EA02-025

FORD 10/27/03

APPENDIX N

BOOK 16 OF 61

PART 3 OF 4

TEXAS INSTRUMENTS

February 5, 1999

TO: Name:	**Mr. Fred Porter** **Ford**	**FROM:**	**Stephen Proia**
Phone Number:	**313-845-3722**		**508-236-1383**
FAX Number:	**313-390-4145**		**508-236-3586**

SJ: 77PS – Cruise Control Pressure Switch **# OF PAGES: 15 (INCLUDING THIS PAGE)**

Fred,

Please feel free to contact me with any questions. In this fax you will find:

1. Process flow diagrams for the 77PS switch
2. Equipment illustration

Have a nice weekend.

Sincerely,

Stephen B. Proia
Hydraulic Pressure Switch
Mfg Engineering Supervisor

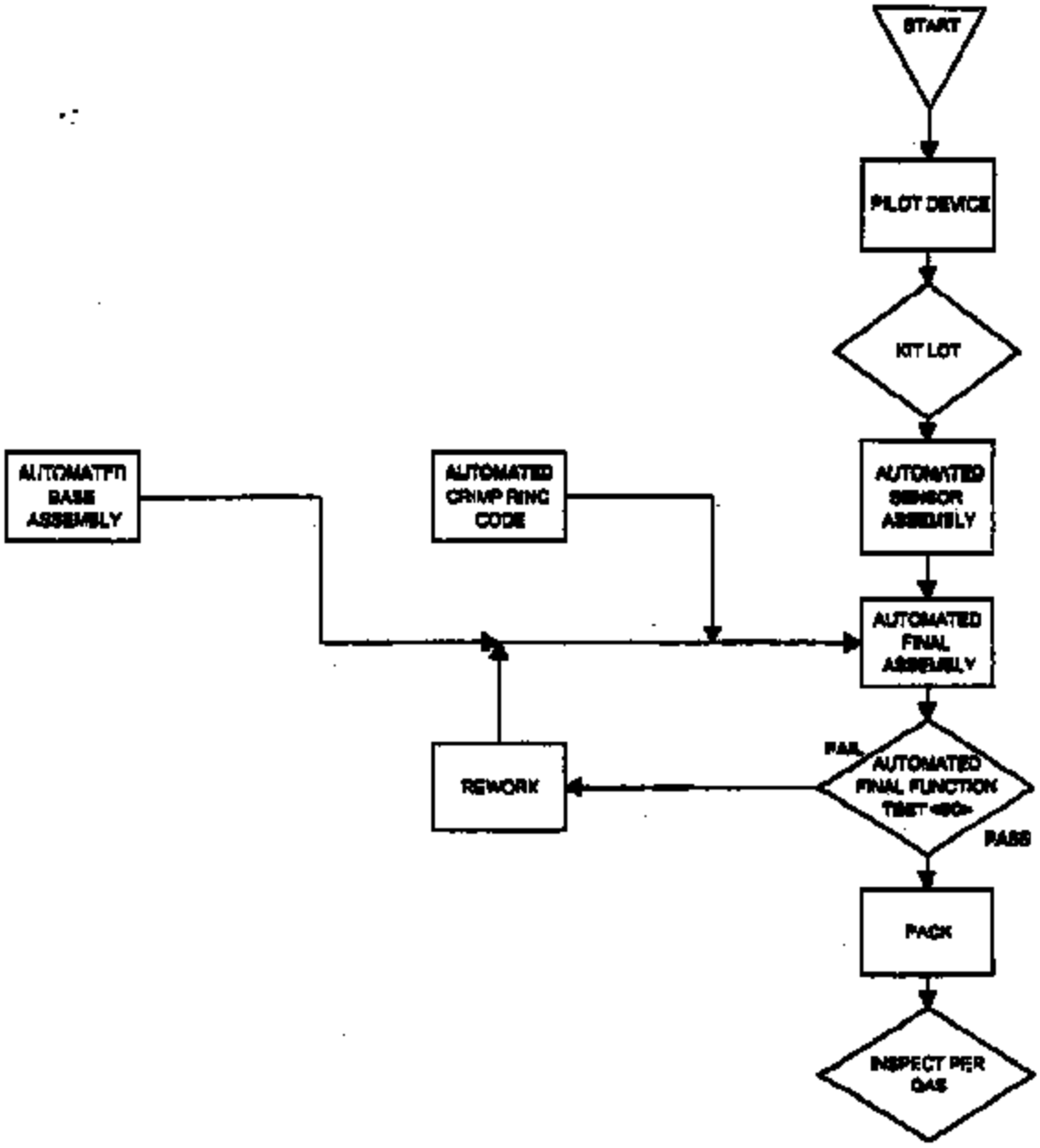
PROCESS FLOW DIAGRAM

PROCESS: OVERVIEW

MODEL YEAR(S)/VEHICLE(S): 7787P6

PREPARED BY: ANN REA
PF DATE(ORIG.): 8/12/90
PF REVISION: A
DOCUMENT #612262

LEGEND:



PROCESS FLOW DIAGRAM

PROCESS: AUTOMATED SENSOR ASSEMBLY

MODEL YEAR(S)/VEHICLE(S): [illegible]

PREPARED BY: ANN RCA
FF DATE(ORIG.): 4/18/96
FF REVISION: A
DOCUMENT NO: [illegible]

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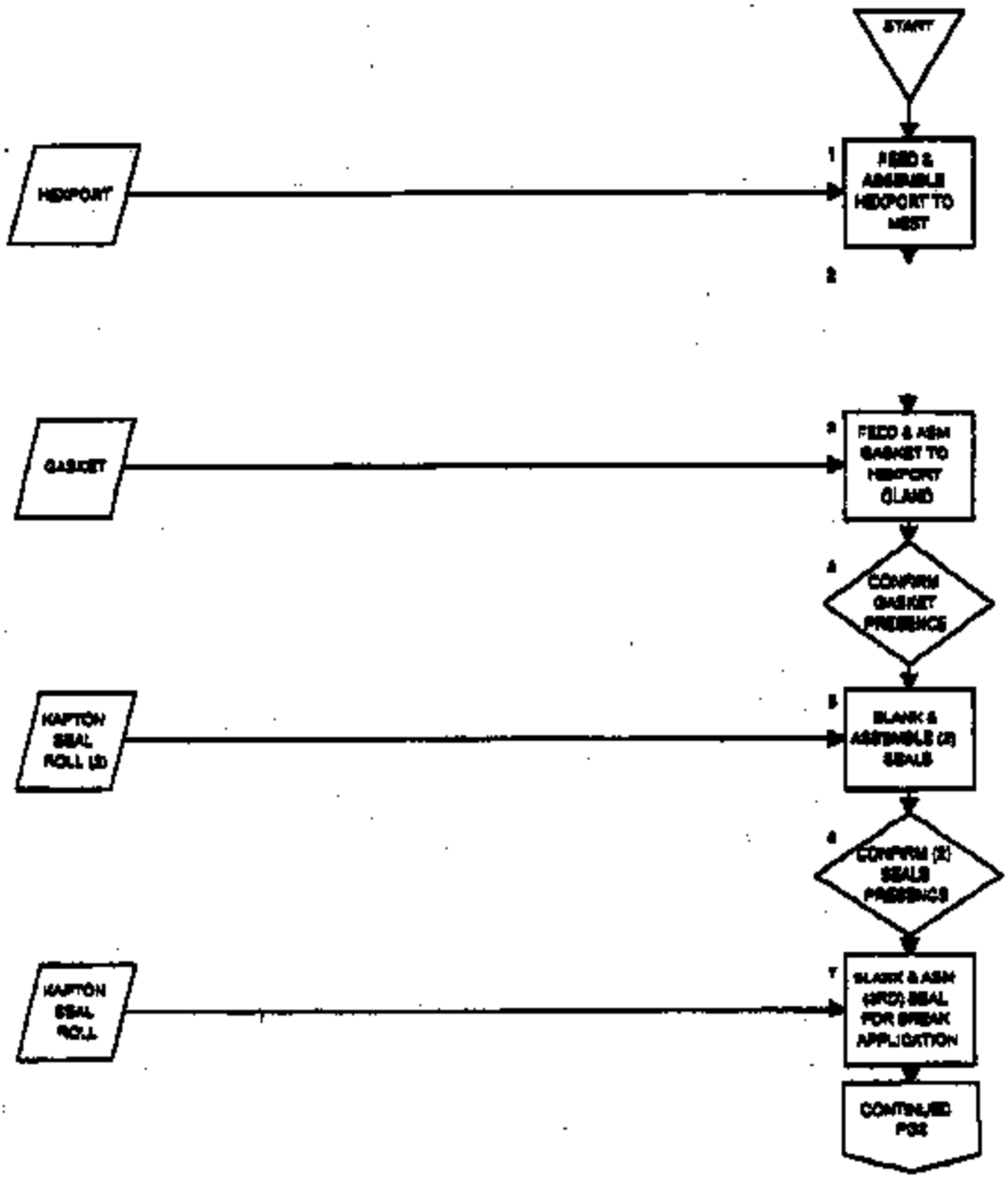
PROCESS | RAW MATL | INSPECT | PAGE CONNECTOR | START | <SC> SPECIAL CHARACTERISTIC CLASSIFICATION



PROCESS FLOW DIAGRAM

PROCESS: AUTOMATED SENSOR ASSEMBLY

PREPARED BY: ANN RIA
PF DATE(ORIG.): 6/1999
PF REVISION: A
DOCUMENT #P2000

LEGEND:

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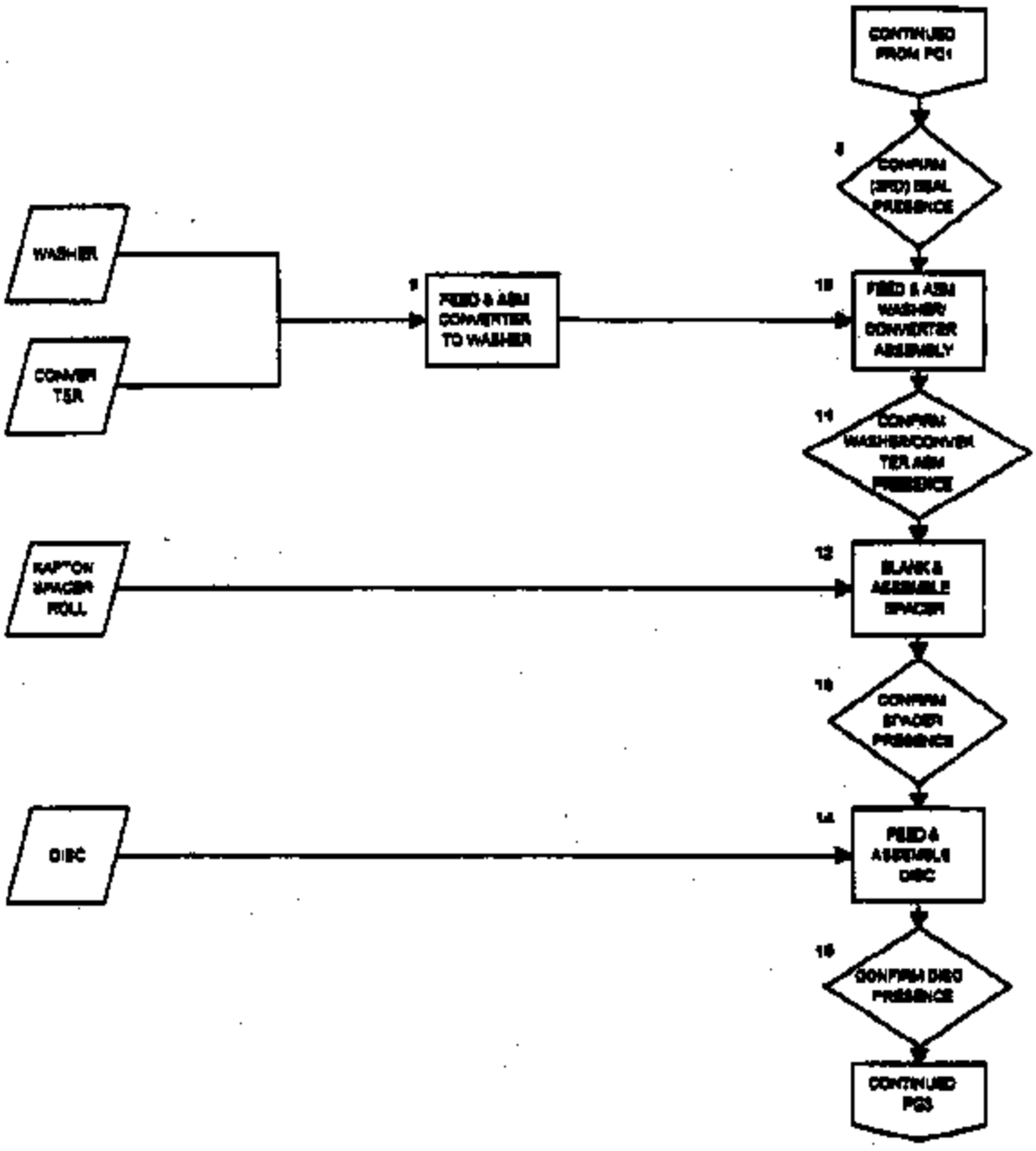
SPECIAL
CHARACTERISTIC
CLASSIFICATION



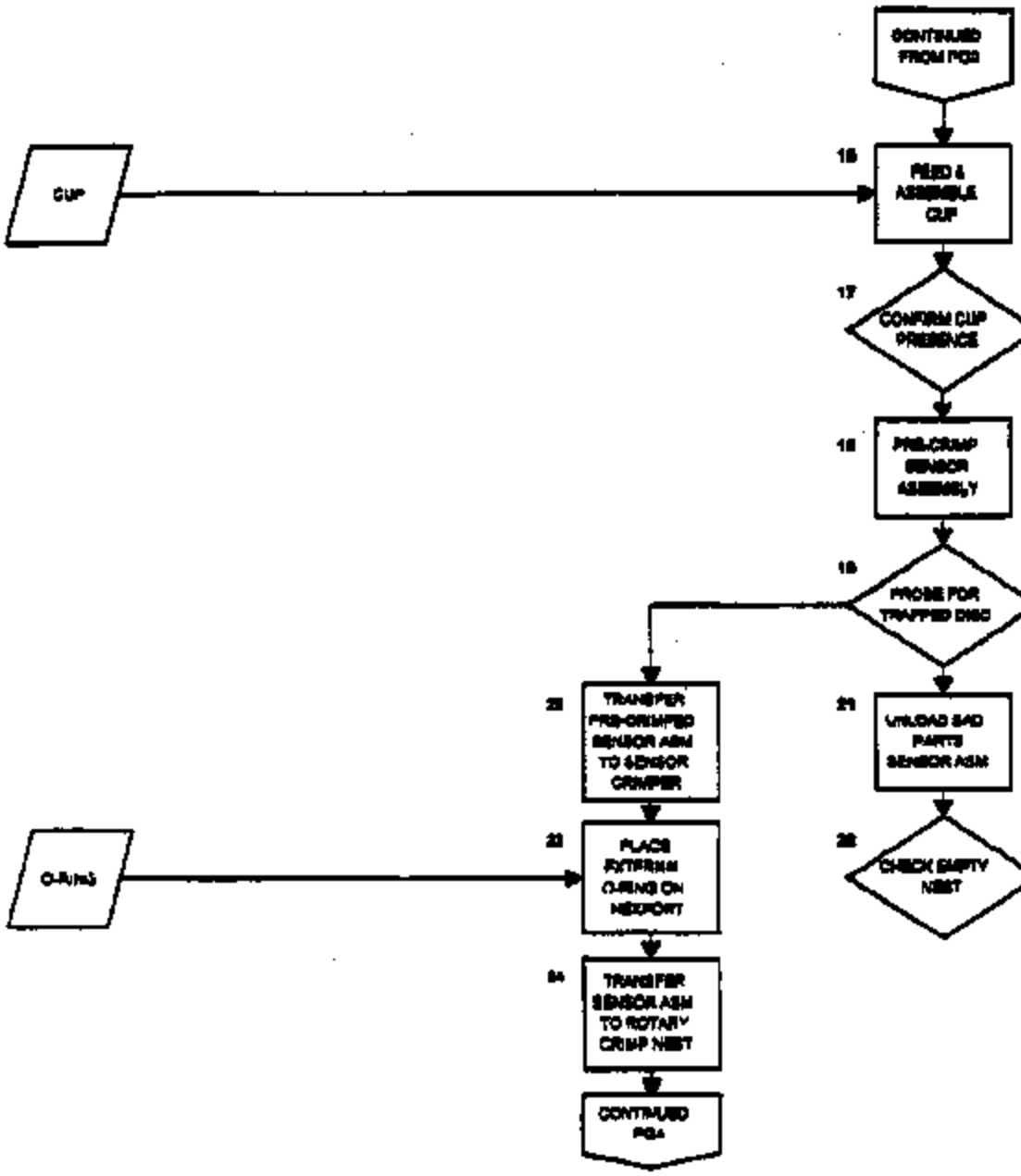
PROCESS FLOW DIAGRAM

PROCESS: AUTOMATED SENSOR ASSEMBLY

PREPARED BY: ANN REA
PF DATE(ORIG.): 6/12/96
PF REVISION: A
DOCUMENT:6913360

LEGEND:

<SC> SPECIAL CHARACTERISTIC CLASSIFICATION



PROCESS FLOW DIAGRAM

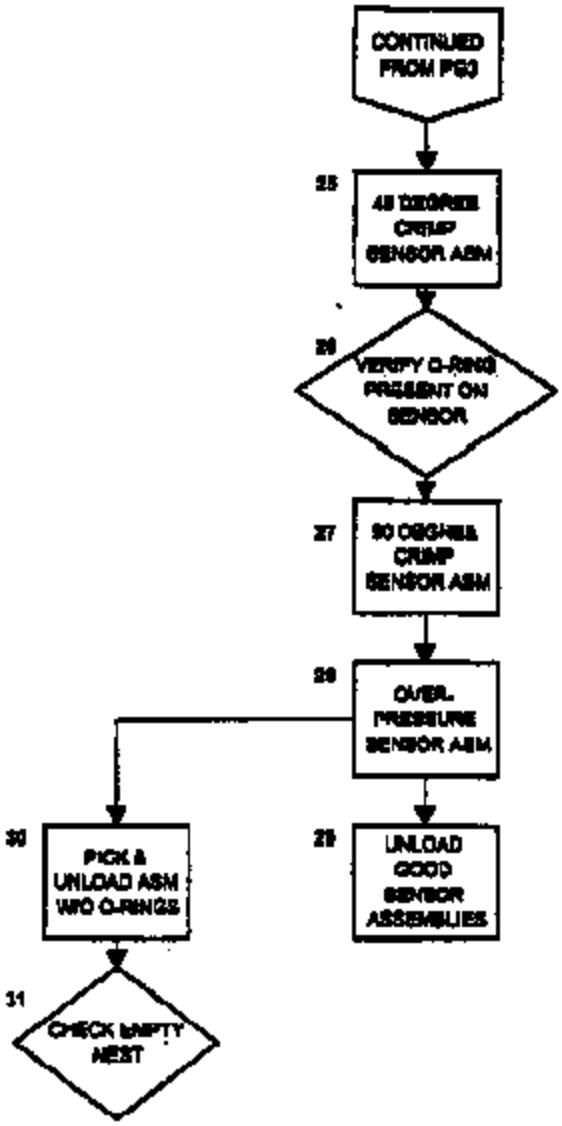
PROCESS: AUTOMATED SENSOR ASSEMBLY

MODEL YEAR(S)/VEH CLASS(ES): [illegible]

PREPARED BY: ANN REA
PF DATE(ORIG.): 8/12/98
PF REVISION: A
DOCUMENT 9612282

LEGEND:

PROCESS | RAW MATL | INSPECT | PARA CONNECTION | STAMP | <SC> SPECIAL CHARACTERISTIC CLASSIFICATION



PROCESS FLOW DIAGRAM

PROCESS: AUTOMATED BASE ASSEMBLY

MODEL YEAR(S)/VEHICLE(S): 7767PS

PREPARED BY: VALENTINA VIDEVA

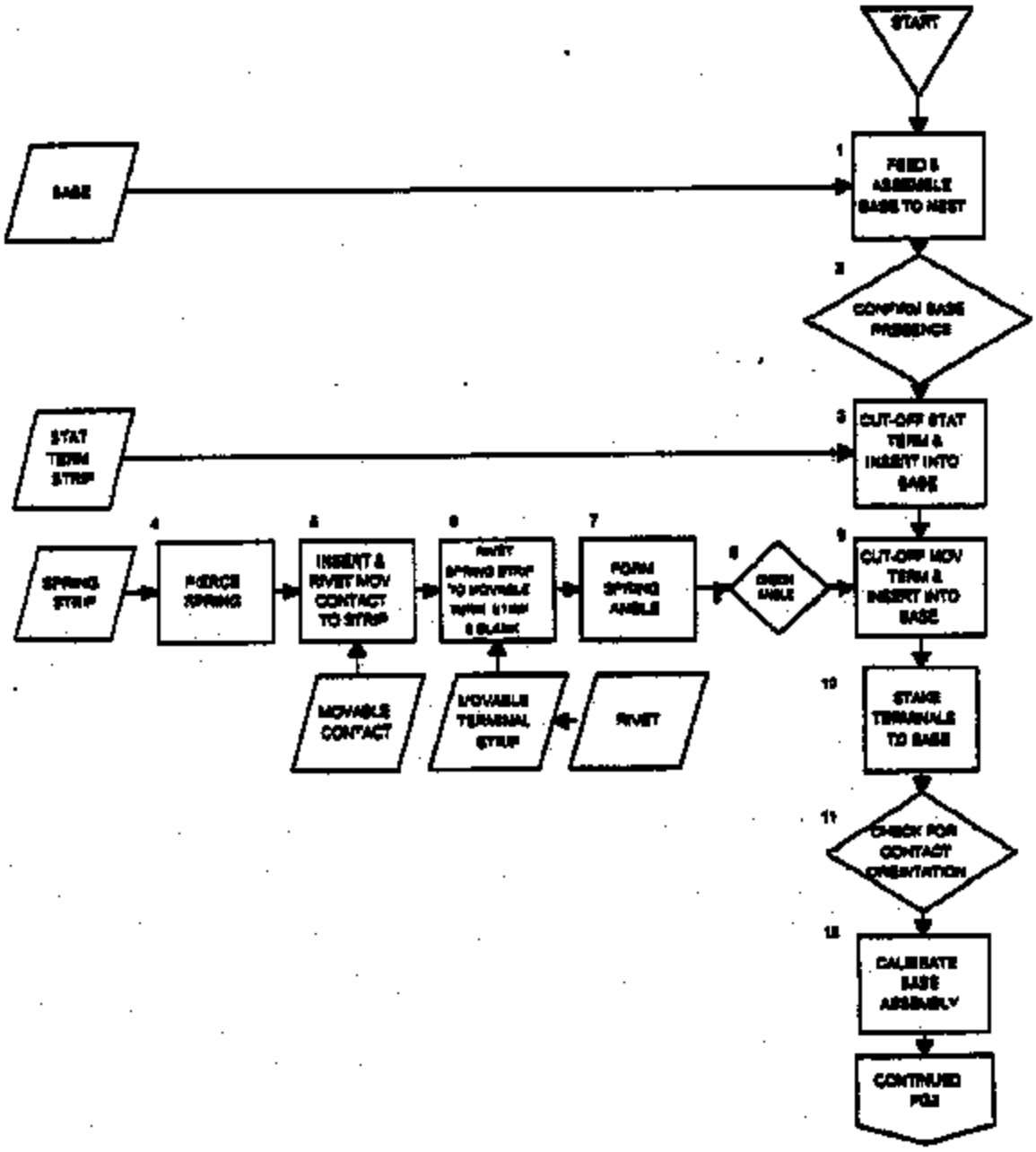
PF DATE(ORIG.): 01/98

PF REVISION: C

DOCUMENT # 81287

LEGEND:

<BC> SPECIAL CHARACTERISTIC CLASSIFICATION



PROCESS FLOW DIAGRAM

PROCESS: AUTOMATED BASE ASSEMBLY

MODEL YEAR(S)/VEHICLE(S): T7/97P9

PREPARED BY: VALENTINA VEDEVA
PF DATE(ORIG.): 8/12/98
PF REVISION: C
DOCUMENT # 512377

LEGEND:

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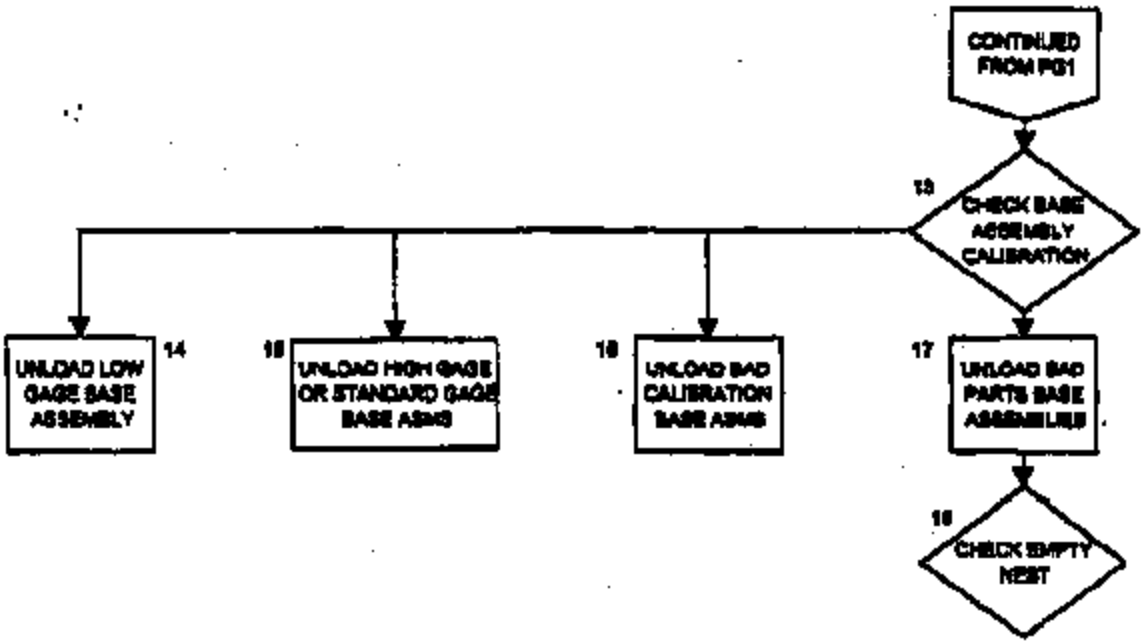
SPECIAL CHARACTERISTIC CLASSIFICATION



PROCESS FLOW DIAGRAM

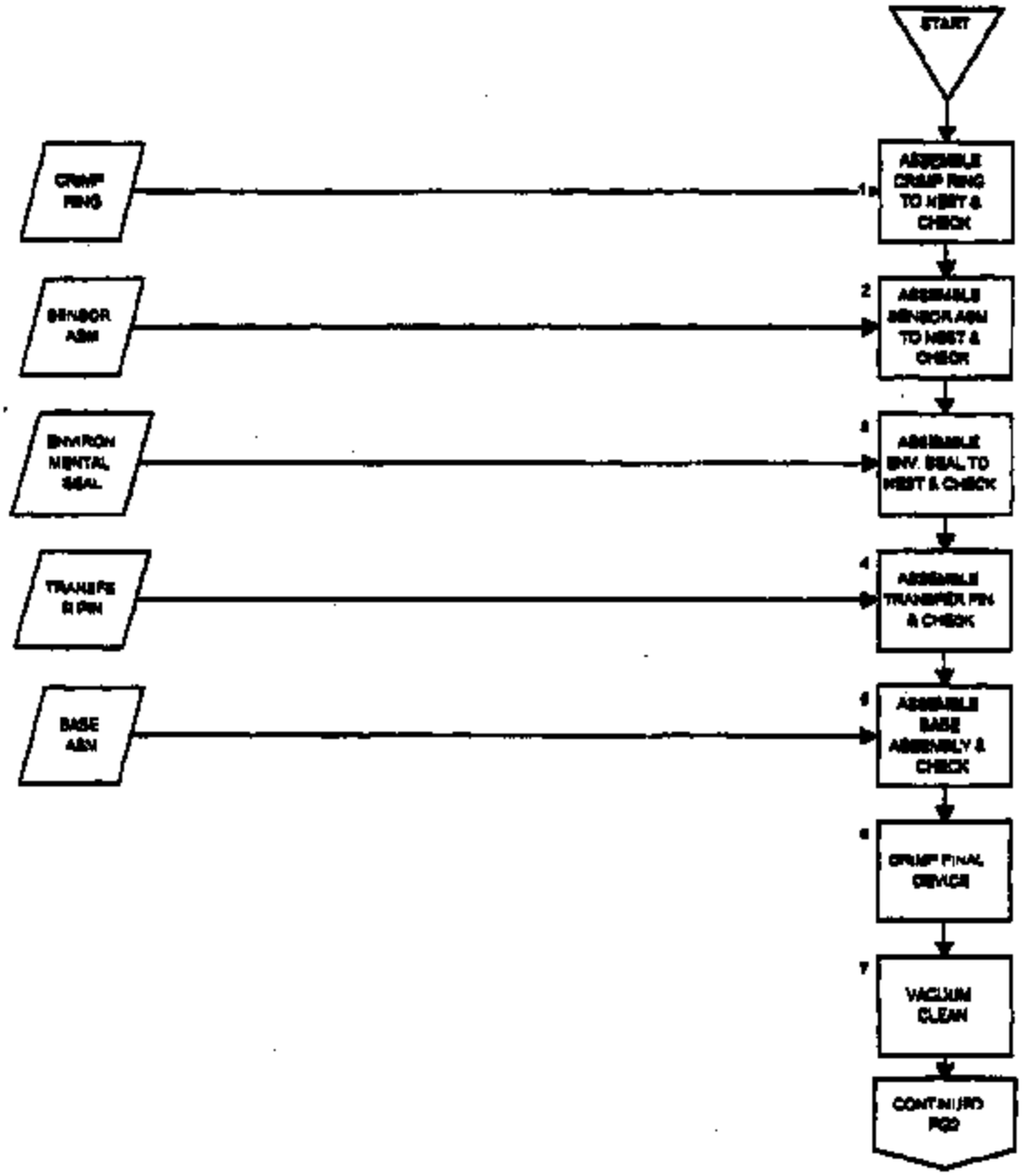
PROCESS: AUTOMATED FINAL ASSEMBLY

MODEL YEAR(S)/VEHICLE(S): 97/737/757

PREPARED BY: ANN REA
PF DATE(ORIG.): 9/1/96
PF REVISION: A
DOCUMENT # 912876

LEGEND:

SPC# SPECIAL CHARACTERISTIC CLASSIFICATION



PROCESS FLOW DIAGRAM

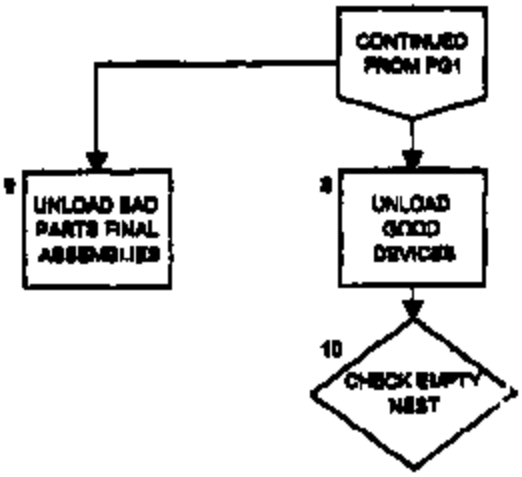
PROCESS: AUTOMATED FINAL ASSEMBLY

MODEL YEAR(S)/VEHICLE(S): 97/7787PS

PREPARED BY: ANN RBA
PF DATE(ORIG.): 8/12/96
PF REVISION: A
DOCUMENT # 612378

LEGEND:

PROCESS | MAN MATL | INSPECT | FADE CONNECTOR | START | <SC> SPECIAL CHARACTERISTIC CLASSIFICATION



PROCESS FLOW DIAGRAM

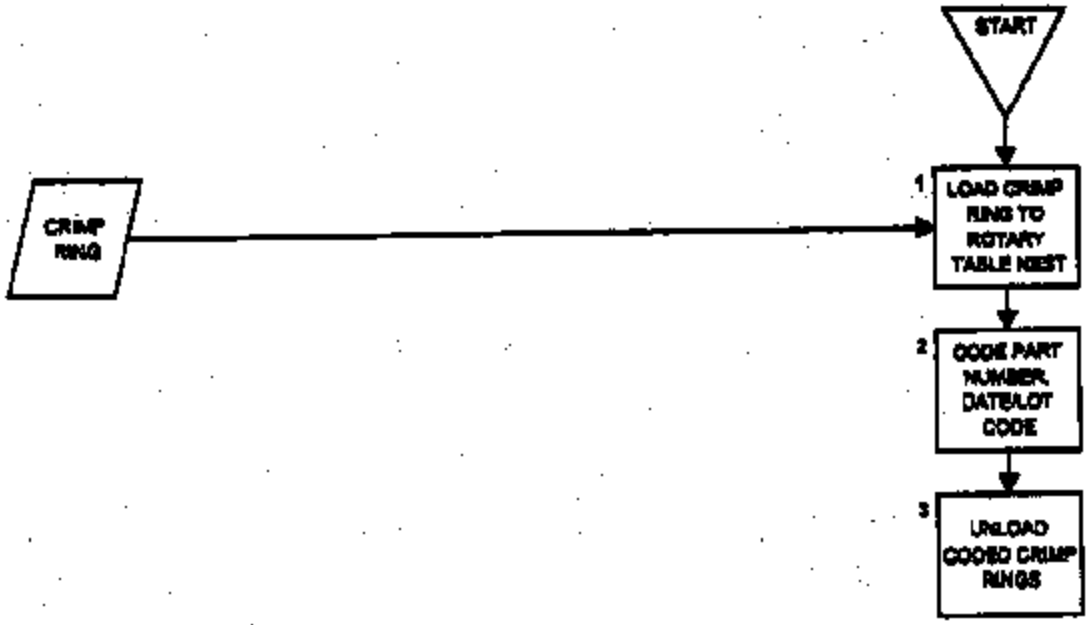
PROCESS: AUTOMATED CRIMP RING CODE

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

PREPARED BY: ANN RIA
FF DATE(ORIG.): 6/12/98
FF REVISION: A
DOCUMENT: 6612356

LEGEND:

<SC> SPECIAL CHARACTERISTIC CLASSIFICATION



PROCESS FLOW DIAGRAM

PROCESS: AUTOMATED FINAL FUNCTION TEST

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

PREPARED BY: ANN REA

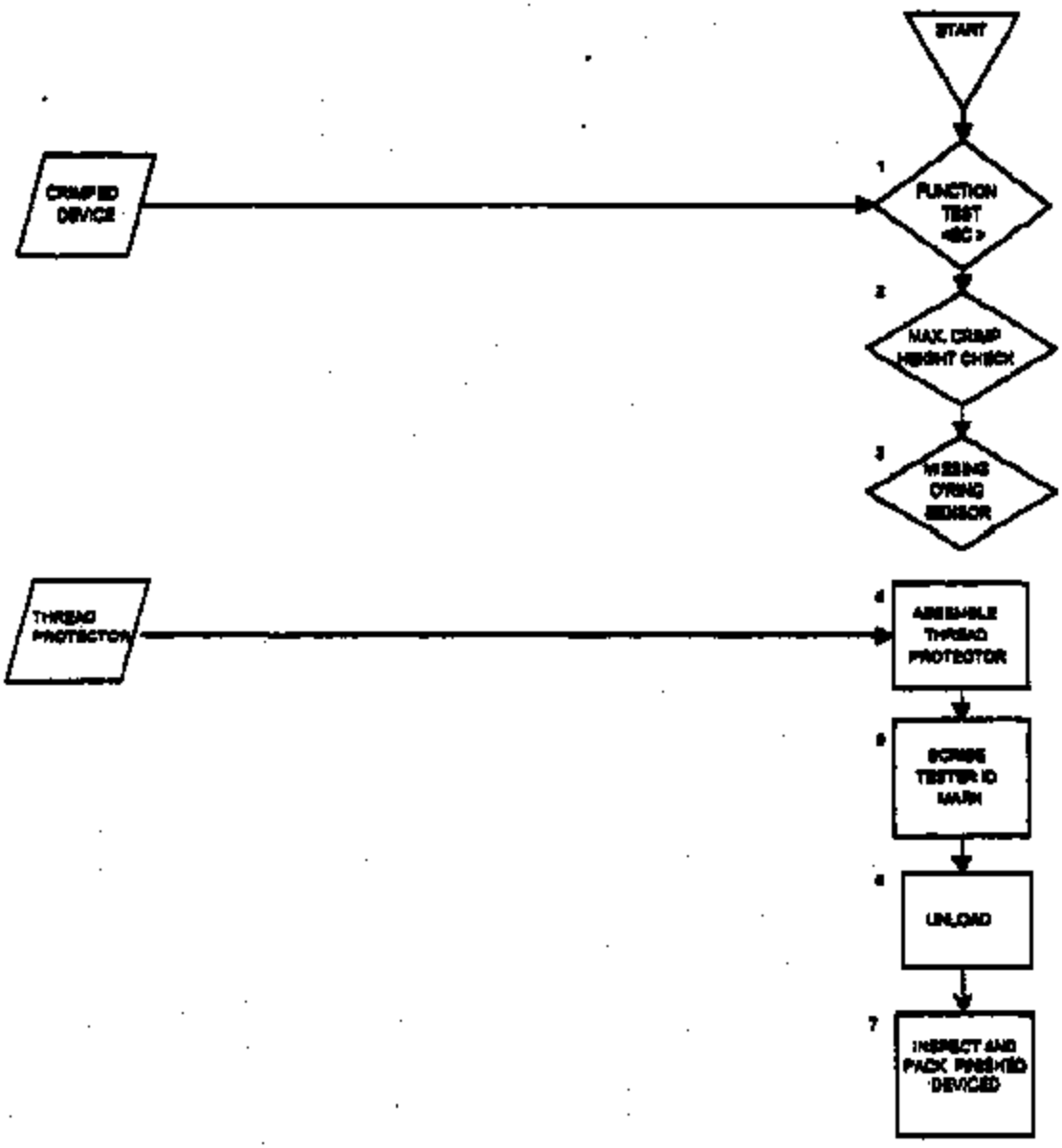
PP REVISION: 3

PP REVISION DATE: 12/15/98

DOCUMENT #:912291

LEGEND:

<SC> SPECIAL CHARACTERISTIC CLASSIFICATION



TEXAS INSTRUMENTS

Automotive Sensors & Controls
Ford Visit - January 7, 1998

Hydraulic Pressure Switches
Line Mount Switches - Attleboro
77PS Product Line

FAILURE MOD. TIAL EFFECTS ANALYSIS (DESIGN FMEA)

Document Number 303795
Revision Level C
Revision Date 4-Nov-98

___System
___Subsystem
X Component Pressure Switch

Design Responsibility Pressure Switch Group

Original (Initial) Date 29-Dec-93

Model Year(s)/Vehicle(s) Various

Key Date 1998

Prepared By C. Wagner

Core Team Design Engineering, Manufacturing Engineering, Manufacturing, Quality

Item / Function	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Class	Potential Cause(s) Mechanism(s) of Failure	Occur	Current Design Controls	Det	RPN	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Actions Taken	Sev	Occ	Det	RPN
BASE (PS) (46515) Provides a system of slots which guide, locate, and physically support terminals.	Fails to properly locate terminals.	Terminals out of position.	3		Incorrect dimensions and/or tolerances specified between slots and terminals. Inadequate slotting design concept.	1	Comparison with dimensions of similar 57PS product.	1	3							
	Fails to properly guide the terminals - difficult insertion.	Device will not assemble properly; yield lost to scrap.	5		Incorrect dimensions and/or tolerances specified between slots and terminals. Insufficient lead-in.	1	Review with assembly equipment designers to determine correct dimensions and lead-in.	1	5							
	Fails to properly support the terminals.	Terminals move relative to each other or the base (such as under physical or thermal loadings).	5		Incorrect material specified. Excessively large dimensions specified on terminal slots.	1	Comparison with design of similar 57PS product.	1	5							
Provides features to enhance the effectiveness of terminal stabing.	Terminal stabing is insufficient.	Loose terminals. Shift/Reduction in switch setpoints	3		Incomplete understanding of design of stabing features.	1	Comparison with design of similar 57PS product. Stabing investigations.	1	3							
Provides a dielectric medium for the electrical elements.	Current leakage between terminals or terminal-to-housing.	Improper switching action.	3		Low insulation resistance. Incorrect material specified.	1	Comparison with design of similar 57PS product. Material investigation.	1	3							

3713 1978

TRAL
FAILURE MOD EFFECTS ANALYSIS
(DEsruM FMEA)

Document Number 593799
Revision Level C
Revision Date 4-Nov-96

___System
___Subsystem
_X_Component Pressure Switch

Design Responsibility Pressure Switch Group

Original (Initial) Date 20-Dec-93

Model Year(s)/Vehicle(s) Various

Key Date 1993

Prepared By C. Wagner

Core Team Design Engineering, Manufacturing Engineering, Manufacturing, Quality

Item / Function	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Class	Potential Cause(s) Mechanism(s) of Failure	Occur	Current Design Controls	Det	R.P.N.	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Actions Taken	Sev	Occ	Det	R.P.N.
BASE [PB] (48515) Provides physical isolation of the switch components.	Fails to physically isolate: ingress of matter from external environment.	High current leakage. High millivolt drop. Erratic or inoperative switch action.	5		Incorrect material specified. Poor molded part design i.e. wall sections too thin, etc.	1	Comparison with design of similar P/PS product. Design review with molder. Mold flow analysis.	1	5							
Provides a reference surface which locates the electrical elements relative to the pressure sensor.	Fails to properly locate the switch elements relative to the pressure sensor.	Shift in setpoints. Erratic or inoperative switch.	5		Warpage of the reference surface. Intrusion of other design elements into the plane of the reference surface. Excessive clearance specified between mating features.	1	Specification of flatness on print. Raise this surface to prevent intrusion of other elements. Tolerances stackup analysis.	1	5							
Provides a flange to compress the external environmental seal.	Improper compression of external environmental seal.	Inadequate compression may lead to ingress of matter. Excessive compression may prevent switch from sealing correctly to sensor assembly.	7		Incorrect seal gland design. Warpage.	1	Review of standard gland design practice. Comparison to similar products. Flatness specified on print.	1	7							

3713 1977

...TIAL
FAILURE MOD ...EFFECTS ANALYSIS
(D... ...FMEA)

Document Number 503784
Revision Level C
Revision Date 4-Nov-98

___System
___Subsystem
_X_ Component Pressure Switch

Design Responsibility Pressure Switch Group

Original (Initial) Date 20-Dec-93

Model Year(s)/Vehicle(s) Various

Key Date 1998

Prepared By C. Wagner

Core Team Design Engineering, Manufacturing Engineering, Manufacturing, Quality

Item / Function	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Class	Potential Cause(s) Mechanism(s) of Failure	Occur	Current Design Controls	Detec	R.P.N.	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Actions Taken	Sev	Occ	Det	R.P.N.
GAGE PS [48518] Provides interference tube to locate and temporarily hold the base in relation to the crimp ring prior to crimp.	Fails to properly locate/hold prior to crimp.	Too large may cause difficulty in assembly, base cracking, or prevent switch from seating to sensor. Too small provides no effect; possibly affecting subsequent assembly operations.	5		Design of interference tube is insufficient.	1	Calculation and experimentation to determine limits of size. Tolerance stackup analysis.	1	5							
Provides a flange surface for the crimp ring.	Fails to provide adequate geometry for crimp ring.	Base loose or insufficient torque achieved Base cracked.	7		Incorrect design of flange for crimp ring.	1	Comparison with design of similar 57PS product.	1	7							
Provides lock tabs, keys, and features which mate to electrical connector.	Mating electrical connector doesn't fit properly.	Connector difficult to install. Connector falls off.	8		Connector geometry improperly specified.	1	Review of dimensions relative to mating connector prints.	1	8							
Provides compression to environmental seal in connector.	Mating connector seal is not properly compressed.	Ingress of water into switch cavity. Connector difficult to install and/or falls off.	7		Connector geometry and/or surface condition/fairness is improperly specified. Incorrect material specified.	1	Review of dimensions relative to mating connector prints. Analytical evaluation.	1	7							

3713 1678

FAILURE MOD[illegible]TIAL EFFECTS ANALYSIS (Design FMEA)

Document Number 93799
Revision Level D
Revision Date 28-May-98

___System
___Subsystem
X Component Passive Switch

Design Responsibility Passive Switch Group

Original (Initial) Date 20-Dec-89

Model Year(s)/Vehicle(s) Various

Key Date 1998

Prepared By C. Wagner

Core Team Design Engineering, Manufacturing Engineering, Manufacturing, Quality

Item / Function	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Class	Potential Cause(s) Mechanism(s) of Failure	Occur	Current Design Controls	Det	RPN	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Action Taken	Sev	Occ	Det	RPN
STATIONARY TERMINAL (38868 & 38728) Provides a brass blade for interconnection.	Poor interconnection.	Device appears open-circuit mating connector installed	7		Contamination of brass blade. Material specified too thin.	1	Review design and dimensions of mating connector to ensure proper interference and wiping action.	1	7							
	Blade geometry improper.	Difficult to install mating connector.	5		Lead-in chamfers on terminal are insufficiently specified. Material specified too thick.	1	Review design and dimensions of mating connector. Comparison with design of similar 537PS product.	1	5							
Provides a silver alloy surface for electrical contact	Fails to provide adequate electrical contact.	Device appears open-circuited. Intermittent continuity. High without drop.	7		Incorrect contact material specified. Contamination. Silver layer specified too thin.	1	Review of TI proprietary and general contact design info. Eliminate pulse for fingers of contamination.	1	7							
	Excessive loss of contact height dimension (mechanical loads).	Shift in set points over life.	7		Silver layer specified too thick.	1	Review of TI proprietary and general contact design info. Life Testing.	1	7							
	Erosion of contacts due to electrical loads.	Shift in setpoints over life. Intermittent or no continuity.	7		Incorrect material specified for particular electrical loading.	1	Review of TI proprietary and general contact design info. Review and testing with actual electrical loads.	1	7							

3719 1879

POTENTIAL FAILURE MODE AND EFFECTS ANALYSIS (Design FMEA)

Document Number 993799
Revision Level D
Revision Date 28-May-98

___System
___Subsystem
_X_Component Pressure Switch

Design Responsibility Pressure Switch Group

Original (Initial) Date 30-Dec-93

Model Year(s)/Vehicle(s) Various

Key Date 1999

Prepared By C. Wagner

Core Team Design Engineering, Manufacturing Engineering, Manufacturing, Quality

Item / Function	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Class	Potential Cause(s) Mechanism(s) of Failure	Occur	Current Design Controls	Det	R.P.N.	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Actions Taken	Sev	Occ	Det	R.P.N.
STATIONARY TERMINAL (28888 & 30729) Provides feature for device calibration.	Poor calibration	Mfg. yield loss Shift in setpoints over life.	5		Design is excessively stiff. Design has excessive spring back. Material hardness is incorrectly specified. Initial position requires excess deformation to calibrate. Design has inadequate strength to maintain calibration over life.	1	Mechanical (and/or FEA) analysis Force deflection springback testing Testing with actual production calibration equipment.	1	5							
Provides features to ensure adequate sliding into base.	Terminal is inadequately slotted into base.	Loose terminals. Shift/Actuation in multiple subpoints.	7		Incomplete understanding of design of sliding features.	1	Comparison of design with similar SYPS product. Sliding evaluation.	1	7							
Provides features which mate with slots in base for location of terminal.	Fails to properly locate terminal.	Terminals out of position.	3		Incorrect dimensions and/or tolerances specified between slots and terminals. Inadequate sliding design concept.	3	Comparison of design with similar SYPS product.	1	9							
Provides electrical path from silver inlay contact to mating connector.	Fails to provide adequate conductivity.	High resistance shown as high millivolt drop.	5		Incorrect material specified. Inadequate cross-section area.	1	Calculations of resistance Testing	1	5							

FAILURE MODE [illegible]FFECTS ANALYSIS
(Design FMEA)

Document Number 593790
Revision Level C
Revision Date 4-Nov-98

___System
___Subsystem
_X_Component Pressure Switch

Design Responsibility Pressure Switch Group

Original (Initial) Date 20-Dec-93

Model Year(s)/Vehicle(s) Various

Key Date 1998

Prepared By C. Wagner

Core Team Design Engineering, Manufacturing Engineering, Manufacturing, Quality

Item / Function	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Class	Potential Cause(s) Mechanism(s) of Failure	Occ	Current Design Controls	Det	R.P.N.	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Actions Taken	Sev	Occ	Det	R.P.N.
MOVABLE TERMINAL (39857) Provides a base/seals for interconnection.	Poor interconnection.	Device appears open-circuit when mating connector installed	7		Material specified too thin.	1	Review design and dimensions of mating connector to ensure proper interference and wiping action.	1	7							
	Blade geometry improper.	Difficult to install mating connector.	5		Lead-in chamfers on terminal are inadvertently specified. Material specified too thick.	1	Review design and dimensions of mating connector. Comparison with design of similar 57PS product.	1	5							
Provides a mounting point for the spring via rivet.	Fails to allow proper spring/rivet installation.	Shift/fluctuation in switch setpoints (loose rivet). Inoperative device (rivet hole not completely) Mfg. yield loss.	7		Rivet hole size is specified incorrectly. Rivet hole position is specified incorrectly. Support surface for spring is incorrectly specified. Choice of fastener style incorrect.	1	Comparison with design of similar products. Check with recommendations of rivet manufacturer. Testing.	1	7							
Provides features to ensure adequate sliding into base.	Terminal is inadequately slotted into base.	Loose terminals. Shift/fluctuation in switch setpoints.	7		Incomplete understanding of design of sliding features.	1	Comparison of design with similar 57PS product. Sliding evaluations.	1	7							

3713 1881

VTAL
FAILURE MODE EFFECTS ANALYSIS
(Design FMEA)

Document Number 923790
Revision Level D
Revision Date 4-Nov-98
Original (initial) Date 26-Dec-89

___System
___Subsystem
_X_ Component Pressure Switch

Design Responsibility Pressure Switch Group

Model Year(s)/Vehicle(s) Various

Key Date 1999

Prepared By C. Wagner

Core Team Design Engineering, Manufacturing Engineering, Manufacturing, Quality

Item / Function	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Class	Potential Cause(s) Mechanism(s) of Failure	Occur	Current Design Controls	Det	RPN	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Actions Taken	Sev	Occ	Det	RPN
MOVABLE TERMINAL (20597) Provides feature which mate with slots in base for location of terminal.	Fails to properly locate terminal.	Terminals out of position.	9		Incorrect dimensions and/or tolerances specified between slots and terminals. Inadequate slotting design concept.	3	Comparison of design with similar 57PS product.	1	9							
Provides electrical path from movable contact via spring to mating connector.	Fails to provide adequate conductivity.	High resistance shown as high millivolt drop.	5		Incorrect material specified. Inadequate cross-section area.	1	Calculations of resistance Testing	1	5							

3713 1692

FAILURE MODE VITAL EFFECTS ANALYSIS (D... ...l FMEA)

Document Number 393792
Revision Level C
Revision Date 4-Nov-98
Original (Initial) Date 30-Dec-93

___System
___Subsystem
_X_ Component Pressure Switch

Design Responsibility Pressure Switch Group

Model Year(s)/Vehicle(s) Various

Key Date 1998

Prepared By C. Wanner

Core Team Design Engineering, Manufacturing Engineering, Manufacturing, Quality

Item / Function	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Class	Potential Cause(s) Mechanism(s) of Failure	Occur	Current Design Controls	Det	R.P.N.	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Actions Taken	Sev	Occ	Det	R.P.N.
SPRING (cont'd) Provides contact force.	Low contact force.	High millivolt drop across contacts.	5		Incorrect geometry specified. Incorrect material specified.	3	Beam deflection equations. Force/deflection testing.	1	15							
	High contact force.	Shift in setpoints. Disc cracking over life.	7		Incorrect geometry specified. Incorrect material specified.	3	Beam deflection equations. Force/deflection testing.	1	21							
Provides electrical path from movable contact to movable terminal.	Fails to provide adequate conductivity.	High resistance shows as high millivolt drop.	8		Incorrect material specified. Inadequate cross-sectional area.	1	Calculations of resistance using R = (Rho)(L) / A Testing	1	8							
Provides feature to interface with transfer pin.	Fails to interface correctly with transfer pin.	Spring failure over life. Shift in setpoints over life. Sticking transfer pin causes intermittent operation.	7		Inadequate height of feature specified. Inadequate shape of feature specified. Improper position of feature specified.	1	Comparison of design with similar product. Dimension and tolerance stackup analysis. Actual measurement. Testing.	1	7							
Provides feature for attachment to movable contact.	Fails to provide adequate mounting for movable contact.	Intermittent or erratic operation. Open circuit.	8		Hole size/position incorrectly specified. Flatness inadequate.	1	Plant mfg. recommendations. Comparison of design with similar product. Testing.	1	8							
Locates movable contact.	Fails to adequately locate movable contact relative to stationary contact.	High millivolt drop over life. Excessive contact erosion over life.	7		Spring geometry incorrectly specified.	1	Dimension and tolerance stackup analysis. Testing	1	7							

3713 1993

...TIAL
FAILURE MOD... ...FFECTS ANALYSIS
(D... ...d FMEA)

Document Number 923792
Revision Level C
Revision Date 4-Nov-93

___System
___Subsystem
X Component Pressure Switch

Design Responsibility Pressure Switch Group

Original (Initial) Date 26-Dec-83

Model Year(s)/Vehicle(s) Various

Key Date 1993

Prepared By C. Wagner

Core Team Design Engineering, Manufacturing Engineering, Manufacturing, Quality

Item / Function	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Class	Potential Cause(s) Mechanism(s) of Failure	Occur	Current Design Controls	Det	RPN	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Actions Taken	Sev	Occ	Det	RPN
SPRING (93888)																
Provides means for attachment to movable terminal.	Fails to properly attach to movable terminal.	Erratic or intermittent operation. Shift in setpoints. Open or short circuit	6		Rivet hole size or position incorrectly specified. Fastener inadequate. Choice of fastener style incorrect.	1	Rivet mfg. recommendations. Comparison of design with similar product. Testing.	1	6							
Allows disc overtravel.	Fails to allow disc overtravel.	Shift in setpoints. Disc cracking. Device inoperative at assembly. Poor calibration.	5		Incorrect geometry specified. Incorrect material specified.	3	Beam deflection equations. Force/deflection testing.	1	15							
Provides force to open contacts.	Inadequate force to open contacts.	Insufficient resistance to mechanical vibration. Short circuit.	6		Incorrect geometry specified. Incorrect material specified.	1	Beam deflection equations. Force/deflection testing.	1	6							
	Excessive force to open contacts.	Shift in setpoints. Disc cracking. Device inoperative at assembly. Poor calibration.	7		Incorrect geometry specified. Incorrect material specified.	3	Beam deflection equations. Force/deflection testing.	1	21							

3713 1994

Page 1

[illegible]TIAL
FAILURE MOD[illegible] EFFECTS ANALYSIS
(D[illegible]N FMEA)

Document Number 509794
Revision Level C
Revision Date 4-Nov-98
Original (Initial) Date 30-Dec-96

___ System
___ Subsystem
_X_ Component Pressure Switch

Design Responsibility Pressure Switch Group

Model Year(s)/Vehicle(s) Various

Key Date 1993

Prepared By C. [illegible]

Core Team Design Engineering, Manufacturing Engineering, Manufacturing, Quality

Item / Function	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Class	Potential Cause(s)/ Mechanism(s) of Failure	Occur	Current Design Controls	Detec	R.P.N.	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Actions Taken	Sev	Occ	Det	R.P.N.
GASKET (74358) Provide fluid seal between hexport and diaphragm.	Fails to provide adequate fluid seal.	Brake fluid leakage.	9		Insufficient compression specified. Very excessive compression specified, leading to displacement from gland. Incorrect ID and/or OD leading to displacement from gland. Incorrect cross-section shape specified. Incorrect material specified, fluid incompatibility. Incorrect design of sealing mechanism.	1	Review of general seal design principles. Manufacturer's recommendations. Burst, impulse, and thermal cycle tests. Comparison with design of similar products.	1	9							

3713 1685

VITAL
FAILURE MDK EFFECTS ANALYSIS
(Design FMEA)

Document Number 937295
Revision Level C
Revision Date 4-Nov-98

__ System
__ Subsystem
X Component Pressure Switch

Design Responsibility Pressure Switch Group

Original (Initial) Date 29-Dec-93

Model Year(s)/Vehicle(s) Various

Key Date 1999

Prepared By C. Wagner

Core Team Design Engineering, Manufacturing Engineering, Manufacturing, Quality

Item / Function	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Class	Potential Cause(s) Mechanism(s) of Failure	Occur	Current Design Controls	Det	R.P.N.	Recommended Action(s)	Responsibility & Target Completion Date	Actions Results: Actions Taken	Sev	Occ	Det	R.P.N.
CUP (27713 OR 27288) Provides crimpable area which holds pressure sensor together.	Fails to provide a suitable geometry for crimp.	Leakage Low burst	8		Crimp wall thickness incorrectly specified. Crimp wall height incorrectly specified. Incorrect material specified.	1	Burst and impulse testing. Comparison of design with similar product.	1	8							
Locates faceport, diaphragm, and washer.	Fails to correctly locate faceport, diaphragm, or washer.	Difficult assembly	5		I.D. specified incorrectly.	1	Tolerance stackup analysis.	1	5							
Provides support and location for disc.	Fails to support and locate the electromeniter correctly.	Shift in setpoints. Erratic operation. Stuck open at assembly. Redundant electric.	7		Incorrect disc envelope specified. Dowel true-position incorrectly specified. Poor surface condition of bump, no control specified.	1	Tolerance stackup analysis. Impulse testing.	1	7							
Provides guide for actuator pin.	Fails to guide actuator pin correctly.	Erratic operation. Device stuck short-circuit.	7		Pin guide geometry is incorrectly specified.	1	Tolerance stackup analysis.	1	7							
Provides portion of environmental seal gland.	Fails to allow a proper environmental seal.	Ingress of moisture. Switch does not seal correctly to cup.	7		Surface condition required for good seal not understood or not correctly specified. Geometry incorrectly specified	1	Environmental testing. Switch cavity pressurization testing. Review of standard gland design rules.	1	7							

937713 1999

POTENTIAL FAILURE MODE AND EFFECTS ANALYSIS (DESIGN FMEA)

___ System
___ Subsystem
_X_ Component: Pressure Switch

Design Responsibility: Pressure Switch Group

Document Number: [illegible]
Revision Level: C
Revision Date: [illegible]
Original (Initial) Date: [illegible]

Model Year(s)/Vehicle(s): Various

Key Date: [illegible]

Prepared By: C. Wagner

Core Team: Design Engineering, Manufacturing Engineering, Manufacturing, Quality

Item / Function	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Class	Potential Cause(s) Mechanism(s) of Failure	Occur	Current Design Controls	Detec	R.P.N.	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Actions Taken	Sev	Occ	Det	R.P.N.
CUP ([illegible] OR [illegible]) Provides surface to interface with base/switch assembly.	Fails to properly locate relative to switch.	Shift in setpoints. Erratic or inoperative switch.	5		Incorrect geometry of sealing surface specified.	1	Tolerance stackup analysis. Cross-section actual devices for inspection of interface.	1	5							
(Post-sensor-crimp) provides geometry for final assembly with crimp ring.	Fails to allow proper final assembly with crimp ring.	Erratic operation. Ingress of matter. Cracked base.	7		Post-crimp geometry is not controlled per design intent. Cup diameter incorrectly specified.	1	Tolerance stackup analysis. Base torque testing.	1	7							

3713 1687

TAIL FAILURE MOD. EFFECTS ANALYSIS (DESIGN FMEA)

Document Number 503798
Revision Level D
Revision Date 4-Nov-98

___System
___Subsystem
X Component Pressure Switch

Design Responsibility Pressure Switch Group

Original (Initial) Date 20-Dec-93

Model Year(s)/Vehicle(s) Various

Key Date 1999

Prepared By C. Wiggey

Core Team Design Engineering, Manufacturing Engineering, Manufacturing, Quality

Item / Function	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Class	Potential Cause(s) Mechanism(s) of Failure	Occur	Current Design Controls	Det	R.P.N.	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Actions Taken	Sev	Occ	Det	R.P.N.
DIAPHRAGM (OR SEAL) (BR) (74178) Forms flexible element of fluid containment cavity.	Fails to contain fluid	Fluid leakage.	9		Gradual rupture over life due to improper design of supporting elements. Gradual rupture over life due to excessive flexure/displacement. Gradual rupture over life due to stress concentrations caused by unfavorable strain distributions. Chemical attack due to incorrect material specified. Incorrect thickness (or # of layers) of diaphragm material. Insufficient location/clamping of diaphragm.	1	Burst, leakage, and thermal cycle tests. Material mfg. recommendation. Comparison of design with similar products.	1	9							
Transfers pressure from fluid to pressure-sensing elements.	Change in area of pressure transfer over life. Excessive change of pressure transfer area versus pressure.	Shift in setpoints over life. Excessively high pressures needed to adequately form pressure transfer area; visible signs on setpoints due to unpredictability at lower pressures.	5 6		Diaphragm too stiff. Incorrect material specified. Diaphragm too stiff. Incorrect material specified.	1 1	Life testing w/ characteristics at intermediate points. Force and pressure versus deflection testing to calculate effective areas.	1 1	5 6							

3713 1999

...ITIAL
FAILURE MOL EFFECTS ANALYSIS
(Design FMEA)

Document Number 609797
Revision Level C
Revision Date 4-Nov-98

___System
___Subsystem
X Component Pressure Switch

Design Responsibility Pressure Switch Group

Original (Initial) Date 30-Dec-98

Model Year(s)/Vehicle(s) Various

Key Date 1999

Prepared By C. Wagner

Core Team Design Engineering, Manufacturing Engineering, Manufacturing, Quality

Item / Function	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Class	Potential Cause(s) Mechanism(s) of Failure	Occur	Current Design Controls	Det	R.P.N.	Recommended Action(s)	Responsibility & Target Completion Date	Action Taken	Sev	Occ	Det	R.P.N.
WASHER (P6) (27836) Provides a portion of the support surface for diaphragm.	Fails to correctly support the diaphragm.	Reduced diaphragm life results in leakage.	5		Contours of diaphragm support surface are specified incorrectly. Condition of edges of support surface specified incorrectly. Clearance between washer I.D. and converter hoop is specified too wide.	1	Burst, Impulse, and Thermal Cycle tests. Comparison of design with similar products.	1	5							
Provides support for compression of gasket.	Fails to allow proper gasket compression.	Leakage.	5		Washer flatness is incorrectly specified or unspecified. Washer thickness is specified too small. Washer material and/or heat-treat is in-correctly specified.	1	Burst, Impulse, and Thermal Cycle tests. Comparison of design with similar products.	1	5							
Locates and guides converter with respect to cup.	Converter is not properly located relative to cup.	Shift in setpoints. Erratic behavior.	5		Incorrectly specified button guide I.D. Incorrectly specified washer O.D.	1	Comparison of design with similar products. Tolerance stackup analysis.	1	5							
	Converter travel is restrained by washer.	Disc cannot rotate; device is stuck open-circuit.	7		Washer flatness is incorrectly specified or unspecified. Washer thickness is specified too small. Washer material and/or heat-treat is incorrectly specified. I.D. of button guide is too small.	1	Burst, Impulse, and Thermal Cycle tests. Comparison of design with similar products. Tolerance stackup analysis.	1	7							

9713 1999

TIAL FAILURE MOD[illegible] EFFECTS ANALYSIS (DFMEA)

Document Number 603787
Revision Level C
Revision Date 4-Nov-88

___System
___Subsystem
_X_Component Pressure Switch

Design Responsibility Pressure Switch Group

Original (Initial) Date 20-Dec-83

Model Year(s)/Vehicle(s) Various

Key Date 1993

Prepared By C. Wagner

Core Team Design Engineering, Manufacturing Engineering, Manufacturing, Quality

Item / Function	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Class	Potential Cause(s) Mechanism(s) of Failure	Occur	Current Design Controls	Det	R.P.N.	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Actions Taken	Sev	Occ	Det	R.P.N.
WASHER [PS] (27638) Interfaces with cup feature and provides a portion of component stack for crimp.	Fails to interface correctly with cup.	Difficult assembly (washer O.D. too large) Poor washer/connector location relative to cup (washer O.D. too small)	7		Washer O.D. specified incorrectly.	1	Comparison of design with similar products. Tolerance stackup analysis.	1	7							
	Fails to allow proper crimp.	Reduced burst capability leads to leakage. Reduced fatigue resistance leads to leakage.	8		Thickness incorrectly specified. O.D. incorrectly specified Edge condition incorrectly or unspecified.	1	Tolerance stackup analysis. Burst, Impulse, and Thermal Cycle tests.	1	8							

3713 1990

FAILURE MODE AND EFFECTS ANALYSIS (Design FMEA)

Document Number 393798
Revision Level E
Revision Date 13-May-98
Original (Initial) Date 29-Dec-93

___System
___Subsystem
X Component Pressure Switch

Design Responsibility Pressure Switch Group

Model Year(s)/Vehicle(s) Yadayo

Key Date 1993

Prepared By DI Ha

Core Team Design Engineering, Manufacturing Engineering, Manufacturing, Quality

Item / Function	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Class	Potential Cause(s) Mechanism(s) of Failure	Occur	Current Design Controls	Detec	R.P.N.	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Actions Taken	Sev	Occ	Det	R.P.N.
CONVERTER (P3) (37406) Transfers pressure from fluid (via diaphragm) to a force on pressure-sensing disc.	Fails to correctly transfer fluid pressure to force on disc.	Shift in setpoint	5		Outline O.D. incorrectly specified relative to washer I.D. Converter major O.D. incorrectly specified relative to cup I.D. Converter thickness incorrectly specified. Incorrect material specified.	1	Tolerance stackup analysis. Force/deflection analysis to determine strength and resistance to plastic deformation. Shock, Impulse, and Thermal cycle tests.	1	5							
Provides alignment and support to disc.	Fails to properly align and support disc.	Loose tolerances allow misalignment which may cause shift in setpoints or erratic operation. Disc out-of-plane relative to converter may cause erratic operation or inoperative device, stuck open-circuit.	5		Outline O.D. incorrectly specified relative to washer I.D. Converter major O.D. incorrectly specified relative to cup I.D. Disc support bump incorrectly specified. Disc retaining wall incorrectly specified.	1	Tolerance stackup analysis. Comparison of design with similar product.	1	5							

3713 1691

FAILURE MODE [illegible]TIAL EFFECTS ANALYSIS
(Design FMEA)

Document Number 583798
Revision Level E
Revision Date 13-May-96
Original (Initial) Date 20-Dec-89

___System
___Subsystem
_X_Component Pressure Switch

Design Responsibility Pressure Switch Group

Model Year(s)/Vehicle(s) Various

Key Date 1993

Prepared By [illegible]

Core Team Design Engineering, Manufacturing Engineering, Manufacturing, Quality

Item / Function	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Class	Potential Cause(s) Mechanism(s) of Failure	Occ	Current Design Controls	Det	R.P.N.	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Actions Taken	Sev	Occ	Det	R.P.N.
CONVERTER (PS) (27408) Provides a portion of the support surface for diaphragm.	Fails to properly support diaphragm.	Reduced diaphragm life results in leakage.	8		Contours of surface in contact with diaphragm are specified incorrectly. Condition of edges in contact with diaphragm are specified incorrectly. Clearance between converter bump and washer I.D. are specified too wide.	1	Burst, impulse, and Thermal cycle tests. Comparison of design with similar product.	1	8							
Provides disc support during over pressure (pos/neut).	Fails to properly support disc during over pressure.	Disc deformation results in shift in setpoints. Reduced disc travel if disc motion is restricted prematurely. Reduced disc life.	8		Features which control disc motion during over pressure are incorrectly specified.	3	Pre-and post-proof characterization Pressure-deflection measurements of disc motion.	1	18							
Vent in converter prevents pressure buildup from affecting setpoints.	Does not vent properly.	Shift in setpoints over temp. Reduced disc snap.	5		Vent hole incorrectly specified.	1	Comparison of design with similar product. Temperature characterizations.	1	5							

3713 1992

'ITIAL
FAILURE MOC EFFECTS ANALYSIS
(Design FMEA)

Document Number 993799
Revision Level C
Revision Date 4-Nov-99

___System
___Subsystem
_X_Component Pressure Switch

Design Responsibility Pressure Switch Group

Original (Initial) Date 29-Dec-93

Model Year(s)/Vehicle(s) Various

Key Date 1999

Prepared By C. Wiggins

Core Team Design Engineering, Manufacturing Engineering, Manufacturing, Quality

Item / Function	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Class	Potential Cause(s) Mechanism(s) of Failure	Occ	Current Design Controls	Det	RPN	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Actions Taken	Sev	Occ	Det	RPN
SPACER (73858) Reduce friction between disc and cover/ar	Fails to effectively reduce friction.	Shift in setpoints over life. Reduced disc life.	5		Incorrect material specified. Incorrect dimensions specified.	1	Impulse and Thermal Cycle tests. Pre- and Post-life characterizations. Tolerance stackup analysis.	1	5							
Allow venting of chamber formed by disc and cover/ar.	Fails to allow venting.	Shift in setpoints over temp. Reduced disc action	5		Vent hole incorrectly specified.	1	Comparison of design with similar product. Temperature characterization.	1	5							

9713 1693

TIAL
FAILURE MOD EFFECTS ANALYSIS
(Design FMEA)

Document Number 503800
Revision Level C
Revision Date 4-Nov-99

Page 1

___System
___Subsystem
_X_Component Pressure Switch

Design Responsibility Pressure Switch Group

Original (Initial) Date 20-Dec-93

Model Year(s)/Vehicle(s) Various

Key Date 1999

Prepared By C. Wagner

Core Team Design Engineering, Manufacturing Engineering, Manufacturing, Quality

Item / Function	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Class	Potential Cause(s) Mechanism(s) of Failure	Occur	Current Design Controls	Det	RPN	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Actions Taken	Sev	Occ	Det	RPN
DISC (SEE 5) Controls actuation and setpoints of switch relative to applied force.	Fails to actuate and/or release at the proper points at assembly.	Mfg. yield loss.	5		Disc material improperly specified. Dimensions and tolerances improperly specified.	1	Characterization experiments. Comparison of design with similar product.	1	5							
Key component in defining usable service life of device.	Disc actuation and/or release setpoints change excessively over life.	Shift in device setpoints over life.	5		Disc material improperly specified. Disc heat-treat improperly specified. Material thickness improperly specified. Excessive force applied by spring.	1	Impulse testing. Pre- and post-characterizations.	1	5							
	Service life shorter than customer requirements.	Drastic shift in setpoints over life. Device inoperative - open circuit.	7		Disc material improperly specified. Disc heat-treat improperly specified. Material thickness improperly specified. Excessive force applied by spring.	1	Impulse testing. Pre- and post-characterizations.	1	7							

3713 1894

TIAL
FAILURE MODE EFFECTS ANALYSIS
(DESIGN FMEA)

Document Number 593801
Revision Level C
Revision Date 4-Nov-96

___System
___Subsystem
X Component Pressure Switch

Design Responsibility Pressure Switch Design

Original (Initial) Date 20-Dec-93

Model Year(s)/Vehicle(s) Various

Key Date 1995

Prepared By C. Wagner

Core Team Design Engineering, Manufacturing Engineering, Manufacturing, Quality

Item / Function	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Class	Potential Cause(s) Mechanism(s) of Failure	Occur	Current Design Controls	Det	R.P.N.	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Actions Taken	Sev	Occ	Det	R.P.N.
CRIMP RING (74767) Hold together base assembly and sensor assembly.	Fails to hold base to sensor correctly.	Erratic switch operation. Cracked base. Shift in setpoints. Low base torque withstand.	5		Incorrect geometry of crimpable area specified. Incorrect geometry of formed radii. Incorrect material specified.	3	Impulse, thermal cycle, base torque, and base/terminal impact tests.	1	15							
Provide a surface for part identification/date code.	ID characters illegible.	Improperly identified parts at assembly plant.	2		Geometry/flatness not properly specified. Wrong material specified.	1	Coding tests. Environmental tests.	1	2							
Impart environmental protection and aesthetics to device.	Inability to withstand environment.	Corrosion causes material consumption, loss of mechanical properties, switch eventually falls off sensor. Illegible coding.	7		Wrong material specified.	1	Environmental tests.	1	7							
Provide lubrication to crimp disc via base coating.	Insufficient lubrication.	Metal fines/particles on external device surfaces.	5		Incorrect or insufficient wax specified.	1	Crimping tests.	1	5							

3719 1696

'TIAL
FAILURE MOD. E/?ECTS ANALYSIS
(DExaIN FMEA)

Document Number 503602
Revision Level C
Revision Date 4-Mar-96

___System
___Subsystem
_X_ Component Pressure Switch

Design Responsibility Pressure Switch Group

Original (Initial) Date 30-Dec-89

Model Year(s)/Vehicle(s) Various

Key Date 1999

Prepared By G. Wagner

Core Team Design Engineering, Manufacturing Engineering, Manufacturing, Quality

Item / Function	Potential Failure Mode	Potential Effect(s) of Failure	S e v	C l a s s	Potential Cause(s) Mechanism(s) of Failure	O c c u r	Current Design Controls	D e t e c	R. P. N.	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Actions Taken	S e v	O c c	D e t	R. P. N.
TRANSFER PIN (74978) Translates disc motion to movable electrical contact.	Fails to properly translate disc motion.	Contacts stuck open. Contacts stuck closed Erratic operation.	7		Diameter incorrectly specified. Chips/fragments cause pin to bdgo.	1	Tolerance stackup between pin and pin guide in cap. Check with supplier for material properties regarding chips.	1	7							
Insulates electrical components from switch housing.	Fails to insulate.	Continuity between movable terminal and housing to ground.	5		Wrong material specified.	1	Check with supplier for material properties. Check with customer for electrical logic of movable terminal.	1	5							

3719 1996

TIAL FAILURE MODE EFFECTS ANALYSIS (DESIGN FMEA)

Document Number 503883
Revision Level C
Revision Date 4-Nov-96

___System
___Subsystem
_X_Component Pressure Switch

Design Responsibility Pressure Switch Group

Original (Initial) Date 20-Dec-93

Model Year(s)/Vehicle(s) Various

Key Date 1999

Prepared By C. Wagner

Core Team Design Engineering, Manufacturing Engineering, Manufacturing, Quality

Item / Function	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Class	Potential Cause(s) Mechanism(s) of Failure	Occur	Current Design Control	Det	R.P.N.	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Actions Taken	Sev	Occ	Det	R.P.N.
ENVIRONMENTAL SEAL (74247) Prevents ingress of water to switch cavity.	Contaminants enter switch cavity.	High current leakage High millivolt drop Erratic or inoperative switch operation.	7		Gasket thickness is specified too small. Limits on porosity not specified. Incorrect material.	1	Review of standard practice for gland design. Review with gasket manufacturer. Comparison of design with similar product.	1	7							
Provides friction to aid in preventing base rotation.	Base rotates too easily.	Perceived as inadequate by assembly plant and/or service personnel.	5		Gasket thickness improperly specified.	1	Review of standard practice for gland design. Torque-to-rotate testing. Comparison of design with similar product.	1	5							

TIAL
FAILURE MODE EFFECTS ANALYSIS
(DESIGN FMEA)

Document Number 503504 — Page 1
Revision Level C
Revision Date 4-Nov-98

___System
___Subsystem
X Component Pressure Switch

Design Responsibility Pressure Switch Group

Original (Initial) Date 20-Dec-93

Model Year(s)/Vehicle(s) Yellow

Key Date 1999

Prepared By C. Wagner

Core Team Design Engineering, Manufacturing Engineering, Manufacturing, Quality

Item / Function	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Class	Potential Cause(s) Mechanism(s) of Failure	Occur	Current Design Controls	Det	RPN	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Actions Taken	Sev	Occ	Det	RPN
THREAD CAP (74000) Protects hexport threads from damage during shipping and transit.	Incorrect length.	Does not protect threads sufficiently.	6		Length incorrectly specified.	1	Dimensional stackup study.	1	6							
Prevents dust from entering the fluid cavity.	Loose Cap	Allows dust to enter fluid cavity	4		Incorrect diameter specified.	1	Dimensional analysis.	1	4							

3713 1699

...TIAL
FAILURE MOC EFFECTS ANALYSIS
(Design FMEA)

Document Number 508805
Revision Level C
Revision Date 30-Oct-98

___System
___Subsystem
_X_Component Pressure Switch

Design Responsibility Pressure Switch Group

Original (Initial) Date 20-Dec-89

Model Year(s)/Vehicle(s) Various

Key Date 1999

Prepared By C. Wagner

Core Team Design Engineering, Manufacturing Engineering, Manufacturing, Quality

Item / Function	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Class	Potential Cause(s) Mechanism(s) of Failure	Occur	Current Design Controls	Det	R.P.N.	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Actions Taken	Sev	Occ	Det	R.P.N.
EXPORT (38866) Provides a hydraulic sealing surface per SAE J512.	Fails to seal.	Leakage of brake fluid.	9	FF	Incorrect surface finish specification. Incorrect material specification. Incorrectly specified geometry. Excessive pressure.	1	Cross-check of print dimensions vs. SAE standard. Comprehensive evaluation of design at tolerance limits. Burst testing to customer-specified limits.	1	9							
Provides external thread for installation into sealing port.	Fails to properly install in sealing port.	Damages throttle in sealing port during installation. Does not allow installation.	7	FF	Threads specified improperly. Threads not gauged per ANSI spec's. Plating buildup.	3	Cross-check of applicable SAE and ANSI standards.	3	63							
	Apparently installs, but fails to properly seat and seal.	Brake fluid leakage.	9	FF	Threads specified improperly. Threads not gauge per ANSI spec's. Plating buildup.	1	Cross-check of applicable SAE and ANSI standards.	3	27							
Provides hex features for 9/16" wrench.	Incorrect hex size.	Damage to hex fails during wrenching. 9/16" wrench does not fit.	5		Hex features improperly specified per established SAE/ANSI spec's.	1	Cross-check of applicable SAE and ANSI standards.	1	5							
Provides fluid passage to pressure-sensing elements.	Fluid passage is too small.	Electrical signal from switch is delayed vs. pressure signal especially at very low temp. Subject to blockage by foreign matter.	7	FF	Inadequate size of fluid passage specified. Inadequate review of Ford standard practices.	1	Review of Ford standard practices. Review of industry practices.	1	7							
	Fluid passage is too large.	Rivetting thin wall section causes breakage: during installation during underhood service operations	7	FF	Fluid passage specified excessively large.	1	Torque testing.	1	7							

8713 1999

FAILURE MOD[illegible]TIAL EFFECTS ANALYSIS (DEsxIN FMEA)

Document Number 303605
Revision Level C
Revision Date 30-Oct-98
Original (Initial) Date 20-Dec-94

___System
___Subsystem
_X_Component Pressure Switch

Design Responsibility Pressure Switch Dept.

Model Year(s)/Vehicle(s) Various

Key Date 1999

Prepared By C. Wagner

Core Team Design Engineering, Manufacturing Engineering, Manufacturing, Quality

Item / Function	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Class	Potential Cause(s) Mechanism(s) of Failure	Occur	Current Design Controls	Detect	RPN	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Actions Taken	Sev	Occ	Det	RPN
HEXPORT (cont.) Provides gland for internal gasket.	Fails to seal internal gasket properly.	Leakage of brake fluid.	9		Gland dimensions improperly specified. Surface finishes improperly specified. Gland geometry improperly designed.	1	Cross-check with recommendations of gasket supplier. Comprehensive testing.	1	9							
Provides flange which fabricates with other components to form pressure-sensor structure.	Flange fails to mate properly with other components of pressure sensor.	Dia. too large results in assembly difficulty. Diameter too small results in bad component alignment. Flange too thick results in poor crimp. Flange too thin results in reduced barrel capacity. Improper edge chamfer results in shear concentration which weakens crimp.	9		Improper or incomplete specification of dimensions and tolerances.	1	Experiments and analysis to determine proper thickness for required strength. Tolerance stack-up analysis. Print review.	1	9							
	Material too soft or weak.	Inadequate barrel capacity. Damage/breakage during installation or subsequent service. Threads prone to damage, leads to assembly difficulties.	9		Improper material selection.	1	Comprehensive evaluation of physical properties.	1	9							
	Material creeps.	Loosening of crimp leads to leakage.	9		Improper material selection.	1	Review of material properties.	1	9							
	Material degrades in presence of working fluid/s.	Leakage	9		Improper material selection.	1	Cross-check with similar products.	1	9							
	Insufficient environmental protection.	Long-term attack causes weakening of key areas which leads to leakage or breakage.	9		Improper or insufficient plating specification.	1	Comprehensive environmental testing.	3	27							

FAILURE MOD[illegible] TIAL
EFFECTS ANALYSIS
(Design FMEA)

Document Number [illegible]
Revision Level C
Revision Date 30-Oct-98

___System
___Subsystem
_X_Component Pressure Switch

Design Responsibility Pressure Switch Group

Original (Initial) Date 29-Dec-93

Model Year(s)/Vehicle(s) Various

Key Date 1999

Prepared By C. Wagner

Core Team Design Engineering, Manufacturing Engineering, Manufacturing, Quality

Item / Function	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Class	Potential Cause(s) Mechanism(s) of Failure	Occur	Current Design Controls	Det	R.P.N.	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Actions Taken	Sev	Occ	Det	R.P.N.
REPORT [illegible] Provides flange which interfaces with other components to form pressure-tight [illegible]		Cosmetic problems.	9			1	Review of plating specifications	3	27							

3719 1701

[illegible] Number [illegible]
[illegible]
[illegible] date [illegible]
Prepared by A. [illegible] [illegible]

Part/Component: Movable Contact
Part No / Revision: [illegible]
Process Flow: [illegible]
Design / Revision

Design Responsibility: A. [illegible] / J. [illegible]
Process/Qual/MFG. Responsibility: R. [illegible] / J. [illegible]
Supplier:
Model Year/Vehicle(s):

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Provide electrical switching interface with stationary terminal	Fails to provide adequate electrical contact	Device appears as an open circuit Intermittent continuity High millivolt drop	7	Contact material specified too thin Incorrect contact pressure specified Contamination Incorrect contact attachment method specified	1	Review of TI proprietary and general contact design info [illegible] for [illegible] of [illegible]	1	7
	Provide electrical path from interface to contact arm	Fails to provide adequate conductivity	High resistance shown as high millivolt drop	7	Incorrect material specified	1	Review with contact manufacturer Experimental verification	1	7
	Provide means of mechanical attachment to contact arm	Inadequate attachment to contact arm	Shift in setpoints over life Erratic operation Open circuit	7	Incorrect geometry specified Incorrect material specified	1	Manufacturer recommendation	1	7
	Provide rigidity to maintain contact gap and therefore device calibration over time	Calibration shift	Shift in setpoints	6	Incorrect geometry specified Incorrect material specified	1	Manufacturer recommendation	1	6
	Provide a feature to concentrate contact forces to a particular area	Inadequate force concentration	High millivolt drop	7	Incorrect geometry specified Incorrect material specified	1	Manufacturer recommendation	1	7
	Provide features to allow feeding automation	Fails to allow feeding automation	Manufacturing yield loss	5	Incorrect geometry specified	7	Manufacturing validation	1	35

3713 1702

POTENTIAL FAILURE & EFFECTS ANALYSIS (DESIGN FMEA)

Document Number 609770
Revision Level B
Revision Date 5-Nov-96

___System
___Subsystem
_X_ Component Pressure Switch

Design Responsibility Pressure Switch Group

Original (Initial) Date 20-Dec-95

Model Year(s)/Vehicle(s) Various

Key Date 1998

Prepared By D. Ha

Core Team Design Engineering, Manufacturing Engineering, Manufacturing, Quality

Item / Function	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Class	Potential Cause(s) Mechanism(s) of Failure	Occur	Current Design Controls	Det	RPN	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Actions Taken	Sev	Occ	Det	RPN
RIVET (7/8 Hi)																
Fastens spring to movable terminal.	Fails to adequately fasten spring to movable terminal.	Spring rotates about axis of rivet. Spring falls off movable terminal.	6		Improper rivet diameter for given hole sizes. Improper rivet length for given material thickness. Improper head size. Improper tubular feature. Improper material.	1	Rivet manufacturer recommendations. Comparison with similar products. Testing to determine torque to rotate spring.	1	6							
Provides a force between movable terminal and spring which causes intimate contact for current flow.	Inadequate force between spring and movable terminal.	High resistance or no continuity at interface of spring and movable terminal.	8		Improper rivet diameter for given hole sizes. Improper rivet length for given material thicknesses. Improper head size. Improper tubular feature. Improper material.	1	Rivet manufacturer recommendations. Comparison with similar products Testing to determine torque to rotate spring.	1	6							

3713 1703

[redacted]

3713 1704

Brake Pressure Switch Usage

VL / MY	92	93	94	95	96	97	98	99
town							■	■
crown vic							■	■
grand marquis							■	■
econo								
club wagon								
f-series	■							
bronco	■		■			■	■	■
explor	■	■	■					
ranger	■	■	■					
exped	■	■	■	■	■			
navi	■	■	■	■	■	■		
sho	■				■	■	■	■
mark VIII	■							■
windstar	■	■	■					

3713 1705

Steve, below is a memo from Charlie Douglas to Fred Foster that was an early answer to the various brake p/s part number question....I have now added plastic type as a difference between switches as well as made position tab more prominent as it might be a conformder in the connector seal theory.....Andy McGuirk 3/18/99

Fred,

I believe that your list includes some service part numbers, older rev levels, as well as pre-production or prototype part numbers. Overall, including Ford Australia, there are eight different production parts. Differences from part to part are fairly minor and include: actuation calibration, release pressure, hexport style, position tab to locate connector, color (and possibly plastic material) of connector base, thread style, and snap noise associated with the pressure disc. The following matrix, helps summarize this information:

Part Number	Actuation	Release	Base/pos tab	Hexport	Thread	S or Q
F2VC 9F924 AB	90-160 (1)	20 min	Brown / pos 2	J512	3/8-24M	Snap
F6LC 9F924 AA	200-300 (2)	40 min	Black / pos 1	J512	3/8-24M	Snap
F2AC 9F924 AA	90-200 (3)	20 min	Natural / pos 2	J512	3/8-24M	Quiet
F58A 9F924 AA	90-160 (4)	20 min	Grey / pos 1	J512	3/8-24M	Quiet
F3TA 9F924 CA	200-300 (5)	40 min	Red / pos 1	J512	3/8-24M	Snap
94DA 9F924 AA	90-160 (6)	20 min	Natural / pos 2	o-ring	M10x1.0M	Quiet
F3DC 9F924 AA	90-160 (7)	20 min	Natural / pos 2	Snubber	3/8-24M	Quiet
94JA 9F924 AB	90-160 (8)	20 min	Grey / pos 1	o-ring	3/8-24M	Quiet

Vehicle – Part Number Correlation

(1) Crown Vic, Grand Marquis, Mark, Town Car
(2) Econoline, Club Wagon
(3) Crown Vic, Grand Marquis, Mark, Town Car
(4) Winstar
(5) Bronco, F-Series, Ranger, Explorer, Navigator, Expedition, Econoline, Club Wagon
(6) Falcon
(7) SHO Taurus
(8) Capri

TI P/N Correlation to Above

(1) 77PSL2-1
(2) 77PSL2-3
(3) 77PSL3-1
(4) 77PSL3-2
(5) 77PSL3-3
(6) 77PSL4-1
(7) 77PSL5-2
(8) 77PSL6-1

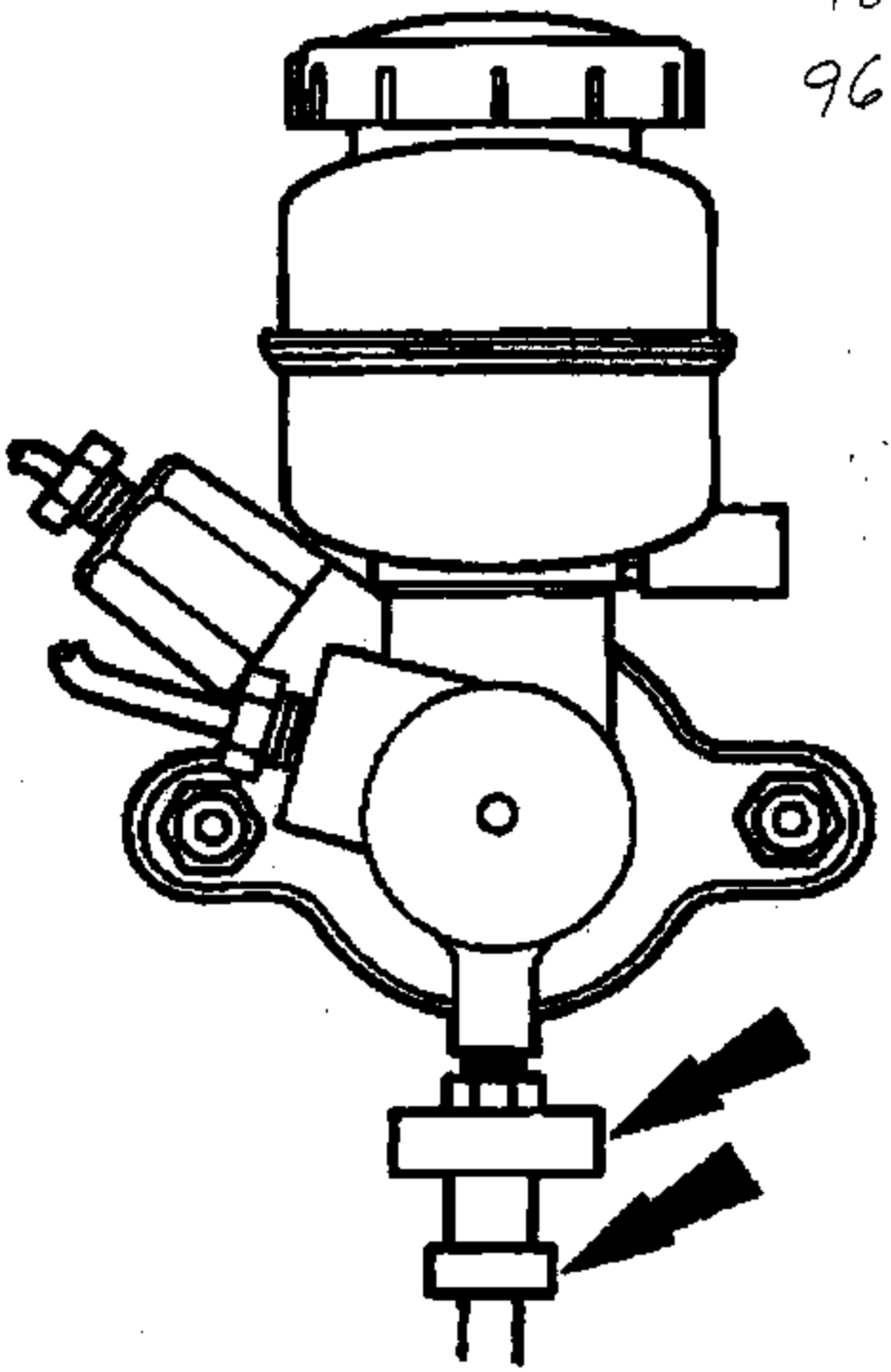
Brake Pressure Switch Terminal Orientation/ Location per Service Manual CDs

VL/yr	92	93	94	95	96	97	98	99	0	1				
capri	none	none	down	na	na	na	na	na						
cutgm	45° UP	45° UP	45° UP	45° UP										
mark	vac	horiz	horiz	down			down							
town	45° UP	45° UP	45° UP	45° UP			PT	PT						
econo	UP-frame	UP-frame	UP-mstrC	Dn-mstrC	Dn-mstrC									
winstar	na	na	na	Undr m-c	Undr m-c	Undr m-c								
bronco	vac	horiz	RP	UP-mstrC		na	na	na						
f-series	vac	horiz	UP-mstrC			UP-mstrC								
ranger	vac	vac	RP	UP-mstrC	Undr m-c	UP-mstrC								
explor	vac	vac	RP	UP-mstrC	Undr m-c	UP-mstrC								
mavi	na	na	na	na	na									
exped	na	na	na	na	na	UP-mstrC								
mto	vac	Undr m-c	Undr m-c	Undr m-c			PT							
	PT pedal travel switch													
	RP push rod position switch													
	vap vacuum dump switch													

3713 1707

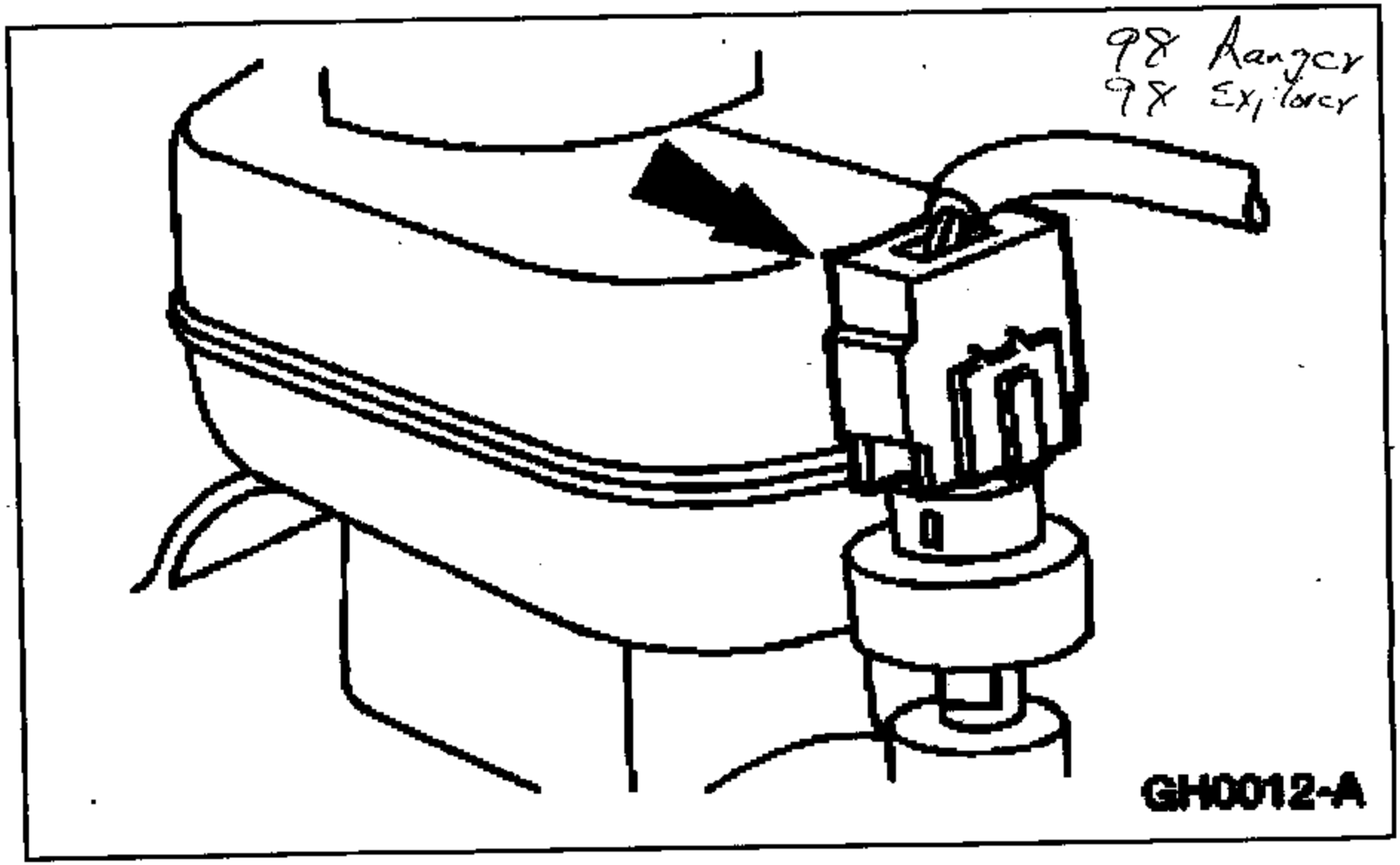
Step 2

98 ECONOL
96 WINSTA



DL0010-A

98 F150/250
98 Ranger
98 Explorer

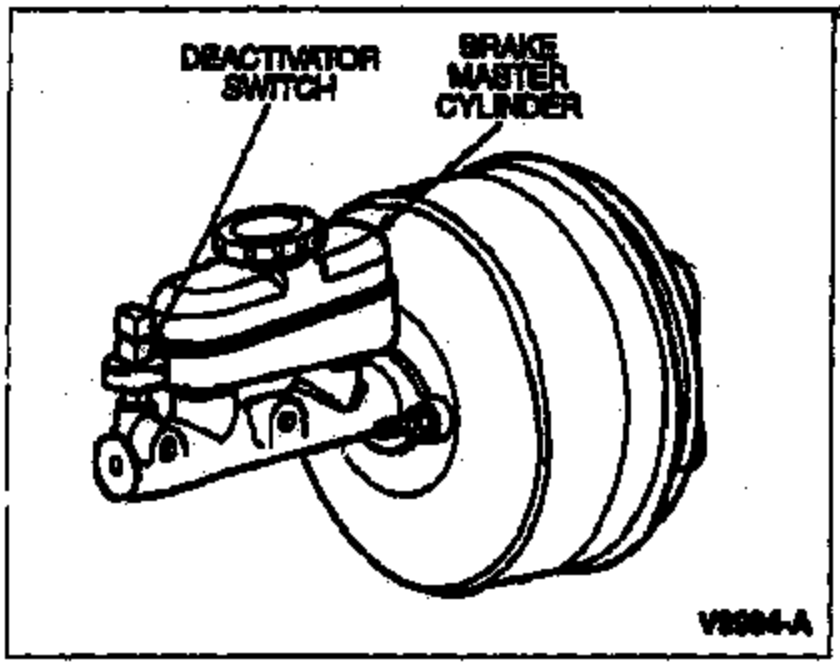


Removal

1. Disconnect deactivator switch connector. Deactivator switch is located on brake master cylinder (2140).
2. Unscrew switch and remove.

Installation

For installation, follow removal procedures in reverse order. Tighten switch to 15-20 N-m (12-14 lb-ft) and bleed brake lines as described in «Section 06-06».

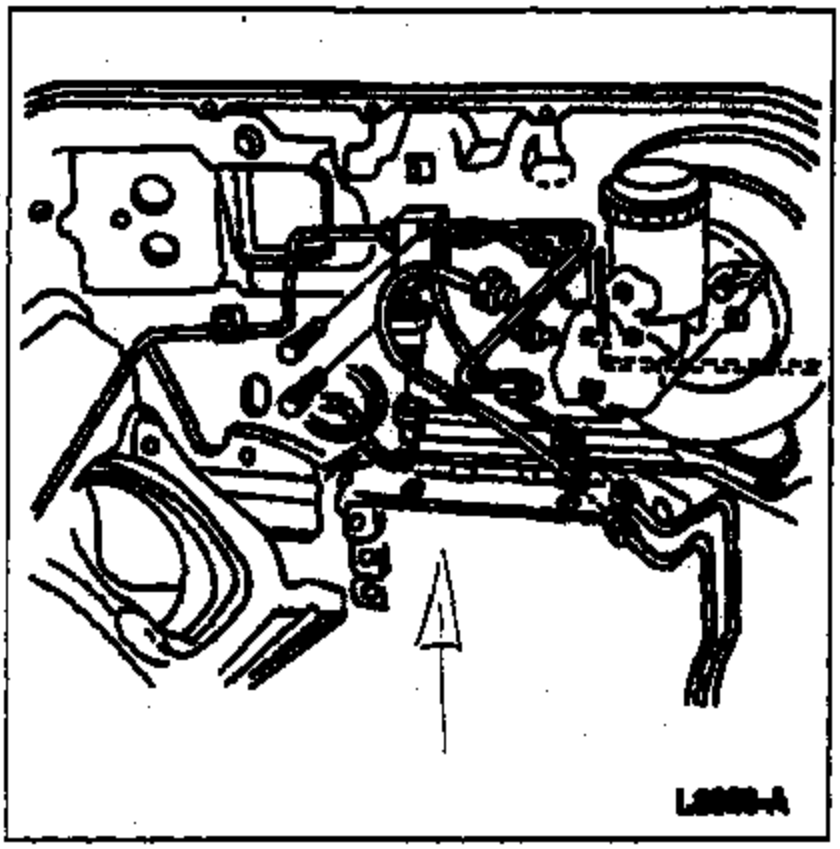


97, 96, 95 Ranger Explorer

94 Econo F Series Bronco

97 Explorer

Speed Control Deactivator Switch Assy



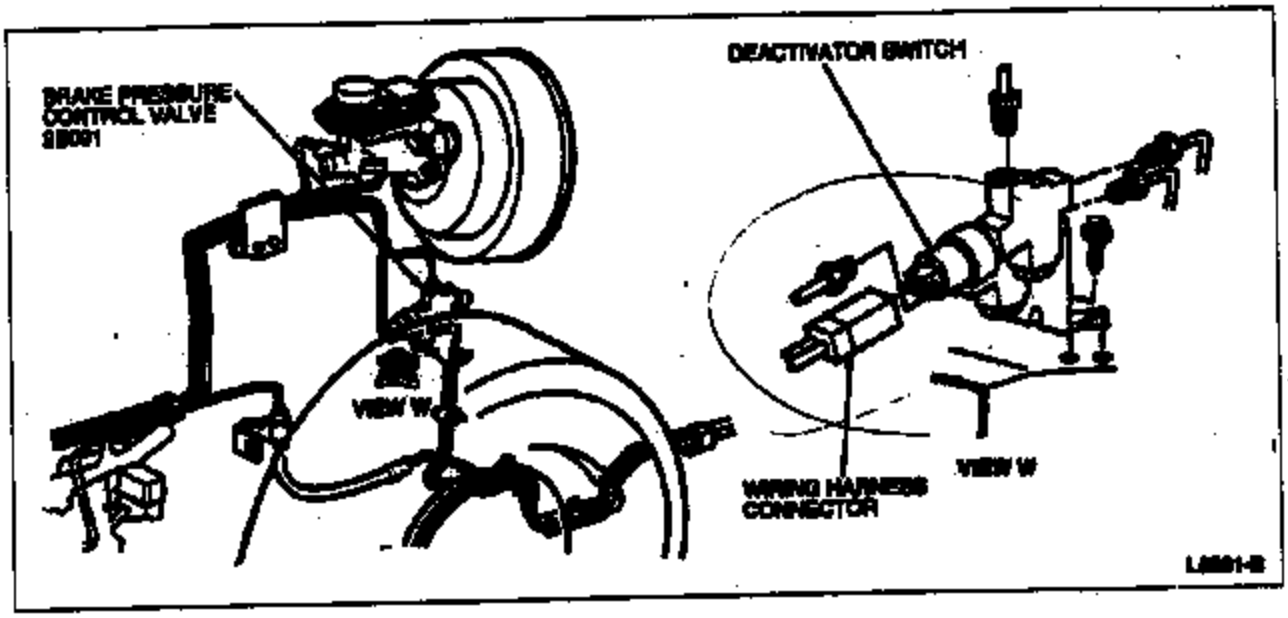
94 CAPRI

Installation

1. Screw deactivator switch into brake master cylinder tube tee. Tighten switch to 8-11 N-m (71-97 lb-in).
2. Attach electrical connector.

Mk 8
9 : 1/2 94

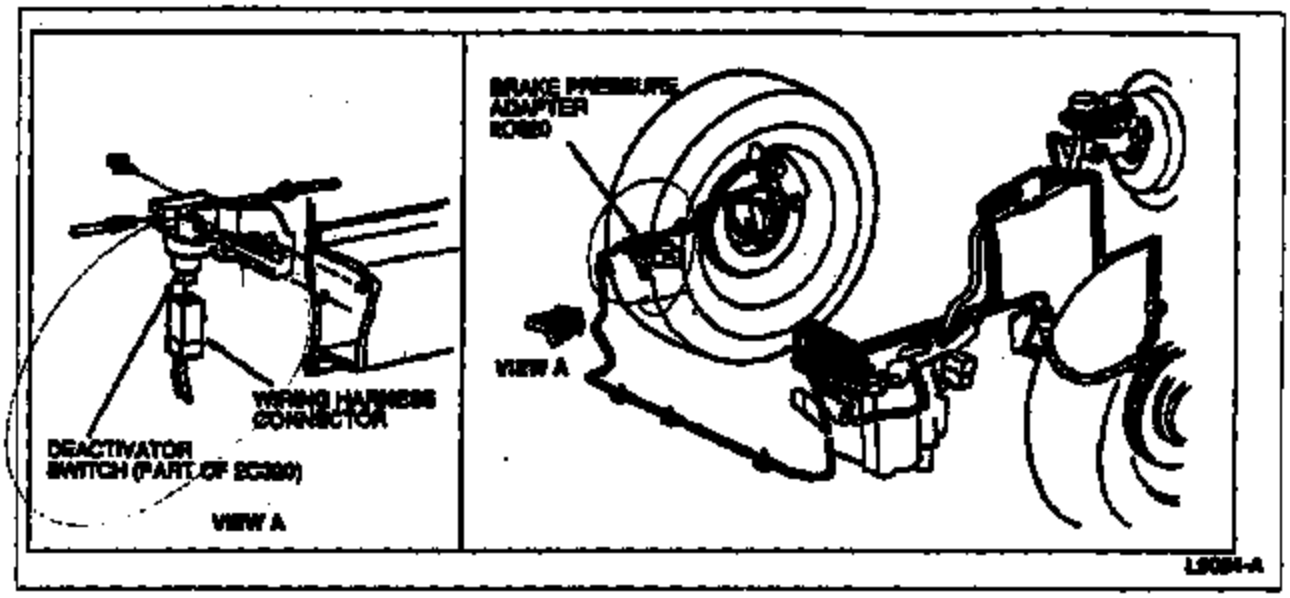
2. Attach electrical connector.
3. Install brake master cylinder reservoir. Refer to «Section 06-06».
4. Bleed brake lines as outlined in «Section 06-00».

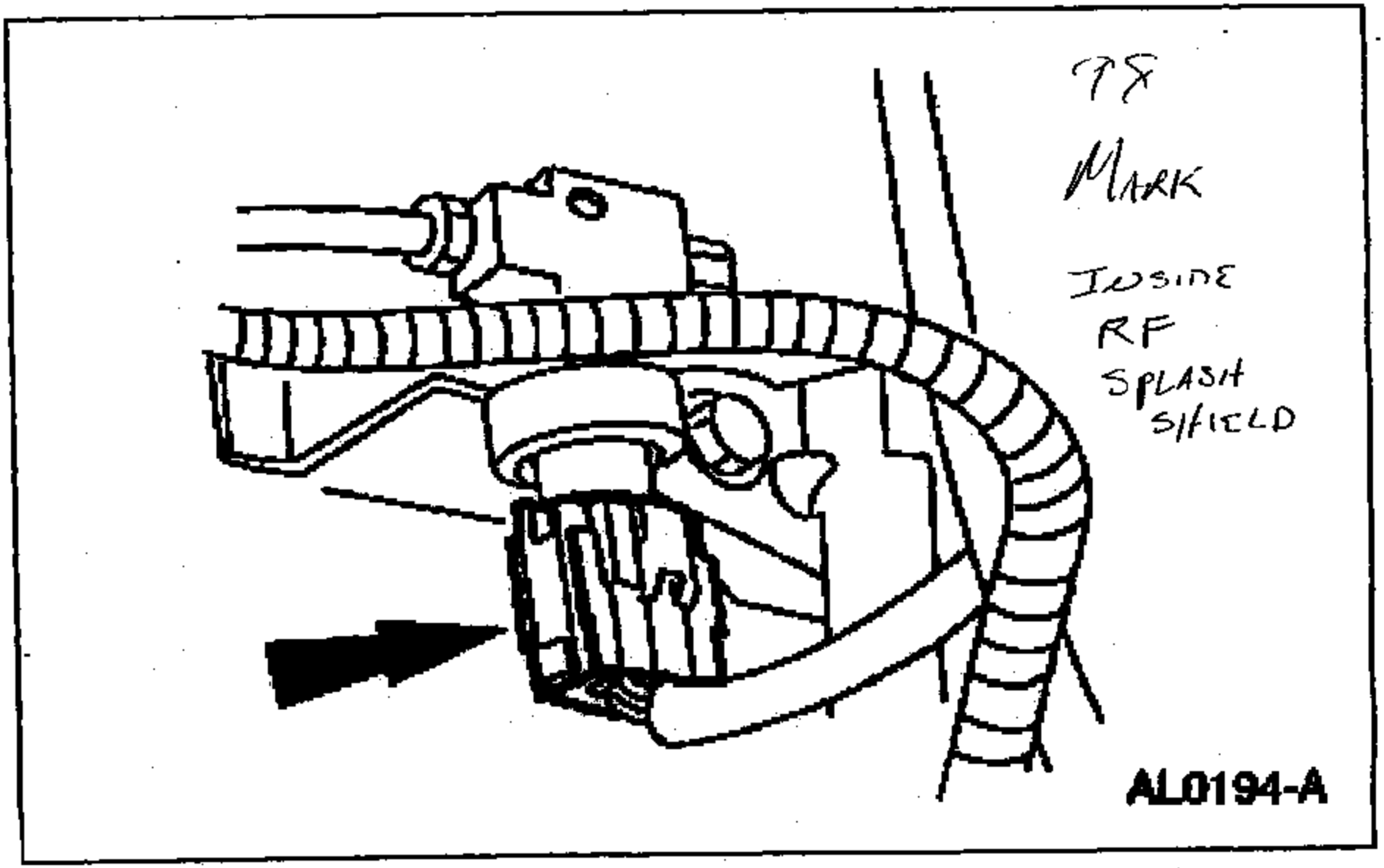


4. Bleed brake lines as outlined in «Section 06-00».

95 Mk VIII

Deactivator Switch

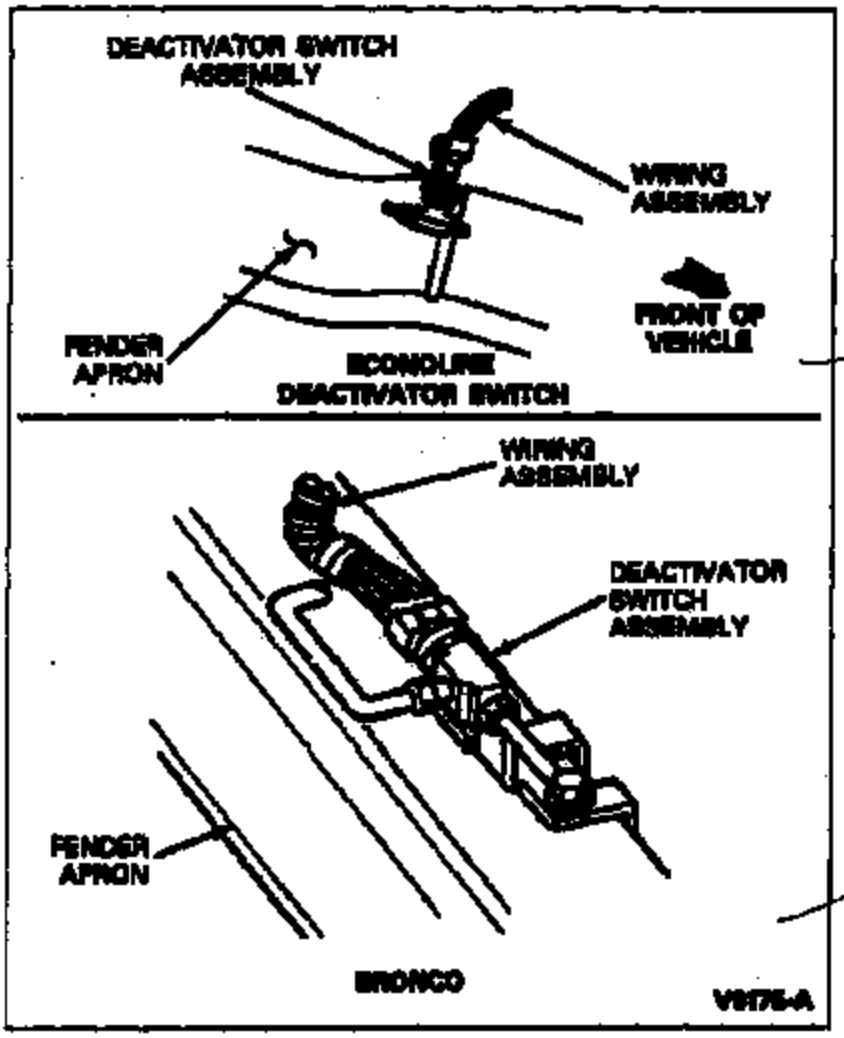




9718 1714

For installation, follow removal procedures in reverse order. Tighten switch to 15-20 N-m (12-14 ft-lb) and bleed brake lines as described in «Section 06-00».

Deactivator Switch



93
ECONO

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F2AC 9F924 AA	90-200 (3)	20 min	Natural / pos 2	J512	3/8-24M	Quiet
F58A 9F924 AA	90-160 (4)	20 min	Grey / pos 1	J512	3/8-24M	Quiet
F3TA 9F924 CA	200-300 (5)	40 min	Red / pos 1	J512	3/8-24M	Snap
94DA 9F924 AA	90-160 (6)	20 min	Natural / pos 2	o-ring	M10x1.0M	Quiet
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(2) 77PSL2-3
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(4) 77PSL3-2
(5) 77PSL3-3
(6) 77PSL4-1
(7) 77PSL5-2
(8) 77PSL6-1

PT [illegible] TRAVEL
F[illegible] – RAIL TRAVEL [illegible]

Sheet1

	92	93	94	95	96	97	98	99	0	1		
capri	NONE	NONE	LOWN	NA	[illegible]	[illegible]	NA					
cvigm	45° [illegible]	45 [illegible]	45 UL	[illegible]			PT					
mark	VAC	H[illegible]	HOLE	[illegible] LOOP			[illegible]					
town	45 [illegible]	45UL	45 UL	45 UL			PT	PT				
econo	FRAME UF	FRAME UF	MC UP	MC LOOP?	[illegible] LOOP	[illegible]						
winstar	NA	NA	NA	(1)	(1)	(1)						
bronco	VAC	HOSE (2)	RP	MC UP		NA						
f-series	VAC	HOSE (2)	MS UP	[illegible]	[illegible]	MS UP						
ranger	VAC	VAC	RP	MC UP	[illegible]	[illegible]						
explor	VAC	VAC	RP	MC UP	[illegible]	[illegible]						
navi	NA	NA		[illegible]								
exped	NA	NA		[illegible]		MC UP						
sho	VAC	VAC + (1)	(1)	(1)			PT					

	92	93	94	95	96	97	98		
[illegible]	VAC			VAC		PT			
VILLAGER		PT		PT					
CONT	VAC		VAC	PT			PT	[illegible]	[illegible] below Dr. floor

(1) ~~[illegible]~~ · UNDER SIDE OF M. CYL

(2) ON FRAME BELOW M. CYL

3713 1717

5

Vehicle	MY	Part Number	Pres Engage
Bronco	94	F3TA 9F924 CA	200-300
Capri	94	94JA 9F924 AB	90-160
Club Wagon		F6LC 9F924 AA	200-300
Club Wagon		F3TA 9F924 CA	200-300
Crown Victoria	92, 93	F2VC 9F924 AB	90-160
Crown Victoria	95?	F2AC 9F924 AA	90-200
Econoline	92, 93		
Econoline	94	F3TA 9F924 CA	200-300
Econoline		F6LC 9F924 AA	200-300
Expedition		F3TA 9F924 CA	200-300
Explorer	95, 96, 97	F3TA 9F924 CA	200-300
F-Series	94, 97	F3TA 9F924 CA	200-300
Falcon		94DA 9F924 AA	90-160
Grand Marquis	92, 93	F2VC 9F924 AB	90-160
Grand Marquis	95?	F2AC 9F924 AA	90-200
Mark VIII	93, 94	F2VC 9F924 AB	90-160
Mark VIII	95, 96	F2AC 9F924 AA	90-200
Navigator		F3TA 9F924 CA	200-300
Ranger	95, 96, 97	F3TA 9F924 CA	200-300
SHO Taurus		F3DC 9F924 AA	90-160
Town Car	92, 93	F2VC 9F924 AB	90-160
Town Car	95?	F2AC 9F924 AA	90-200
Windstar		F58A 9F924 AA	90-160

Service P/N's

FROM WEB 3/31/99 SJR

Service Numbers

a) F2VY - 9F924 - A

b) F2AZ - - A

c) F3DZ - - A

d) F58Z A

e) F3TZ 9F924 B

f) not found

g) F6LZ 9F924 AA

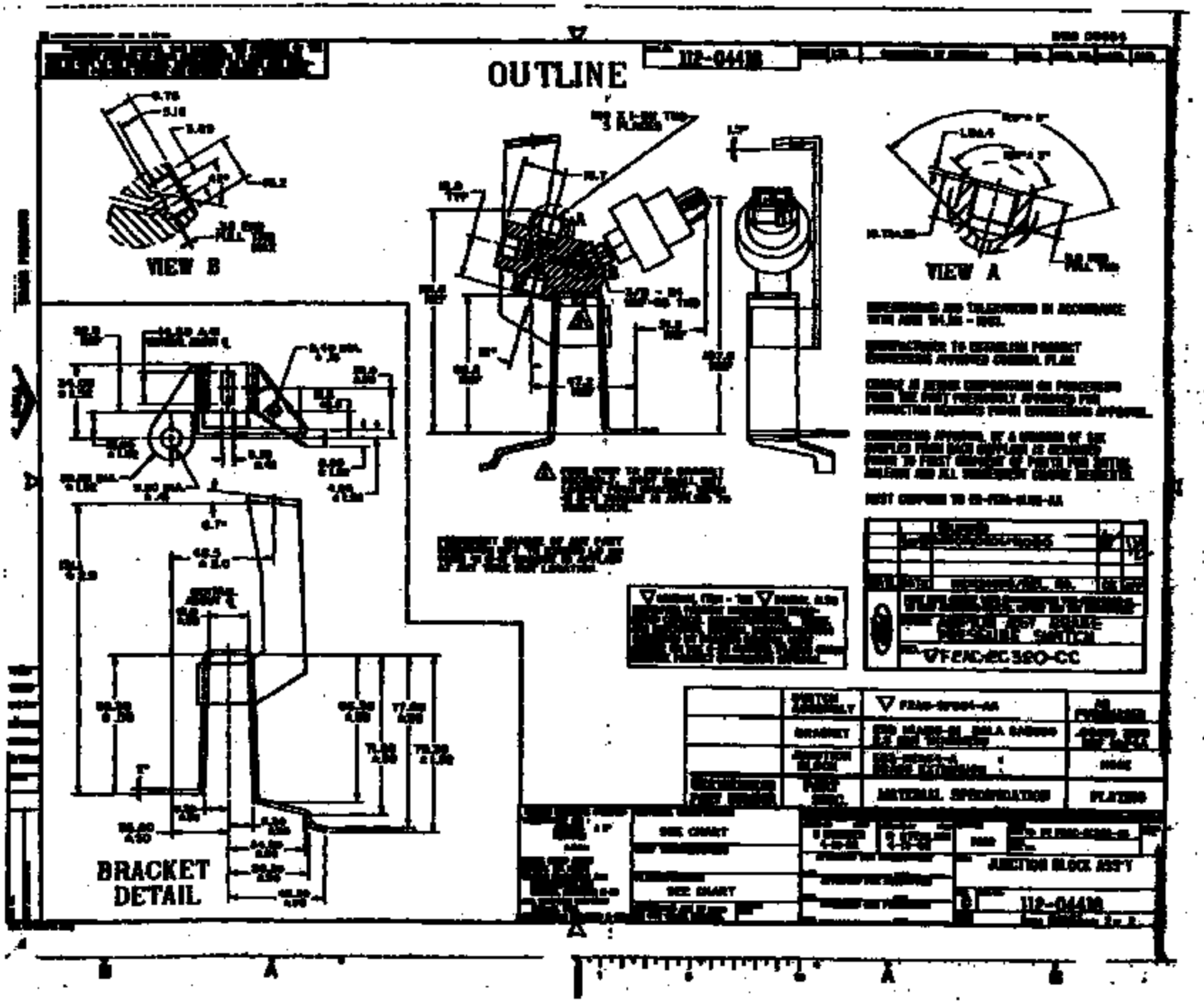
h) not found

97B 1718

Originator: Fred Porter
File: I:\SAGE.xls Vehicles

Vehicle	MY	Part Number	Pressure		Color	Key	Port	Threads		Material	Location	Orientation	Component
			Engage	Release									
Bronco	94	F3TA 9F924 CA	200-300	40	Red	pos 1	J512	3/8-24M	Snap	Polyphenylene Oxide			
Capri	94	94JA 9F924 AB	90-160	20	Grey	pos 1	o-ring	3/8-24M	Quiet		322	180, 0	Prop Valve
Club Wagon		F8LC 9F924 AA	200-300	40	Black	pos 1	J512	3/8-24M	Snap				
Club Wagon		F3TA 9F924 CA	200-300	40	Red	pos 1	J512	3/8-24M	Snap	Polyphenylene Oxide	321	0, 0	Master Cylinder
Crown Victoria	92, 93	F2VC 9F924 AB	90-160	20	Brown	pos 2	J512	3/8-24M	Snap	Celanex 4300	311	45, 0	Prop Valve
Crown Victoria	957	F2AC 9F924 AA	90-200	20	Natural	pos 2	J512	3/8-24M	Quiet		311	45, 0	Prop Valve
Econoline	92, 93								Snap		211	0, 0	Brake Line
Econoline	94	F3TA 9F924 CA	200-300	40	Red	pos 1	J512	3/8-24M	Snap	Polyphenylene Oxide	321	0, 0	Master Cylinder
Econoline		F8LC 9F924 AA	200-300	40	Black	pos 1	J512	3/8-24M	Snap				
Expedition		F3TA 9F924 CA	200-300	40	Red	pos 1	J512	3/8-24M	Snap	Polyphenylene Oxide			
Explorer	95, 96, 97	F3TA 9F924 CA	200-300	40	Red	pos 1	J512	3/8-24M	Snap	Polyphenylene Oxide	321	0, 0	Master Cylinder
F-Series	94, 97	F3TA 9F924 CA	200-300	40	Red	pos 1	J512	3/8-24M	Snap	Polyphenylene Oxide	321	0, 0	Master Cylinder
Falcon		94DA 9F924 AA	90-160	20	Natural	pos 2	o-ring	M10x1.0M	Quiet				
Grand Marquis	92, 93	F2VC 9F924 AB	90-160	20	Brown	pos 2	J512	3/8-24M	Snap	Celanex 4300	311	45, 0	Prop Valve
Grand Marquis	957	F2AC 9F924 AA	90-200	20	Natural	pos 2	J512	3/8-24M	Quiet		311	45, 0	Prop Valve
Mark VII	93, 94	F2VC 9F924 AB	90-160	20	Brown	pos 2	J512	3/8-24M	Snap	Celanex 4300	311	100, 0	Prop Valve
Mark VII	95, 98	F2AC 9F924 AA	90-200	20	Natural	pos 2	J512	3/8-24M	Quiet		113	180, 0	Prop Valve
Navigator		F3TA 9F924 CA	200-300	40	Red	pos 1	J512	3/8-24M	Snap	Polyphenylene Oxide			
Ranger	95, 96, 97	F3TA 9F924 CA	200-300	40	Red	pos 1	J512	3/8-24M	Snap	Polyphenylene Oxide	321	0, 0	Master Cylinder
SHO Taurus		F3DC 9F924 AA	90-160	20	Natural	pos 2	Snubber	3/8-24M	Quiet				
Town Car	92, 93	F2VC 9F924 AB	90-160	20	Brown	pos 2	J512	3/8-24M	Snap	Celanex 4300	311	45, 0	Prop Valve
Town Car	957	F2AC 9F924 AA	90-200	20	Natural	pos 2	J512	3/8-24M	Quiet		311	45, 0	Prop Valve
Wheeler		F8BA 9F924 AA	90-160	20	Grey	pos 1	J512	3/8-24M	Quiet				

3713 1719



3713 1720

NOTES:

1. ENGINEERING APPROVAL OF SAMPLES FROM EACH SUPPLIER IS REQUIRED PRIOR TO AUTHORIZATION OF PART PRODUCTION.
2. AFTER INITIAL RELEASE, NO CHANGE MAY BE MADE IN MATERIALS, PROCESS OR DESIGN WITHOUT PRIOR ENGINEERING APPROVAL.
3. THIS PRODUCT IS DRAFTED IN ACCORDANCE WITH ANSI Y14.24-1989.
4. UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN INCHES.
5. ▽ MUST CONFORM TO ENGINEERING SPECIFICATIONS E9-E7SC-[illegible]-AA.
6. PACKAGE IN CLOSED POLYETHYLENE BAGS.

▽ CONTROL ITEM - THE ▽ SYMBOL ALSO IDENTIFIES PRODUCT ENGINEERING DESIGNATED CRITICAL CHARACTERISTIC. THESE, AND ADDITIONAL CRITICAL CHARACTERISTICS IDENTIFIED BY PROCESS REVIEWS, MUST APPEAR ON THE D-M1 CONTROL PLANS WHICH REQUIRE PRODUCT ENGINEERING APPROVAL.

PART MUST COMPLY WITH SPECIFICATION WSS-M99P9999-A1 TO HELP SAFEGUARD HEALTH, SAFETY AND THE ENVIRONMENT.

MANUFACTURER TO ESTABLISH PRODUCT ENGINEERING APPROVED CONTROL PLAN.

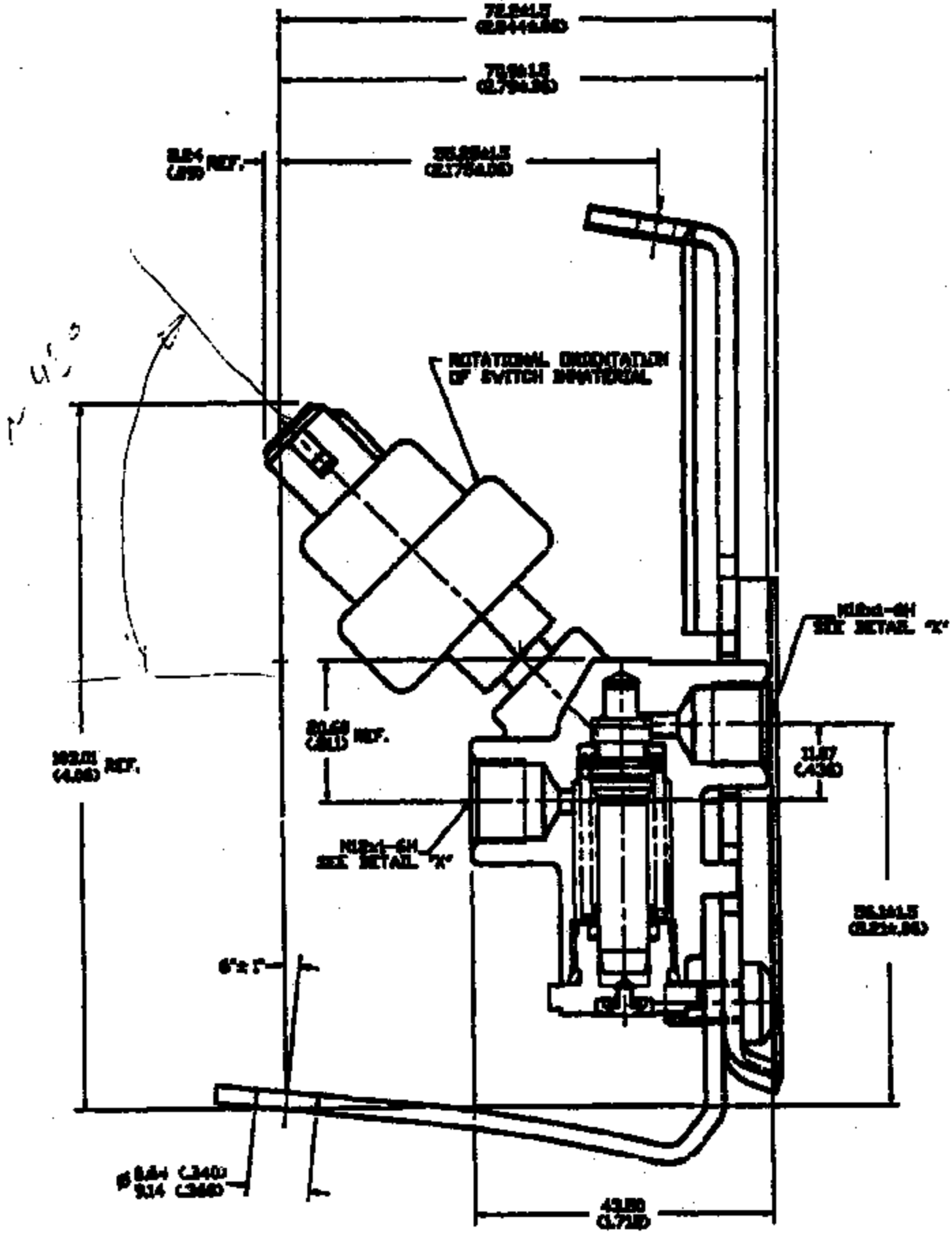
ENGINEERING APPROVAL OF A MINIMUM OF SIX SAMPLES FROM EACH SUPPLIER IS REQUIRED PRIOR TO FIRST SHIPMENT OF PARTS FOR INITIAL RELEASE AND ALL SUBSEQUENT CHANGE REQUESTS.

		RELEASED		
	[illegible]	NCOOE1012983000		9D
MATL	DATE	REVISIONS/REL NO.	CK	APP

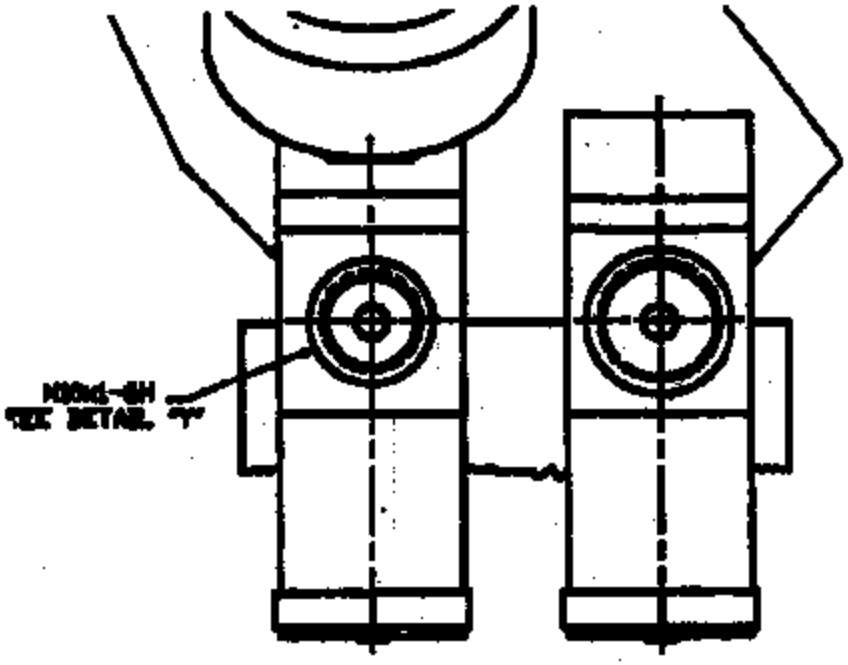
PART MUST COMPLY WITH SPECIFICATION WSS-M99P9999-A1 TO HELP SAFEGUARD HEALTH, SAFETY AND THE ENVIRONMENT

NAME
VALVE ASY-BRAKE PRESSURE CONTROL

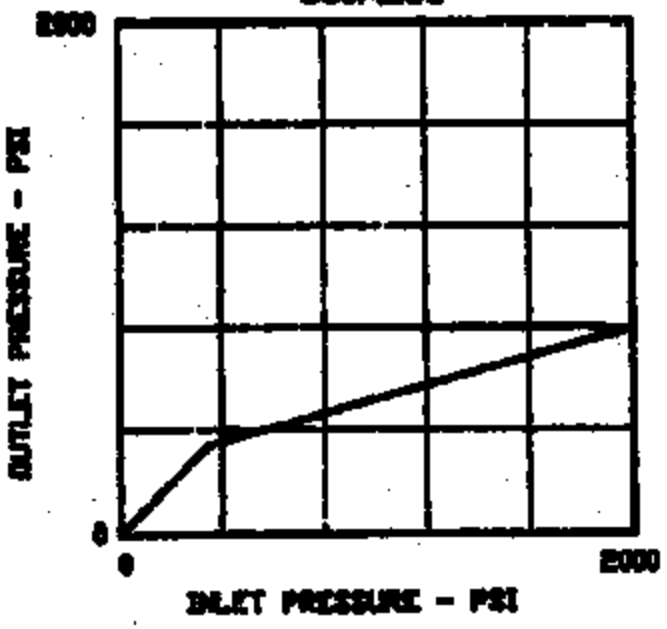
NO. ▽F3VC-2B091-BA



3713 1722

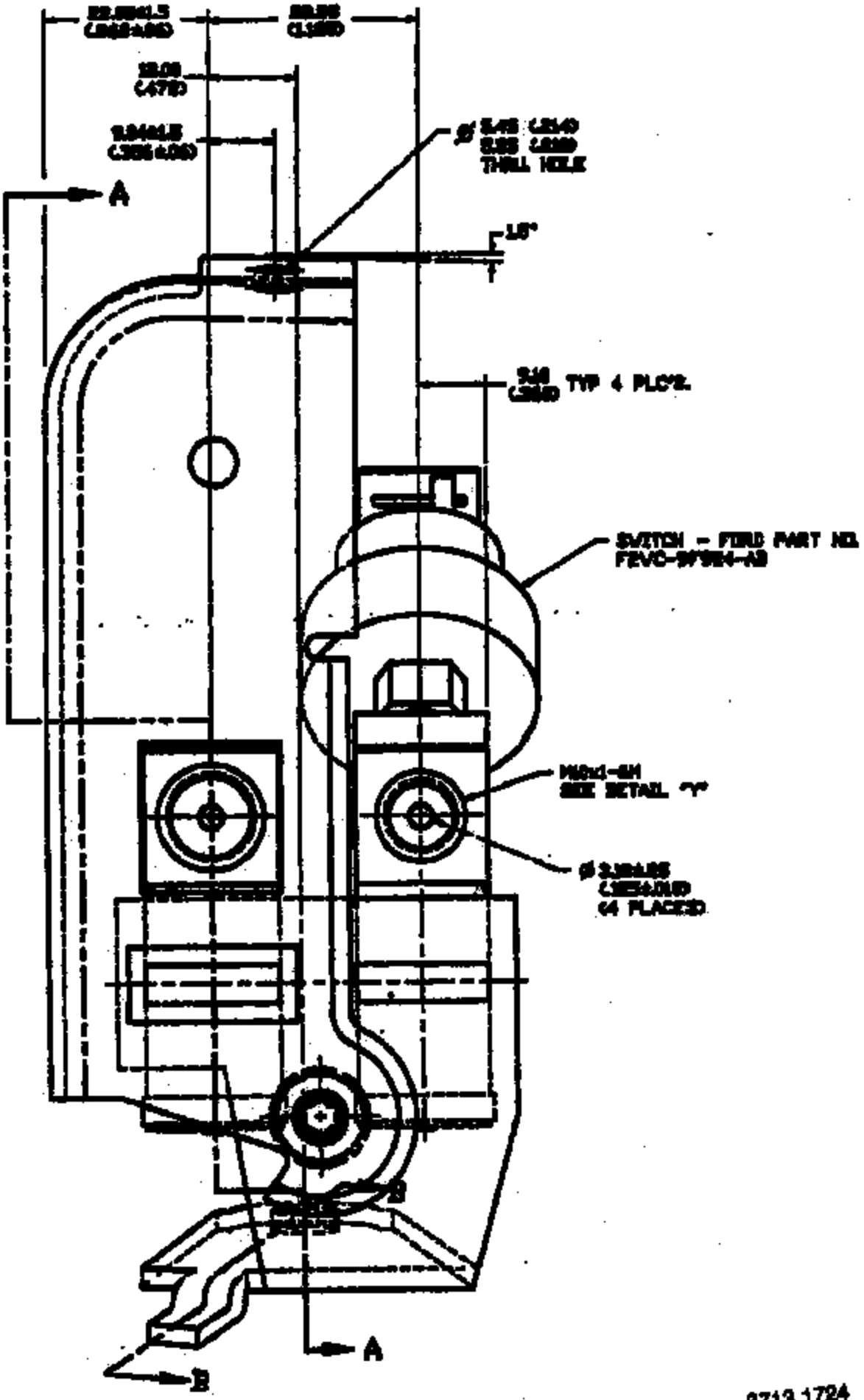


REFERENCE THEORETICAL VALVE PERFORMANCE
350/263



▽ VALVE PERFORMANCE REQUIREMENTS

WITH HYDRAULIC INLET PRESSURE INCREASING OUTLET PRESSURE MUST BE 350 TO 450 PSI WHEN THE INLET PRESSURE IS 350 PSI, AND OUTLET PRESSURE MUST BE 720 TO 980 PSI WHEN INLET PRESSURE IS 2000 PSI.



3713 1724

```
SNXPARFA                    Display Usage Translations              03/17/99 08:32:39
===>

ENG PART:   F2VC    9F924 AB_____________ ORIGIN: WERS  REGION: _  USG STAT: _
Eng Name: SW ASY-SPD CONT DEACT              PT:          PTO: ____      VL: _
  : Part:  F2VY-   9F924-A                Replaces: Y  Is Repld: N    USG IND: _
    In Out
t Vl Yr Yr Feature Descriptions                 Feature Descriptions
- -- -- -- ------------------------------------ ------------------------------
C DA 94 95 TAURUS
C FB 92 94 CROWN VIC                           4 SPD AUTO TRANS NAAO MODE
           LESS ANTI-SPIN TRACTION BRAKES      SPEED CONTROL
C JB 92 94 CROWN VIC                           4 SPD AUTO TRANS NAAO MODE
           ANTI-SPIN TRACT BRAKES W/O IVD      SPEED CONTROL
C FP 92 94 GRAND MARQ (EN53/EN114)             4 SPD AUTO TRANS NAAO MODE
           LESS ANTI-SPIN TRACTION BRAKES      SPEED CONTROL
C JP 92 94 GRAND MARQ (EN53/EN114)             4 SPD AUTO TRANS NAAO MODE
           ANTI-SPIN TRACT BRAKES W/O IVD      SPEED CONTROL
C LA 93 93 MARK
C LB 94 95 MARK VIII (FN10)
C VB 94    TOWN CAR (FN36/FN116)               LINO CONVERSION PACKAGE
C VB 93 93 TOWN CAR (FN36/FN116)               LINO CONVERSION PACKAGE
F1=Help  F4=Prv  F5=Nxt  F9=UAFA  F10=EXEA  F11=EPEA  F13=RPLD  F14=RPLG
RECORD FOUND                                                    EEL6796
```

STEVE REIMERS

04145

3713 1725

MAR 17 '99 9:33 FROM DISTRON FCSE AT ETC PAGE.001

```
SHOPARFA                    Display Usage Translations              03/17/99 08:33:11
===>

ENG PART:   F2VC    9F924 AB          ORIGIN: WERS  REGION: _  USG STAT: _
Eng Name: SW ASY-4FD CONT DRIVE          PT:          PTO:          VL: _
Svc Part:  F2VY-   9F924-A          Replaces: Y  Is Replcd: N   USG IND: _
P    In Out
t Vl Yr Yr Feature Descriptions                  Feature Descriptions
- -- -- -- ------------------------------------ ------------------------------
C VC    88 LINCOLN TOWN CAR                    LINC CONVERSION PACKAGE
C VC 98 00 LINCOLN TOWN CAR                    LINC CONVERSION PACKAGE
           LESS SPECIAL EQUIPMENT PACKAGE
```

```
SHOPARFA                    Display Usage Translations              03/17/99 08:33:06
===>

ENG PART:   F2VC    9F924 AB          ORIGIN: WERS  REGION: _  USG STAT: _
Eng Name: SW ASY-4FD CONT DRIVE          PT:          PTO:          VL: _
Svc Part:  F2VY-   9F924-A          Replaces: Y  Is Replcd: N   USG IND: _
P    In Out
t Vl Yr Yr Feature Descriptions                  Feature Descriptions
- -- -- -- ------------------------------------ ------------------------------
C VB 93 93 TOWN CAR (FN36/FN116)               LINC CONVERSION PACKAGE
           4 WHL ANTI-LOCK BRAKES
C VB 97 97 TOWN CAR (FN36/FN116)               LINC CONVERSION PACKAGE
           LESS SPECIAL EQUIPMENT PACKAGE
C VB 93    TOWN CAR (FN36/FN116)               4 SPD AUTO TRANS HAAO MODE
           LESS SPECIAL PURPOSE VEHICLE
C VB 93 93 TOWN CAR (FN36/FN116)               4 SPD AUTO TRANS HAAO MODE
           LESS SPECIAL PURPOSE VEHICLE        4 WHL ANTI-LOCK BRAKES
C VB 92    TOWN CAR (FN36/FN116)               4 SPD AUTO TRANS HAAO MODE
           LINC CONVERSION PACKAGE
C VB 93    TOWN CAR (FN36/FN116)               4 SPD AUTO TRANS HAAO MODE
           LINC CONVERSION PACKAGE             4 WHL ANTI-LOCK BRAKES
C VC    98 LINCOLN TOWN CAR                    LINC CONVERSION PACKAGE
F1=Help  F4=Prv  F5=Nxt  F9=SHPA  F10=EXEA  F11=EPEA  F13=SPLD  F14=SPLC
RECORD FOUND                                                        EXL4794
```

SDMPGPMA Global Part Information 03/17/99 08:33:16

=>

SERVICE PART: F2VT- 9F924-A SW ASY-SPD CONT DEACT
ENGINEERING PART: F2VC 9F924 AB ORIGIN: WERB
SUPPLIER LOC: FINIS: 3424326
Vendor Part: Fam Buy:
Aftercraft Part: Prime Suplr: A9N2E
Comparable Part: Packager Cd: AFJ0E
Replaced Part: F2VT- 9F924-B Mat Content:
Replacing Part: Harmn Cd: 8536.50.9065
Buyer: 1C1 SHARON L. RAYNER NBA Phone: 734-266-9895
Dmnd Anlyst: 1AD DANIELLE ROY NDA Phone: 734-266-9893
Prod Anlyst: 406 BRIAN PEKARSCIK NPA Phone: 734-52-35410
Price Anlyst: I91 SHEILA WEITHMAN Profs ID: SWEITHMA
Color Name: Pallet Qty: 8400

Pnd Obs:		Svc Disp:		Unit Issue:	1	Overpack Qty:	20
Obs Not:		Mach Ob Cd:		Trfc Cd:	428	Max Ord Qty:	0
Obs Eff:		Procure Cd:	2	Hvy Trk App:	2	Min Run Qty:	0
Eff In:	01/14/91	Rise Hld:	N	Fab/Hold:	N	Min Ship Qty:	0
Eff Out:	07/31/00	Final Rise:	N	Wgt UOM:	LB	Package Wgt:	0.00
Ship Mlt:	238	Spec Pgm:	N	Dir Ship:		Standard Cst:	2.52
Commdty:	060605	Volume Grp:	D	Hvy Trk Cd:		Dealer Net:	6.81

F1=Help F2=GIMA F4=PrvPart F5=NxtPart F6=PIGA F9=DEEA F10=HIIA F11=ARFA
RECORD FOUND EEL6796

3713 1727

SEMPARFA Display Usage Translations 03/17/99 08:33:11

==> _____

ENG PART: F2VC 9F924 AB_____ ORIGIN: MEXS REGION: _ USG STAT: _
Eng Name: SW ASY-SPD CONT DEACT PT: PTO: VL: _
PG Part: F2VY- 9F924-A Replaces: Y Is Replcd: N USG IND: _

C	Vl	In Yr	Out Yr	Feature Descriptions	Feature Descriptions
C	VC		98	LINCOLN TOWN CAR	LINO CONVERSION PACKAGE
C	VC	98	00	LINCOLN TOWN CAR LESS SPECIAL EQUIPMENT PACKAGE	LINO CONVERSION PACKAGE

F1=Help F4=Prv F5=Nxt F9=UAFA F10=EXEA F11=EPEA F13=SPLD F14=SPLC
RECORD FOUND EEL6796

3713 1725

****
* Note printed by SREIMERS on 22 Feb 1999 at 12:30:07 *
****

From: LGEE3 --DRBN006 Date and time 02/22/99 11:35:14
To: KEUBLER1A--DRBN006
cc: LGEE3 --DRBN006 SREIMERS--DRBN007

*** Reply to note of 02/22/99 08:23
FROM: Larry Gee USAET(UTC -05:00)
Subject: 92/93 Town Car Options?

For 1992, the coding handbook first states that ABS is optional. This is followed by a statement:

Per marketing decision, ABS anti-lock brakes (less traction control) is standard on all Lincolns except the Limosine Package.

From this one would guess that ABS is standard and Traction Control is optional for 1992.

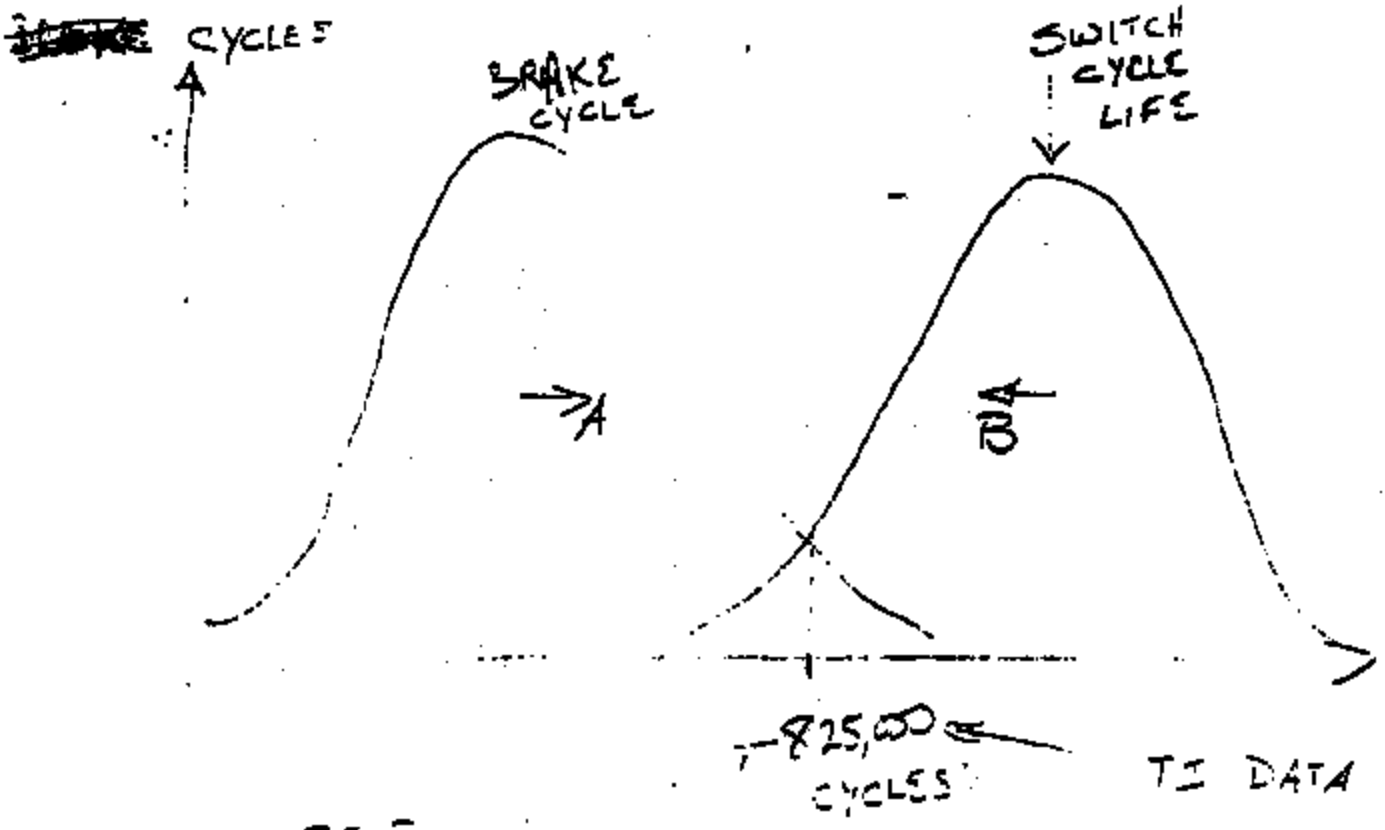
For 1993, the manual is incomplete. The page containing this information is missing. By 1994, however, ABS with traction control is listed as optional for all Lincoln Town Cars. ABS without traction control is not listed.

Regards,
Larry Gee

Telecon 2/16/99

FROM: Norm LaPointe

Re: GTO Correlation Data for Brake Application vs 99% Reliability of Switch.

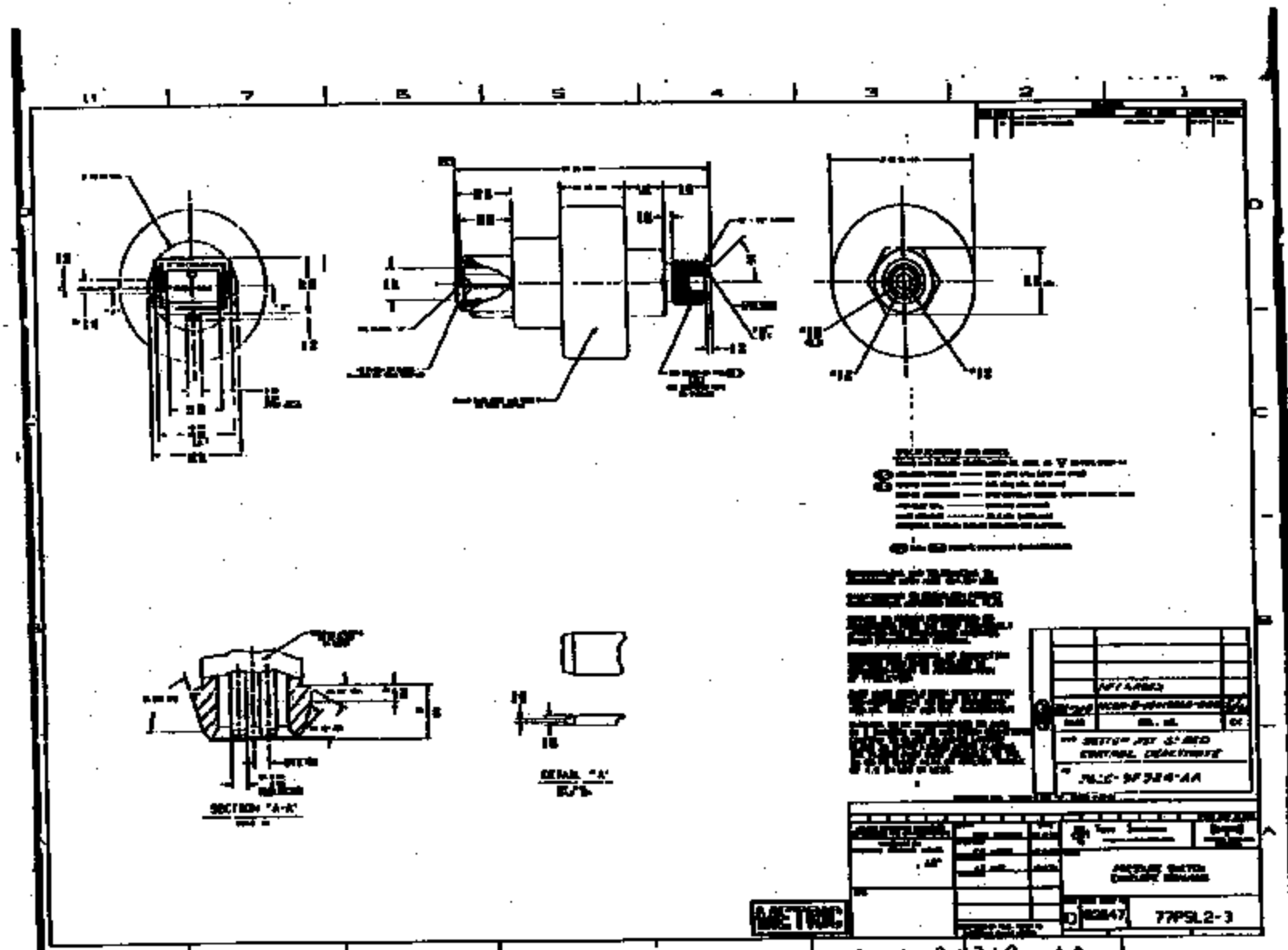


95 Percent
Driver 16 cycles per mile
x Number Car miles

A new Energy for B if A to right because of ABS

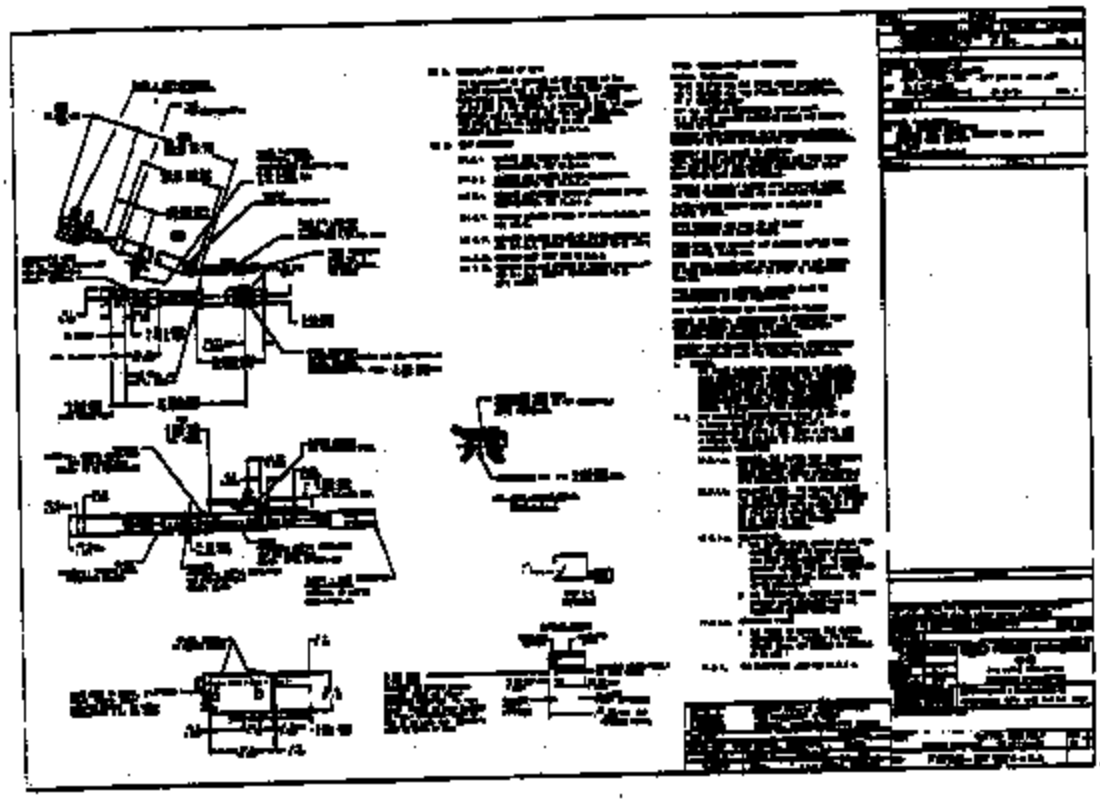
Don,

3713 1730



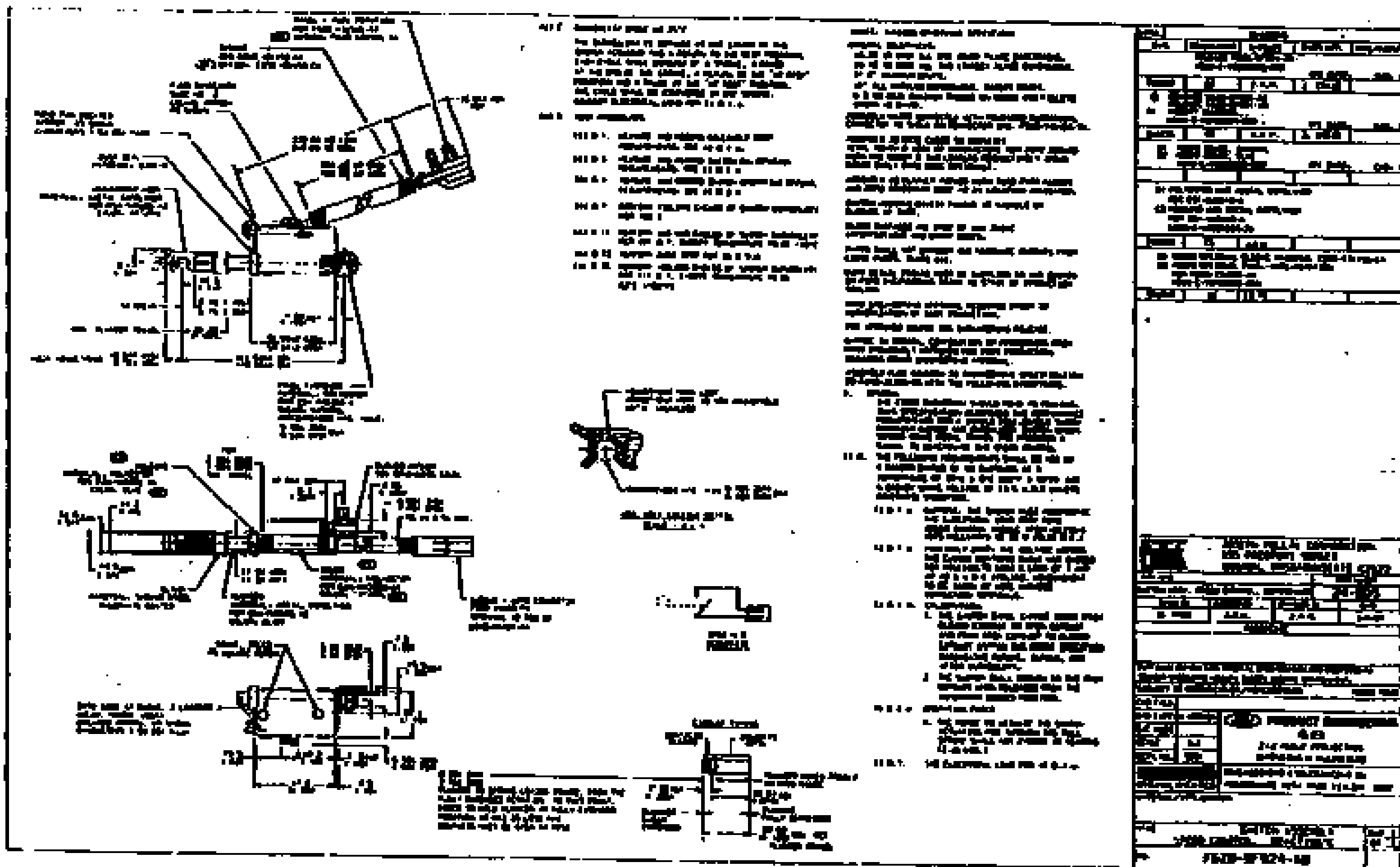
3713 1731

FCLC-9F924-AA

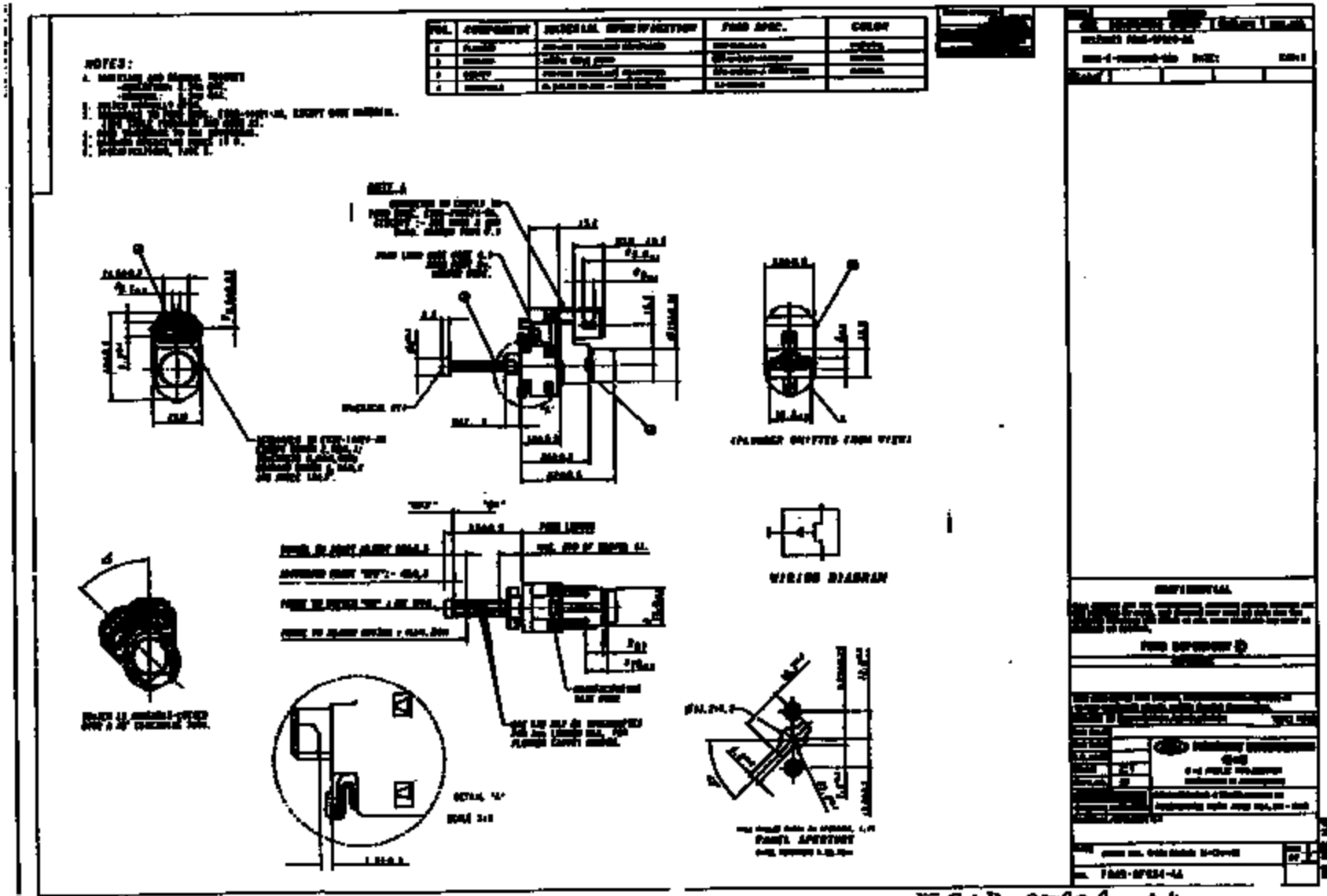


E7SB-9F924-AE

3719 1733

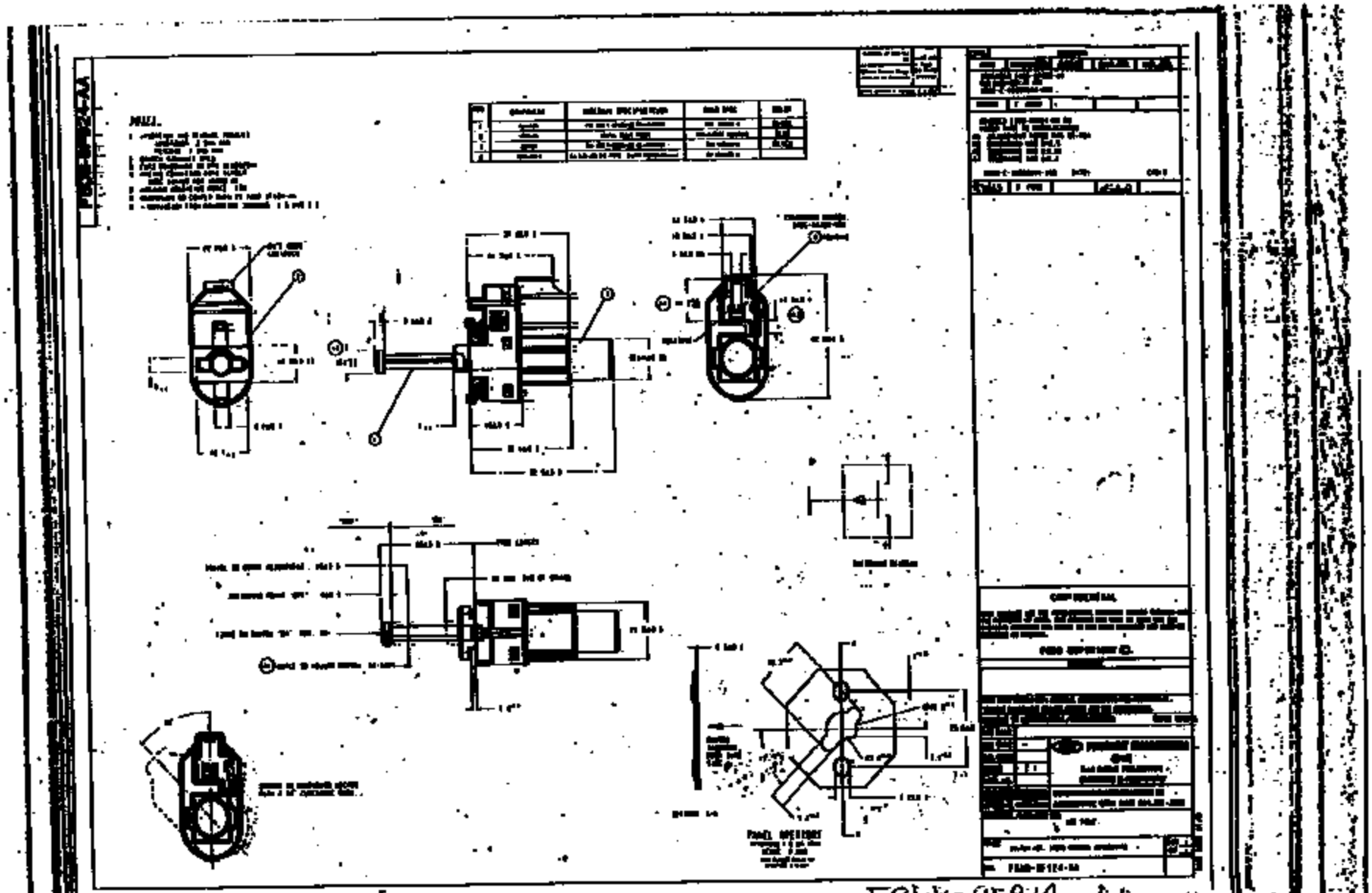


F6ZB-9F924-AB



FBAB-9F924-AA

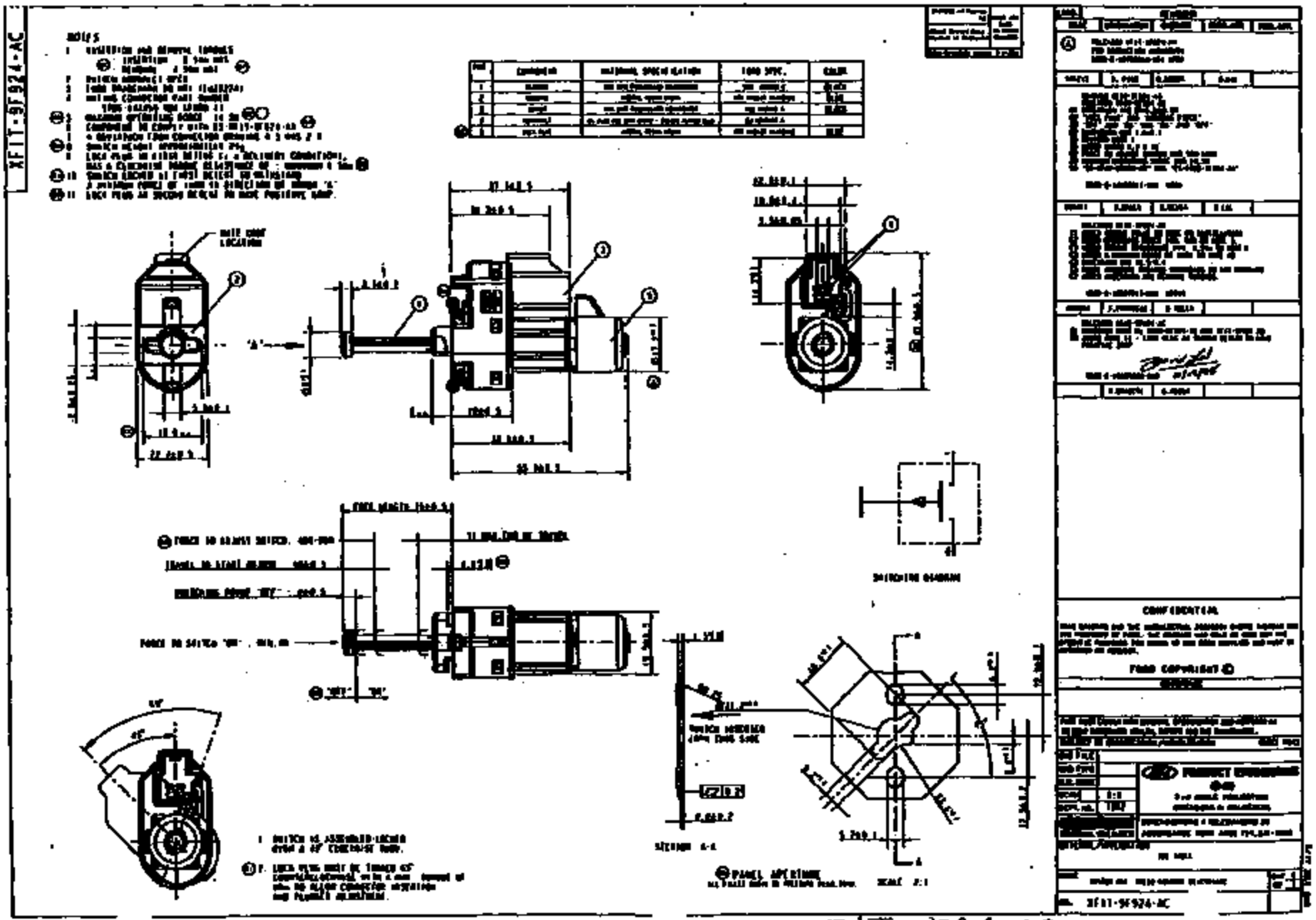
8713 1734



FRUB-9F974-AF

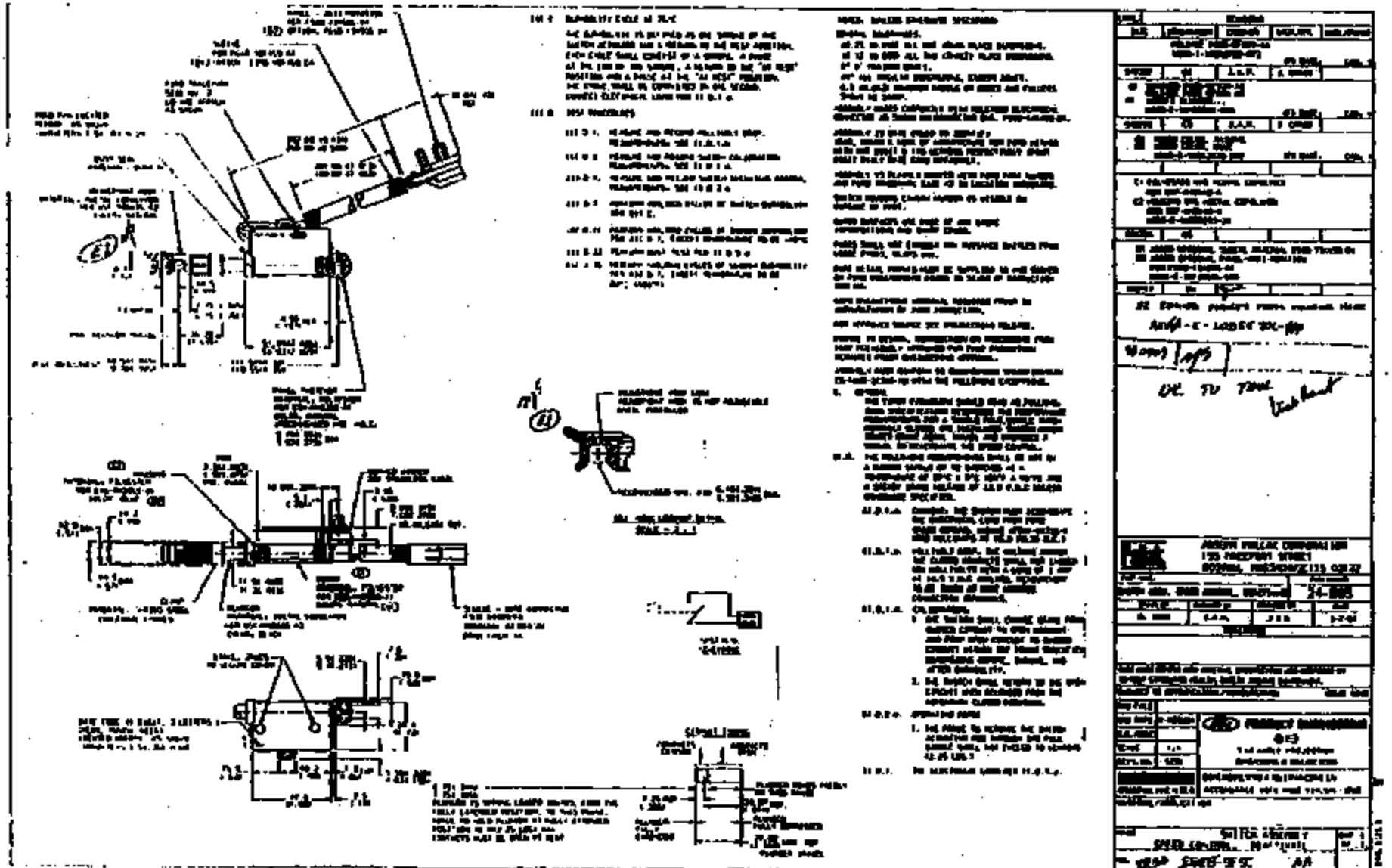
3718 1735

XF1T-9F924-AC



XF1T-9F924-AC

3713 1736



3713 1737

XR83 9F924 AA

THIS COMPONENT IS THE SAME AS XFIT-9F924-AB.
EXCEPT NOTE 6 REPLACED BY:-
'COMPONENT' TO COMPLY WITH ES-XFIT-9F924-AA
EXCEPT ELECTRICAL DURABILITY LOAD IS 10mA (RESISTIVE)'
HOUSING COLOUR TO BE ADVISED

REVISIONS				
DATE	DRAWN/ISSUED	CHECKED	ENGR APP	MATL APP

PRODUCT ON RELEASE

REFERENCE

CAD FILE

CAD TYPE

DC MODE

SCALE

DEPT NO

CAD PRINT

3rd ANGLE PROJECTION

DIMENSIONS & TOLERANCES IN ACCORDANCE WITH ASME Y14.5M-1994

MATERIAL/FINISH

SWITCH ASY SPEED CONTROL DEACTIVATE

XR83 9F924 AA

XF83-9F924-AA

3713 1798

DOC MAN DRAWINGS

Sheets

9F924

		Vehicle	92	93	94	95	96	97	98	99	00
F2VC	AA	CV/GN	X			X					
F2VC	AA	TOWN CAR				X			X		
F2VC	AA	CV/GN	X								
F2VC	AA	TOWN CAR	X								
F2VC	AB	CV/GN	X								
F2VC	AB	DEN99								X	
F2VC	AB	MARK VIII		X	X						
F2VC	AB	TAURUS/SABLE		X	X		X				
F2VC	AB	TOWN CAR	X	X	X						
F2VC	BA	TOWN CAR	X								
F2VC	BB	TOWN CAR	X								
F30C	AA	TAURUS/SABLE		X	X						
F37A	AA	ECONOLINE						X			
F37A	BA	BRONCO/F50		X							
F37A	BA	EXPEDITION						X			
F37A	BA	F-SERIES					X				
F37A	BA	F150		X							
F37A	BA	F250		X							
F37A	CA	ECONOLINE F/C							X	X	
F37A	CA	EXPLORER							X		
F68A	AA	MUSTANG F/C					X				
F68A	AB	MUSTANG F/C					X				
F68B	AA	[illegible]					X		X	X	
F68B	AB	[illegible]									
F68B	AA	TAURUS/SABLE F					X				
F68B	AB	[illegible]									
F68C	AA	MARK VIII					X				
F68E	AA	DEN99								X	
V68E	AA	JAG X300								X	
F68E	AA	ESCORT/COUGAR				X	X	X			
F68E	AB	MUSTANG					X			X	
F68E	AB	DEN99								X	
F68E	AB	JAG X300								X	
F68E	AB	MUSTANG					X				
F68J	AA	CV/GN							X		
F68J	AA	TOWN CAR							X		
F68K	AA	CONTINENTAL							X	X	
F68K	AA	CV/GN							X	X	
F68K	AA	DEN99								X	
F68K	AA	JAG X300								X	
F68K	AA	TAURUS/SABLE							X		X
F68K	AA	TOWN CAR							X	X	
XF1T	AC	CONTINENTAL								X	
XF2T	AC	CV/GN								X	
XF2T	AC	DEN99								X	
XF1T	AC	JAG X300								X	
XF1T	AC	TAURUS/SABLE								X	X
XF1C	AC	TOWN CAR								X	
XR3J	AA	MUSTANG									
XX03	AA	JAG X300								X	

F2AE-9F924-A

F2VV-9F924-A

F2VV-9F924-B

F3DE-9F924-A

F3TE-9F924-B

F3TE-9C832-AA

F58E-9F924-A

SERVICE PART #

ALL DISPLACEMENTS

9F924 dlo - 2/2/99

		Vehicle	92	93	94	95	96	97	98	99	00
F2VC	AA	CV/GN	X			X					
F2VC	AA	TOWN CAR				X			X		
F2VC	AA	CV/GN	X								
F2VC	AA	TOWN CAR	X								
F2VC	AB	CV/GN	X								
F2VC	AB	ESCORT								X	
F2VC	AB	MARK VIII		X	X						
F2VC	AB	TAURUS/SABLE		X	X		X				
F2VC	AB	TOWN CAR	X	X	X						
F2VC	BA	TOWN CAR	X								
F2VC	BB	TOWN CAR	X								
F3DC	AA	TAURUS/SABLE		X	X						
F3TA	AA	ECONOLINE						X			
F3TA	BA	BRONCO		X							
F3TA	BA	EXPEDITION						X			
F3TA	BA	F-SERIES					X				
F3TA	BA	F150		X							
F3TA	BA	F250		X							
F3TA	CA	ECONOLINE							X	X	
F3TA	CA	EXPLORER							X		
F68A	AA	MARK VIII				X					
F68A	AB	MARK VIII					X				
F6DB	AA	CONTINENTAL				X			X		
F6DB	AA	TAURUS/SABLE					X				
F6DB	AA	TAURUS/SABLE					X				
F6DB	AB	TAURUS/SABLE					X			X	X
F6LC	AA	MARK VIII					X				
F6LB	AA	ESCORT								X	
F6SE	AA	XR2 K200								X	
F6TB	AA	THUNDERBIRD/COUGAR				X	X	X			
F6TB	AA	MUSTANG					X			X	
F6TB	AB	ESCORT								X	
F6TB	AB	XR2 K200								X	
F6TB	AB	MUSTANG					X				
F6UB	AA	CV/GN							X		
F6UD	AA	TOWN CAR							X		
F6UC	AA	CONTINENTAL							X	X	
F6UE	AA	CV/GN							X	X	
F6UE	AA	ESCORT								X	
F6UB	AA	XR2 K200								X	
F6UB	AA	TAURUS/SABLE							X		X
F6UB	AA	TOWN CAR							X	X	
XF1T	AC	CONTINENTAL								X	
XF1T	AC	CV/GN								X	
XF1T	AC	ESCORT								X	
XF1T	AC	XR2 K200								X	
XF1T	AC	TAURUS/SABLE								X	X
XF1T	AC	TOWN CAR								X	
X313	AA	MUSTANG									
X313	AA	XR2 K200								X	

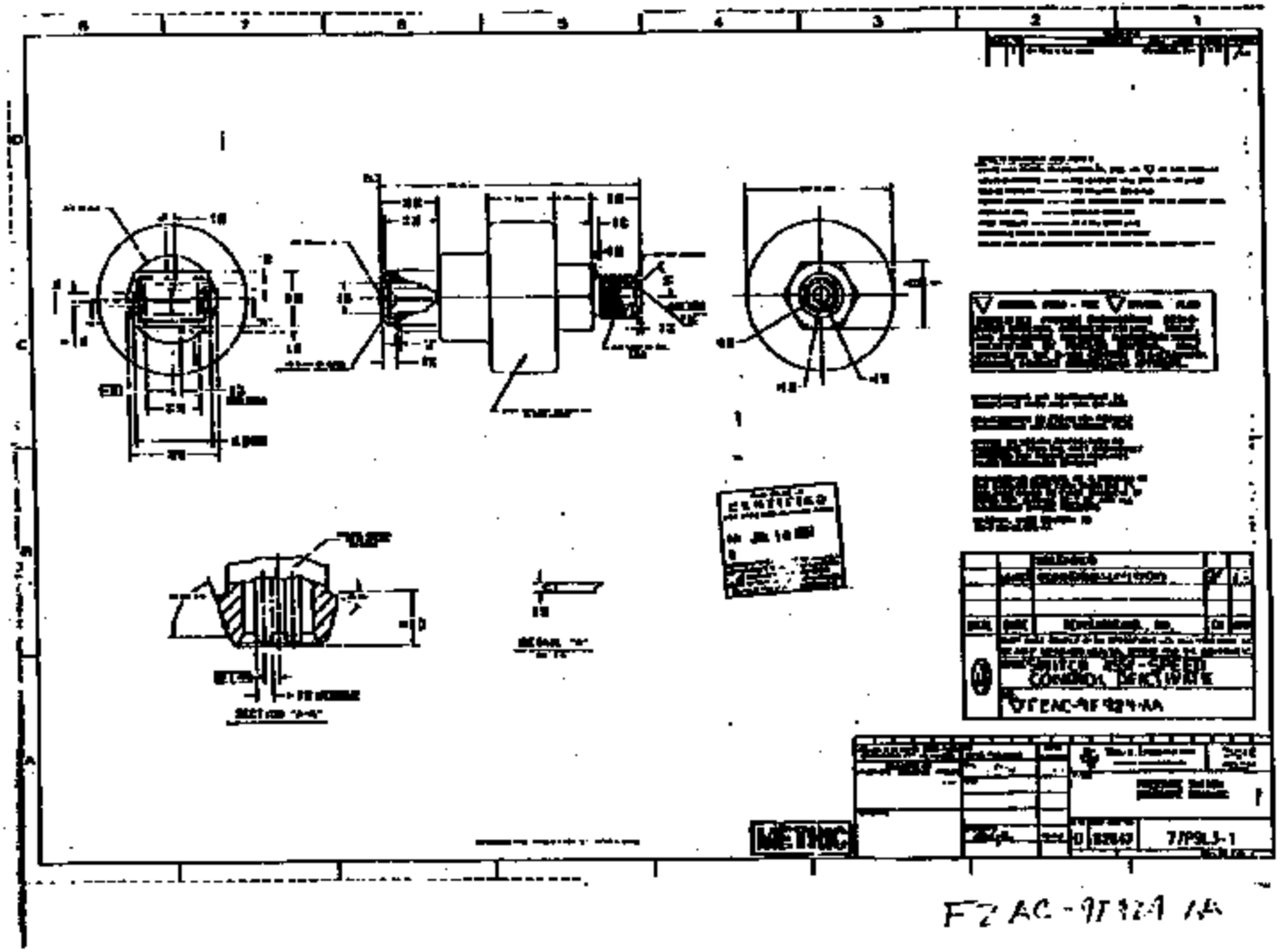
Mini-FAX Transmittal Date 2/4/99 Pages 1

To BILL ABRAMCHIK From FRED PORTER

Co. Co.

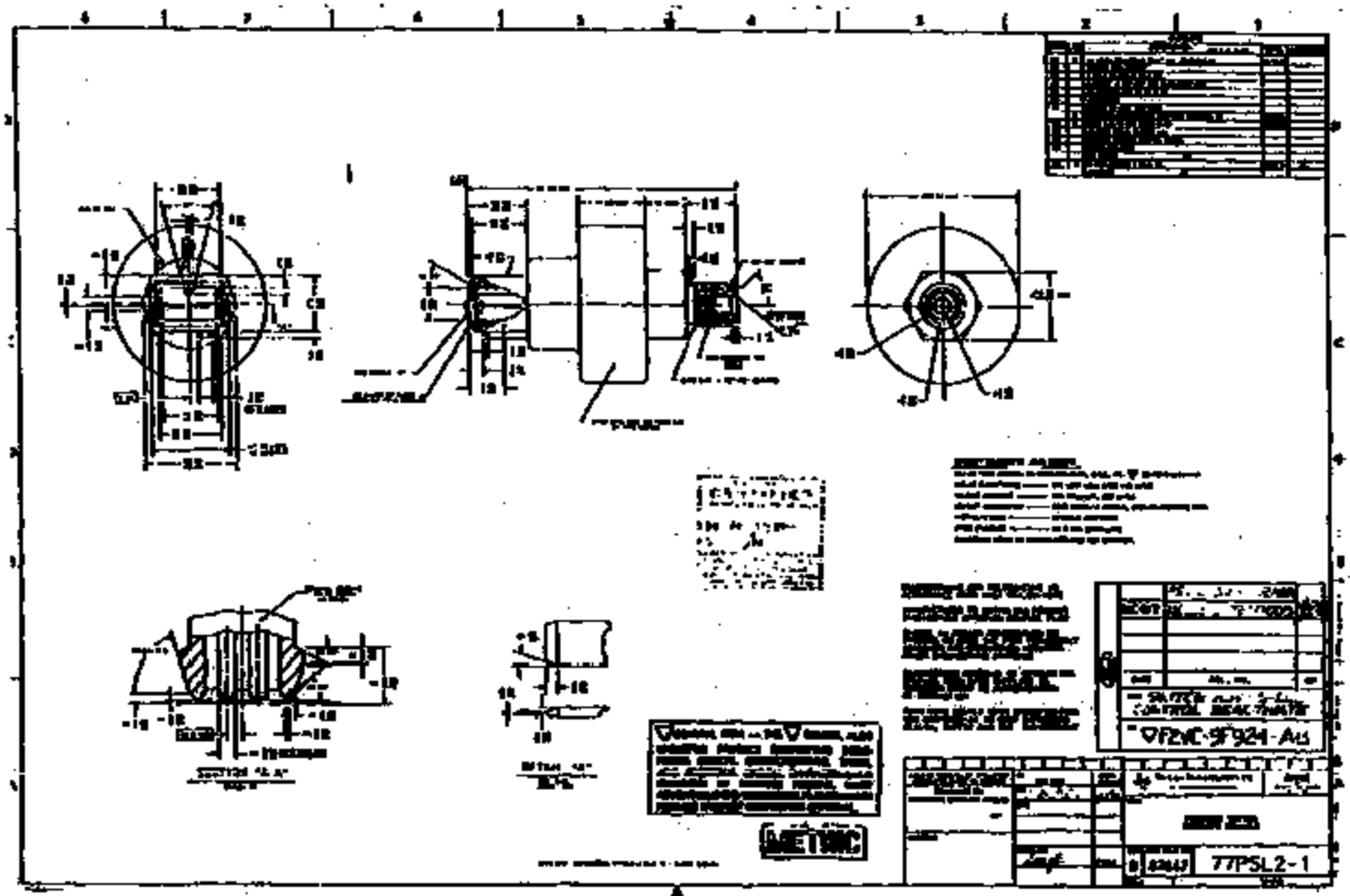
Phone Phone 53722

Fax # 42268 Fax #

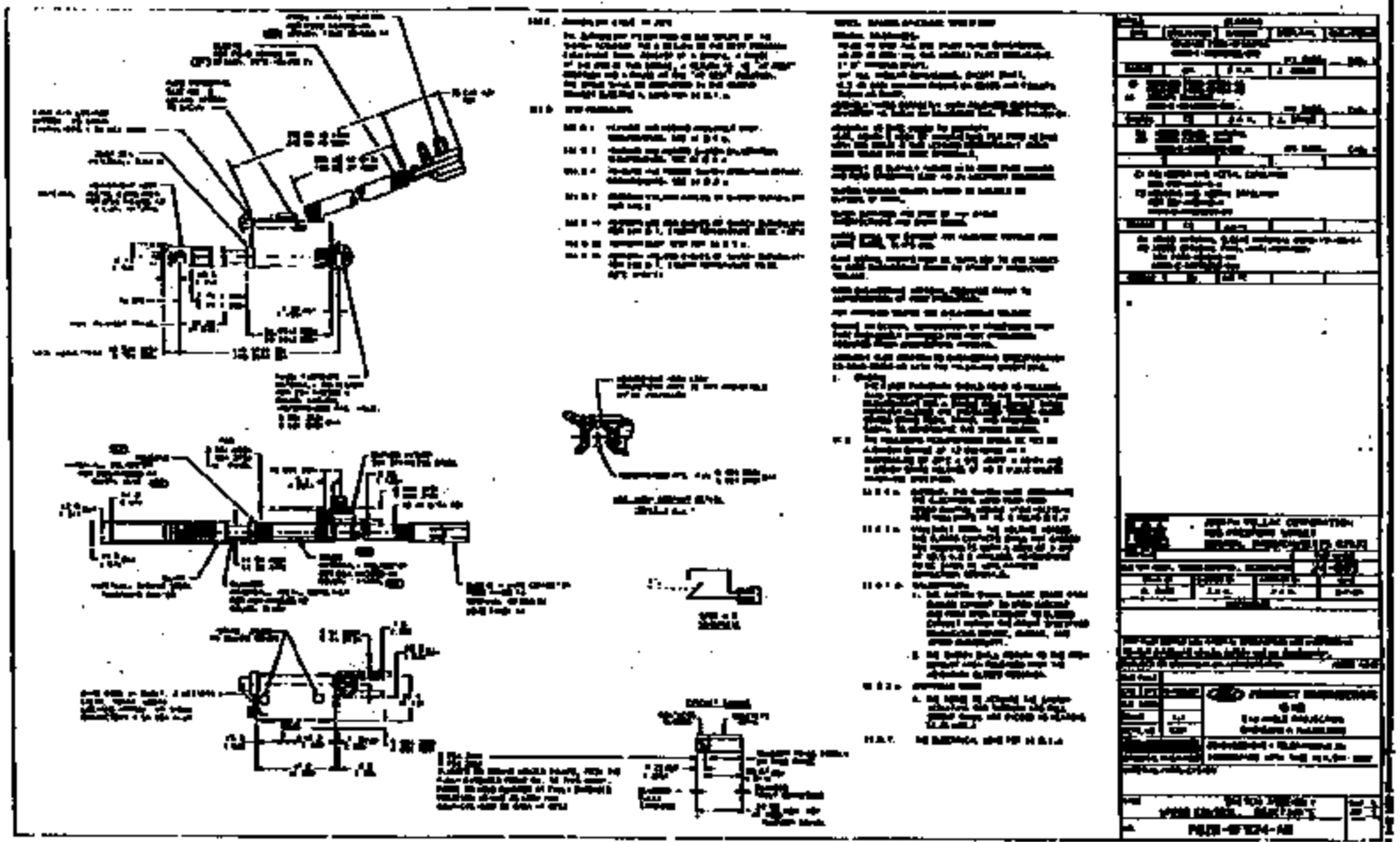


F2AC-9F924-AA

3713 1741

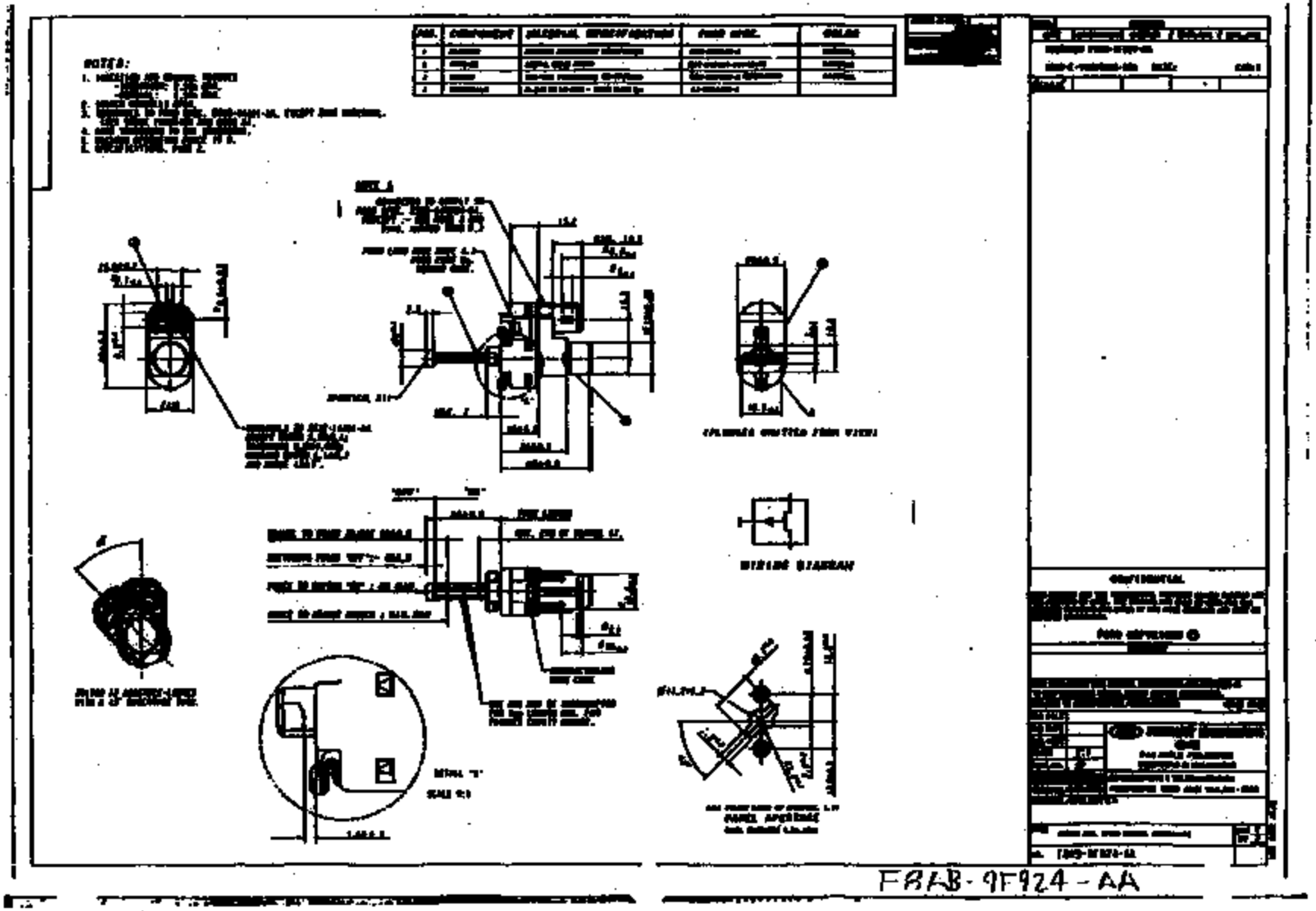


3713 1742



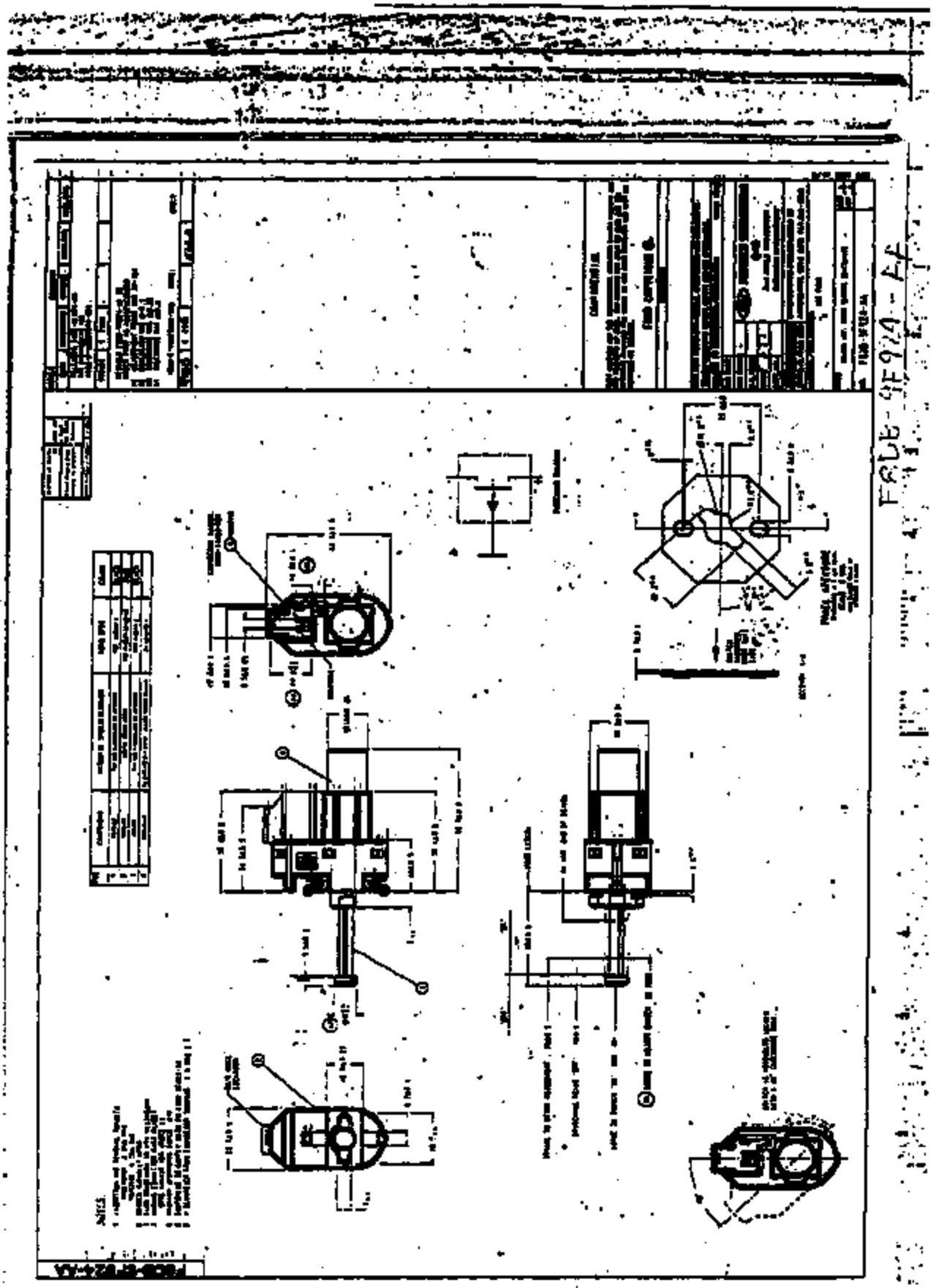
F6ZB-9F924-AB

3713 1743

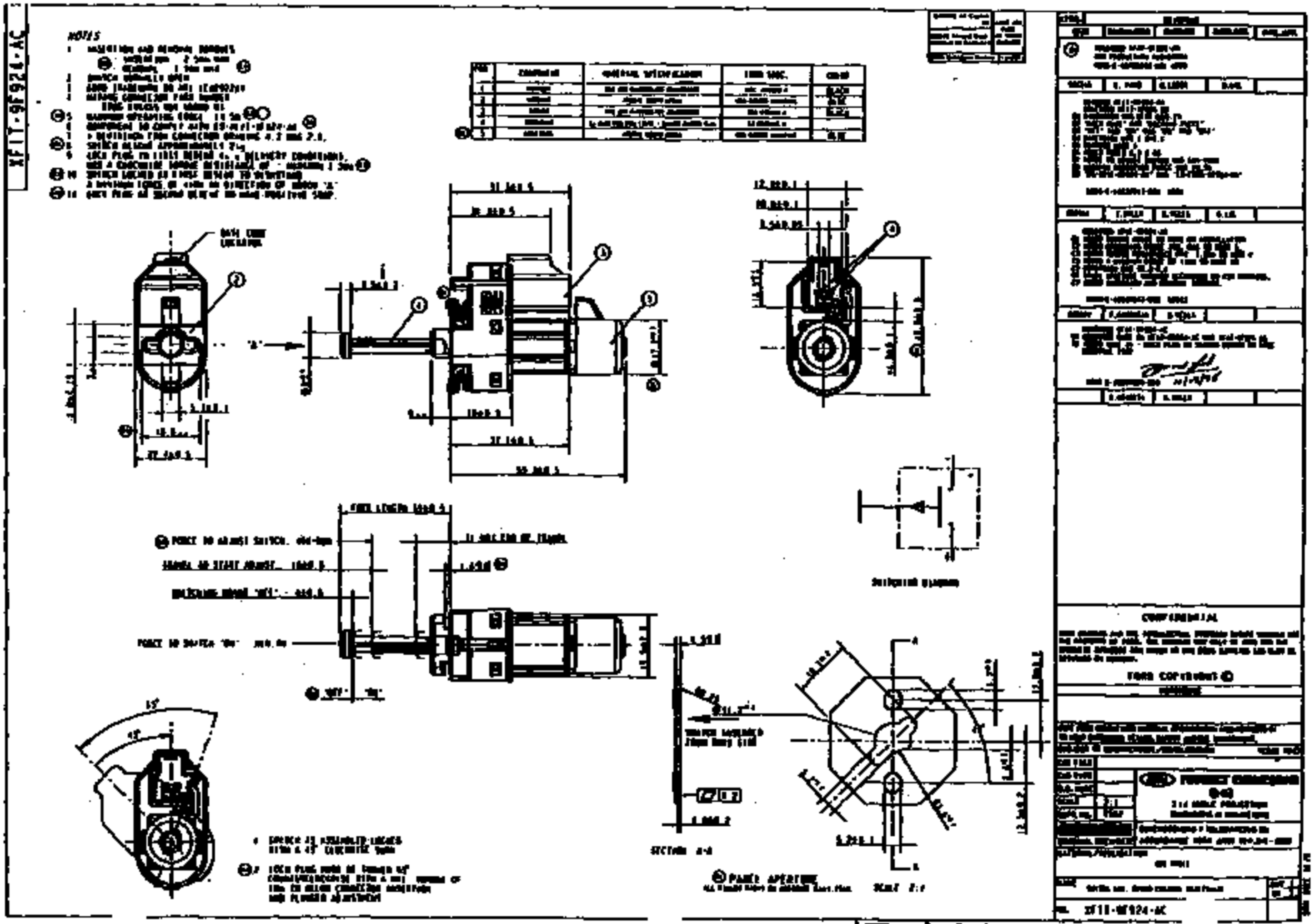


FBAB-9F924-AA

9713 1744



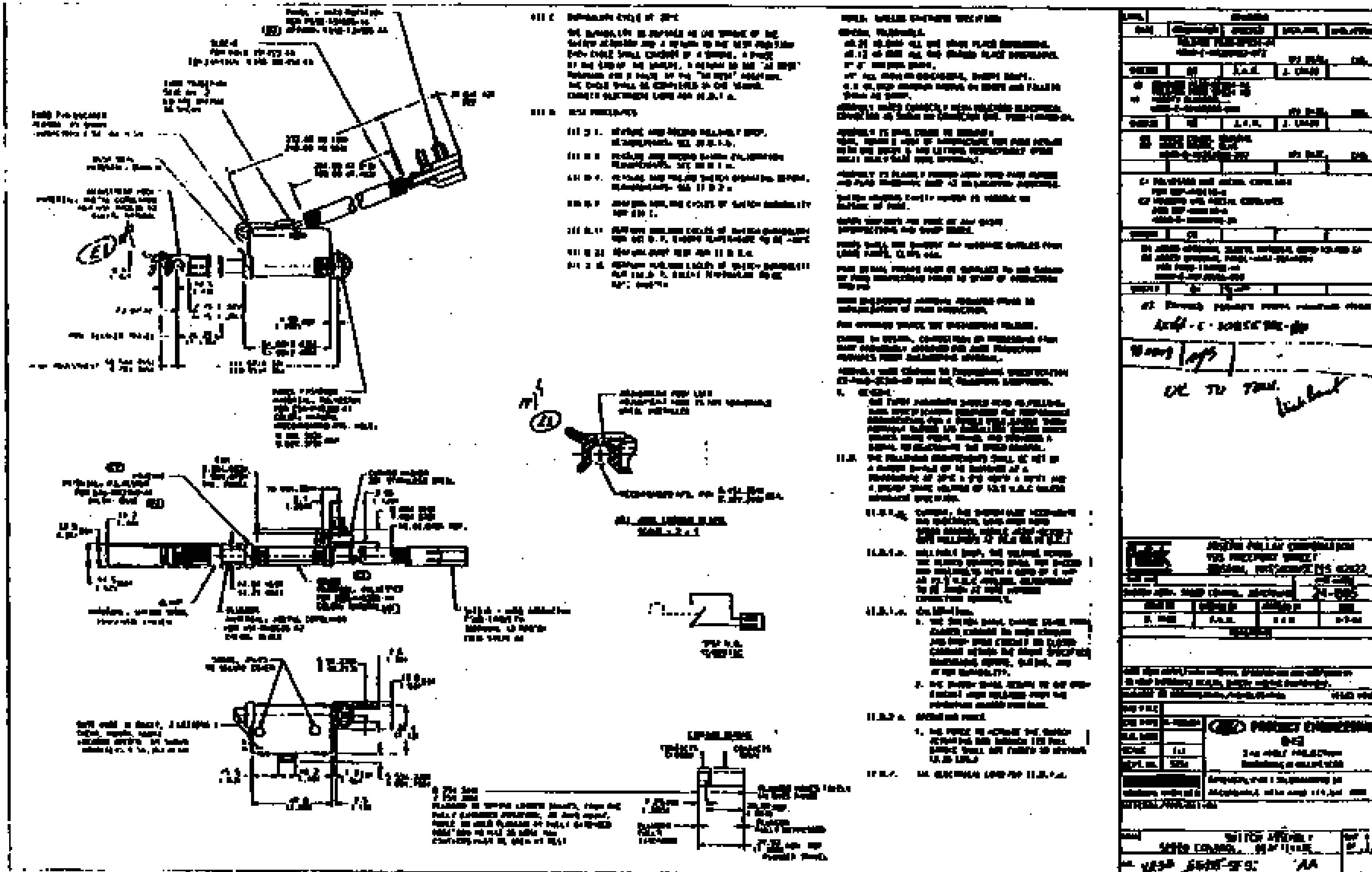
XF1T-9F924-AC



XF1T-9F924-AC

3718 1748

8713 1747



XR33-9T924-AA

XR83 9F924 AA

THIS COMPONENT IS THE SAME AS XFIT-9F924-AB.
EXCEPT NOTE 6 REPLACED BY:-
'COMPONENT TO COMPLY WITH ES-XFIT-9F924-AA
EXCEPT ELECTRICAL DURABILITY LOAD IS 10mA (RESISTIVE)'
HOUSING COLOUR TO BE ADVISED

LTRS	REVISIONS				
DATE	ORIGINATOR	CHECKER	ENGR APP	MATL APP	
	PRODUCTION RELEASE				
	R.HUGHES	R.PERKINS	C.PACKER	M.HEATH	

CONFIDENTIAL

CAD FILE XR83.9F924.AA

CAD PRINT

SCALE N.T.S

DEPT NO ELEC

NAME SWITCH ASY SPEED CONTROL DEACTIVATE

XR83 9F924 AA

XR83-9F924-AA

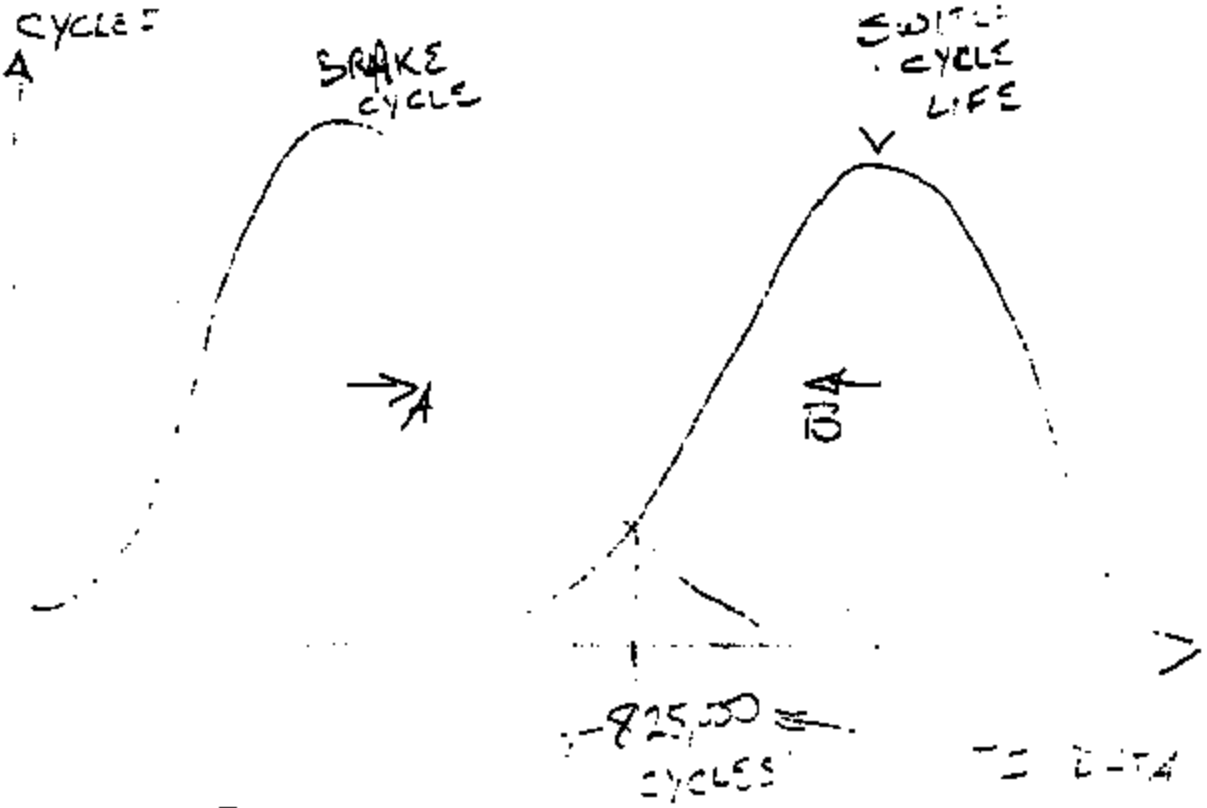
9713 1740

Telecon 2/16/99

FROM: Norm LaPointe

Re: GTO Correlation Data for Brake Application

vs 99% Reliability of Switch



95 Percentile Driver 16 Events per mile

x Number Car miles

Need new Equation for B if A moves to right because of ABS modulation.

3713 1749

****
* Note printed by SREINERS on 22 Feb 1999 at 12:30:07 *
****

From: LGEE3 --DRBN006 Date and time 02/22/99 11:35:14
To: KSUBIETA--DRBN006
cc: LGEE3 --DRBN006 SREINERS--DRBN007

*** Reply to note of 02/22/99 08:23
FROM: Larry Gee USART(UTC -08:00)
Subject: 92/93 Town Car Options?

For 1992, the coding handbook first states that ABS is optional. This is followed by a statement:

Per marketing decision, ABS anti-lock brakes (less traction control) is standard on all Lincolns except the Limosine Package.

From this one would guess that ABS is standard and Traction Control is optional for 1992.

For 1993, the manual is incomplete. The page containing this information is missing. By 1994, however, ABS with traction control is listed as optional for all Lincoln Town Cars. ABS without traction control is not listed.

Regards,
Larry Gee

[redacted]

3713 1751

RVT - EESE WORKPLAN FOR 92-93MY TOWN CAR UNDERHOOD FIRES

	Champion	Target Complete Date
Read, assess, and categorize CQIS verbatims:		
(A). Town Car, CV/GM.	RVT-Elect	A - 3/8/99
(B). Econoline and F-Series.	RVT-Elect	S - 3/12/99
(2). Identify underhood hot at all times wiring circuits and electrical components.	RVT-Elect	S - 3/9/99
(A). Draw possible conclusions relative to CQIS verbatims.	RVT-Elect	S - 3/10/99
(3). Review previous repair info on 47 Town Cars identified with underhood fires:	RVT-Elect	A - 3/5/99
(A). Draw possible conclusions relative CQIS verbatims.	RVT-Elect	S - 3/9/99
(4). Correlate 47 Town Cars against orderable options - traction assist and trailer tow.		
(A). First 31 out of 47 Town Cars.	FCSD	A - 3/1/99
(B). Last 16 out of 47 Town Cars.	FCSD	S - 3/10/99
(C). Draw possible conclusions relative to CQIS verbatims.	RVT-Elect	S - 3/11/99
(5). Perform field inspections of the 47 Town Cars:		
(A). Perform phone survey using questionnaire by RVT-EESE and Design Analysis.	LVC-Safety	S - 3/15/99
(B). Litigation Prevention Team follows up with selected field reviews of vehicles.	LVC-Safety	S - 4/5/99
(6). Brake Pressure Switch:		
(A). Determine root cause.	RVT-Chassis	
(B). Brainstorm and identify possible resolution proposals.	RVT-Chassis	S - 3/10/99
* Recommend resolution proposal along with supporting rationale.	RVT-Chassis	S - 3/22/99
(C). Identify required DVP&R testing: CAE and/or Bench and/or In-Vehicle, etc.	RVT-Chassis	
* Complete DVP&R testing.	RVT-Chassis	
(D). Determine manufacturing feasibility with effected suppliers.	RVT-Chassis	S - 3/17/99
* Obtain supplier cost/timing/tools to support resolution proposal.	RVT-Chassis	
(E). Determine Assy Feas for proposal - review installation procedure with FCSD.	RVT-Chassis	S - 3/17/99
(F). Complete 14D white paper.	RVT-Chassis	

Work Plan- Brake Pressure Switch

Root Cause Investigation-

Identify the combustibles?
AVT EESE Materials Engineering

Identify the contaminants in returned parts?
Central Lab analysis

Identify source of contaminants?
Central Lab analysis

Identify causes of brake fluid leakage?
Central Lab and Texas Instrument

Identify heat source(s) start event?
AVT EESE Chassis Electronics

Create Event in Lab
AVT EESE Chassis Electronics

Collect Field Samples
LVC - Safety

Root Cause Investigation Tasks

What are the combustibles?

AVT EESE Materials Engineering

Are the switch materials compatible with brake fluid? ___
by 2/18/99

Are the switch materials compatible with brake fluid in an electric field?
by 2/18/99

Are the switch materials compatible with brake fluid and contaminants?
by 2/18/99

Are the switch materials compatible with contaminated brake fluid in an electric field? by 2/18/99

Flash points for all materials? by *completed*

TI provided to Norm LaPointe

Get Dow assistance by 2/16/99

How can a fire start with the switch given the constraints:

Continuous Battery voltage applied between switch electrical components and the hydraulic connection, circuit fused at 15 amps, inductive load current of 0.5 amps switched when speed control is turned off, the switch cavity contains a black material containing at least copper, zinc, sulfur, and brake fluid (probably containing water), vehicle underhood temperatures.

By 2/22/99

What is the difference in the base materials that look different?

Texas Instruments by *complete*

Color of plastic base identifies calibration. Also, plastic material change from Celianex 4300 to Noryl GTX430 in MY 1995 when P/N changed from F2VC to F2AC

What are the material call-outs for 1992 and 1993?
Texas Instruments by 2/15/99

Brake Pressure Switch
F3VC-9F884-AB
Material List for MY 92/93

Component Name	Material	Comment
Gasket	Elastomer Ethylene Propylene	JBL Compound # E-7104-70
Diaphragm	Kapton, Polyimide	Dupont 500 FN131L, 3 Diaphragms per switch
Base	PBT, Plastic	Grade Celanex 4300
Crimp Ring	Aluminum	Grade # 5052
Spacer	Kapton, Polyimide	Dupont #200H,Fritelon Reducer on Disc
Rivet	Brass	CDA 360
Transfer Pin	Ceramic	Steatite , L-5 Grade
Environmental Seal	Silicone	JBL Compound # S7519
Converter	Cold Rolled Steel	Grade # 1008
Washer	Cold Rolled Steel, Zinc Plated	Grade # 1060
Cup	Cold Rolled Steel	Grade 1010
Spring Arm	BeryBum Copper	Grade # C17500
Movable Contact	Silver Plated Copper	Oxygen Free Cu, Fine Silver
Stationary Terminal	Brass + Silver Inlay	CDA 260
Movable Terminal	Brass	CDA 260
Disc	Stainless Steel	Grade 302
Hexport	Cold Rolled Steel, Zinc Plated	C10L10
Thread Cap	LDPE, Plastic	

What are the contaminants in returned parts?
Central Lab analysis
Results of Memphis part analysis by 2/18/99

Results of testing with corrosion simulation?
AVT EESE Chassis Electronics by *complete*

Black corrosion recreated in lab on virgin parts. Given to Lab for analysis

TI analysis results of the Memphis parts (crease marks in diaphragm, etc) ?
Texas Instruments by *complete*

TI gave to Norm LaPointe on 2/10/99. Crease mark caused by degradation of Kapton. TI chemical analysis matches Ford analysis.

What is source of contaminants?

Central Lab analysis by 2/18/99

What causes brake fluid leakage? By 2/24/99

Central Lab and Texas Instrument

What does TI DFEMA say about this failure mode?

Texas Instruments by ~~2/16/99~~ Complete

TI identifies potential for leaks. Copy to Norm Lapointe.

What are TI in-process test failures?

Texas Instruments by *completed*

TI provided IP and Weibull test reports to Fred Porter and Norm Lapointe. First leaker observed at 994,000 cycles. Test suspended at 1.6 million cycles. Leaker was by Kapton diaphragm.

Provide TI end-of-life lab test parts to Norm Lapointe.

TI by 2/18/99

Does the event occur only on vehicles with ABS?

LVC-Safety by 2/18/99

Characterize the real vehicle brake pressure seen at the switch.

AVT Chassis Brakes by

Characterize the real vehicle brake pressure during ABS and TC events seen at the switch. AVT Chassis Brakes by

DOE work plan for TI activities.

TI by 2/16/99

Correlate Lab test cycle Kapton wear with field mileage Kapton wear.

TI and Central Lab by 2/29/99

What heat source(s) start event?

AVT EESE Chassis Electronics

Analysis of harness pig-tails
AVT EESE OPD by 2/18/99

Use thermocouple to record switch temperature during and after driving. AVT EESE OPD by 2/18/99

Recreate Event in Lab

AVT EESE Chassis Electronics

What does it take to start an event? by on-going

If a switch is contaminated can it start the event? by on-going

Switch with clean Brake fluid inside is being monitored for increase in leakage current.

If current is stopped does combustion stop?

Collect Field Samples

LVC - Safety

Collect Brake Pressure switches and speed control servos with harnesses attached. By 2/22/99

Miscellaneous

Can the switch act as a fuse?

Team by complete

No.

Could a fuse (e.g. 2 amp) be added in series between the stop lamp fuse and the brake pressure switch? Failure parameters would have to be known.

What are descriptions from AWS and CQIS?

LVC-Safety by 2/18/99

What are we seeing in returned Speed control modules (FRACAS)?

Visteon Speed Control by 2/17/99

Provide color photos of Econoline?

Texas Instruments by *complete*

There are no color photos.

Containment / Corrective Action Tasks

Competitive Vehicles

How is switch packaged?
Is it always Powered (HOT_ALL_TIME) ?
Are the contacts opened when pressure applied?
What is fuse limit?
What is being switched?
Is it a redundant switch?

AVT EESE Competitive Analysis **by** **2/24/99**

What does Speed control FMEA say about Brake Switch ?

Visteon Speed Control **by** *completed*

The Brake Pressure Switch (Deactivation Switch) coupled with the Stop Lamp switch are categorizes as "Automatic Deactivation". The FMEA lists Automatic Deactivation" as current design control for 66 different potential cause/ mechanical failures.

Brake Pressure Switch (Deactivator Switch) is one of the most important safety features.

When was non-Pressure actuated switched introduced?

AVT EESE Chassis Electronics **by** *completed*

95 Continental and T/Bird were first to use it.

Is the Circuit drive hi-side or low-side?

Visteon Speed Control **by** *completed*

Circuit is low side driven.

How does speed control use this switch?

Visteon Speed Control **by** *completed*

1. *Brake Pressure Switch provides electrical power to the speed control servo clutch circuit The clutch circuit needs to be energized for the servo motor to pull the cable.*

2. *Switch provides a redundant method of sensing brake application independent of the primary system deactivation mode; this is a SDS (SC-0005) requirement.*

- *Signal from the stop lamp switch is primary deactivation mode for brake application.*
- *Under "hard" braking condition; Brake Pressure Switch provides redundant brake signal to the speed control logic (similar to stop lamp switch signal) and disconnects power to the clutch circuit; causing the speed control servo pulley to immediately return to the idle position. Note: Under normal braking conditions, only the stop lamp switch signal cancels speed control operation.*

Do all Ford applications use switch between fuse and load?

Visteon Speed Control **by** *complete*

YES

Do all Ford applications have switch connected to HOT-ALL-TIMES?

AVT EESE OPD **by** **2/18/99**

Can Brake Pressure Switch function be removed from power feed circuit and placed in ground return circuit?

Visteon Speed Control **by** *completed*

1. *Would require redesign of the speed control electronics.*
2. *Additional isolated ground circuit is required.*
3. *From FMEA position switching the ground circuit is not as good as switching the B+ feed.*
   - *With a ground return circuit; short to ground (fault) it would override the deactivation switch.*
   - *With the current power feed circuit; short to ground make the speed control system inoperative. A short to power is required to override the deactivation switch; much lower potential to occur.*

Why is this switch connected to HOT-ALL-TIMES?

Visteon Speed Control **by** *completed*

Because the SDS requires it to be connected to the same fuse as the stop lamp.

What is SDS requirement number?

Vietson Speed Control **by** *completed*

SDS (SC-0068) states: The stop lamp switch and redundant deactivator switch must be on the same fused circuit.

Is it feasible to disconnect the switch as immediate containment?

Yes. The customer will not have use of the speed control.

Is it acceptable to Jumper out the switch as immediate containment?

Vietson Speed Control **by** *completed*

NO... Would eliminate an important safety feature of the speed control system. The Brake Pressure Switch provides the redundant method for sensing brake application independent of the primary system deactivation mode. This is an SDS (SC-0005) requirement.

Elimination of this feature requires the concurrence of the OGC.

Other recommendations for immediate containment?

All **by** **on-going**

Add fuse between the stop lamp fuse and the brake pressure switch?

Recommendations for increased Life of switch.

TI **by** **3/5/99**

TI suggested looking at an Automotive ceramic diaphragm pressure transducer (not a switch) that is used for ABS.

1. Connector Seal

2. Power continuously available

3. Switch orientation

4. Current limit / fuse

5. Hexport isolation

6. Higher temperature plastic

TEXAS INSTRUMENTS

Brake Pressure Switch
Potential Thermal Event Theory - 2/24/99

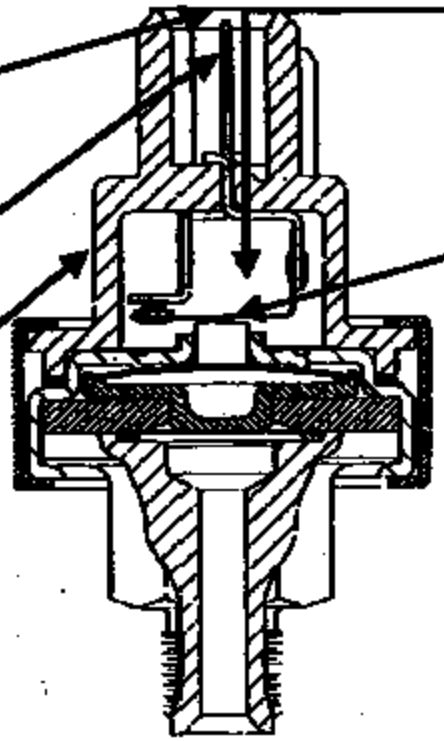
1. Water enters the switch cavity

2. 12V Battery source to drive corrosion and provide energy

3. Contact arm corrosion increases resistance (heater wire).

4. Down stream short to ground causes high current to pass through the switch

5. Plastic connector melts. Once it opens, oxygen enters the switch cavity. If any arcing is present a fire can start, burning the plastic.



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STA Mtg | BPS | 5/21/97

John Rentis - Andy, FRED, Steve,

Team meeting - "Prevent action" ch
plans development

- Recall parts examine plan

XRAY
TEST TO FAILURE
REGIONAL BANDING

- Invite John Rentis
jrentis

JUNE 17-18 TRIP TO ATTLEBORO

- LINE VISIT — JOHN / ME
- UNDERSTAND 92 PROCESS — JOE K?
- " 99 PROCESS — TOM M?
Norm LaPointe?

BP TEAM MTG NOTES | 5/19/99

ROB SHARPE (TI), FRED, GREG, ANDY McGuirk, Steve Berning* *via phone.

- TI Record retrieval not fruitful yet.
  - IP TEST HISTORY WAS FOUND,
  - NO SPC DATA OF THAT PERIOD. (998 antidotal)
- CRIMP DIE from manual process to auto-mated, IS WHAT CHANGED TO GET PROCESS TO PASS PARTS.
- CRIMP DIE REPLACEMENT FREQUENCY.
- PM's for polishing dies exist.
- TI When were Dies replaced? (over time).
- TI IS OPERATING PRESSURE TRIP/RESET VALUE A BETTER/WORSE PARAMETER?
- FORD IS THERE A MIN/MAX PRESSURE ~~RANGE~~ TC v ECON THAT MAKES THE SWITCHES CYCLE MORE OR LESS?
- TI When did you ship service parts
  - 100,000 Shipped for Recall (to Ford).

ROOT CAUSE PROGRESS -

- Planning analysis of Returned Parts
- STA review of TI

OTHER VEHICLE LINES EFFECTED

- WARRANTY CLAIMS REVIEW
  R/1000 DATA BEING GATHERED

TENTATIVE AGENDA FOR ATTLEBORO VISIT

- FINDINGS OF 91, 2, 3 PROCESS
  SPC CHART
  W.O.
  THRU-PUT
- TODAYS SPC
  OR
- HOW DO WE CREATE LEAKS BY TWEAKING THE PROCESS

DuPont Telecon Notes, 4/26/99

- K. ON CORONA TREATED TO (IMPROVE ADHERENCE) when TEFLON ONE-SIDE only

  Electrode 3/8 → ½ WIDE
  Burnout
  SPOT CHECKED . . . . . .

- Cold Peel Test samples
  5yrs not seen delam return from customer

- ASIDE
  Z Kapton Inspection?

- RADIATION, OXIDATION
  Permeation 0.4 cm/

- Hi-Fi
  Separate

- PFA Teflon Hi Melt better flex endurance-
  190° cards 6000 ~~5000~~ 3 MIL KAPTON

- Cu · failure Modes / Joe - Machine/C & TEST F on Hi-Lite

BP Team Mtg 4/21/99

- 200 mA Cu/Sn Deposit
- Old BP SW may have Deposits.

- Relay Kit to wire the ground connection to the moveable terminal (this is the one located furthest from the keying tab).

- Key off = No corrosion / driver with Ign OFF

- Brake Fluid contamination test continues at 7I (± 15 days elapse with no thermal action and no excess current.)

BP TEAM Mtg

4/14/99

Fuse for Econo Line 15 AMP ?

ECONO-LINE SWITCHES "NO LEAKERS", ANOY (TI).

① Proposed Relay 200 mA, 48 hours, no ignition
Salt H_2O injection

② Impending burn → 200 mA 18 hours no ignition
desire real lab simulation process with salt water & unlimited (15 Amp?) TI to switch to impending burn then limited current to 200 mA and NO IGNITION occurred
Resistance wire wrapped around base to simulate maximum power dissipation no ignition

④ Vertical Orientation also burned in TI expert

Hi-Lite 1 Supplier of prop valve 93 3, 4
1 Mil by 8/1/99 if starting today at TI.
9F924 for recall

Will BP switch in Taurus / TownCar, Econ, F Series to compare?

BP Team Mtg 4/7/99

MARTY REESE, BILL ABRAMCZYK, ANDY McGUIRK, FRED PORTER, JOE KAFATI, TOM MASTERS, PETER JOH, NORM LAPOINT, 5 Raimers

- Bill Read Report from Myrtle Beach, SC
  -- home destroyed.
- Joe – Selecting Waterproof relay

UTA
- Need UTA to explain work plan timing
  why 8 weeks turn-around?
- Validate Pilot Relay fix
  - Splash, Vibration
  - Does Speed control still work.
- Need DV work plan developed.
- Will the BP Switch be replaced as part of recall?

- Are we going to take interim action of disconnecting Brake Pressure Switch? This disables Speed Control.

A – For Monday Meeting should have FMEA Dec & Process, Timing for Kits, Timing for Validation

- Econoline 8D similarities & uniqueness

TI Testing Vertical (Plus-up) ignition

? – Does SYMPTOM MOVE ACROSS PLATFORMS BLOWN FUSE, STUCK-IN-PARK, CRUISE INOP,

○ TI needs to look at capacity to provide kits

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BP Switch Mtg Notes 3/31/99

Pilot Relay – Is feasible on Town Car, need to check CV/GM.
Joe K

Re-locate – must use ABS DPDT or find ~~[illegible]~~ Switch to fit where Vacuum switch went on TC. May require removal of IP.

Isolation ~~of~~ from Prop-valve – still looking at (~~[illegible]~~ In-line + Drip Loop)

Containment Material – still looking at

- Buy CV/GM
A. Test leaver ability to light Brake Fluid.

F01B-14B192-AA

- Short to Ground that provides pullin voltage to Pilot Relay will override the switch contacts openning.
- Preference polarity for "Pilot Relay" is to put spring arm & Movable terminal on the ground connection. ~~[illegible]~~ The Stationary terminal provides the minimum area for

BP Team Notes 3/31/99

* Callanex 3316 5% NaCl FI/experiment caused connector ignition
* 0 or 2 ignitions of switch base
* Noryl ~ GTX830 Lt Brown Ignited like 4300
  Sean TI

TI suggested Plastic Base Testing.
Flame ignition, Hot Wire Ignition, Self Extinguishing

? Plastic change for "Pilot Relay"

Note: 3316 Experimental Base has the tabs in wrong place.

Pu 1 Amp FUSE blows at what time with NaCl test
PA NaCl in BASE Connector interface cavity

TIN [illegible] look BF + 5% NaCL + H_2O @TI ✓
TIN WEIBULL DATA FOR QUIET SWITCH.
TIN Test NaCl @ 200mA & 2 AMP
LEADED — BT

[illegible] BF w/o TI.

~~IZ [illegible] @ Temp Cycle) - MCL To-C~~

- Process PFMEA for installation of Pilot Relay
  FCSD
- Pilot Relay FMEA

Brake Pressure Switch Team Mtg 3/31/99

Steve Reimers	RVT/EESE	SREIMERS	x03286
Fred Foster	RVT/EESE	FFOSTER	x53722
Fred Kohl	Visteon	FKOHL	21801
Greg Stevens	RVT MAT'L	GSTEVENS	36685
Joe Krafati	EESE	JKRAFATI	05889
Norm LaPointe	Design Anal	NLABOINT	42686
Andy McGuirk	TI QRA	a-mcguirk@ti.com	5082563086

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* Note printed by SREINERS on 24 Mar 1999 at 14:03:55 *
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From: SLAROUCH--FORDMAIL
To: NLAPOINT--FORDMAIL LaPointe, Norman
FPORTER --FORDMAIL Porter, Fred
GSTEVEN1--FORDEMTP Stevens, Gregory

Date and time 03/24/99 13:20:55
SLAROUCH--FORDMAIL LaRoucha, Steve
SREINERS--FORDMAIL Reimers, Steve

From: LaRoucha, Steve (S.)
Subject: Switches from HAA

I have received two switches with filled out questionaires from HAA. One is from a 92 Town Car (Davenport, FL), and the other is from a Town Car with no model year listed (Insurance Auto Auction in Anoria, IL). One vehicle caught fire while it was left idling (IL vehicle), the other caught fire ~15-20 minutes after it was parked. Owner couldn't get it out of park previous evening. Police changed fuse for her. Both switches badly burned. Probably won't be able to tell much from them. A 15A fuse was included with one of the switches. No other parts or brake fluid received with switches. Will not be able to make today's meeting.

Steve LaRoucha (SLAROUCH)
Metallurgy Section, Central Laboratory, Room E410
(313) 845-4876 (313) 322-1614 FAX

Team meeting notes

3/24/99

92 CV NON/ABS w/SPEED CONTROL
DUNT AIR SUSPENSION

Bring Back 92 Town

Jon Watson — Contain fire to switch with Jacket/Shell

70/900 Report Leaks From ANS ABRAMCZYK

Fsrior PN96 - 2 Melted Connectors. Nory!?

OVER

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