(1) [illegible]

- [illegible]

Action

- [illegible]

- [illegible]

(3) [illegible]

- [illegible]

Action

- [illegible]

- [illegible]

[illegible]

Action: [illegible]

- prepare change to [illegible] to accelerate [illegible]
- [illegible]

- access capability [illegible]
- [illegible]

- pit fluid vacuum sensor for brake fluid
- [illegible]

3) Spec does not call out threshold for open & closed circuits; we need to understand them & instrument P.V. testing to these exact [illegible]

Action:

- [illegible]
- [illegible]

HL FOR WEEK ENDING 08/07/90

TO: BILL SWEET

FROM: KEITH ROBERTS

AMI

THE AMI CRIMPER RAN AT 38 CPM WITH THE AMI FOLLOWING AT 33CPM, THIS MARKS THE THIRD WEEK WHERE THE MACHINE HAS BEEN RUNNING IN THE THIRTIES. UPTIME FOR THE MACHINE AVERAGED IN THE LOW FORTIES FOR THE MONTH OF AUGUST DUE TO THE DOWNTIME INTENSIVE SPEED MODIFICATIONS. CURRENT EFFORTS INCLUDE CLEANING UP THE CRIMPER FOR FUTURE R & M AND A POSSIBLE 40+ C.P.M., OPERATOR SPEED ASSISTANCE, AND AMI SPEED AND UPTIME INCREASE TO MATCH THE CRIMPER.

CONTINUITY FAILURES ARE DOWN 70% FOR THE WEEK. THE AVERAGE WEEKLY FALL OUT IN AUGUST WAS 425, FAILURES FOR THIS WEEK ARE 129. THE FALL OUT FROM THIS WEEK COULD BE DUE TO BAD SPRINGS AND IS NO LONGER CAUSED FROM THE PRE-CRIMP STATION. WORK CONTINUES TO ELIMINATE THE FALL OUT.

APG

WE ATTEMPTED TO START THE APG THIS WEEK. THE GAGE'S LIMIT SWITCHES WERE FOUND OUT OF ALIGNMENT, THE CRIMPERS EXHAUST MUFFLER WAS BORROWED FOR THE AMI,...ECT. THE MACHINE HAS BEEN RESTORED TO OPERATING LEVEL AND WE WILL BEGIN THE NEXT LEVEL OF OPERATION TODAY.

CCPS

THE CURRENT SWITCH DESIGN ITERATION WILL BE COMPLETED IN A FEW WEEKS, THE TEAM IS OPTIMISTIC THAT ANOTHER ITERATION MAY NOT BE NECESSARY. THIS FITS VERY WELL WITH THE TOOL RELEASE DEAD LINE COMING UP IN MID OCTOBER.

THE SWITCH DESIGN DOES LOOK LIKE IT WILL BE DIFFERENT THAN THE CURRENT DESIGN. DESIGN ENGINEERING IS LEANING TOWARD THE 33PS SPRING DESIGN WHICH WOULD NECESSITATE INCREASING THE SIZE OF THE SWITCH. THE INCREASE IN TERMINALS AND BASE SIZE IS EASILY COMPREHENDED IN OUR CURRENT TOOLING CONCEPTS, HOWEVER COSTS WILL GO UP.

THE RELEASE OF THE CUP TOOL TO PROVIDE A LOW RATIO SENSOR PACKAGE FOR THE 57PS PC ISIR SUBMISSION IN DECEMBER WILL BE DONE AS SOON AS WE HAVE A PRINT. WE ARE CURRENTLY DISCUSSING THE TOOLING CONCEPTS WITH VALENTINE VIA MARKED UP PRINTS. WE WILL HAVE TO USE RE-WORKED MODEL SHOP PARTS FOR THE ISIR AS THE TOOL LEAD TIME IS ALMOST TWO MONTHS PAST THE ISIR DATE.

THE PINNING WINDOW AND PROCESS CAPABILITY OF THE PASS CAR LOW RATIO SENSOR IS ACCEPTABLE. COMPONENTS WERE PILOTED AND TESTED ON THE PRODUCTION LINE USING PRODUCTION PROCESSES AND WERE FOUND TO BE COMPARABLE TO CURRENT PRODUCTION WITH YIELDS IN THE HIGH 90'S.

THE TOOLING OVER RUN FOR THIS LINE HAS NOT BEEN RESOLVED TO DATE. MARKETING CONTINUES TO ALLOW FORD THE BELIEF THAT WE WILL ABSORB "CAPITAL" PORTIONS OF TOOLING. THERE IS CURRENTLY ALMOST 200K$ ON THE TABLE WHICH IS ABOVE WHAT FORD IS WILLING TO PAY. WE CONTINUE TO STRUGGLE WITH HOW TO HANDLE THIS EXPENSE.

SAMPLE ORDER

ORDER NO: CO-72

REQUEST DATE: 08/09/90

CREDIT ACCOUNT: 5902

COST CENTER: 101

PRODUCT CODE: 060

CUSTOMER: [redacted]

CUSTOMER P.O. NO: [redacted]

TI PART NO: 57P8L5-3

CUSTOMER PART NO: N/A

QUANTITY: 10

PRICE: $50.00 EA

DELIVERY PROMISED: 8/24 OR SOONER

SPECIAL INSTRUCTIONS: STANDARD HEXPORT IS ACEPTABLE

BILL TO:
[redacted]
ROMULUS, MI [redacted]

SHIP TO:
[redacted]
ROMULUS, MI [redacted]

PRODUCTION SAMPLES

XX ENGINEERING DEVELOPMENT SAMPLES

CC: ENGINEERING: STEVE OFFILER

PRODUCTION CONTROL: MARIE CROSSLAND

SALES ENGINEER: JOE SCHUCK

CCPS 6/6/10

Low cal PC approval ← key geometry relocated cup bump "bellmouth" brake disc

- zinc paint strip disc

Sample PC
Testing for fitting component

Need kit upgrade for 7MC

LT:

316656 3/4" disc spec 250±30 40 min a release

- need to add a check # to print.

disc is ~7-8 psi differential 26 psi act

min differential type bias to ~~min~~ on skills cusp

12-20 psi is a typical differential for 57 discs

diff of 35% of selection

- Supposedly will "never change out"

- have 9 disc one spec issues

Recalibration

- already 5% drift on act & calc

- may get OH involved.

- need the mating fitting for these; some are restrictive.

* Steve - micrometer for 57LT Recalibration.

- Check on spec

- Ford's miniature connector has .025" thick fingers, whereas Bosch type fuel injectors use .032" thick; should try to standardize this.

- Andy needs to research "best case" for the

MSG MN= 161125 FR=EDRM TO=TC SENT=08/09/90 08:49 AM
R#=138 ST=C DIV=0050 CC=00869 BY=EDRM AT=08/09/90 08:49 AM

09 AUG 90

TO: KEITH ROBERTS PCNE
ED KADISEVSKIS MDES
STEVE MCCOOEY MDES
STEVE OFFILER ELS
STAN STELIGA STEL
WAYNE CARLSON AMSD
STEVE RODKEY AMSD
DONNA MOYNIHAN PCDA
BILL FARROW MDES
ANDY MCKENNA AJM3

CC: JIM ARMSTRONG EDRM
JOHN GORNLEY AMSD
BILL SWEET PCNE
RAY TOURANGEAU PCNE
CHARLIE DOUGLAS CPPC
BOB VIENS MDES
ED PONTES MDES
ANDY MCGUIRK PCDA
MIKE DEMATTIA PCDA
MIKE POHL FIXR
TOM CHARBONEAU TC
BOB BASILIERE ELTL
BOB ROBICHAUD PCNE

FR: JOHN KOURTESIS MDES

SUBJ: WEEKLY CCPS STATUS UPDATE

NEXT MEETING:

DATE: WEDNESDAY, AUGUST 15TH
TIME: 8:00AM
PLACE: #920 DESIGN C.R.

) BASE ASSEMBLY

- DESIGN IS RELOOKING AT MOVABLE ARM DESIGN AND TERMINALS. WE WILL NOT HAVE DRAWINGS FOR 3-4 WEEKS THUS OUR SCHEDULE FOR COMPLETION OF THIS MACHINE IS OPEN AT THIS TIME. WE WILL CONTINUE OUR DESIGN ON STATIONS, ETC. AS LONG AS POSSIBLE WITHOUT THESE PRINTS AND REDO SCHEDULE/COST WHEN FINAL DESIGN IS COMPLETED.

ANDY AND STEVE RODKEY WILL RELOOK AT SPRINGBACK DATA FROM SSPS DESIGN.

- STEVE RODKEY NOTED THAT WE NEED TO CLOSE ON CHECK STATION APPROACH. WE MAY CONSIDER TWO CHECK STATIONS. ONE TO CHECK DIMENSION/FORCE-LIKE CALIBRATION AND A SECOND TO CHECK USING CONTINUITY WHICH IS MORE PRODUCT OPERATION ORIENTED.

O FINAL ASSEMBLY

- STEVE M. PUT TOGETHER A FIRST PASS SCHEDULE THAT SHOWS COMPLETION IN 6/91 TIMEFRAME. DESIGN WILL START IN 1-2 WEEKS.

- WE NEED PARTS AND DRAWING ASAP TO SUPPLY TO FEEDER VENDORS.

- WE WILL DESIGN MACHINE TO RUN AS FAST AS POSSIBLE AND NOT BE LIMITED BY RATE FROM BASE ASSEMBLY MACHINE.

- STEVE M. WILL LOOK INTO LAYOUT OF OPERATOR LOAD STATIONS (BASED SENSOR) TO TRY AND COMBINE TO ONE OPERATOR LOADING BOTH PARTS.

- BASE LOAD BELT SHOULD BE DESIGNED TO PREVENT BELT FROM MOVING WITH BASE STATIONARY SO AS TO PREVENT CONTAMINATION PER OUR DISCUSSION.

- STEVE M. WILL RELOOK AT COST VS OUR ORIGINAL PROPOSAL BASED ON LATEST ASSEMBLY APPROACH. I DON'T ANTICIPATE ANY CHANGES.

- STEVE M. WILL REVIEW LOCATION OF PIN INSERTION STATION PER INPUT FROM BILL SWEET ON PIN FALLING OUT.

O PRESSURE TESTER

- PROPOSAL IS COMPLETED. ED K. WILL REVIEW WITH KEITH PRIOR TO NEXT WEEK'S MEETING.

- ED WILL PUT TOGETHER A SCHEDULE BY NEXT WEEK'S MEETING.

REGARDS,
JOHN

JK:CJP MSG ID: MDE6 TEL: 699-3679 MS: 20-25

-MSO MM= 172910 FR=AZ TO=CO= SENT=08/09/90 02:12 EM
          STC DIV=0050 CC=0010: E/=AZ AT=[illegible]

To:	Dave Czarn	ELB
	Mike DeMatteis ,	AODA
	Jeff Dickenson	ELE
	Charlie Douglas	CREC
	[illegible] Roberts	PCNE
	Jim Schmidt	WIE
FR:	Steve Offiler	SEO:

SU: Conversations with Bruce Agase. Ford Pass-Car

ENGINEERING SPECIFICATION:
Bruce and I went over the ES again in detail. Bruce needs to finalize this ASAP to get it into their system.

I asked Bruce to move the proof spec value from the ES to the envelope print (George Randall's idea). This is presently done with the calibration values, to allow one ES to cover many device variants. Putting the proof on the envelope will allow one ES to cover the truck device (at 4K proof) and the car device (at 3K).

Bruce also sent a copy of the almost-finalized spec to Gary Klingler. Gary raised two points. The first is that he'd like the spec to call out use of the actual clutches as loads during the powered portion of the impulse test, in order to include the effects of the coil inductance. (We do this now anyway.)

The second is unfortunately a major issue and is receiving immediate attention. Gary indicates that he'd like the current leakage spec tightened from 1 milliamp at 500 VAC to 1 MICROamp. I tried to contact Gary to find out exactly what is driving this change of 3 orders of magnitude, however he's travelling until 08/23/90. (Charlie Webber, phone 645-1495, is covering for him.) The two tests in the ES most likely to affect current leakage are humidity and salt spray. We are building a circuit to measure microamps and running quick-and-dirty tests on available devices immediately. I owe Bruce an answer on this ASAP, hopefully by Friday AM.

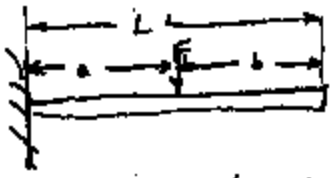
ENVELOPE DRAWINGS:
Bruce has indicated that he must put the latest, corrected metricated drawings into the system immediately. He originally requested that our drawings be corrected per George Randall's inputs by Friday 08/10. I explained to Bruce that most of George's "corrections" are invalid because of my outward funnelling of dimensions during the metric coversion (see MSO #114026). Bruce has accepted this explanation...

However, Bruce STILL needs some minor print revisions (addition of "inverted delta" control symbols). This means we need some action taken by our drafting department ASAP. He can wait until Tuesday 8/14 at the absolute latest to receive the new prints.

A decision has been made regarding the centered VS offset polarity tab for Pass-Car. The supplier of the mating connector, UTC, will be able to do the offset tab after all. Therefore, Pass-Car as of now has officially switched back to the offset tab design.

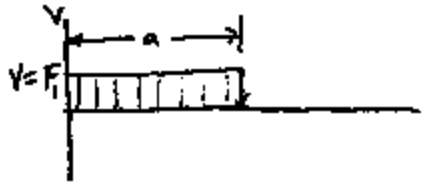
Regards,
Steve O

1. Cantilever Beam, Point Load



assume $a = \frac{L}{2}$ for this analysis

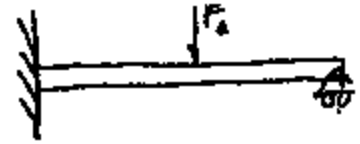
V



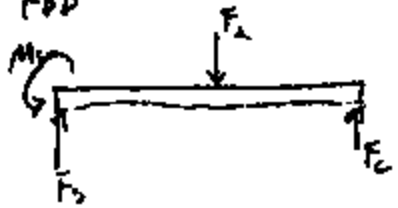
M_b

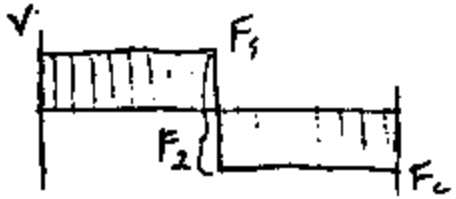
$\sigma_{max} = -\frac{M_b \frac{h}{2}}{I}$

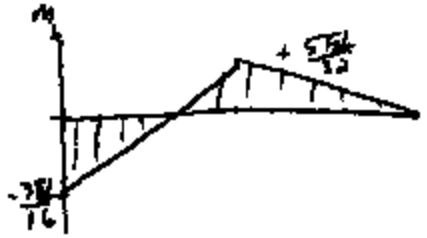
2. Beam, Fixed at left, free to move in y direction but not y dir. at right



FBD



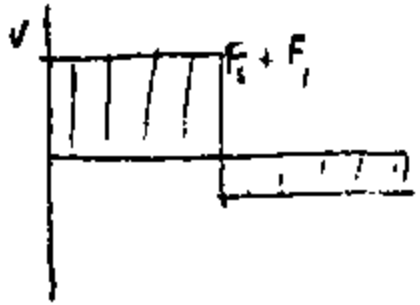


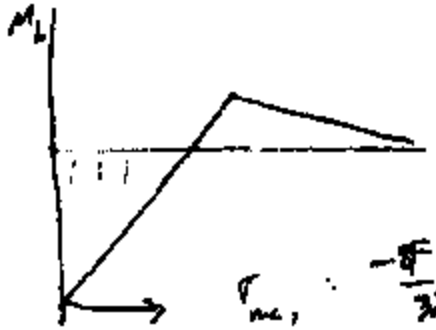


$F_c = -\frac{5}{16} F_2 \quad F_3 = \frac{11}{16} F_2$

(for $a = \frac{L}{2}$ and $\frac{1}{2}$)

Total





$\sigma_{max} = \frac{-8FLh}{32I} - \frac{3FLh}{32I}$

$= -\frac{11}{32}\frac{FLh}{I}$

$$\phi = \int \frac{M_b}{EI}\, dx + C_1 \qquad \delta = \int \phi\, dx + C_2$$

In our case,

$$M_b \begin{cases} = \left[\frac{M + P_A a}{a}\right] x - M & \text{for } x = 0 \text{ to } a \\ = -\left[\frac{P_c a}{L-a} x + \frac{P_A a L}{L-a} = \frac{P_A a}{L-a} L - x \right. & \end{cases}$$

but $P_A = P - P_c = P - \frac{P_c}{2L^3}$

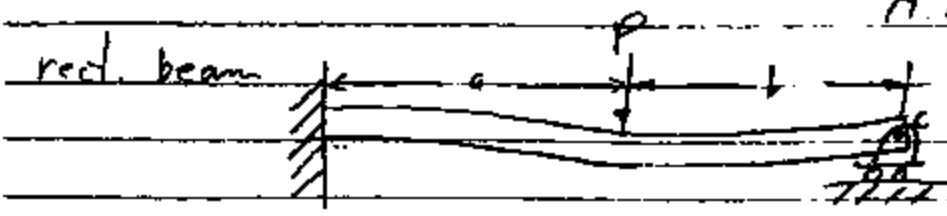
and $M = Pa - P_c L$

Let $D_1 = \frac{M}{a}$

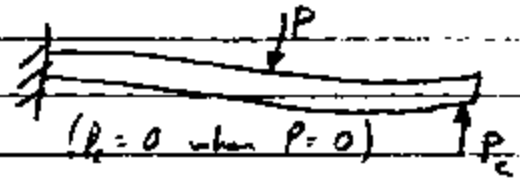
$$\phi = \frac{1}{EI} \int$$

CCPS Spring Calculations

A McKenna 8/8/90



☆ Calculate reaction force, P_c, at C for given load P:



Use Superposition:

① Deflection at C due to P:

$$\delta_P = \frac{Pa^2}{6EI}(3L-a)$$

② Deflection at C due to P_c:

$$\delta_{P_c} = \frac{P_c L^3}{3EI}$$

but $\delta_P + \delta_{P_c} = 0$ or $\frac{Pa^2}{6EI}(3L-a) + \frac{P_c L^3}{3EI} = 0$

$$\therefore \boxed{P_c = -\frac{Pa^2}{2L^3}(3L-a)}$$

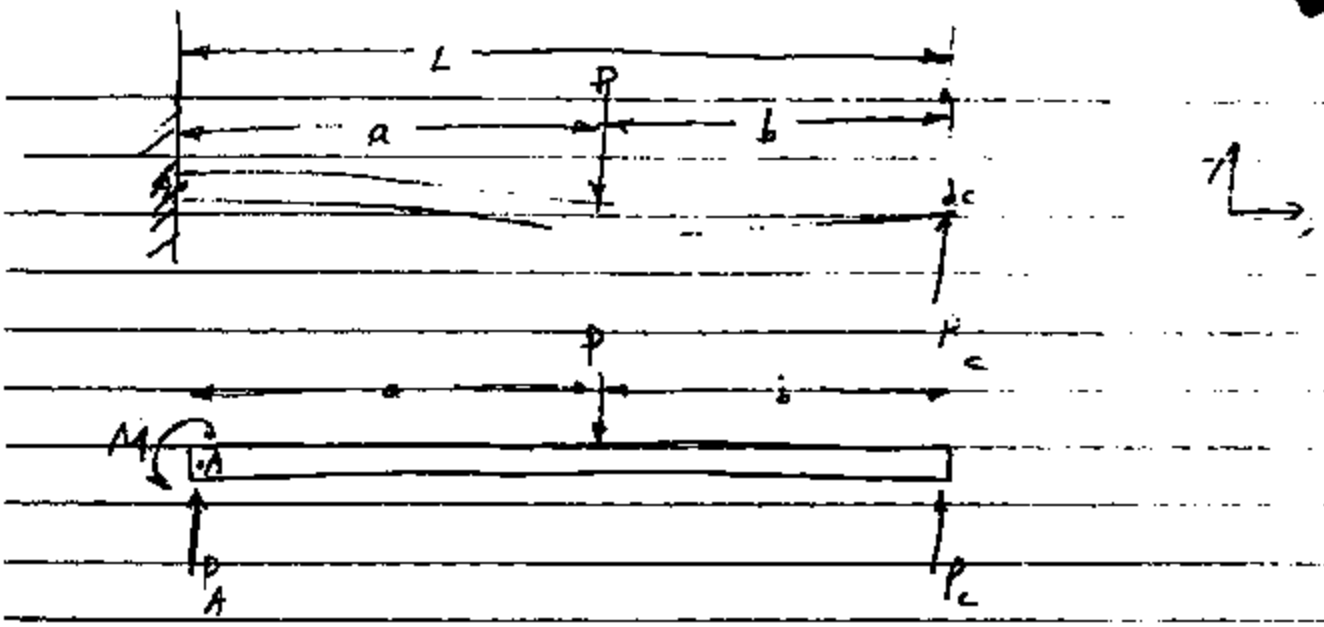
$$\text{Slope} = \frac{3P/6EI}{P a^2 \cdot 2a} \qquad \frac{3EI}{a^3}$$

$E = 19$
$h = .16$
$b = .00$
$a = .193$

$$I = \frac{hb^3}{12} = \frac{(.162)(.004)^3}{12} = 8.64 \times 10^{-}$$

Slope = 6.85 #/in

.407
.457

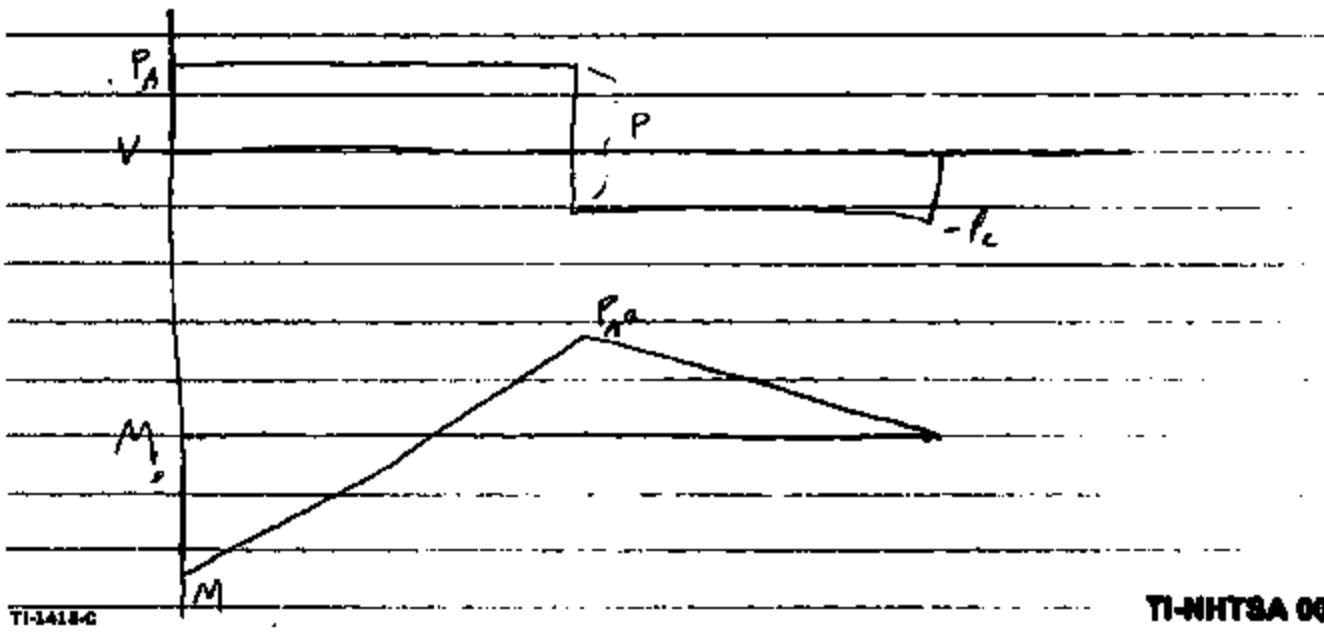


$$P_c = -\frac{P a^2}{2L}(3L - a)$$

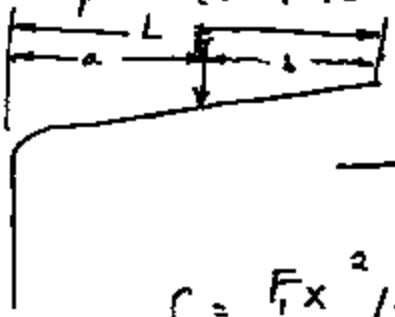
$$\Sigma F_y = P_A + P_c - P = 0$$

$$\Sigma M_A = M + P_c L - Pa = 0$$

$$M = Pa - P_c L$$



(1) Force, F_1, required at bump to deflect simple cantilever by "G" at contact:

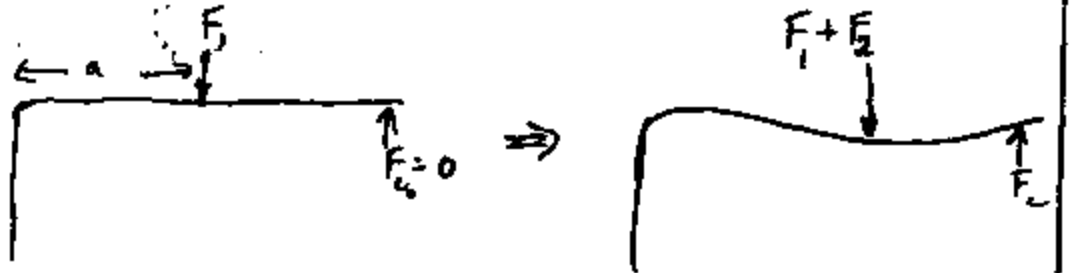


$$\delta = \frac{F_1 x^2}{6EI}(3a - x) \quad \text{or} \quad F_1 = \frac{6EI\delta}{x^2(3a-x)}$$

for $X = L$ $\delta = G$,

$$G = \frac{F_1 a^2}{6EI}(3L - a) \quad \text{or} \quad F_1 = \frac{6EIG}{a^2(3L-a)}$$

(2) Force, F_2, required to achieve Force F_c at contact



$$F_c = \frac{F_2 a}{L} - \frac{3F_2}{16} = F_2\left(\frac{a}{L} - \frac{3}{16}\right)$$

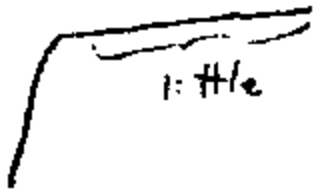
CCPC

Mtg w/ Tom C, Dave Cramm

(1) Spring Rate Low .006 → = 0%

.005 → 2.5% lg/in

(2) Mech wants high spring rate



capability w/ SSPS style

- Review Spring w/ Rodkey

(3) Size

(4) What Device to design for

- Act
- Diff
- Life

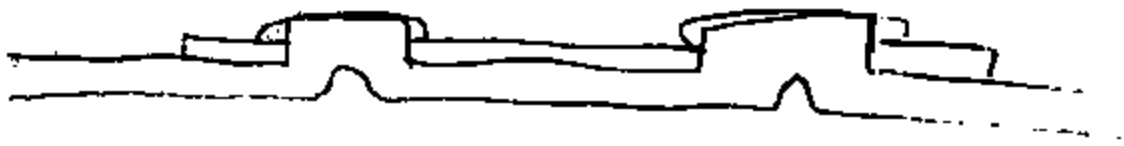
(5) Truck 250 ± 90 → See Steve

Pass Car 135 ± 35 → car weight map

(6) Comments

- Watch Spring force on disc. Cal. Δ?

-



(7) Components

Springs

Make change to bump radius

Model Shop Work order Mon. AM

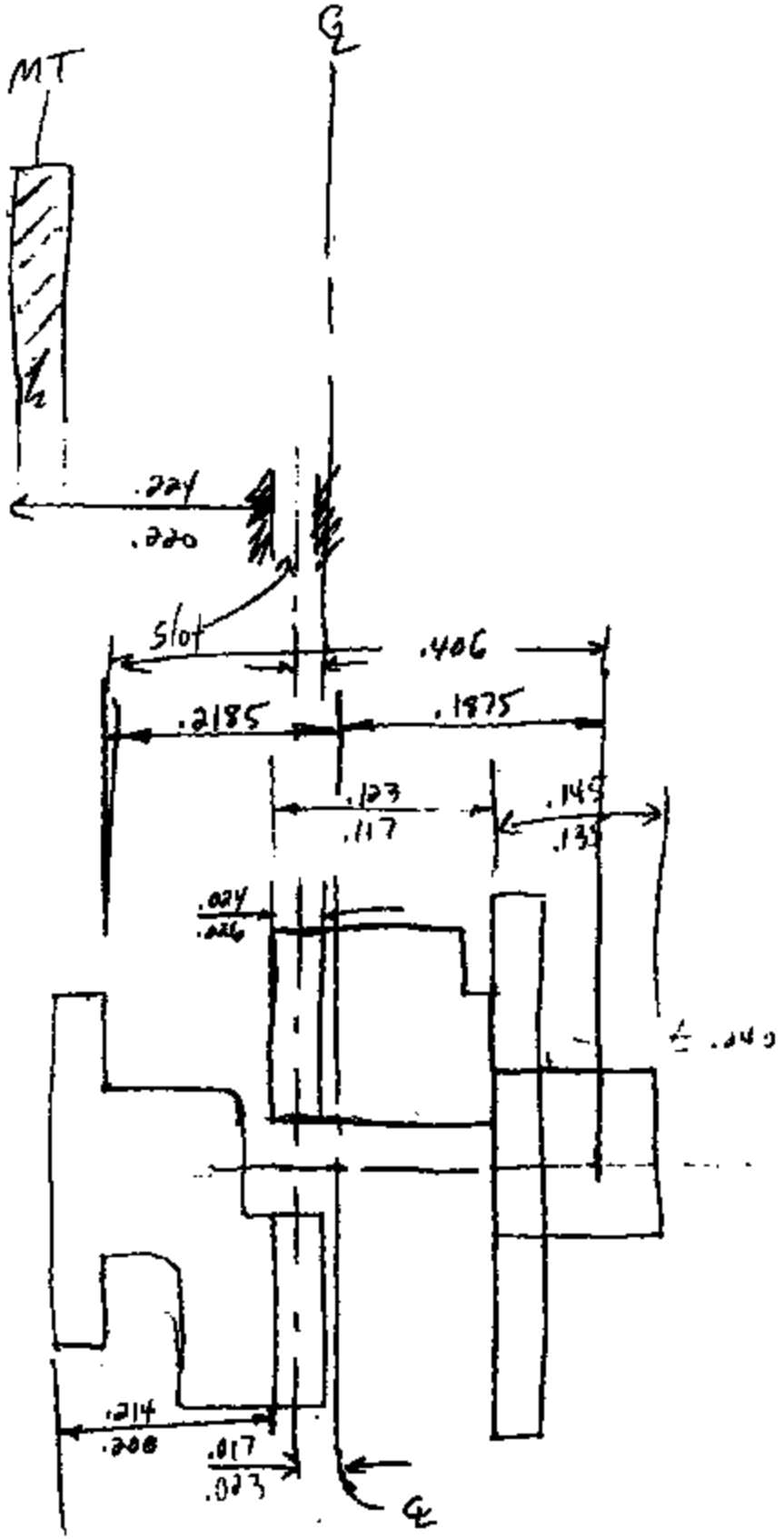
Terminals

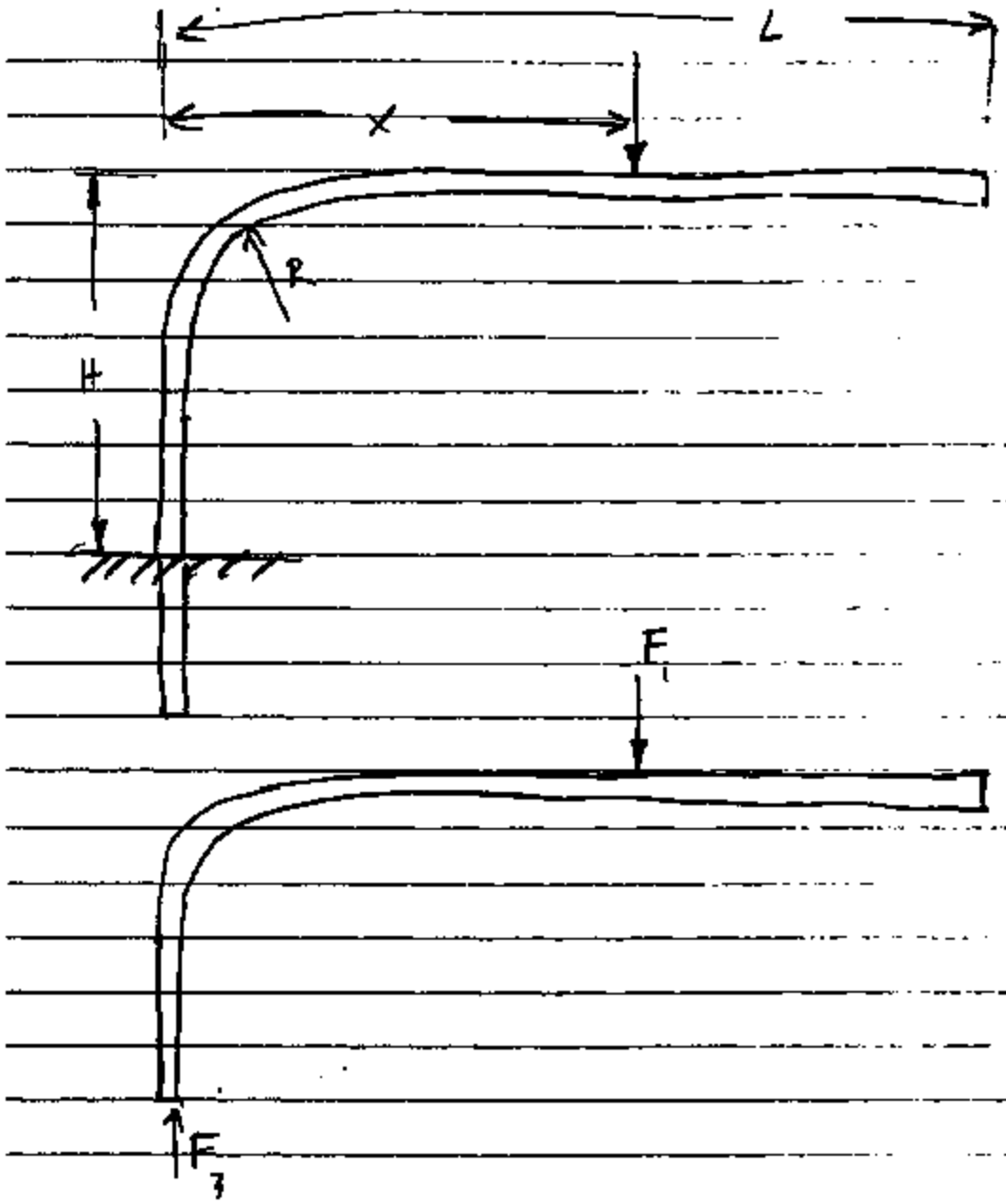
ST: adjust height for bend

MT:

- Have [illegible] tool made

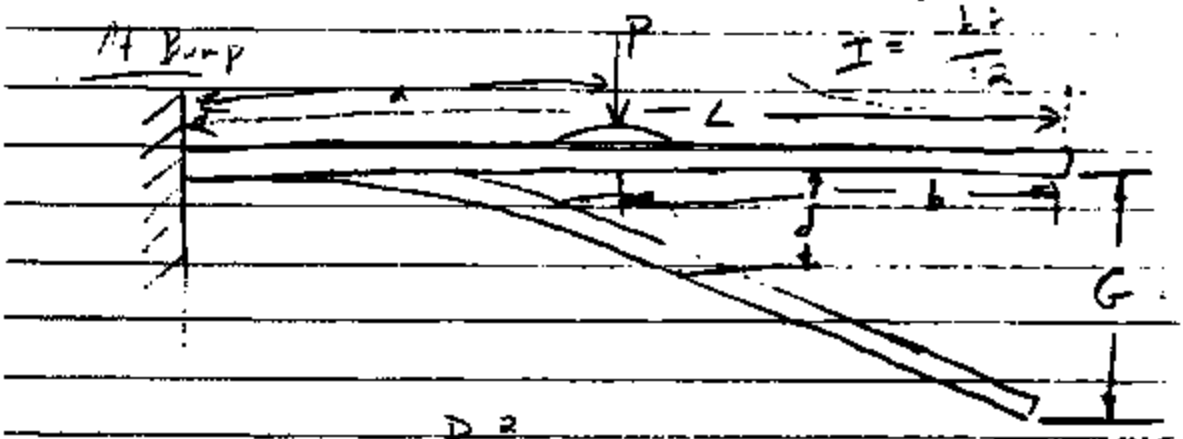
CCPC




L
X
R
H
F1
F3

Spring Deflection Force applied bump vs. Force applied at contact

At Bump

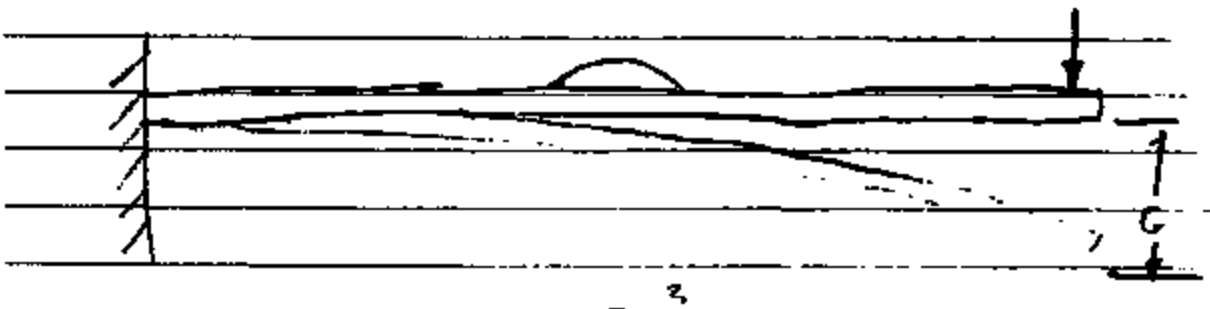


at end: $G = \frac{Pa^2}{6EI}(3L-a)$

at Bump $\delta = \frac{Pa^3}{3EI}$

$c = \frac{\delta}{G} = \frac{\frac{Pa^3}{3EI}}{\frac{Pa^2(3L-a)}{6EI}}$

At Contact



at end: $G = \frac{PL^3}{3EI}$

at Bump: $\delta = \frac{Pa^2}{6EI}(3L-a)$

$c = \frac{\delta}{G} = \frac{\frac{Pa^2}{6EI}(3L-a)}{\frac{PL^3}{3EI}} = \frac{a^2(3L-a)}{2L^3}$

Discussion w/ Bryan Jansen Jim Taylor,
TI Versailles 7/23/90

#32/33 PS Spring/Contact Assy
Design

(1) Spring Rate
2 - 5 lb/in

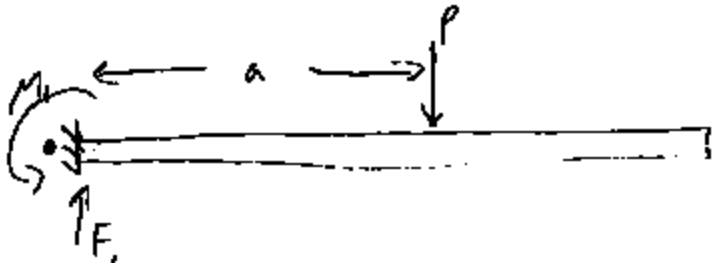
(2) See Dave Jones Re: Mfg costs

(3) Materials (Spring)
Current : 172 CDA Worse Elec. load
Better mech. prop
Others : 174 CDA Better elec. cond.
Worse mech prop

(4) Taper - ideal theoretical spring properties
(stress)

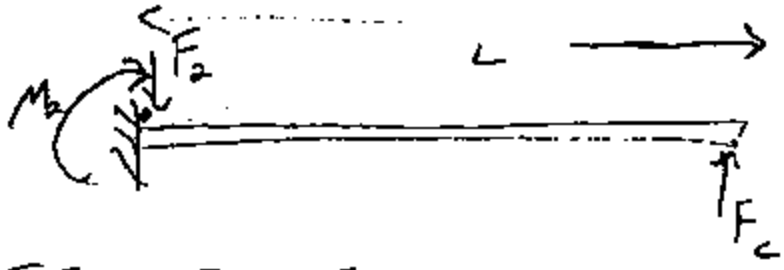
(5) Fatigue Life is low
- δ > .015"
$\delta \approx$ .104" overtravel

(6) life testing
UL approval 5 SPA 10 SPA 120V Ind ↳ 25 K ~



$\Sigma F_y = P - F_1 = 0 \qquad P = F_1$

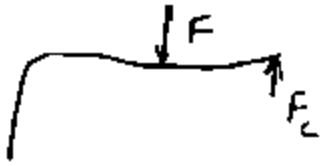
$\Sigma M_0 = M - Pa = 0 \qquad M_1 = Pa$



$\Sigma F_y = F_c - F_2 = 0 \qquad F_c = F_2$

$\Sigma M_0 = M_2 - F_c L = 0 \qquad M_2 = F_c L$

(1) Calculate F, given desired F_c:



$$F = -\frac{2F_c L^3}{a^2(3L-a)}$$

(2) Calculate Force at bump required to deflect spring by G at contact:

$$F_1 = \frac{6EIG}{a^2(3L-a)}$$

(3) Calculate deflection at bump w/ F_1:

$$\delta_b = \frac{a}{L}G$$

(4) Calculate deflection of spring (i.e. a) after contact assuming no gap, under load F

$$v_{NG}(x=a) = \frac{11Fa^3}{96} - \frac{3FLa^2}{32}$$

(5) Calculate deflection of spring at a assuming a gap G under load $F_{tot} = F + F_1$

$$v_G(x=a) = \frac{C_1 a^3}{6} + \frac{C_2 a^2}{2}$$

(6) Is $v_{NG} = v_G$?

$\sigma_m = \frac{11}{32} \frac{FLh}{I}$ $\quad I = \frac{bh^3}{12}$

$\therefore \quad \sigma_m = \frac{33}{8} \frac{FL}{bh^2}$ $\quad F_A = \frac{2F_c L^3}{a^3(3L-a)}$

$F_B = \frac{6EIG}{a^2(3L-a)}$

2.67×10^7

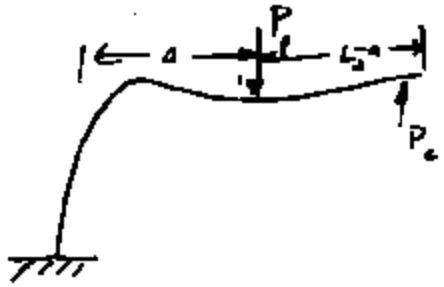
Spring Design

Requirements:

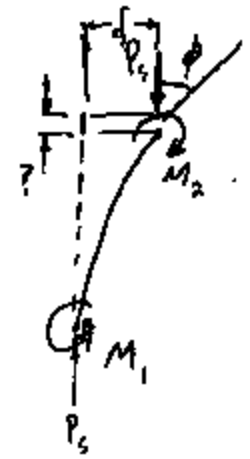
Contact force = 30 gm (.066 #) min
Spring rate = 1 #/in

Diag: Unloaded

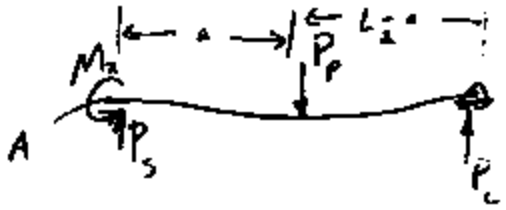
Loaded



FBD:



+



$\Sigma F_y = P_s + P_c - P_p = 0$

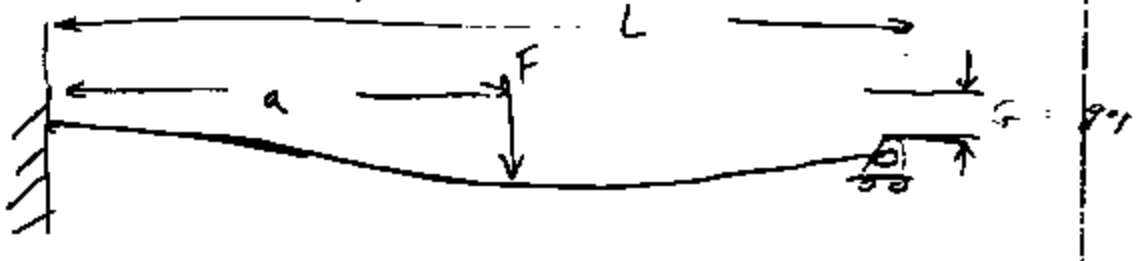
$\Sigma M_A = M_2 + LP_c - aP_p = 0$

$\Sigma F_y = P_s - P_s = 0$

$\Sigma M_B = M_1 - M_2 - P_s\delta_1 = 0$

$$EIv(x) = \left(-\frac{F(x-a)^3}{6} + \frac{C_1 x^3}{6} + \frac{C_2 x^2}{2} + C_3 x + C_4 \right)$$

for this case,



$$C_3 = C_4 = 0$$

$$C_1 = \frac{11F}{16} + \frac{3EIG}{L^3}, \quad C_2 = -\frac{3FL}{16} - \frac{3EIG}{L^2}$$

Q: what force F is required to have deflection at bump = $T \approx .014"$ (T is deflection beyond ...

$\therefore T_{Tot} = T + \frac{a}{L} G$

for $x = a$, set $v(a) = T_{Tot}$ & solve for F:

$$\frac{2FIT_{tot}}{a^2} = 0 + \frac{C_1 a^3}{3!} + \frac{C_2 a^2}{2} + 0 + 0$$

$$\frac{2EIT_{tot}}{a^2} = \frac{11Fa}{3 \cdot 16} + \frac{3EIGa}{3 \cdot L^3} - \frac{3FL}{16} - \frac{3EIG}{L^2}$$

$F_{C_{tot}} \geq 70_g = .066\ 16$

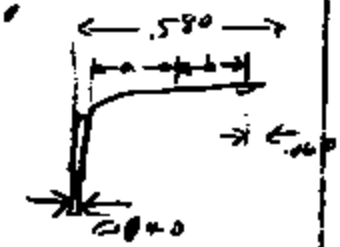
$E = 19 \times 10^6$ psi (131 GPa) for 25/C172 $\frac{1}{2}$ hard BeCu

$I = \frac{bh^3}{12}$ $\quad b \geq .180"$ $\quad h = ?$

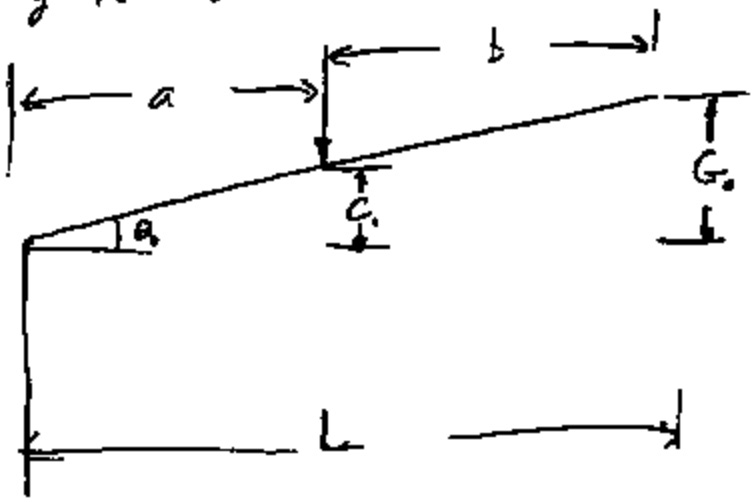
G = contact g-p, undeflected spring $\approx .050"$

$L \leq .450"$

$a \approx b_1 \approx .225"$

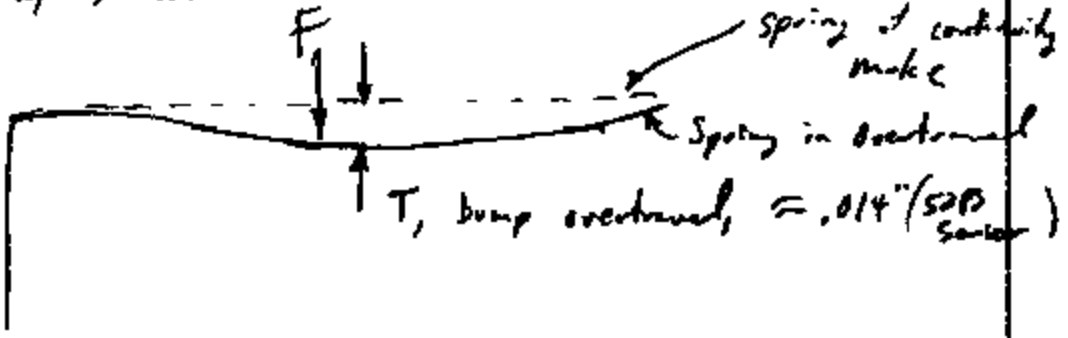


Free spring in base



$G_o = L \sin\theta_o$

Spring w/ Sensor



$$\therefore \quad v(x=a) = \frac{1}{EI}\left[\frac{1}{6}\left(\frac{11F}{16} + \frac{3EIG}{L^3}\right)a^3 - \frac{1}{2}\left(\frac{3FL}{16} + \frac{3EIG}{L^2}\right)a^2\right] = T$$

F?

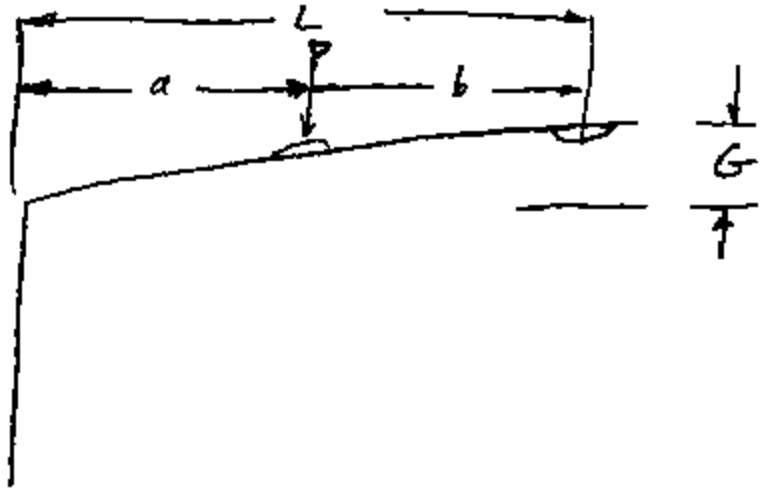
$$\frac{11F}{96}a^3 + \frac{EIG}{2L^3}a^3 - \frac{3}{32}FLa^2 - \frac{3EIG}{2L^2}a^2 = TEI$$

$$F\left(\frac{11}{96}a^3 - \frac{3}{32}La^2\right) = \left[TEI - \frac{EIGa^3}{2L^3} + \frac{3EIGa^2}{2L^2}\right]$$

$$\left(\frac{11}{96}a^3 - \frac{3}{32}La^2\right)$$

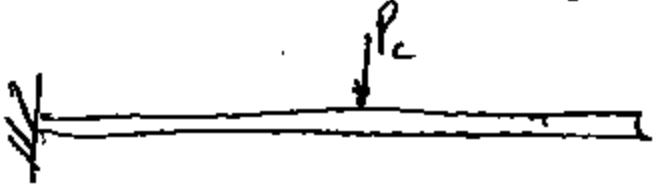
A. McKenna 7/30/10

Prior to Contact



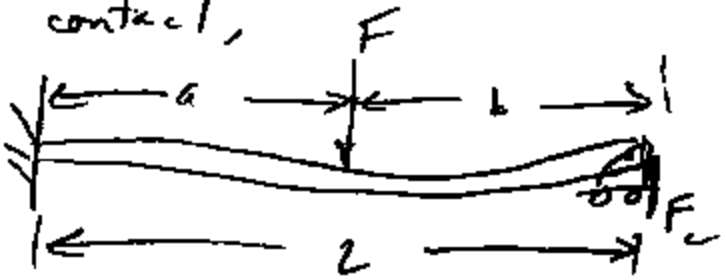
Force required just to make contact, P_c :

Assume cantilever only:



$$G = \frac{P_c a^2}{6EI}(3L-a) \quad \text{or} \quad P_c = \frac{6EIG}{a^2(3L-a)}$$

After contact,



$$-V(x) = -F(x-a) + \frac{11F}{16} + \frac{3EIG}{L^3} \quad \text{(Shear Stress)}$$

$$M_b(x) = -F(x-a) + \left(\frac{11F}{16} + \frac{3EIG}{L^3}\right)x - \left(\frac{3FL}{16} + \frac{3EIG}{L^2}\right)$$ (Bending Moment)

$$v(x) = \frac{1}{EI}\left[\frac{-F(x-a)^3}{6} + \frac{1}{6}\left(\frac{11F}{16} + \frac{3EIG}{L^3}\right)x^3 - \frac{1}{2}\left(\frac{3FL}{16} + \frac{3EIG}{L^2}\right)x^2\right]$$ (Displ

or

$$-V(x) = -F(x-a) + C_1$$

$$M_b(x) = -F(x-a) + C_1 x + C_2$$

$$v(x) = \frac{1}{EI}\left[-\frac{F(x-a)^3}{6} + \frac{C_1 x^3}{6} + \frac{C_2 x^2}{2}\right]$$

where

$$C_1 = \left(\frac{11F}{16} + \frac{3EIG}{L^3}\right) \qquad C_2 = \left(-\frac{3FL}{16} - \frac{3EIG}{L^2}\right)$$

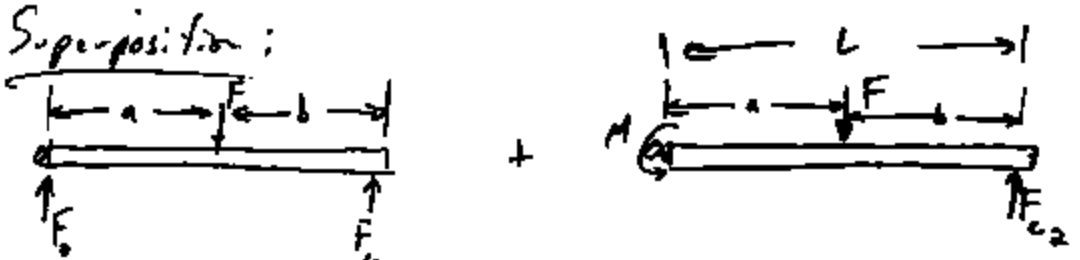
Requirements

$G \approx .030"$

$F_{c_{tot}} \approx 30g$ min

Approximating F_c:

Superposition:



$F_{c_1} = \frac{Fa}{L}$

$\Sigma M_0 = M + F_{c_2} L - Fa = 0$

but $M(\text{fixed}) = Fa - \frac{3FL}{16} - \frac{3EIG}{L^2}$

$\therefore \cancel{Fa} - \frac{3FL}{16} - \frac{3EIG}{L \cdot L^2} + F_{c_2} L - \cancel{Fa} = 0$

$F_{c_2} = \frac{3F}{16} + \frac{3EIG}{L^3}$

$\therefore F_{c_{Tot}} = F_{c_1} - F_{c_2} =$

$F_{c_{Tot}} = \frac{Fa}{L} - \frac{3F}{16} - \frac{3EIG}{L^3}$

or

$F = \left(F_{c_{Tot}} + \frac{3EIG}{L^3} \right) \frac{1}{\left(\frac{a}{L} - \frac{3}{16} \right)}$

$$EI\,v(x) = -F\frac{(x-a)^3}{6} + C_1\frac{x^3}{6} + C_2\frac{x^2}{2} + C_3 x + C_4$$

$$C_1 = \frac{11F}{16} + \frac{3EI\delta_L}{L^3} \qquad C_2 = -\frac{3FL}{16} - \frac{3EI\delta_L}{L^2} \qquad C_3 = C_4 = 0$$

For $x = a$,

$$EI\,v(a) = \frac{1}{6}C_1 a^3 + \frac{1}{2}C_2 a^2$$

$$\frac{EI\,v(a)}{a^2} = \frac{1}{6}\left(\frac{11F}{16} + \frac{3EI\delta_L}{L^3}\right)a + \frac{1}{2}\left(-\frac{3FL}{16} - \frac{3EI\delta_L}{L^2}\right)$$

$$\frac{2EI\,v(a)}{a^2} = \frac{11}{48}Fa + \frac{EI\delta_L}{L^3}a - \frac{3FL}{16} - \frac{3EI\delta_L}{L^2}$$

$$\frac{2EI\,v(a)}{a^2} - \frac{EI\delta_L a}{L^3} + \frac{3EI\delta_L}{L^2} = F\left(\frac{11}{48}a - \frac{3L}{16}\right)$$

$$EI\left(\frac{2v(a)}{a^2} - \frac{\delta_L a}{L^3} + \frac{3\delta_L}{L^2}\right) = F\left(\frac{11}{48}a - \frac{3L}{16}\right)$$

$$F = \frac{EI\left(\frac{2v(a)}{a^2} - \frac{\delta_L a}{L^3} + \frac{3\delta_L}{L^2}\right)}{\left(\frac{11}{48}a - \frac{3L}{16}\right)}$$

$$EI\left(\frac{2T_{HL}}{a^2}\frac{3aG}{3L^3}+\frac{3G}{L^2}\right)=F\left(\frac{11a}{48}-\frac{3L}{16}\right)$$

$$F=\frac{EI\left(\frac{2T_{HL}}{a^2}-\frac{3aG}{3L^3}+\frac{3G}{L^2}\right)}{\left(\frac{11a}{48}-\frac{3L}{16}\right)}$$

$F=$ E

$$-V(x) = -F\langle x-a\rangle + C_1 = -F\langle x-a\rangle + \frac{11F}{16}$$

$$-V(x=0) = \cancel{Fa}^{0} + \frac{11F}{16}$$

$$-V(x=a) = \frac{11F}{16}$$

$$-V(x=L) = -F(L-a) + \frac{11F}{16}$$

MSG #== 145772 FR=VAGS TO=ELB SENT=03/08/90 02:17 PM
Rec077 ST=C D(U=3070 CC=00134 by=VAGS AT=03/08/90 - 2:17 PM

	Tom Charbonneau	ELB
	Dave Ciarn	ELB
	Andy McKenna	ELB
	Steve Offiler	ELB
	Gary Snyder	CPPC
	Bill Sweet	PCME
	Charlie Douglas	CPPC
	Steve McCooey	MDES
C:	Ray Tourangeau	PCME
	John Kourtesis	MDES
	Ed K.	MDES
	Mike DeMattia	PCOA
rom:	Keith Roberts	PCME
ubj:	77PS Schedule Meeting Notes	

77PS LITE TRUCK

This portion of the program is on schedule. The only action emaining is to get J512 Re-ports in the next few weeks for ISIR ubmission on 10/10/90.

77 PASS CAR

The ISIR date of 2/6/91 shown is incorrect. Ford is asking for his ISIR in 12/90.

The gating item is the sensor design. Of the three possibilities, the "moved cup bump" will be pursued as the only alternative due to tooling lead time constraints.

1. The immediate action is to build production pin window to verify production tolerances.
2. If the pin window test passes, the print must be changed for quote iteration and production planning.

here is no fall back position to meet the above ISIR date. If an lternative design is necessary, this date must be re-negotiated.

77PS SCHEDULE

The Production Mold release date has been passed. The gating item o release the production mold is the switch design, specifically he switch spring. The current action of the team is to nvestigate using the prototype mold for initial sampling and/or ee how much time can be saved by designing the mold in parallel ith the product design.

The Base Assembly Machine parallel design effort will reach an mpasse in the next week. The product designers estimate one month e the a design concept is solidified. We will institute a plan or a pilot .ine to hand assemble these assemblies, to satisfy nitial samples without the automation in place.

ACTIONS	WHO	WHEN
---	---	---

Check the pin window of he moved cup dump.	Keith Steve	8/8
Meet with AFCC molding.	Keith	8/10
Establish a pilot line plan..	Keith	8/10
Solidify the cup bump sensor.	Steve	8/17
Evaluate the possible spring designs.	Andy	8/7
Publish a new schedule.	Keith	8/8
Phone Customer for date flexibility.	Charlie	8/10

he next meeting will be announced if the need arises.

egards Keith

PRESSURE SWITCH DATA Form 21605 **TEST NO.** 97-15-6

DEVICE	DATE REQUESTED	REQUESTED BY	REQUESTED COMPL DATE
33PS	8/9/90	A. McKenna	
PERFORMED BY	**DATE STARTED**	**DATE COMPLETED**	**APPROVED BY**
Rich Turner	8/15/90		Andy McKenna

PROJECT TITLE: 33PS Switch Assy evaluation when mated w/ OCPS & 57PS Sensor

CUSTOMER: [redacted]

PURPOSE OF TEST: To determine life & performance characteristics of 33PS spring arm & switch assy.

PROCEDURE:
(1) Assemble devices 1-6; 1-3: use "reburp" cup, .005" shim between washer & cup 4-6: use std 57 PLL2-1 sensor. Measure dim. calib pins to assy.
(2) Measure Pin gage 33PS base assy & cup (prior to final sensor assy)
(3) Measure calib of sensor alone.
(4) Assemble base to sensor, measure pre-crimp calib & T.T*
(5) Crimp whole unit like a 57 PL device, measure
(6) Cycle per 33PS impulse test procedure, to failure, stopping every ★

				Pre-Crimp		Post Crimp		50K cycles	
	Disc	Pin F L	Sensor Calib A R	Calib A R	T.T A R	Calib A R	T.T A R	Calib	T.T
-1	24.2-7.3	.311-.314	139-35	130-32	1.2-0.7	131-36	1.1-1.5	138-32	1.0-2.2
-2	23.5-7.5	.314-.314	133-42	128-41	1.0-0.7	130-40	1.0-1.0.0	135-36	0.9-1.0.0
-3	21.7-7.9	.309-.308	128-42	129-40	1.1-0.6	126-42	1.1-0.8	135-32	1.4-2.0
-4	49.7-31.2	.301-.305	966-249	960-236	1.4-0.7	952-244	1.3-0.7	944-233	1.0-2.0
-5	50.2-31.2	.302-.300	970-249	961-255	1.5-0.5	959-255	1.2-0.8	953-242	1.2-0.7
-6	49.8-29.0	.300-.305	950-238	933-235	1.3-0.7	936-234	1.3-0.7	927-217	1.3-2.3

	100K Cycles		150K Cycles		200K		250K		
	Calib	T.T.	Calib	T.T.	Calib	T.T.	Calib	T.T.	
-1	131-36	1.1-2.0	126-35	1.2-.9	122 40	1.4 .6	120 30	1.2 .8	→
-2	108-36	1.2-10.0	108-35	1.1-10.0	110 31	1.0 ca	108 34	1.2 ca	
-3	107-32	1.2-1.7	105-30	1.1-1.7	104 27	1.2 .8	108 30	1.1 1.3	Continue
-4	939-236	1.8-1.7	936-237	1.6-2.4	940 228	1.3 .8	944 233	1.1 .9	
-5	949-241	1.1-1.0	944-239	1.1-0.8	950 240	1.3 .9	956 241	1.4 .8	on
-6	928-220	1.3-0.8	928-221	1.7-0.8	932 223	1.8 1.0	928 222	1.4 .7	back

(6 cont'd) 50K cycle to re-check Calib, T.T, and continuity change.

★ Change/Alter pin as necessary to avoid creep.

(OVER)

	300K-A		350K-A		400K-A		450K-A		
Device #	Calib	T. T.	Calib	T. T.	Calib	T. T	Calib	T. T.	
1	127-35	1.1-1.0	122-33	1.1-1.7	129-37	1.8-1.1	132-32	1.1-1.0	
2	111-28	1.2-10.0	107-34	1.0-10.0	112-38	0.8-10.0	117-35	1.1-10.1	
3	109-34	1.3-1.7	104-30	1.3-2.2	106-36	1.3-1.6	103-33	1.1-1.2	
4	477-240	1.4-0.5	430-240	1.6-0.6	432-277	1.6-1.6	431-230	1.3-0.8	
5	478-246	1.1-2.1	479-245	1.1-0.8	457-218	1.4-0.8	460-240	1.3-0.9	
6	431-326	1.5-0.8	428-225	1.6-0.7	435-221	1.2-0.9	437-227	1.1-0.9	
	500 K			Retry 1 & Recalib				600K-A	
Device #	Calib	T. T.		Device #	Calib	T. T.	Device #	Calib	T. T.
1	122-33	1.1-1.0		1	123-37	1.2-1.6	1	127-31	1.2-1.0
2	105-36	1.0-10.0		2	107-39	1.2-10.1	2	113-37	1.1-10.0
3	102-31	1.1-0.9		3	105-36	1.0-1.3	3	107-33	1.1-0.9
4	432-239	1.4-0.6		4	436-240	1.3-0.7	4	446-240	1.3-0.7
5	478-246	1.2-0.6		5	455-218	1.1-0.6	5	462-240	1.1-0.5
6	431-326	1.2-1.2		6	438-228	1.2-0.8	6	438-229	1.2-0.7
	700K-A				800K-A			900K-A	
Device #	Calib	T. T.		Device #	Calib	T. T.	Device #	Calib	T. T.
1	129-29	1.3-1.8		1	127-29	1.6-1.1	1	123-25	1.1-1.8
2	114-26	1.1-10.0		2	118-35	1.1-10.0	2	110-26	1.1-10.0
3	115-31	1.2-1.6		3	105-29	1.3-0.7	3	108-26	1.0-0.8
4	445-241	1.2-0.6		4	443-240	1.4-0.6	4	447-240	1.1-0.8
5	468-246	1.1-0.6		5	460-243	1.1-0.5	5	460-248	1.1-0.8
6	439-228	1.2-0.6		6	444-227	1.2-0.6	6	433-227	1.2-0.7
	1000K-A				1100K-A			1200K-A	
Device #	Calib	T. T.		Device #	Calib	T. T.	Device #	Calib	T. T.
1	127-33	1.1-1.7		1	125-34	1.1-0.7	1	126-34	1.2-1.6
2	112-36	1.0-10.0		2	110-33	1.0-10.0	2	111-36	0.9-0.2
3	106-31	1.2-1.5		3	107-31	1.1-0.8	3	108-31	1.1-1.5
4	446-243	1.2-0.7		4	447-245	1.2-0.4	4	447-244	1.2-0.6
5	465-251	1.4-0.6		5	464-247	1.4-0.5	5	467-252	1.4-0.5
6	445-229	1.2-0.2		6	443-227	1.1-0.5	6	447-228	1.4-0.7
	1300K-A								
Device #	Calib	T. T.							
1	125-28	1.1-1.8							
2	107-25	1.2-1.2							
3	107-31	1.2-1.8							
4	448-240	1.2-0.9							
5	467-244	1.1-0.6							
6	444-228	1.2-0.7							

DRASTIC DRIFT

PRESSURE SWITCH DATA Form 21605 TEST NO. 9075-25

DEVICE	DATE REQUESTED	REQUESTED BY	REQUESTED COMPL DATE
77PS	9/1/90	ANDY McKENNA	
PERFORMED BY	**DATE STARTED**	**DATE COMPLETED**	**APPROVED BY**
Bill Turner	9/1/90	10-25-90	C. McKenna

PROJECT TITLE: Spring Arm Development - L-shaped Arm, 77PS "rebump" Sensor

CUSTOMER:

PURPOSE OF TEST: To test life and performance characteristics of L-shaped spring arms in 77PS devices

PROCEDURE: ① Measure Contact Gap and Pin Ref. Dimension

② Bend Stat Terminal. Desired Pin Ref. Dim: .093" 2nd Stat term per following (Method 1)

Bend = [.093(Des PRD) − PRD prior to Bend] × 2] + .006 (approx springback)

Method 2: (Measure at Bump)

ΔPRD_{gross} = .093(Des PRD) − PRD prior + .003(springback/2)

Sensor Ref to Bump Dim = .057

③ Assemble devices, pin at shortest length that gives CR − .002" I-pulse test

	Pre-Bend				Pin Ref after H.T. Term Bend			
	Contact Gap	Pin Ref Dimension	Pin Ref, after bending	Pin Ref Prior to Bend	ΔPRD gross required	ΔPRD gross Actual	PRD Post Bend	ΔT Gap
✓-1	.060	.073	.0745	.0735	.0925	?	.097	69g
-2	.062	.084	.0780	.090	.091	.2922	.293/.094	
-3	.048	.075	.0900	.090	bend	.032	.092	
-4	.053	.0845	.0845	.083	bend	.026	.092	
✓-5	.0425	.0845	.0910	.0905	.0055	.0056	.094	61g
✓-6	.0365	.0886	.0905	.0870	.0098	.0090	.0965	90g
✓-7	.0795	.0822	.0890	.0895	.0151	.0152	.092	—
-8	.047	.0795	—					
-9	.0295	.079	.0840	.0820	.0145	.0140	.093	
-10	.0295	.0795	.0830					
-11	.0045	.079	.0805					
-12	.0385	—	.0745					
✓-13	.0295	.0795	.0760	.0780	.0363	.0360	.094	—
-14	.0215	.0785	.0795	.0830	.0140	.042	.0965	116g
-15	.0166	.075	.0790					
✓-16	.0185	.0768	.0750	.0740	.0940	.090	.0935	—
-17	.0105	.076	.0800					
-18	.0395	.075	.0750					
-19	.0125	.0845	.0815					
✓-20	.022	.075	.0758	.077	.050	.039	.0836	—
✓-21	.0205	.0765	.0795	.079	.034	.0341	.0935	—
-22	.0225	.074	.0740	.0785	.047	.039	.086	—
-23	.028	.0785	.0785					
-24	.0185	—	.0750					
-25	.032	.077	.0770	.0780	.0910	.0835	.0841	.089	.0985(2nd)
								—
								—
								—

BASE | POST-CRIMP | 170 K-15 | 500 K

ID	Sensor ID	Sensor Cal (45?)	Ar G-L	Calib	T.T.	Calib	T.T.	Calib	T.T.
-1	1	160-65	.154-.152	147-65	1.0-3.3	137-57	0.9-1.3	132-51	1.0-
2									
3									
4									
5	2	155-70	.151-.148	146-70	1.0-1.7	132-53	1.1-1.7	130-57	1.0-1..
6	3	158-72	.1535-.155	141-66	0.9-2.1	126-57	1.0-CR	128-50	0.9-CR
7	4	158-66	.149-.157	143-61	0.9-CR	133-53	0.9-CR	127-49	0.9-CR
8									
9									
10									
11									
12									
13	5	150-71	.151-.150	133-65	1.0-1.6	124-48	1.0-0.8	123-54	0.9-0..
14	6	156-67	.1525-.155	138-65	1.1-3.1	126-40	1.0-4.4	130-45	0.9-1.5
15									
16	7	144-64	.1495-.152	127-63	1.0-4.7	115-48	1.0-2.2	115-45	1.0-0.8
17									
18									
19									
20	8	146-69	.143-.144	127-64	0.9-5.9	112-54	1.0-2.9	113-53	1.1-1.0
21	9	156-72	.1465-.147	112-64	1.0-CR	102-57	1.0-CR	104-48	1.0-2.0
22	10	149-63	.143-.146	105-50	1.0-2.5	107-43	1.0-2.2	102-41	1.0-1.4
23									
24									
25									

AFTER	SOAK		add	250K	+ 100K	(total)	+ 70K	(1M total)
DEVICE #	CALIB	T.T.	CALIB	T.T.	CALIB	T.T.	CALIB	T.T.
1	137-57	1.1-0.7	138-53	1.2-1.2	136-53	0.9-1.6	134-47	0.9-0.7
5-	131-56	1.0-1.2	133-53	0.9-1.9	133-53	0.8-1.9	133-56	1.0-1.0
6-	131-54	0.9-CR	129-51	1.0-CR	132-51	0.9-CR	134-55	1.1-CR
7-	129-57	0.9-CR	131-47	0.9-CR	129-49	0.9-CR	136-52	0.9-CR
13-	123-62	1.0-1.1	123-57	1.0-1.8	122-56	0.9-1.7	125-56	1.0-0.9
14-	126-53	1.0-1.1	127-47	0.9-2.5	126-50	0.7-1.3	128-53	1.0-1.1
16-	121-50	1.0-0.9	117-47	1.0-1.7	117-47	1.0-1.6	119-49	1.1-0.9
20-	115-56	1.1-1.0	114-53	1.1-3.8	113-53	0.9-1.7	120-55	1.1-1.0
21-	104-55	1.0-2.8	103-46	1.0-3.4	103-47	1.0-14.9	107-58	1.0-2.0
22-	105-45	1.0-1.4	104-48	1.0-3.8	104-42	1.0-2.9	105-45	1.0-1.8

NOTE: PHOTO'S TAKEN AT SOAK-1

TI-NHTSA 000966

77PS EVALUATION – 1000000 A

Device I.D.		VISUAL INSPECTION
90-15-1 SENSOR # 1	.004"	SOME OBVIOUS WEAR ON BUMP OF MOVEABLE TERMINAL – CIRCULAR WEAR MARK OF TERMINAL CAUSED BY TRANSFER PIN – SHINY AREA ON DISC, POSSIBLE POLISHING DUE TO CONTACT WITH TRANSFER PIN. SLIGHT WEAR ON CONTACT SURFACES
90-15-5 SENSOR # 2	"	VERY SLIGHT WEAR ON TERMINAL BUMP – OBVIOUS CHAFING OF TRANSFER PIN – VERY SLIGHT WEAR ON CONTACT SURFACES – NO OBVIOUS WEAR IN DISC
90-15-6 SENSOR # 3	.005	HEAVY WEAR ON TERMINAL BUMP + ABOVE CIRCUMFERENCE OF BUMP – CAUSED BY TRANSFER PIN – SLIGHT POLISHING OF DISC – HEAVY PITTING ON CONTACTS.
90-15-7 SENSOR # 4	"	HEAVY WEAR ON TERMINAL BUMP – INDICATION OF TRANSFER PIN CONTACT ABOUT CIRCUM. OF BUMP – SEVERE WEAR ON CONTACT OF MOVEABLE ARM POLISHING OF DISC IS EVIDENT.
90-15-13 SENSOR # 5	.006	OBVIOUS WEAR ON TERMINAL BUMP NOTED INCORRECT ALIGNMENT OF CONTACTS CAUSING SEVERE DISTORTION OF CONTACT; SOME POLISHING OF DISC.
90-15-14 SENSOR # 6	"	SEVERE WEAR ON BUMP – POSSIBLY SIGNIFICANT; INDICATION OF TRANSFER PIN CONTACT ABOUT CIRCUMFERENCE OF BUMP – SEVERE WEAR ON CONTACTS – SOME POLISHING OF DISC.
90-15-16 SENSOR # 7	.007	SEVERE WEAR ON BUMP (ALMOST FLATTENED); INCORRECT ALIGNMENT OF CONTACTS RESULTING IN SIGNIFICANT CONTACT WEAR – SLIGHT POLISHING OF DISC
90-15-21 SENSOR # 9	"	BUMP ON CONTACT ARM ALMOST FLAT – MISALIGNMENT OF CONTACTS – SLIGHT POLISHING OF DISC
90-15-20 SENSOR # 8	.010	SLIGHT WEAR ON BUMP OF TERMINAL ARM – SEVERE WEARING OF CONTACTS – DUE TO MISALIGNMENT SLIGHT POLISHING OF DISC
90-15-22 SENSOR # 10	"	SEVERE WEAR ON BUMP OF TERM. ARM SEVERE WEARING OF CONTACTS SLIGHT POLISHING OF DISC

DRAWINGS AVAILABLE UPON REQUEST

77 PS EVALUATION

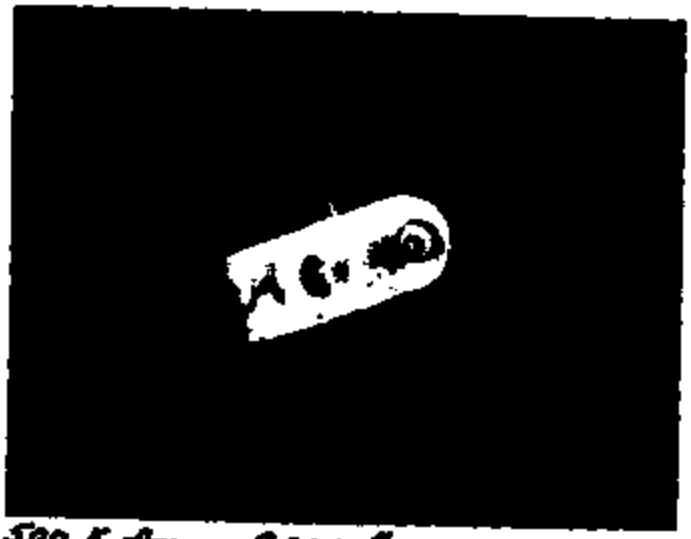
500 K cycles

BASE #1

(1) NO SIGNS OF PITTING ON STATIONARY TERMINAL

(2) Shiny AREA ON disc, FROM CONTACT WITH TRANSFER PIN

(3) Slight WEAR ON bump AND SCRAPE MARK ON MOVABLE TERMINAL (See Photo



500 K Base #1

77 PS EVALUATION
500 K cycles

BASE #5

① NO PITTING ON STATIONARY TERMINAL

②. WEAR MARKS ON BUMP OF MOVEABLE TERMINAL

500 K + BASE # 5

77 PS EVALUATION

500 K cycles

BASE #6

① SLIGHT PITTING ON STATIONARY TERMINAL
② DISCOLORATION + WEAR ON MOVEABLE TERMINAL, DUE TO CONTACT WITH TRANSFER PIN
③ SHINY AREA ON CENTER OF DISC, POLISHED BY CONTACT WITH TRANSFER PIN?

BASE #6 500 K

77 PS EVALUATION

500 K cycles

BASE #7

① NO PITTING ON STATIONARY TERMINAL

② SOME DISCOLORATION + WEAR ON MOVEABLE TERMINAL DUE TO CONTACT WITH TRANSFER PIN

③ SMALL SHINY AREA (WEAR) ON DISC, POLISHED DUE TO CONTACT WITH TRANSFER PIN?

BASE #7 500K

77 PS EVALUATION

500 K cycles

BASE # 13

① NO WEAR OR PITTING ON # STATIONARY TERMINAL

② SLIGHT WEAR ON BUMP OF MOVABLE TERMINAL — LITTLE OR NO DISCOLORATION

③ CENTER OF BASE WELL POLISHED BY CONTACT W/TRANSFER PIN

500 K # BASE # 13

77 PS EVALUATION

500 K cycles

Base #14

1. NO PITTING ON STATIONARY TERMINAL
2. SLIGHT WEAR ON BUMP OF MOVABLE TERMINAL, DISCOLORATION DUE TO CONTACT W/ TRANSFER PIN.
3. SLIGHT POLISHING OF DISC

500K — BASE #14

77 PS EVALUATION

500 K cycles

BASE #16

① NO PITTING OF STATIONARY TERMINAL

② SLIGHT WEAR ON BUMP OF MOVABLE TERMINAL

③ MODERATE POLISHING OF DISC

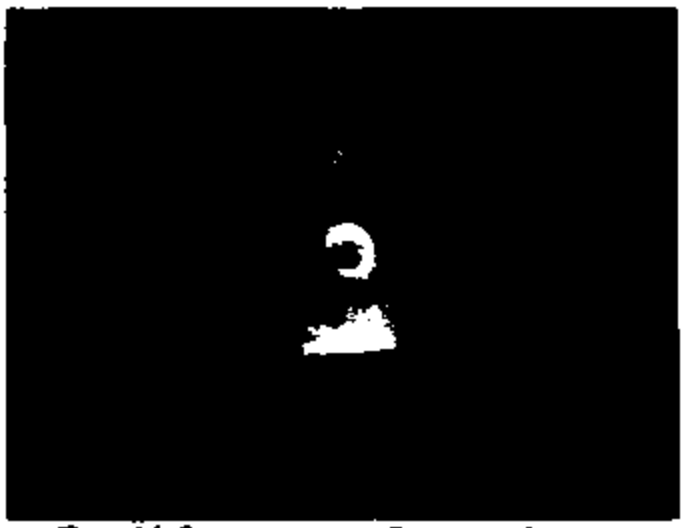
500K # BASE # 16

77 PS EVALUATION

500 K cycles

BASE #20

1. NO PITTING ON STATIONARY TERMINAL
2. SLIGHT WEAR + PARTIAL DISCOLORATION ON BUMP AREA OF MOVEABLE TERMINAL
3. SLIGHT POLISHING OF DISC DUE TO CONTACT WITH TRANSFER PIN



500K # BASE # 20

77 PS EVALUATION

500 K cycles

BASE #21

1. NO PITTING ON STATIONARY TERMINAL
2. SUBSTANTIAL WEAR ON BUMP ON MOVEABLE TERMINAL
3. NO DISCOLORATION (see PHOTO)
4. SLIGHT POLISHING OF DISC

500 K ↓ BASE #21

77 PS EVALUATION

500 K cycles

BASE #22

① NO PITTING OF STATIONARY TERMINAL

② CONSIDERABLE WEAR AND SUBSTANTIAL DISCOLORATION ON MOVEABLE CONTACT ARM (see photo)

③ SUBSTANTIAL "Polishing" ON SURFACE OF DISC

500K ⑥ BASE #22

PRESSURE SWITCH DATA Form 21605 **TEST NO.** _____

DEVICE	DATE REQUESTED	REQUESTED BY	REQUESTED COMPL DATE
PERFORMED BY	DATE STARTED	DATE COMPLETED	APPROVED BY

PROJECT TITLE:

CUSTOMER:

PURPOSE OF TEST:

PROCEDURE: ① Measure Contact Gap and Pin Ref Dimension
② Bend Stat Terminal. Desired Pin Ref Dim .093". Bend Ter-
minal per following (Method 1)
Bend = [.093(Des PRD) − PRD prior to Bend × 2] + .006 (approx spring back)
Method 2: (Measure at Bump)
ΔPRD_{press} = .093(Des PRD) − PRD prior + .003 (spring back / 2)
Sensor Ref to Bump Dim = .057

	Pre-Bend				Pin Ref After Terminal Bend			
	Contact Gap	Pin Ref Dimension	Pin Ref. After Bend	Pin Ref. Prior to Bend	ΔPRD during bend	ΔPRD during Actuation	PRD Ref Bend	Actuation
✓-1	.060	.073	.0745	.0735	.0725	?	.077	69g
-2	.063	.084	.0850	.090	.091	.0922	.0937	
-3	.049	.075	.0800	.090	bent	.032	.092	
-4	.053	.0845	.0845	.093	bent	.026	.092	
✓-5	.0426	.0845	.0910	.0905	.0055	.0054	.094	57g
✓-6	.0365	.086	.0905	.1570	.0090	.0090	.0865	99g
✓-7	.0795	.088	.0890	.0895	.0151	.0152	.092	—
-8	.047	.0775	—					
-9	.0295	.079	.0840	.0820	.014	.0140	.093	
-10	.0295	.0886	.0830					
-11	.0045	.079	.0805					
-12	.0935	—	.0745					
✓-13	.0295	.0725	.0760	.1780	.0360	.0360	.094	—
✓-14	.0315	.0755	.0795	.0820	.0140	.0142	.0968	116g
-15	.0165	.075	.0790					
✓-16	.0185	.068	.0750	.0740	.0740	.0740	.0985	—
-17	.0105	.076	.0800					
-18	.0845	.075	.0750					
-19	.0175	.0845	.0815					
✓-20	.022	.074	.0730	.071	.050	.039	.096	—
✓-21	.0205	.0765	.0745	.079	.034	.034	.0935	—
✓-22	.0225	.074	.0740	.1745	.047	.0524	.096	—
-23	.028	.0785	.0785					
-24	.0195	—	.0730					
-25	.032	.077	.0770	.0780	.0910	.0835	.0840	.089	.0905 (2nd)

*Method 1 of Test Bottomed out on base

		Base			Post-Temp		100K-0		500K	
ID	Sensor ID	Sensor (Calibrate)	Air 6-6	Calib	T.T	Calib	T.T	Calib	T.T
-1	1	160-65	154-152	177-65	1.0-3.3	139-57	0.9-4.3	132-51	1.0-
2									
3									
4									
5	2	155-70	151-148	146-70	1.0-1.9	132-53	1.1-1.7	134-57	1.0-1.5
6	3	158-72	1535-155	141-66	0.9-2.1	126-54	1.0-CR	118-50	0.9-CR
7	4	158-66	149-150	143-61	0.9-CR	133-53	0.9-CR	129-49	0.9-CR
8									
9									
10									
11									
12									
13	5	150-71	151-150	132-65	1.0-1.6	124-48	1.0-0.8	123-54	0.9-0.9
14	6	156-67	1520-156	139-65	1.0-3.1	136-70	1.0-2.4	130-45	0.9-1.5
15									
16	7	149-64	1495-152	127-63	1.0-4.2	115-48	1.0-2.2	115-45	1.0-0.8
17									
18									
19									
20	8	N6-69	150-149	127-64	0.9-5.9	113-54	1.0-2.9	113-53	1.1-1.0
21	9	156-72	1465-147	112-64	1.0-CR	102-54	1.0-CR	104-48	1.0-2.0
22	10	149-63	143-146	105-53	1.0-2.5	107-52	1.0-2.2	102-41	1.0-1.4
23									
24									
25									
ID									
-1		-8.1	10.8/						
A		-							
3									
4									
5		-6.9	10.5/						
6		-12.1	9.2/						
7		-10.5	11.6						
8									
9									
10									
11									
12									
13		-11.3							
14		-11.5							
15									
16		-11.3							
17									
18		=							
19									
20		-13							
21		-9.5							
22		-9.9							
23									
24									
25									

PRESSURE SWITCH DATA Form 21605 TEST NO. _____

DEVICE	DATE REQUESTED	REQUESTED BY	REQUESTED COMPL DATE
77PS	8/7/80	A. McKenna	
PERFORMED BY	DATE STARTED	DATE COMPLETED	APPROVED BY
Rick Tupper	8/15/80		L. McKenna

PROJECT TITLE: 33PS Switch Assy evaluation when mated w/ 66PS & 57PS Sensor

CUSTOMER: [redacted]

PURPOSE OF TEST: To determine life & performance characteristics of 33PS spring arm & switch assy

PROCEDURE: (1) Assemble devices 1-6: 1-3: use "redump" cup, .005" shim between washer & cup. 4-6: use std 57 PIL 2-1 sensor. Measure disc calib prior to assy.
(2) Assem Pin gage 33P2 body assy & cup (prior to final swaging)
(3) Measure calib of sensor alone
(4) Assemble base to sensor, measure pre-crimp calib & T.T.*
(5) Crimp whole unit like a 57 PI device, measure
(6) Cycle per 57PS impulse test procedure to failure, stopping every

				Pre-Crimp		Post Crimp		150K cycles	
	Disc	Pin G L	Sensor Calib A R	Calib A R	T.T A R	A R	A R	Calib	T.T
-1	29.2-7.5	311-311	137-35	130-32	1.2-0.7	131-36	1.1-1.5	128-33	1.0-2.0
-2	23.5-9.5	314-314	133-42	128-41	1.0-0.7	130-40	1.0-1.0	125-36	0.9-1.0
-3	21.7-7.8	303-303	130-42	129-40	1.1-0.6	126-42	1.1-0.8	125-32	1.1-2.2
-4	41.7-36.2	301-300	266-244	260-236	1.4-0.7	252-244	1.3-0.7	244-233	1.0-2.0
-5	50.2-36.2	303-300	220-247	261-255	1.5-0.5	257-255	1.2-0.8	253-242	1.2-0.9
-6	41.8-28.0	300-300	256-238	242-235	1.3-0.7	246-234	1.3-0.7	227-227	1.3-2.3

	100K Cycles		150K Cycles		200K		250K	
	Calib	T.T.	Calib	T.T.	Calib	T.T	Calib	T.T.
-1	121-36	1.1-2.0	125-35	1.2-.9	122 40	1.4 .8	122 30	1.2 .8
-2	108-35	1.2-1.0	108-35	1.1-1.0	110 32	1.0 .6	108 34	1.2 .6
-3	107-32	1.2-1.7	105-30	1.1-1.7	104 33	1.2 .8	108 30	1.1 1.2
-4	238-236	1.8-0.7	236-237	1.6-2.4	240 228	1.2 .8	244 232	1.1 .9
-5	247-241	1.1-1.0	244-237	1.1-0.8	250 240	1.2 .9	256 241	1.1 .8
-6	228-228	1.2-0.8	228-221	1.7-0.8	232 222	1.8 1.0	238 222	1.1 .7

(9) Cycle 50K cycle to re-check Calib, T.T, and continuity after change

* Change/Alter pin as necessary to avoid creep.

Continue

back

TI-NHTSA 000082

	300K		350K		400K		450K		
Device #	Calib	T. T.	Calib	T. T.	Calib	T. T	Calib	T. T.	
1	127-35	1.1-1.0	122-33	1.1-4.9	129-37	0.8-0.1	122-32	1.1-1.0	
2	111-38	1.2-10.0	107-34	1.0-10.0	112-38	0.8-10.1	107-35	1.1-10.1	
3	107-34	1.3-1.7	104-30	1.2-2.2	106-36	1.3-1.6	103-33	1.1-1.2	
4	449-240	1.7-2.5	430-240	1.6-0.6	432-244	1.5-1.6	431-240	1.3-0.6	
5	448-246	1.1-2.1	437-245	1.1-0.8	457-248	1.0-0.8	450-248	1.3-0.9	
6	431-226	1.5-0.8	429-225	1.6-0.7	435-229	1.2-0.9	439-227	1.1-0.9	
	500 K			Re-build & Recalib			600K		
Device #	Calib	T. T.		Device #	Calib	T. T.	Device #	Calib	T. T.
1	122-33	1.1-1.0		1	123-37	1.2-1.6	1	127-33	1.2-2.2
2	105-35	1.0-10.0		2	107-39	1.2-10.1	2	112-37	1.1-1.2
3	102-31	1.1-0.9		3	105-36	1.0-1.2	3	107-33	1.4-0.7
4	432-239	1.4-0.6		4	436-240	1.3-0.7	4	445-240	1.3-0.5
5	448-246	1.2-0.6		5	455-248	1.4-0.6	5	453-247	1.3-0.5
6	439-226	1.3-1.7		6	436-227	1.2-0.8	6	439-229	1.3-0.5
	700K				800K			900K	
Device #	Calib	T. T.		Device #	Calib	T. T.	Device #	Calib	T. T.
1	127-29	1.1-1.8		1	127-29	1.6-1.1	1	123-25	1.1-1.8
2	111-36	1.1-10.0		2	110-35	1.1-10.0	2	105-36	1.1-10.6
3	105-31	1.2-1.6		3	105-29	1.3-0.7	3	103-26	1.1-0.9
4	445-241	1.7-0.6		4	443-241	1.4-0.6	4	441-241	1.1-1.1
5	453-245	1.6-0.6		5	456-243	1.4-0.5	5	456-243	1.5-0.3
6	439-229	1.4-0.6		6	442-229	1.2-0.6	6	433-227	1.2-1.9
	1,000K				1,100K			1,200K	
Device #	Calib	T. T.		Device #	Calib	T. T.	Device #	Calib	T. T.
1	127-33	1.1-1.7		1	125-34	1.1-0.7	1	126-29	1.2-1.4
2	112-36	1.0-10.0		2	110-33	1.0-10.0	2	111-36	0.9-0.2
3	106-31	1.2-1.5		3	107-31	1.4-0.8	3	108-31	1.1-1.5
4	445-243	1.3-0.7		4	447-245	1.7-0.4	4	447-244	1.7-0.6
5	465-251	1.4-0.6		5	464-247	1.4-0.5	5	467-250	1.4-0.5
6	445-229	1.2-0.7		6	443-227	1.1-0.5	6	444-228	1.4-0.7
	1300K								
Device #	Calib	T. T.							
1	125-28	1.1-1.8							
ERRATIC CALIB → 2	107-56	1.3-0.8							
3	107-31	1.2-1.8							
4	448-240	1.3-0.7							
5	467-246	1.6-0.6							
6	444-229	1.2-0.7							

5/10/90

ORS CCRS E.S. Brief - Item 3

Concerns

① 1 μA reqmt. for current leakage ; reqts to change low Gate Voltage to 1 μA
- may be applicable to 14 Vdc circuits, perhaps not 5 Vdc

Actions
- test in-house devices that have been Burn-in, humidity & salt spray
Status - Complete
- 1-2 μA measured from terminal to case of closed switch

Actions
- Perform 3 tests of 14 devices - 7 to Texas Peace - Steve/Charlie

- Submit test results of current "successful" switches from the field for current leakage - Steve/Charlie

Steve & Charlie will close actions w/ a letter to Bruce, copying George Tsiatsios & Gary Kinzler
5/14/90

(1) Humidity

- Accept request call for [illegible] at end of test, including [illegible]

Action

- Suggest to Lisa that "D" prof test not be included in this time period - Dave/Charlie

- Set-up Norwg calibration of current [illegible] at 3L when test is run. - Steve

(3) Vibration

- no braking during test

Action

- set-up vibration test using brake fluid. - Steve

- Get request (or what is) [illegible]

[redacted] 2 Cycle

- [redacted]

T : second cycle

Aaron spec

- propose change to "a maximum of 10 seconds/cycle"
  - Dave Schultz

- assess capability of system at this rate
  - Steve - time TBD

- get fluid viscosity curves for brain fluid
  - Charlie / Steve

3) Spec does not call out thresholds for open & closed circuits; we need to understand them & instrument P.V. testing w/ these current threshold voltage indicators. (Complete circuits)

Aaron

- determine "open" "closed" circuit threshold voltages for controller.
  - Steve

- [redacted] - Steve

3. Revalidation Requirements

#4 - What is test "N"?

[redacted]

5/10/90

FORD CORP ES Brief – Item 3

Concerns

① Init reqmt for current leakage ; regs to change by [illegible] to 1 μA
- may be applicable to hybrid circuits ; perhaps not Ford spec

Actions
- test in-house units that have low Temp humidity leakage spikes – complete
- 1-2 μA measured from Terminal to case of shunt resistor

Actions
- Determine if 100 μA limit applies to Temp Range – Steve/Charlie
- Separate from the rest current "successful" section from the fete for current leakage – Steve/Charlie

Steve & Charlie will share responsibilities & letter to Bruce, copying Steve Fr. [illegible] & Gary Kingston
5/14/90

[redacted]

(2) Humidity

- Accept request call for [illegible] test, including proof

Action

- Suggest to Ford that "D" proof not be [illegible] in this time period - Dave/Chuck

- Set up Vorago calibration & correct [illegible] - Steve

(3) Vibration

- [illegible] testing

Action

- Set up vibration test using brake fluid - Steve

- 2nd [illegible]

[redacted]

[redacted] Spec

[redacted] T seconds apart

[redacted]

Action

- propose change to "2 seconds ± 10 seconds"
  - Dave Schenk

- assess capability of [redacted] spec
  - Steve - time TBD

- get flow rejection curves for brass flow
  - Charlie, Steve

3) Spec does not call out thresholds for open & closed circuits; we need to understand them & instrument P.V. testing will determine threshold voltage in vehicle. (Complete circuit)

Action

- Propose "open" threshold voltage for each valve.
  - Steve

[redacted]

(3) Revolutions Requirement

#4 - What is test "N"?

HIGHLIGHTS
Stephen B. Offiler
Week Ending 08/10/90

FORD MY91.75 CRUISE CONTROL PRESSURE SWITCH 7775

CUSTOMER / PROGRAM ISSUES:
George Randall (Ford Light Truck) raised objections to our maximization of the envelope prints. I took liberties during the conversion to insure all dimensions were dimensioned outward, which resulted in certain converted dimensions seeming inaccurate by a maximum of 0.01mm (=.00039"). George shared his concerns with other Ford groups, then went on on vacation, so I have not been able to explain our position to him. However, I've explained it to Bruce Pease (Pass-Car) and he was agreeable. Bruce made finalized envelope drawings from us absolutely right away. Bruce indicates that he has missed an internal deadline to submit the final envelope print, and is relying on typical delays in the Ford system so that he can slip it in late and not be noticed. I am trying to work with drafting to get the final, minor envelope revisions completed today or Monday, so Bruce has prints Tuesday at the latest.

Bruce is also at a deadline for submission of the final Engineering Specification. He circulated the final rough draft to me and to other Ford groups including Speed Control and Light Truck. My only comment was that we should move the proof pressure value to the envelope print; this will allow a single ES document to cover the Pass-Car and Light Truck devices which have different proof spec's. Gary Klingler, supervisor of the Speed Control group, raised a significant issue: he wants the current leakage spec tightened from 1 milliamp max to 1 MICROamp max. I conjecture that this concern is related to sensitive circuitry within the computer; however Gary is off on vacation and I cannot get a good explanation of his motivation. We have tried to get a quick-and-dirty final for our leakage capability. We tested some old devices that have been through salt-spray and measured 1-2 microamps leakage, so apparently we're in the gray area. We'll definitely need to negotiate this with Ford before the ES is finalized.

A meeting to discuss the overall program schedule was held. We know this schedule is in need of revision, since it contains conflicting dates which were obtained from various groups within Ford. In parallel, Mike Dahlstein talked to Ford SQA Scott Kunsch, who basically said that the dates from Ford Purchasing are the right ones (and of course the most aggressive). My key areas of focus on this schedule are the 5778 revalidations for Light Truck and Pass-Car. Gating items are the J512 hotspots for LT and finalization of the low-ratio sensor design for PC. I am working on detail schedules for these.

We received a field-failure back from Ford. This is an old, direct-disc device from a 50 car durability test on 5.0 liter Mustang police cars in Texas. This speed control system was functioning erratically, and cutting out after about 20 minutes of use. Ford sent an engineer (Barry Kaltz) to debug, and statically he could find nothing wrong. However by plug-and-chug he was finally able to isolate the problem as our switch. It may be somehow affected by heat build-up since the problem is intermittent and only seems to occur when hot. Quality is assisting us in resolution of this problem. Ford has requested an official "8D" report.

SAMPLES:
We've received an order from Pins for 40 devices, by approx. 8/10/90. We've also got a request from Ford for 2 devices by 8/15. These must have the J512 fixes, and we're using this requirement to justify an indeterminate slip in schedule. We have recently received 50

model-shop J512 hotpots which will be used for these samples. This underscores the need to expedite production-intent J512's from Elco.

SENSOR:
Keith Roberts is conducting a production pin-window experiment on the sideward-cup-bump sensors and also on production sensors with the same disc as controls. These sidecups were built without shims under the washers, therefore some disc pre-deflection is evident. They are calling for pins quite a bit longer than standard sensors, on the order of 14 mils. The first trial was built without knowledge that longer pins are required; devices are being rebuilt accordingly.

We've got four lots of Belville discs from the Disc Dept. which we plan to get some test as soon as possible. The test is planned, and devices are built, but this test has been delayed due to capacity constraints.

MES M#= 216415 FR=VAGS TO=ELB SENT=08/13/90 06:55 AM
R#=121 ST=C DIV=0050 CC=0013 SY=VAGS AT=08/13/90 06:55 AM

TO: STEVE OFFILER ELB

CC: DAVE CIARN ELB
BILL SWEET ACME

FROM: KEITH ROBERTS PCME

SUBJECT: J512 HEXPORTS

STEVE,

PLEASE PROCEED WITH THE MODEL SHOP ORDER FOR ENOUGH J512 HEXPORTS
FOR 57PS AT ISIR.

THE HEXPORTS FROM ELCO WILL HAVE A SECOND THREADING OPERATION DONE
DUE TO SOME ELCO INTERNAL QUALITY ISSUES. BECAUSE OF THE SECOND
OP I AM SETTING UP A STRIP AND RE-PLATE PLAN FOR THE ISIR HEXPORTS.

THE MODEL SHOP HEXPORTS WILL BE A CONTINGENT FOR THE RUSH ORDER
WITH ELCO.

REGARDS KEITH

-MSG M#= 229212 FR=ELB TO=ELB SENT=08/13/90 12:44 PM
R#=132 ST=C DIV=0050 CC=00101 BY=ELB AT=08/13/90 12:44 PM

AUGUST 13, 1990

TO: PAUL LESSER
MIKE CAVANAUGH
BILL CONGDON
LEO MARCOUX
ANDY McQUIRK
ED O'NEILL
MARTHA SULLIVAN
RAY TOURANGEAU

MIKE DeMATTIA
CHARLIE DOUGLAS
JOHN KOURTESIS
ANDY McKENNA
STEVE OFFILER
KEITH ROBERTS
JOE SCHUCK
GARY SNYDER
BILL SWEET

CC: DAVE CZARN

FR: TOM CHARBONEAU

RE: CRUISE CONTROL PRESSURE SWITCH PROGRAM MANAGER

IN ORDER TO INSURE THAT WE MEET CUSTOMER AND INTERNAL OBJECTIVES FOR THE CRUISE CONTROL PRESSURE SWITCH, DAVE CZARN HAS BEEN ASSIGNED START-UP RESPONSIBILITY FOR THIS PROGRAM. DAVE WILL HOLD WEEKLY START-UP MEETINGS TO ASSIGN AND TRACK ACTION ITEMS. PLEASE GIVE DAVE YOUR FULL COOPERATION IN THIS EFFORT.

THANKS,
TOM CHARBONEAU
/dh

FORD CRUISE CONTROL PRESSURE SWITCH

DESIGN ASSUMPTIONS AS OF 08/13/90:

57 L/T REVALIDATION - COMPLETE 08/17/90

- PRODUCTION 57PS BLACK BASE, NOT MODIFIED TO MEET RNV. DWG.
- PRODUCTION HEXPORT W/ MODEL SHOP MACHINED .518 FLARE: MACHINED PORTION WILL NOT BE PLATED
- PRODUCTION TERMINALS, SPRING, ARM AND CONTACTS
- STANDARD 57PS SENSOR COMPONENTS
- "STANDARD" DISC - NOT INCIPIENT SNAP

- BUILT ON PRODUCTION LINE

57 L/T IBR SWITCHES - FOR 10/15/90 SUBMITTAL

- PRODUCTION 57PS BLACK BASE, MODIFIED TO MEET RNV. DWG.
- PRODUCTION HEXPORT FROM ELCO; COMPLETELY PLATED
- ALL ELSE IS THE SAME AS THE REVALIDATED SWITCHES

- BUILT ON PRODUCTION LINE

57 P/C REVALIDATION - BEGIN 09/01/90

- SENSOR WITH CUP BUMP MODIFIED IN MODEL SHOP WITH SHIMS FOR CORRECT VERTICAL HEIGHT FOR DISC
- "STANDARD DISC" - NOT INCIPIENT SNAP
- ALL ELSE IS THE SAME AS 57 L/T IBR SWITCHES

- BUILT ON PRODUCTION LINE

57 P/C IBR - FOR 12/01/90 SUBMITTAL

- PRODUCTION TOOLED SENSOR
- ALL ELSE IS THE SAME AS THE REVALIDATED SWITCHES

- BUILT ON PRODUCTION LINE

77PS PROD. VALIDATION - BEGIN 03/91

- INCIPIENT SNAP DISC FOR L/T AND P/C
- PRODUCTION TOOLED SWITCH ASSEMBLY
- ALL ELSE IS THE SAME AS THE P/C PRODUCTION LEVEL SWITCHES

- SENSOR BUILT ON PRODUCTION LINE
- SWITCH ASSEMBLY BUILT ON PILOT LINE
- FINAL ASSEMBLY BUILT ON PRODUCTION LINE

D. CZARN 08/13/90

[illegible] Msg 245470 FR=HA2 TO=ELS SENT=08/14/90 07:43 AM
RR=147 STAT DIV=0050 CC=0010; BY=HA2 AT=08 14:00 07:45 AM

TO: [illegible] OTB
Charlie Douglas CFPC

CC: Dave Crank ELB
Mike Demattia PCGA
Jeff DiDomenico ELB
Keith Roberts PCME

FR: Steve Offiler S201

SU: Ford CCPS Customer Info

I received a fax yesterday from Bruce Pease. It contained an internal memo from Joseph Jira, who works for Gary Klingler in ELD. It explains the concerns raised by ELD on the Engineering Specification. There are three specific points:

1) ELD wants to change the current leakage from 1 milliamp to 1 microamp, because the clutch that we switch will remain engaged (under certain conditions) at 4-5 milliamps. They think that the 1 milliamp spec is just too close.

2) ELD wants to include a Resistance to Fluids test in the ES. This calls out 5 seconds immersion in various underhood fluids (gasoline, engine oil, coolant, brake fluid, ATF, Isopropyl alcohol, and methanol). The test is run serially on a single device, and including drainage/storage periods takes 30 days to complete. Apparently ELD requires this test on all other NOBC components.

3) ELD has included a diode across the clutch coil, which will quench the inductive voltage spike that occurs at our contacts during switching.

Items 1 and 2 will need to be negotiated between TI, Ford Pass-Car (Bruce Pease), Ford Light Truck (George Randall), and Ford ELD NOBC (Gary Klingler et al). Item 3 is actually good news. The problem is that both George and Gary are away for a couple weeks, which leaves Bruce forced to release the spec. incomplete.

My own position on item 1 is that ELD is way out of line insisting on 3-plus orders of magnitude safety factor. One-plus O.M. should suffice, putting the leakage spec. at 100 microamps. Initial testing indicates we'll be able to hit this without problem.

I have no opinion on item 2, never having tried anything like this. It will be difficult to get even a quick-and-dirty idea of the performance of our device on this test. This particular test represents yet another change in the rules of the game on Ford a part.

Regards,
Steve O.

-PRG ### 24e342 FR=DFA TO=ELP SENT=08/13/90 08:1? AM
R#=152 ST=C DIV#=050 CC=00134 BY=DFA AT=08 14/9? ??:?? A-

TO: AGNES JARDOZO EJDN
     JACK KEHRNS EJDN

CC: DAVE CZARN ELB
     STEVE DEFFLER ELB
     BILL SWEET PCME

FROM: KEITH ROBERTS PCME

SUBJ: 77PS PINS

JACK AND AGNES,

WE ARE FINDING THAT THE EXISTING 52 AND 57PS PINS ARE TO SHORT FOR THIS PRODUCT. TO CONFIRM OUR FINDINGS I WOULD LIKE TO ASK OUR PIN SUPPLIERS ABOUT THE AVAILABILITY OF LONGER PINS.

WE NEED MINIMUM QUANTITIES FOR THIS EXPERIMENT, 200 EACH LENGTH WOULD BE MORE THAN ENOUGH FOR NOW. THE LENGTHS WOULD BE AN EXTENSION OF THE EXISTING FAMILY. WE NEED FROM .154 TO .170 +/- .0005.

PLEASE ASK HOW LONG IT WOULD TAKE TO TURN SOMETHING LIKE THIS AROUND AND WHAT THE CHARGE, IF ANY, IS.

THIS IS A FAST PACED QUESTION, IF I COULD GET A PRELIMINARY INDICATION IN A DAY OR TWO THAT WOULD BE GREAT.

AGNES, I HOPE YOUR TRIP TO DALLAS WAS GOOD.
THANKS KEITH

PRESSURE SWITCH DATA Form 21505 TEST NO. 98-01-40

DEVICE	DATE REQUESTED	REQUESTED BY	REQUESTED COMPL. DATE
EX3423	9/19/90	SBU	
PERFORMED BY	DATE STARTED	DATE COMPLETED	APPROVED BY
LAD	9/25/90	9/27/90	

PROJECT TITLE: Cruise Control Pressure Switch

CUSTOMER: [redacted]

PURPOSE OF TEST: Sample order CO-70

PROCEDURE:
Qual: Fy: 40
Spec: 115 psi
Cap: Red
Base: Gray "L" SHIMS??
Header: JSU Yes it is; that uses this
Crimping: Yellow/Green code non-shim for
Disc: 25.5 x 10.5 yes w 57

Device #	Left-Port-3K Act	Left-Port-3K Rel	Right-Port-3K Act	Right-Port-3K Rel
98-01-01	NG	—	114	98
02	114	43		
03	120	46		
04	113	46		
05	116	41		
06	NG	—	103	46
07	118	41		
08	121	52		
09	124	52		
10	129	50		
11	119	47		
12	128	57		
13	109	41		
14	119	46		
15	95	31		
16	120	47		
17	111	43		
18	NG.	—	108	45
19	132	59		
20	115	40		
21	107	39		
22	125	39		
23	105	45		
24	112	49		
25	NG	—	118	41
26	129	37		
27	NG	—	116	40
28	117	45		

PRESSURE SWITCH DATA Form 21605 TEST NO. 79-01-03

DEVICE	DATE RECEIVED	RECEIVED BY	CALIBRATION CHECK DATE
E & 3423	9/14/79	SAD	
PERFORMED BY	DATE STARTED	DATE COMPLETED	APPROVED BY
J A D	9/20/79	9/20/79	

PROJECT TITLE: Cruise Control Pressure Switch

CUSTOMER: [redacted]

PURPOSE OF TEST: Sample order eb-79

PROCEDURE: Quantity: 63
Spec : 250PST
Cap : Standard
Base : Gray "L"
Heaters : yellow rubber w/lead
Crimp ring : yellow no code
Disc : 10.25 thick

Device #	Act. Lock Pt. Act	Act
79-01-01	255	146
02	257	147
03	267	153
04	261	150
05	251	145
06	256	154
07	246	140
08	245	153
09	255	151
10	251	145
11	261	150
12	256	147
13	252	148
14	261	146
15	254	149
16	251	153
17	252	147
18	260	145
19	[illegible]	[illegible]
20	256	147
21	258	146
22	253	145
23	251	146
24	255	141
25	249	144
26	255	145
27	252	151

PRESSURE SWITCH DATA Form 21605 TEST NO. 88-61-16

DEVICE	DATE REQUESTED	REQUESTED BY	REQUESTED COMPL. DATE
EK3423	9/14/90	SBO	
PERFORMED BY	**DATE STARTED**	**DATE COMPLETED**	**APPROVED BY**
JAD	8/27/90	9/27/90	

PROJECT TITLE: Cruise Control Pressure Switch

CUSTOMER: Kelsey-Hayes

PURPOSE OF TEST: Sample evals. CD-72

PROCEDURE: Quantity: 1lb
Spec : 125 psi
Cap : Rebuy w/Seal
Base : gray "L"
Hexport: yellow contact w/o-ring
Ring Ring: yellow chromate; no code
Disc: 35.5d/10.81

Device #	Post-Pinch Act	Post-Pinch Rel	Actuation Act	Actuation Rel					
88-61-01	131	60							
02	141	57							
03	103	52							
04	136	60							
05	148	55							
06	123	49							
07	NG	—	93	37					
08	147	73							
09	132	59							
10	n/a	—	103	43					

9-15-90

Final Characterizations

Device	Current leakage				Act	Rel	Voltage Drop	Prot	[illegible]
					[illegible]	[illegible]	mV		
04-1[illegible]	Pass	Humidity			113	125	5.6	Pass	7300
02	Pass				127	129	7.9	Pass	7300
03	Pass				117	131	6.7	Pass	
04	Pass				126	122	4.5	Pass	
05	Pass				119	116	4.9	Pass	
06	Pass				119	124	4.1	Pass	
07	Pass	Salt spray			132	131	[illegible]	Pass	7300
08	Pass				124	128	[illegible]	Pass	7300
09	Pass				132	129	5.3	Pass	
10	Pass				148	127	[illegible]	Pass	
12	Pass				157	130	5.4	Pass	
13	Pass				[illegible]	128	5.9	Pass	
11	Dead	[illegible]							
15					133	138	4.8	Pass	7400
16		Vibration Test			130	125	4.9	Pass	7300
17					122	128	4.3	Pass	
18					131	132	5.1	Pass	
19					132	128	4.4	Pass	
20					118	129	4.9	Pass	
21		Vacuum & Temp Cycle			127	113	4.8	Pass	7300
22					127	118	4.1	Pass	7400
23					119	142	5.5	Pass	
24					124	123	4.9	Pass	
25					124	121	7.5	Pass	
26	[illegible]								
27					130	118	4.9	Pass	
28		Impact Test			Dead at	[illegible]	Cycles		
29					Dead at	[illegible]	[illegible]		
30					Dead at	[illegible]	Cycles		
31					Dead at	[illegible]	Cycles		
32					Dead at	[illegible]	Cycles		
33					Dead at	[illegible]	Cycles		
34					Dead at	[illegible]	Cycles		
35					Dead at	[illegible]	Cycles		
36					Dead at	[illegible]	Cycles		
37									
38									
39									
40									

TI-NHTSA 001004

CCPS [illegible] 5/15/90

- outline build reqmts for 91 — KR
- schedule for prod components' availability for [illegible]
- updated sketches to Steve McCoy — Am
- set up EX drgs for L Shape [illegible] — Am
- get info details of [illegible] w/ Steve McCoy — Am
- [illegible]
- Supply F-d curves for fixed contacts — Am
- look at fixed contact orientation on chip ; discuss to align with rolling direction for most compliant [illegible] — Am
- Set up separate mtg to review Strip Testing issues [illegible] (Monday @ 1:00 BR cabbage)
- ID schedule for 40/min rate @ [redacted]
- [redacted]
- Target for release of CCPS sensor assy machine is ~7/91
  - plan to use Mod 2 currently to support 1st yr of production
  - need to keep cost of [redacted]
- mech feels that ±.001" capability on calibrator is adequate, but probably achievable ; ±.0005 has been requested.
- mech. wants that both terminals need to be supplied to strip from ; not sure yet whether assembly of wire to term. will be [illegible] or on the dial.
- mech wants to assume a rivetless assy-to-terminal joint with 2 rivets (expected)

CC: DAVE CRAIN

REGARDING THE NGSC DEACTIVATION PRESSURE SWITCH, IT IS TI'S POSITION THAT THE CURRENT LEAKAGE SPECIFICATION SHOULD FALL MIDWAY BETWEEN THE TWO EXTREMES, DEFINED AS FOLLOWS:

HIGH EXTREME LIMIT: 4mA @ 16 VDC, BASED ON THE CLUTCH COIL RELEASE GIVEN BY FORD.

LOW EXTREME LIMIT: 2μA @ 500 VAC, BASED ON TI'S LIMITED TESTING OF THE SWITCH.

USING OHM'S LAW, WE CAN CALCULATE AN EQUIVALENT INSULATION RESISTANCE VALUE FOR EACH:

$\frac{16\ V}{4E-3\ A} = 4.0E3\ \Omega$; $\frac{500\ V}{2E-6\ A} = 2.5E8\ \Omega$

NOTE THAT THESE VALUES ARE ROUGHLY 5 ORDERS OF MAGNITUDE APART. THE PROPER SPEC. VALUE SHOULD FALL 2½ ORDERS OF MAGNITUDE FROM EACH.

LOG 4.0E3 = 3.602 ; LOG 2.5E8 = 8.398

MIDPOINT = (3.602 + 8.398)/2 = 6.000

ANTILOG 6.000 = 1.0 E6

ASSUMING A TEST VOLTAGE OF 500V, THIS GIVES:

$\frac{500\ V}{1.0\ E6} = 500\ E\text{-}6\ Amps$

WE RECOMMEND A CURRENT LEAKAGE SPEC. OF 500 MICROAMPS @ 500 VAC

So 8/15/90

-MSG MS= 273770 FR=KA2 TO=COPY SENT=08/15/90 06:33 AM
BT=C DIV=0050 CC=00101 BY=KA2 AT=08/15/90 06:33 AM

TO: Dave Czarn ELB
Charlie Douglas CPPC
Joe Schuck JIB

FR: Steve Offiler SBC1

SJ: Call from Joe Jira at Ford ELD

I received a telephone call late yesterday (Tuesday 8/14) from Joe Jira. He works for Klingler and apparently is dealing with the current leakage spec. in Klingler's absence. He tried to barter a leakage spec. in the 25 microamp region, but I managed to hold him off until I was able to develop a mathematical argument. You will all be receiving my one-page calculation which shows a bottom line of 500 microamps at 500 VAC. I have fax'ed copies to Bruce Pease, Joe Schuck, and Joe Jira as well.

Joe also discussed the fluid resistance spec. I informed him of our position; that is, that we have not run anything like this and will NOT commit to a position until we have run the test. Again he tried an emotional negotiating technique, asking how TI can conscientiously sell underhood devices without knowing their compatibility with underhood fluids. I resisted, and he became cooperative and offered to help out if possible. I asked him to help by looking into accelerating the fluid test so we can get some results ASAP. As presently written it takes 30 days to complete.

Ford is really pushing to get these issues wrapped up immediately. As such, Dave and Charlie, I recommend we hold off on the position letter we had planned to write to Ford. Things are changing way too quickly right now.

Regards,
Steve O.

Close w/ Charlie on letter

HIGHLIGHTS
Stephen B. Offiler
Week Ending 06/17/90

FORD MY91.75 CRUISE CONTROL PRESSURE SWITCH *TPS*

CUSTOMER ISSUES: We have been going back-and-forth with Ford on the current leakage spec. ELD has been pushing for a reduction from 1 milliamp max (present established spec) to some value around 1 to 25 microamps. Their concern is driven by testing which shows that the electromagnetic clutch will not release under certain conditions until current falls below 4-5 milliamps; they felt that the present 1 milliamp spec was just too close. *They are failing to recognize that our 1 milliamp max spec is run at 500 volts.* I have proposed that the spec be set midway between the two functional extremes, which are 4 milliamps @ 16V on the high end (Ford) and 2 microamps @ 500 V on the low end (TI). Using Ohm's Law, calculating an equivalent insulation resistance for each extreme and then taking the midpoint, I have proposed a spec of 500 microamps at 500 V. We await Ford's reply.

Another spec issue raised by ELD is addition of a fluid resistance spec. Apparently this type of test is run on all other components of the speed control system, and is a fairly standard type of test for any underhood component. The particular test they've proposed takes 38 calendar days to complete; of course they want an answer on this right now, not 38 days from now. I have asked the individuals responsible for creation of this spec to look into acceleration of the test so we have time to actually try it before we sign up to it. Our concern is that this test may expose some unknown weakness of our device which requires a potentially expensive redesign. I plan to speak with Hank Griffin about conducting the test in the Chem Lab.

The field-failure device returned from a Ford durability test last week is presently undergoing analysis. This is an old, direct-dies design. We initially observed infinite contact resistance but by applying mechanical impacts this dropped in stages to a normal value. When pressure was applied, the contacts opened but did not reclose until we hit it. After observing as much as possible, we autopsied the device. Nothing looked abnormal. We have sent the contacts over to Al Hopkins to analyze for such things as silver sulfides or stray silicone films, etc. We owe Ford a reply ASAP.

SAMPLES: We have shipped a total of 115 customer samples this week as follows: Two devices, truck spec, to Ford; 40 devices, car spec, to Pins; 63 devices, car spec, to Carron & Co.; and 10 devices, car spec, to Kelsey-Hayes.

HEXPORT: We've been working to accelerate the quoting process with Elco. They are giving our prints, EX3423-41 and -51 due attention. We have received their quotes with exceptions. Both devices came back at exactly the same price, $0.32/each. The only difference between the two dashes is the internal volume. -41 uses the large counterbore found in the standard 57PS hexport, while -51 removes most of this counterbore. Since the two quotes are identical, and Ford is driving us to minimize the internal volume, *we will proceed only with the -51.* Elco's exceptions include the surface finish of the sealing surface, the ID of the sealing surface chamfer, and the diameter of the through-hole. The surface finish should not be a problem, since we spec'ed 63 microinch and the SAE J512 spec calls for 100. The chamfer ID will be a problem, since Ford will definitely hold us to the dimension called out in J512 and Elco claims they cannot hold this dimension. Finally, the

through-hole is likely to be a problem with Ford since we've already been through one negotiation on this. Purchasing is giving this issue due attention with Elco.

TESTING: The CCPS cycler has died. Individuals in Life Test noted strange sounds and smells coming from the cycler, and shut it down immediately. As near as we can tell at this point, a large relay is arcing severely and causing all kinds of interesting electrical problems. For example, various TTI status LED's are flashing inappropriately, along with other indicator lights. I have a concern that the electrical disturbances caused by the failed relay have stimulated failure of other components. Additionally, brake fluid leakage has begun in the isolation cylinder (unrelated to the electrical problem) indicating that it is time for a rebuild; this is considered normal maintenance. The plan is to disassemble the cycler as soon as possible and correct all problems, as well as complete installation of the Impulse Monitor circuit while the cycler is down. We estimate that the cycler will be up in approximately one week.

SENSORIDISC: We still do not have any test results from the Belville disc test, because of the cycler failure. This test was in the cycler when it died. We are trying to finish a complete characterization of our best-shot Belville designs in both 301V and 455 SS. We will look at drift caused by proof and by cycling, as well as disc life.

Jeff Melton has delivered discs which should represent our final iteration of the Light Truck snap disc. The plan is to ensure both snap discs and incipient discs for both the truck application and the car application. I owe Jeff 3 ECO's to complete this matrix.

Keith Robert's attempt at a pin-window test on relocated-cup-bump sensors discovered that these sensors need longer pins. We took measurements of production and rebump sensors during our sample builds, and discovered that the rebumps (built with shims) need pins on average .007" longer than standard. Keith's devices were built without shims, meaning some disc pre-deflection was present, which would further increase the required pin length. Keith is trying to obtain a family of pin lengths which cover this increased range so he may conduct the pin-window test properly.

TO: BILL SWEET
FM: MATT SELLERS
SJ: HIGHLIGHTS, W/E 8/17/90

LOW TEMP DISC PROGRAM . . . AMBIENT DERATING TESTING WILL BEGIN NEXT WEEK ON 1" DEVICES. THE DELAY HAS BEEN THE LEAD TIME REQUIRED FOR DESIGN TO BUILD A NEW BOX. RUPTURE TESTING EQUIPMENT REQUIRED BY DESIGN TO COMPLETE SIDE BY SIDE TESTING IS STILL ON ORDER WITH EXPECTED DELIVERY IN THREE WEEKS. ALTHOUGH NO SCHEDULE HAS BEEN PRESENTED BY DESIGN YET, IT SEEMS AS IF THEY WILL NEED UNTIL JANUARY TO COMPLETE ALL TESTING. AS A RESULT ALL FUTURE LOW TEMP CONVERSIONS WILL BE PUSHED OUT TO NEXT YEAR.

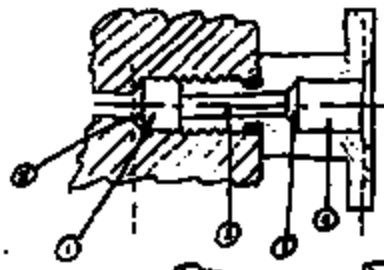
PLASTIC COVER PROGRAM . . . MARKETING HAS NOT YET COMPLETED PREPARING THE INFORMATION AND SAMPLES TO BE SENT TO THE FIELD REP'S. MFG. ENG. ASSISTED IN DRAFTING THE PRESENTATION MID JULY, 90. PROJECTED COMPLETION DATE IN AUGUST 23RD.

SAMPLES OF USD DEVICES WERE PROVIDED TO MFG. ENG. FOR EVALUATION. THESE DEVICES APPEAR TO BE DIRECT COMPETITION FOR NAVY LINE 1-1/2" PRODUCTS. THEY ARE STRIP DISC DESIGN, AND ARE ENVIRONMENTALLY SEALED BY WAY OF A PLASTIC COVER DESIGN. THEY USE A NEOPRENE GASKET THE IS COMPRESSED TO THE BASE BY WAY OF A WEDGE ON THE PLASTIC COVER. HOWEVER, THEY RIVET THE COVER AS OPPOSED TO OUR EXPECTED ADHESIVE SEAL. (THINGS FOR THE TEAM TO THINK ABOUT.)

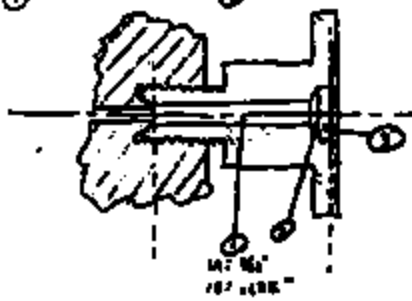
DISC QUALITY ISSUES . . . TOM DECOSTA HAS REPORTED THAT A NEW CONTACT WELDING PROCESS HAS BEEN DEVELOPED TO COMBAT THE HOLES EXHIBITED ON LOW AMP DISC. THE NEW PROCESS CONSIST OF ALTERNATE ELECTRODE MATERIAL, AND MANIPULATION OF WELD PARAMETERS. SAMPLES OF THIS NEW PROCESS HAVE BEEN PRELIMINARILY TESTED ON A SMALL SCALE AND NO PROBLEMS WERE ENCOUNTERED. HOWEVER, CORRELATION STUDIES WILL NEED TO BE PERFORMED ON THE DIFFERENT AMP RATINGS AS PRODUCTION LOTS BEGIN TO ARRIVE.

9115-5-15 . . . DESIGN HAS COMPLETED TESTING ON THE SAMPLES SUBMITTED BY THE NAVY LINE. HOWEVER, THEY HAVE NOT FORMALLY INTERPRETED AND PUBLISHED THE DATA YET. IT APPEARS THAT WE HAVE MORE THAN ONE AREA OF CONCERN WITH THESE BREAKERS. ONE IS THAT THE DISC IS NOT OPTIMUM, BUT HANS STATES ALL 15 AMP BREAKERS ARE 'HARD'. THERE IS ALSO REASON TO BELIEVE THAT THE TIME CHECK FIXTURING ON THE NAVY LINE IS CREATING SOME TIME CHECK DISPERSION ARTIFICIALLY. THIS COMES AS A RESULT OF THE WAY THE CONTACTS MATE WITH THE DEVICE TERMINALS. TO CORRECT THE PROBLEM AND CONTACT THE WAY WE SHOULD, THERE WILL NEED TO BE SOME SORT OF CAM ACTION IN THE TOOLING. THIS SHOULD FIRST BE A TECH. PROJECT TO TEST THIS THEORY. THE PULL-IN BOARD IS ALWAYS A CONCERN, BUT THERE IS A LACK OF PEOPLE WHO FULLY UNDERSTAND THE BOARD ENOUGH TO TEST IT. SANDY RUBEL IS CURRENTLY PERFORMING TEST TO CONCLUSIVELY POINT THE FINGER AT THE BOARD. MECHANIZATION WILL THEN BE DRAFTED INTO THE EFFORT FULLY.

14411-1 INDICATING RING . . . PAUL WESTERLIND IS SETTING UP A DESIGN REVIEW WITH DYNACAST ON THE RETOOLING OF THIS 7270/7271 PART. INVENTORY IS SATISFIED UNTIL 3/91. ART SMITH WILL BE BROUGHT UP TO SPEED DURING THIS REVIEW.



I



II A, B

$V = \frac{1}{3} A_b H$

$V_1 = \frac{1}{3} A_b H_1$

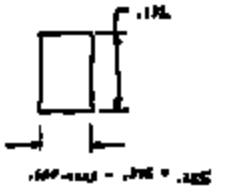
$V_2 = \frac{1}{3} A_2 H_2$

$V = V_1 - V_2$

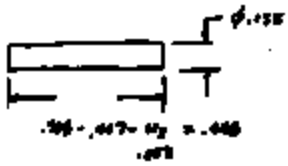
$V_1 = \frac{1}{3}\left[\left(\frac{\pi}{4}\right)(1.32^2)\right](.0919) = .0419$

$V_2 = \frac{1}{3}\left[\left(\frac{\pi}{4}\right)(.813^2)\right](.0376) = .0160$

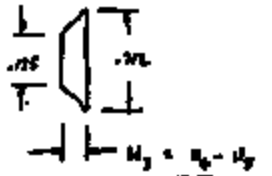
$V = 2.7536 \times 10^{-3}\ m^3$ (5)



$V = Ah = \left(\frac{\pi}{4}\right)(.116)^2(.111) = 1.190\,E-2\ m^3$ ①



$V = Ah = \left(\frac{\pi}{4}\right)(.115)^2(.040) = 4.15\,E-3$ ②



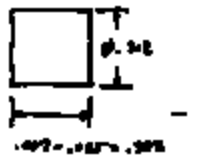
$w_b = \frac{.115\ \sin 5^\circ}{2} = .00573$

$w_t = \frac{.115\ \sin 5^\circ}{2} = .00456$

$V_b = (\frac{1}{3})[(\pi/4)(.116)^2](.00573) = 2.90\,E-3$

$V_t = (\frac{1}{3})[(\pi/4)(.115)^2](.00456) = 1.58\,E-3$

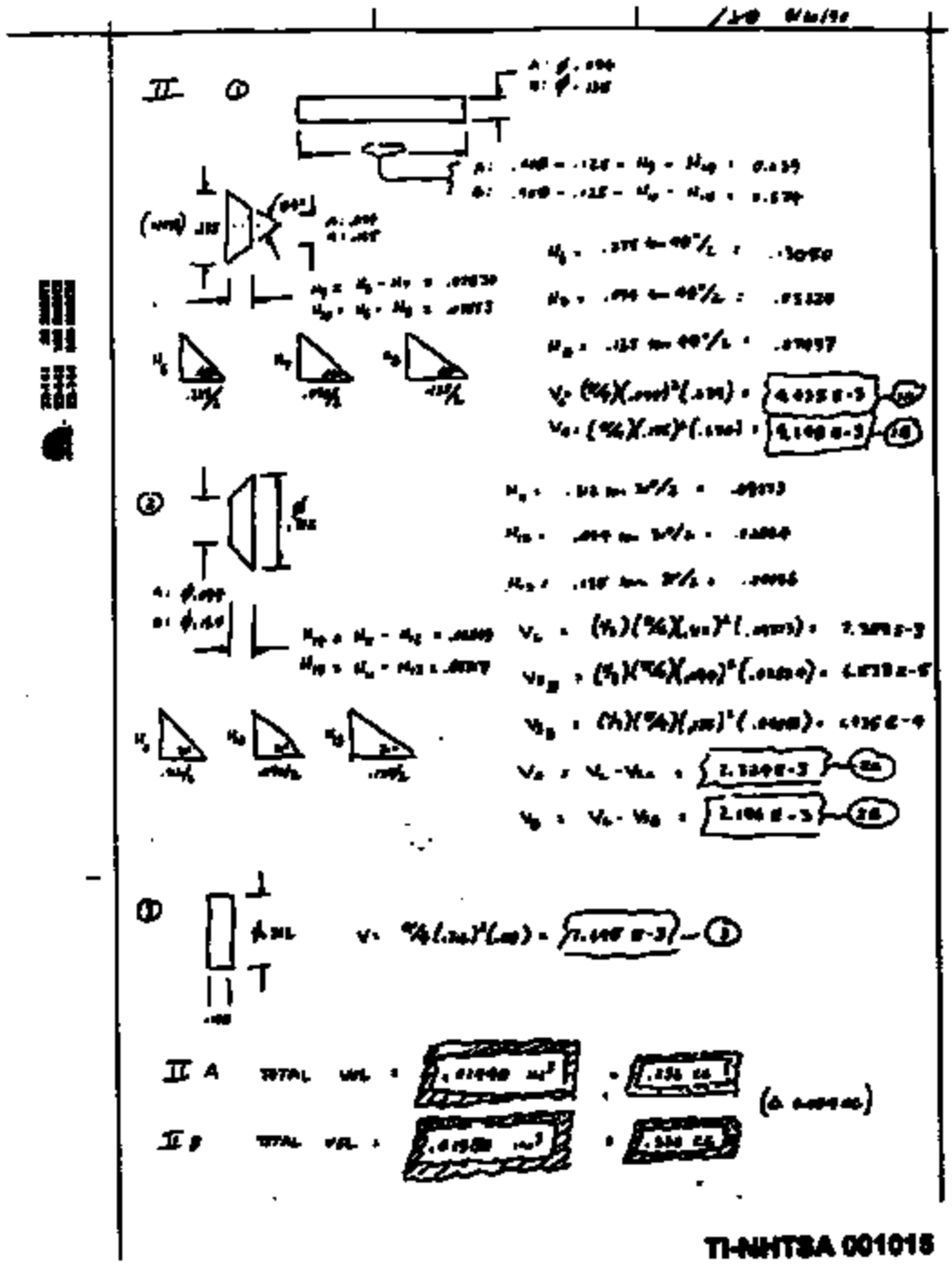
$V = 2.196\,E-3$ ③



$V = (\pi/4)(.116)^2(.200) = 2.11\,E-2$ ④

Σ. TOTAL VOLUME $= \sum_{i=1}^{5} V_i = 4.001\,E-2\ m^3$ ⑤

$.04\ m^3 \left| \frac{2.54^3\ in^3}{m^3} \right| = 2.44\ in^3$



TI-NHTSA 001015

/10 obtain

BOTTOM LINE (1):

I. INITIAL: 0.983 cc

A. FINAL (SMALL 3/32 HOLE): 0.336 cc

B. FINAL (LG .125 HOLE): 0.380 cc

% REDUCTION A = $\frac{\text{ORIGINAL-TO-3/32 SMALL HOLE}}{.983} = \frac{.336 - .983}{.983} \times 100 = -76.0\%$

% REDUC. B = $\frac{\text{ORIGINAL-TO-.125 LG HOLE}}{.983} = \frac{.380 - .983}{.983} \times 100 = -67.9\%$

Δ 8.1%

THIS DELTA OF 8.1% IS TZ SYSTEM ONLY - VIEWED IN TERMS OF OVERALL SYSTEM, EXHAUSTING THE 100'S OF CC'S, IS SMALL FRACTION OF ONE PERCENT. (SO SMALL HUNDREDTH'S OF ONE PERCENT)

[illegible]

TO: Charlie Douglas CRPC
Brad Howe CLE
Keith Roberts [illegible]
Joe Schuck JIB

CC: Tom Charbonneau TC
Dave Czarn AELE

FR: Steve Offiler ELE

RE: Ford Pass-Car Fitting Change (77FS and 57FGF3-x)

I received a call from Bruce Peace on Friday, [illegible]. He informed me that his proportioning-valve supplier, Surfaces Inc., subsidiary of Fittz Industries Inc., will have trouble combining the SAE J512 inverted flare cone seat into the prop valve. Their proposed solution was to increase the thread size one step, from 3/8-24UNF to 7/16-24UNS, while maintaining the given cone seat dimensions for the smaller thread.

I immediately called George Randall at Light Truck, since he was the originator of the use of the J512 inverted flare on this program. He is strongly against bastardization of Standards. He is sure that Surfaces is out of line here because the fitting is in fact machinable per J512. Light Truck uses this type of fitting all the time, produced by other vendors who CAN do it.

George has since spoken with Bruce and expressed his concerns. But of course has no political influence over him. Therefore, it is up to TI to develop a good, factual argument against the thread change and present it to Bruce and his manager, Frank Jansen. [illegible] as aside, George alluded to the idea that Jansen may be deliberately trying to diverge from Light Truck, motivation unknown. We may need to feel him out.!

Possible points to consider in developing the argument:

* COST: Possible piece-price increase for Pass Car's 7/16" thread variant, Kloo tooling charges, and smaller numbers of pcs/yr for each because Light Truck will remain with the 3/8" thread.

* MANUFACTURING: Parts handling, assembly equipment, and test equipment concerns, and the possibility for mix-ups.

* TESTING: Quick-change fixturing which can handle both threads will be required for all test stations to perform validation and continuous in-process testing. Furthermore, the 7/16" thread is non-standard (not UNF or UNC) although it is fairly standard in the [illegible] automotive hydraulics industry. This complicates creation of test [illegible]ixtures i.e. lead time to obtain taps and dies, and total unavailability of Heli-Coil thread inserts which we use regularly.

* STANDARDS: This 7/16" thread is a digression from the established and respected industry-wide Standard.

TI-NHTSA 001017

	CHARLIE DOUGLAS	CPPC
	BOB VIENS	MDES
	ED PONTES	MDES
	ANDY MCGUIRK	PCBA
	MIKE DENATTIA	PCBA
	MIKE POHL	FIXR
	TOM CHARBONEAU	TC
	BOB BASILIERE	ELTL
	BOB ROBICHAUD	PCME
	JOHN KOURTESIS	MDES

BJ: WEEKLY CCPS STATUS UPDATE

XT MEETING

DATE: WEDNESDAY, 8/22
TIME: 8:00A
PLACE: 820 DESIGN C.R.

SC

KEITH WILL SUPPLY US PRODUCT BUILD SCHEDULE FOR 1991 BY MONTH. ALSO, HE WILL LOOK AT AMI #2 REQUIREMENTS IN 1991 TO INSURE WE KNOW WHEN TO START PLANNING TO BUILD A SECOND SENSOR ASSEMBLY MACHINE.

KEITH WILL SUPPLY STEVE M. INFO ON WHEN PRODUCT PARTS WILL BE AVAILABLE TO US FOR FEEDER DEVELOPMENT AND MACHINE SETUP AND DEBUG.

KEITH WILL PUT TOGETHER A LIST OF EQUIPMENT NEEDS FOR A PILOT LINE IF NECESSARY.

DAVE AGREED TO SUPPLY STEVE M. WITH LATEST DRAWINGS/SKETCHES OF ALL PARTS BY 8/21. STEVE M. WILL GIVE US FEEDBACK ON ANY SCHEDULE IMPACT WITH CURRENT DRAWINGS/SKETCHES.

SE ASSEMBLY

WE AGREED THAT A SECOND CHECK STATION WILL BE ADDED. CONTINUITY METHOD WILL BE USED.

WE NEED TO CONTINUE THINKING ABOUT [redacted] CAPABILITY.

WE AGREED TO HAVE A FINAL DECISION ON PARTS ON STRIP WITHIN TWO WEEKS, 8/29. WE WILL MEET AT 1:00PM ON 8/20 TO DISCUSS.

WE REVIEWED THE LAYOUT OF CALIBRATE STATION:

- DESIGN TEAM NEEDS TO CLEARLY UNDERSTAND FORCE DEFLECTION DATA ON CURRENT TERMINAL DESIGN AND PUBLISH THIS INFO.
- STEVE M. WILL SCHEDULE A LAYOUT DESIGN REVIEW FOR THE CALIBRATOR. REVIEW SHOULD BE HELD W/O 8/20.

INAL ASSEMBLY

WE PLAN TO START MACHINE DESIGN ON 8/20.

+SO 4pm 421379 FR=KA2 TO=ELB SENT=02 22:50 05:47 AM
R#=051 ST=C Div=0050 CC=0010. Sys=A2 AT=05/22/90 07:17 34

3:	Dave Czarn	ELB	Jack Kearns	MAU
	Mike DeMattia	PCOA	Keith Roberts	PCME
	Jeff DiDomenico	ELB	Joe Schuc'	JIB
	Charlie Douglas	CPPC	Matt Sellers	PCME
R:	Steve Offiler	SBOI		

J: CCPS Customer-Related Information

spoke yesterday with Joe Jira (Ford ELD) and Bruce Pease (Pass ar Brake Eng). Items of discussion follow.

) CURRENT LEAKAGE SPECIFICATION: After negotiating back and orth several times, we have reached a consensus at 100 microamps.

) FLUID RESISTANCE SPECIFICATION: I had previously asked Joe ira to provide me with a one-time-only accelerated version of this 8-day spec so that we could get some initial feel for our device's erformance ASAP. He put the ball back in our court, allowing us o do whatever we see fit to convince ourselves that we can meet ord's 38-day spec. I plan to shorten the dwell times while aising ambient temperature, exact details TBD.

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) HEXPORT: As most of you are aware, Elco has taken certain xceptions to our hexport print, the most significant being the .D. of the through-hole, the surface finish on the J512 sealing urface, and the .233-.237 chamfer dimension.

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he sealing surface actually meets J512.

SAMPLE REQUIREMENTS: Charlie asked me to remind Bruce that
e owes us an estimate of upcoming sample requirements for the next
-6 months. He is digging out this information.

*** ACTION ITEMS ***

pdate ES to include 100 microamp spec.....	Bruce Pease
lan accelerated fluid resistance test.....	Steve/Chem Lab
esign/build prop-valve mockups w/ J512 seal.....	Steve/Model Shop
un accelerated fluid resistance test.....	Chem Lab
pdate ES to include Fluid Resistance spec.....	Bruce
evelop PV flow chart	Bruce
pdate envelope prints.....	Steve/Drafting
pdate hexport prints	Steve/Drafting
etermine capability to meet .233-.237 dimension.	Rico
inalize negotiations with Elco	Jack Kearns
uild proto hexports for PV & ISFR.....	Model Shop
raft letter explaining internal volume.....	Charlie/Steve
ollow up with Bruce on above items.....	Joe Schuck

egards,
teve O.

-MSG MB= 73672 FR=EGRM TO=ELB SENT=08/27/90 12:47 PM
R#=119 ST=C DIV=0050 CC=00869 BY=EGRM AT=08/27/90 12:47 PM

2. AUG 90 (TYPED)

TO:	KEITH ROBERTS	PCME
	ED KADISEVSKIS	MDES
	STEVE MCCOOEY	MDES
	STEVE OFFILER	ELB
	STAN STELIGA	STEL
	WAYNE CARLSON	AMSD
	STEVE RODKEY	AMSD
	DONNA MOYNIHAN	PCBA
	BILL FARROW	MDES
	ANDY MCKENNA	AJM3
CC:	JIM ARMSTRONG	EGRM
	JOHN GORMLEY	AMSD
	BILL SWEET	PCME
	RAY TOURANGEAU	PCME
	CHARLIE DOUGLAS	C=PC
	BOB VIENS	MDES
	ED PONTES	MDES
	ANDY MCGUIRK	PCBA
	MIKE DEMATTIA	PCBA
	MIKE POHL	FIXR
	TOM CHARBONEAU	TC
	BOB BASILIERE	ELTL
	BOB ROBICHAUD	PCME
FR:	JOHN KOURTESIS	MDES
SUBJ:	WEEKLY CCPS STATUS UPDATE	

Dave Czaren

NEXT MEETING:

DATE: WEDNESDAY, AUGUST 29TH
TIME: 9:00AM
PLACE: 820 DESIGN C.R.

O MISC

- WE RECEIVED KEITH'S PROPOSED SCHEDULE AND WILL UPDATE OUR EQUIPMENT PORTIONS BY 8/23 (STEVE M & ED K)

- MODEL SHOP MOVABLE ARMS SHOULD BE AVAILABLE WITHIN NEXT WEEK PER INPUT FROM ANDY. WE NEED TO EVALUATE FORCE DEFLECTION AT CONTACT AND AT PIN BUMP IN ARM ASAP. ANDY WILL ALSO RUN TESTS WITH FLAT ARM VS "L" SHAPE. STEVE M. WILL HAVE OTHER BOWL FEED PEOPLE LOOK AT FEEDING THE ARM. INITIAL FEEDBACK WAS IT CANNOT BE BOWL FED. THIS LED US INTO REQUESTING STRIP DESIGN. WE WILL CLOSE THIS ISSUE BY 9/5. WE WILL ALSO REVIEW OUR BENDING CAPABILITY TO MEET PRINT REQUEST BY 8/29 (MEET WITH STEVE BUCK).

- KEITH NOTED THAT TERMINALS AND BASES WOULD BE AVAILBLE BY 3/91 AND 2/91 RESPECTIVELY, FOR DEBUG OF STATIONS, ETC.

O BASE ASSEMBLY

- THE ISSUE OF TWO CHECK STATIONS NEEDS FINAL RESOLUTION. WE WILL MEET

- AS NOTED ABOVE, WE NEED DECISION ON TERMINALS AND MOVABLE ARM DESIGNS ASAP. WE ARE NOT AFFECTING THIS SCHEDULE AS YET BUT COULD BE MOVING AHEAD WITH THIS INFO AND ADDITIONAL DESIGNER FOR THESE STATIONS.

- CALIBRATION LAYOUT REVIEW SCHEDULED FOR 8/29 AT 9AM.

O PSSURE TESTER

- ED K WILL HAVE SCHEDULE TO KEITH BY 8/29.

- KEITH WILL SUPPLY PROTO PARTS AND DRAWINGS TO ED K. BY 8/23.

O FINAL ASSEMBLY

- NEED CRIMP FORCE DATA FROM KEITH 8/29.

REGARDS,
JK

JK:LJP MSGID:MDEB TEL:699-3679 MS:20-25

-MSG MSG# I65263 FR=EDRM TO=ELB SENT=08/30/90 02:51 PM
#0=188 ST=C DIV=0050 CC=00869 BY=EDRM AT=08/30/90 02:51 PM

30 AUGUST 1990

TO: KEITH ROBERTS PCME
ED KADISEVSKIS MDES
STEVE MCCODEY MDES
STEVE OFFILER ELB
STAN STELIGA STEL
WAYNE CARLSON AMSD
STEVE RODKEY AMSD
DONNA MOYNIHAN PCDA
BILL FARROW MDES
ANDY MCKENNA AMS

DAVE C

CC: JIM ARMSTRONG EDRM
JOHN GORMLEY AMSD
BILL SWEET PCME
RAY TOURANGEAU PCME
CHARLIE DOUGLAS CPPC
BOB VIENS MDES
ED PONTES MDES
ANDY MCGUIRK PCDA
MIKE DEMATTIA PCDA
MIKE POHL FIXR
TOM CHARBONNEAU TC
BOB BASILIERE ELTL
BOB ROBICHAUD PCME

FROM: JOHN KOURTESIS MDES

SUBJECT: WEEKLY DCPS STATUS UPDATE

NEXT MEETING:

DATE: WEDNESDAY, SEPT. 5TH
TIME: 9:00 A.M.
PLACE: B20 DESIGN C.R.

o MISC

- ANDY M. EVALUATED TAPERED CONTACT ARM WITH GOOD RESULTS. HE IS TESTING THE MORE SIMPLIFIED "L" SHAPED ARM THIS WEEK AND WILL UPDATE US AT NEXT WEEK'S MEETING.

- WE WILL BE USING THE BABE DESIGN WITH THE CENTERED CONNECTOR. THE PRINTS PROVIDED TO MECHANIZATION REFLECT THIS DESIGN. THEY ARE:

BABE	EX 3423-49	REV 1
STAT TERM	EX 3423-27	REV 1
MOVE TERM	EX 3423-48	REV 1

TI-NHTSA 001023

- KEITH R. HAS CLOSED WITH BABBLER AND BABBLER HAS AGREED TO PUT BOTH TERMINALS ON STRIP AND CLEAN TO KEITH'S SPECS. KEITH AND ANDY WILL CLOSE WITH BABBLER REGARDING STRIP DESIGN. STRIP PRINTS TO BE ISSUED WITHIN 2 WEEKS.

- WE ARE ALL STILL DISCUSSING THE METHOD OF ATTACHING THE ARM TO THE

[illegible] MEETING IS AS FOLLOWS:

[illegible] WILL TRACK DOWN ALL THE INFORMATION AVAILABLE ON THE ORIGINAL SAMPLES GIVEN TO STEVE C. MANY MONTHS AGO.

[illegible] WILL CLOSE WITH PHILIPS ON THEIR ARTWORK AND POSSIBLE FUTURE HELP [illegible] TO VENDORS.

ANDY M. WILL REVIEW OUR DATA WITH STEVE BUSH FOR HIS [illegible].

BASE ASSEMBLY

- THE PROTOTYPE CALIBRATOR WAS REVIEWED AGAIN. STEVE M. NEED TO VERIFY SPRINGS WILL DELIVER FORCES AGREED UPON IN THE REVIEW. AND PROVIDE A LOCK FOR THE LVDT SLIDE.

  THE CALIBRATOR BUILD WILL BE ON HOLD UNTIL ANDY M. GETS A BIT CLOSER TO THE ARM DESIGN (2 WKS).

- THE ISSUE OF TWO CHECK STATIONS WAS DISCUSSED. THE CONSENSUS IS THAT WE HAVE ONE CONTINUITY CHECK STATION AFTER THE CALIBRATOR BUT WILL TRY TO LEAVE ROOM FOR AN ADDITIONAL CHECK IF REQUIRED. AN OFF LINE CONTINUITY GAUGE WILL BE BUILT TO ACT AS THE REFEREE.

- THE DESIGN AND BUILD SCHEDULE SHOWS THAT WE CAN COMPLETE THE MACHINE IN THE TIME FRAME REQUESTED ASSUMING NO MAJOR PRODUCT CHANGES AND THAT PRODUCT PRINTS ARE ISSUED ASAP. WHAT WAS A CONSERVATIVE SCHEDULE 4 MONTHS AGO HAS BEEN COMPRESSED TO AN AGGRESSIVE SCHEDULE. WE NEED TO FINALIZE ON PRODUCT DESIGN ISSUES TO PRODUCE A PRODUCTION READY MACHINE ON SEPTEMBER 1 OF 1991.

[illegible] REGARDS,
STEVE MCCOOEY

MSG ### 421379 FR=KA2 TO=ELB SENT=08/22/90 05:49 AM
R#=066 ST=C DIV=0050 CC=00101 BY=A2 AT=08/22/90 05:49 AM

J:	Dave Czarn	ELB	Jack Kearns	MRJK
	Mike DeMattia	PCQA	Keith Roberts	PCNE
	Jeff DiDomenico	ELB	Joe Schuck	JIB
	Charlie Douglas	CPPC	Matt Sellers	PCNS

R: Steve Offiler SBD1

J: CCFS Customer-Related Information

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TI-NHTSA 001025

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SAMPLE REQUIREMENTS: Charlie asked me to remind Bruce that he owes us an estimate of upcoming sample requirements for the next 3-6 months. He is digging out this information.

*** ACTION ITEMS ***

Update EB to include 100 microsap spec.....	Bruce Pease
Plan accelerated fluid resistance test.....	Steve/Chem Lab
Design/build prop-valve mockups w/ J512 seal.....	Steve/Model Shop
Run accelerated fluid resistance test.....	Chem Lab
Update EB to include Fluid Resistance spec.....	Bruce
Develop PV flow chart	Bruce
Update envelope prints.....	Steve/Drafting
Update hexport prints	Steve/Drafting
Determine capability to meet .233-.237 dimension.	Elco
Finalize negotiations with Elco	Jack Kearns
Build proto hexports for PV & ISIR.....	Model Shop
Draft letter explaining internal volume.....	Charlie/Steve
Follow up with Bruce on above items.....	Joe Schuck

Regards,
Steve O.

GAGE REPEATABILITY AND REPRODUCIBILITY DATA SHEET (Long Method)

	1	2	3	4	5	6	7	8	9	10	11	12
Operator	A- Diane				B- Claire				C-			
Sample #	1st Trial	2nd Trial	3rd Trial	Range	1st Trial	2nd Trial	3rd Trial	Range	1st Trial	2nd Trial	3rd Trial	Range
1	.1180	.1179			.1127	.1188						
2	.1184	.1182			.1214	.1154						
3	.1197	.1197			.1190	.1136						
4	.1185	.1190			.1169	.1183						
5	.1172	.1137			.1125	.1160						
6	.1170	.1134			.1161	.1181						
7	.1175	.1174			.1208	.1165						
8	.1198	.1160			.1184	.1156						
9	.1183	.1177			.1154	.1150						
10	.1172	.1171			.1107	.1144						
Totals												
				R_a				R_b				R_c
		Sum X_a				Sum X_b				Sum X_c		

$\bar{R}_a$	
$\bar{R}_b$	
$\bar{R}_c$	
Sum	
$\bar{R}$	

# Trials	D_4
2	3.27
3	2.68

($\bar{R}$) x (D_4) = UCL_R

(_____) x (_____) = ___

Max. $\bar{X}$	
Min. $\bar{X}$	
$\bar{X}$ Diff.	

NOTES: Used Laptops

24

protect the lead-in thread, which Elco agreed to provide without any cost penalty.

Also, again due to air entrapment concerns, FC wants the large opening on the backside of the hexport to be filled. We are looking into either building the hexport without the large cavity, or filling it.

HUMIDITY TEST: I presented the results of our three-way humidity comparison test. All devices passed all tests functionally. Based on cosmetics, Ford's favored 15-cycle MIL-STD test was obviously the most severe by far, the original Ford spec. was most lenient, and my favored test, the standard 10-cycle MIL-STD fell between the two. Bruce agreed to step back to my test.

RELEASE SPEC: We explained a rationale, based on estimated Cpk numbers, for a reduction in release from 40 to 20. They really don't have a problem with this, as long as they are guaranteed that release will in fact take place. We explained about the speed-control's logic whereby, after a brake-lite failure, if our switch disengages the system then a key-off cycle must take place which indirectly means the brake pressure falls to zero and our device is guaranteed to reset.

ES SPEC ISSUES: The specific wording of several miscellaneous items in the "Notes and Instructions" section is being updated to reflect the real world, based on our internal Quality Assurance Specification document QAS 296 (S7PS ... previously approved by Ford SQA). I left a copy of this which Bruce will use to update those areas I hilited.

'VELOPE PRINTS / SAMPLES: Bruce has asked that we submit a revised envelope print showing the new flare within about 2 weeks. Furthermore, he needs 2 ride-height switch samples (S7PSF3-3) with the new flare and filled hexport in about a week.

*** Meeting II - ELD MGSC ***
TI Personnel: Steve Offiler, Joe Schuck
Ford Personnel: Gary Klingler

This was an informal program status/update meeting. Joe obtained the most recent schedule dates for the lead platforms... ISIB's, 4E and SP MRD's, etc. He'll get a copy of these to me for use in updating our overall program schedule.

We delivered test devices at 90 psi and 160 psi for system testing to take place to confirm the FC spec. Also, Gary would like a couple devices which represent roughly the min release for both car and truck. I have 125 psi devices with releases in the 30's and a 201 psi device with 62 psi release ... these will suffice.

Gary is pursuing business at Ford Australia, roughly 40K units per year. He has beat out GM Holden's electronic speed control based on both cost and performance. They want a fully-engineered package which will be a drop-in. No idea how the brake pressure switch will fit into the system, in terms of fluid fitting, etc.

*** Meeting III - Light Truck Speed Control ***
TI Personnel: Steve Offiler, Joe Schuck
Ford Personnel: George Randall

George dropped a couple of bombshells "off the record":

PRESSURE SWITCH DATA Form 21605 TEST NO. 91-15-03

DEVICE	DATE REGISTERED	REQUESTED BY	RECEIVING CHARGE DATE
CCPS	9/22/90	BBB	
PERFORMED BY	**DATE STARTED**	**DATE COMPLETED**	**APPROVED BY**
JAD	9/11/90	9/19/90	

PROJECT TITLE: Cruise control Pressure Switch

CUSTOMER:

PURPOSE OF TEST: This is an accelerated version of Ford's Fluid Resistance test.

PROCEDURE: Next Page

Device#	Initial Act	Rel	Post-Proof Act	Rel	Mydap	Hyst
91-15-01	151	103	142	98	36.1	4.9-A
01	155	104	150	101	38.3	3.9
02	148	99	139	97	42.5	2.2

Corrected

Device#	Act	Rel	Mydap	Hyst	Post
91-15-01	152	113	38.9	3.9-A	Pass
01	149	111	40.7	3.1	Pass
02	139	107	32.2	2.3	Pass

All 3 devices passed. The following observations were made upon disassembly:

- Red cloud (dye) was found inside the drive cup and at the lowest side of the cup.
- Dye and hydraulic oil appeared to be the same.
- Gasket cutting procedure: The tool is probably too sharp. Hydraulic oil in the recessed area after post test. The rubber gasket does not appear to have the capacity to completely seal the piston. Gasket is identical oil and test over night to see if oil would reach the outside of the gasket. The oil and dye either should be separated or the gasket cracked but not do both as the latter one.

TEST

- OBTAIN TEST DEVICES. PERFORM INITIAL CHAR - PROOF, ACT/REL & mV DROP (@ 75mA); CURRENT LEAKAGE - ALLIED VALVE

- SEAL BOTH ENDS OF DEVICE, USING SPECIAL ADAPTERS FOR UNIT AND & STANDARD MATING CONNECTOR FOR OTHER END.

DAY 1 - IMMERSE IN ROOM TEMPERATURE GASOLINE (PER ASTM D
DAY 1A 471 REF. FUEL C) FOR 5 ± 1 MINUTES

DAY 1A - REMOVE AND DRAIN FOR 1 HR

DAY 2A - IMMERSE IN ROOM-TEMP ENGINE OIL FOR 5 ± 1 SEC.

DAY 2A - REMOVE AND DRAIN OVERNIGHT (@ THE MINIMUM)

DAY 3A - STORE FOR 24 HR AT 200°F

DAY 3A - IMMERSE IN 50/50 H_2O/ETHYLENE GLYCOL @ ROOM TEMP

DAY 3AN - DRAIN FOR 4 HRS

DAY 4AN - IMMERSE IN DOT-4 BRAKE FLUID

DAY 4A - DRAIN OVERNIGHT (4 HRS MIN)

DAY 5A - IMMERSE IN FORD ATF @ R.T. 5 SEC.

DAY 5AN - DRAIN 4 HRS

DAY 6A - STORE OVERNIGHT @ 200°F

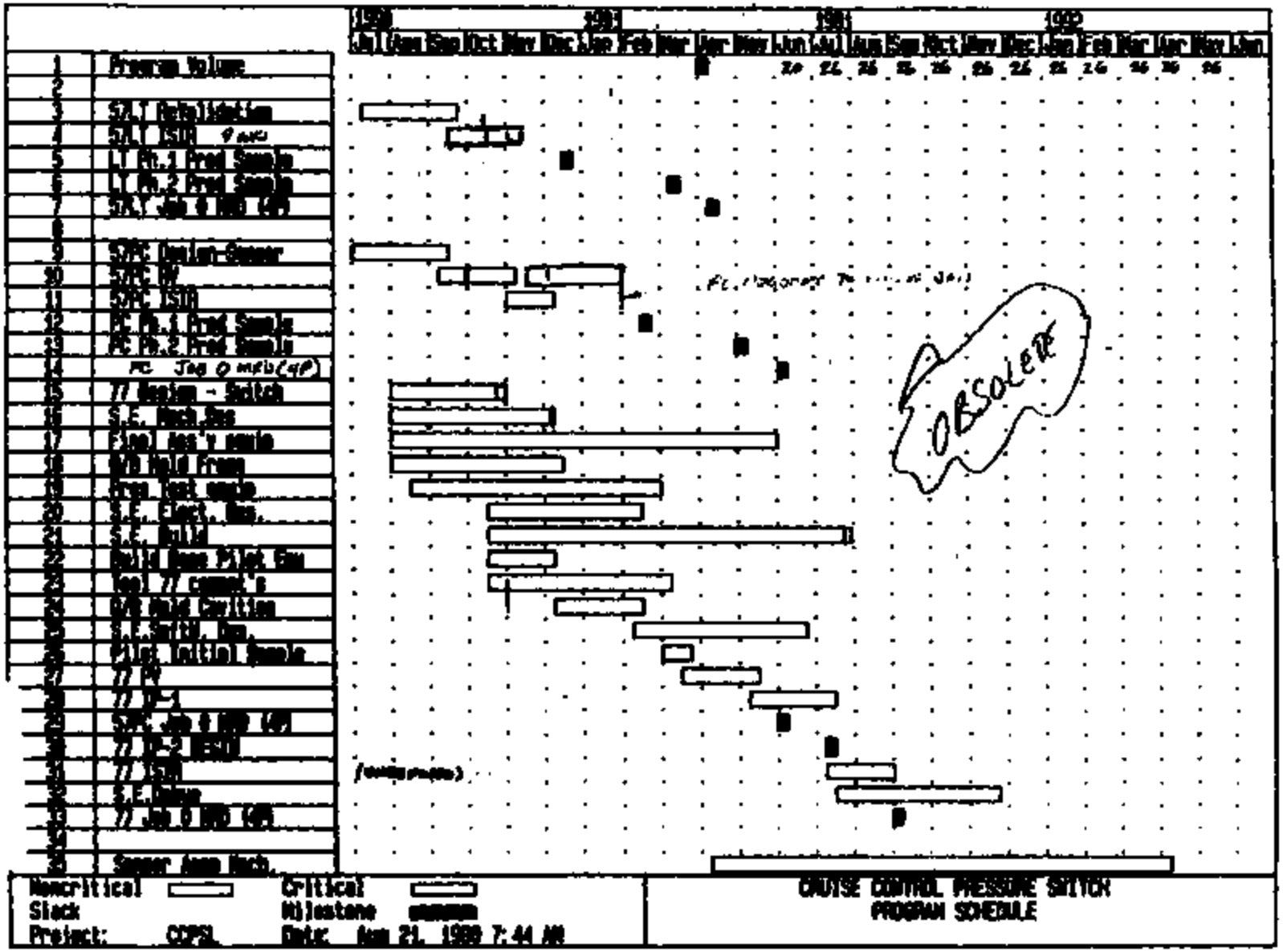
DAY 6A - IMMERSE IN H_2O/ISOPROPYL ALCOHOL 50/50 ROOM TEMP 5 SEC

DAY 6AN - DRAIN 4 HR

DAY 7AN - IMMERSE IN 95/5 GASOLINE/ motor oil

DAY 7P - DRAIN 1 HR

- PERFORM FINAL CHAR; ACT/REL; mV DROP @ 75mA LOAD; CURRENT LEAKAGE; AND PROOF TEST



HIGHLIGHTS
Stephen B. Offiler
Week Ending 06/24/90

FORD MY91.75 CRUISE CONTROL PRESSURE SWITCH 77PS

I was contacted by Joe Jira again regarding my proposed 500 microamp current leakage spec. He told me that one assumption used in my calculation was in error. (It is pertinent to note that *he gave me* the erroneous assumption.) I used 4 milliamps at 16 VDC as the high extreme value; Joe changed this to 1 milliamp, which basically moved the midpoint downward from 500 microamps to about 250. In order to settle this dispute, I agreed to a spec of 100 microamps rather than continue haggling.

During another conversation with Joe, he informed me that we should not use our clutches as loads during the powered portion of the Impulse test. He stated two reasons: 1) the clutches in our possession are several iterations old and 2) the load that these clutches present to the circuit will vary due to heating. He wants us to use inductors with a value of 300 - 360 millihenrys in place of the clutches. We are pursuing these now.

I have designed an accelerated field test based on Ford's specification. I shortened drain times from typical 24 hours to about 4 hours, and shortened 14-day room-temp storage times to 24 hours at 200 °F. Basically all the same seven fluids will be used; I am taking liberties by using pump gasoline rather than ASTM Reference Fuel, etc. This test is presently underway, and will continue over the weekend. Final results will be available Tuesday morning.

I spoke with Bruce Pease (Pass Car Brake Eng.) regarding the hexport issues raised by Elco. I was able to convince him that use of the larger .134 - .138 diameter through-hole will have negligible effect on his internal volume concerns while making the part significantly easier for Elco to make. He grudgingly agreed, but is requiring us to put our justification for this change in writing and enclose my internal volume calculations. Also on the subject of the hexport, Elco committed to reply this week regarding their capability to meet the .233 - .237 chamfer dimension; we have not heard from them yet. We must now update the envelope prints and the hexport print.

All of the above issues pertain to all programs, Truck and Car. As such, it is important to ensure that George Randall (Truck Eng.) is in the loop. I have asked both Bruce and Joe to contact him; in parallel, I plan to contact him also.

We have received a request for two samples directly from Ford Purchasing, Paul Hendershot. One is to be a 57PS and the other is to be a 77PS. We strongly suspect that the purpose for these samples is reverse engineering. Charlie requests that one device be a truck calibration and the other a car calibration to maximize the differences between the two. These are due ASAP politically speaking, since any delays will be recognized directly by the buyer. We will assembly them as parts for the 77 become available.

I was contacted by Al Hopkins regarding the RMR contacts I sent him for analysis. He has found significant zinc oxide on them, and is further studying where this may have come from. It is possible that the brass terminal material contributed zinc from the alloy. At any rate, these were initial prototypes made from plated terminals, while the production parts will be inlaid. I await Al's final report so we can complete the formal paperwork with Ford.

The cycler, broken last week, has been repaired. Jeff found the root cause to be program steps missing from the JTI's memory, indicating a weak battery. We have reprogrammed it, and now are running a replacement battery. This allowed completion of the Belville disc life test. This test was running a set of 301's and a set of 455's in parallel. We found three of 12 301's cracked radially outward from the center hole, although only one was actually dead... the other two cracked discs continued to function normally and within spec. We found all 12 of the 455's to be dead, similar failure mode. These exhibited no continuity; dissection showed the cracked discs to be bistable and stuck in an actuated position.

I have spoken with the model shop regarding the J512 lowpoints for the Light Truck revalidation test. They will modify another 75 bar's so we may proceed with the test. They will need to be stripped and replated before we actually undergo testing.

- SL /ew [illegible]

Email A Std [illegible] CCed Sw: BY-BORN ATTN: ET [illegible]

[illegible] TYPED

_I	KEITH ROBERTS	MDE
	ED KAPLISH'S	MDES
	STEVE NICHOLS	MDES
	STEVE CASTLE	ELE
	STAN STELLA	STEL
	WAYNE CARLSON	AMSD
	STEVE ROOKEY	AMSD
	DONNA MOYNIHAN	PCQA
	BILL FARROW	MDES
	ANDY MCKENNA	PCM2
CC:	LIN ARMSTRONG	EZRM
	JOHN GORMLEY	AMSD
	BILL SWEET	PCME
	RAY TOURANGEAU	PCME
	CHARLIE DOUGLAS	CAPC
	ROB VIENS	MDES
	ED PONTES	MDES
	ANDY MCGUIRK	PCQA
	MIKE DEMATTIA	PCQA
	MIKE POHL	FIXR
	TOM CHARBONEAU	TC
	ROB BASTLIERE	ELTL
	BOB ROBICHAUD	PCME
FR:	JOHN KOURTESIS	MDEE

SUBJ: WEEKLY CCPS STATUS UPDATE

NEXT MEETING:

DATE: WEDNESDAY, AUGUST 29TH
TIME: 8:00AM
PLACE: B20 DESIGN C.R.

O MISC

- WE RECEIVED KEITH'S PROPOSED SCHEDULE AND WILL UPDATE OUR EQUIPMENT PORTIONS BY 8/23 (STEVE N & ED K)

- MODEL SHOP MOVABLE ARMS SHOULD BE AVAILABLE WITHIN NEXT WEEK FOR INPUT FROM ANDY. WE NEED TO EVALUATE FORCE DEFLECTION AT CONTACT AND AT PIN BUMP IN ARM ASAP. ANDY WILL ALSO RUN TESTS WITH FLAT ARM VS "L" SHAPE. STEVE N. WILL HAVE OTHER BOWL FEED PEOPLE LOOK AT FEEDING THE ARM. INITIAL FEEDBACK WAS IT CANNOT BE BOWL FED. THIS LED US INTO REQUESTING STATE DESIGN. WE WILL CLOSE THIS ISSUE BY 9/5. WE WILL ALSO REVIEW OUR BENDING CAPABILITY TO MEET PRINT REQUEST BY 8/29 (MEET WITH STEVE BUCK).

- KEITH NOTED THAT TERMINALS AND BASES WOULD BE AVAILABLE BY 8/1 AND 8/8, RESPECTIVELY, FOR DEBUG OF STATIONS, ETC.

O BASE ASSEMBLY

- [illegible] STATIONS NEEDS FINAL RESOLUTION. [illegible]

- AS NOTED ABOVE, WE NEED DECISION ON TERMINALS AND [illegible] AT KEITH-AEAF. WE ARE NOT AFFECTING THIS SCHEDULE AS SET BUT COULD BE [illegible] AHEAD WITH THIS INFO AND ADDITIONAL DESIGNER FOR THESE STATIONS.

- CALIBRATI[redacted] REVIEW SCHEDULED FOR 8.25 AT 9AM.

2 FIXTURE T[redacted]

- ED W WILL [redacted] SCHEDULE TO KEITH BY 8.23.

- KEITH WILL SUPPLY PROTO PARTS AND DRAWINGS TO ED W. BY 8.31.

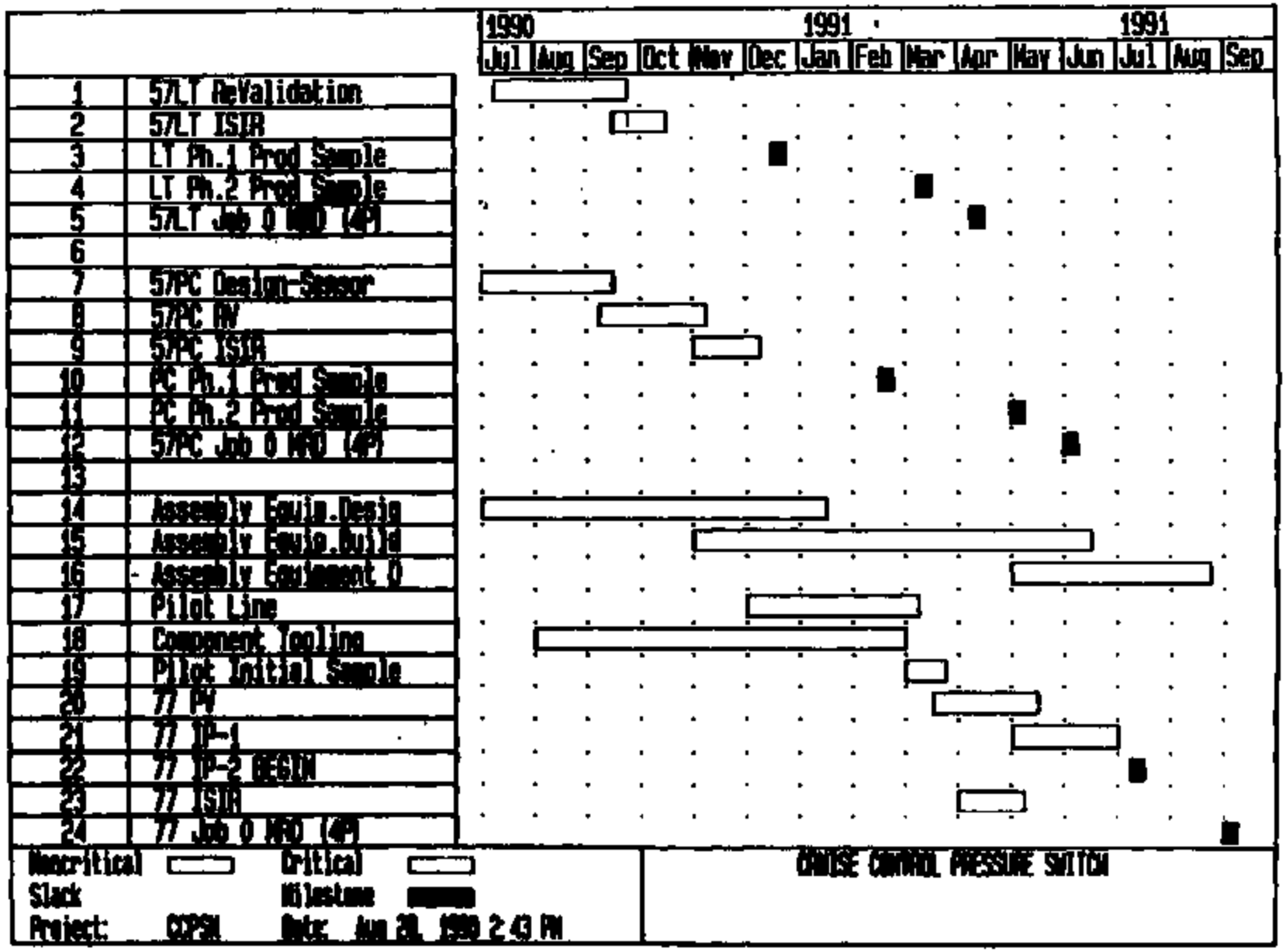
3 FINAL ASSEMBLY

- NEED CRIMP FORCE DATA FROM KEITH 8/29.

REGARDS,
JK.

[illegible] MSGID:MDES TEL:649-3679 [redacted]

[redacted]



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TL Dave Czarn ELB
Mike DeMattia PCBA
Charlie Douglas CPPC
Keith Roberts PCME
Joe Schuck JIB
Matt Sellers PCME

FR: Steve Offiler SBDI

SJ: Call from Bruce Pease

Bruce contacted me Tuesday afternoon to discuss the following subjects:

1) He needs the envelope print with the revised hole diameter and the written explanation of the change ASAP. I'll need to push this up my list of priorities. Charlie... we'll have to get that letter written soon.

2) He has fax'ed me the revised specification including the PV flow chart and the fluid resistance spec. He's taken ELD's original fluid resistance spec and interpreted it in a unique way which may be beneficial for us. Instead of running seven fluids in series, he has different devices going into each fluid so they run in parallel, reducing this part of the critical path from 30 d to 15. Please note this is a rough draft, and still needs ELD's and Randall's approval. Our accelerated version of the 30 day test was completed this morning. All devices passed.

3) He informed me that one of our early prototypes began to leak while undergoing testing. He will forward the device via overnite for formal failure analysis. This is an old, direct-disc design and its hydraulic seal system is fundamentally different from the production-intent design.

4) Bruce was contacted by Joe regarding the Sept 11 visit to TI Attleboro. He is not sure if his management will allow travel, given restrictions that are in place (sound familiar?). He also mentioned that George Randall is unavailable that entire week. We'd better rethink this. I do not feel that we can have a productive meeting with only Fred Hendershot in attendance.

5) UTC, supplier of the mating connector, will have roughly 200 prototypes of the offset polarity key in October. Bruce wants to co-ordinate this with us so we have offset devices in this timeframe as well.

6) He has been trying to answer the question we raised about future sample needs, and indicates he's not having much luck.

Regards,
Bl /s O.

PRESSURE SWITCH DATA Form 21605 TEST NO. 97-09-12

DEVICE	DATE REQUESTED	REQUESTED BY	REQUESTED COMP. DATE
LCPS	8/12/96	BBD	
PERFORMED BY	DATE STARTED	DATE COMPLETED	APPROVED BY
BBD	9/24/96	9/27/96	

PROJECT TITLE: Cruise Control Pressure Switch

CUSTOMER:

PURPOSE OF TEST: Standard dist life test on 12.5 inch tree

PROCEDURE: Impulse cook

Device #	Dist Act	mV pol	Device Act	mV Rel	Pos - Act	mV Rel	Pos - Act	mV Rel
97-09-01	24.9	11.9	248	107	249	105	249	105
02	24.9	11.9	248	108	246	112	246	109
03	25.1	11.9	254	100	249	108	247	111
04	24.9	11.1	247	103	241	113	254	114
05	24.9	11.9	245	100	236	102	241	106
11	25.3	12.1	252	106	235	102	245	107
07	24.3	11.3	242	99	238	102	241	108
08	25.3	11.3	247	106	240	102	247	112
09	25.9	11.7	255	108	240	107	241	113
10	24.6	11.7	248	104	242	107	247	108
11	24.3	11.6	245	103	239	103	247	109
12	25.3	11.9	248	104	247	103	253	111

Device #	Dist Act	mV Rel
97-09-01	24.3	110
02	24.5	116
03	24.9	11.8
04	25.3	11.7
05	24.1	11.5
11	24.3	110
07	24.9	11.8
08	25.8	11.9
09	24.6	10.9
10	24.3	11.4
11	24.9	10.9
12	24.9	10.9

TEXAS INSTRUMENTS

August 29, 1990

[redacted]

Ford Motor Company
Rotunda Drive at Southfield
Dearborn, MI 48121

Dear Fred,

I am writing in reference to your upcoming visit to Texas Instruments to discuss the Next Generation Speed Control deactivation pressure switch. In order to insure that our time together is used effectively, I would like to take this opportunity to address several subject areas which will need discussion during your visit.

1) SCHEDULE

Please review the attached schedule. It is based on Ford input and includes all key program milestones as required by Ford. As you will note, we will meet start of production for both Light Truck and Passcar with modified versions of the existing pressure switch we supply to Ford (This is consistent with information we have been supplying this entire calendar year). Our current schedule calls for a running change to the fully automated/application specific pressure switch to be made by mid September of 1991. However, given recent Ford requests for changes to both the engineering specification and port fitting design (which will be covered in this letter), this date could conceivably slip by 1 - 2 months.

2) ENGINEERING SPECIFICATION (ES)

Recently, one change and one addition has been made to the specification requirements. Ford had requested a change in current leakage at 500 VAC from 1 milliamp to 1 microamp. After testing on our part, and discussion with ELD as to the reasoning behind this request, a current leakage spec of 100 microamps has been agreed upon.

A resistance to fluids test is an addition to the specification requirements. Since this is a 38 day test as currently written, we are unable to formally respond as to our capability at this time. We have run an accelerated version of this test and based on the results would tentatively agree to this requirement. However, before formally agreeing to this requirement, we would like to complete all requirements of the test as written. Currently, ELD, Passcar, and TI are negotiating the requirements of the fluids resistance te... When the requirement is agreed upon (expected very soon), we will complete the test and put forth a formal position.

3) PORT FITTING

The switch from an O-Ring seal to an SAE J512 metal to metal seal, combined with a reduction to the .312" counterbore on the back side of the hexport has increased the manufacturing complexity of this part. As a result, our supplier has quoted a price for the hexport that is substantially higher than the standard hexport we currently use. The impact to Ford, based on the current design will be approximately $.07.

As we now understand it, there is a desire to further reduce the through hole ID to .094". We understand the desire to reduce internal volume on all components within the brake system, however, as the attached calculations show, the marginal benefit of reducing the through ID from .136" to .094" is minimal. If this is Ford's desire, we will certainly adhere to it, however, cost estimates we have received for this change indicate we would have to increase our price to Ford by $.15 - $.25.

One final point to be aware of on the hexport is that decreasing the through hole ID means increasing the chamfer surface area. This may mean some subtle change to the manner in which a metal to metal seal is accomplished (such as an increased torque requirement to properly deform the larger metal area). The key point here is that since we really don't conform to the SAE J512 specification, we need to be aware of any potential problems which may result.

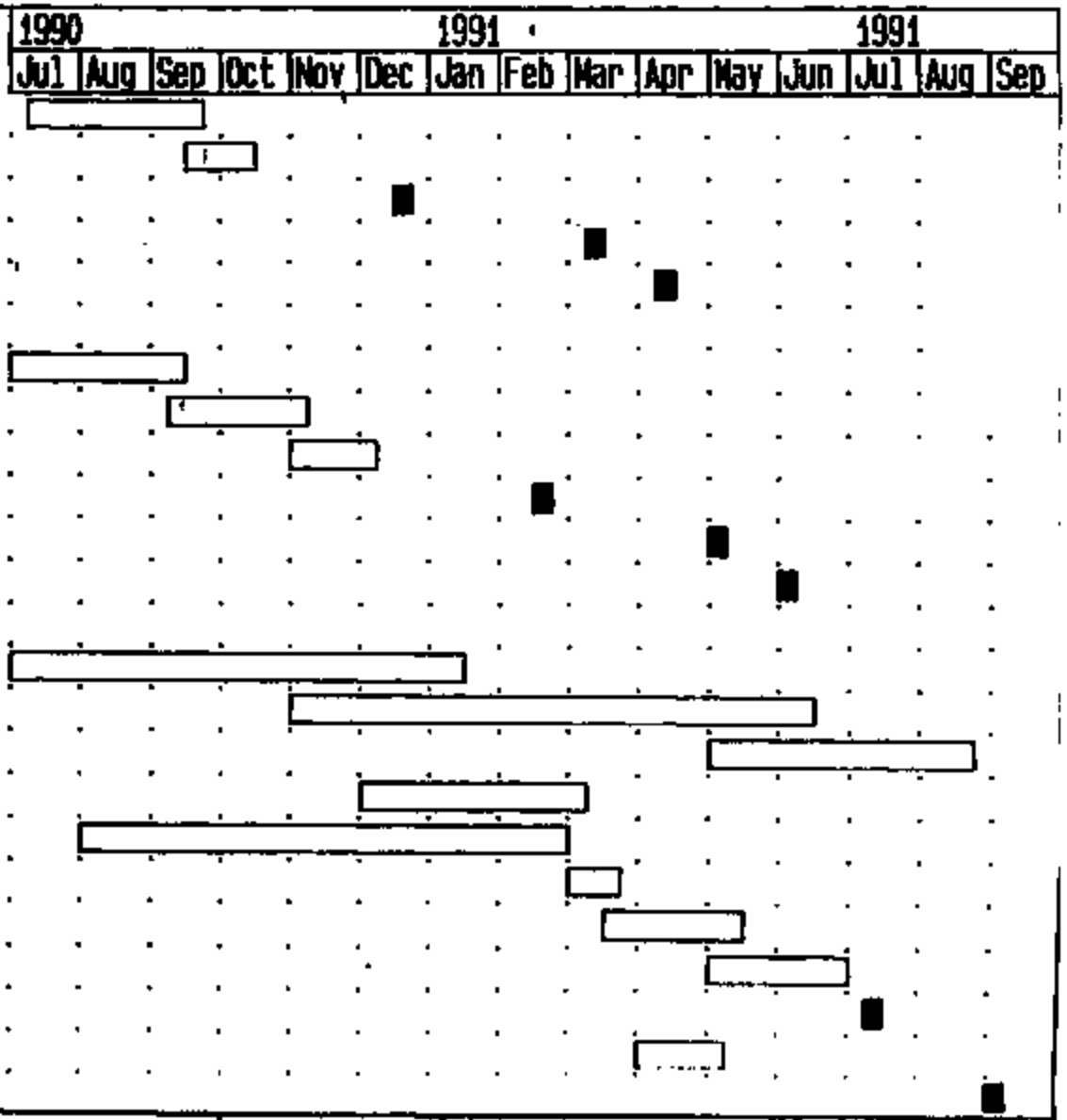
Fred, we welcome the opportunity to sit down with key program individuals at Ford to discuss these and other issues of interest to Ford. We understand there may be some difficulties in coordinating schedules such that everyone can attend a September 11 meeting. However, based on the issues at hand, we would stress the need for this meeting to take place at some time during the September time frame.

Sincerely,

Charles L. Douglas
Product Marketing Engineer
Precision Controls Department

cc: George Randall, Light Truck Engineering
Bruce Pease, Body and Chassis Engineering
Scott Kusch, SQA Engineer
Gary Klingler, Electronics Division
Joe Schuck, TI-FSE, Farmington Hills, MI
Steve Offiler, Design Engineering, Attleboro
Keith Roberts, Manufacturing Engineering, Attleboro
Dave Czarn, Design Engineering, Attleboro

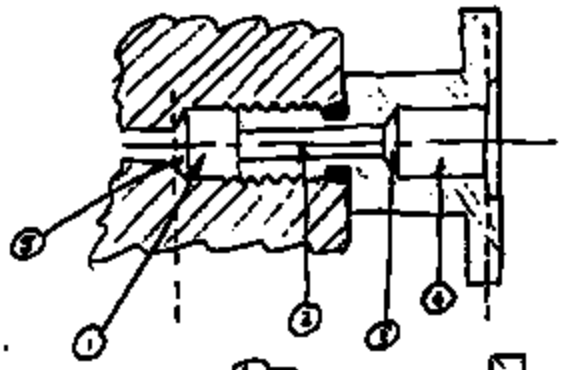
1	57LT ReValidation
2	57LT ISIR
3	LT Ph.1 Prod Sample
4	LT Ph.2 Prod Sample
5	57LT Job 0 MRD (4P)
6	
7	57PC Design-Sensor
8	57PC RV
9	57PC ISIR
10	PC Ph.1 Prod Sample
11	PC Ph.2 Prod Sample
12	57PC Job 0 MRD (4P)
13	
14	Assembly Equip.Desig
15	Assembly Equip.Build
16	Assembly Equipment D
17	Pilot Line
18	Component Tooling
19	Pilot Initial Sample
20	77 PV
21	77 IP-1
22	77 IP-2 BEGIN
23	77 ISIR
24	77 Job 0 MRD (4P)



Noncritical
Critical
Slack
Milestone
Project: COPSN
Date: Aug 28, 1990 2:43 PM

CRUISE CONTROL PRESSURE SWITCH

TI-HMTSA 001041



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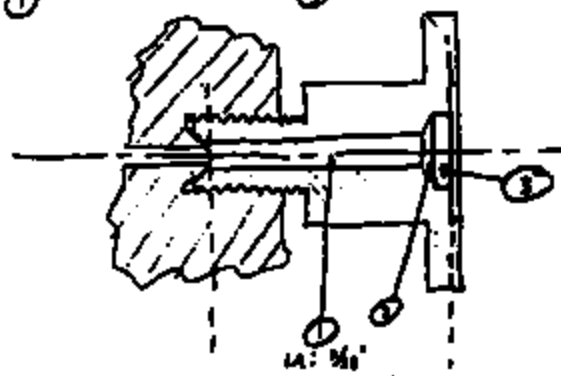
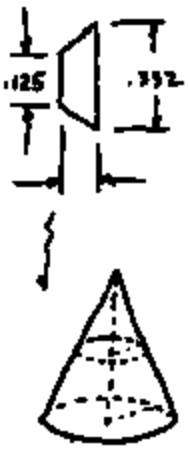


II A, B

I: ⑤ .125 .332



$V = \frac{1}{3} A_b H$

$V_1 = \frac{1}{3} A_1 H_1$

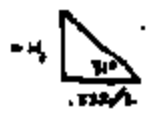
$V_2 = \frac{1}{3} A_2 H_2$

$V = V_1 - V_2$

$V_1 = \frac{1}{3}\left[\left(\frac{\pi}{4}\right)(.332^2)\right](.0997) = 2.8778$

$V_2 = \frac{1}{3}\left[\left(\frac{\pi}{4}\right)(.125^2)\right](.0376) = 1.530$

$V = 2.7283 E-3 \ in^3$ ⑤



$\tan 31° = \frac{2H_1}{.332}$

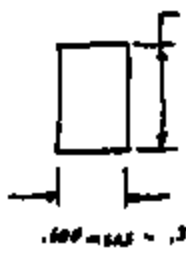
$\frac{.332 \tan 31°}{2} = H_1$

$H_1 = .0997$

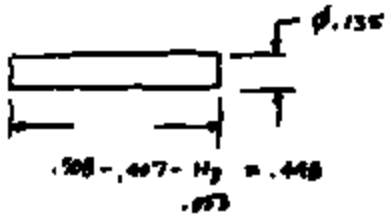
$\tan 31° = \frac{H_2}{.125/2}$

$\frac{.125 \tan 31°}{2} = H_2$

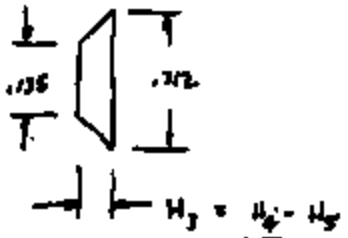
$H_2 = .0376$



$V = Ah = \left(\frac{\pi}{4}\right)(.132)^2(.325) = 1.948\,E-2\ in^3$ — ①



$V = Ah = \left(\frac{\pi}{4}\right)(.135)^2(.448) = 6.413\,E-3$ — ②



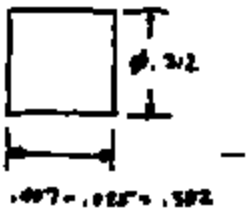
$H_4 = \frac{.372 \tan 31°}{2} = .09373$

$H_5 = \frac{.135 \tan 31°}{2} = .04056$

$V_4 = (1/3)\left[\left(\pi/4\right)(.132)^2\right](.09373) = 2.3818\,E-3$

$V_5 = (1/3)\left[\left(\pi/4\right)(.135)^2\right](.04056) = 1.935\,E-4$

$V = 2.196\,E-3$ — ③

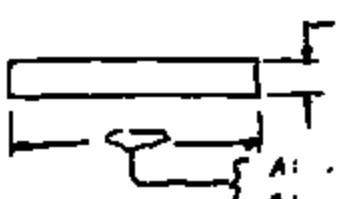


$V = \left(\pi/4\right)(.312)^2(.382) = 2.921\,E-2$ — ④

I. TOTAL VOLUME $= \sum_{n=1}^{5} V_n = 1.002\,E-2 = .0600\ in^3$ — (I)

$\frac{.06\ in^3}{2.54^3\ cm^3/in^3} = 0.98\ cc$

II ①



A: .998 − .125 − H_7 − H_{10} = 0.639
B: .998 − .125 − H_8 − H_{11} = 0.679

H_7 = H_5 − H_6 = .07830
H_8 = H_5 − H_8 = .05513

H_6 = .235 tan 40°/2 = .13050

H_7 = .094 tan 40°/2 = .05220

H_8 = .135 tan 40°/2 = .07497

V_A = (π/4)(.094)²(.639) = 4.435E-3 (1A)

V_B = (π/4)(.135)²(.679) = 9.648E-3 (1B)

②

H_9 = .312 tan 34°/2 = .09373

H_{12} = .094 tan 34°/2 = .02824

H_{13} = .135 tan 34°/2 = .04056

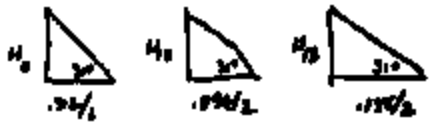
A: ϕ.094
B: ϕ.135

H_{10} = H_4 − H_2 = .68549
H_{11} = H_4 − H_3 = .85317

V_L = (1/3)(π/4)(.312)²(.09373) = 7.309E-3

V_{SA} = (1/3)(π/4)(.094)²(.02824) = 6.533E-6

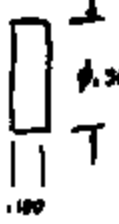
V_{SB} = (1/3)(π/4)(.135)²(.04056) = 1.936E-4



V_A = V_L − V_{SA} = 2.324E-3 (2A)

V_B = V_L − V_{SB} = 2.116E-3 (2B)

③



V = π/4 (.312)²(.100) = 7.645E-3 — ③

II A TOTAL VOL = .01440 in³ = .236 cc (Δ 0.004 cc)

II B TOTAL VOL = .01952 in³ = .320 cc

/10 dizi/94

BOTTOM LINE (S):

I. INITIAL: 0.983 CC

A. FINAL (SMALL 3/32 HOLE): 0.336 CC

B. FINAL (LG .135 HOLE): 0.320 CC

% REDUCTION A (O-RING-TO-3512 SMALL HOLE) = $\frac{.336 - .983}{.983} \times 100 =$ -76.0 %

% REDUC. B (ORING-TO-3512 LG HOLE) = $\frac{.320 - .983}{.983} \times 100 =$ -67.4 %

Δ 8.6 %

THIS DELTA OF 8.6% IS TI SWITCH ONLY - VIEWED IN TERMS OF OVERALL SYSTEM, CAPACITY IN 100'S OF CC'S, IS SMALL FRACTION OF ONE PERCENT. (OR SINGLE HUNDREDTH'S OF ONE PERCENT)

HIGHLIGHTS
Stephen B. Offiler
Week Ending 08/30/90

FORD MY91.75 CRUISE CONTROL PRESSURE SWITCH 77PS

I've been in contact with Bruce Pease at Pass-Car Brake Eng. several times this week. He has an immediate need for the latest envelope print revision, which shows the larger through-hole size. Drafting needs their priorities rearranged for this to happen.

Bruce has reworded the ES to include the fluid resistance spec. He originally interpreted it as a parallel test, when in fact it is a serial test. Once he was clear on this point, he produced a production validation flow chart showing how the fluid test fits in. 36 devices will undergo the fluids test, then be split up into sub-groups to undergo salt spray, humidity, impulse, and terminal strength. The fluids test stretches the time to complete the PV from about 6 weeks to about 11 weeks.

We completed an accelerated version of this test, compressing it by reducing dwell times while increasing ambient temperature. The devices easily passed the acceptance criteria, which is actuation, release, mV drop, current leakage, and pencil. Dissection showed very small amounts of fluid (reddish in color, indicating ATF, but other clear liquids certainly could have been mixed in) had penetrated the crimp ring and the cap crimp. However, no evidence of fluid could be seen in the switch cavity.

We received another RMR from Ford. This was one of the 90 psi devices we built for testing at the 125 +/- 35 psi spec limits. It was on an internal Ford test, not a fleet in the field. The observed failure mode was leakage. We have proofed the part, and in doing so discovered that the device held fluid under pressure but leaked upon release of pressure. This is typical of a questionable crimp. Bruce has requested that we replace this part, and supply two more sets of 90/160 devices for more testing.

Per the request of Ford ELD, we are setting up to test our devices using inductors instead of the actual loads. We have received 25 inductors at 300 milliHenrys (nominal). We plan to test the actual inductance of these devices by employing an L-R circuit, energizing it with DC, and capturing the exponential voltage rise curve on a scope. L can be calculated from this curve. We will also test the clutches we have in-house with the same circuit for comparison. Furthermore, we will also test the transient produced by the inductor and by the clutch in the actual circuit, with and without the flyback diode.

Elco has responded with results of their capability experiment on the .233 - .237 JS12 chamfer dimension. They can statistically hold only +/- .005, two and a half times wider than needed. We are getting good support from Purchasing on this issue, and we're scrambling for alternatives. Elco has offered to cold-head blanks and send them out to a screw-machine house for second-op's.

We've received about 95 reworked hexpons from the Model Shop. These look particularly good, mostly because they were fixtured by referencing off of the thread. We are having them stripped and replated now for use in PV testing.

I am in the process of creating a schedule for the FV and ISIR. This requires significant effort to juggle priorities and resources in the most effective manner. The list of activities presently stands at 34 separate but interrelated items, and is growing. The most significant contributor to the critical path by far is the 38-day fluid resistance span. Tentatively, this schedule is showing completion of the FV on 11/13/90, which misses the date of 10/15/90 supplied by Ford for completion of ISIR. FV is one of several things which are supposed to be done for submission of ISIR.

We've been able to arrive upon a method to adapt our present aluminum manifolds to the J512 male. Jeff located an adapter which has a 3/8"-24 J512 on one side and a 1/8"F NPT on the other. These are made by Dana Corp. Weatherhead Div. and supplied to TI by Pelletier's Automotive. We will rework the manifolds for 1/8"F NPT, and connect using a 1/4 x 1/8 male adapter. We plan to Loc-Tite the adapters into the manifold because the aluminum pipe threads will not tolerate repeated usage. This will allow us to refresh the J512 seal repeatedly by replacing only the J512 x 1/8 adapter.

We have begun the life test of the Light Truck 250 psi discs. It will be complete sometime over the long weekend, and results will be available Tuesday.

TO: BILL SWEET
FM: MATT SELLERS
SJ: HIGHLIGHTS, W/E 8/31/90

9115-9-15 . . . DESIGN ENGINEERING IS WORKING WITH BOB COOPER ON THE DISC ANALYSIS. FORCE DEFLECTION EVALUATIONS ON THESE DISC/CONTACT ASSEMBLIES SHOULD BE COMPLETED FOR A MEETING NEXT TUESDAY, 9/4/90. THIS DATA SHOULD PROVIDE A TRUE PICTURE OF HOW NARROW THE STABLE OPERATING RANGE OF THIS DISC ACTUALLY IS.

THERE HAS BEEN RESISTANCE FROM MANUFACTURING ON MANUF. ENG. INSTRUCTIONS TO INITIATE A 100% RATE CHECK SCREEN ON THESE DEVICES. MANUFACTURING HAS INDICATED THAT THEY WISH TO PURSUE REDUCING THE TIME CHECK SCREENING WINDOW FROM (5 SECONDS) TO (3 SECONDS). UNREASONABLE IN MY OPINION. OPENING THE TIME WINDOW TO (6 SECONDS) AND PERFORMING A 3% FUNNEL AT RATE CHECK WILL NOT ONLY REDUCE PILOTING DIFFICULTIES, BUT WILL ALSO ELIMINATE THE EXPENSE OF SORTING AND RE-SORTING WHICH IS MOST LIKELY MORE EXPENSIVE IN THE LONG RUN.

7855 STATIONARY TERMINALS . . . PROBLEMS THIS WEEK IN THE TIME/RATE CHECK AREA ON 7855 DEVICES. A STATIONARY CONTACT FELL OUT OF A DEVICE DURING ELECTRICAL CYCLING. THIS WAS A RESULT OF THE CONTACT NOT BEING PROPERLY BRAZED TO THE DEVICE TERMINAL. SUBSEQUENT INSPECTION OF TERMINAL ASSEMBLY STOCK REVEALED TWO TERMINALS THAT WERE MISSING CONTACTS ALTOGETHER. ALL IN-PROCESS MATERIAL HAS BEEN PLACED ON HOLD.

A MEETING WITH THE BRAZER, FIREBALL HEAT TREAT, REVEALED THAT THEY HAD REDUCED THE BRAZING OVEN TEMPERATURE FOR THE LAST SCHEDULED ORDER TO REDUCE THREAD DISTORTION. NO HEADS UP WAS GIVEN TO T.I. ON THIS PROCESS CHANGE.

ALL IN-PROCESS MATERIAL AND IN-STOCK MATERIAL IS CURRENTLY BEING 100% SCREENED FOR BRAZE JOINT FAILURE BY WAY OF A NON-DESTRUCTIVE IMPACT TEST. NO NEGATIVE BILLINGS IMPACT IS ANTICIPATED.

<0Gd0s0B

DISC LIFE TEST ON 27.01/12.5# DISCS TEST 82-09-12 JAD 9/4/90

DEVICE #	DISC INIT ACT	DISC INIT REL	DEVICE INIT ACT	DEVICE INIT REL	POST-PROOF ACT	POST-PROOF REL	500K CYC ACT	500K CYC REL	DISC FINAL ACT	DISC FINAL REL
82-09-01	26.8	11.8	248	107	248	108	257	115	24.9	11.3
82-09-02	26.9	12.4	242	112	236	112	246	115	24.5	10.4
82-09-03	27.1	11.9	254	100	249	100	254	111	24.7	11.3
82-09-04	26.8	12.1	247	109	241	113	252	114	24.3	[illegible]
82-09-05	26.9	11.8	245	100	236	102	241	106	24.1	10.7
82-09-06	27.2	12.1	242	100	235	102	245	108	24.5	11.0
82-09-07	26.7	11.9	242	99	238	102	241	108	24.4	11.0
82-09-08	27.3	12.3	257	106	250	109	255	112	25.0	11.2
82-09-09	26.8	11.7	245	106	240	107	249	112	24.6	10.9
82-09-10	26.6	11.7	252	106	247	107	257	108	24.7	11.0
82-09-11	28.5	9.8	235	102	234	103	247	109	24.4	10.8
82-09-12	27.2	12.0	250	108	244	109	253	112	24.9	10.9
AVG.	27.0	11.7	247	105	242	106	250	111	24.5	10.9
STD.	0.48	0.63	5.83	4.07	5.63	4.09	6.24	2.68	0.25	0.14

<0Gd0s0B

PRESSURE SWITCH DATA Form 21605 **TEST NO.** 93-5-25

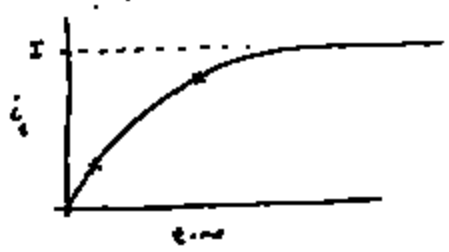
DEVICE	DATE REQUESTED	REQUESTED BY	REQUESTED COMPL. DATE
E13413	9/4/90	DBT	
PERFORMED BY	**DATE STARTED**	**DATE COMPLETED**	**APPROVED BY**
JAD	9/5/90	9/7/90	

PROJECT TITLE: Cruise Control Pressure Switch

CUSTOMER:

PURPOSE OF TEST: Inductor value test. Ford specs our inductor loads at 300 mHy min and the actual loads are recorded 300 mHy +50 -20 %. Therefore, it is necessary to test the inductance of each inductor.

PROCEDURE: on next page



$R_{tot} = R + R_L + R_{shunt}$

$i_L = \left(\frac{V}{R_{tot}}\right)\left(1 - e^{-(R_{tot})(t)/L}\right)$

TIME CONST. $T = L/R$, TIME FOR i_L TO REACH 63.2%

2T	→ 86.5%	5T	→ 99.3%
3T	→ 95.0%	6T	→ 99.8%
4T	→ 98.2%	7T	→ 99.91%

R_{tot} "IDEAL" = 13.800 / .798 = 17.293 Ω

TIME CONST = .3 / 17.293 = .017 sec .634 (.798) = .474

THE "IDEAL" CKT SHOULD REACH 474 mA IN 17 mSEC

SCOPE TRACE SHOULD BE MEASURED AT 17 mS, 180 mSEC

$L = \frac{-R_{tot}\, t}{\ln\left(1 - \frac{i_{tot}}{V}\right)}$

ALLOW SOLVING FOR L BASED ON i AND t FROM CURVE

$i = \frac{V_{tot}}{R_{tot}}$

CAPTURE TRACE ON SCOPE; PRINT THEN RANDOM PTS ON CURVE AS SHOWN ABOVE CALCULATE L FOR EACH, TAKE AVG.

$R_{tot} = 25.21\ \Omega$

$r_{shunt} = 22.10\ \Omega$

$V_{tot} = 13.865$ V

CHOOSE $V = 3.632$

$t = .01$

$L = \frac{-(25.21)(.01)}{\ln\left(1 - \frac{(25.21)(3.632/22.10)}{13.865}\right)}$

"L" #	Vtest 1	Ttest 1	L value 1	Vtest 2	Ttest 2	L value 2	Ave. L
1	3.620	0.01040	0.6662	0.420	0.03000	0.5731	0.6196
2	4.015	0.01000	0.5864	0.935	0.03000	0.5031	0.5448
3	3.910	0.01000	0.6061	0.620	0.03000	0.5452	0.5757
4	3.665	0.01040	0.6563	0.490	0.03000	0.5632	0.6098
5	4.380	0.01000	0.5370	0.870	0.03000	0.5116	0.5247
6	4.450	0.01040	0.5146	0.845	0.03000	0.4988	0.5017
7	4.230	0.01040	0.5491	0.810	0.03000	0.5196	0.5344
8	3.740	0.01040	0.6402	0.605	0.03000	0.5473	0.5938
9	4.190	0.01040	0.5550	0.760	0.03000	0.5263	0.5410
10	4.165	0.01000	0.5604	0.735	0.03000	0.5296	0.5448
11	4.395	0.01040	0.5230	0.895	0.03000	0.4940	0.5085
12	4.560	0.01000	0.4986	0.995	0.03000	0.4696	0.4841
13	4.195	0.01000	0.5550	0.710	0.03000	0.5330	0.5440
14	4.210	0.01000	0.5525	0.700	0.03000	0.5263	0.5394
15	4.200	0.01000	0.5541	0.755	0.03000	0.5269	0.5405
16	4.240	0.01000	0.5475	0.805	0.03000	0.5203	0.5339
17	4.130	0.01000	0.5660	0.680	0.03000	0.5371	0.5515
18	4.135	0.01000	0.5651	0.640	0.03000	0.5425	0.5538
19	4.195	0.01000	0.5550	0.715	0.03000	0.5323	0.5436
20	4.370	0.01000	0.5260	0.995	0.03000	0.5005	0.5136
21	4.185	0.01000	0.5566	0.715	0.03000	0.5023	0.5045
22	4.190	0.01000	0.5558	0.725	0.03000	0.5310	0.5434
23	4.215	0.01000	0.5516	0.750	0.03000	0.5276	0.5396
24	4.190	0.01000	0.5712	0.620	0.03000	0.5452	0.5582

"L" #15 calculated manually @ .5K/BY

PRESSURE SWITCH DATA Form 21603 TEST NO. 94-15-03

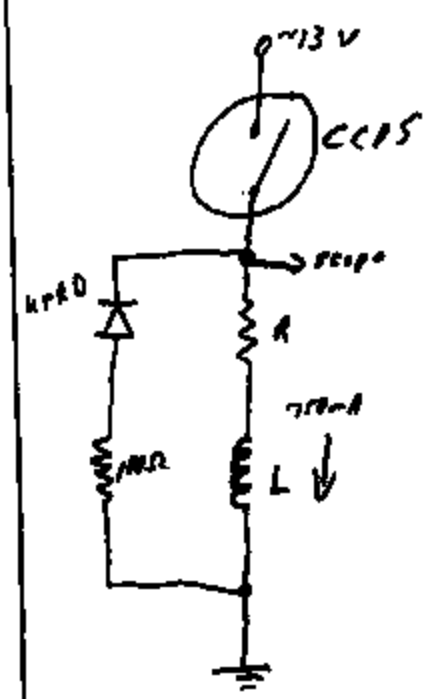
DEVICE	DATE REQUESTED	REQUESTED BY	REQUESTED CLOSE DATE
Ex 3413	9/5/90	SGB	
PERFORMED BY	**DATE STARTED**	**DATE COMPLETED**	**APPROVED BY**
JAL	9/5/90	9/6/90	

PROJECT TITLE: Cruise Control Pressure Switch

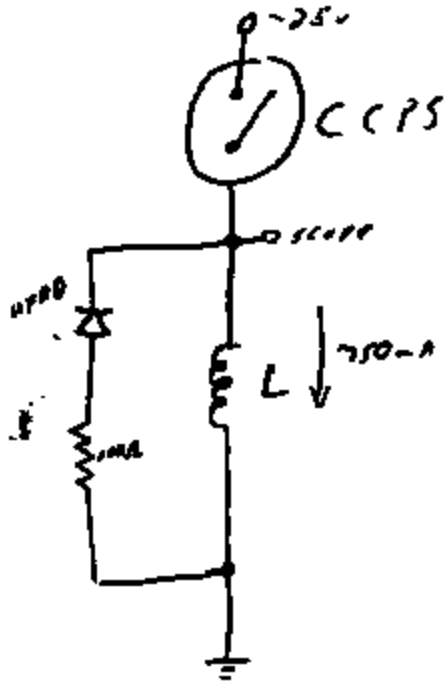
CUSTOMER:

PURPOSE OF TEST: To compare the transient produced by the new .3 MF inductors to the transient produced by the old clutch loads. This test will be run with and without the Flyback diode.

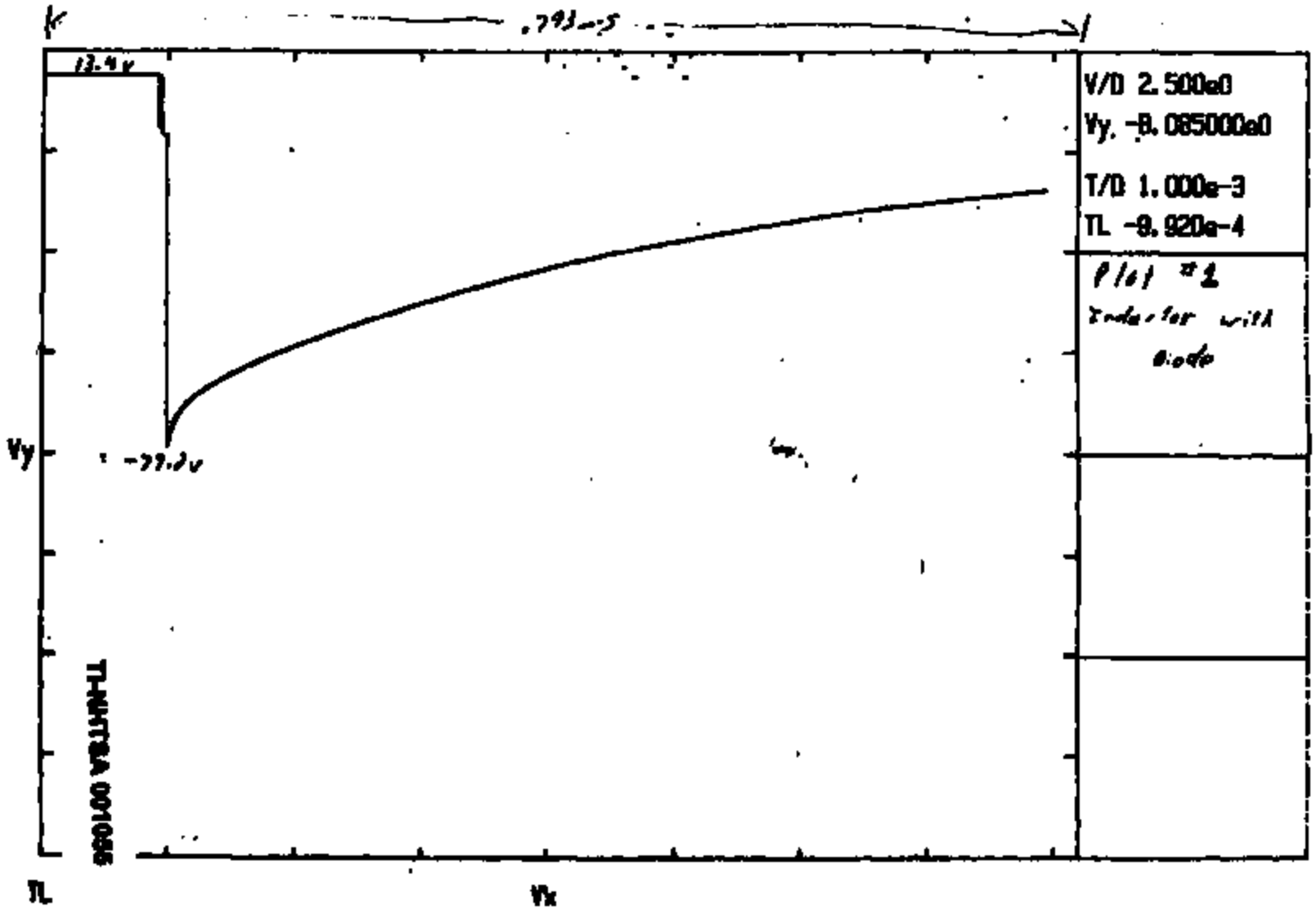
PROCEDURE: Construct the circuit shown on next page. Open the CCRS with air pressure and capture the transient with the scope.

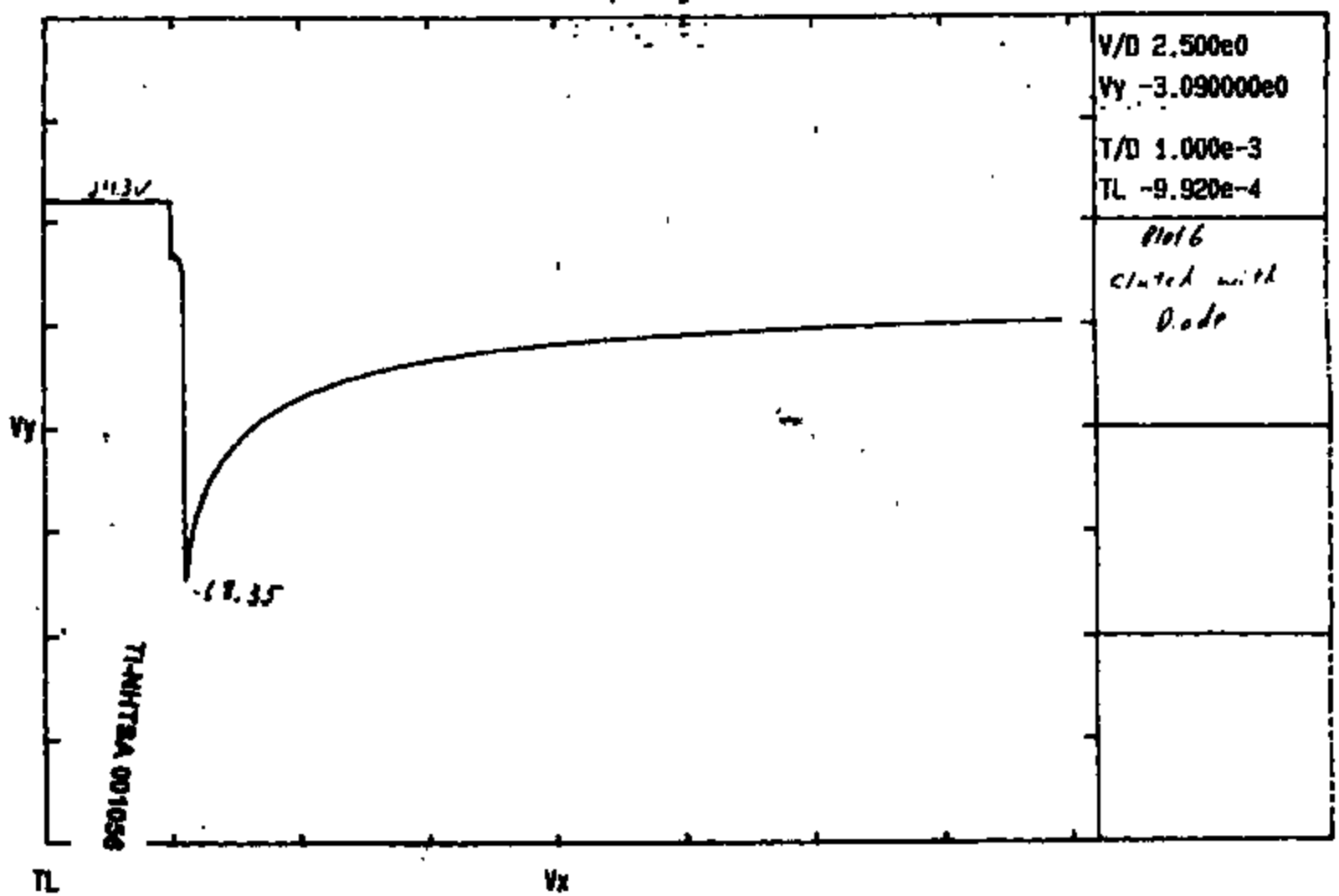


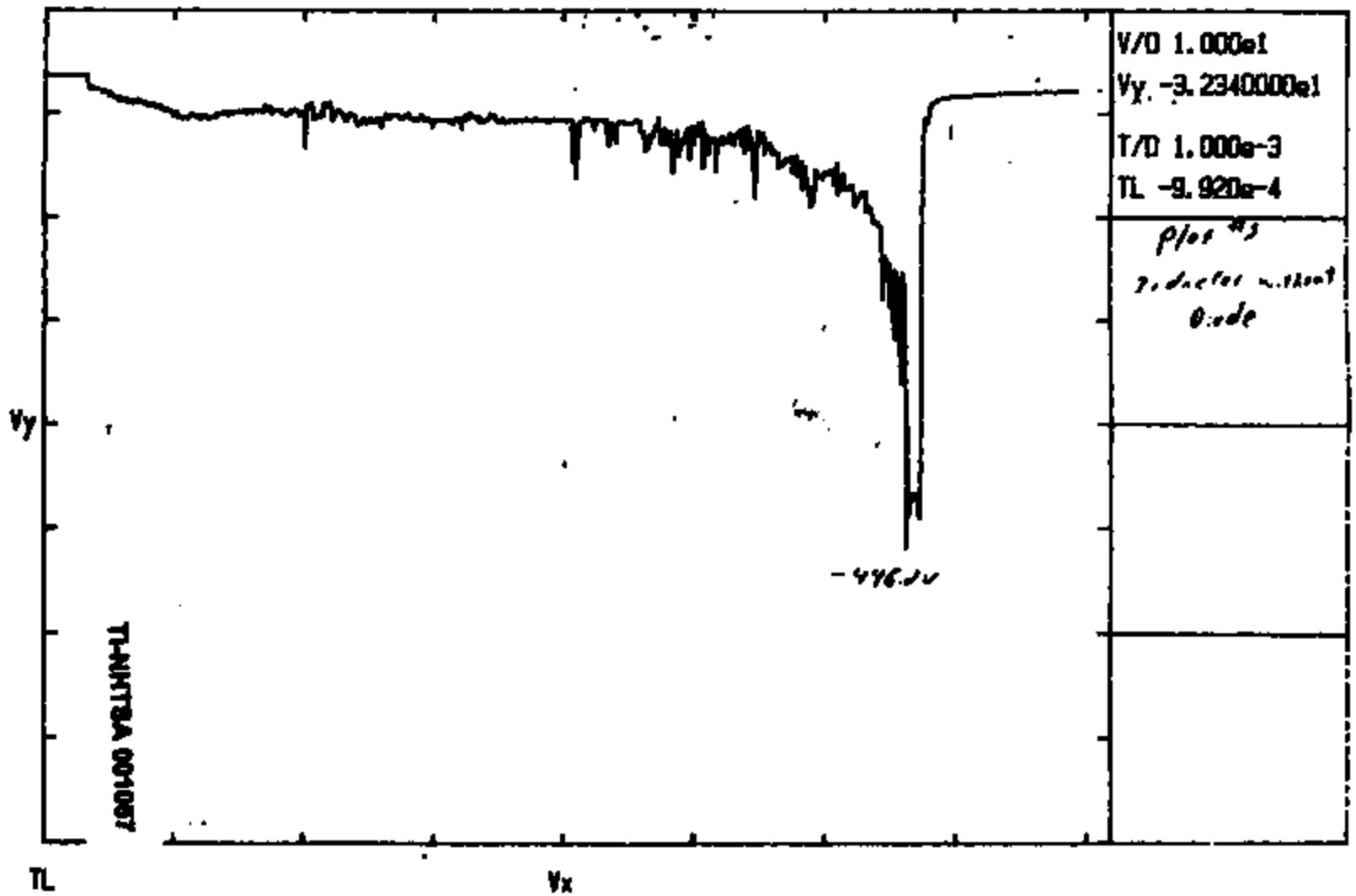
Inductor

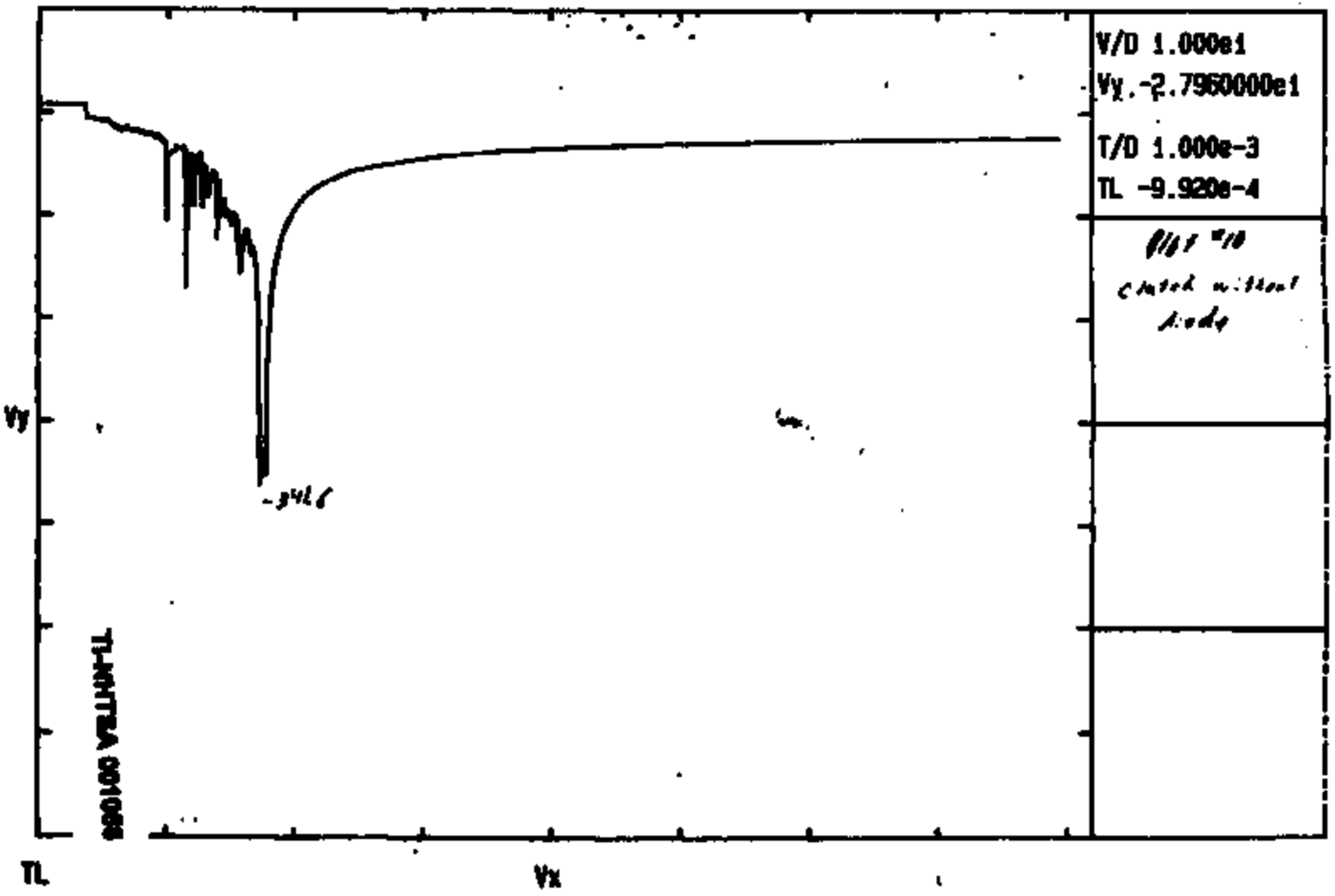


Coiled


.793m-5
13.4v
-77.2v
V/D 2.500e0
Vy. -8.085000e0
T/D 1.000e-3
TL -8.920e-4
Vy
TL
Vx
THRUSTER 001036


V/D 2.500e0
Vy -3.090000e0
T/D 1.000e-3
TL -9.920e-4
Plot 6
Vy
TL
Vx


V/D 1.000e1
Vy -3.2340000e1
T/D 1.000e-3
TL -9.920e-4
plot #3
Vy
TL
Vx
TANKTRA 001007


V/D 1.000e1
Vy.-2.7960000e1
T/D 1.000e-3
TL -9.920e-4
Vy
TL
Vx

HIGHLIGHTS
Stephen B. Offiler
Week Ending 09/07/90

FORD MY91.75 CRUISE CONTROL PRESSURE SWITCH 77PS

Mike DeMaria has recently received important news from Ford SQA Scott Karsch. Since we are Q1 on the 14BT, we are "initial sample acceptance level 1" meaning that we are required to submit only a single piece of paperwork, the Initial Sample Warrant, for ISR. This assumes we have satisfactorily completed all required tests, material cert's, etc. but we do not have to submit this additional paperwork on the ISR data. We must have all supporting data available upon request.

Bruce Pease has informed me that our latest print submission, along with the Engineering Specification, have been officially entered into Ford's system. To the best of my knowledge, this officially casts everything in concrete.

We've received an unofficial request for quotation from ELD for a Ford Australia application of the CCPS (probably the new convertible Capri) at volumes of 15K/yr. Details are lacking, such as hydraulic seal method and actuation/release spec's. I have a fax'ed sketch which shows the port having an M10 x 1.0 thread with a 45 degree chamfer to the root diameter. This is not an SAE J514 O-ring spec, nor does it look like the ISO flare. The M10 x 1.0 is slightly larger than our present 3/8 - 24 hexport, meaning different cold-heading tooling may be required.

We have received the inductors as specified by ELD for the powered portion of the hopsine test. We have measured the inductance of each using an L-R circuit. We have also experimented with comparing the transients created by the actual clutch and the inductor, with and without the flyback diode. With diode, the inductor produces a negative pulse of 80 volts which dissipates in less than 1 millisecond. The clutch produces a negative pulse of 70 volts and dissipates even quicker. The stored energy is obviously larger in the inductor, but with the diode in the circuit there still seems to be no cause for concern. Without the diode, the negative pulses from both inductor and clutch are obviously much larger, in the range of 300-400 volts, and arcing is evident. The arc is sustained much longer with the inductor.

Two detailed schedules of actions needed to complete Light Truck ISR have been developed. One shows the 35-day fluid test, the other shows no fluid test. We could complete ISR by 10/15/90 without the fluid test. It will be mid-November to complete ISR with the 35-day test in place. We plan to discuss this with Ford during the meeting here on Sept. 18.

We have completed a 500K cycle test of the production-intent Light Truck 250 psi discs. Results were excellent. Devices averaged 246-psi actuation with sigma about 6, giving a Cpk of 2.55. After completion of cycles, recognizing changes will occur which affect device average and sigma, Cpk was still over 2.50. This is very encouraging.

We are working with Mfg. Eng. to develop a disc spec for the Pass Car low-ratio device. We've been using 26.2 psi discs, which produce devices slightly above the mean of 125 psi.

SAMPLE ORDER

ORDER NO: CO-80

REQUEST DATE: 09/10/90

CREDIT ACCOUNT: 5902

COST CENTER: 101

PRODUCT CODE: 060

CUSTOMER: KELSEY-HAYES COMPANY

CUSTOMER P.O. NO: A0E033046

TI PART NO: 57PSL5-3

CUSTOMER PART NO: 77PSL-2-2

QUANTITY: 10

PRICE: $50.00 EACH

DELIVERY PROMISED: 09/17/90

SPECIAL INSTRUCTIONS: USE 57PS HEXPORT WITH O-RING

BILL TO:
KELSEY-HAYES COMPANY
38481 HURON RIVER DRIVE
P.O. BOX 98
ROMULUS, MI 48174

SHIP TO:
KELSEY-HAYES COMPANY
ROMULUS PLANT
38481 HURON RIVER DRIVE
ROMULUS, MI 48174

PRODUCTION SAMPLES

XX ENGINEERING DEVELOPMENT SAMPLES

CC: ENGINEERING: STEVE OFFILER

PRODUCTION CONTROL: MARIE CROSSLAND

SALES ENGINEER: JOE SCHUCK

[redacted]

-MSG MR= 357759 FR=AMSD TO=AJN3 SENT=09/10/90 09:57 AM
RR=058 ST=C DIV=0050 CC=00157 BY=AMSI AT=09/10/90 09:57 AM

10 SEPTEMBER 1990

TO: DAVE CIARN ZARN
ANDY MCKENNA AUMI

CC: RAY TOLRANSKY PCME
KEITH ROBERTS PCME

FROM: JOHN KOURTESIS MDES

SUBJECT: CPS RIVETLESS CONNECTION OF MOVEABLE ARM (SPRING) TO TERMINAL

PER YOUR INPUT WE ARE GOING TO DESIGN THE ASSEMBLY EQUIPMENT TO USE A RIVET TO JOIN THE SPRING TO TERMINAL. WE HAVE BEEN DISCUSSING THIS RIVETLESS JOINT OPPORTUNITY FOR OVER A YEAR NOW AND I'M DISAPPOINTED THAT WE CAN'T USE WHAT APPEARS TO BE A PERFECT FIT FOR THIS PROCESS. I RECOGNIZE THAT NOW BECAUSE OF OTHER PRODUCT DESIGN ISSUES TIME IS NOT AVAILABLE TO ENABLE THE RIVETLESS JOINT PROCESS, BUT I DO BELIEVE WE ARE MAKING A MISTAKE. IF THERE IS ANY CHANCE OF REVERSING THIS DECISION WE WILL WORK WITH YOU TO INCORPORATE THE PROCESS IN THE ASSEMBLY EQUIPMENT.

REGARDS,
JOHN KOURTESIS

John - See Me

MD

F-ND-5

YES Corrective Action Required
NO
Maintained
Individually
Automated Controlled Data?

SUPPLIER PLANT VISITS, FALL 1990
LIST OF QUESTIONS AND ISSUES

1. Review entire process in order including:
   A. Process sheets

   B. Control Plan
      - are there two plans, one for manuf & one for Ford?

   C. Design FMEA
      - is it the same as your copy?
      - if not, get a copy

   D. Manuf FMEA ←
      - review & get a copy

   E. List of Significant and Critical Characteristics for each part
      - this must be defined before leaving (take blank form along)

   F. Plant Review including:
      - shipping/receiving
        - are parts tagged?
        - are parts quarantined?
        - list of material suppliers
        - list of sub-suppliers

      - receiving inspection
        - equipment available?
        - written plan (sample size, written action plan, etc..)
        - drawing availability?
        - are parts tagged?
        - is sub-supplier data reviewed?
        - are parts quarantined if bad?
        - is there a written acceptance/rejection process?

9/18/90

Pathfinder Alert 5-7P/S

"Control Plan" - Outline SPC, In-Process, Final QC
Tour Rec. Insp.

KEY CONTROLLING ACTIVITY NO REQ'D?
RESPONSIBLE INDIVIDUAL?
ANTICIPATED COMPLETION DATE?

SUPPLIER PLANT VISITS, FALL 1990
LIST OF QUESTIONS AND ISSUES

1. Review entire process in order including: (cont)

F. Plant Review including: (cont)

- manufacturing process
  - inspect each press/machine
  - inspect each gage/in process measurement
  - inspect each lab/in process measurement
  - inspect each material transfer
  - look in all bins and floor
  - talk to operators

- in-process inspection
  - where are the charts?
  - who does the inspecting?
  - equipment available?
    - how is it calibrated?
    - when is it calibrated?
  - are the parts picked at random?

- check against Control Plan
  - if there is a problem, where is your written action plan?
  - is there a quarantine area?
  - are the parts tagged?
  - final inspection

- packing and shipping
  - how do they know what to ship?
  - what is the normal shipping size?
  - when was the last plant return?
    - for what reason?

- preventative maintenance program?
  - dies, presses, etc...

G. Control chart tracking
- short term
- long term

1. If there is a problem, what is the plan to deal with it (written plan)?

2. Who is the quality control manager for the specific part(s)?

3. Who is the person responsible for incoming receiving inspection?

4. What is the track record of each of the sub-suppliers?
   - review sub supplier C_p & C_{pk}
   - review what they have chosen as critical and significant

5. What is the C_p and C_{pk} for each of the Significant Characteristics? Record C_p and C_{pk} data on all critical and significant items. Be sure to include the previous two quarters as well as the latest lot run.

6. Get example copy of control chart on a critical or significant dimension.

7. Who has access to each of the quarantine areas?

8. Who does prototype work?

9. Who does die work (design, build, etc...)

10. How much change in personnel ?
    - Worker level
    - Office level

11. Plans for expansion or contraction or structural change?

12. What type of work do you do for other companies?

13. What improvements are you working on?
    - designs
    - inspection techniques
    - process capability
    - productivity improvements
    - any suggestions?

14. When setting up, how are you assured of proper dims, sta...

15. If there is an issue at the assy plant, who would respond?

16. Have you done any studies on competitive applications of similar components?

17. Have you done any studies on new concepts before there is a program targeted for the application?

18. What do you do when you have an out of control condition?

19. Is appropriate equipment and facilities available for measuring and testing?

20. Written maintenance program including tooling, gages, and general equipment maintenance.

21. What happens to rejected stock?
    - how is it identified?
    - how is it inspected if returned to production?

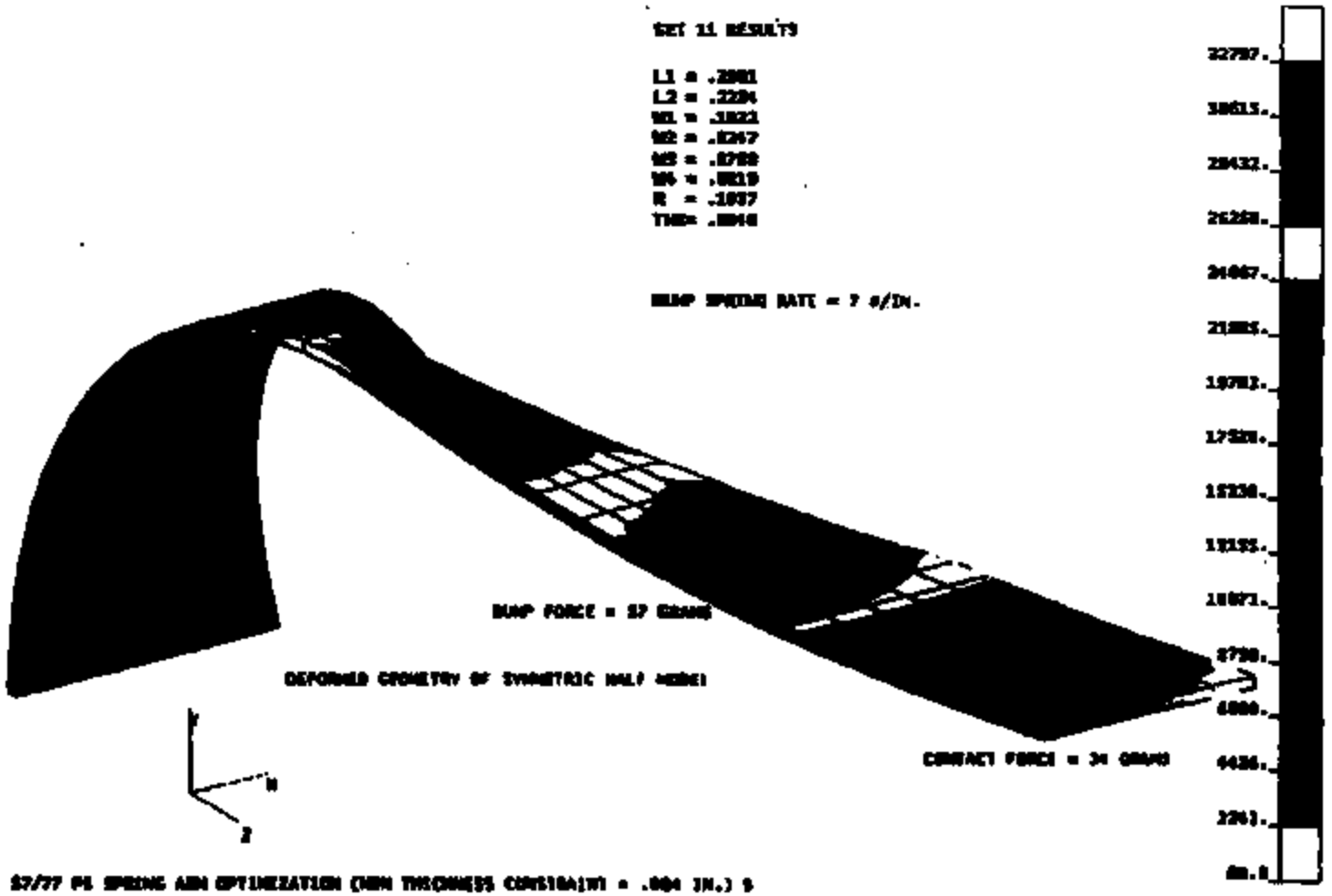
22. Do you have quality circles or some thing of that nature?

23. What is your biggest manufacturing problem?

24. Open discussion
    - anything they want to talk about?
    - any issues?

25. Write report, go through it with QC manager (and others if necessary), and have them sign it.

/u/ballard/visit.supp
900713



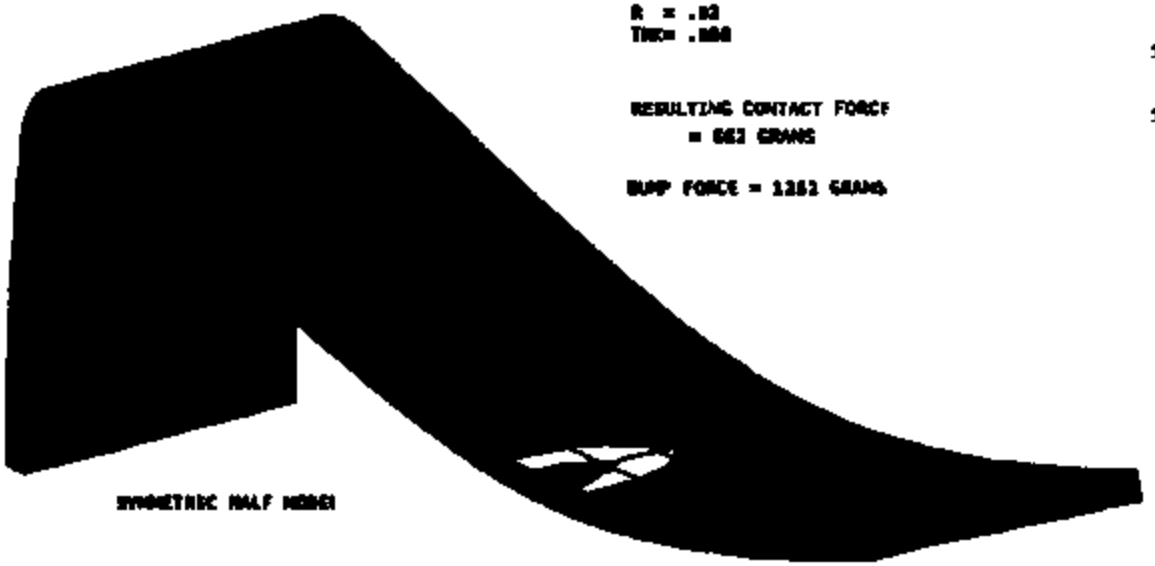
S7/77 P4 SPRING ARM OPTIMIZATION (MIN THICKNESS CONSTRAINT = .004 IN.) 9
PLOT OF VON MISES STRESS FOR OVERTRAVEL = .010 IN.

ORIGINAL DIMENSIONS

L1 = .489
L2 = .294
W1 = .09
W2 = .09
W3 = .09
W4 = .09
R = .02
THK= .050

RESULTING CONTACT FORCE
= 662 GRAMS

BUMP FORCE = 1252 GRAMS



SYMMETRIC HALF MODEL

F3P1 ORIGINAL SPRING ARM ANALYSIS (5/31/96)
DEFORMED GEOMETRY PLOT OF VON MISES STRESS (PSI) DUE TO .050 IN. OVERTRAVEL

SET 11 RESULTS

L1 = .3420

L2 = .2294

H1 = .1888

H2 = .0732

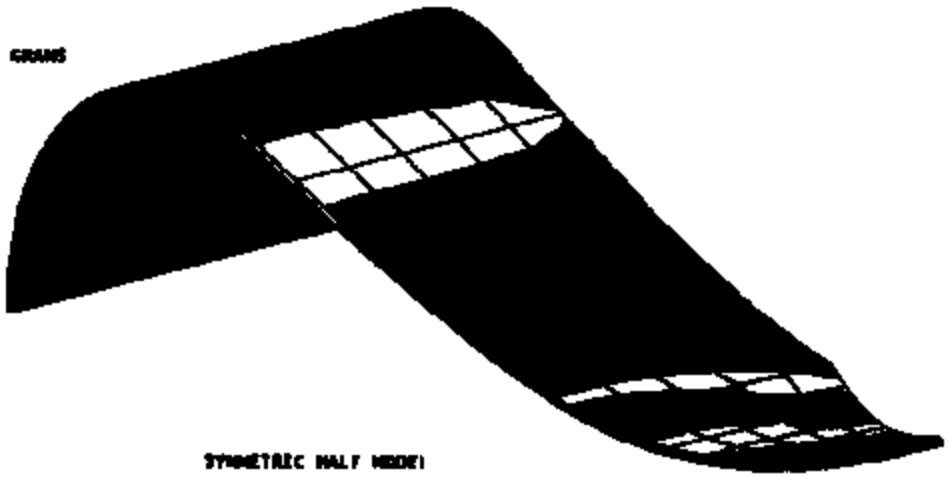
H3 = .0629

H4 = .0157

H = .0846

THK= .0018

CONTACT FORCE = 31.6 GRAMS



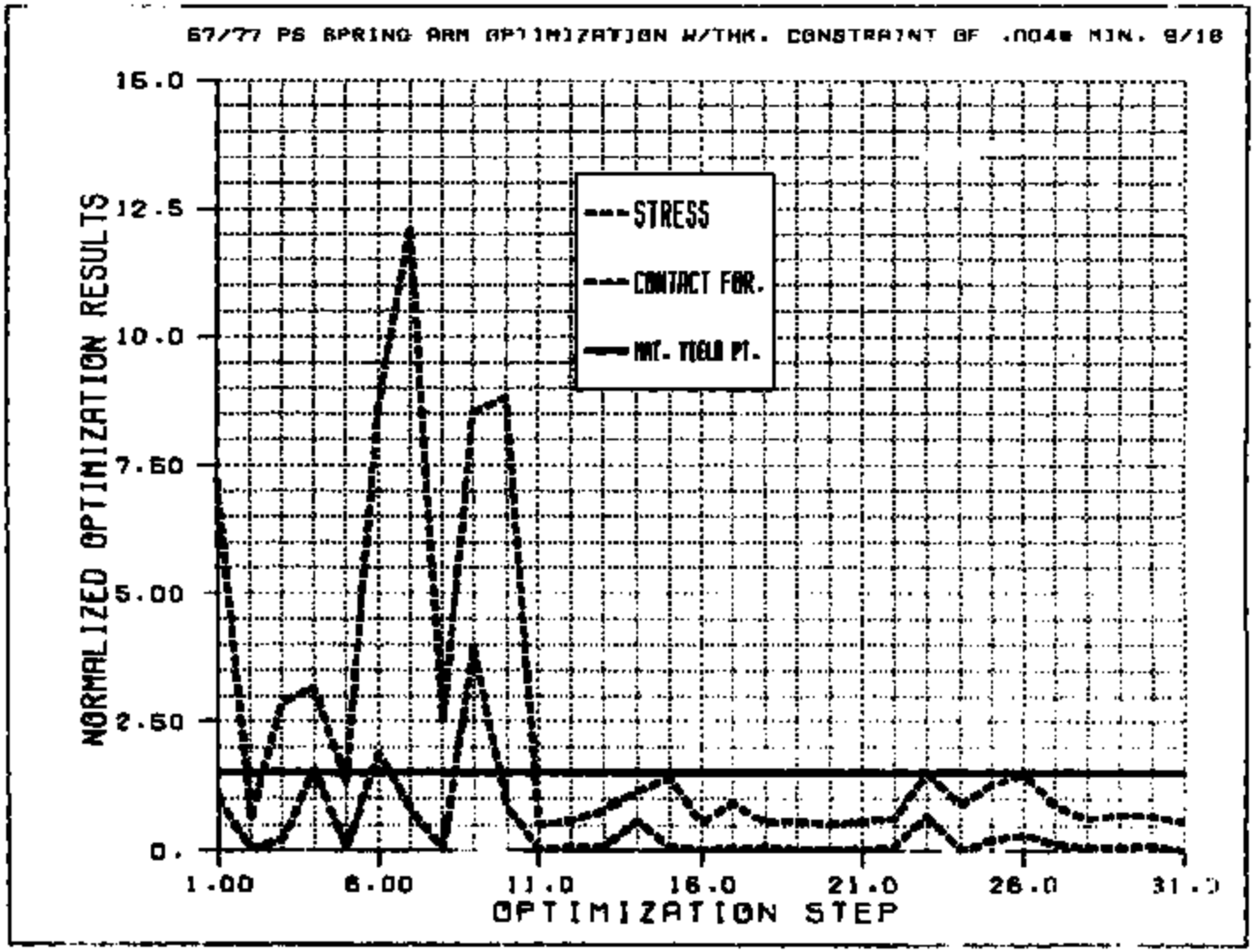
SYMMETRIC HALF MODEL

TYPE1 SPRING ARM ANALYSIS (TEST OF SET 11 OF ANSYS OPTIMIZATION) 8/11/98

DEFORMED GEOMETRY PLOT OF VON MISES STRESS (PSI)

OVERTRAVEL = .015 IN.

TI-HNTSA 001068



PRESSURE SWITCH DATA Form 21605 TEST NO. 95-C1-10

DEVICE	DATE REQUESTED	REQUESTED BY	REQUESTED COMPL DATE
Ex 3423	9/11/98	SAE	
PERFORMED BY	**DATE STARTED**	**DATE COMPLETED**	**APPROVED BY**
LAD	9/11/98	9/12/98	

PROJECT TITLE: Cruise Control Pressure Switch

CUSTOMER:

PURPOSE OF TEST: Sample build CO-80

PROCEDURE: Harness - long stalker
crimp ring - yellow per code
base - brown "L"
Cap - charge + Idle
Pins - 25/16 $

Position #	Y-cut	Act	Rel
95-C1-C1	Fuse		
11		111	49
12		104	47
04		117	45
15		123	51
11		117	43
01		121	49
09		117	45
05		128	47
10		124	51
11		107	41
12		126	51

-MSG M#= 412505 FR=ELB TO=PCQA SENT=09/12/90 09:06 AM
R#=085 ST=C DIV=0050 CC=00101 BY=ELB AT=09/12/90 09:06 AM

SEPTEMBER 12, 1990

TO: KARL ABRAHAMSON ELB
TED BREDIKIN MFPC
YOGEN CHEMBURKAR PCME
MIKE DEMATTIA PCQA
CHARLIE DOUGLAS CPPC
JOHN HAYNES PCQA
STEVE OPPITER ELB
KEITH ROBERTS PCME
JOE SCHUCK JIB
MATT SELLERS PCME
TIM SPOONER PCME
BILL SWEET PCME
JIM WOOD CPPC

CC: TOM CHARBONEAU TC
GARY SNYDER CPPC

FR: DAVE CZARN CZARN

SJ: FORD HPCO & CCPS 9/10/90 MEETING - TRIP REPORT

9:30 - 1:00 HPCO MEETING AT CLIMATE CONTROL DIVISION

ATTENDEES:
RON BREUHAN - FORD PRODUCT DESIGN ENGINEER
JOE SCHUCK - TI
DAVE CZARN - TI

RON IS THE ENGINEER RESPONSIBLE FOR DEVELOPING A MY 93 HPCO SWITCH AND APT WITH FORD'S F9LB SUBMERSIBLE CONNECTOR. FORD HAS CONTRACTED AFL PEP TO DESIGN THE CONNECTOR, AND DENNIS YERMACK IS FORD'S CONNECTOR CHAMPION. RON, THEREFORE, IS REALLY CONCERNED WITH ALL BUT THE CONNECTOR END OF OUR SWITCH. HE IS DEVELOPING THE ENG SPECIFICATION FOR BOTH THE HPCO SWITCH AND THE APT. OUR CONVERSATION WITH RON FOCUSED FIRST ON THE SPECIFICATION AND THEN ON SWITCH DESIGN.

SPECIFICATION

RON IS ALREADY ABOUT 2 WKS BEHIND SCHEDULE IN RELEASING THE SPEC. HE HAS MADE LITTLE OR NO PROGRESS SINCE OUR DISCUSSION WITH HIM 1 1/2 WEEKS AGO. BECAUSE IT WAS NOT COMPLETE AT THAT TIME, RON WOULDN'T GIVE US A COPY; HOWEVER, HE GAVE US THE UNFINISHED SPEC TODAY. WE PLAN TO REWRITE THE SPEC AND FORWARD TO HIM IN ABOUT 1 WEEK.

.CALIBRATION

RON'S DESIRE IS TO KEEP THE UPPER TOLERANCE OF SWITCH ACTUATION (OR CUT-OUT) VERY CLOSE TO THE RELIEF VALVE LOW LIMIT, WHILE ENSURING THAT THE LOW END WILL NOT CAUSE NUISANCE TRIPS. THE PRESSURE RELIEF VALVE SPEC IS 525 PSI NOMINAL, AND RON STATED THAT THEIR +/- 4 SIGMA CAPABILITY IS +/- 75 PSI. THEREFORE, THE LOWEST VALVE PRESSURE SET POINT SHOULD BE 450 PSI. RON ASKED FOR 430 +/- 15 PSI

[redacted] FOR 430
+/- 20 PSI.

ON THE RELEASE (OR CUT-IN) SIDE, THE COMPRESSOR GROUP IS PUSHING RON TO ALSO HOLD A TIGHT TOLERANCE. THEY'RE CONCERNED ABOUT TWO THINGS. FIRST, IF THE AMBIENT TEMPERATURE IS VERY HOT - RON CITED 120F AS AN EXAMPLE - HEAD PRESSURE CAN BE AS HIGH AS 450 PSI ON INITIAL START-UP. IF THIS OCCURS, THE HPCO SWITCH WILL DISENGAGE THE COMPRESSOR CLUTCH. THE SYSTEM MUST DEPEND ON RAM AIR COOLING TO REDUCE SYSTEM PRESSURE TO RESET THE SWITCH. THEY ARGUE THAT TOO WIDE OF A RELEASE SPEC WOULD RESULT IN EXCESSIVELY LONG RESET TIME FOR THE HPCO SWITCH, UNDER THE VERY UNIQUE CONDITION STATED ABOVE.

SECOND, THE COMPRESSOR GROUP WANTS A TIGHT SPEC ON RELEASE (AS WELL AS ACTUATION) SO THERE IS GOOD CONSISTENCY FROM SWITCH TO SWITCH. WITH SOME RELUCTANCE, RON AGREED TO 200 +/- 30 PSI ON THE RELEASE SPEC.

WITH THE TENTATIVELY AGREED UPON SPEC, WE ALSO TOLD RON THAT WE WOULD ASSESS TOLERANCING THE SWITCH BY ACTUATION AND DIFFERENTIAL (NOM. OF 230 PSI), RATHER THAN ACTUATION AND RELEASE; A WIDE DIFFERENTIAL WAS ONE OF RON'S MAIN CONCERNS, FOR THE REASONS STATED ABOVE.

CLEARLY, WE NEED TO GIVE THEM THE TIGHTEST SPEC FEASIBLE. SINCE GE IS NOT RAISING ANY CONCERNS OVER THE OPERATING PRESSURE TOLERANCES.

ACTION:
- DETERMINE CAPABILITY ON ACT/REL SPEC — CIARN — 9/17/90

IN BRIEF, RON WROTE THE REST OF THE SPEC AROUND A COMBINATION OF FORD'S CLUTCH CYCLING SPEC AND THE FORD-EUROPE HPCO SPEC.

ALL APPLICATIONS KNOWN TO RON WILL HAVE THE SWITCH WIRED DIRECTLY IN SERIES WITH THE CLUTCH COIL. THEREFORE OUR VALIDATION AND IN-PROCESS CYCLE TESTS SHOULD BE WITH APPROPRIATE CLUTCH LOAD. RON WANTS TO WRITE THE SPEC AS 5A MAXIMUM CURRENT AND 0.1A MINIMUM CURRENT; THE MINIMUM VALUE ASSUMES THAT SOME FUTURE APPLICATION MAY DRIVE THE CLUTCH THROUGH A RELAY. (HE WAS A BIT VAGUE HERE.)

.PRODUCTION VALIDATION

- RON WANTS TO COMBINE PRESSURE AND THERMAL CYCLING TESTS. HE COMMENTED THAT WE ONLY NEED TO PRESSURE CYCLE AT ABOUT 25C AND ABOVE.
- +/- 5% DRIFT OR ACT AND +/- 10% RELEASE IS ACCEPTABLE. HE WANTS TO RUN TO 20K PRESSURE CYCLES (NUMBER OF THERMAL CYCLES TBD) AS AN ACCEPTANCE CRITERIA. THEN RUN TO FAILURE. WE COMPROMISED AT ENDING THE TEST AT 4X LIFE - OR 80K CYCLES.
- HIGH TEMPERATURE TESTING WILL BE CONDUCTED AT 250F, WHICH IS MORE APPLICABLE THAN THE PREVIOUSLY SPECIFIED 200F.
- RON DOES NOT CARE IF WE "SELF-CYCLE" THE SWITCHES AS LONG AS WE STOP THE TEST "IMMEDIATELY" UPON FAILURE.

IN-PROCESS TESTING

WE AGREED THAT THE 3 MAIN IN-PROCESS TESTS WOULD BE:

. REFRIGERANT LEAKAGE - WITH R134A
  - PROBABLY 6 SWITCHES/HOUR
. HYDROSTATIC BURST - 1125 PSI (2.5 TIMES THE 450 PSI OPERATING PRESSURE) MIN BURST AT ROOM TEMP.

-MSG M#= 412541 FR=ELB TO=PCOA SENT=09/12/90 08:07 AM
R#=086 ST=C DIV=0050 CC=00101 BY=ELB AT=09/12/90 08:07 AM

SEPTEMBER 12, 1990

TO:	KARL ABRAHAMSON	ELB
	TED BREDIKIN	MFPC
	YOGEN CHEMBURKAR	PCME
	MIKE DEMATTIA	PCQA
	CHARLIE DOUGLAS	CPPC
	JOHN HAYNES	PCQA
	STEVE OFFILER	ELB
	KEITH ROBERTS	PCME
	JOE SCHUCK	JIB
	MATT SELLERS	PCME
	TIM SPOONER	PCME
	BILL SWEET	PCME
	JIM WOOD	CPPC
CC:	TOM CHARBONEAU	TC
	GARY SNYDER	CPPC
FR:	DAVE CZARN	CZARN

FORD TRIP -- (cont'd)

ADDITIONALLY, HE WANTS A CONTAMINATION CONTROL PLAN IN PLACE. A FAIRLY EXTENSIVE PROCEDURE WITH 40 PCS/LOT IS CURRENTLY IN THE SPEC, BUT IS NEGOTIABLE. HE WANTS TO KNOW OUR CURRENT CLEANING PROCESSES AND CONTROLS.

ACTION:

- SUMMARIZE CURRENT CLEANING PROCESSES AND CONTROLS	YOGEN/ TIM	9/17/90
- REPORT CURRENT IN-PROCESS TESTS FOR HYDROSTATIC BURST REQUIREMENTS	YOGEN/ TIM	9/17/90

FORD WANTS A REFRIGERANT LEAKAGE OF 2GR/YR MAXIMUM BEFORE AND AFTER DURABILITY TESTING. THE 3 OF US IN THE MEETING SUSPECTED THAT THIS WOULD BE AT OR BELOW THE SENSITIVITY OF THE FREON LEAK CHECK SYSTEM. RON INSISTED THAT WE TEST SOME OF OUR PARTS ON A HELIUM MASS SPEC TEST AND REPORT RESULTS.

ACTION:

- HE MASS SPEC LEAK TEST 10 HPCO SWITCHES	KARL/ DAVE	9/17/90
- ASSESS LOW LIMIT ON LEAK CHECK SENSITIVITY	YOGEN/ TIM	9/24/90

RON WANTS DATA ON OUR ROOM TEMP VS. 250F CALIBRATION.

ACTION:

- SUPPLY DATA TO FORD	TIM/ KARL	9/24/90

DESIGN
======

ACTION:
- REVIEW AND COMMENT ON ENVELOPE DWG — KARL — 9/17/90

WE DESCRIBED OUR ASSUMED DIFFERENCES BETWEEN THE END OF NOVEMBER/EARLY DECEMBER PROTOTYPES AND THE PRODUCTION DESIGN; RON SAW NO PROBLEM WITH OUR APPROACH. (PROTOTYPE USES PRESS-FIT PINS; PRODUCTION WILL LIKELY BE INSERT MOLDED.)

A VENTED BASE DESIGN IS ACCEPYABLE. RON'S MAIN CONCERN WAS FOR CONTAMINATION, BUT NON BELIEVES THIS SHOULD NOT BE AN ISSUE WITH THE SEALED CONNECTOR. ALSO, HE DID NOT WANT TO CONTEND WITH THE TEMPERATURE EFFECT ON CALIBRATION WITH THE SEALED DESIGN.

ACTION:
- DESIGN VENT INTO BASE — KARL — 9/17/90

1:30 - 2:30 DENNIS YERMACK - FORD BODY & CHASSIS ELECTRICAL CONNECTOR ENGINEERING

THE CONNECTOR DESIGN HAS CHANGED, REDUCING OUR CRIMP AREA FURTHER. SIMILAR CONNECTOR DESIGNS HAVE PROBLEMS WITH THE LOCKING ARM BREAKING OFF IN THE FIELD. THE DESIGN SOLUTION IS TO REDUCE THE LEAD-IN ANGLE ON THE RAMP, AND TO PUT A HOOD OVER THE ARM TO AVOID OVERBENDING. WITH THE LEAD-IN CHANGE, FORD ENGINEERING FELT THAT IT WOULD BE VERY EASY TO PUT THE CONNECTOR ON AT 180% OUT OF ROTATION. THEREFORE, A SECOND FLAG WAS ADDED, MAKING 3 INTERRUPTED AREAS FOR THE CRIMP. BURST PRESSURE WILL LIKELY BE COMPROMISED. RON B. IS AWARE OF OUR CONCERN.

ACTION:
- REDESIGN BASE TO CURRENT FORD PRINT — KARL — 9/14/90
- RUN RT AND 250F BURST TESTING WITH 360 DEG. CRIMP AND INTERRUPTED CRIMPS — KARL — 9/21/90

DENNIS WAS SURPRISED THAT WE WERE CONSIDERING SOLID INSTEAD OF ROLLED PINS. HE SAID THAT MEETING THE TIP GEOMETRY IS A CLASSIC PROBLEM WITH SOLID PINS. WE SHOULD STILL CONSIDER ROLLED PINS IN THE PRODUCTION DESIGN.

DENNIS STATED THAT HE WOULD HAVE MATING CONNECTORS NOVEMBER 26. THERE ARE 8 WEEKS OF ES TESTING THAT HE'S RESPONSIBLE FOR, WITH OUR SWITCH AND THE MATING CONNECTOR. HE GAVE US A COPY OF THE SPEC FOR OUR REVIEW.

WE ASKED FOR THE PLATING SPEC THAT IS LISTED ON THE TERMINAL PIN PRINT.. THE RESPONSIBLE ENGINEER WAS NOT IN THE OFFICE TODAY. THIS IS THE SAME ENGINEER WHO IS THE PIN MATERIAL EXPERT.

ACTION:
- GET PLATING SPEC FOR TERMINAL PINS — JOE — 9/17/90
- GET PHONE # AND NAME OF THIS ENGINEER TO KARL — JOE — 9/17/90

DENNIS CAUTIONED US THAT THE PIN POSITIONAL TOLERANCE WAS CRITICAL. I SUSPECT THE 0.2MM POSITIONAL TOLERANCE WILL BE VERY DIFFICULT FOR

ACTION:
- PLAN FOR ASSURING PIN POSITION FOR PROTOTYPES AND FOR PRODUCTION — DAVE / CARL

1:30 - 3:30 FORD BODY & CHASIS ENGINEERING

BRUCE PEASE - PRODUCT ENGINEER FOR CCPS

BRUCE GAVE US A COPY OF THE FINAL SPEC; ALL THAT'S LEFT TO DO IS TO GET THE APPROPRIATE SIGNATURES AT FORD.

WE REVIEWED WHERE WE STAND IN OUR SCHEDULE RELATIVE TO P/C REVALIDATION. BRUCE IS LEANING TOWARDS DELAYING START OF TESTING UNTIL WE CAN IMPLEMENT THE POLARITY CHANGE ON THE BASE. UTC - THE MATING CONNECTOR SUPPLIER ALSO-FACTORS INTO THIS. BRUCE THINKS THAT CONNECTORS WILL BE AVAILABLE IN MID OCTOBER, AND THAT WE SHOULD CONTINUE TO IMPLEMENT THE BASE MOLD CHANGE WITH THIS TIME FRAME IN MIND. HE WILL FIRM THIS UP WHEN HE GETS MORE INFO FROM UTC, AND FROM OUR SWITCH CUSTOMER; EG. PITTS AND KELSEY - HAYES. BRUCE IS ASSUMING THAT EARLY-JANUARY 1991 IS THE TENTATIVE ISIR DATE FOR P/C.

WE DISCUSSED THE CHAMFER DD WHICH IS TIGHTLY TOLERANCED AT +/- .002". BRUCE DID NOT SEEM REAL CONCERNED ABOUT OPENING UP THIS SPEC. AS LONG AS WE CAN ARRIVE AT A CRITERIA TO ENSURE FUNCTIONALITY IN THE APPLICATION. HE'S WILLING TO WORK WITH US TO DEVELOP THE TESTING REQUIRED TO RELAX THE TOLERANCE CALLED OUT IN THE SAE SPEC. FIRST, HOWEVER, HE WANTS TO WORK WITH THE PROPORTIONING VALVE SUPPLIER TO GET THEM TO DETERMINE THE ASSEMBLY TORQUE REQUIREMENTS FOR OUR SWITCH. HE WANTS TO KNOW THE MINIMUM TORQUE BEFORE LEAKAGE OCCURS AND THE MAXIMUM TORQUE, BEFORE EXCESS DEFORMATION TO THE CONE SEAT.

AS A STARTING POINT, HE RECOMMENDS WE TORQUE TO 10-15 FT. LB.

THE FACTORY FILL FOR THE AUTOMATIC TRANSMISSION AND THE STEERING SYSTEM IS THE SAME.

ACTION:
- GET SPECIFICATION ON FACTORY FILL FLUID FROM BRUCE; ALSO GET SOME FLUID FOR OUR TESTING — STEVE — 9/21/90

BRUCE WAS CONCERNED ABOUT THE VERY SMALL CLEARANCE BETWEEN THE END OF THE NEXPORT AND THE BASE OF THE CONE SEAT WHEN ASSEMBLED - BASED ON A PAPER STACK AND A VISUAL OBSERVATION OF OUR CUT-AWAY MOUNTED SWITCH. HE PLANS TO ASSESS IF A CHANGE IS NEEDED IN THIS AREA OF THE DESIGN; NO DEFINITE TIME WAS DETERMINED.

BRUCE HAS BEEN ASKED TO FILL OUT A SURVEY OF HIS OBSERVATIONS DURING HIS VISIT TO TIA NEXT TUESDAY, 9/18. HE WILL REPORT THIS TO HIS MANAGER. THIS IS AN INFORMAL SURVEY THAT THEY PLAN TO CALL UPON WHEN SOURCING NEW PRODUCTS, SO IT'S IN OUR BEST INTEREST TO REVIEW THIS AND TO PREPARE ACCORDINGLY. I'LL DISTRIBUTE A COPY OF THE SURVEY TO THE TEAM MEMBERS.

ACTION:
- COPY OF SURVEY TO KEITH/MATT/MIKE D/ CHARLIE — DAVE — 9/11/90

TEAM

HIGHLIGHTS
Stephen B. Oliffer
Week Ending 09/14/90

FORD MY91.75 CRUISE CONTROL PRESSURE SWITCH 7/PS

HEXPORT: Significant activity. Purchasing is beginning to get back RFQ's for the J512 hexport. Some are no-quoting, such as Curtis Screw and Camcar/Textron. Elco has stumbled across an NC lathe in their shop, negating their previous proposal to use a third-party screw machine house for second-op's. None of the quotes to-date are anywhere near the sub-30 cent bogey. I've had a couple conversations with Gary Lamelli at Weatherhead. They are very excited by this opportunity, and their specific expertise is automotive brake fittings, so the tight J512 tolerances are no problem at all. However, they are a brass house. I am having the Model Shop make a small quantity of hexports in brass so we can do a quick test. I plan to cycle these to 500K, then do a burst test. This will be complete by the end of next week.

FORD AUSTRALIA APPLICATION: We owe Ford a response on this low-volume (15K/yr) opportunity. Ford Australia is considering use of the Next Generation Speed Control system, and as such must fit the Deactivate switch (that is, our CCPS) into their existing brake system. The thread is metric, and the seal system is per ISO-4038-1977. This will require a special hexport and will drive up the cost of our device substantially. I have created a rough sketch of the hexport required, and delivered copies to Jack Keeton. Please note that I do not have a copy of the above ISO spec; I created the sketch based on a similar metric tube nut found in SAE J1290.

We cannot afford to ignore this, however, since that may force Ford to a full-back position such as a redundant brake pedal switch which could ultimately design us out completely. Another idea which merits consideration is to suggest the use of a screw-machined ISO adapter fitting, allowing us to employ either the J512 hexport used on all other NAAO applications, or even to use a standard 37PS hexport with J514 O-ring seal.

REVALIDATION: We have created and evolved the Light Truck Revalidation schedule to a realistic, usable form. The schedule is very aggressive, but we are managing to follow it effectively. This is requiring considerable effort and daily status review. The danger inherent in such an aggressive schedule is absolutely no room for human error, or for the occasional customer sample build, equipment malfunction, bottlenecks in the Environmental Labs, etc. etc. etc.

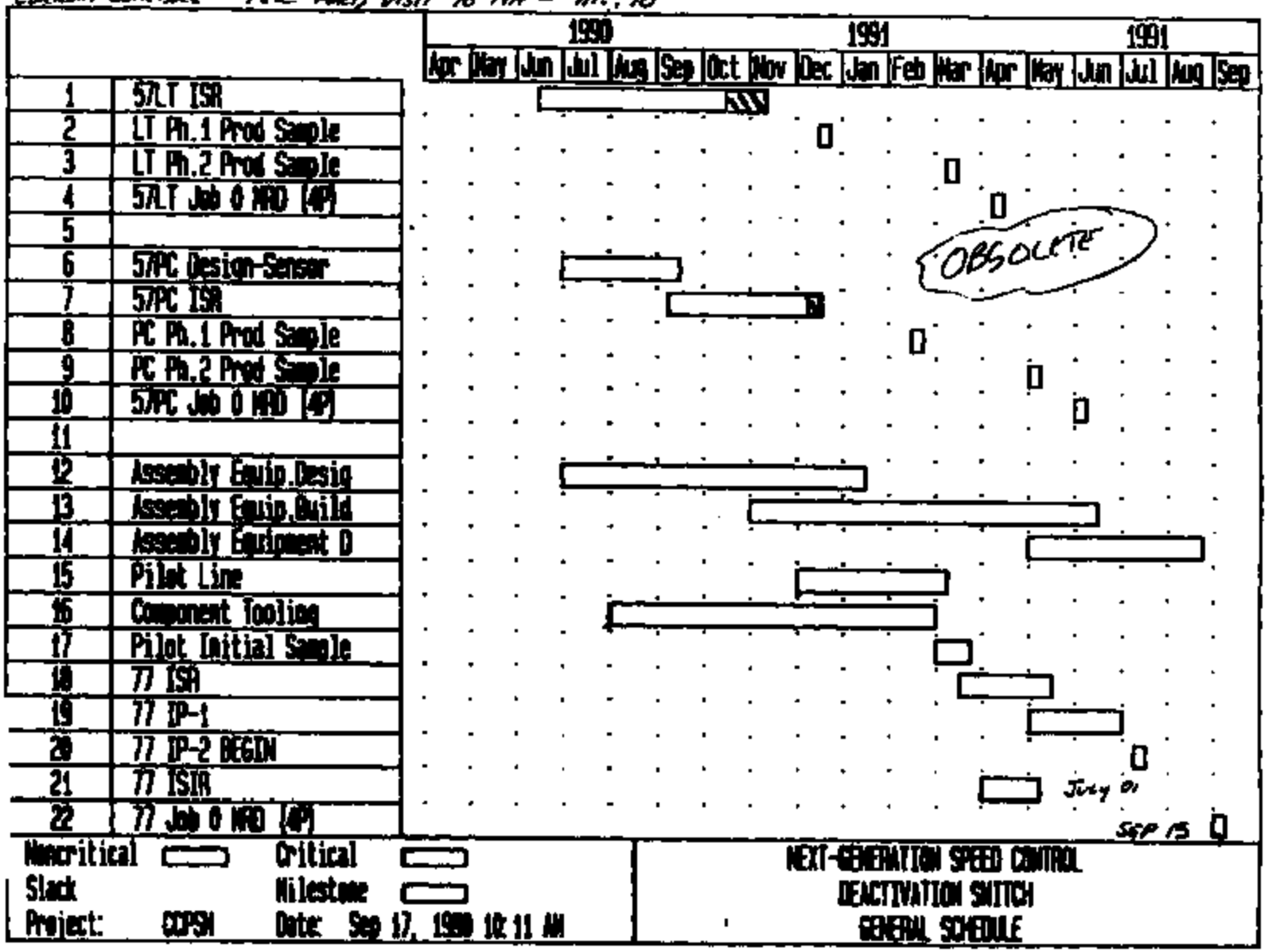
Jeff has completed build of 80 devices total for ES testing. We need only to receive power resistors (due today) for construction of the mV drop tester so initial characterization can be completed.

I have contacted Hank Griffin regarding the Fluids Resistance Test, which is the key item on the critical path. He informed me that he must start on a Tuesday at 8:00 am in order to avoid weekend work. The schedule originally showed devices available next Thursday. We have reprioritized in order to get devices to Hank by this Monday afternoon. We need to complete the initial characterization on these 36 parts only (for expediency), and complete build of hexport seals and connectors to close both ends of the device. Hank can

get the specified gasoline, oil, antifreeze, and alcohols; he is relying on us to supply the correct brake fluid (no problem) and ATF (problem). Bruce Penn has called out a specific Ford ATF spec. in the ES. I can easily obtain a multipurpose Motorcraft ATF from any auto parts store which meets this spec along with several others. Bruce indicates the multipurpose fluid is not the same as the specific fluid which meets ONLY the given spec. I contacted Roberts Ford and Aamco Transmission and discovered they use the multipurpose fluid. I have asked Bruce to obtain the fluid he wants me to use, and ship it or bring it along next week.

I have completed a rough draft of the Pace Car revalidation schedule. Items on the critical path include the priority key change and the new Rotunda cap. Given an aggressive, unrealistic four weeks to complete these two items in parallel, we will be finishing up the Pace Car validation around 12/18/90 versus Ford's date of 12/12/90.

CURRENT SCHEDULE PER FIELD VISIT TO TIA – 9/11, 90



THNHTSA 001078

DAVE

September 17, 1990

To:	Blount,	Walt	Ford Brake Engineering
	Carruthers,	Dale	Kelsey-Hayes
	Farrell,	Jim	Weatherhead
	Froates,	Ron	Ford Connector Engineering
	Hagan	Gary	Ford Purchasing
	Hendershot	Fred	Ford Purchasing
	Janosi,	Frank	Ford Brake Engineering
	Klingler,	Gary	Ford Electronic Speed Control Engineering
	Park,	Bill	Surfaces
	Randall,	George	Ford Light Truck Speed Control
	Schuck,	Joe,	Texas Instruments
	Wilson,	Chuck	United Technologies Automotive

From: Bruce Pease

Subject: Passenger Car Electronic Speed Control Deactivation Switch

The new Electronic Speed Control is currently released for 1992 FN-36 (Lincoln Town Car), 1992 1/2 EN-53 (Crown Victoria), and 1993 FN-10 (Mark) passenger cars. A speed control deactivate switch is PIA (part-in-assembly) for either the Proportioning Valve or Adapter Assembly in these vehicles.

The passenger car speed control switch will be gray in color and have a polarized connector to distinguish it from the truck speed control switch (black), the power steering switch (white), and the suspension control switch (blue). The polarized connector will foolproof the speed control switch when it is packaged adjacent to the suspension switch on the 1994 Continental, Thunderbird, and Cougar.

Three issues require clarification for the passenger car switch:

1. Usage of an interim "modified" switch.
2. Incorporation of SAE J512 port.
3. Incorporation of polarized electrical connection.

INTERIM "MODIFIED" SWITCH USAGE

The initially released F2VC-9F924-AA switch will be produced by automated methods. Due to tooling time, these switches will not be available until September 15, 1991 (1992 FN-36 Job#1 plus 90 days). Notice E-100798A4 has released an alternate switch, F2VC-9F924-BA, produced by non automated methods for the first 90 days of production.

The modified switch will be used for all current requirements up until the "AA" switch is incorporated. The parts and timing are summarized as follows

Usage	Timing	End Item	Switch
FN-36/ EN-53	Present to October 1991	F2VC-2B091-BA Prop Valve	F2VC-9F924-BA
	After October 1991	" " -AA " "	" " -AA
FN-36	Present to October 1991	F2VC-2C320-BA Adapter Assy	F2VC-9F924-BA
	After October 1991	" " -AA " "	" " -AA
EN-53	Present to October 1991	F2AC-2C320-CA Adapter Assy	F2VC-9F924-BA
	After October 1991	(same) -CA " "	(or) -AA
FN-10	Present to October 1991	F3LC-2B091-A2 Prop Valve	F2VC-9F924-BA
	After October 1991	(same) -A2 " "	(or) -AA

The interim -BA switch will be 62.23 mm overall length while the -AA switch is 57.15 mm, due to a different plastic housing length and there are internal differences in the terminal contacts geometry. Otherwise the -BA switch and -AA switches are the same for performance, SAE J512 port, polarized connector, and dimensions, subject to the issues below.

SAE J512 PORT

The SAE J512 port configuration is released for both the -BA and -AA switches Texas Instruments states this design will not be available in quantities until October 1990. All proportioning valves and adapter assemblies shipped after October 31 are to incorporate the SAE J512 port. (The FN10 EP Build parts with a December 19, MRD must have the J512 port.) End Item suppliers are to coordinate the port design requirements with Texas Instruments.

End Item		Supplier
F2VC-2B091-BA	Proportioning Valve	Surfaces Company
F2VC-2C320-BA	Adapter Assembly	Weatherhead
F2AC-2C320-CA	Adapter Assembly	Weatherhead
F3LC-2B091-A2	Proportioning Valve	Kelsey-Hayes

End item suppliers are to develop and document the assembly stackup conditions, torque to seal and torque to damage data for the SAE J512 connection.

POLARIZED ELECTRICAL CONNECTION

The passenger car speed control switch will have a polarized electrical connection to foolproof its use when adjacent to the suspension switch. The polarization consists of an offset rib on the switch that will engage an offset groove on the wiring connector. The new polarized connector is being released on Notice 10077149 by Body Engineering. The connector will be manufactured by United Technologies Automotive. Incorporation of the polarized connection on upcoming prototype and build vehicles requires coordination of the wiring harness and proportioning valve/adaptor assembly.

Target dates for incorporation of the polarized connection are as follows

1992	FN-36:	PhI Build,	MRD January 18, 1991.
1992 1/2	EN-53:	VP Build,	MRD of February 4, 1991.
1993	FN-10:	EP Build,	MRD of December 19, 1990.

Please call me with comments.

Bruce Pease

Bruce Pease

Brake Department
(313) 323-7955

TEXAS INSTRUMENTS SEPTEMBER 18, 1990

SPEED CONTROL CUT OFF SWITCH

FORD PART #	TI PART #	ISIR DATE	SWITCH ASSY	ASSEMBLY PROCESS	FORD ENGINEERING LAUNCH SEQUENCE	LEAD VEHICLE
TRUCK (Line rate 1 to 4/5)						
F2TA-9C888-AA (→ 4/5 Builds in Feb.)		11-21-90	MODIFIED SWITCH	MANUAL ASSY	JOB 1, 1992	VN-58
F2TA-9C888-BA OR F2TA-9F924-AA		7-1-90/	FINAL DESIGN	AUTOMATED	RUNNING CHANGE 1992 1/2	VN-58
CAR (Line rate 2 to 5/6) → need to supply part to Prop valve supplier						
F2VC-9F924-BA		12-21-90	MODIFIED SWITCH	MANUAL ASSY	JOB 1, 1992	FN-36
F2VC-9F924-AA		7-1-90/	FINAL DESIGN	AUTOMATED	RUNNING CHANGE 1992 1/2	FN-36

F2VC-9C888-AA - BAD PART #

TI-NHTSA 001062

TEXAS INSTRUMENTS
SPEED CONTROL CUT OFF SWITCH

RELEASING ENG NAME/PHONE #	DATE RELEASED	ENGINEER RELEASE #	PIECE PRICE	TOOL COST	FORD USAGE	PROJECTED ANNUAL VOLUMES
G. RANDALL X-24391	2-2-90	NL00100137 191-083	$2.97*	NR	END ITEM B & A	1992 150,000/ 200,000
G. RANDALL X-24391	TBD	TBD	$2.05*	SEE BELOW	END ITEM B & A	1992 150,000/ 200,000
					500,000 ACT	1993 ~~650,000~~ ~~700,000~~ IF F SERIES
B. PEASE X-37955	9/19 SCH.	(10079844)	$3.11*	? NONE	P.I.A. TO VALVE	1992 220,000
B. PEASE X-37955	TBD	TBD	$2.19*	1.3 MIL	P.I.A. TO VALVE	1992 220,000

* BASED ON J514 HEXPORT
PIA = PURCHASE IN ASSEMBLY
END ITEM = SHIPPED DIRECTLY TO FORD BODY & ASSEMBLY

TI-MMTSA 001063

FN-36

9-10-90

SUPPLIER PLANT VISITS, FALL 1990
LIST OF QUESTIONS AND ISSUES

1. Review entire process in order including:
   A. Process sheets

   B. Control Plan
      - are there two plans, one for manuf & one for Ford?

   C. Design FMEA
      - is it the same as your copy?
      - if not, get a copy

   D. Manuf FMEA
      - review & get a copy

   E. List of Significant and Critical Characteristics for each part
      - this must be defined before leaving (take blank form along)

   F. Plant Review including:
      - shipping/receiving
        - are parts tagged?
        - are parts quarantined?
        - list of material suppliers
        - list of sub-suppliers

      - receiving inspection
        - equipment available?
        - written plan (sample size, written action plan, etc..)
        - drawing availability?
        - are parts tagged?
        - is sub-supplier data reviewed?
        - are parts quarantined if bad?
        - is there a written acceptance/rejection process?

YES CORRECTIVE ACTION?
NO NEED?
FREQUENCY?
INDIVIDUAL?
INTEGRATED
COMPLETION DATE?

SUPPLIER PLANT VISITS, FALL 1990
LIST OF QUESTIONS AND ISSUES

1. Review entire process in order including: (cont)

F. Plant Review including: (cont)

- manufacturing process
  - inspect each press/machine
  - inspect each gage/in process measurement
  - inspect each lab/in process measurement
  - inspect each material transfer
  - look in all bins and floor
  - talk to operators

- in-process inspection
  - where are the charts?
  - who does the inspecting?
  - equipment available?
    - how is it calibrated?
    - when is it calibrated?
  - are the parts picked at random?

- check against Control Plan
  - if there is a problem, where is your written action plan?
  - is there a quarantine area?
  - are the parts tagged?
  - final inspection

- packing and shipping
  - how do they know what to ship?
  - what is the normal shipping size?
  - when was the last plant return?
    - for what reason?

- preventative maintenance program?
  - dies, presses, etc...

G. Control chart tracking
- short term
- long term

1. If there is a problem, what is the plan to deal with it (written plan)?

2. Who is the quality control manager for the specific part(s)?

3. Who is the person responsible for incoming recieving inspection?

4. What is the track record of each of the sub-suppliers?
   - review sub supplier C_p & C_{pk}
   - review what they have chosen as critical and significant

5. What is the C_p and C_{pk} for each of the Significant Characteristics? Record C_p and C_{pk} data on all critical and significant items. Be sure to include the previous two quarters as well as the latest lot run.

6. Get example copy of control chart on a critical or significant dimension.

7. Who has access to each of the quarantine areas?

8. Who does prototype work?

9. Who does die work (design, build, etc...)

10. How much change in personel ?
    - Worker level
    - Office level

11. Plans for expansion or contraction or structural change?

12. What type of work do you do for other companies?

13. What improvements are you working on?
    - designs
    - inspection techniques
    - process capability
    - productivity improvements
    - any suggestions?

14. When setting up, how are you assured of proper dies, etc...

15. If there is an issue at the assy plant, who would respond?

16. Have you done any studies on competitive applications of similar components?

17. Have you done any studies on new concepts before there is a program targeted for the application?

18. What do you do when you have an out of control condition?

19. Is appropriate equipment and facilities available for measuring and testing?

20. Written maintenance program including tooling, gages, and general equipment maintenance.

21. What happens to rejected stock?
    - how is it identified?
    - how is it inspected if returned to production?

22. Do you have quality circles or some thing of that nature?

23. What is your biggest manufacturing problem?

24. Open discussion
    - anything they want to talk about?
    - any issues?

25. Write report, go through it with QC manager (and others if necessary), and have them sign it.

/u/ballard/visit.supp
900713

PRESSURE SWITCH DATA Form 21605 TEST NO. 97-15-10

DEVICE	DATE REQUESTED	REQUESTED BY	REQUESTED COMPL. DATE
EV3913	9/01/10	SBO	
PERFORMED BY	**DATE STARTED**	**DATE COMPLETED**	**APPROVED BY**
LAD	9/10/10	9/24/10	

PROJECT TITLE: Cruise Control Pressure Switch

CUSTOMER:

PURPOSE OF TEST: Test the strength of Brass Hermetic

PROCEDURE: Build Sensors S w/brass hermetic P S contacts. Locate 500 K and Burst.

Brass Hermetic were rather than normal hermetic and were damaged during crimp. The test will continue with the knowledge that the part is weakened in the area of the threaded O-Ring stem.

Device #	Hermet	Tube Style	Burst	Failure mode				
97-15-01	brass	Port	6100	Nut and cracked upper flange				
02			6400	"				
03			6300					
04			6400					
05	Alloy		6300	Nut and cracked flange				
97-15-06	standard		7900	Gap opened				
07			8100	"				
08			9000	"				
09			7900	"				
10	SS., Axial		8100	"				

90 % CONFIDENCE

(BETA)
LOWER LIMIT 91.211

(THETA)
LOWER LIMIT 6378.491

RELIABILITY(%)
72

DATA : 6600
6400
6300
6400
6300

BRASS NEXPARTS (SENSOR ONLY)

$P_{90} - 072 = 6155$ PSI

90 % CONFIDENCE

SHAPE(BETA) PARAMETER = 33.13
LOWER LIMIT = 31.443
UPPER LIMIT = [illegible]

SCALE(THETA) PARAMETER = 8127.721
LOWER LIMIT = 8033.059
UPPER LIMIT = 8223.105

[illegible]

[illegible]
[illegible]
[illegible]

	RELIABILITY(%)	[illegible]
	72	[illegible]

DATA :
7900
8200
8100
7900
8150

CONTROL SENSORS

P@ - 0.72 = 7754 PSI

FORD VISIT NOTES - 10/10/13

Ford Personnel:
Fred Hendershot, Buyer
Gary Klingler, Sup'v Driver Controls, ELD
Bruce Pease, Release Eng'r, Pass-Car Brake
George Randall, Release Eng'r, Light Truck NGSC

TI Personnel:
Dave Czara, Des Eng Sup'v
Charlie Douglas, Mkt Eng'r
John Haynes, QRA Eng'r
John Kountanis, Branch Mgr, Mechanization
Steve Offiler, Des Eng'r
Keith Roberts, Mfg Eng'r
Joe Schuck, Detroit Field Sales Eng'r
Matt Sellers, Mfg Eng'r
Gary Snyder, Mkt Sup'v

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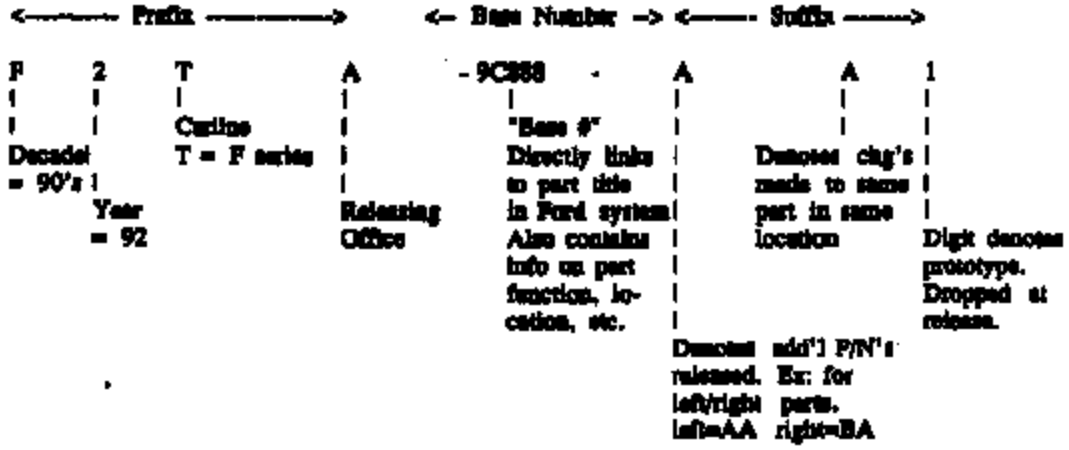
* Ford Part Number nomenclature:



* George, Bruce, or Joe will obtain a carline table for TI (3rd digit of prefix)

* Fred needs an exploded assembly sequence display, using actual parts velcro'ed to the display board. This should be 77FS (new automated switch) not 57FS. He also needed a cross-section drawing, and a process flow diagram, which were delivered during the meeting.

* Changeover from "carryover" switch (57FS, manual ass'y) to "final" switch (77FS, automated ass'y) at Body & Assembly is 90 days MINIMUM, not maximum as previously assumed by TI. Fred explained that B & A freezes a design for 90 days after Job 1, basically allowing a grace period to get things sorted out.

- A spreadsheet was developed, tabulating key part numbers, dates, prices, volumes, etc. Prices are based on original TI quotes which assumed J514 hydraulic seal (o-ring). ISIR dates were generated off-the-cuff; both Bruce and George will forward ASAP actual 4P, 5P, and Job 1 MRD dates and quantities for PN-36 and VN-38 respectively, as generated by the appropriate Planning Office(s). (note: this info rec'd from George for VN-38 via fax on 90/09/19)

- Accurate ISIR dates will be generated, with Ford Purchasing approval, based on above information. This will take into account the fact that TI is Tier 1 to Light Truck and Tier 2 to Pass-Car. TI will co-ordinate ISIR with the Pass-Car Tier 1 supplier(s)

- TI (who?) needs to close with Rich Eldridge (or, is Scott Kurnik the correct individual ?) regarding ISIR definition, and where PV and IP-1 testing must fall relative to ISIR submission. We know that PV is a subset of the ISIR submission package, and parts run through PV testing must be built from production tooled components but not necessarily production assembly. We know IP-1 tests are used to demonstrate process capability. Fred told us that ISIR assumes fully production-ready processes, at full production rates. We need help to put this all together on a schedule.

- [redacted] has been asked to study the sample quantities and requirements of both IP-1 and IP-2... it was noted by Gary K. that IP-2 looks more stringent while everyone agrees that IP-1 should be the more stringent of the two.

- We presented our list of quotes from roughly ten suppliers on the J512 hexport. Our intention was to show that a metal-to-metal seal requires significantly tighter tolerances and correspondingly higher cost than an o-ring seal. This is due to the deformable nature of the o-ring which allows for much looser gland tolerances, versus the minimal deformability of the metal-to-metal seal. Both Pass Car and Light Truck are steadfast in their choice of J512; LT because it is favored by a high-level manager and PC because it has significantly lower internal volume. Ford Purchasing understands that all of our previous quotes were based on J514 o-ring seals, and we will in fact need to raise our prices for the J512.

- Changes to pricing structure will be accompanied by written justification, i.e. the cost associated with change from J514 to J512.

- TI is presently pursuing parallel paths to resolve the J512 hexport problem. The first path is to reopen the pursuit of alternate suppliers in the US and abroad. George gave us Parker-Hannifin and Aeroquip as two major US automotive brake fitting houses; Fred suggested we try harder to locate an offshore source. The second path is to examine relaxation of J512's specifications:

  1) Telephone SAE hdq. to find out who chairs the J512 committee. Contact this individual to determine the feasibility of loosening the critical spec.

  2) Complete a paper study of present stackup given present tolerances. From this, determine possibility of relaxing critical spec; determine what new limits are.

  3) Have model shop modify hexports to new tolerance extremes, and also beyond, in order to determine where problems may begin to occur. This includes the .005" runout dimension, to be created by offsetting the hexport in the lathe chuck by .0025" while using the threads as reference.

  4) Obtain aluminum mating parts produced to J512 standard tolerances which represent the maximum deformability, and steel mating parts which represent minimum deformability. (note: since it is certainly not desirable to have different spec's for different material

combinations. It may be wise to choose only steel as representative of worst-case.)

5) Determine torque specifications in conjunction with mating part supplier. This is typically done by starting at a small nominal value, and recording torque vs. theta until a plateau is reached indicating plastic deformation is occuring. George will try to find a copy of recommended torque values for hydraulic fittings which he recalls from his work in the tractor business.

6) Build (quantity T-B-D) devices representative of worst-case, i.e. outer limits of tolerances including smallest torque value.

7) Impulse and thermal cycle test... look for evidence of leakage during these tests to indicate unacceptable geometry/tolerance.

8) Section half and disassemble half of each lot of test parts for inspection.

* We agreed that some aspect of the J512 seal must be given a Significant Characteristic designation. Ford has left it up to TI to decide which, either the angle or the diameter, working with the hexport supplier.

* Gary Klingler has asked us for two pieces of documentation to prepare for future speed-control related litigation. (His indicates roughly 4-5 court cases per year is about average; so it's a question of "when", not "if"). One is an FTA of the most critical fault, which is contacts remaining closed at pressures well above the normal actuation point. Two is a written description of the operation of our device, including a cutaway drawing for reference. Bruce and George would like copies of this for their own information.

* We posed the question of reusability of the J512 fitting; our limited experience seems to suggest that it is a one-shot. George indicates that in theory, yes, it is only good once, but in practice it really lasts for as many as half a dozen reinstallations.

* TI has received from Bruce the specific HFP-M2C138-CJ automatic transmission fluid which Bruce has called out in the Fluid Resistance spec. This is supplied by EPP-Tech Oil Co. in Detroit under P/N M2C138-CJ. We should be able to obtain quantities from them in the future.

* We clarified the recent sample request from one of Gary's people, Rupert Andrews. It was misinterpreted on our end as 50 at 250 +/- 50 and 50 at 250 +/- 50. The correct order is simply 50 standard Pass Car devices (125 +/- 35) and 50 standard Light Truck devices (250 +/- 50). The hydraulic seal was discussed, and I believe o-rings are acceptable - this should be clarified.

* We hand-delivered a 90 psi direct-disc test device to Bruce to replace one which he returned to us as a leaker. At the same time we hand-delivered to Gary two test sets consisting of 90 and 160 psi (nominal) devices. The actual actuation value was scribed on these devices.

FORD VISIT NOTES - 98/09/18

Ford Personnel:
Fred Hendershot, Buyer
Gary Klingler, Sup'v Driver Controls, HLD
Bruce Pease, Release Eng't, Pass-Car Brake
George Randall, Release Eng't, Light Truck NGSC

TI Personnel:
Dave Citam, Des Eng Sup'v
Charlie Douglas, Mkt Eng't
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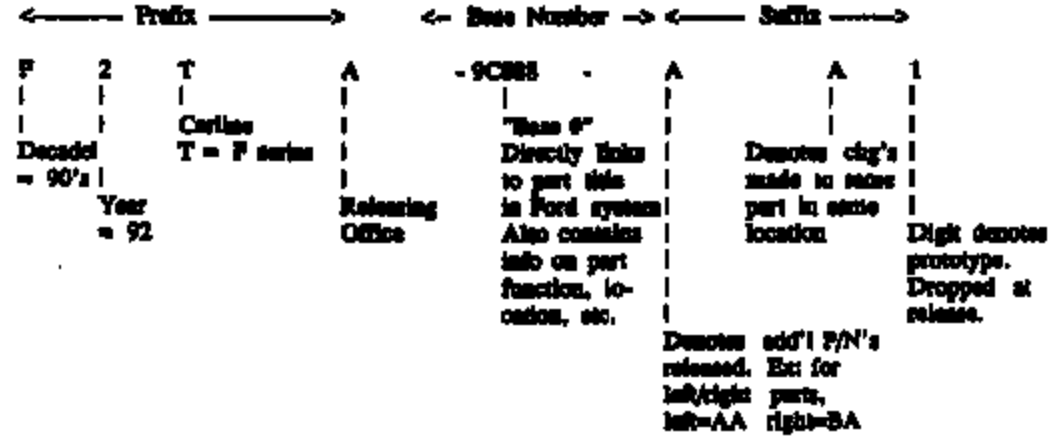

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6) Build (quantity T-8-D) devices representative of worst-case, i.e. outer limits of tolerances including smallest torque value.

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TEXAS INSTRUMENTS — SEPTEMBER 18, 1990

SPEED CONTROL CUT OFF SWITCH

FORD PART #	TI PART #	ISIR DATE	SWITCH ASSY	ASSEMBLY PROCESS	FORD ENGINEERING LAUNCH SEQUENCE	LEAD VEHICLE
TRUCK (with rec'r in eff.)						
F2TA-9C888-AA		11-21-90	MODIFIED SWITCH	MANUAL ASSY	JOB 1, 1992	VN-58
F2TA-9C888-BA OR F2TA-9F924-AA		7-1-90	FINAL DESIGN	AUTOMATED	RUNNING CHANGE 1992 1/2	VN-58
CAR (with TAU 2.7D Pkg.)			need to supply parts to Prop. Vehicle Suppliers for Jan. 1991			
F2VC-9F924-BA		12-21-90	MODIFIED SWITCH	MANUAL ASSY	JOB 1, 1992	FN-36
F2VC-9F924-AA		7-1-90	FINAL DESIGN	AUTOMATED	RUNNING CHANGE 1992 1/2	FN-36

F2VC-9C888-AA - BAD PART #

TEXAS INSTRUMENTS
SPEED CONTROL CUT OFF SWITCH

RELEASING ENG NAME/PHONE #	DATE RELEASED	ENGINEER RELEASE #	PIECE PRICE	TOOL COST	FORD USAGE	PROJECTED ANNUAL VOLUMES
G. RANDALL X-24391	2-2-90	NL00100137 191-083	$2.97*	[illegible]	END ITEM B [illegible]	1992 150,000/ 200,000 Switch Volume
G. RANDALL X-24391	TBD	TBD	$2.05*	SEE BELOW	END ITEM B [illegible]	1992 150,000/ 200,000
					500,000 NOT SWITCHES, BASED ON "60" [illegible]	1993 ~~650,000~~ ~~700,000~~ IF F SERIES
B. PEASE X-37955	9/19 SCH.	(10079844)	$3.11*	? None	P.I.A. TO VALVE	1992 220,000 at this will be ~20K.
B. PEASE X-37955	TBD	TBD	$2.19*	1.3 MIL	P.I.A. TO VALVE	1992 220,000

* BASED ON J514 HEXPORT
PIA = PURCHASE IN ASSEMBLY
END ITEM = SHIPPED DIRECTLY TO FORD BODY & ASSEMBLY

246 K Mil [illegible] for mg92 FN-36

TI-NHTSA 001088

Ford Visit to [illegible] - 7:1990

Gene

Gene Kendricks - L/T

Ken Mass - P/C

Gene Knight - C.D

Fred Hendershot - Panels

- L/T schedule is officially pushed out from April (mid) to July
  - New TSR date is 11/21/90
  - We are first supplier to L/T, so this is the date they & the rest of their parts

- P/C schedule is pushed in slightly to 12/21 TSR.
  - We are first supplier to P/C, meaning we need to supply parts to Ford third suppliers (Sorton, Kelly Hayes, et) before this time.
  - actual MRD date for P/C is Jan. 15, 91

Actions: Close with Ford's third supplier to establish the actual supply date for our "TSR'd" parts - Steve A/Glenda

- 77RS Shutdown on Sept 14, 1991.
  - TSR commitment date is 7/1/91

- Benkin 77RS pc price - assuming JSH (Coking) buy out
  L/T = 2.05
  P/C = 2.19

- We need to work on added cost of TSR items
  - We need to justify to Ford the cost difference between P/C and L/T parts

• Fred requested a set of production switch components so Fred can do a cost analysis – with JSIC's many designs

Action: parts ① Tilt mounted switch – Steve O (ASAP)
② ignition – Steve O (ASAP)
③ take-apart connector w/ a board w/ components
thereon; parts should be removable from the board
– Chuck (Lower Cost)

• Bruce is receptive to a brass bracket; George seemed to have no objection either. Gimbal must be applied to steel bracket against Aluminum prop. bracket. We told them Ron plans to test a brass bracket

Action: complete brass bracket testing, report results to P/C and L/T

• Bruce noted a gap steel that permits a potential interference between the bracket and base of cone (didn't understand all the details). He's to report findings to us and (if necessary) we need to use dimension on part to help avoid. Thanks figures.

• Ron proposed a test plan for a wide base and change ② on the JSIC bracket (3 cones x 3 cones). Bruce is very receptive to the plan and felt that the wide base was a major issue. Ron will report out non-conformance to SAE spec. By the end of the discussion however, it seems best long off on the change and conduct a very DOE and analyze findings in the next week

We proposed 5.0# blower & thereby when a problem and what the problem is. We need to close with Ford upon [illegible] to determine whether a next testing should continue. The 1st steps are to:

1. Contact SAE to discuss } both items = $5k O.
2. perform pipe study if fit-up

In brief, Ford has accepted that the $5k price will be higher than the $14 (Allen) change. They need us to do everything possible to avoid the price increase. We've not yet identified how to do this. We were very frank in discussing objectives just more discussing of the increased per price / lack of repeatability associated with the $5k and this generally well-received.

Steve advised us that specific characteristics (OD) for the 4th point. Both pressure transducer and "one of the 2 flare dimensions", is what he requested. We need to determine the best approach to take in measuring the flare chamfer OD or the flare angle. SAE or Ford dimensions for the supplier only is acceptable.

Actions: Identify what dimension to measure and how to measure it. — Matt/Steve O

- Identify a supplier cut out in progress
- What is said by Ford for SC dimensioning; what process is used? — Mike D / Matt

TEXAS INSTRUMENTS INCORPORATED
FORD NGSC VISIT

SEPTEMBER 18, 1990

QUALITY CAPABILITIES

- PRECISION CONTROLS DEPARTMENT QUALITY ASSURANCE MANUAL
- FMEA
  - 57PS
  - NGSC
- 57PS QUALITY ASSURANCE SPECIFICATION
- 57PS MANUFACTURING CONTROL PLAN
- RECEIVING INSPECTION TOUR

TEXAS INSTRUMENTS INCORPORATED
MANUFACTURING CONTROL PLAN

CUSTOMER: FORD MOTOR COMPANY
PART DESCRIPTION: POWER STEERING PRESSURE SWITCH
CUSTOMER PART NUMBER: VARIOUS
TI PART NUMBER: 57P8

RESPONSIBLE ENGINEER: John Havens
TITLE: Quality Assurance Engineer
TELEPHONE: 508-699-1852
DATE: September 18, 1990

MANUFACTURING CHARACTERISTICS	CONTROLLED CHARACTERISTICS	FREQUENCY	SAMPLE SIZE	ANALYSIS METHOD AND CONTROL	ATTRIBUTE/ VARIABLE	LAST R&R STUDY	REACTION PROGRAM	AUDIT FREQUENCY
SENSOR ASSEMBLY	SENSOR DIAMETER	HOURLY	5	VERNIER CALIPERS X-BAR & R	VARIABLE	8/90	SORT 100% SINCE LAST CHECK & ADJ.CRIMPER	DAILY
	THREAD FUNCTION/ SIZE	HOURLY	5	RING GAGE Q.C.AUDIT	ATTRIBUTE	8/90	SORT 100% SINCE LAST CHECK & REWORK	DAILY
	CRIMP HEIGHT	HOURLY	5	VERNIER CALIPERS X-BAR & R	VARIABLE	8/90	SORT 100% SINCE LAST CHECK & ADJ.CRIMPER	DAILY
RIVET SPRING TO ARM	RIVET HEIGHT	HOURLY	5	CALIPERS X-BAR & R	VARIABLE	8/90	SORT 100% SINCE LAST CHECK & ADJ. RIVETER	DAILY
RIVET MOVABLE ARM/ SPRING ASSEMBLY	RIVET HEIGHT	HOURLY	5	VERN. CALIPERS X-BAR & R	VARIABLE	8/90	SORT 100% SINCE LAST CHECK & ADJ. RIVETER	DAILY
STAKE TERMINALS TO BASE	TERMINAL SEPARATION	HOURLY	5	PLUG GAGES X-BAR & R	VARIABLE	8/90	SORT 100% SINCE LAST CHECK & ADJ.STAKER	DAILY
	TERMINAL HEIGHT	HOURLY	5	DIAL INDICATOR X-BAR & R	VARIABLE	8/90	SORT 100% SINCE LAST CHECK & ADJ. STAKER	DAILY
	PUSH-OUT FORCE	HOURLY	5	DIAL INDICATOR X-BAR & R	VARIABLE	8/90	SORT 100% SINCE LAST CHECK & ADJ.STAKER	DAILY
GAGE BASE ASSEMBLY	PIN LENGTH	HOURLY	5	DIAL INDICATOR QC AUDIT	VARIABLE	8/90	SORT 100% SINCE LAST CHECK & RE-GAGE	DAILY
MANUFACTURING CHARACTERISTICS	CONTROLLED CHARACTERISTICS	FREQUENCY	SAMPLE SIZE	ANALYSIS METHOD AND CONTROL	ATTRIBUTE/ VARIABLE	LAST R&R STUDY	REACTION PROGRAM	AUDIT FREQUENCY
FINAL DEVICE CRIMP	DEVICE TORQUE	HOURLY	5	CUSTOM TORQUE TEST X-BAR & R	ATTRIBUTE	8/90	SCRAP SINCE LAST CHECK & ADJ.CRIMPER	DAILY
	CRIMP RING DIAMETER	HOURLY	5	VERN. CALIPERS X-BAR & R	VARIABLE	8/90	SORT 100% SINCE LAST CHECK & ADJUST CRIMPER	DAILY
FINISHED DEVICE FUNCTION TEST	ALL PRESSURE SPECIFICATIONS	ON GOING	ALL	CUSTOM PRESSURE TESTER P CHART	ATTRIBUTE	8/90	SCRAP BAD DEVICES	DAILY
	PRESSURE TESTER CALIBRATION (ACTUATION)	HOURLY	4	MASTER DEVICES X-BAR & R	VARIABLE	N/A	ADJUST CUSTOM PRESSURE TESTER AS NECESSARY	DAILY
	PRESSURE TESTER CALIBRATION (RELEASE)	HOURLY	4	MASTER DEVICES X-BAR & R	VARIABLE	N/A	ADJUST CUSTOM PRESSURE TESTER AS NECESSARY	DAILY

-MSG M#= 115755 FR=VAGS TO=ELB SENT=09/19/90 09:38 AM
R#=040 ST=C DIV=0050 CC=00134 BY=VAGS AT=09/19/90 09:38 AM

TO: NORM ROY MLDG
DAVE NOLAN MLDG
PAUL THEROUX MLDG
JOE LAZARZ JML8
BRIAN COUGHLIN PEC
RON BOTELHO CPRB
SCOTT MARTIN MFPC

CC: DICK GARIEPY MFPC
BILL CONGDON MFPC
DAVE CZARN ELB
STEVE OFILIER ELB
STAN HOMOL ELB
RAY TOURANGEAU PCME
BILL SWEET PCME
MATT BELLERS PCME
CHARLIE DOUGLAS CPPC
GARY SNYDER CPPC

FROM: KEITH ROBERTS PCME

SUBJ: 46412 CONNECTOR KEY INSERT AND LOCKING TAB CHANGES

LOCKING TAB

ALL PRE-LOCKING TAB MODIFIED AFCC INVENTORY HAS BEEN SHIPPED TO BLDG 12 WAREHOUSE. NO ADDITIONAL SHIPMENTS WILL BE MADE UNTIL THE INVENTORY OF OLD BASES HAS BEEN PURGED.

WE HAVE MADE THE LOCKING TAB CHANGE AND THE INITIAL SAMPLES LOOK GOOD ACCORDING TO DAVE NOLAN.

I HAVE GIVEN A TOL ORDER TO RON BOTELHO TO RUN BLACK BASES FOR THE 97PS CRUISE CONTROL LITE TRUCK ISR SUBMITTAL. THESE SHOULD BE RUN WITH IN THE WEEK.

RON WILL RUN THE MOLD FOR ONE MORE WEEK TO BUILD INVENTORY AT THE AFCC TO HAVE A SUPPLY OF PARTS FOR THE NEXT MODIFICATION.

CONNECTOR KEY INSERT

WHILE RON IS BUILDING A WEEKS WORTH OF INVENTORY, PAUL WILL BEGIN WORK ON THE INSERTS AND THE MOLD DESIGN. IN ONE WEEKS TIME HE WILL BE READY TO RECEIVE THE MOLD FOR THE REMAINDER OF THE CONNECTOR KEY WORK. THE MOLD WILL BE OUT FOR TWO WEEKS. (THE DESIGN AND INSERT WORK AND THE ACTUAL MOLD MODIFICATION WORK TAKE 3 WEEKS TOTAL.

JL LAZARZ AND OUR PRODUCTION CONTROL HAVE ENOUGH INVENTORY FOR TWO WEEKS OF DOWNTIME.

OVER ALL SCHEDULE

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R#=126 ST=C DIV=0050 CC=00869 BY=EQRM AT=09/19/90 09:53 AM

19 SEP 90

TO:	KEITH ROBERTS	PCME
	ED KADISEVSKIS	MDES
	STEVE MCCOOEY	MDES
	STEVE OFFILER	ELB
	STAN STELIGA	STEL
	WAYNE CARLSON	AMSD
	STEVE RODKEY	AMSD
	DONNA MOYNIHAN	PCQA
	BILL FARRON	MDES
	ANDY MCKENNA	AJM3
	MATT BELLERS	PCME
CC:	JIM ARMSTRONG	EQRM
	JOHN DORMLEY	AMSD
	BILL SWEET	PCME
	RAY TOURANGEAU	PCME
	CHARLIE DOUGLAS	CPPC
	BOB VIENS	MDES
	ED PONTES	MDES
	ANDY MCGUIRK	PCSA
	MIKE DEMATTIA	PCQA
	MIKE POHL	FIXR
	TOM CHARBONEAU	TC
	BOB BASILIERE	ELTL
	BOB ROBICHAUD	PCME
FR:	JOHN KOURTESIS	MDES

SUBJ: WEEKLY CCPS STATUS UPDATE

NEXT MEETING

DATE: WEDNESDAY, 9/26
TIME: 8:00A
PLACE: 820 DESIGN C.R.

- "L" ARM AND 33PS ARM ARE STILL BEING EVALUATED. DESIGN REVIEW ON 9/20 SHOULD FOLLOW UP WITH RECOMMENDATION ON ONE DESIGN. LIFE TESTING RESULTS WILL BE AVAILABLE FOR BOTH DESIGNS BY 9/20 AS WELL. WE NEED DECISION TO BEGIN DESIGN OF ASSEMBLY PROCESS FOR MOVABLE ARM, TERMINAL, AND RIVETS.

- PROTOTYPE CALIBRATOR DESIGN VALUE DESIGN VALUE ENGINEERED AND PRINTS ARE IN SHOP. MRO TO BUILD WILL BE TO US 9/21. STEVE WILL HAVE STANLEY PUT TOGETHER A BUILD SCHEDULE BY 9/26.

- ANDY WILL GET BACK TO STEVE M. WITH DATA ON CALIBRATION FORCE REQUIRED.

- STRIP DESIGNS FOR TERMINALS AND MOVABLE ARM ARE STILL OPEN ISSUES.

- MATT WILL PUT TOGETHER A LIST OF SPC GAGES REQUIRED FOR PROJECT AND PLAN FOR DESIGN AND BUILD 9/26.

C DESIGNS PROGRESSING TO SCHEDULE ON BOTH BASE AND FINAL ASSEMBLY MACHINES.

O DESIGN STARTED THIS WEEK ON PRESSURE TESTER.

JK JP MSG ID:MDES TEL:699-3679 MB:20-25

77PS SPRING ARM DEVELOPMENT
ANDY MCKENNA
SEPTEMBER 20, 1990

SPRING FORCE AND CONTACT FORCE DATA

L-SHAPED SPRING ARM

THICKNESS	K BEFORE (LB/IN)	K AFTER (LB/IN)	CONTACT FORCE	K(B) POST LIFE (LB/IN)
0.004	2.28	24.2	150	2.26
0.005	4.07	57.6		4.07
0.006	7.94	77.0		7.94
0.007	9.93			9.93
0.010	28.69			28.69

33PS SPRING ARM

THICKNESS	K BEFORE (LB/IN)	K AFTER (LB/IN)	CONTACT FORCE	K(B) POST LIFE (LB/IN)
0.004	3.04	19.9	190	

OPTIMIZED L-SHAPED SPRING ARM (PREDICTED)

THICKNESS	K BEFORE (LB/IN)	K AFTER (LB/IN)	CONTACT FORCE	K(B) POST LIFE (LB/IN)
0.004	7		34 GRAM	

56PS SPRING ARM

THICKNESS	K BEFORE (LB/IN)	K AFTER (LB/IN)	CONTACT FORCE	K(B) POST LIFE (LB/IN)
0.004	3.04	39.4		

77PS SPRING ARM DEVELOPMENT
ANDY MCKENNA
SEPTEMBER 20, 1990

L-SHAPED ARM, 77PS REBUMP SENSOR

ID	SENSOR ALONE ACT	SENSOR ALONE REL	PRE-TEST ACT	PRE-TEST REL	POST-TEST ACT	POST-TEST REL	% CHANGE BY SENSOR		% CHANGE OVER LIFE	
1	160	65	147	65	132	51	-8.1	0.0	-10.2	-21.5
5	155	70	145	70	130	51	-6.5	0.0	-10.3	-27.1
6	158	72	141	66	128	50	-10.8	-8.3	-9.2	-24.2
7	158	66	143	61	127	49	-9.5	-7.6	-11.2	-19.7
13	150	71	133	69	123	54	-11.3	-8.5	-7.5	-16.9
14	156	67	138	65	130	45	-11.5	-3.0	-5.8	-30.8
16	144	64	127	63	115	45	-11.8	-1.6	-9.4	-28.6
20	146	69	127	64	113	53	-13.0	-7.2	-11.0	-17.2
21	156	72	112	64	104	48	-28.2	-11.1	-7.1	-25.0
22	148	63	105	50	102	41	-29.1	-20.6	-2.9	-18.0

33PS SPRING ARM, 77PS REBUMP SENSOR

ID	SENSOR ALONE ACT	SENSOR ALONE REL	PRE-TEST ACT	PRE-TEST REL	POST-TEST ACT	POST-TEST REL	% CHANGE BY SENSOR		% CHANGE OVER LIFE	
1	137	35	133	36	122	33	-2.9	2.9	-8.3	-8.3
2	133	42	130	40	105	35	-2.3	-4.8	-19.2	-12.5
3	130	42	126	42	102	31	-3.1	0.0	-19.0	-26.2

33PS SPRING ARM, 57PS SENSOR

ID	SENSOR ALONE ACT	SENSOR ALONE REL	PRE-TEST ACT	PRE-TEST REL	POST-TEST ACT	POST-TEST REL	% CHANGE BY SENSOR		% CHANGE OVER LIFE	
4	466	244	452	244	432	239	-3.0	0.0	-4.4	-2.0
5	480	-247	459	255	448	246	-4.4	3.2	-2.4	-3.5
6	450	238	446	231	434	225	-0.9	-2.9	-2.7	-2.6

PRECISION CONTROLS DESIGN ENGINEERING
DESIGN REVIEW - 20 September 1990
77PS SPRING ARM / SWITCH ASSEMBLY

GOALS

SELECT FINAL SPRING DESIGN APPROACH:

* 33 PS STYLE SPRING ARM
* SIMPLE L-SHAPED SPRING ARM
* OPTIMIZED L-SHAPE SPRING ARM (FEA)

FINALIZE SELECTED DESIGN BY 01 NOV 90

PRECISION CONTROLS DESIGN ENGINEERING
DESIGN REVIEW - 20 September 1990
77PS SPRING ARM / SWITCH ASSEMBLY

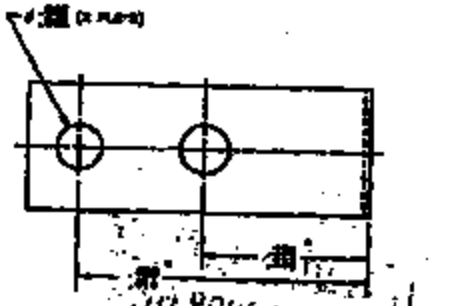
SIMPLE L-SHAPED SPRING ARM

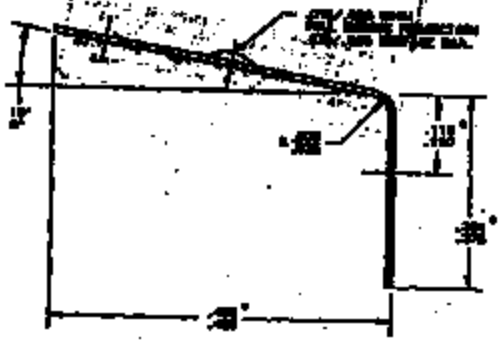
ADVANTAGES:

* MEETS 77PS (RE-BUMP SENSOR) LIFE REQUIREMENTS
  - NO FAILURES AT 500K CYCLES (10 DEVICES TESTED)
  - LIFE REQUIREMENT: 500K CYCLES
* RELATIVELY SIMPLE TO MECHANIZE
* FITS INTO CURRENT PACKAGE, NO MAJOR TERMINAL OR BASE CHANGES REQUIRED

DISADVANTAGES:

* FULL TESTING NOT COMPLETE, MTTF NOT DETERMINED
* NOT TESTED WITH 57PS SENSORS
* DESIGN IS NOT OPTIMIZED
* SUITABILITY FOR BEND/ CALIBRATION OPERATION UNKNOWN





REVISIONS			
SYMBOL	DESCRIPTION	DATE	APPROVED

TI-NHTBA 001111

TOLERANCE ON FRACTIONS DECIMALS ANGLES	
MATERIAL	

TEXAS INSTRUMENTS

TITLE: SPRING ARM

SIZE	CODE IDENT NO.	
C	82647	EX3423-34

SCALE: NONE SHEET

PRECISION CONTROLS DESIGN ENGINEERING
DESIGN REVIEW - 20 September 1990
77PS SPRING ARM / SWITCH ASSEMBLY

33PS SPRING ARM

ADVANTAGES:

* MEETS 77PS (RE-BUMP SENSOR) AND 57PSL2-1 LIFE REQUIREMENTS
  - NO FAILURES AT 1.3KK CYCLES (3 DEVICES TESTED)
  - LIFE REQUIREMENT: 500K CYCLES

* DESIGN ALREADY EXISTS

DISADVANTAGES:

* WOULD REQUIRE BASE, STATIONARY TERMINAL AND MOVABLE TERMINAL REDESIGN

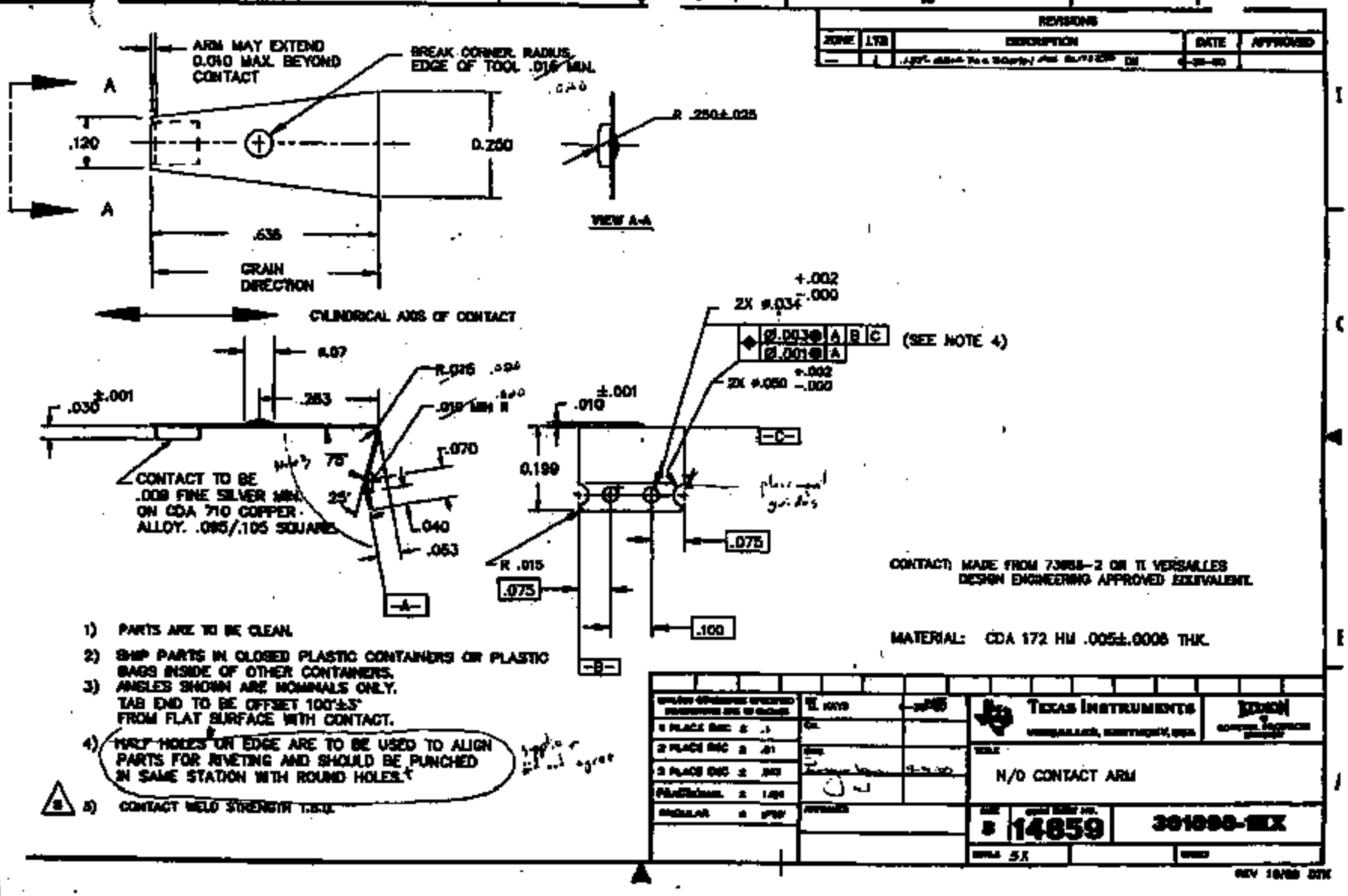
* BASE BODY DIAMETER WOULD INCREASE
  - HINDER LONG-TERM GOAL OF MINITIMER A/C SWITCH AUTOMATION

* 33PS SPRING WOULD HAVE TO BE MODIFIED

* SUITABILITY FOR BEND/CALIBRATION OPERATION UNKNOWN

* RELATIVELY DIFFICULT TO MECHANIZE (STRIP FED, BEND)

20 Sep 90 AJM 50-101



TI-NHTBA 001113

PRECISION CONTROLS DESIGN ENGINEERING
DESIGN REVIEW - 20 September 1990
77PS SPRING ARM / SWITCH ASSEMBLY

OPTIMIZED L-SHAPED SPRING ARM

ADVANTAGES:

- FEA ANALYSIS PREDICTS LONG LIFE IN BOTH 77PS AND 57PS DEVICES
- RELATIVELY SIMPLE TO MECHANIZE (?)
- FITS INTO CURRENT PACKAGE, NO MAJOR TERMINAL OR BASE CHANGES REQUIRED

DISADVANTAGES:

- NO SAMPLES MADE, NO TESTING PERFORMED
- SUITABILITY FOR BEND/CALIBRATION OPERATION UNKNOWN

PRESSURE SWITCH DATA Form 21605 TEST NO. 99-01-03

DEVICE	DATE REQUESTED	REQUESTED BY	REQUESTED COMP. DATE
EX 3423	7/11/90	LBD	
PERFORMED BY	DATE STARTED	DATE COMPLETED	APPROVED BY
JAD	7/11/90		

PROJECT TITLE: Cruise Control Pressure Switch

CUSTOMER:

PURPOSE OF TEST: Samples for Calibration

NR Charge

PROCEDURE: Body: Grey 5705 "L" type
Cap: Exhaust w/Skirt
Magnet: JSID
Disc: 25/40
Case Mtg: Aluminum

Device #	Prod	Act	Ref						
99-01-01	Open	113	95						
01	Incr	116	50						

TI-NHTSA 001115

HIGHLIGHTS
Stephen B. Offiler
Week Ending 09/21/90

FORD MY91.75 CRUISE CONTROL PRESSURE SWITCH 77PS

HEXPORT: We presented our current dilemma to Ford during their visit last Tuesday. Charlie showed a list of potential hexport suppliers and the additional cost associated with the J512 hexport beyond the J514 o-ring hexport. For various reasons, Ford will not consider anything but J512, and they now understand there will be some cost penalty. We have embarked on a parallel-path effort to minimize this cost penalty. One, Ford suggested Parker-Hannifin and Aeroquip as US sources we should quote, and we are expected to renew our offshore efforts. Two, we are looking into relaxing the particular J512 tolerance which is causing the difficulty. I have contacted SAE, and while they flatly refused to provide the name of the J512 chairman, they did give me the name of a committee member, Mike Chernuk. I contacted Mike, who told me J512 is a *guideline*, not gospel, and any changes we propose could very well be feasible, and must be tested and proven out. Mike gave me the name of the chairman, Harry Pond, who I have been unable to reach. However, we anticipated this kind of response from the J512 guys, and have already developed in conjunction with Ford a lengthy and exhaustive test plan to prove out the relaxed spec. All indications are that we should begin this plan immediately.

Jack Kearns indicates that Eloo will be visiting next Tuesday on other subjects. We will meet with the key players at 7:30 am, before their other meetings begin, to discuss J512 requirements and their ability to make prototypes (approx. 2000 - 5000) as well as production parts.

LIGHT TRUCK REVALIDATION: We received the power resistors needed to construct the millivolt-drop tester. This allowed completion of the initial characterization of all test devices. Thirty-six parts were delivered to the Chem Lab on schedule Monday afternoon to begin the fluid resistance test. Also, Bruce Pease shipped us two quarts of the specific ATF he wants the test run with, along with the name of the supplier. We have delivered parts to the Environmental Labs to undergo vibration testing. George O'Leary indicates these will be done in about 2 weeks (drop-dead date is 5 weeks). We have also completed burst testing. Using Ford's criteria of meeting 7000 psi with 72% reliability at 90% confidence, I have used Weibull techniques to demonstrate that we actually meet 8315 psi with the given reliability and confidence. Vacuum testing was conducted this morning, results T-B-D, but no problems are anticipated.

The next test planned to begin is the Thermal Cycle test. For this test, we will need the Impulse Monitor Circuit and the modifications to the manifolds. Jeff is working on the circuit, and will check with the Model Shop to see if they can do the manifolds for us. If not, the modifications are not difficult and we will do them ourselves as needed. We are getting the TC test underway on a very aggressive schedule for two reasons: 1) it will take about 8-9 working days to complete; and 2) the 57PS originally failed this test during its validation and I am not confident we can pass it on the first attempt. My schedule allows for an iteration if necessary.

A potential problem surfaced during the Ford meeting. George Randell (Light Truck Release Engineer) does not want us to validate using lexports which were plated in-house, when the production plan calls for the lexport supplier to plate, i.e. our plating is not production-representative and does not meet ISIR definitions. We plan to skirt this issue by running Pass-Car parts through validation using actual production-intent lexports, and using this Pass-Car data to demonstrate suitability to Light Truck.

All other Light Truck validation tests require completion of the fluid resistance test first; these will be coordinated as needed. The inductor load bank for the powered lexpiler test is not needed until this time, although we originally planned to complete it early and run a "practice" test to expose any difficulties with the connect system. The present schedule does not allow for this. The final outstanding item in my mind is the terminal strength test. I understand that equipment for this test exists, but I am not familiar with it.

LT ISIR DIMENSIONAL PARTS: We owe six parts to QRA by 10/01 to undergo dimensional checks per the released envelope drawing. These parts will use 46412 hoses with the revised lock tabs. Molding has completed this change to all cavities, and has molded 400 parts. Keith Roberts will receive these hoses, and have "L" cavities built up and gages on the production line. We will use these to build parts for QRA.

PASS-CAR VALIDATION: Molding is presently working to complete changes to 46412 allowing the shift of the polarity key. The plan is to complete PC validation with these new offset-key parts.

We are meeting early next week with Valentine to discuss the changes to the reinsp cup. They have quoted this job, but we are not sure if they understand we need this tool to continue to produce *both* standard and reinsp cups. Their tool changes must be made reversible.

-MSG ID= 177750 FR=ELBJ TO=CC=1 SENT=09/21/90 10:53 AM
ST=C DIV=0050 CC=00101 BY=ELBJ AT=09/21/90 10:53 AM

TO: KEITH ROBERTS PCMZ
MATT SELLERS PCMZ
DAVE CZARN ZARN
TOM CHARBONEAU TC
STEVE MCCODEY MDES
RAY MANDEVILLE ATRD
STEVE OFFILER SB01

CC: JOHN KOURTESIS MDES
STEVE RODKEY MDES
BILL SWEET PCME
CHARLIE DOUGLAS CPPC
GARY SNYDER CPPC
RAY TOURANGEAU PCME

FR: ANDY MCKENNA AJM3

RE: 77PS (CCPS) SPRING ARM STATUS & DESIGN REVIEW MINUTES

AT THE SUBJECT MEETING, THE TEAM DECIDED TO PURSUE THE SIMPLIFIED RECTANGULAR SPRING ARM DESIGN. THE GOAL IS TO HAVE DRAFTING PRINTS OF A' BASE ASSEMBLY COMPONENTS READY FOR A FINAL REVIEW BY OCT. 2.
Bu. JRE THIS CAN HAPPEN, SEVERAL ADDITIONAL ACTIONS MUST BE PERFORMED:

WHAT	WHO	WHEN
* TEST BASES W/ L-SHAPED SPRING ARMS TO FAILURE	MCKENNA	9/28
* TEST L-SHAPED SPRINGS W/ 57PS SENSORS	MCKENNA	9/28
* PERFORM DYNAMIC LOADING & VIB. ANAL.	MCKENNA/MANDEVILLE	9/26
* WORK W/ BASSELER ON STRIP PRINTS	MCKENNA/ROBERTS/ SELLERS	9/28
* MARKED-UP PRINTS TO DRAFTING	MCKENNA	9/25
* DISCUSS/DECIDE SPRING TOOLING APPROACH	MCKENNA/ROBERTS/ SELLERS	9/26

REGARDS,
ANDY MCKENNA X1164

PRECISION CONTROLS DESIGN ENGINEERING
DESIGN REVIEW - 20 September 1990
77PS SPRING ARM / SWITCH ASSEMBLY

GOALS

SELECT FINAL SPRING DESIGN APPROACH:

* 33 PS STYLE SPRING ARM
* SIMPLE L-SHAPED SPRING ARM
* OPTIMIZED L-SHAPE SPRING ARM (FEA)

FINALIZE SELECTED DESIGN BY 01 NOV 90

PRECISION CONTROLS DESIGN ENGINEERING
DESIGN REVIEW - 20 September 1990
77PS SPRING ARM / SWITCH ASSEMBLY

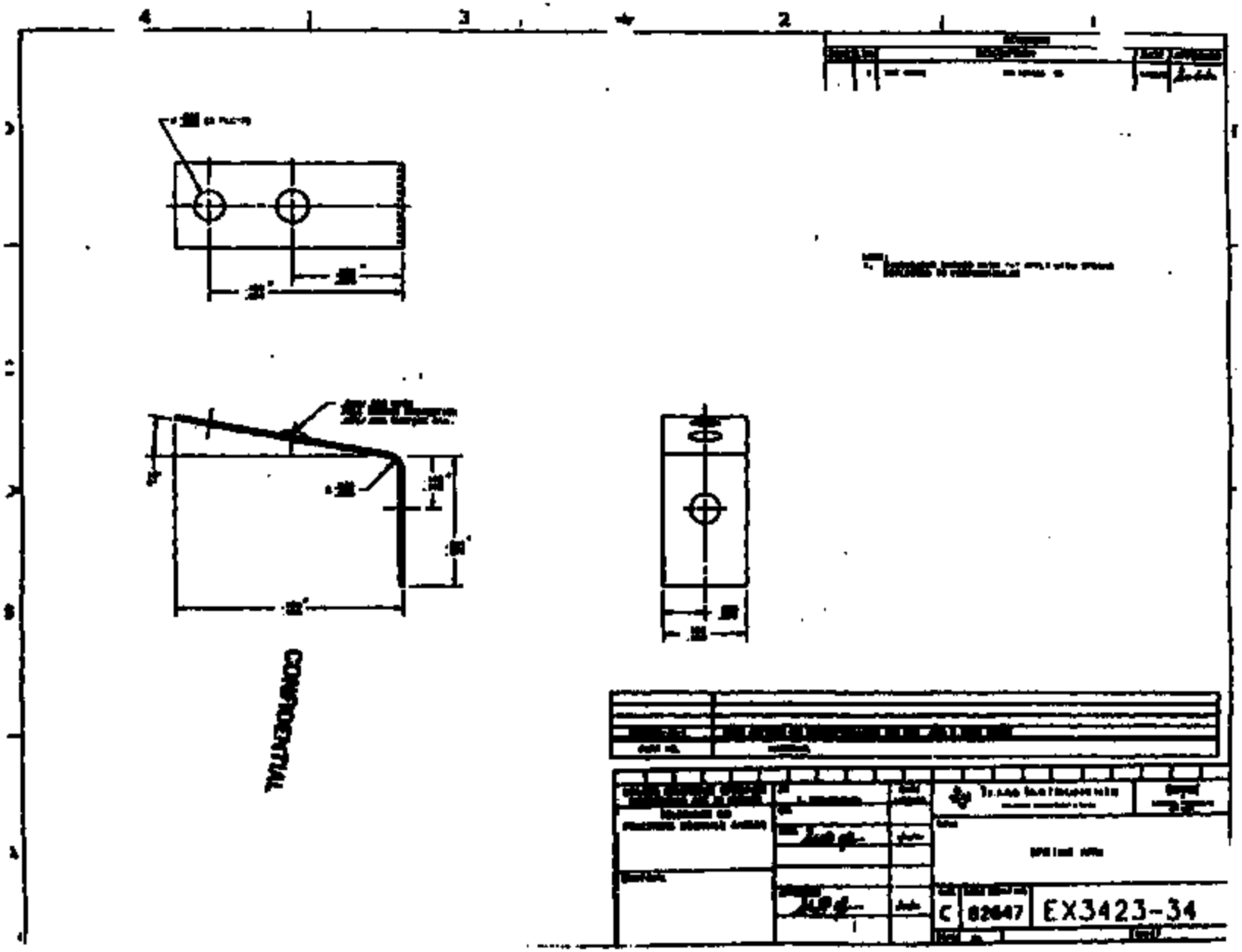
SIMPLE L-SHAPED SPRING ARM

ADVANTAGES:

- MEETS 77PS (RE-BUMP SENSOR) LIFE REQUIREMENTS
  - NO FAILURES AT 500K CYCLES (10 DEVICES TESTED)
  - LIFE REQUIREMENT: 500K CYCLES
- RELATIVELY SIMPLE TO MECHANIZE
- FITS INTO CURRENT PACKAGE, NO MAJOR TERMINAL OR BASE CHANGES REQUIRED

DISADVANTAGES:

- FULL TESTING NOT COMPLETE, MTTF NOT DETERMINED
- NOT TESTED WITH 57PS SENSORS
- DESIGN IS NOT OPTIMIZED
- SUITABILITY FOR BEND/CALIBRATION OPERATION UNKNOWN



CONFIDENTIAL

TI-HWTSA 0011121

PRECISION CONTROLS DESIGN ENGINEERING
DESIGN REVIEW - 20 September 1990
77PS SPRING ARM / SWITCH ASSEMBLY

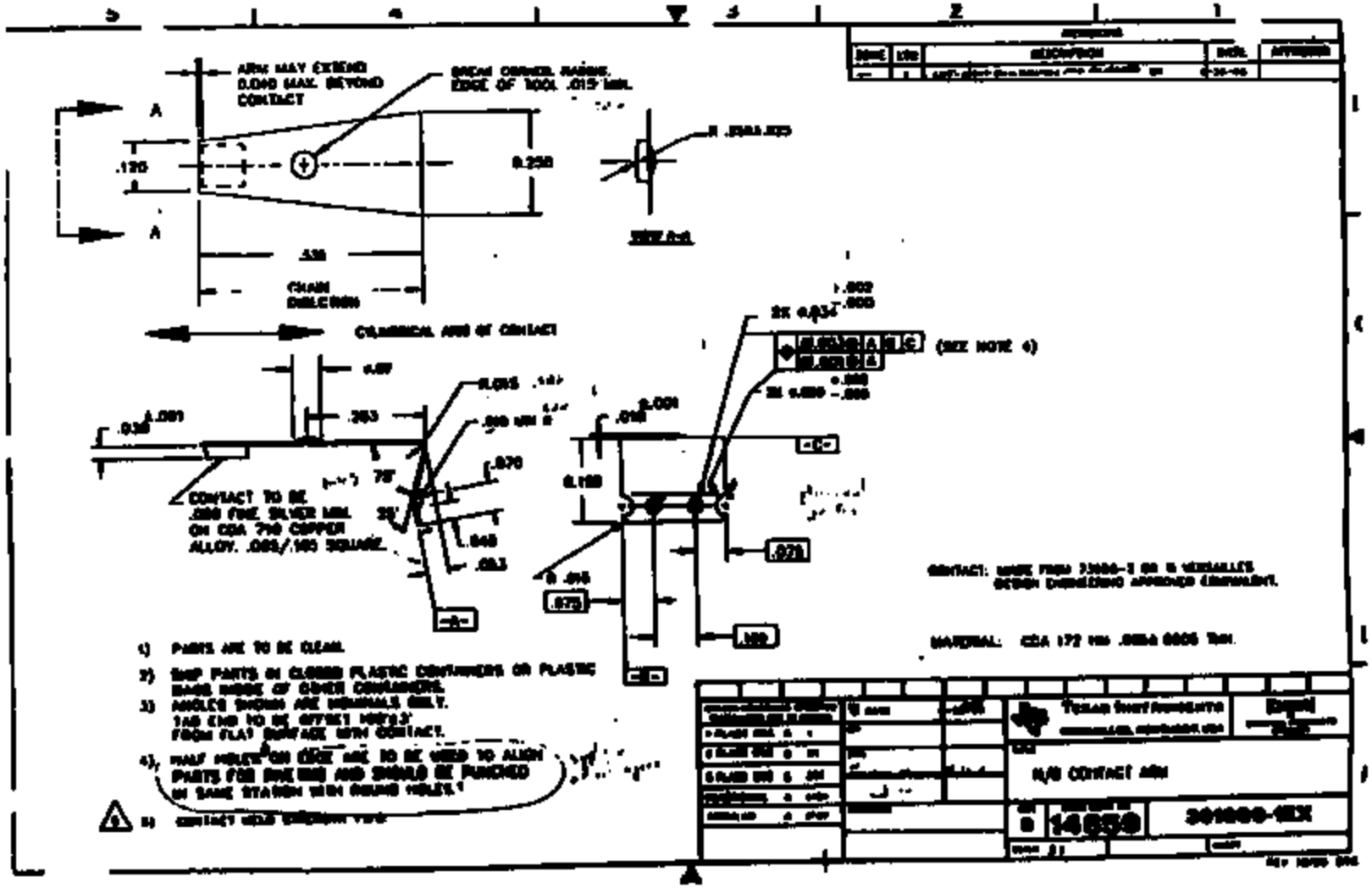
33PS SPRING ARM

ADVANTAGES:

- MEETS 77PS (RE-BUMP SENSOR) AND 57PSL2-1 LIFE REQUIREMENTS
  - NO FAILURES AT 1.3KK CYCLES (3 DEVICES TESTED)
  - LIFE REQUIREMENT: 500K CYCLES
- DESIGN ALREADY EXISTS

DISADVANTAGES:

- WOULD REQUIRE BASE, STATIONARY TERMINAL AND MOVABLE TERMINAL REDESIGN
- BASE BODY DIAMETER WOULD INCREASE
  - HINDER LONG-TERM GOAL OF MINITIMER A/C SWITCH AUTOMATION
- 33PS SPRING WOULD HAVE TO BE MODIFIED
- SUITABILITY FOR BEND/CALIBRATION OPERATION UNKNOWN
- RELATIVELY DIFFICULT TO MECHANIZE (STRIP FED, BEND)



CONFIDENTIAL

TI-HHTBA 001123

PRECISION CONTROLS DESIGN ENGINEERING
DESIGN REVIEW - 20 September 1990
77PS SPRING ARM / SWITCH ASSEMBLY

OPTIMIZED L-SHAPED SPRING ARM

ADVANTAGES:

* FEA ANALYSIS PREDICTS LONG LIFE IN BOTH 77PS AND 57PS DEVICES
* RELATIVELY SIMPLE TO MECHANIZE (?)
* FITS INTO CURRENT PACKAGE, NO MAJOR TERMINAL OR BASE CHANGES REQUIRED

DISADVANTAGES:

* NO SAMPLES MADE, NO TESTING PERFORMED
* SUITABILITY FOR BEND/ CALIBRATION OPERATION UNKNOWN

I)19AIQ

77PS SPRING ARM DEVELOPMENT
ANDY MCKENNA
SEPTEMBER 20, 1990

SPRING FORCE AND CONTACT FORCE DATA

L-SHAPED SPRING ARM

THICKESS	K BEFORE (LB/IN)	K AFTER (LB/IN)	CONTACT FORCE	K(B) POST LIFE (LB/IN)
0.004	2.28	24.2	150	2.28
0.005	4.07	57.6		4.07
0.006	7.94	77.0		7.94
0.007	9.93			9.93
0.010	28.69			28.69

33PS SPRING ARM

THICKESS	K BEFORE (LB/IN)	K AFTER (LB/IN)	CONTACT FORCE	K(B) POST LIFE (LB/IN)
0.004	3.04	19.9	190	

OPTIMISED L-SHAPED SPRING ARM (PREDICTED)

THICKESS	K BEFORE (LB/IN)	K AFTER (LB/IN)	CONTACT FORCE	K(B) POST LIFE (LB/IN)
0.004	7		34 GRAM	

56PS SPRING ARM

THICKESS	K BEFORE (LB/IN)	K AFTER (LB/IN)	CONTACT FORCE	K(B) POST LIFE (LB/IN)
0.004	3.04	39.4		

)19AIQ

77PS SPRING ARM DEVELOPMENT
ANDY MCKENNA
SEPTEMBER 20, 1990

L-SHAPED ARM, 77PS REBOMP SENSOR

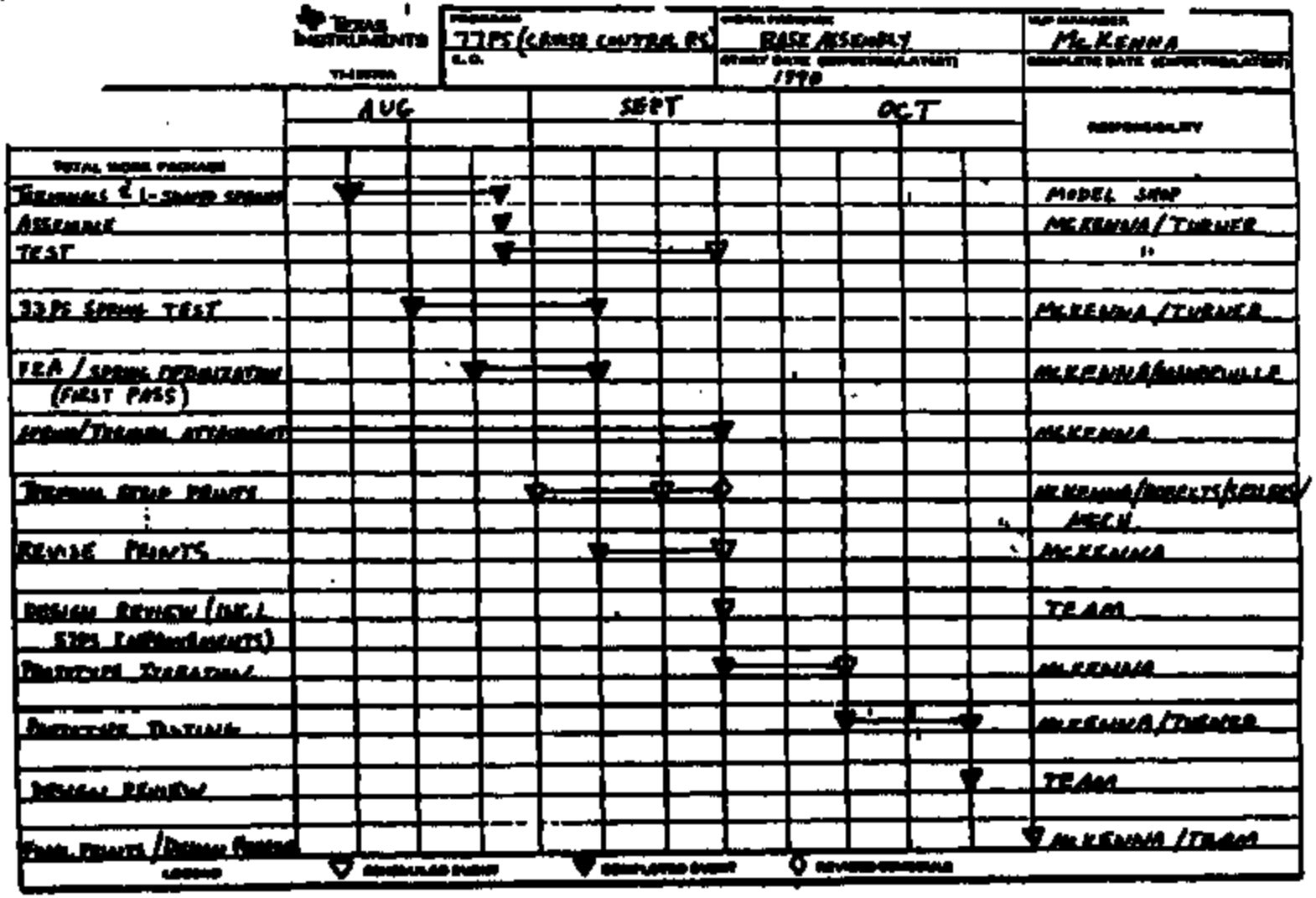
ID	SENSOR ALONE ACT	SENSOR ALONE REL	PRE-TEST ACT	PRE-TEST REL	POST-TEST ACT	POST-TEST REL	% CHANGE BY SENSOR ACT	% CHANGE BY SENSOR REL	% CHANGE OVER LIFE ACT	% CHANGE OVER LIFE REL
1	160	65	147	65	132	51	-8.1	0.0	-10.2	-21.5
5	155	70	145	70	130	51	-6.5	0.0	-10.3	-27.1
6	156	72	141	66	128	50	-10.4	-8.3	-9.2	-24.2
7	158	66	143	61	127	49	-9.5	-7.6	-11.2	-19.7
13	150	71	133	65	123	54	-11.3	-8.5	-7.5	-16.9
14	156	67	138	65	138	45	-11.5	-3.0	-5.8	-30.8
16	144	64	127	63	115	45	-11.8	-1.6	-9.4	-28.6
20	146	69	127	64	113	53	-13.0	-7.2	-11.0	-17.2
21	156	72	112	64	104	48	-28.2	-11.1	-7.1	-25.0
22	148	63	105	50	102	41	-29.1	-20.6	-2.9	-18.0

33PS SPRING ARM, 77PS REBOMP SENSOR

ID	SENSOR ALONE ACT	SENSOR ALONE REL	PRE-TEST ACT	PRE-TEST REL	POST-TEST ACT	POST-TEST REL	% CHANGE BY SENSOR ACT	% CHANGE BY SENSOR REL	% CHANGE OVER LIFE ACT	% CHANGE OVER LIFE REL
1	137	35	133	36	122	33	-2.9	2.9	-8.3	-8.3
2	193	42	136	46	105	35	-2.3	-4.8	-19.2	-12.5
3	130	42	126	42	102	31	-3.1	0.0	-19.0	-26.2

33PS SPRING ARM, 57PS SENSOR

ID	SENSOR ALONE ACT	SENSOR ALONE REL	PRE-TEST ACT	PRE-TEST REL	POST-TEST ACT	POST-TEST REL	% CHANGE BY SENSOR ACT	% CHANGE BY SENSOR REL	% CHANGE OVER LIFE ACT	% CHANGE OVER LIFE REL
4	466	244	452	244	432	239	-3.0	0.0	-4.4	-2.0
5	460	-247	459	238	440	246	-4.4	3.3	-2.6	-3.5
6	450	230	446	232	434	225	-0.9	-2.9	-2.7	-2.6



cc: DAVE

December 21, 1990

To:	Bagamni,	Larry	Ford Body Electrical
	Blount,	Walt	Ford Brake Engineering
	Carrasbero,	Dale	Kelsey-Hayes
	Ettinger,	Harvey	Ford Body Electrical
	Farrell,	Jim	Southerhead
	Freeman,	Ken	Ford Component Engineering
	Hagen	Gary	Ford Purchasing
	Henderschot	Fred	Ford Purchasing
	Jamasi,	Frank	Ford Brake Engineering
	Klingler,	Gary	Ford Electronic Speed Control Engineering
	Park,	Bill	Sumitomo
	Randall,	George	Ford Light Truck Speed Control
	Schaub,	Joe,	Texas Instruments
	Weiss,	Colleen	Ford Purchasing
	Wilson,	Chuck	United Technologies Automotive

From: Bruce Peace

Subject: Update on Passenger Car Electronic Speed Control Deactivation Switch

The new Electronic Speed Control is currently released for 1991 FN-26 (Lincoln Town Car), 1991 L/S BN-53 (Ford & Mercury), 1991 FN-10 (Bronco) and 1991 Taurus automatic 3.2L SHO passenger cars. A speed control deactivate switch is PIA (purchased-in-assembly) for either the Proportioning Valve or Adapter Assembly in these vehicles.

The passenger car speed control switch will be gray in color (and have a gray color polarized connector) to distinguish it from the truck speed control switch (black), the power steering switch (white), and the suspension control switch (blue). The polarized connector will foolproof the speed control switch when it is packaged adjacent to the suspension switch on the 1994 Continental Thunderbird, and Cougar.

INCORPORATION OF DEACTIVATE SWITCH

To date, Ford Builds have utilized the released switch, except with non polarized plastic housing (polarized housing and connectors were unavailable). Incorporation of both the polarized switch and electrical connector will be as follows:

1991 FN26 (Lincoln Town Car):	MED Build,	MSB	1991	April 8
1991 L/S BN53 (Cr Vic, Gd Marquis):	VP Build,	MSB	1991	January 21
1991 FN10:	VP Build,	MSB	1991	July 29
1991 Taurus 3.2L Automatic SHO:	VP Build,	MSB	1991	July 29

The polarized switch can be identified by a black mark on top of the offset polarizing tab. This mark will be placed on all polarized switches shipped prior to August 15, 1991.

SWITCH USAGE and CONFIGURE

The following switches are currently released for passenger car.

F2VC-9F924-BA, Usage through approx. Sept. 1991	(Manually Assembled)
F2VC-9F924-AA, Usage after approx. Sept. 1991	(Automatically Assembled)

Concern C10112069 is being written (discussed later) that will revise the switch part numbers as follows:

F2VC-9F924-BA will revise to	F2VC-9F924-BB
F2VC-9F924-AA will revise to	F2VC-9F924-AB

No change in the current and them part numbers is anticipated.

The -BA and -AA switches are equivalent in performance and interchangeable. The part number differences are primarily for cost tracking. However, the -AA is 5.1 mm shorter than the -BA. Proportioning Valve and Adapter Assy end user suppliers must be aware of this and take into account for design of assembly torquing, and test equipment.

SWITCH RECEIVER DIMENSIONS

The switch and receiving port on the Proportioning Valve or Adapter Assy are designed per SAE J511. Dimensional Stacking drawings indicate 2 potential areas of concern.

1. The switch maximum diameter cone seat can have clearance (no seal) to the minimum diameter port cone, if port depth is at minimum.
2. The switch thread may bottom out with the port thread when torqued

Concern C10112069 has been issued to resolve these potential problem areas. The following dimensions will be revised:

1. Switch cone diameter will be revised from 6.0/5.91 to 5.81/5.69 mm.
2. Switch dog point length will be revised from 1.27/.76 to 1.40/1.10 mm
3. Switch thread lead-in angle will be revised from 60/35 to 30/40 degrees

1 places

COST AVOIDANCE DIMENSIONAL REVISION

The switch supplier, Texas Instruments states that maintaining the SAE J512 +/-.051 mm tolerance will result in an approximate $.50 (with permission) cost increase from previously quoted SAE J514 (O-ring seal) design. This can be avoided by increasing tolerance from +/-.051 to +/-.125 mm.

This tolerance is accepted and included in the C10112069 contract. This new tolerance is included in the new case switch diameter of 3.81/3.56 mm as described above. JB

SUPPLIER VALIDATION RESPONSIBILITIES

It is judged that the new switch dimensions, while a departure from SAE specification, are not detrimental and on the contrary result in increase design robustness. Nonetheless, each Ball Team Supplier is responsible to conduct necessary testing to validate the customs dimensional characteristics of the switch as packaged in their respective propersioning or adapter assembly. Test documentation should include at least the following cases

1. Establish minimum torque to seal 2000 psi for 1 minute.
   (Maximum Sealing Surfaces Interference Case).
   * Switch case dia. = 3.68 mm Minimum, Port bore = 3.94 mm Maximum
   * Switch full thread = Min. length, Port full thread = max depth

2. Establish maximum torque to seal 2000 psi for 1 minute.
   (Minimum Sealing Surfaces Interference Case).
   * Switch case dia. = 3.81 mm Maximum, Port bore = 3.84 mm Minimum
   * Switch full thread = max. length, Port full thread = min. depth

3. Establish torque to fail (leak). Define failure mode.
   (Maximum Sealing Surfaces Interference Case).
   * Switch case dia. = 3.68 mm Minimum, Port bore = 3.94 mm Maximum
   * Switch full thread = Min. length, Port full thread = max depth

4. Establish torque to fail (leak). Define failure mode.
   (Minimum Sealing Surfaces Interference Case).
   * Switch case dia. = 3.81 mm Maximum, Port bore = 3.84 mm Minimum
   * Switch full thread = max. length, Port full thread = min. depth

5. Determine burst pressure for crushed up minimum full thread engagement case for switch to port. Requirement is 34.5 MPa (5000 psi).

   (Note: current switch dimensions permit a nominal 2.7 mm [minus tolerance allowance] deeper port than prescribed by SAE J513. If more full thread engagement is required.)

6. Determine reduction in hole diameters at maximum finalized production installation torque. Requirement is 2.1 mm (.083 in.) min post test dia.

Please call me with comments or questions.

Bruce Pompa

Bruce Pompa

Brake Department
(313) 322-7916

R/=070 ST=C DIV=0050 CC=00101 BY=SB01 AT=05/15/91 08:54 AM

TO:	Tom Charbeneau	TC	Gary Snyder	CPPC
	Dave Cahn	ZARW	Martha Sullivan	CPPC
	Steve Major	NHLS		
CC:	Mike DeBattis	PCQA	Matt Sellers	PCNE
	Charlie Douglas	CPPC	Jim Watt	PCQA
	Joe Schuck	NHLS		
FR:	Steve Offiler	SB01		

SJ: CCPS Engineering/Program Milestones

The following is a list of milestones that was compiled in preparation for the Wednesday 91-05-15 meeting with Ford Light Truck Brake Engineering, specifically Mehru Modi. Mr. Modi, as you are well aware, is not a TI ally. The goal of the meeting is to convince Mr. Modi that TI has been intimately and actively involved for a significant length of time, and that we have been supportive and responsible throughout. Key milestones from this list will be hand-picked by Mkt and Field Sales for the meeting.

02/89 — Eng. trip to Ford; Engineering discussions kicked off including Design Validation requirements, sample needs, Eng. Specification, etc. Met with PC Brake Eng. Diane Koenig & Speed Control Supv. Gary Klingler.

03/89 — Design Validation of old, direct-disc design based on an abbreviated Prod. Val. test from 5795 ES.

04/89 — Discussions of connector styles; 5795 (Minitimer) with altered polarity key is suggested by Ford.

04/28/89 — First samples ship: qty 116, to Gary K., based on modified 5795.

05/25/89 — 50 samples using 7795 switch shipped.

06/89 — First info from Ford that the original 150 psi act. assumption may change, and may be different for car and for truck. This later proves to be true. Test devices are constructed in several different ranges to support Ford testing.

06/23/89 — Mehru Modi surfaces for the first time; he insists upon an SAE J512 metal-to-metal seal rather than O-ring.

07/89 — Our Mechanization people are becoming involved; calibration of switch asm. rather than pin selection is proposed as being higher quality, lower cost, and more automatable.

08/89 — PIST & PIPC samples for LT are shipped.

11/89 — First word that the LT spec will be 250 +/- 50; design direction changes fundamentally from direct disc to 5795 converter-style sensor.

12/89 ES negotiations begin; we provide Ford with a marked-up S7P8 spec to form a basis for discussion.

01/90 LT decides to use a S7P8 variant for initial production.

Major meetings are held within Ford, with TI in attendance, in order to reconcile program issues between PC Brake, LT Brake, and Speed Control Eng.

02/90 The PC spec will be 12S +/- 3S; internal changes to convertar sensor to hit this range are begun.

During ongoing ES negotiations, we support Ford in several ways by suggesting more cost-effective/more realistic test procedures; ex: powered impulse tests, use of MIL-STD humidity tests.

02/08/90 First word that Tokico is considered for LT master cylinder business; the only issue raised is overall length: (no diameter is mentioned) they want 1.75".

03/90 ES is finalized in content; work is ongoing to redesign the sensor in a cost-effective (tooling, etc) manner for the PC 12S +/- 3S spec.

05/90 All envelope prints for this program are converted to conform to ANSI Y14.5M-1982 and metricated.

06/90 PC decides upon the J512 seal also; first samples ship.

07/90 We are in contact with Ford SQA Scott Rauch. Details of ISIR submission for LT & PC are being addressed.

08/17/90 Ford adds a fluid-resistance test requirement to the ES at the eleventh hour (in terms of ISIR efforts). We accept it.

Also, we redesign internal components to minimize internal volume and reduce trapped air potential per Ford.

09/90 The cost-effectiveness of producing a J512 chamfer with standard +/- .003" tolerance becomes a major issue, eventually leading to a comprehensive paper study followed by a validation test and verbal blessing from the SAE J512 committee.

09/18/90 Ford visits TIA; Pease, Randall, Klingler.

11/90 LT Production Validation (S7P8) is completed; ISIR package is submitted.

12/90 PC okays the modifications to J512.

PC PV and ISIR (S7P8) is completed and submitted.

TI invents a method to gage the J512 chamfer.

02/91 LT okays the modifications to J512.

Tokico and TIJ correspondence begins.

Mechanization is nearing completion of automated tooling design; important calibration debug is very successful.

03/91 Tokido samples with nickel-plate bezzerts are shipped.

We are supporting PC Tier-1 suppliers in their modified J512 validation testing.

04/91 Audible noise on WIN86 platform alerts LT and PC Eng. of possible problems; we immediately begin development of quiet devices and ship samples.

Regards,
Steve O.

7/24/90

To: Ray Mandeville

FR: Andy McKenna

Re: 77PS/57PS Spring Arm dynamic analysis

Ray, could you please perform the analysis we've discussed previously on the spring arm (print enclosed). Could we perform a matrix of analyses for 3 material thicknesses (.004", .005", .006") and 2 loading conditions (57PS, 77PS) – Total: 6 analyses. If you have any questions or comments, please let me know.

thx,

Andy x1164

1418-C