch to comply with for the 77PS?

MR. CARTER: Objection, form.

A. At this point, TI would have had the main Ford specification.

Q. Yes.

A. It's possible some of those specifications may have changed over time. Something could have been added.

Q. Right.

A. I don't know if the specification was finalized at, at this point. TI would have had the bulk of the specifications.

Q. Okay. But it would be typical during the

development of a pressure switch to have those engineering specifications from the customer, you know, while you're in the middle -- while TI is in the middle of the development stages?

A. It would be common to have specifications from the customers, yes. There may be some changes over time. But to have a base set of specifications, yes.

Q. And at this point in time, there are as much as sample switches that have already been provided by TI to Hilite Industries, presumably to be tested by Hilite and/or Ford to see if they're, they're going to comply with the specifications or be suitable for their uses?

MR. CARTER: Objection, form.

A. I'm not sure exactly what testing Hilite or Ford would be doing. I assume they would do some system level testing. I don't know if they did any switch component testing as well.

Q. But any testing that Ford or Hilite would

do, they'd normally report back to TI the outcome of those kinds of testing?

A. Not necessarily.

Q. Okay. It's not a normal thing for that customer to report back any testing that they conduct on their own regarding the development of any switches at TI developing?

MR. CARTER: Objection, form

A. If there are any issues with the switches, the customer would come back and tell TI what the issues were. Some customers sometimes will give results of testing, but it's not always -- not all testing completed.

Q. Okay. Let's turn to the next week of January 18th, '91, Bates stamped 4368. Just one thing on this page, under the sampling, testing paragraph, first sentence, it mentions that TI has, "received a request for 7798 samples from Bendix." Who is Bendix?

A. At the time they were a great supplier.

Q. And is this -- the 7798 switch, is that

the Ford 77PS switch we're talking about that's in developmental stages at TI?

A. 77PS is a family name of, of the design that matches the, the same as the Ford family.

Q. Okay. So the, the Bendix request, did it have anything to do with the Panther platform utilization of the TI pressure switch?

MR. CARTER: Objection, form.

A. The Pan -- the system supplier of the Panther platform was Kelsey-Hayes --

Q. Okay.

A. -- not Bendix.

Q. Not Bendix. So Bendix may have been from some, some other car manufacturer? They, they may be middle man for some other car manufacturer?

A. Well, it could have been a different Ford platform.

Q. Okay. You just don't know?

A. I don't know.

Q. All right. Then the next week of January

26th, '91, Bates stamped 4366, there's a new term introduced, and it's under *SAMPLES, CUSTOMER ISSUES*, and it's S-R-E-A, which is an acronym for supplier request for engineering approval?

MR. CARTER: Objection to form.

MR. JOLLY: What's, what's wrong with that question.

MR. CARTER: I don't think it's a question. I don't think you asked him a question.

Q. Is that what it says?

A. Right here it says --

MR. CARTER: And it also assumes facts not in evidence, which is that is a new term.

A. -- under *SAMPLE, CUSTOMER ISSUES*, it says SREAs, which stands for supplier request for engineering approval.

Q. Okay. What does that mean?

A. An SREA would be a document that a supplier would put together for Ford outlining any change request.

Q. Okay. Someone like a company who is supplying Texas Instruments the cup, for example? Or those kinds of suppliers?
A. Any, any, any supplier to Ford. It's a Ford requirement.
Q. Okay. So it, it's in that direction, not, not suppliers to TI --
A. No.
Q. -- for component that go in the switches?
A. It would be suppliers to Ford.
Q. Okay. And then turn to the second page of that week Highlight, and the second to last paragraph talks about a meeting was held with mechanization. What is the mechanization group at TI, and what does it have to do with?
A. The mechanization group designs and builds the production equipment.
Q. Okay. Is this -- do you know if this is the first meeting with mechanization at TI, TI to discuss the production of the 77PS?
A. I'm sure there were earlier meetings with mechanization.

Q. Okay. But you don't know if any others were held prior to this for the 77PS? Actually, it talks about the pressure tester, doesn't it?
A. Yes.
Q. That pressure tester is what you talked about a while ago, that, that unit at the end of the line that, that pressure tests each switch as, as it comes off?
A. Yes.
Q. Okay. There are some tests conducted at that point in the pressure test, right?
A. Yes.
Q. And a millivolt drop measurement, is that conducted at the pressure tester?
A. Yes.
Q. So when the pressure tester secures a switch to test, it somehow makes an electrical connection with it?
A. It has to to know if the contact's open or closed.
Q. All right. And does it make the electrical connection at the hexport and also at the terminal?

A. No, it makes electrical connection at the two terminals.
Q. Okay. But not at the hexport?
A. The, the system may, but that's not how those -- how millivolt drop would be measured.
Q. Okay. How would milli -- millivolt drop be measured?
A. It would be measured between the two terminals in the --
Q. And it, it would be something that would drop off when the switch opens or closes?
A. Well, it would be the, the millivolt drop while the switch is closed. If you had a high resistive connection, you have too high of a voltage drop.
Q. All right.
A. At the switch contact. So it -- Ford has a specification that the millivolt drop needs to be low enough so that the switch resistance isn't too high.
Q. Okay. So what is the purpose for conducting that test?
A. To make sure the switch is meeting

specification.
Q. Okay. And that, that specification has to do with electrical communication through the switch, correct?
A. It has to do with the, the resistance of the switch.
Q. Okay. And also to make sure the switch is being manufactured as to the specifications provided by Ford?
A. To make sure the switch is meeting the millivolt drop specification --
Q. Okay.
A. -- that's designed by Ford.
Q. All right. And so Ford supplied Texas Instruments with all the information necessary to conduct a milli -- millivolt drop measurement that it wanted -- that Ford wanted it to?
A. Ford provided the specification for what their millivolt drop needed to be.
Q. Okay.
A. Or the maximum that it could be.
Q. All right. Typically, what type of voltage is supplied to the switch to

conduct the millivolt drop measurement test at the pressure tester?

A. I'm not sure exactly what voltage is applied. I imagine somewhere around twelve or thirteen volts.

Q. Okay.

A. I'm not positive.

Q. And is there any kind of a current meter of some sort on that supply of electricity to the switch at that test?

A. I'm not sure exactly how it's measured on the pressure tester.

Q. There's not an amp meter?

A. There may be.

Q. But you don't know?

A. No.

Q. And then it says millidrop -- let me see. It says, "millivolt drop measurement and continuity definition." What does that mean, continuity definition?

A. That the switch is closed when it's supposed to be closed and open when it's supposed to be open.

Q. Okay. So just does it work -- does it

open and close?
A. Yes.
Q. In that regard? But at this millivolt drop measurement, there's no test -- there's no other test having to do with amps or anything like that, or you don't know how many amps are supplied to the electrical wire that's hooked up to the pressure switch?
A. No, I'm not sure what current is used when that test is made.
Q. Okay. Would it be -- would that be something that Ford would supply to Texas Instruments, the amount of current?
A. Either it would be supplied in the specification or, at a minimum, TI would discuss with Ford how we were running that test.
Q. Do you know if there's any documents that discuss what type of current is supplied to the pressure tester test to conduct the millivolt drop measurement?
A. It might be in the Ford specification. I'm not sure.

Q. All right. Is there some type of a, a current measurement that is applied to the switch at the millivolt drop measurement test?
A. I'm not sure.
Q. Well, there's electricity supplied to the switch, correct?
A. Voltage applied.
Q. A voltage -- which is electricity, correct?
A. Essentially, yes.
Q. All right. And that has with it a component which is amperes, right?
A. Only if there's a certain resistance. It would have to ground.
Q. Well, I mean every wire that has electricity in it and a current flowing through it will give you a measurement of amperes, correct?
A. If current's flowing through it, by definition there's amperes.
Q. Okay. And if Texas Instruments is measuring a millivolt drop, then you're going to see a current flow through the

switch, aren't you?
A. There's probably some current being applied. I don't know for sure how that measurement is being made.
Q. Well, if there's a millivolt drop, then there is a current going through the switch, correct?
A. There should be, yes.
Q. Okay. And if Texas Instruments is measuring the millivolt drop at this test, then there is a current going through that switch at that same time, correct?
A. There probably is. I don't know how that test is being run.
Q. Okay. But I'm not asking you if -- how -- if you know how that test is being run, I'm just asking you physically, electrically, if someone is measuring a millivolt measurement like TI does at this test, while the electricity is running through that switch, there is a current which is measured in amps, correct?

MR. CARTER: Objection, form.

A. Most likely ther would be a current behind it.

Q. Okay. But --

A. It's a measure of millivolt.

Q. But you don't know if Texas Instruments actually measures that current through the switch during this millivolt drop measurement test?

A. No, I don't know how the millivolt drop is measured.

Q. Okay. Let's go to the next week, February 1st, '91. This is the first time I see this, this term. It may not be the first time it's in the documents, but it's the first time I came across it. About in the middle of that -- of the page -- oh, this is Bates stamped 4365. About the middle of the page under a paragraph that starts out 77PS, it says, "The very first prototype of 77PS devices have been built." This is after 77PS samples have been sent to Bilite, right?

A. I don't know if the samples supplied were the 77PS version or an earlier version of the switch design.

Q. Okay. So they may not have been called 77PS, the switches that were given to Hilite?

A. Right. During the development, we'll supply samples of different design configuration as the design progresses through the development stage.

Q. Yeah. But the eight hundred that Texas Instruments gave to Hilite before February the 1st, 1991, those eight hundred, they were all the same design, right?

A. Same design as each other?

Q. Yes.

A. I -- assuming so.

Q. They weren't eight hundred different designs?

A. No. I would imaging they were all the same design.

Q. Okay. But on this page, 4365, it says this is the first prototype of 77PS.

That's just a little bit confusing to me, after all this time that now, on February the 1st, '91, this is -- it says that this is the first prototype. What does that mean to you when you read something like this? Does this mean that this is the first switch that's been manufactured on a, a automated line, or, or just tell us what it means to you?

A. It really depends on how Steve Offiler's defining it. It could have been the first parts made with the 77PS base off the soft tool part. It could have been the first parts off the production line.

Q. Yeah.

A. I would imagine it's not first parts off the production line, 'cause they were manually calibrated. Could have been the first samples we're actually calling 77PS.

Q. Okay.

A. I don't know.

Q. The, the, the last sentence of that paragraph under 77PS, the last line?

A. Uh hum.
Q. It says, "in terms of pin window." What is pin window? Can you describe that for me?
A. The ceramic pin that's used in the device is used to adjust for dimensional tolerance variation of the components. So -- and variations of the disc itself. So different devices will have a different length pin, depending on other features of the part. And the pinning window is the allowable window of pin dimensions that we'll select.
Q. Okay. So the window is a distance that --
A. It's the length of the pin.
Q. Okay. The length of the pin?
A. Or the tolerance on the length of the pin. Whatever you want to call it.
Q. The room that you have to work with to place the pin, the window?
A. Essentially.
Q. Okay. And then right after that it says, "snap sound." What is snap sound?

A. That is the sound of the disc snapping.
Q. Is that something that occurs when the switch has got brake fluid in it and it's pressured up?
A. That's the sound that occurs when the disc snaps. When it reaches the actuation pressure and the disc snaps.
Q. Like when brake fluid on the pressure side of the switch reaches an actuation pressure --
A. When the disc snaps.
Q. -- mount and the disc snaps?
A. That, that's the sound, yes.
Q. Okay. Who is making the hexport for Texas Instruments for the pressure switches for the Panther platform?
A. Elco.
Q. Okay.

(Discussion off the record.)

Q. Okay. Let's turn to the week ending 2/15/91, Bates stamped 4362. About in the middle of the page, it says, "We have shipped twelve 77PSL2-3." What did the 2-3 go on?

A. I'm not sure which vehicle the 2-3 goes on.
Q. Okay. Who's George Randall?
A. I think George Randall worked at Ford.
Q. Okay. So more than likely the 2-3 went on a Ford, because it says that the samples were shipped to George Randall?
MR. BURROW: Objection. It calls for speculation.
A. I, I think the 77PSL2-3 goes to Ford.
Q. All right. And it says, "These are the first fully functional 77PS devices shipped?" What does that mean, fully functional 77PS devices shipped?
A. Probably in the, the 77PS configuration, so the 77PS base that are calibrated have the right actuation pressures and release pressures and millivolt drops, and things like that.
Q. Okay. So it passes all the tests that TI runs on the, on the switch, right?
A. Well, at this point the switch would not have been fully tested to the entire Ford specification.

Q. Okay. And it says, to carry on in that paragraph, "To confirm that nothing would go wrong with these first-pass 77PS calibrated switch assemblies, we did a full Impulse test including 25K powered cycles before samples shipped." What does that mean, 25K powered cycles?

A. As part of the Ford specification, they require that the last 25,000 pressure cycles of the impulse test is done while powered with the fourteen volt power source and the Ford supplied clutch coil loads.

Q. Okay. With fourteen volt power supply? Is that what you said?

A. Yes.

Q. And do you know what type of current load limiter at all may have been placed on the power that goes to the switch?

A. That clutch coil limits the current to a maximum of eight hundred milliamps.

(Discussion off the record.)

Q. Okay. And so was that the, the current load that was supplied for these powered

cycles?
A. Ford provided it to us, the clutch coils to use for the test. The clutch coils themselves would have defined the current.
Q. Okay.
A. And Ford specification says that maximum current would be eight hundred milliamps.
Q. All right.
A. I don't know exactly --
Q. That's --
A. -- during this test what the current was.
Q. All right. So there wasn't an amp meter placed on the, the wire going to the switches or out of the switches to determine what the current was at the time of this -- these, these tests?
A. There may have been. I don't know.
Q. TI may have had a, a hand meter on there, you just don't know?
A. Right.
Q. But at any rate, Ford had supplied some clutch coils --
A. Yes.

Q. -- to TI?
A. Yes.
Q. To use to conduct these type of tests?
A. Specifically for that test.
Q. For this power up cycle test?
A. For the powered portion of the impulse test.
Q. All right. Did Ford also supply TI with the electrical schematic of the circuitry that -- to hook up the switches to the clutch coil?
A. Yes, they did. It's provided in the specification.
Q. And that was supplied to TI back when this test was done and reported on 2/16/91?
A. It would have been before this test was run. I don't know the exact date.
Q. Okay.

MR. CARTER: I'd like you to -- when you get to the breaking point, maybe between weeks or something, it's getting about lunch time.

MR. JOLLY: Oh, okay. We

can go ahead and take a break now. Lunch break. If you all want to. Okay.

THE VIDEOGRAPHER: This, this is the video reporter. The time is 12:00. We are going off the record.

(Recess.)

THE VIDEOGRAPHER: This is the video reporter. The time is 1:09. We are back on the record.

Q. Okay. I'm going to skip up to the week ending May the 26th, 1991, Bates stamped 4348. And the second paragraph under the paragraph entitled *CUSTOMER ISSUES*. I'll wait for you to get there.

A. What is the -- which week?

Q. It's Bates stamped 4348, week ending April 26th, '91. Near the --

MS. SPEER: April or May, Mike?

MR. BURROW: He said April.

MS. SPEER: April.

Q. First paragraph is entitled *CUSTOMER ISSUE -- CUSTOMER ISSUES*. The second paragraph under that section, it mentions

"We have -- we have received a returned device from Kelsey-Hayes." Is Kelsey-Hayes one of the entities that's involved in the 77PS pressure switch for the passenger cars?

A. They're the brake system manufacturer.

Q. Okay. So Kelsey-Hayes evidently has one of the sample switches that was re -- they returned? Or how can you -- can you tell what happened based on reading this? And let me interrupt your reading first. That, that first line in that second paragraph, at the end it it says, "We are not treating this as an official RMR." What does RMR stand for?

A. Return material report.

Q. Okay. Because it failed during a development test, right?

A. That's --

Q. That means that it's a sample?

A. What it says. It was a sample, yes.

Q. Maybe one of the eight hundred that were sent out earlier to Hilite, or you really can't tell?

A. I can't tell.
Q. It says that it failed while "undergoing a salt water submersion test?"
A. Yes.
Q. Evidently, Kelsey-Hayes was conducting some tests on its own?
A. Yes.
Q. From reading this?
A. Yes, they were probably trying to qualify the products that they were sending to Ford. Or at least testing their designs for their products.
Q. Okay.
A. What they were going to be delivering to Ford.
Q. And then TI's response to that, Stephen wrote it down. He, he wrote, "We immediately responded that A) our device is not submersible, and that B) potential problems with the environmental seal on the mating connection can cause problems which are completely out of our control." Do you agree with that?
A. Agree with which?

Q. What I just read about what Stephen wrote, the sentence starting with we? I assume he means Texas Instruments when he says we?
A. Yes.
Q. Is that what he means when he says we?
MR. BURROW: Object to form.
MR. CARTER: Object to the form.
MR. BURROW: Calls for speculation.
A. I would assume in this place he was referring to either he responded or someone at Texas Instruments responded.
Q. Okay. So the devices that Texas Instruments was developing for Ford are not submersible in salt water?
A. I think what he's referring to is that the connector design that Ford had selected --
Q. Uh hum.
A. -- for the switch was not a submersible connector design.
Q. Okay.

A. There's several places throughout the Highlights where it's mentioned that, that Ford has said the connector is not a submersible connector design.

Q. Okay. And at the bottom of that same paragraph, it talks about -- the last sentence of that paragraph, "K-H has requested an 8D." What's an 8D?

A. 8 discipline. That is a Ford definition for a corrective action report.

Q. Okay. Do you know if one ever came about because of this? A corrective action by Ford?

A. I assume here Kelsey-Hayes had requested the, the 8D from TI.

Q. Okay. And was one ever given --

A. I'm sure that one was.

Q. Corrective action? Is that what that means?

A. Corrective action report.

Q. And does the corrective action report talk about a possible solution to what K-H, or Kelsey-Hayes, foresees as a problem?

A. An 8D essentially has eight steps that you go through. Those include defining the team working on the 8D, defining what, what the problem is, defining any containment in place, defining root cause, defining how you prove that the root cause fixes any issues, going, going all the way through.

Q. Does it talk about any solutions to the issue?

A. Yes. It will talk about any corrective actions or --

Q. Okay.

A. -- and solutions.

Q. All right. Let's jump ahead from that. The next one I want to look at is the week ending May 3rd, '91, Bates stamp number 4346. Under the paragraph entitled *PRODUCTION ISSUES*, the second paragraph under that, it says, "Issues related to on-line in-process inspection have begun to surface. Most significant is the failure of one device (out of four) during burst testing." It says

that the device passed the requirement of the engineering standards, "which is holding pressure -- holding 7000 psi for thirty seconds without leakage." And, "upon release of pressure the cup crimp was forced -- was found to have loosened." What does that mean to you? Does that mean that -- does this sentence mean, or communicate to you, that these devices actually passed Ford's engineering specifications?

A. Yes.

Q. And then TI took it upon themselves to go a little bit further with that testing and, and it resulted in a failure of one of the switches out of four?

A. What this is saying that when we ran the standard burst test defined in the Ford specification, all four parts met that, that burst specification defined by Ford.

Q. Right.

A. But we found that one of the cups, the cup crimp had, had loosened, which we would not have expected to happen during

that test. So we wanted to investigate further. So parts style was still meeting the requirements, but TI further investigated to make sure there was no issues.

Q. But one of out of four, it says, did not pass, right? During the burst testing? What is burst testing?

A. Burst testing is when you --

MR. CARTER: Object to form.

A. -- when you, as defined in Ford's spec, you're pressuring the part to a certain pressure to make sure that the part does not start to leak at that pressure.

Q. Okay. You don't raise it to a pressure during this test until it leaks? You just raise it to a pressure to see if it does leak?

A. Yes. You raise it to a certain defined pressure, hold it for a certain amount of time, and then release the pressure.

Q. Okay.

A. Typically, customers will set that burst pressure to be higher than the worst case

pressure a system could see.

Q. What is -- this, this same paragraph mentions in the middle -- Weibull, W-E-I-B-U-L-L, techniques. What is Weibull techniques?

A. Weibull techniques are statistical analysis tools to define confidence level and reliability levels when you do sample testing of what you would expect the entire population to perform to.

Q. Okay. Jump ahead to June 14th, '91. The second page of that week ending -- it's Bates stamped 4336. And the first beginning paragraph on that page talks about crimp shift. Have we talked about that yet? Or is that something new?

A. I don't think we've talked about crimp shift.

Q. What is crimp shift? It says, "This phenomenon," and it starts talking about it. What, what is crimp shift, and how does it affect the production or development of the 77PS pressure switch for the Panther platform vehicles?

A. What Steve's talking about here is that on the hand samples we were making measurements of the parts to select the pin length before crimping. Because of some of the compression during crimping, there's a shift in what the ideal pin length would be.

Q. Okay. And that was eventually corrected for the products that were made and put on the vehicles?

A. Well, he says right here that it applies only to, to lab pin parts, because in production we don't make the measurements what the pin should be until after the device is crimped. So, by definition, there is no crimp shift.

Q. There is not crimp shift in the product parts?

A. The measurement isn't made until after crimping.

Q. Okay.

A. So even if there's any compression or, or changing during the crimp process, it's automatically accounted for because the

measurement is done after crimp rather than before crimp.

Q. All right. So it's not an issue with regard to any production parts?

A. Not at all.

Q. And why would it be something you would test for to determine whether or not you can produce parts?

A. For the hand built parts where Steve was making measurements to select the pin, if he didn't understand how much that shift would be, then he may build parts that have the wrong actuation pressure.

Q. Okay. I gotcha. Okay. Jump ahead to the week of August the 16th, 1991, Bates stamp number 4324. And up at the top, *VALIDATION* paragraph. And this is about two months, roundabout -- I'm not holding to you to any specific dates -- but about two months before TI shipped any pressure switches to Ford to be installed on Panther platform vehicles, correct?

A. This was about two months before any pressure switches were shipped by TI to

Ford to be on production vehicles.

Q. Okay. And at this time during what's -- I guess it's during validation, right, that this was written?

A. Yes.

Q. It talks about a -- the thermal cycle test. What is a thermal cycle test?

A. Thermal cycle test is where we cycle the temperature environment for parts from some cold temperatures to some hot temperature, cycle the temperature back and forth.

Q. Is back and forth hot, cold, hot, cold, maintaining the temperature at specific amounts?

A. There's different versions of how the test is run. Some of it is -- sometimes you have two temperature baths that the part shuttles between that are at constant temperatures. Other times you have the part inside of an oven that ramps up a temperature and down a temperature.

Q. Uh hum. And do you know what the

temperature extremes are for the temperature cycle test that were conducted on the pressure switches for the Panther platform vehicles?

A. I'm not positive, but it would have about -40 and 125 C.

Q. Okay.

A. Might have been a little different than that, but not significantly.

Q. All right. It says that test was expedited, "successfully expedited?"

A. Yes.

Q. "In order to begin the important Impulse test as soon as possible." What is the important impulse test?

A. The impulse test, as defined in Ford specification, is the pressure cycling test.

Q. Okay. And Ford represents to TI that that is an important test?

A. All of the tests in the Ford ES spec need to be passed successfully --

Q. Okay.

A. -- to qualify the product.

Q. And explain for us, again, the impulse test?
A. It's the pressure cycling test where zero to fourteen hundred fifty psi --
Q. Uh hum.
A. -- is applied to the -- and pressure is applied to the switch for five hundred thousand cycles.
Q. All right. And then it says that half of the devices were impulse test, they were virgin devices?
A. Uh hum.
Q. The other half were, I guess, devices which had been complete -- had completed the fluid resistance test? What is the fluid resistance test?
A. That's a test where the parts are exposed to different fluids.
Q. Now, this test in this paragraph here, is it talking about the pressure switches for the Panther platform vehicles, validation of those, those switches?
A. They're talking about both the switches for the passenger car platforms and the

Panther platform as well as switches for the light truck.

Q. Okay. Okay, tell us about the fluid resistance test? What fluids are the switches exposed to?

A. I don't remember exactly which fluids. It's defined in the Ford specification. And it's typical automotive fluids that may be splashed on to the part.

Q. Okay. Would brake fluid be one of those parts?

A. Brake fluid would --

Q. I mean one of those fluids?

A. -- probably be one of the fluids.

Q. All right. You don't know for sure?

A. I don't know for sure. If I --

Q. Is the --

A. -- if I saw the Ford spec, I could tell you.

Q. Okay. Is, is the fluid resistance test run by putting fluids through the hexport to contact the Kapton on the outside of the switch?

A. I think the fluid is placed on the

outside of the switch.
Q. Just on the outside? Not --
MR. CARTER: Objection, form.
Q. -- not through the hexport?
A. For the fluid resistance test, I believe the fluid's just placed on the outside of the switch, not through the hexport.
Q. Okay. So the, the purpose of the fluid resistance test is not to test for Kapton compatibility with any of the pressure fluids -- the pressure media fluids?
A. No, it's not.
Q. And I'm calling the pressure media fluids the fluids that would be going through the hexport and contacting the Kapton?
A. Yes, that's correct.
Q. Okay. So --
A. In this case brake fluid.
Q. All right. So the fluid resistance test does not include any testing having to do with those pressure media fluids?
A. Well, it may include the pressure media fluids, because you could have brake

fluid splash on the outside of the part in the application.

Q. Right. On the outside, but not the inside through the hexport?

A. Well, you will have brake fluid in the inside of the hexport in part two in the application, but that's not what you're testing for in the fluid resistance test.

Q. You're not testing for compatibility with Kapton?

A. No.

Q. Okay. But you're saying that the fluids may get down into the hexport and contact the Kapton during this test?

MR. CARTER: Object to form.

Q. How's the test done? Just tell us physically, if you know, how the test is accomplished at, at Texas Instruments.

A. I, I don't remember it off the top of my head. It's defined in the Ford specification, and we would read that in the specification before the running the test and run it according to that spec.

Q. Okay. So whatever that spec says, that's

what you all do at TI?
A. Yes.
Q. About the fluid resistance test?
A. Yes.
Q. And -- let me see, where were we? A little bit further down, it says, "A significant problem is occurring on the PC devices." Does that mean passenger car devices?
A. Yes.
Q. And it says, "We have three failures to date." And then it's in parenthesis, "(325K of 500K)." In other words -- what are they -- what is he saying here, that you're failing at three hundred twenty five thousand cycles?
A. The testing has completed three hundred and twenty five thousand pressure cycles of the required five hundred thousand --
Q. Okay.
A. -- pressure cycles.
Q. "Due to fluid leakage." Then he says, "Autopsies of two (thus far) shows fatigued Kapton; no real evidence of

foreign matter nor damage to the Kapton during assembly." Is this -- do you know if this is the first time that anyone at TI during the developmental stages of the, the Panther platform pressure switch found problems with fatigued Kapton?

MR. CARTER: Object to form.

A. The ultimately wear out mode of that switch is fatigued Kapton. The issue here was that the number of cycles were below the specification.

Q. Right. But my question is, is this the first time that someone at TI, during the developmental stages of the 77PS, the Panther platform switch, is this the first time that one -- an engineer or anybody found problems with fatigued Kapton prior to the termination of a impulse test?

A. Fatigued Kapton itself isn't a problem. That is the wear out condition of the device. I, I would imagine during testing before he -- this time parts were tested until they eventually leaked,

tested till failure.
Q. Yeah.
A. At that point, the Kapton would have been fatigued.
Q. But is it a problem if the Kapton fatigues and fails prior to the, the test protocol of five hundred thousand cycles?
A. If the Kapton fatigues before five hundred cycles, then the parts do not meet specification.
Q. Okay. So would that be a problem or not a problem?
A. That would be a problem.
MR. CARTER: Object to form.
Q. All right. Okay. Then a little bit further down in that same paragraph, Stephen -- looks like he notes some hypotheses for the failure, or maybe solutions. I can't tell. It says, "increased converter travel in the rebump design." What does that mean?
(Court reporter read back the end of the last question.)
A. Can, can you repeat the question?

Q. What is increased converter travel in the rebump design? What does that mean?
A. Steve Offiler is saying that in the passenger car parts, because of the bump configuration on the cup that defines the actuation pressure, the converter travels further during a, a snap condition.
Q. Okay.
A. In that design than it does on the light truck design.
Q. And what do you gather from that?
MR. CARTER: Object to form.
A. What, what do I gather from what?
Q. That you have an increased travel of the converter?
MR. CARTER: Object to form.
A. Well, we would expect to have an increased converter travel because of the way the part's been designed to hit the actuation pressure.
Q. All right. Does it look like Steve may be pointing to that as a possible problem for what he characterized as three failures?