EA02-027

FORD 8/5/03
LETTER TO ODI

APPENDIX A

5 BOXES
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measure MEMS performance, but the development of in-process wafer-level testing will be necessary for low cost manufacturing. Wafer-level testing of MEMS presents special challenges that are often product dependent. Nevertheless, generic test structures that indicate basic mechanical properties of MEMS materials at the wafer level should be developed and characterized. As more and more industries, universities, and other research groups enter the MEMS field, it is also becoming increasingly important to provide accepted standards that can be used for comparison.

Conclusion. Test-and-characterization methods and metrologies are required to (1) help fabrication facilities define MEMS materials for potential users, (2) facilitate consistent evaluations of material and process properties at the required scales, and (3) provide a basis for comparisons among materials fabricated at different facilities.

Recommendation. Standard test methods, characterization methods, and test devices should be developed and disseminated that are suitable for the range of materials and processes of MEMS. Ideally, metrology structures will be physically small, simply designed, easily replicated, and conveniently and definitively interrogated. MEMS engineering standards should be similar to those already established for materials and devices in conventional sizes by organizations such as the National Institute of Standards and Technology (NIST), the American Society for Testing and Materials (ASTM), and the Institute of Electrical and Electronics Engineers (IEEE). This recommendation calls for new strategic investment.

MEMS PACKAGING

Packaging a device, interfacing it to its operating domain, and assembling it as a part of a larger system are critical final production steps and can easily represent up to 80 percent of the cost of a component. Although considerable attention continues to be paid to innovative applications of MEMS processing techniques and devices, "back-end" processes have historically been approached on a specialized, case-by-case basis. The lack of publicly available technology or information to support packaging has meant that each organization has essentially had to invent and reinvent solutions to common problems. Possible extensions of batch processing to back-end processes could substantially reduce costs.

Conclusion. Packaging, which has traditionally attracted little interest compared to device and process development, represents a critical stumbling block to the development and manufacture of commercial and military MEMS. The imbalance between the ease with which batch-fabricated MEMS can be produced and the difficulty and cost of packaging them limits the speed with which new MEMS can be introduced into the market. Expanding the small knowledge base in the packaging field and disseminating advances aggressively to workers in MEMS could have a profound influence on the rapid growth of MEMS

Recommendation. Research and development should be pursued on MEMS packaging and assembly into useful engineering systems. The goal should be to define, insofar as possible, generic, modular approaches and methodologies and to extend batch-processing techniques into the various back-end steps of production. This recommendation calls for new strategic investment.

FOUNDRY AND COMPUTER-AIDED DESIGN INFRASTRUCTURE FOR MEMS

Rapid development in the IC industry has been aided by the establishment of a foundry infrastructure that ensures that industry and government users will be able to manufacture IC products at competitive rates and enables companies that do not have wafer-processing capabilities to enter the field. One of the key factors in the development of the IC foundry infrastructure was the development of a CAD infrastructure that became the backbone of foundry operations. Design methods were implemented that allowed IC designers to develop systems independently and have them manufactured by submitting only a design-language file. The MEMS field is more complicated because of the broad range of electrical and mechanical applications, including consumer, automotive, aerospace, and medical products. Thus, several standard-process MEMS foundries would have to be available and accessible, as well as custom, flexible fabrication facilities for users who require access and manipulation of the process to produce and optimize their products.

The committee recognizes that realizing the concept of MEMS foundries may be difficult because many commercial companies have difficulty seeing "what's in it for them." Besides the danger of compromising proprietary know-how, companies offering a foundry service will have to commit to specific processes and reasonable turnaround schedules. In the instances where small industries have tried to accommodate MEMS foundry runs so far, the results have not been warmly received. A more feasible road to at least moderate success at the present juncture appears to be using academic and government laboratories to provide foundry services. The recent expansion of the National Nanofabrication Laboratory to sites at several universities and the capabilities of national laboratories, like Sandia and Livermore, may provide opportunities for MEMS foundries of a different nature, where direct hands-on work can be done by the MEMS researcher. This kind of operation could not be as widely extended as the more traditional foundry approach of MCNC, which interacts with users only through exchanges of software, but it may provide an interim avenue until specific areas in the MEMS field are further developed.

Conclusion. Establishing standard CAD and foundry infrastructures for MEMS is essential in the near future to support the growth of MEMS from the prototype and low-volume commercial level to the volume-driven, low-cost commercial level. The development of a MEMS foundry-technology base, similar to the base that supports ICs, would ensure that MEMS products could be manufactured at competitive rates and would enable more small companies and research organizations to enter the field.

Recommendation. A MEMS CAD-infrastructure that extends from the processing and basic modeling areas to full system-design capabilities should be established. A process-technology infrastructure (e.g., supporting electrical, mechanical, fluid, chemical, and other steps and their integration to form complete systems) that is widely available to MEMS designers and product engineers should be developed. This recommendation calls for new strategic investment.

ACADEMIC STRUCTURE TO SUPPORT MEMS

The field of MEMS rests on multidisciplinary foundations. Practitioners who are poised to advance MEMS must have knowledge and skills in several fields of engineering and applied sciences. The participation of motivated, well trained young researchers is probably the single most important driver for success in MEMS. Some of these researchers will come from the ranks of trained IC engineers, who are already familiar with tools, materials, and procedures that are useful for MEMS. In general, however, these practicing engineers will have to learn new aspects of mechanical design, materials behavior, computing techniques, and systems design. Providing learning opportunities and educational materials for practicing engineers is important. But for future engineering students, effective instruction in MEMS will require major changes in curricula. A high priority should be placed on establishing an academic infrastructure that conveys the excitement and promise of the field, offers a sound and thorough education for MEMS researchers, and facilitates development of and access to new and innovative ideas across and among various disciplines.

Conclusion. Contributors to MEMS can be recruited both from practitioners already active in the IC field and from newly trained engineers. To facilitate the entry of practicing engineers into the field, opportunities to learn material that is special to MEMS should be encouraged through stimulating short courses and specialized text materials. For engineering undergraduates entering MEMS, programs and industrial procedures should be encouraged that stimulate multidisciplinary university education and enhance the skill and knowledge base of those training for or contributing to the development of MEMS. New MEMS engineers will require a broad understanding of several fields (e.g., electrical, mechanical, materials, and chemical engineering).

Recommendation. MEMS short courses and instructive materials that introduce practicing IC engineers to MEMS should be encouraged. Teaching institutions should be encouraged to see the benefits to their students and to their programs of emphasizing a broad, basic foundation in materials, production techniques, and engineering needed for MEMS. This recommendation calls for new strategic investment.

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Etching Recipes

Recipes

Process		Author	Comments
Go	Etch rates		(April 2000)
Load	Cr mask for deep KOH etching	Yael Hanein	(May 2000)

Etch Rates:

Mater ial	Etchant	Etch rate	Conditions	Comments
Cr	AZ351/AZ400			(05/26/99) Udo Lang
	KOH • Relatively low selectivity between Si and oxide. • High selectivity between Si and nitride. • Selectivity depends on T. • Verify solution concentration before use.			
Si (100-wafer)		2.2 um/h 9 55	45%, 30 deg 45%, 50 45%, 80	
Si (110-wafer)		3.3 um/h 13.6 85	45%, 30 deg 45%, 50 45%, 80	Very rough surface
Si (100-wafer)		3.3 um/h 13 83	25%, 30 deg 25%, 50 25%, 80	

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Au	**Au Etchant**	~ 700 A/min		
	EDP • High selectivity between Si and oxide. • excellent for deep etching with oxide as a mask (through holes). • Very toxic.	~ 60 um/h	110degC	Yael Hanein
Al	20:3:77 (Acetic acid: Nitric acid: Phosphoric acid)	~1 um/h		T> 35 degC Joel Reiter
SiO2	**BOE**	0.05 um/min	(10:1)	
Nitride	**BOE**	200 nm/hour	(10:1)	Yael Hanein

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The Silicon

Availability - 25% of the Earth's crust by weight with only oxygen being more abundant

Why silicon and not germanium?

Ge can exhibit much higher junction leakage currents than Si due to relatively narrow band gap of 0.66eV for Ge (1.12eV for Si). Also, it is easy to grow an oxide layer on Si with good device properties whereas Ge oxide is unsuitable for device applications.

Other considerations are the fact that electronic grade Ge is some 10x more expensive to produce than Si of similar quality.

Intrinsic resistivity of Ge = 47 ohmcm

Intrinsic resistivity of Si = 230,000 ohmcm

[Also silicon devices operate up to 150C versus 100C for germanium]

So Ge is no good for high breakdown rectification and other high voltage applications.

Silicon is now used in 98% of all electronic engineering devices and is certainly the best understood semiconductor. A literature search on published papers using silicon as the search world yields over 25,000 references.

Preparation of Electronic Grade Silicon (EGS)

Electronic Grade Silicon (EGS) is one of the purest materials routinely available. For some idea of the purity requirements consider the following: Si has 5×10^{22} atoms/cm^3 (50 thousand billion billion)
For intrinsic Si, number of donors or acceptors = 1.45×10^{10}cm^{-3}
(10 billion conducting electrons per cubic cm)
Hence the number of atoms per free electron or hole = 3.5×10^{12}
Purity of better than 3donors/acceptors per 10^{12} atoms! (thous. billion)

EGS preparation starts with metallurgical grade silicon (MGS) which in turn is formed from quartzite - a very pure form of sand. This is prepared in a submerged arc furnace with the addition of carbon in the form of coal, coke and wood chips. The overall reaction is:

$$SiC\ (s) + SiO_2\ (s)\ Si\ (l) + SiO\ (g) + CO\ (g)$$

where the molten Si is drawn off and solidified into MGS which is 98% pure. This is a very energy intensive process requiring ~13kW/kg of Si. The MGS is then reacted with HCl in the presence of a catalyst as follows:

$$Si\ (s) + 3HCl\ (g) \xrightarrow{300C} SiHCl_3\ (g) + H_2\ (g) + Heat$$

Trichlorosilane can easily be separated out because it is a liquid at room temperature having a boiling point of 32C and is then purified further by distillation. After purification the $SiHCl_3$ and H_2 are used to produce EGS in a Chemical Vapor Deposition (CVD) process - similar to that used in epitaxial growth (- see later notes). A typical reactor system uses slim rods of Si acting as a nucleation point for the deposition of polycrystalline silicon. These rods are resistively heated. The overall reaction is:

$$2SiHCl_3\ (vapor) + 2H_2\ (g)\ 2Si\ (s) + 6HCl\ (g)$$

The complete deposition may take many hours and results in polycrystalline deposits > 0.2m in diameter and several metres in length. These are then cut or crushed into chunks for conversion to single crystal EGS.

Silicon Wafers

Growth of the large single crystal is usually carried out by the Czochralski method which is responsible for at least 90% of crystalline silicon.

A small cylindrical seed crystal of about 2mm diameter is immersed into a melt at 1500°C. This seed crystal is rotated and slowly pulled from the melt (to which any desired impurities can be added prior to pulling the crystal). Crystallisation is usually carried out in an inert atmosphere or under vacuum (important to exclude oxygen). About 60kg of Si can be transformed into a crystal 3m long x 100mm (4") diameter. Typical extract rates are around 2mm/min (25hours for 3m long ingot).

After growth, the crystal is made round on a grinding lathe and cut into large sections for resistivity/defect evaluation (also zone refining). Some 50% of the crystal may be rejected (but may be recycled if pure enough - if not goes off to be MGS). Sections meeting specification then undergo surface grinding in which the diameter of the material is defined. Silicon ingots are grown slightly oversized since the automatic diameter control in crystal growing cannot maintain the needed diameter tolerance and the crystals cannot be grown perfectly round.

Following grinding, one or more orientation flats are ground along their lengths. The largest flat, called the "major" or "primary" flat is usually relative to a specific crystal direction and is located by an x-ray technique. This flat is later used as a mechanical locator in automated processing equipment and also to orient the wafer relative to the crystal structure. Smaller flats termed "secondary" flats serve to identify the orientation and conductivity of the material.

Finally the wafers are sliced and polished to a final thickness of a little under 0.5mm (500μm) with a flatness of ~2μm across their surface and a surface finish (roughness) of < 10nm. Finally the edges are rounded which reduces chipping during subsequent processing and so reduces the possibility of particulate contamination. It also aids in reducing photoresist build up at the edges.

Photolithography

To define windows in a film such as silica, polysilicon, silicon nitride, silicides or refractory metals we require a masking layer. Ideally such a film should be thin, highly adherent, uniform and completely free from dust or pinholes.

To meet these requirements optical lithography has been developed for the formation of images with visible or ultra-violet radiation in a photoresist using contact, proximity or projection printing.

For IC fabrication the linewidth limit of optical lithography lies near 0.4μm although 0.2μm features can be printed under carefully monitored conditions.

The photoresists themselves are of two types. A negative resist on exposure to light becomes less soluble in a developer solution while a positive resist becomes more soluble.

Commercial negative resists consist of two parts, a chemically inert polyisoprene rubber (elastomer) which is the film forming component, and a photoactive agent. The photoactive agent on exposure to light reacts with the rubber to form crosslinks between rubber molecules making the rubber less soluble in an organic developer solvent. The reactive species formed during the exposure can react with oxygen and can be rendered ineffective for crosslinking. Therefore, the resist is usually exposed in a nitrogen atmosphere.

The developer solvent dissolves the unexposed resist. The exposed resist swells as the uncrosslinked molecules are dissolved. The swelling distorts the pattern feature and limits resolution to 2 to 3 times the initial film thickness and so techniques to de-swell by appropriate rinses are adopted. Also harsh chemical strippers must be used to remove the exposed resist after processing hence techniques such as plasma ashing.

One advantage is found as the edge definition increases with over exposure hence lending itself to smaller features.

Positive resist behavior on the other hand, is quite different. Unlike negative resists, the chemical reaction between exposed photoinitiator and polymer is not fundamental in positive resist chemistry.

Positive resists have two components, a resin and a photoactive compound dissolved in a solvent. The photoactive compound is a dissolution inhibitor. When it is destroyed by exposure to light, the resin becomes more soluble in an aqueous developer solution. The unexposed regions do not swell much in the developer solution, so higher resolution is possible. Since it is the unexposed resist that is left behind as the masking layer, it is relatively easy to remove with solvents after subsequent processing stages. The photoactive components are generally diazoquinone compounds.

Absorption of actinic ultraviolet radiation (220-450nm) such as near u.v. light (320-450nm), raises the diazoquinone to a higher energy state which decomposes very rapidly with the loss of nitrogen from the diazo group to form an unstable keto-carbene. This transient species immediately isomerizes by ring contraction to form a more stable intermediate called a ketene. Ketenes are quite reactive organic molecules and combine readily with many reagents such as water to form and organic acid called indene carboxylic acid.

By this sequence of events, then, the initially insoluble diazoquinone can be converted photolytically to an acid species quite soluble in alkaline solution leading to a differential solubility in alkali between exposed and unexposed regions.

The coating process consists of spinning the wafer at high speed after a small quantity of pre-filtered photoresist has been placed on it. The film thickness is inversely proportional to the square root of the spin rate, typically, spinning speeds range from 1000-5000rpm and result in films that are 0.5-2.5μm thick. It is necessary to bring the spinner rapidly up to full speed in order to obtain a uniform coating and consistent results are obtained only if the viscosity of the photoresist is maintained constant.

$$\text{Thickness} \propto (\sqrt{\text{Speed}})^{-1}$$

Extreme care must be taken to use clean, dry slices to obtain good adhesion of the photoresist. Freshly prepared wafers may be coated directly, however, wafers that have been stored must be subjected to cleaning and drying procedures before coating.

Although ultraclean conditions should be maintained during the entire process operation, the coating step is the most critical one from the point of view of dust contamination. This is because the spinning action creates an air suction along the axis of the slice and promotes the delivery of any airborne particles to its surface which at this point is still very sticky.

Due to the build up on the outer edge of the wafer, which forms thickness discontinuity, a solvent may be applied to the underside of the wafer during spinning. This then acts on the outer edge by combining with the resist building up on the top surface and by reducing its viscosity stops the resist film from thickening.

Other techniques are also employed which do not require the use of solvent. One such technique is to add a final stage to the spin cycle whereby, for a brief time, after the main cycle is complete, the sample is spun very rapidly reducing the build up on the edge

Drying

After coating the wafer is heated for 10-20min at 80-90°C to drive out all traces of solvent from the photoresist. With positive photoresists the drying time and temperature are critical and care must be taken to follow the manufacturer's recommendations to avoid changes in sensitivity to subsequent exposure.

Thermogravametric Analysis (TGA) and Differential Scanning Calorimetry (DSC) can be used to optimise the conditions for new materials.

Mask Alignment

Many variations are available in photomask alignment but the conventional, and the one still in use at our facility, consists of a gelatin photographic emulsion on a glass plate placed over the substrate, brought into contact with it, then backed off slightly to produce an air gap. Next it is manipulated into the desired position by micrometer adjustment. This alignment process is performed with the aid of a microscope. Finally, physical contact is re-established between the mask and the substrate, and then exposure is made. This is known as contact printing. In this mode the physical contact between the wafer and mask can cause damage to the soft gelatin emulsion. In addition, this damage results in defects which are transferred to all successive wafers using this mask. Hence, depending upon density and resolution requirements, these working masks are replaced as often as every 5-25 operations. More durable masks are found by replacing the gelatin with a thin hard film such as iron oxide or chrome. These are much more abrasion resistant and dimensionally stable during wet etch processing. The primary advantage however lies in their superior edge resolution characteristics and absence of shadowing effects because of their extreme thinness (100-200nm). Typically gelatin masks must be 4µm thick in order to have the same opacity as these materials.

Iron oxide is more abrasive resistant and has better adhesion properties than chrome. It is opaque in the u.v. and transparent in visible light and so simplifies visual and automatic alignment. However, since iron oxide is an insulator it is not at all suitable for e-beam patterning where charge build up will occur.

An alternative to contact printing is proximity printing where a gap 2.5-25µm is maintained. The minimum resolution increases with the square root of the gap so there is a slight loss of resolution with this approach. Also, the mask and wafer flatness is paramount in maintaining a uniform gap but this approach does avoid physical damage to the mask.

$$\text{Minimum resolution} \propto \sqrt{\text{Gap}}$$

Projection Printing

In projection printing, the mask pattern which may be anywhere from one to ten times the actual size is imaged on the plane of the wafer. Industry use 5X reticles as standard and steppers (DSW) to project onto the substrate. This technique is comparable in resolution to that obtained by proximity gap

printing and allows greater flexibility in wafer handling. Main problem is that any contamination of reticle reproduces itself on each and every die giving zero yield.
As a rule of thumb

Alignment accuracy = ¼ (minimum element size)

Thus for a 1μm feature requires alignment accuracy of 0.25μm.

This is best met by automatic mask alignment. Typically a series of fiduciary marks are placed on the mask and illuminated by a He-Ne laser. The diffraction pattern produced by the edge of these marks is measured by photosensors and the mask movement is automatically adjusted for equal response.

Antireflective layers can also be incorporated underneath the photoresist. especially when patterning films such as aluminium. This reduces standing wave propagation within the photoresist and eliminates the interference from light reflected from the substrate.

Exposure

Photoresists are exposed by some means of collimated ultraviolet light. Some filtering of the source is necessary to prevent undue heating of the mask during exposure. Monochromatic light sources are undesirable due to their formation of standing wave patterns during printing which produce variations in resist pattern.

As VLSI technology requires better resolution, the main problem to overcome is that set by the diffraction limit. This can be improved by using shorter wavelengths such as deep u.v. (200-300nm) rather than near u.v. (300-400nm). High intensity (0.5-2kW) Xe-Hg lamps serve as the light source in deep u.v. systems. The photoplate is made of synthetic quartz since it is transparent at these wavelengths (glass absorbs at <300nm). Chrome is opaque to deep u.v. and hence can be used to form the masking pattern.

New photoresists have been developed for exposure at shorter wavelengths.

λ < 250nm Poly-methyl methacrylate (PMMA)
λ < 200nm Polybutene sulfone

At these much shorter wavelengths the radiation quantum is large enough to cause scission (breakage) of the molecular chain.

[0.25μm features have been produced in 1.8μm thick PMMA using 200-260nm radiation.]

Developing Technique

The final stage in photolithography is development of the resist to remove either exposed or unexposed regions in an alkali developer solution.

Development conditions affect resist exposure times directly with low alkali concentration necessitating long exposure times. At higher concentrations however, shorter exposure times are possible but this potential gain is limited by eventual thickness loss in the unexposed film. Higher development temperatures will also promote film dissolution and hence resist speed but again are limited by solubility considerations in unexposed regions. It is therefore evident that control of developer concentration, time and temperature are essential in fine line lithography with positive resists.

Developer composition as well as strength is important. NaOH or KOH developers will etch Al substrates rapidly, whereas phosphate/silicate developers form an impervious Al silicate film resistant to further developer attack on the substrate. Metal Ion Free developers are also available containing very low levels of inorganics and are usually based on strong organic bases such as ammonium hydroxide but are more expensive. If the latter is not used, the wafer must be rinsed exhaustively with deionised water after development to remove metal ions.

The development technique normally involves full immersion of the sample in the developer whilst applying slight agitation, but spraying or spin development techniques can also be adopted to keep fresh developer supplied to the surface and add to the reproducibility of feature sizes.

Growth In Complexity

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Year	Chip Size	Devices	Min Feature Size
1960 First IC (Texas Instr.)	1x1mm	2	
1963	2x2mm	6	25um
1977 (8086 CPU)		<1million	
1984	6x6mm	262,144	3um
1990	10x10mm	1,000,000	1um
1991 (4M DRAM)	11x11mm	10,000,000	0.7um
1993 (16M DRAM)	16x16mm	30,000,000	0.5um
1994 (64M DRAM)	20x20mm	100,000,000	0.35um
1994 (Pentium CPU)		3,300,000	0.35um
1994 (Pentium Pro)		21,000,000	0.35um
1995 (Cyrix 6x86)		3,500,000	0.5um
1997 (Power PC604)	12x12mm		0.25um
2000 (1G DRAM)	25x25mm		0.18um
2005			0.1um
2010			0.05um

Significance of Scotland

Of total UK chip manufacture, 80% is done in Scotland. Major companies include:

Design and Fabrication: Motorola, Ferranti, National Semiconductor, Raytheon Microelectronics.

Fabrication: NEC, Digital Equipment, Semifab, Compugraphics, Du Pont.

Design: Burr Brown, Lattice Logic, Wolfson Microelectronics, Walmsley Microelectronics.

Essentially all based along the Forth-Clyde valley known as Silicon Glen.

Design and Maskmaking

The production of the photomask itself has three main phases :-

(i) design concept
(ii) circuit design using circuit symbols and circuit simulation to test its

(theoretical) operation

(iii) geometrical layout - how the circuit will be represented in real terms with respect to the various levels (layers) and types of processing available during the rest of the fabrication.

CAD software is vital to both (ii) and (iii) but still requires human experience and expertise to produce the final layout schematics. Geometric layout data is then sent to the mask maker usually in digital form, and this information is then (after some further processing) used to drive the machines which will write the image onto the mask plate. The most critical part of the lithographic process is conversion of the layout pattern into a *master mask*. This mask is often used directly in projection printing. Alternatively, *working masks* are made from this master by contact printing and are used for defining the pattern on each wafer to be processed. The quality of the master mask is extremely important in determining the process yield over its entire production life and hence great care must be taken to ensure it remains defect free.

The complexity of a microcircuit is limited by three factors. The first is the ingenuity of the circuit designer in reducing the number of devices required to perform a given electronic function. The second is the maximum size of the chip that can be made with a reasonable processing yield. Materials and process technologies have a large bearing on this. The third limit is the size of the minimum element which can be placed on the chip. This is determined by lithographic techniques, which are used in conjunction with pattern transfer processes to delineate the various regions in the integrated circuit.

Optical techniques for pattern generation, in combination with conventional optical printing methods, can be routinely used to fabricate circuits with a minimum element size of 1.5µm. This however does not satisfy most VLSI applications.

Electron Beam Lithography

Electron beam (e-beam) techniques show the greatest promise for satisfying these requirements. Electron lithography offers higher resolution than optical lithography because of the small wavelength of the 10-50keV electrons. The resolution of e-beam systems (Electron Beam Exposure Systems, EBES) is not limited by diffraction, but by electron scattering in the resist and by various aberrations of the electron optics. Because of the serial nature of the pattern writing, throughput is much less than for optical systems.

The e-beam system resembles, in many ways a scanning electron microscope with the addition of beam blanking and computer controlled deflection. Additional features include the use of a laser-driven stage and fiducial mark detectors. This combination, together with fiducial marks which are printed during the first pattern writing, allows the system to be precisely positioned for each successive step and repeat operation. Typically the beam has a deflection field of about 2mm x 2mm. Consequently, a complete mask usually requires "stitching" together a number of such fields to form the entire pattern.

Two types of scan systems are in use - raster and vector scan. In raster scan, rectangular strips of the circuit are scanned by a series of lines (e-beam diameter 0.1-1.0μm) in order to form the complete pattern. In a vector scan system, the e-beam is controlled to scan a feature, move directly to the next feature, and so on. While this often requires wider scan defection and considerably more complex data handling and beam blanking techniques, it results in a much faster system since the beam does not spend time scanning featureless regions. This is quite an important advantage since the main limitation of e-beam systems is their low throughput.

The writing time of mask making equipment is set primarily by limitations in the intensity of the electron beam, and the sensitivity of the e-beam resist. A writing time for a 10cm x 10cm mask of 1hour is thought acceptable since this single master will define one particular set of regions for an entire micro-circuit run.

The electron resist is another important factor. Electron exposure of resists occurs through bond breaking (positive resist) or the formation of bonds or crosslinks between polymer chains (negative resist). The incident electrons have energies far greater than the bond energies in the resist molecules, and so all these energies are effective. Both bond scission and bond formation occur simultaneously and which predominates determines whether the resist is positive or negative.

When the electrons are incident on a resist, they enter the material and lose energy by scattering, thus producing secondary electrons and x-rays. This fundamental process limits the resolution of the electron resist to an extent that depends on resist thickness, beam energy, and substrate composition (e.g. more electrons scattered back from a GaAs surface than a Si surface).

Resist resolution is better in thinner resist layers. Minimum thickness is set by the need to keep defect density sufficiently low and by resistance to etching in device processing. For photomasks where the surface is flat and only a thin layer of chrome need to be wet etched, a resist thickness of 0.2-0.4μm is used. For device processing in which topographic steps must be covered and more severe dry gas plasma etching is used, a thickness of 0.5-2µm is required. Most electron resists are not as resistant to dry etching as optical resists. Also the substitution of a conducting layer instead of SiO_2 to prevent charge build up may also be adopted.

Rather than a small beam writing the pattern in serial fashion, a large beam of electrons may provide parallel exposure of a large area of pattern. This electron projection system utilises a photomask covered with CsI on top of the chrome region facing the wafer. Photoelectrons are generated by backside u.v. illumination. Although this offers good resolution, fast step and repeat exposure with low sensitivity electron resists the mask suffers from an unacceptably short lifetime of 50 exposures before more CsI needs to be coated onto the mask.

X-Ray Lithography

We have seen how diffraction effects can be reduced and resolution improved by reducing the wavelength. However, as the wavelength is reduced further, all optical materials become opaque because of the fundamental absorption, but transmission increases again in the x-ray region. In x-ray lithography an x-ray source illuminates a mask, which casts shadows into a resist covered wafer.

An electron resist is also an x-ray resist, since an x-ray resist is exposed largely by the photoelectrons produced during x-ray absorption. The energies of these photoelectrons are much smaller (0.3-3keV) than the 10-50keV energies used in electron lithography, making proximity effects negligible in the x-ray case and promising higher ultimate resolution.

Since the x-ray wavelength is small, diffraction effects can be largely ignored and simple geometrical consideration can be used in relating the image to the pattern on the mask. The x-ray source is produced by the interaction of incident electrons on a target material (early experiments used e-beam evaporator with target metal changeable to modify x-ray spectrum). Another type of source is the plasma discharge source where heating a plasma to a high enough temperature produces x-rays.

The photomask used in x-ray lithography consists of an absorber on a transmissive membrane substrate. The ratio of metal thickness to substrate thickness is greater than that used for an optical photomask. The thickness is ultimately determined by the transmission of the material for the x-ray wavelength of interest. Of the heavier metals gold has been widely used because it is easily patterned. The thickness of gold necessary to absorb 90% of the incident flux for an x-ray wavelength 0.44nm is 0.7μm (For synchrotron x-ray source, gold absorber >10μm thick often used). Thus, in general the metal is considerably thicker than the chromium layer on a photomask. Methods for patterning the gold with high resolution include electroplating and ion milling. Electroplating produces excellent definition with vertical walls, but requires a vertical-wall primary pattern in a resist that has a thickness equal to that of the metal to be plated. More often, a subtractive process has been employed in which a thinner resist layer is used to pattern a thin layer of a refractive metal which serves as a mask for ion milling the underlying gold.

The membrane forming the mask substrate should be as transparent to the x-ray as possible, smooth, flat, dimensionally stable, reasonably rugged and transparent to visible light if an optical registration scheme is to be used. Materials that have been employed include polymers such as polyimide and kapton, silicon, SiC, Si_3N_4, Al_2O_3 and beryllium. Generally different materials are chosen depending on the x-ray spectrum in use.

Phase Shift Masks

Optical lithography will continue to improve with wavelengths approaching 190nm, the limit for silica. Even if reflective optics are employed, the radiation must still be able to penetrate the mask.

The optical wafer stepper will be the lithographic system of choice for the foreseeable future because of its relative simplicity, convenience and reasonable high throughput. However the main barriers in achieving higher resolution are optical materials, small depth of focus and difficulty in obtaining diffraction-limited imaging over a large field. This final barrier can be addressed using *phase-shifting techniques.*

The diffraction limit becomes most noticeable when the feature dimensions approach the wavelength of the exposing radiation. This can cause constructive interference to occur in supposedly masked regions of the photoresist generating the formation of errors in the pattern transfer.

By optically shifting the phase of the light by 180° ($\lambda/2$) from neighboring features on the photomask we can cause destructive, rather than constructive interference to occur at the photoresist. This results in the removal of erroneous exposures.

This optical shifting is brought about by adding a layer of u.v. transparent material to the mask. This region requires a thickness which will allow the optical path of the light to be shifted by exactly half a wavelength and is calculated by the following equation:

$$d = \lambda / 2(n-1)$$

where d is the thickness, λ is the wavelength of illuminating radiation and n is the refractive index of the phase shifting material.

Phase shifting in practice (for more practical reasons), is accomplished by etching the mask substrate to the corresponding depth rather than adding extra material to the surface.

Orientation and doping convention

Orientation flats are used to identify two important properties of the wafer - its doping type, and the orientation the crystal was grown in (determined by the orientation of the initial seed crystal). These identification flats are set as standard within the industry and only include (100) and (111) silicon [(110) silicon not commonly used].

The identification numbers shown refer to the Miller indices of the crystal structure. These define the three dimensional positioning in space of the given plane. These planes are found, on a unit cube by taking the reciprocal value of where the plane cuts the x, y and z axes.

Note that the (100), (010) and (001) planes are indistinguishable as are (110), (101), and (011) planes. In the event that a plane crosses an axis on the negative side of the origin then the intercept is written with a bar over it. The notation used to express a direction is the use of square brackets so that (111) plane has a direction [111].

The full family of equivalent faces (100), (010), (001), $(\bar{1}00)$, $(0\bar{1}0)$, and $(00\bar{1})$ have the notation {100} and the set of direction axes [100], [010], [001], $[\bar{1}00]$, $[0\bar{1}0]$, and $[00\bar{1}]$ are written as <100>.

Why is the crystal orientation important?

Any regular lattice can be considered to have different atomic planes. Depending on how this plane 'slices' the crystal to form a surface, governs how many atoms per unit area will be present in this plane (or surface). Thus, many physical properties vary depending on the plane to which they are applied. For Si, the (111) plane has the highest density of atoms per unit area so such a surface will oxidise faster than say, the (100) plane since there are more Si atoms present to react. Generally, different planes also etch at different rates and this will be discussed later.

Orientation for Scribing

The significance of the orientation becomes important when scribing the Si wafer. Unlike amorphous or polycrystalline material the single crystal nature of the wafer means that scribing must be accurately aligned so that cleavage occurs along the planes of interest.

The separation between adjacent parallel planes is as follows -

Crystal Plane	Separation
(100)	5.42Å
(110)	3.83Å
(111)	3.13Å

The separation between two adjacent parallel planes (hkl) is given by:

$$d = a / \sqrt{(h^2 + k^2 + l^2)} \qquad \text{[For Si a = 5.42Å]}$$

Thus for <100> d = a
<110> d = 0.707a
<111> d = 0.577a

Thus, since the {111} planes exhibit the smallest separation (3.13Å), growth of the crystal along the <111> direction is most easily accomplished since it results in the setting down of one atomic layer upon another in its closest packed form.

Both the ultimate tensile strength and modulus of elasticity are also at their maximum in the <111> direction and as a result, silicon tends to cleave in the {111} planes.

Wet Etching

This method is based upon immersing the wafer into a liquid etchant for some pre-determined time (if control of etch depth is required) or until the etch reaches another layer with which it is considerably less reactive (an etch-stop layer). Etching is usually stopped by immersing the wafer in clean water or by rapid rinsing.

Wet chemical etching has been used in silicon semiconductor processing since its beginning in the early 1950's. These consisted mainly of hydrofluoric (HF), nitric (HNO_3) and acetic (CH_3COOH) acid and were used for etching and chemically polishing.

Wet etch composition is usually specified as volume parts of the liquid components and consistency of composition is essential for reproducible results.

Typical wet etches are:

Si:	HF - HNO_3 - CH_3COOH - gives smooth surface	
SiO_2:	HF - NH_4F (buffer) - gives little Si etching	
Si_3N_4:	HPO_4 - etches SiO_2 40x slower than Si_3N_4	
Al:	HPO_3 - HNO_3 - C_2H_6COOH - not suitable for GaAs	
or	HCl - H_2O	- safe for GaAs

Most etching processes are carried out in a relatively slow, controlled rate and consequently tend to be limited by the rate of diffusion of the reactant through a stagnant layer which covers the surface. This stagnant layer is usually a few microns thick, and can be broken up if the chemical reaction results in the evolution of a gas. Here, agitation of the solution can increase the etch-rate by enhancing this out-diffusion effect.

Silicon Etching

The etching of polycrystalline and amorphous materials is *isotropic*, however, etches for crystalline materials may be isotropic or *anisotropic* depending on the nature of the reaction. Isotropic etches for crystalline materials are often called polishing etches, since they result in a smooth surface. Anisotropic etches often sharply delineate planes or surface defects and are used as *crystallographic etches*.

Isotropic etching means that the etching occurs in all directions (both down and laterally). This leads to an undercutting of the protective resist layer and the desired feature size may not correspond to the size of the resist feature. This can be a great problem for small features (such as the gate region in a MOSFET) where the undercutting may lead to total loss of resist. The thinner the layer to be etched, the less undercutting occurs before the layer is etched to completion (this concept is utilised for the Cr layer in photomask production).

Isotropic etching may be overcome to some extent in Si by very specialised etches which etch one crystal plane much faster than others. These often involve much more exotic chemicals (e.g. ethylene diamine). These etches are termed anisotropic etches and the degree of anisotropy can be controlled by the concentration.

Single crystal silicon exhibits long as well as short range order and etching can be either isotropic or anisotropic. Low temperature etching of Si, using wet chemicals, proceeds by oxidation, followed by dissolution of the oxide by a chemical reaction. Both of these processes are carried out simultaneously by a mixture of the reagents in the same etching solution. The oxidation chemistry is that of anodic oxidation where points on the surface of the semiconductor behave randomly as localised anodes and cathodes.

Over a period of time each localised area (which is large compared to atomic dimensions) adopts the role of both anode and cathode. If the proportion of time allocated to each role is roughly equal, uniform etching occurs. Conversely, selective etching occurs if these times are very different.
Such factors as the defect nature of the surface, the etchant temperature, impurities in the etchant, and adsorption processes at the silicon-etchant interface play an important role in determining the selectivity of the etchant as well as its etch rate.

The most commonly used etchant for silicon are mixtures of HNO_3 and HF in water or acetic acid.

Here the anodic reaction is given by

$$Si + 2h^+ \rightarrow Si^{2+}$$

This oxidation reaction requires holes for its execution. These ai produced by the reduction of NO_2 at a localised cathode.

The Si^{2+} then combines with $(OH)^-$ so that

$$Si^{2+} + 2(OH)^- \rightarrow Si(OH)_2$$

which subsequently liberates hydrogen to form SiO_2.

$$Si(OH)_2 \rightarrow SiO_2 + H_2$$

The primary oxidising species is $(OH)^-$ and is formed by the dissociation of water which is present in the etchant. The formation of the subsequent oxide layer presents a barrier to further oxidation so it is necessary to add additional chemicals for its dissolution into water soluble compounds.

Hydrofluoric acid can be used to dissolve this SiO_2, the reaction being given by

$$SiO_2 + 6HF \rightarrow H_2SiF_6 + 2H_2O$$

Stirring serves to remove the soluble complex H_2SiF_6 from the vicinity of the silicon wafer so that further oxidation can proceed. *

The production of holes for the initial anodic reaction proceeds due to trace impurities of HNO_2 as follows

$$HNO_2 + HNO_3 \rightarrow N_2O_4 + H_2O$$
$$N_2O_4 \Leftrightarrow 2NO_2$$
$$2NO_2 \Leftrightarrow 2NO_2^- + 2h^+$$
$$2NO_2^- + 2H^+ \Leftrightarrow 2HNO_2$$

The HNO_2 generated reenters into reaction with HNO_3 and the process is thus *autocatalysed*. The first of these reactions is the rate-limiting one and in some cases ammonium nitrite is added deliberately to induce NO_2^- ions. Since

HNO_2 is regenerated the oxidising power is a function of the amount of undissociated HNO_3.

Water can be used as a diluent for this etchant. However, acetic acid is preferred because of its lower dielectric constant (6.51 compared to 81 for water). Use of acetic acid results in less dissociation of the nitric acid and hence a higher concentration of undissociated species. This preserves the oxidising power of the HNO_3 for a wider range of dilution than if water were used. The oxidising power of the etchant tends to remain relatively constant during its operating life.

The overall reaction is given by

$$Si + HNO_3 + 6HF = H_2SiF_6 + HNO_2 + H_2O + H_2$$

Isoetch Curve

The isoetch curve indicates the etch rate for various constituents by weight. The etch rates given represent silicon removal on both sides of the wafer and must therefore be divided by 2 to give the thickness removed from each surface.

At low HNO_3 and high HF concentrations, corresponding to the upper vertex, the etching contours run parallel to the lines of constant HNO_3. Thus the etch rate is controlled by the HNO_3 concentration in this region. This is due to the fact that there is an excess of HF to dissolve the SiO_2 formed during the reaction.

Etching with this formulation tends to be difficult to initiate because of the uncertain induction period and tend to result in unstable silicon surfaces which tend to be somewhat orientation dependent. However this effect is slight since etching is relatively rapid and is accompanied by the liberation of heat.

For high HNO_3 and low HF, corresponding to the lower right vertex, the etch rate contours are parallel to the lines of constant HF. Here there is an excess of HNO_3 and the etch rate is governed by the ability of the HF to remove the SiO_2 as it is formed.

The primary limit on the etch rate is the rate of removal of the complexes by diffusion. Consequently, etches in this region are not sensitive to crystallographic orientation, and are true polishing etches.

Anisotropic Etches

The etching of Si proceeds by a successive dissolution of individual layers from the surface. It is therefore reasonable to expect that this process will be slowest on the (111) planes, since they are the closest packed low-index planes. This has been shown to be true for etches which are reaction-rate limited, provided they are slow and do not generate much heat. Etches which are diffusion limited, as well as those which are fast and result in localised rise in temperature, tend to etch uniformly in all directions.

Following the reasoning that etching is slowest in the {111} planes etching will be fastest in the {100} planes and {110} planes will etch at an intermediate rate due to their spacing.

A commonly used anisotropic etch for silicon consists of a mixture of KOH in water or isopropanol alcohol. Typical etch rates at 80C result in an etch ratio of 400:1 for (110):(111) with an etch rate of 0.6um/min on the (110) plane. Dilution can be used to reduce this ratio, but results in a more controllable etch rate.

Other etches encountered include mixtures of ethylene diamine, pyrocatechol and water (EDP) or hydrazine (N_2H_2) or ammonium hydroxide (NH_4OH). The ultimate choice of an etchant depends on the overall process requirements but is beneficial for the SiO_2 etch-rates to be slow. This means that SiO2 can be used like a nitride layer to act as a good masking material.

In order to control the shape of the etched structure, it is often necessary to ensure that the etching stops at a particular position. The etch rates of alkaline etchants are strongly influenced by boron doping of the silicon [at doping level of $1 \times 10^{20}cm^{-3}$, the etch rate may fall by a factor of 100 for KOH and EDP]. The boron etch-stop method is therefore often employed to stop the etching of n-Si at a p^+ interface (i.e. a boron doped region).

A variety of structures can be formed which depend on mask design, crystal orientation and etch time. Flat-bottomed cavities with flat or sloping sidewalls can be made or v-shaped grooves. In addition, the removal of material from both sides of a mask can produce mesa or flat topped structures. In principle, we would expect to get a perfect pyramid or oblong structure, however, corner undercutting may take place due to etching other planes (e.g. {122}, {141}). This can be prevented by using better etchants or compensating masks.

Bulk micromachining has extensively been used to fabricate cantilevers, bridges and other mechanical structures through the use of anisotropic etching. However, this technique may be extended so that thin films of polysilicon, amorphous silicon, silica, oxides or polyimides may also be made into microstructures. This has enable the micromachining of insulating materials with more favourable physical properties than crystalline silicon. Initial techniques adopted in 1977 used sacrificial thin films which when subsequently removed acted as spacers. The development of surface micromachining has led to the fabrication of a wide variety of micromechanical structures that can be used as microsensors or microactuators.

Crystallographic Etches

Crystallographic etches can be used to delineate the regions where dislocations intersect with the semiconductor surface. These dislocations, together with their associated strain fields, are present in starting material, and are also created during strain-inducing processes such as dopant incorporation and oxide growth. They result in highly localised shifts in the surface potential, which will etch selectively, if the etch is slow and reaction-rate limited. Fast etches on the other hand, tend to generate considerable amounts of heat, which obscure these localised variations.

Crystallographic etches are thus generally slow, and are often composed of the same constituents as polishing etches. Frequently one or more heavy metal ions are added; they tend to electroplate out during etching, and give further visual contrast to the etched regions.

Dash etch is one such etch which has historical value since it was used to establish a correlation between dislocations within a material and the pattern of etch pits created by them at the surface. This etch requires several hours of immersion to be fully effective and is composed of HF, HNO_3, and CH_3COOH.

Sirtl, Secco, and Wright etches all utilise chromium salt oxidisers, which also provide the heavy metal ion. All delineate etch pits in a few minutes and are used extensively.

Sirtl	Anisotropic	(111) Si	Triangular pits
Secco	Isotropic	(100) or (111) Si	Elliptical etch pits
Wright	Anisotropic	(100) or (111) Si	Shapes gives information on defect orientation

Non-Crystalline films

The patterned removal of a wide variety of thin film materials is necessary during microfabrication. These films are either amorphous or polycrystalline in nature. They lack long-range order so that etching by wet-chemicals is usually isotropic in character. Due to this, the etchant spreads out under the mask layer by an amount roughly equal to the etch thickness and can result in lifting and tearing of the resist.

Silica films fall into this category and are readily etched by HF acid. In practice, this reaction is performed in a dilute solution of HF, buffered with NH_4F to avoid depletion of the fluoride ion. This ensures consistency when etching from one run to the next. This formulation is referred to as buffered HF and can be diluted in order to slow down its etching rate.

Silicon Nitride is often used as a diffusion barrier to sodium since it is such a dense material. It therefore is used as a protective coating for silicon microcircuits. Although etching in HF can be used it is extremely slow, even at elevated temperatures, and results in resist films being ruined. To avoid this etching is carried out in H_3PO_4 and etch rates of 0.01μm/min are typical.

Epitaxial Growth

Epitaxial growth is the deposition of a thin layer of material onto a single crystal wafer in such a way that the deposited layer is also a single crystal with a fixed crystal orientation with respect to the substrate wafer. In fact, the wafer can be considered to be an extended seed crystal. (epitaxial - is a word derived from the Greek 'epi' meaning 'upon', and 'taxis' meaning 'ordered').

This growth differs from the Czochralski process because growth below the melting point is possible (growth from the melt can be considered to be liquid phase epitaxy - LPE).

Epitaxy has been classed into two groups:

Homoepitaxy - growing a layer of material which is of the same composition as the substrate (e.g. Si on Si)

Heteroepitaxy - when layer and substrate are different materials (e.g. Al_xGa_xAs on GaAs). However, the two materials have to be similar crystallographically.

There are two main methods for epitaxial growth:

i) vapour phase epitaxy
ii) molecular beam epitaxy (MBE)

i) Vapour Phase Epitaxy

This can be considered to be CVD carried out with high substrate temperatures (~1200C). The source gas is usually $SiCl_4$ (or another chlorosilane), and, the reaction (grossly simplified) is:

$$SiCl_4\,(g) + 2H_2\,(g) \quad Si\,(s) + 4HCl\,(g)$$

A typical deposition rate is around 1µm/min. A slightly lower substrate temperature can be used if silane is the source gas. This process is now really thermal decomposition

$$SiH_4\,(g) \;{}^{1000C}\; Si\,(s) + 2H_2\,(g)$$

Substrate temperature limits may be imposed by prior doping treatments - prolonged high temperature may cause destruction of well defined doped regions due to diffusion and may even drive the dopant out into vapour phase and dope the growing epitaxial layer. It is therefore important to have a growth rate considerably faster than the dopant diffusion rate (and 1µm/min satisfies this). The fact that the epi layer can be doped easily from the vapour phase is exploited by deliberately adding dopant to the source gas. This allows the doping to be graded if the doping concentration is changed during the growth - a process unique to epitaxially grown crystal layers.

Another way of reducing the substrate temperature is to modify the basic CVD process. If a plasma discharge is struck within the CVD reactor (Plasma Enhanced CVD - PECVD), then the energy needed to drive the reaction is not wholly obtained from a hot substrate, thus it can be held at a lower temperature. One can also use radiant heating from banks of high output lamps to supply the energy. This can grow very thin layers of very high quality as the rapid heating/cooling leads to very little migration of dopants. This is rapid thermal processing (RTP).

ii) Molecular Beam Epitaxy

This method is based on evaporation of solid sources to form molecular (or atomic) beams which impinge on the substrate. As the substrate only receives the molecular species rather than inducing chemical reactions, the substrate need only be hot enough to allow sufficient atomic mobility to arrange themselves into a regular crystalline lattice - around 400C-600C with typical deposition rates of 0.2µm/min. However, the low throughput and great expense of the equipment severely limit its' use in IC production - it is mainly used as a research tool. Part of the expense comes from the fact that the equipment need to operate under UHV conditions to give atoms a long mean free path

$L = 5x10^{-3}$/Pressure (Torr) cm

Thus, at 10^{-9} Torr, L would be $5x10^{6}$cm (50km)

The main advantages of MBE are that complicated doping gradients can be performed by co-evaporating from a dopant source without the degree of thermal redistribution encountered with CVD. Also, heteroepitaxy can be carried out very easily by opening and closing different diffusion sources by means of mechanical shutters. Layer thickness can be controlled to atomic precision and MBE is most extensively used for GaAs/AlGaAs systems, particularly multilayer structures used for semiconductor and quantum well lasers and LEDs.

Metallisation

Conductive films are required to provide inter-connections between contacts on devices and between devices and the outside world. The requirements for these connections are (ideally):

i) Low resistivity
ii) Easy to form
iii) Easy to etch for patterning
iv) Stable in oxidising ambient
v) Mechanically stable, good adhesion, low stress

vi) Smooth surface
vii) Stable throughout processing
viii) Compatible (i.e. no reaction) with final metal, Al
ix) Non-contaminating (to devices, equipment, etc.)
x) Good device characteristics

No metal satisfies ALL of these criteria! - not even Al. Need to consider the particular application to determine metal type and may have to consider an alloy. However, Al can be considered for most applications (except diffusion barrier which need, for example, Ti - W alloys), but is limited due to its' low melting point. Al is particularly suited to being deposited onto oxide layers.

Deposition is usually by vacuum processes. This is to :

a) exclude all oxygen to prevent oxidation
b) increase the deposition rate

Evaporation

This is a well understood process which can be modeled to predict:

Mean free path = kT/p2²

where p = pressure in Pa (1Pa = 0.01 Torr)
= atom diameter

Therefore, at p = 0.01Pa, = 1m
at p = 1Pa = 1cm

Evaporation rate = $(2mkT)^{-1/2} P_c$
where P_o = vapour pressure at temperature
m = atomic mass

Evaporation may be achieved by resistive heating for low melting point metals such as Al, or by electron beam heating for high melting point metals. This latter method is particularly suited to continuous feed of source metal (in rod form) for continual coatings.

Alloys

These may be prepared by co-deposition (either via evaporation or sputtering) i.e. by running two separate metal sources simultaneously.

Patterning of metal layers

The metal is usually deposited over the whole wafer area. Patterning can be done in one of two methods.

a) by deposition of the metal into pre-defined resist pattern and then removing the resist - Lift-Off technique

b) by deposition of the metal then defining a photoresist pattern on top and etching the pattern into the metal layer.

Sputtering

Other techniques for deposition include sputtering. Sputtering is the ejection of material from a surface caused by bombardment by energetic inert ions such as Ar^+ or Xe^+. Since these billiard-ball-like elastic collisions never result in bonding with ejected surface atoms, the interaction is purely physical. The rate of sputtering is related to the projectile momentum, flux density, and angle of incidence.

This process is initiated using plasma glow-discharge techniques. A sputtering gas, ideally inert with large atoms, such as argon (although xenon and krypton have also been used) has a discharge struck in it. The action of this discharge on a target of the material to be sputtered, is to knock atoms out of the target and these atoms are then collected on a substrate facing the target. The low pressure is required so that the atoms reach the substrate without significant collision (large mean free path) which would slow down growth. The plasma is often concentrated magnetically over the target to improve the efficiency of the removal process and the substrate table may be biased to improve collection of charged target.

The power supply driving the discharge depends on the nature of the target material.

Conductive targets - can use DC

Non-conductive targets - use RF (this prevents target charging up and ultimately repelling the Ar radicals - hence no deposition)

In the case of Al, RF sputtering is required and this is due to the insulating oxide present on the surface which has to be sputtered away prior to the deposition of the metal.

Microengineering

Micro-Electro-Mechanical Systems (MEMS) incorporate miniature electro-mechanical components fabricated with processing techniques and equipment originally developed in the semiconductor industry. Due to this, silicon is typically adopted as the MEMS substrate material. However, non-silicon materials such as glass, quartz, ceramic, plastic and metal substrates are also emerging in microfabrication. The process technologies normally employed in silicon MEMS manufacturing include bulk micromachining, surface micromachining, and high aspect micromachining.

Bulk micromachining refers to processing in which the silicon substrate acts as the mechanical constituent of the devices (applications include pressure sensors, ink jet nozzles and high precision acceleration sensors).

Surface micromachining incorporates processes in which thin films on the substrate act as mechanical constituent while the substrate acts solely as the support.

One of the major limitations in surface micromachining has been its restriction to relatively thin layers (a few microns). Although this is not usually applicable to microsensors, which often have thin active layers, it is often a limiting factor in the fabrication of microactuators. These often require large microstructures, such as microgears with a 100μm diameter.

Non-traditional lithographic processing for the fabrication of tall, high aspect features are generally referred to as HARMS (High Aspect Ratio Micromachining). HARMS processes include high intensity exposure using x-rays as a source and deep vertical etching of substrates.

LIGA Processing

The recent development of the LIGA process has allowed the patterning of structures to a depth >100μm. The LIGA process produces three-dimensional microstructures made from metals, plastics and ceramics. These are created by combining x-ray lithography with electroforming and moulding processes and thereby enables the increased vertical depth. However, the cost of the synchrotron radiation source needed to generate the collimated beam of hard x-rays limits its implementation as a standard sensor manufacturing process.

The manufacture of microstructures by the LIGA process is quite simple. As with x-ray lithography, a layer of radiation sensitive resist, is irradiated through a mask containing the 2D x-ray absorbing areas. The resist, usually PMMA, is coated by casting techniques forming a thickness up to several hundred microns. This is then irradiated by high energy synchrotron radiation and then subsequently removed by the solvent action during the development process.

A negative copy is then manufactured (normally from metal) by electroplating into this plastic mould. This can be the final product itself or it can be used as a mould insert for a micromoulding process. Thus new microstructures made from thermoplastics are produced directly by injection moulding. These plastic structures can also be used as lost moulds for the mass-production of metal or ceramic microstructures.

Aspect ratios (height versus feature size) as high as 100:1 have been reported at institutes such as CMF (Central Microstructure Facility at Daresbury and RAL, UK) and IMM (Institute of Microtechnology, Mainz GmbH). Problems arise when trying to develop or electroplate into very thin cavities when the height becomes too great. However, LIGA structures as high as 5mm have been reported.

LIGA Applications

New applications are increasing rapidly which adopt the LIGA process and some of the current technologies are highlighted:

Automotive Engineering

- Acceleration sensors with integrated signal processing (suspension control)
- Acceleration-sensitive switches for air bag release
- Torque sensors
- Inductive position sensors
- Fast switching microvalves
- Components for fuel injection systems

Assembly and Interconnection Technology

- Electrical microconnectors
- Precision printed circuit boards
- Fiber-chip coupling

Medical Engineering

- Components for endoscopic systems
- Components for catheter systems
- Microfilters for cell separation
- Sensors for respiratory gas analysis
- Implants such as micropumps, valves and filters

Precision Engineering

- Micromechanical components such as joints, bearings, springs, gearwheels
- Electromechanical components
- Microsensors and microactuators
- Microfluidic systems

World Market for Micro-Systems Technology (MST)

Product	1996 ($Million)	2002 ($Million)
HDD	4500	12,000
Inkjet Nozzle	4400	10,000
Heart Pacemaker	1000	3700
In-vitro-diagnostics	450	2800
Hearing Aids	1150	2000
Pressure Sensors	600	1300
Chemical Sensor	300	800
Infrared sensor	220	800
Accelerometer	240	430
Gyroscope	150	360
Magnetoresistive	20	60
Microspectrometer	3	40
Total	13,033	34,290

Emergent Products

Drug delivery	10	1000
Optical Switch	50	1000
Lab-on-a-chip	0	1000
Micromotors	5	80
Electronic Nose	0.1	5
Total	107	4200

Price must also reflect consumer demand

1996 $50-60 per unit 2002 $25-50 per unit

Biomedical Application

Microstructured disposables for biomedical applications must fulfill several requirements. These devices, usually ranging in size between a stamp and a credit card, must be mass produced at low cost. They must possess specific surface properties (e.g. for blood wetting) and the material must be compatible with the application.

Micromoulding permits mass production at low cost with a large range of polymers commonly adapted for biomedical applications. These materials include polystyrene, PMMA, PEEK, polycarbonate and polypropylene.

Lithography, silicon etching, laser machining, mechanical micromachining and combinations of these techniques to manufacture the tools required for micromoulding. The different techniques provide the scope necessary to create microstructures with mechanical, optical or fluidic functions. Unlike microelectronics, these rather complicated and expensive methods are used only once to produce a master structure. This is then copied to a metal tool by electroforming and can be used to produce exact replicas by micromoulding.

X-ray Lithography	E-beam Lithography	UV Lithography	Laser Machining	Mechanical Micro-fabrication	Si Micro-machining RIE

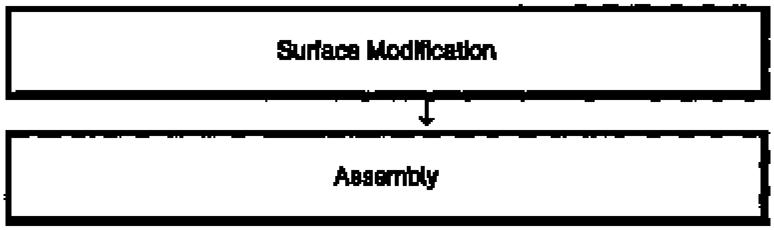
↓

Fabrication of a mould insert by electroforming

↓

Series production: injection moulding, hot embossing

↓



Laser Micromachining

Lasers have been used in materials processing for the past 20 years. Initially, the CO_2 laser and neodymium yttrium aluminium garnet (Nd:YAG) were favoured over the traditional laser types such as He:Ne or dye laser because of their higher power output.

CO_2 lasers use a mixture of helium (83%), nitrogen (16%) and carbon dioxide (6%) as the lasing material. The CO_2 laser produces a collimated coherent beam in the infrared region of wavelength 10.6μm, characteristic of the active material (CO_2), and generate beam powers up to 25kW. The wavelength is strongly absorbed by glasses or polymers and so either mirrors or ZnSe lenses are used to handle the beam.

The Nd:YAG laser produces a collimated coherent beam in the near-infrared region of wavelength 1.06μm and is run in a pulsed mode with peak power pulses up to 20kW. The shorter wavelength allows the use of optical glasses to control the beam path.

In 1975 the excited dimer (excimer) laser was invented in which a diatomic molecule such as N_2 or H_2 was used as the lasing material. Since then rare gas halide lasers have become more common but are still referred to as excimer lasers.

Excimer lasers cover a range of wavelengths in the ultraviolet from 157nm (F_2) to 353nm (XeF) with 193nm (ArF), 248 (KrF) and 308nm (XeU) being particularly useful intermediate wavelengths. Peak powers range from 3MW (F_2) to 50MW (KrF) in pulses lasting a few tens of nanoseconds.

There are various applications of lasers in micromachining as follows:

i) dry etching of polymers

ii) exposure of resist masks
iii) laser induced chemical etching of semiconductors, metals, ceramics
iv) Focused beam milling of plastics, glasses, ceramics, metals.

The excimer laser has several distinct advantages in the dry etching of polymers over the CO_2 and Nd:YAG lasers. For instance, the wavelengths are more compatible with the chemical bond energies in organic compounds and tend to produce less thermal damage. Polycarbonate films micromachined by a KrF excimer laser at 248nm through a suitable mesh pattern can produce laser etch rates of about 0.5µm per pulse of 1J/cm^2.

Excimer lasers can also be used as more efficient u.v. sources for photolithographic exposures of resists for VLSI circuits. In addition excimers are used to assist the wet chemical etching of VLSI circuits. This process is called *laser-induced chemical etching*, in which chlorine for example may be used as the etchant and is photo-dissociated to react with the semiconductor. An attraction of this technique is that it produces practically no debris at the edges and thus has excellent spatial resolution.

Microholes, grooves and other structures can be micromachined in a variety of materials. The smallest feature of about 0.8µm being set by the minimum diameter of the focused beam in combination with the diffraction limits of the imaging system.

System	Feature Resolution (µm)	Focal Depth (µm)	Wavelength (µm)	Average Power (µW)
CO_2	17	60	10.6	1,000-25,000
Nd:YAG	1.7	6.0	1.06	1,000-2,000
KrF	0.4	1.4	0.248	<150
FIBM	0.05	10-100	0.002	Medium
EDM	>50	n/a	n/a	Low

Focused Ion Beam Milling (FIBM) and Electro-Discharge Machining (EDM) are added for comparison.

Excimer Laser Ablation

The intense ultraviolet output from excimer lasers can be used to ablate material without causing thermal damage to the surrounding areas and this, together with the careful control of parameters such as laser fluence, beam characteristics and workpiece motion, can be utilised to machine 3D structures with sub-micron precision.

The most common method for the writing of structures into materials involves the use of a 2D mask. Masks needed for the highest resolution imaging are made from multilayer dielectrics. These operate at high fluences (~1J/cm^2) and also have a long lifetime since they absorb very little of the laser energy since they are made from highly-reflecting dielectric layers. At lower fluences (~100mJ/cm^2) masks can be made of chrome on quartz. These have quite good resolution but cannot withstand higher fluences due to the thickness of the chrome layer (typically <100nm).

For low resolution work (>10μm), free-standing metal masks can be used and these can withstand much higher fluences than the chrome.

The amount of material ablated with a single laser pulse is fixed for a particular sample for a given laser wavelength and fluence. Hence, 3D structures can be produced where the laser beam stays stationary and the position of the workpiece and laser repetition are altered. By controlling the speed of the workpiece and the firing of the laser more complicated structures may be fabricated containing ramps and curved surfaces.

Multilayered structures may also be produced by using different masks. This entails machining a section of the pattern and then altering the mask and superimposing a different pattern on the sample.

Many applications also exist where the sample is not planar and the pattern may be etched onto a cylindrical or spherical surface. This can be achieved by the optical equivalent of a lathe where the sample is axially rotated while mask projection transfers a structure onto its surface.

Microsensors

A sensor may be defined as a device that converts a non-electrical physical or chemical quantity into an electrical signal. When discussing the subject of sensors it is necessary to classify them according to the function they perform (e.g. measurement of temperature, pressure etc.) or the physical principle upon which they work (e.g. optoelectronic, magnetoresistive etc.).

Form of Signal	Measurand
Thermal	Temperature, heat, heat flow, entropy, heat capacity etc.
Radiation	Gamma rays, x-rays, u.v, visible, infrared, microwave, radio-wave etc.
Mechanical	Displacement, velocity, acceleration, force, torque, pressure, mass, flow, acoustic wavelength and amplitude etc.
Magnetic	Magnetic field, flux, magnetic moment, magnetic permeability etc.
Chemical	Humidity, pH, ions, gas conc., vapours and odours, pollutants etc.
Biological	Sugars, proteins, hormones, antigens, DNA, enzymes etc.
Electrical	Charge, current, voltage, resistance, conductance, capacitance, inductance, dielectric permittivity, polarisation, frequency etc.

In the case of human senses the following lists some analogous devices to the biological sensors

Human Sense	Signal	Measurand	Sensing Device	Analogue device
Sight	Radiant	Intensity and wavelength of light	Rods and cones in retina	Photographic film, photo-diode, phototransistor
Hearing	Mechanical	Intensity and frequency of sound	Cochlea in inner ear	Microphone
Touch	Mechanical	Pressure, force	Nerves	Potentiometers and LVDTs, tactile arrays
Smell	Chemical	Odorants	Olfactory receptor cells in nose	Electronic nose
Taste	Biological	Proteins	Taste buds in tongue	

Recommended Reading

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VLSI Fabrication Principles - Silicon and Gallium Arsenide,
S.K. Ghandi, Wiley-Interscience, ISBN 0-471-86833-7

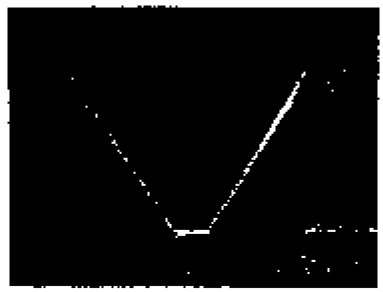
Microsensors - Principles and Applications, J.W. Gardner, Wiley, ISBN 0-471-

94135-2

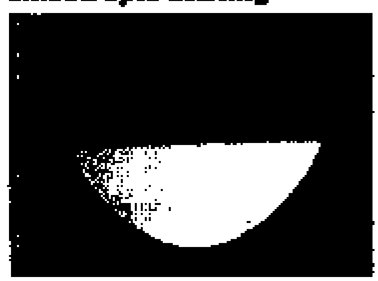
Fundamentals and simulation of wet-chemical etching techniques for the fabrication of 3-dimensional structures in silicon:

Anisotropic wet-chemical etching of silicon

DESCRIPTION



anisotropic etching



isotropic etching

In the recent past much work has been done to control the anisotropic etching process in silicon micromachining. The research is mostly being performed by groups rooted in electrical and mechanical engineering, which have no background in physical chemistry. Up to now the attempts to understand the etching process did not consider the scientific knowledge developed by groups active in crystal growth.

The main goal is the development of physical-chemical theories of anisotropic and isotropic etching and a deeper understanding of the kinetics of solid-liquid interfacial processes in a technological important model system. It will provide fundamental insight in the surface kinetics of rough crystal surfaces far away from thermodynamic equilibrium and it will result in a unique simulation tool for silicon micromachining. This simulation tool will combine interfacial kinetic processes and volume diffusion processes, which will enable designers for the first time to include effects of the size of the structures on the etch rate.

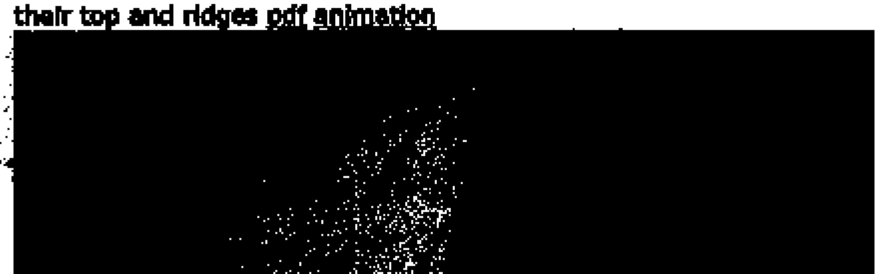
The merit of this project is the combination of experience of the knowledge in silicon micromachining and crystal growth of the Micromechanical Transducers (MESA/UT) and Solid State Chemistry (RIM/KUN) groups.

Results include:

- The chemical saturation of etchant solutions has been investigated by NMR. These measurements were performed at the SON facility for NMR in Nijmegen.
- The heat of dissolution of the reaction between silicon and KOH has been measured. These measurements were performed at the Thermodynamic Center in Utrecht.
- The etch rate minimum in {111} directions is critically examined. Experimentally, the reproducibility of this minimum, as measured by other research groups, seems to be poor, and values seem to depend on generally neglected conditions. We can explain this by the "velocity source" concept which had already been predicted in our theoretical approach, pdf
- The nature of etch pits that arise during anisotropic etching on Si{111} has been investigated. Bulk stacking faults are the source of these pits as shown by Yang

etching the substrate.

- 
- Boundary conditions to the equation of motion of a crystal surface can give rise to macroscopic effects near the boundary; the boundary then acts as a velocity source. This velocity source behaviour will have to be taken into account in the simulation tool pdf
- The network procedure for the construction of analytical R(n,C,T) functions has been extensively studied and elaborated. We have started a cooperation with prof. Sato (Japan). His precise measurements of the etch rate as a function of orientation have been translated into a network etch rate function containing 9 physically meaningful parameters with an accuracy of 5% of the maximum etch rate or less pdf
- Monte Carlo simulations have been performed to investigate kinetic roughening during growth of the Kossel (100) surface. The gradual nature of the kinetic roughening transition is confirmed. We have also performed Monte Carlo simulations to compare growth and etching. There are fundamental differences. If the interactions in the crystal are large, there is no kinetic roughening transition for etching. The surface remains relatively smooth even for infinite undersaturation.
- We have performed Monte Carlo simulations on a model for the silicon (111) surface. For equilibrium, it is shown that apart from a flat and a rough phase there is not a third phase, a so-called disordered flat (DOF) phase, as claimed in the literature.
- Pyramidal etch hillocks are stabilized by semipermeable masking particles on their top and ridges pdf animation



ER02-027-C 3336

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"Formation and stabilization of pyramidal etch hillocks on silicon {100} in anisotropic etchants: experiments and Monte Carlo simulation"
J.Appl.Phys., submitted, pdf, 378 Kb

CONTACTS

MESA+

A.J. Nijdam
J.G.E. Gardeniers
Prof. M. Elwenspoek

RIM

E. van Veenendaal
J. van Suchtelen

RELATED

Onderwijsopdrachten

- *Pyramidevorming tijdens het etsen*
- *Nat-chemisch etsen van silicium*
- *Niet vlakke facetten*

- Dr. W.J.P. van Enckevort
- Prof. E. Vlieg

Infrared Microscopy

See also

→ Prepara

→ Failure a

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→ About a updates

Applications

- Optical inspection through silicon die, allowing inspection of aluminum-gold bond quality, metal conductor corrosion, die cracks, and chip outs
- Near field IR imaging of LEDs and semiconductor lasers (electroluminescence), including intensity profiles

Description of Technique

This microscope has an IR Vidicon camera with sensitivity from 400 nm to 1800 nm (vis/IR) in place of the eyepieces. The video signal from the camera is fed into a signal processor and enhanced as required.

The microscope has two light sources — a 100 W halogen lamp and a 250 W high performance lamp. Both are suitable for work in the near infrared spectrum.

Infrared light easily passes through silicon (if not heavily doped) and is reflected by the object on the opposite surface (e.g., aluminum). Since the bulk of the material in semiconductors is silicon, this allows imaging through the device backside for internal and top surface anomalies (such as chip-outs) and features (such as metal lines). The microscope is also an emission profile imager, which allows the examination of the pattern of IR light being emitted by laser diodes. This is key information for determining the failure mechanism in laser diodes.

Instrument Model(s)

- Reichert Infrapol
  (Reichert, Vienna, Austria)
  - 100 Watt Halogen light source
  - 250 Watt high performance light source
  - Objectives: 4X, 10X, 20X, 50X, 100X (plus 50X long working distance)
  - Magnification range: 32X to 2000X
  - Camera: vidicon tube type; IR sensitive to 1800 nm
  - Television horizontal resolution: 450 lines

Sample Information

Any lightly doped silicon-based semiconductor, as well as any other device that emits in the IR region, can be inspected under the IR microscope.

Inspection through the backside requires a surface that is relatively smooth. The top surface of an encapsulated device can remain intact so that surface anomalies (e.g., aluminum corrosion or bond pad intermetallics) are not disturbed.

Information Obtained

The processed / unprocessed image is displayed on a monitor. A hard copy of the displayed image can also be produced. Evidence of Au-Al bond quality can be imaged through the die backside along with detection of corroded conductor lines, die cracks, and chip-outs.

ER02-827-C 3341

Failure analysis

The following is an outline that can be applied to the 'Failure Analysis' of most microelectronic components including:

- ICs (memories, Microprocessors, ASICs)
- Hybrids
- Discretes (transistors, resistors, capacitors)
- Magnetics (pulse transformers, delay lines)

For any particular analysis, the exact path that the analyst may take is dependent upon such factors as:

- the component technology
- the nature of the fail mode that is involved
- the extent of the analysis that is requested (defect identification versus root cause analysis)

We also offer 'Construction Analysis' services, which follow steps similar to those outlined for Failure Analysis, with the difference in ultimate objective...to verify processes, device structure and quality. In addition to failure analysis applications, 'Focused Ion Beam' (FIB) techniques are often called upon to recover first hardware design errors via circuit modification. The microsurgery capability of our FIB tools allows the designer to quickly resolve zero-yield situations arising from mask errors.

Analysis step	Purpose	Techniques
Incoming fail data & analysis	•Problem definition •Analysis approach design	
Initial inspection & sample prep	•Package/assembly level	•X-ray microscopy •Optical microscopy •Acoustical microscopy •Package entry •Die/wire bond analysis •Die removal/SMT rework
Electrical fail verification and defect localization	•Physical fail site definition •Cause/effect verification with respect to electrical fail data	•Defect localization Test for diagnostics Fault isolation (mechanical probing, LC hot spot, emission microscopy) •Laser delete •FIB Electrical F/A (circuit isolation, probe sectioning)
Fail site imaging	•Characterization and documentation	•Optical microscopy •Optical microscopy •Confocal laser scanning microscopy •Etching/delayering •Scanning electron microscopy

		•FIB Physical analysis (cross sectioning)
Material, structural, and surface analysis	•Root cause identification	•Scanning electron microscopy (EDX, WDX) •Auger electron microscopy •Transmission electron microscopy

Freeland, Mark (M.)

From: Rossi, Roberto (R.A.)
Sent: Friday, March 22, 2002 12:33 PM
To: Freeland, Mark (M.)
Cc: Plante, Paul (P.G.); Maurer, James (J.B.); Awad, Mahmoud (M.I.)
Subject: RE: Special Service Message 14747 for short in connector to PCM

Here is the text of SSM 14747.

CSQI702 CQIS Technical Service Detail 03/22/02 12:30:58
==> ____
Next/Previous Article (N/P): _ Article #: SSM 14747 Date: 03/14/2001
Symptom:
Year Vt Fm Vl Mdl Trans Engine Calib Axle
Criteria:

FOLLOW NORM DIAG FOR (FPDM), CONNS, HARNESS, ETC...
SOME 2000/2001 FOCUS MAY EXHIBIT A CHECK ENGINE LIGHT ON WITH DIAGNOSTIC TROUBLE CODE P1233, P1235, P1237 (FUEL PUMP DRIVER MODULE). THIS MAY ALSO BE ACCOMPANIED BY A LOSS/LACK OF POWER OR CRANK NO START WITH A LOSS OF FUEL PRESSURE. THIS MAY BE CAUSED BY THE FPDM CONNECTIONS, CIRCUIT. FIRST FOLLOW NORMAL PC/ED DIAGNOSIS. SPECIFIC FPDM AREAS TO CHECK ARE; AN IMPROPERLY SEATED CONNECTOR, A TIGHT OR CHAFFED HARNESS OR GROUND (G54) BEING LOOSE. CHECK THE BATTERY JUNCTION BOX (BJB) FOR A LOOSE CONNECTION OR PIN PUSH OUTS. VERIFY THAT THE CONNECTIONS AT THE TRANSMISSION HOUSING (C95/C96) ARE PROPERLY SEATED AND THE HARNESS IS NOT CHAFFED AGAINST THE TRANSMISSION. ALSO CHECK FOR A POSSIBLE PINCHED WIRING HARNESS UNDER THE RIGHT FRONT DOOR SCUFF PLATE AREA.

Robert Rossi
Electrical/Electronic Systems Campaign Prevention Specialist
North American Car Lifestyle Vehicles
Phone/Fax: 84-51436

-----Original Message-----
From: Freeland, Mark (M.)
Sent: Thursday, March 21, 2002 6:05 PM
To: Rossi, Roberto (R.A.)
Cc: Plante, Paul (P.G.); Maurer, James (J.B.); Awad, Mahmoud (M.I.)
Subject: Special Service Message 14747 for short in connector to PCM

Roberto,

Can you please find out the details of **Special Service Letter 14747 for short in connector to PCM.** (see attached .pdf).

I found it referred to in a GQRS report for a 2.0L Zetec Focus VIN # 1FAHP38391W107129, Build date 9/9/2000, which has been in several times for no start, died while driving, and other concerns. This vehicle had a dPFE replaced on 1/25/2002.

Thanks

Mark Freeland

<< File: 1FAHP38391W107129.pdf >>

EA02-027-C 3344

PURCHASING 69886 FOCUS

TOM HERMAN

FREEMAN 24607

DR BOR APR 10 : 2:45

CENTRAL

Thank you for your order.
You can print this form as your confirmation
Order Number 1608 - Sep 20 2002 10:18:00 AM

Products

CT KIT 14 CTLL1005FH Series (Multi-Layer Chip) Inductance: 1.0nH - 120nH Current: 100mA - 300mA 6 Values (10 each) 1005 Package Size	1
CT KIT 12 CTMC1210 Series (Molded Chip) Inductance: 0.005 µH - 470 µH Current: 25mA - 450mA 12 Values (5 each) 1210 Package Size	1

CTMC1812 Series (Molded Chip)
Inductance: 0.1 µH - 1,000 µH
Current: 30mA - 800mA
12 Values (5 each)
1812 Package Size

Customer Information

First Name	**Mark**
Last Name	**Freeland**
Address	**SRL Rm.1517, 2101 Village Road**
City	**Dearborn**
State	**MI**
Post Code	**48121-2053**
Country	**USA**
Email	**mfreela1@ford.com**
Phone	**(313) 594-7645**
* Company	**Ford Motor Company**

Shipping Information

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Shipping Method **UPS Ground**

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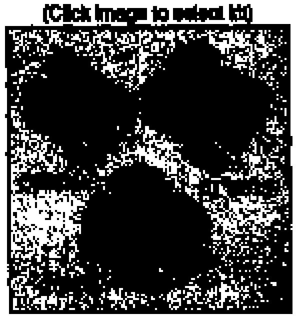

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➩ View CT622LY Spec

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➩ View CT1008CS Spec

CT K
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CT KIT 7
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Inductors
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CT KIT 8
SMD Power
Inductors
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CT K
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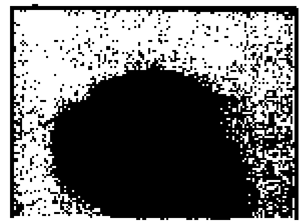

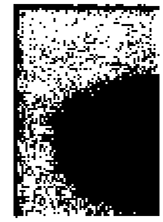

ER02-027-C 3349

CENTRAL

CTLL1005FH Series

From 1.0 nH to 120 nH

Characteristics

Description:
Ceramic core, multi-layer chip inductor for high frequency applications

Applications:
Portable telephones, PMS, pagers and miscellaneous high-frequency circuits

Operating Temperature:
-40°C to + 100°C

Inductance Tolerance:
±0.3 nH, ±5%, ±10%

Testing:
Inductance and Q are tested on an HP4286A at specified frequency

Packaging:
Tape & Reel

Marking:
Reels are marked

Specifications

Please specify tolerance code when ordering.

CTLL1005-FH@@N_ = ±0.3nH, J = ±5%, K = ±10%

* S only ** S or K only

Part Number	Inductance (nH)	L Test Freq. (MHz)	Q Factor Typ.	Q Test Freq. (MHz)	SRF Min. (MHz)	DCR Max. (Ω)	Rated DC (mA)	Request Samples & Quotes
CTLL1005-FH1N0S	1.0	100	28	800	13500	.10	300	➡ Reque
CTLL1005-FH1N2S	1.2	100	28	800	12000	.10	300	➡ Reque
CTLL1005-FH1N5_S	1.5	100	30	800	10600	.10	300	➡ Reque
CTLL1005-FH1N8_S	1.8	100	28	800	9400	.10	300	➡ Reque
CTLL1005-FH2N2_S	2.2	100	30	800	8700	.12	300	➡ Reque
CTLL1005-FH2N7_S	2.7	100	30	800	7700	.12	300	➡ Reque
CTLL1005-FH3N3_**	3.3	100	30	800	6800	.15	300	➡ Reque
CTLL1005-FH3N9_**	3.9	100	31	800	6300	.15	300	➡ Reque
CTLL1005-FH4N7_**	4.7	100	30	800	5700	.18	300	➡ Reque
CTLL1005-FH5N6_	5.6	100	31	800	5100	.20	300	➡ Reque
CTLL1005-FH6N8_	6.8	100	31	800	4550	.25	300	➡ Reque
CTLL1005-FH8N2_	8.2	100	34	800	4100	.28	300	➡ Reque
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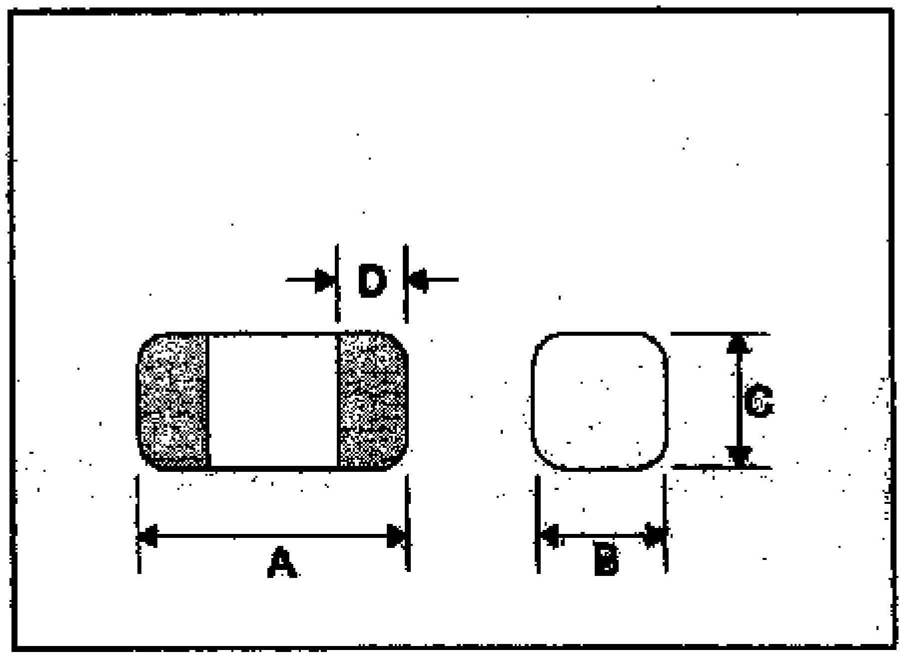
CTLL1005-FH12N_	12	100	31	800	2950	.30	300	➡ Reque
CTLL1005-FH15N_	15	100	30	800	2600	.40	300	➡ Reque
CTLL1005-FH18N_	18	100	29	800	2250	.50	300	➡ Reque
CTLL1005-FH22N_	22	100	28	800	1950	.60	300	➡ Reque
CTLL1005-FH27N_	27	100	27	800	1750	.80	300	➡ Reque
CTLL1005-FH33N_	33	100	25	800	1700	1.5	200	➡ Reque
CTLL1005-FH39N_	39	100	25	800	1650	1.8	200	➡ Reque
CTLL1005-FH47N_	47	100	23	800	1300	2.0	200	➡ Reque
CTLL1005-FH56N_	56	100	22	800	1250	2.0	200	➡ Reque
CTLL1005-FH68N_	68	100	18	800	1150	2.2	180	➡ Reque
CTLL1005-FH82N_	82	100	16	800	1000	2.6	150	➡ Reque
CTLL1005-FHR10_	100	100	8	100	850	2.8	100	➡ Reque
CTLL1005-FHR12_	120	50	8	50	750	2.8	100	➡ Reque

CENTRAL

CTLL1005FH

Physical Dimensions

Size	A	B	C	D
mm	1.0 ± 0.15	0.5 ±0.15	0.6 ± 0.15	0.25 ± 0.1
Inches	0.05 ± 0.006	0.02 ± 0.006	0.02 ± 0.006	0.01 ± 0.004



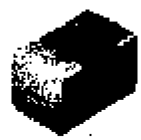
Pad Layout

EA02-027-C 3353

CENTRAL

CTML0603 Series

From .047 μH to 33 μH



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Pad Layout Physical Dimensions

Request a Design Kit

Characteristics

Description:
Ferrite core, multi-layer chip inductor

Applications:
LC resonant circuits such as oscillator and signal generators, RF filters, disk drives, audio and video equipment, TV, radio and telecommunication equipment

Operating Temperature:
-25°C to +85°C

Inductance Tolerance:
±5%, ±10%, ±20%

Testing:
Inductance and Q are tested on a HP4286A at specified frequency

Packaging:
Tape & Reel

Marking:

Specifications

Please specify tolerance code when ordering.
CTML0603-R047_ J = ±5%, K = ±10%, M = ±20%
* K = ±10% or M = ±20% only

Part Number	Inductance (μH)	L Test Freq. (MHz)	Q Fact. Min.	Q Test Freq. (MHz)	SRF Min. (MHz)	DCR Max. (Ω)	Rated DC (mA)	Sample Request & Quote
CTML0603-R047_	.047	50	10	50	260	.30	50	➡ Requ
CTML0603-R056_	.056	50	10	50	250	.30	50	➡ Requ
CTML0603-R068_	.068	50	10	50	245	.30	50	➡ Requ
CTML0603-R10_	.10	25	15	25	240	.60	50	➡ Requ
CTML0603-R12_	.12	25	15	25	205	.60	50	➡ Requ
CTML0603-R15_	.15	25	15	25	180	.60	50	➡ Requ
CTML0603-R18_	.18	25	15	25	165	.60	50	➡ Requ
CTML0603-R22_	.22	25	15	25	160	.60	50	➡ Requ
CTML0603-R27_	.27	25	15	25	135	.60	50	➡ Requ
CTML0603-R33_	.33	25	15	25	125	.85	35	➡ Requ
CTML0603-R39_	.39	25	15	25	110	1.0	35	➡ Requ
CTML0603-R47_	.47	25	15	25	105	1.3	35	➡ Requ
CTML0603-R56_	.56	25	15	25	95	1.5	35	➡ Requ
CTML0603-R68_	.68	25	15	25	80	1.7	35	➡ Requ
CTML0603-R82_	.82	25	15	25	65	2.1	35	➡ Requ
CTML0603-1R0_	1.0	10	35	10	75	.60	25	➡ Requ
CTML0603-1R2_	1.2	10	35	10	65	.80	25	➡ Requ
CTML0603-1R5_	1.5	10	35	10	60	.80	25	➡ Requ
CTML0603-1R8_	1.8	10	35	10	55	.95	25	➡ Requ
CTML0603-2R2_	2.2	10	35	10	50	1.1	15	➡ Requ
CTML0603-2R7_	2.7	10	35	10	45	1.3	15	➡ Requ
CTML0603-3R3_	3.3	10	35	10	40	1.5	15	➡ Requ
CTML0603-3R9_	3.9	10	35	10	35	1.7	15	➡ Requ
CTML0603-4R7_	4.7	10	35	10	33	2.1	15	➡ Requ
CTML0603-5R6_	5.6	4	35	4	22	1.5	5	➡ Requ

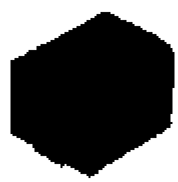
E992-827-C 3354

EA02-027-C 3355

CENTRAL

CTMC1812 Series

From .10 µH to 1,000 µH



Characteristics

Description:
Ferrite core, wire-wound molded chip inductor

Applications:
TV's, VCR's, disk drives, computer peripherals, telecommunication devices and electronic control boards for automobiles

Operating Temperature:
-40°C to +100°C

Inductance Tolerance:
±5%, ±10%, ±20%

Testing:
Inductance and Q are tested on an HP4285A at specified frequency

Packaging:
Tape & Reel

Marking:
Parts are marked with

Specifications

Please specify tolerance code when ordering.
CTMC1812-R10_ J = ±5%, K = ±10%, M = ±20%

Part Number	Inductance (µH)	L Test Freq. (MHz)	Q Factor Min.	Q Test Freq. (MHz)	SRF Min. (MHz)	DCR Max. (Ω)	Rated DC (mA)	Samp Req. & Quo
CTMC1812-R10_	.10	25.2	35	25.2	300	.18	800	➡ Re
CTMC1812-R12_	.12	25.2	35	25.2	250	.20	770	➡ Re
CTMC1812-R15_	.15	25.2	35	25.2	250	.22	730	➡ Re
CTMC1812-R18_	.18	25.2	35	25.2	220	.24	700	➡ Re
CTMC1812-R22_	.22	25.2	40	25.2	200	.25	665	➡ Re
CTMC1812-R27_	.27	25.2	40	25.2	180	.26	635	➡ Re
CTMC1812-R33_	.33	25.2	40	25.2	165	.28	605	➡ Re
CTMC1812-R39_	.39	25.2	40	25.2	150	.30	575	➡ Re
CTMC1812-R47_	.47	25.2	40	25.2	145	.32	545	➡ Re
CTMC1812-R56_	.56	25.2	40	25.2	140	.36	520	➡ Re
CTMC1812-R68_	.68	25.2	40	25.2	135	.40	500	➡ Re
CTMC1812-R82_	.82	25.2	40	25.2	130	.45	475	➡ Re
CTMC1812-1R0_	1.0	7.96	50	7.96	100	.50	455	➡ Re
CTMC1812-1R2_	1.2	7.96	50	7.96	80	.55	430	➡ Re
CTMC1812-1R5_	1.5	7.96	50	7.96	70	.60	410	➡ Re
CTMC1812-1R8_	1.8	7.96	50	7.96	60	.65	390	➡ Re
CTMC1812-2R2_	2.2	7.96	50	7.96	55	.70	380	➡ Re
CTMC1812-2R7_	2.7	7.96	50	7.96	50	.75	370	➡ Re
CTMC1812-3R3_	3.3	7.96	50	7.96	45	.80	355	➡ Re
CTMC1812-3R9_	3.9	7.96	50	7.96	40	.90	330	➡ Re
CTMC1812-4R7_	4.7	7.96	50	7.96	35	1.0	315	➡ Re
CTMC1812-5R6_	5.6	7.96	50	7.96	33	1.1	300	➡ Re
CTMC1812-6R8_	6.8	7.96	50	7.96	27	1.2	285	➡ Re
CTMC1812-8R2_	8.2	7.96	50	7.96	25	1.4	270	➡ Re
CTMC1812-100_	10	2.52	50	2.52	20	1.6	260	➡ Re
CTMC1812-								

E002-027-C 3358

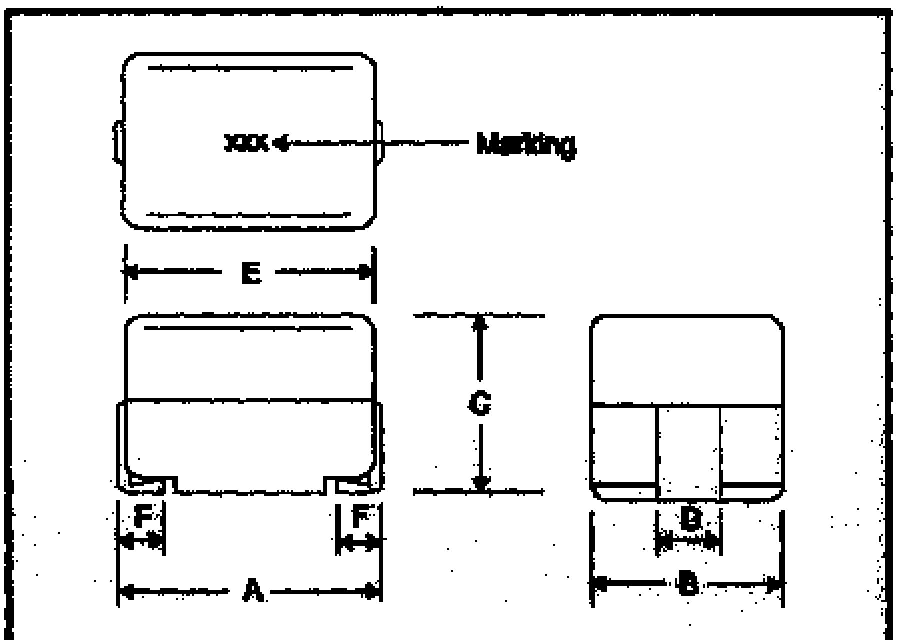
ER02-027-C 3357

CENTRAL

CTMC1812

Physical Dimensions

Size	A	B	C	D	E	F
mm	4.5 ± 0.3	3.2 ± 0.2	3.2 ± 0.2	1.2	4.2 ± 0.2	1
Inches	0.18 ± 0.012	0.13 ± 0.008	0.13 ± 0.008	0.047	0.17 ± 0.008	0.04



Rev. 7.12.14.01

ER02-627-C 3358

Part Number	Description	IND	IDC	DCR	Package	Series	Size
CT0603CS-R11_	SMD Wire-Wound Chip Inductor	0.11	300	0.86	SMD	ct0603cs	0603
CT0603CS-R12_	SMD Wire-Wound Chip Inductor	0.12	300	0.92	SMD	ct0603cs	0603
CT0603CS-R22	SMD Wire-Wound Chip Inductor	0.22	200	1.6	SMD	ct0603cs	0603
CT0603CS-R27	SMD Wire-Wound Chip Inductor	0.27	170	2.1	SMD	ct0603cs	0603
CT0805CS-271_	SMD Wire-Wound Chip Inductor	0.27	280	1.1	SMD	ct0805cs	0805
CT0805CS-331_	SMD Wire-Wound Chip Inductor	0.33	260	1.2	SMD	ct0805cs	0805
CT0805CS-391_	SMD Wire-Wound Chip Inductor	0.39	200	1.5	SMD	ct0805cs	0805
CT0805CS-471_	SMD Wire-Wound Chip Inductor	0.47	170	2.5	SMD	ct0805cs	0805
CT0805CS-561_	SMD Wire-Wound Chip Inductor	0.56	170	3.5	SMD	ct0805cs	0805
CT0805CS-681_	SMD Wire-Wound Chip Inductor	0.68	170	4	SMD	ct0805cs	0805
CT0805CS-821	SMD Wire-Wound Chip Inductors	0.82	160	2.4	SMD	ct0805cs	0805
CT0805HS-331	SMD Wire-Wound Chip Inductor	0.33	300	1.5	SMD	ct0805hs	0805
CT0805HS-391	SMD Wire-Wound Chip Inductor	0.39	270	1.7	SMD	ct0805hs	0805
CT0805HS-471	SMD Wire-Wound Chip	0.47	250	1.7	SMD	ct0805hs	0805

CENTRAL

Part Number	Description	IND	IDC	DCR	Package	Series	Size
CTLL2012-FHR68	SMD Multi-Layer Chip Inductor	0.68	50	4.5	SMD	ctll2012fh	0805
CTLL2012-R10_	SMD Multi-Layer Chip Inductor	0.1	200	1	SMD	ctll2012	0805
CTLL2012-R12_	SMD Multi-Layer Chip Inductor	0.12	250	1.3	SMD	ctll2012	0805
CTLL2012-R15_	SMD Multi-Layer Chip Inductor	0.15	250	1.5	SMD	ctll2012	0805
CTLL2012-R18_	SMD Multi-Layer Chip Inductor	0.18	250	1.8	SMD	ctll2012	0805
CTLL2012-R22_	SMD Multi-Layer Chip Inductor	0.22	200	2	SMD	ctll2012	0805
CTLL2012-R27_	SMD Multi-Layer Chip Inductor	0.27	200	2.5	SMD	ctll2012	0805
CTLL2012-R33_	SMD Multi-Layer Chip Inductor	0.33	150	3	SMD	ctll2012	0805
CTLL2012-R39_	SMD Multi-Layer Chip Inductor	0.39	150	3.5	SMD	ctll2012	0805
CTLL2012-R47_	SMD Multi-Layer Chip Inductor	0.47	100	4	SMD	ctll2012	0805
CTLQ1210C-100K	SMD Power Inductor	10	300	0.8	SMD	CTLQ1210C	1210
CTLQ1210N-100_**	SMD Power Inductor	10	190	1.8	SMD	CTLQ1210N	1210
CTLQ1210N-3R3_*	SMD Power Inductor	3.3	300	1	SMD	CTLQ1210N	1210
CTLQ1210N-3R9_*	SMD Power Inductor	3.9	290	1.1	SMD	CTLQ1210N	1210
CTLQ1210N-4R7_*	SMD Power Inductor	4.7	270	1.2	SMD	CTLQ1210N	1210
CTLQ1210N-5R6_*	SMD Power Inductor	5.6	250	1.3	SMD	CTLQ1210N	1210
CTLQ1210N-6R8_*	SMD Power Inductor	6.8	240	1.5	SMD	CTLQ1210N	1210
CTLQ1210N-8R2_*	SMD Power Inductor	8.2	225	1.6	SMD	CTLQ1210N	1210
CTLQ1612N-100_**	SMD Power Inductor	10	10	10	SMD	CTLQ1612N	1812
CTMC1210-	SMD Molded						

CENTRAL

Part Number	Description	IND	IDC	DCR	Package	Series	Size
CTMC1612-6R2_	SMD Molded Chip Inductor	6.2	270	1.4	SMD	ctmc1812	1812
CTML0603-1R0_	SMD Multi-Layer Chip Inductor	1	25	0.6	SMD	ctml0603	0603
CTML0603-1R2_	SMD Multi-Layer Chip Inductor	1.2	25	0.8	SMD	ctml0603	0603
CTML0603-1R5_	SMD Multi-Layer Chip Inductor	1.5	25	0.8	SMD	ctml0603	0603
CTML0603-1R8_	SMD Multi-Layer Chip Inductor	1.8	25	0.95	SMD	ctml0603	0603
CTML0603-2R2_	SMD Multi-Layer Chip Inductor	2.2	15	1.15	SMD	ctml0603	0603
CTML0603-2R7_	SMD Multi-Layer Chip Inductor	2.7	15	1.35	SMD	ctml0603	0603
CTML0603-3R3_	SMD Multi-Layer Chip Inductor	3.3	15	1.55	SMD	ctml0603	0603
CTML0603-3R9_	SMD Multi-Layer Chip Inductor	3.9	15	1.7	SMD	ctml0603	0603
CTML0603-4R7_	SMD Multi-Layer Chip Inductor	4.7	15	2.1	SMD	ctml0603	0603
CTML0603-R10_	SMD Multi-Layer Chip Inductor	0.1	50	0.5	SMD	ctml0603	0603
CTML0603-R12_	SMD Multi-Layer Chip Inductor	0.12	50	0.5	SMD	ctml0603	0603
CTML0603-R15_	SMD Multi-Layer Chip Inductor	0.15	50	0.6	SMD	ctml0603	0603
CTML0603-R18_	SMD Multi-Layer Chip Inductor	0.18	50	0.6	SMD	ctml0603	0603
CTML0603-R22_	SMD Multi-Layer Chip Inductor	0.22	50	0.8	SMD	ctml0603	0603
CTML0603-R27_	SMD Multi-Layer Chip Inductor	0.27	50	0.8	SMD	ctml0603	0603
CTML0603-R33_	SMD Multi-Layer Chip Inductor	0.33	35	0.85	SMD	ctml0603	0603
CTML0603-R39_	SMD Multi-Layer Chip Inductor	0.39	35	1	SMD	ctml0603	0603
CTML0603-R47_	SMD Multi-Layer Chip Inductor	0.47	35	1.35	SMD	ctml0603	0603
CTML0603-	SMD Multi-Layer						

E062-027-C 3361

CENTRAL

Part Number	Description	IND	IDC	DCR	Package	Series	Size
CTML0805-3R9_	SMD Multi-Layer Chip Inductor	3.9	30	0.9	SMD	ctml0805	0805
CTML0805-4R7_	SMD Multi-Layer Chip Inductor	4.7	30	1	SMD	ctml0805	0805
CTML0805-5R6_	SMD Multi-Layer Chip Inductor	5.6	15	0.9	SMD	ctml0805	0805
CTML0805-6R8_	SMD Multi-Layer Chip Inductor	6.8	15	1	SMD	ctml0805	0805
CTML0805-8R2_	SMD Multi-Layer Chip Inductor	8.2	15	1.1	SMD	ctml0805	0805
CTML0805-R10_	SMD Multi-Layer Chip Inductor	0.1	250	0.3	SMD	ctml0805	0805
CTML0805-R12_	SMD Multi-Layer Chip Inductor	0.12	250	0.3	SMD	ctml0805	0805
CTML0805-R15_	SMD Multi-Layer Chip Inductor	0.15	250	0.4	SMD	ctml0805	0805
CTML0805-R18_	SMD Multi-Layer Chip Inductor	0.18	250	0.4	SMD	ctml0805	0805
CTML0805-R22_	SMD Multi-Layer Chip Inductor	0.22	250	0.5	SMD	ctml0805	0805
CTML0805-R27_	SMD Multi-Layer Chip Inductor	0.27	250	0.5	SMD	ctml0805	0805
CTML0805-R33_	SMD Multi-Layer Chip Inductor	0.33	250	0.55	SMD	ctml0805	0805
CTML0805-R39_	SMD Multi-Layer Chip Inductor	0.39	200	0.65	SMD	ctml0805	0805
CTML0805-R47_	SMD Multi-Layer Chip Inductor	0.47	200	0.65	SMD	ctml0805	0805
CTML0805-R56_	SMD Multi-Layer Chip Inductor	0.56	150	0.75	SMD	ctml0805	0805
CTML0805-R68_	SMD Multi-Layer Chip Inductor	0.68	150	0.8	SMD	ctml0805	0805
CTML0805-R82_	SMD Multi-Layer Chip Inductor	0.82	150	1	SMD	ctml0805	0805
CTML1206-100_	SMD Multi-Layer Chip Inductor	10	25	1	SMD	ctml1206	1206
CTML1206-1R0_	SMD Multi-Layer Chip Inductor	1	100	0.4	SMD	ctml1206	1206
CTML1206-	SMD Multi-Layer						

E062-027-C 3362

CENTRAL

Part Number	Description	IND	IDC	DCR	Package	Series	Size
CTML0805-3R9_	SMD Multi-Layer Chip Inductor	3.9	30	0.9	SMD	ctml0805	0805
CTML0805-4R7_	SMD Multi-Layer Chip Inductor	4.7	30	1	SMD	ctml0805	0805
CTML0805-5R6_	SMD Multi-Layer Chip Inductor	5.6	15	0.9	SMD	ctml0805	0805
CTML0805-6R8_	SMD Multi-Layer Chip Inductor	6.8	15	1	SMD	ctml0805	0805
CTML0805-8R2_	SMD Multi-Layer Chip Inductor	8.2	15	1.1	SMD	ctml0805	0805
CTML0805-R10_	SMD Multi-Layer Chip Inductor	0.1	250	0.3	SMD	ctml0805	0805
CTML0805-R12_	SMD Multi-Layer Chip Inductor	0.12	250	0.3	SMD	ctml0805	0805
CTML0805-R15_	SMD Multi-Layer Chip Inductor	0.15	250	0.4	SMD	ctml0805	0805
CTML0805-R18_	SMD Multi-Layer Chip Inductor	0.18	250	0.4	SMD	ctml0805	0805
CTML0805-R22_	SMD Multi-Layer Chip Inductor	0.22	250	0.5	SMD	ctml0805	0805
CTML0805-R27_	SMD Multi-Layer Chip Inductor	0.27	250	0.5	SMD	ctml0805	0805
CTML0805-R33_	SMD Multi-Layer Chip Inductor	0.33	250	0.55	SMD	ctml0805	0805
CTML0805-R39_	SMD Multi-Layer Chip Inductor	0.39	200	0.65	SMD	ctml0805	0805
CTML0805-R47_	SMD Multi-Layer Chip Inductor	0.47	200	0.65	SMD	ctml0805	0805
CTML0805-R56_	SMD Multi-Layer Chip Inductor	0.56	150	0.75	SMD	ctml0805	0805
CTML0805-R68_	SMD Multi-Layer Chip Inductor	0.68	150	0.8	SMD	ctml0805	0805
CTML0805-R82_	SMD Multi-Layer Chip Inductor	0.82	150	1	SMD	ctml0805	0805
CTML1206-100_	SMD Multi-Layer Chip Inductor	10	.25	1	SMD	ctml1206	1206
CTML1206-1R0_	SMD Multi-Layer Chip Inductor	1	100	0.4	SMD	ctml1206	1206
CTML1206-	SMD Multi-Layer						

BR02-627-C 3383

CENTRAL

Part Number	Description	IND	IDC	DCR	Package	Series	Size
CTML1206-R10_	SMD Multi-Layer Chip Inductor	0.1	250	0.25	SMD	ctml1206	1206
CTML1206-R12_	SMD Multi-Layer Chip Inductor	0.12	250	0.3	SMD	ctml1206	1206
CTML1206-R15_	SMD Multi-Layer Chip Inductor	0.15	250	0.3	SMD	ctml1206	1206
CTML1206-R18_	SMD Multi-Layer Chip Inductor	0.18	250	0.4	SMD	ctml1206	1206
CTML1206-R22_	SMD Multi-Layer Chip Inductor	0.22	250	0.5	SMD	ctml1206	1206
CTML1206-R27_	SMD Multi-Layer Chip Inductor	0.27	250	0.5	SMD	ctml1206	1206
CTML1206-R33_	SMD Multi-Layer Chip Inductor	0.33	250	0.6	SMD	ctml1206	1206
CTML1206-R39_	SMD Multi-Layer Chip Inductor	0.39	200	0.5	SMD	ctml1206	1206
CTML1206-R47_	SMD Multi-Layer Chip Inductor	0.47	200	0.6	SMD	ctml1206	1206
CTML1206-R56_	SMD Multi-Layer Chip Inductor	0.56	150	0.7	SMD	ctml1206	1206
CTML1206-R68_	SMD Multi-Layer Chip Inductor	0.68	150	0.8	SMD	ctml1206	1206
CTML1206-R82_	SMD Multi-Layer Chip Inductor	0.82	150	0.9	SMD	ctml1206	1206

[redacted] [Page6 of 6]

These CT Parts Most Closely Match Your Search. Please Refer to the Series Link for More Information.

Our Part Capabilities Are Constantly Expanding. If You Do Not See The Part Series You Are Looking For.

Please Contact Us At Sales@CTparts.com

We Can Provide A Large Assortment Of Fit, Form, And Function Replacements.

[redacted]

EN02-027-C 3364

NEW PAPER ARTILCE AVAILABLE UPON REQUEST

Freeland, Mark (M.)

From: Gates, Freeman (F.C.)
Sent: Monday, October 07, 2002 9:33 AM
To: Freeland, Mark (M.); Kolwicki, Allan (A.J.)
Subject: FW: Zener Diode voltage rating

FYI...

-----Original Message-----
From: Hueniken Peter [mailto:Peter.Hueniken@at.siemens.ca]
Sent: Sunday, October 06, 2002 8:49 AM
To: 'icrawley@ford.com'; 'fgates@ford.com'
Cc: Jefford Bob
Subject: FW: Zener Diode voltage rating

Hello Freeman

Per your request; the Zener Diode incorporated with the Transient Voltage Suppression is rated at 9.1 volts nominal.
Note from Don Ayers is attached below.

Regards
Peter Hueniken

-----Original Message-----
From: Ayers, Don [mailto:DAyers@kavlico.com]
Sent: Friday, October 04, 2002 6:14 PM
To: Hueniken Peter
Cc: Bugaj, Barry; makins@ford.com
Subject: Zener Diode voltage rating

Per Freeman's request via you, the diode used on ESM is rated at 9.1 volts nominal. I've requested the warranty data that you wanted on TBD's. I hope to get that out to you later.

Regards,
Don

EA02-027-C 3357

Freeland, Mark (M.)

From:	Gates, Freeman (F.C.)
Sent:	Monday, October 07, 2002 9:33 AM
To:	Freeland, Mark (M.); Kotwicki, Allan (A.J.)
Subject:	FW: Zener Diode voltage rating

FYI...

-----Original Message-----
From: Hueniken Peter [mailto:Peter.Hueniken@at.siemens.ca]
Sent: Sunday, October 06, 2002 8:49 AM
To: 'icrawley@ford.com'; 'fgates@ford.com'
Cc: Jefford Bob
Subject: FW: Zener Diode voltage rating

Hello Freeman

Per your request; the Zener Diode incorporated with the Transient Voltage Suppresion is rated at 9.1 volts nominal.
Note from Don Ayers is attached below.

Regards
Peter Hueniken

-----Original Message-----
From: Ayers, Don [mailto:DAyers@kavlico.com]
Sent: Friday, October 04, 2002 6:14 PM
To: Hueniken Peter
Cc: Bugaj, Barry; makins@ford.com
Subject: Zener Diode voltage rating

Per Freeman's request via you, the diode used on ESM is rated at 9.1 volts nominal. I've requested the warranty data that you wanted on TBD's. I hope to get that out to you later.

Regards,
Don

EA02-027-C 3358

Freeland, Mark (M.)

From:	McCoy, James (J.D.)
Sent:	Monday, October 07, 2002 8:39 AM
To:	Hermann, Thomas (T.J.)
Cc:	Alles, Sharon (S.A.); Freeland, Mark (M.); Maurer, James (J.B.); O'Neall, Jim (J.D.)
Subject:	Access to PDC00024 MPG Data

Hi Tom,

I am investigating an issue across multiple vehicle lines and need to compare BBRE plots for the 2001 MY. I spoke to Bob Kern about reviewing the J551 traces and he suggested it would be easier to view them on line and print out what I needed. I agree it would save a lot of time. Would it be possible to get access to the PDC00024 server and the MPGRPT directory?

Thanks Tom.
Regards,

Jim McCoy
Fuel Metering, Emissions & Ignition Systems Engineering
Hardware Control Interface Group
V-Engine Engineering
POEE - MD#69 - Rm. D142 - Cube DF186
Phone (313) 33-79690 / Fax (313) 39-04084
E-Mail: jmccoy1@ford.com

Freeland, Mark (M.)

From: Verner, Carol (C.J.)
Sent: Tuesday, October 08, 2002 10:06 AM
To: Maurer, James (J.B.)
Cc: Freeland, Mark (M.)
Subject: RE: U204 Stall Meeting (Field issue update: Engine stall -> No restart (DPFE shortage))

Jim,

Visteon has not shipped the PCMs I ordered back on 5/13/02. There were a lot of emails back and forth between Purchasing and Visteon to get the parts shipped but Visteon refused based on the part number having information in it (ZZ on the end of the order) which violated an 'ISO' guideline. My guess is for some reason they are not interested in shipping them. Can we get Jim's approval to buy a PCM at the dealership?

Carol

-----Original Message-----
From: schen16 [mailto:schen16@ford.com]
Sent: Tuesday, October 08, 2002 4:37 AM
To: Verner, Carol (C.J.); Freeland, Mark (M.)
Subject: Re: U204 Stall Meeting (Field issue update: Engine stall -> No restart (DPFE shortage))

Carol:

We did not receive the PCM so far, can you advise when we can have your mail for this PCM?

Regards,
----- Original Message -----
From: "Verner, Carol (C.J.)" <cverner@ford.com>
To: "Chen, Smith S N (S.)" <schen16@ford.com>; "Freeland, Mark (M.)" <mfreela1@ford.com>
Sent: Monday, May 06, 2002 7:40 PM
Subject: RE: U204 Stall Meeting (Field issue update: Engine stall -> No restart (DPFE shortage))

> Smith Chen,
>
> Thank you very much for the information on the PCM.
>
> Regards,
> Carol
>
> -----Original Message-----
> From: schen16 [mailto:schen16@ford.com]
> Sent: Monday, May 06, 2002 2:38 AM
> To: Verner, Carol (C.J.)
> Cc: Jao, Jack (J.); Chang, Chia Kai (C.); Kanai, Shinji (S.); Maurer,
> James (J.B.)
> Subject: Re: U204 Stall Meeting (Field issue update: Engine stall -> No
> restart (DPFE shortage))

>
>
> Carol:
>
> I have asked the MC service people and confirmed the PCM of this
> vehicle,
> the PCM which I sent to Mark is the original one, no any record for
> replacement.
>
> Regards,
>
> S. N. Chen
> ----- Original Message -----
> From: "Verner, Carol (C.J.)" <cverner@ford.com>
> To: "Chen, Smith S N (S.)" <schen16@ford.com>; "Verner, Carol (C.J.)"
> <cverner@ford.com>
> Cc: "Jao, Jack (J.)" <jjao@ford.com>; "Chang, Chia Kai (C.)"
> <cchang9@ford.com>; "Kanai, Shinji (S.)" <kanai.sh@sv.mazda.co.jp>;
> "Maurer,
> James (J.B.)" <jmaurer@ford.com>
> Sent: Tuesday, April 23, 2002 7:20 PM
> Subject: RE: U204 Stall Meeting (Field issue update: Engine stall -> No
> restart (DPFE shortage))
>
>
> > Good Day S. N. Chen,
> >
> > This information should be helpful for me to order a PCM. Can you or
> > someone at Mazda let me know if the PCM you have is the orignal one or
> > is it a replacement. The part number YL8F-12A650-TG suggests that it
> is
> > a replacement. Please confirm.
> >
> > Regards
> > Carol
> >
> > -----Original Message-----
> > From: schen16 [mailto:schen16@ford.com]
> > Sent: Sunday, April 21, 2002 11:29 PM
> > To: Verner, Carol (C.J.)
> > Cc: Jack Jao; Chang C.K; Kanai, Shinji (S.); Maurer, James (J.B.)
> > Subject: Re: U204 Stall Meeting (Field issue update: Engine stall ->
> No
> > restart (DPFE shortage))
> >
> >
> > Carol:
> >
> > It's nice to have your assistance, this vehicle is Mazda Tribute 2.0L
> > with
> > automatic transmission, I have got this PCM and attached the label of
> > this
> > PCM for your reference. I hope this can help you to order the PCM.
> >
> > Regards,
> >
> > S. N. Chen
> >
> >

EA02-027-C 3371

> > ----- Original Message -----
> > From: "Verner, Carol (C.J.)" <cverner@ford.com>
> > To: "Chen, Smith S N (S.)" <schen16@ford.com>
> > Cc: "Maurer, James (J.B.)" <jmaurer@ford.com>; "Kanai, Shinji (S.)"
> > <kanai.sh@sv.mazda.co.jp>
> > Sent: Saturday, April 20, 2002 3:01 AM
> > Subject: FW: U204 Stall Meeting (Field issue update: Engine stall ->
> No
> > restart (DPFE shortage))
> >
> >
> > > Good Morning Mr. Chen,
> > >
> > > I am a member of a Team working on the dpfe sensor and stall issues
> > > regarding the Tribute/Escapes. Mark Freeland is a member of the
> team
> > as
> > > well. I have the assignment to order a PCM to replace the one Mark
> has
> > > asked you to send to him. Before I can order one I need some more
> > > information about the vehicle. Attached is a memo from Kanai-san in
> > > Kansas City which list the VIN and vehicle build date.
> > >
> > > I am attaching an excel spreadsheet from the Design Engineer at
> > Visteon
> > > with the part numbers for the all PCMs (EEC) across the world. You
> > will
> > > see that there are different part numbers depending on vehicle
> > content.
> > > I would like you help to make sure I have enough information to
> order
> > > the correct PCM from Visteon. If I use the part number you sent
> Mark
> > > Freeland (YL8Z-12A650-TG) it will take another 2 - 3 weeks to get
> the
> > > part. This is a Service part number and unfortunately they do not
> > stock
> > > the part. They would have to order it from Visteon as well. This
> is
> > > why I have decided to try and order from Visteon myself to save
> time.
> > >
> > > Based on all the information I have the vehicle is a Model Year 2002
> > > Mazda Tribute with a 2.0L Zetec engine with VIN provided by
> Kanai-san.
> > I
> > > need to know if I should buy PCM for a manual transmission (MTX,
> Part
> > > Number YL8F-12A650-PD) or automatic transmission (ATX, Part Number
> > > YL8A-12A650-AA) for the Taiwan market?
> > >
> > > If you have any questions about the information I am asking for,
> > please
> > > send back a note.
> > >
> > >
> > > Thank you
> > > Carol Verner
> > > FMEI Component Engineer

> > > '
> > > -----Original Message-----
> > > From: Freeland, Mark (M.)
> > > Sent: Friday, April 19, 2002 12:36 PM
> > > To: Verner, Carol (C.J.)
> > > Subject: FW: U204 Stall Meeting (Field issue update: Engine stall ->
> > No
> > > restart (DPFE shortage))
> > >
> > >
> > >
> > >
> > > Regards
> > >
> > > Mark Freeland
> > >
> > > > 6-Sigma Black Belt
> > > > Engine Research Department
> > > > Ford Research Laboratory
> > > > P.O. Box 2053
> > > > MD 2629 - SRL - Room 1517
> > > > Dearborn, MI 48121-2053 USA
> > > email: mfreela1@ford.com
> > > Tel.: (313) 594-7645
> > >
> > >
> > > -----Original Message-----
> > > From: Shinji Kanai [mailto:kanai.sh@sv.mazda.co.jp]
> > > Sent: Wednesday, April 10, 2002 6:59 PM
> > > To: 'Sanders, Muriel (M.S.)'; 'Altoonian, Don (D.J.)'; 'Badgley,
> Joel
> > > (J.K.)'; 'Bauer, Scott (S.C.)'; 'Bhojwani, Kamal (K.)'; 'Blackburn,
> > > Thomas (T.J.)'; 'Bogema, John (P.)'; 'Cary Powell'; 'Chick, John
> > (J.)';
> > > 'Chih, Ming-Hiu (M.H.)'; 'Chin, Darrel (D.)'; 'Corbett, Sandra
> > (S.M.)';
> > > 'Dalbo, Bob (R.J.)'; 'Dan Rothweiler'; 'De Pena, Juan (J.E.)';
> 'Diez,
> > > Timothy (T.P.)'; 'Fascetti, Bob (R.J.)'; 'Fournelle, Gilbert (G.)';
> > > 'Freeland, Mark (M.)'; 'Giles, Stuart (S.)'; 'Gokhale, Renuka
> (R.V.)';
> > > 'Grimes, Jeff (J.R.)'; 'Hansen, George (G.C.)'; 'Herr, George
> (G.J.)';
> > > 'Hofman, Michael (M.V.)'; 'Holmes, Jeffrey (J.R.)'; 'Ichikawa,
> > > Jiyunichiro (J.)'; 'Jensen, Ted (T.E.)'; 'John McDonald'; 'Jones,
> > Andy';
> > > 'Jordan, Donald (D.E.)'; 'Kanai, Shinji (S.)'; 'King, Robert
> (R.F.)';
> > > 'Klostermann, Eric (E.)'; 'Kosko, Jeff (J.R.)'; 'Kwon, Soon (S.K.)';
> > > 'Limtiaco, Steven (S.)'; 'Linde, Peter (P.A.)'; 'Liu, Jana (J.)';
> > > 'Luehrsen, Eric (E.A.)'; 'Marck, Edmond (E.C.)'; 'Matesa, John
> (J.)';
> > > 'Maurer, James (J.B.)'; 'Mazzella, Gary (G.R.)'; 'Mooney, Larry
> (L.)';
> > > 'Moorhouse, Scott (S.R.)'; 'Morgan, Tom'; 'Morishima, Shigeki (S.)';
> > > 'Naveed Khan'; 'Nematollahi, Sonya (S.)'; 'Nikolai, Bernie';
> > 'Noteboom,
> > > Jim (J.E.)'; 'Ortman, James (J.W.)'; 'Powers, Ken (K.W.)'; 'Price,
> > > Martin (M.)'; 'Raquepau, Alden (A.P.)'; 'Shah, Kiran (K.C.)';

> > > 'Shiraishi, Masaru (M.)'; 'Stilgenbauer, Jeffrey (J.R.)'; 'Suarez,
> > Rhae
> > > (R.)'; 'Sullivan, Jamie (J.P.)'; 'Takasawa, Keith (K.D.)'; 'Takubo,
> > > Hiroichi (H.)'; 'Vecchio, Anne Marie (A.)'; 'Wakenell, Ray (R.A.)';
> > > 'Wettach, Bill (B.)'; 'Williams, Les (LHW.)'; 'Williamson, David
> > > (D.E.)'; 'Yeung, Lem (.)'
> > > Subject: U204 Stall Meeting (Field issue update: Engine stall -> No
> > > restart (DPFE shortage))
> > >
> > >
> > > I update Taiwan case as follows.
> > >
> > > VIN:5F2CU08B81KM71661
> > > Prod. July,2001 at Hofu. Sale: Sep. 24,2001.
> > >
> > > Stall occurred on Mar. 01, 2002, 6997km.
> > > Before the case, the car had no problem (back to the dealer for
> 1000
> > &
> > > 5000KM regular maintainence only.)
> > > When the car picked back to the dealer:
> > >   1. can't start again.
> > >   2. can't communicate with WDS.
> > >   3. replacing another PCM (from anothe same model
> > car),can't
> > > communicate with WDS.
> > >   4. with original PCM, communicate with WDS by using "
> > Manual
> > > Entry" function of WDS.
> > >   5. WDS showed DTC : B1681/B1401/U1262
> > >   6. diagnoze the DTCs with ' Probe test" function of WDS,
> > > everything seemed OK.
> > >   7. because the connector of DPFE was disconnected in
> "Probe
> > > test', the technician tried to
> > >   start again after the test, the car started, then
> found
> > > the DPFE was disconnected.
> > >   8. try several times, all the same, when the connector
> was
> > > connected, can't start. when disconnecting,
> > >   can start again.
> > >   9. change another new DPFE, the problem was disappeared.
> > >
> > > Shinji Kanai
> > > -----Original Message-----
> > > From:
> > > Sent: Monday, April 08, 2002 9:16 PM
> > > Subject: U204 Stall Meeting (Field issue update: Engine stall -> No
> > > restart (DPFE shortage))
> > >
> > >
> > > I update concern which I reported Stall meeting in last week. Failed
> > > DPFE sensors were scrapped at dealers in all cases.
> > >
> > > CASE 1 (Japan)
> > > VIN: EPEW-101286, Hofu build: 2000/12/13, Retail 2000/12/26
> > > (1) First repair 2001/4/9   4,893km
> > > DTC P0401 and P1408 illuminated. DPFE output Voltage was 0.122V

> > > (standard 0.95 - 1.05V).
> > > Replace DPFE sensor with new one. Problem was solved.
> > > (2) Second repair 2001/8/20   11,084km
> > > Engine stall during normal operating temp. Starter was clanking but
> > > engine did not start.
> > > WDS tester could not communicate with PCM. BUS(-) terminal voltage
> > > showed 1.9V (standard 4.5V) causing NO communication.
> > > Vref was 2.0V (standard 4.0 - 6.0V). When DPFE sensor connector was
> > > disconnected, Vref increased to 5V.
> > > Same time Click sound was observed from Fuel pump relay and fuel
> > > pressure was increased to normal range.
> > > Also BUS(-) terminal voltage was returned 4.5V at same time, and WDS
> > can
> > > communicate with PCM.
> > > Replace DPFE sensor with new one. Problem was solved.
> > > <<<DPFE sensor lot number is unknown. According to second repair
> date,
> > > it might be pre CM part.>>>
> > >
> > > CASE 2 (Taiwan)
> > > We are contacting Taiwan continuously.
> > >
> > > CASE 3 (Australia)
> > > Attachment is the information from Australia (VIN:
> JM0YU06BY11100053,
> > > Hofu build 2001/01/09).
> > > In addition to this report;
> > > (1) Vref was 2.1 V (standard 4.0 - 6.0V) during NO start condition.
> > > (2) Vref returned standard value and engine started immediately
> after
> > > disconnect DPFE connector.
> > > (3) In this DPFE internal shortage case, WDS cannot communicate to
> > PCM.
> > > Replace DPFE sensor with new one. Problem was solved.
> > > <<<DPFE sensor lot number is unknown. According to build date, it
> > might
> > > be pre CM part.>>>
> > >
> > >
> > > Shinji Kanai
> > > Manager, Tribute Plant QA
> > > Mazda North American Operations
> > >
> > > Ford Kansas City Assembly Plant
> > > Plant Vehicle Team
> > > 8121 N.E. Hwy. 69, Claycomo, MO 64119 USA
> > > Tel: 816-459-1623/ Fax: -1726/ e-mail: kanai.sh@sv.mazda.co.jp
> > > Local Text Pager: 9135677156@alphapage.airtouch.com
> > >
> > >

Freeland, Mark (M.)

From:	Carter, Roscoe (R.O.)
Sent:	Tuesday, October 08, 2002 2:21 PM
To:	Maurer, James (J.B.)
Cc:	Helms, Jeffrey (J.H.)
Subject:	RE: Protective Gel in DPFE

Jim,

I am not aware of material other than the one chosen and that only because of the present contact with this fluoro-silicone polymer. This is a truly corrosive and high temperature environment. I would suggest you contact Jeff Helms, Manager of Material Science Department, for others who might know about such materials. Stable inorganic gels come to mind but I don't know who is working on such materials either here, commercially or in academe. I wish you good hunting!

Roscoe "ROC" Carter
Ford Research Lab
Physical and Environmental Sciences Department
Lubricant Science and ATF Analysis Group Leader

-----Original Message-----

From:	Maurer, James (J.B.)
Sent:	Tuesday, October 08, 2002 12:25 PM
To:	Carter, Roscoe (R.O.)
Subject:	Protective Gel in DPFE

The gel that you analyzed previously for the DPFE team was considered as the best available for protecting the sensor IC from exhaust by Kavlico. My management is questioning us as to whether a better alternative exists.

Do you know of any other people in research (university or another gel manufacturer) who might know of the types of gel commercially available that would be suitable for this application? We would need a flexible gel that would allow the pressure signal to get in, but would keep exhaust gas constituents out.

Regards,
Jim Maurer
James B. Maurer
V-Engine 6-Sigma Team Leader
Fuel Metering Dept. V Engine Engineering
Phone (313) 390-3672, Fax (313) 390-4084
Text Page: (313) 795-5219
Email: jmaurer@Ford.com

Freeland, Mark (M.)

From:	McCoy, James (J.D.)
Sent:	Tuesday, October 08, 2002 1:55 PM
To:	Freeland, Mark (M.); Alles, Sharon (S.A.)
Subject:	FW: Access to PDC00024 MPG Data

I'm running into problems getting data..................................My buddy Bob is trying hard to help us out.

Regards,

Jim McCoy

Fuel Metering, Emissions & Ignition Systems Engineering
Hardware Control Interface Group
V-Engine Engineering
POEE - MD#69 - Rm. D142 - Cube DF186
Phone (313) 33-79690 / Fax (313) 39-04084
E-Mail: jmccoy1@ford.com

-----Original Message-----

From:	Diaz, Timothy (T.P.)
Sent:	Tuesday, October 08, 2002 10:32 AM
To:	Kern, Bob (R.S.); McCoy, James (J.D.)
Subject:	RE: Access to PDC00024 MPG Data

Jim,

The 2001 Focus was engineered in Europe. The 2001 Escape was engineered by Mazda in Japan. I have data for neither vehicle.

Sincerely,
Timothy Diaz

Cross Vehicle EMC Technology Applications
313-32-39927, Fax: 313-322-1692
e-mail: tdiaz@ford.com

-----Original Message-----

From:	Kern, Bob (R.S.)
Sent:	Tuesday, October 08, 2002 9:55 AM
To:	McCoy, James (J.D.)
Cc:	Diaz, Timothy (T.P.); Collins, Bruce (B.R.); Boguslawski, Larry (L.J.)
Subject:	RE: Access to PDC00024 MPG Data

Jim,
There are no 2001 vehicles in the pdc00024/proj/mpgrpt/ directory.
We don't keep reports for more than 1 yr here at EMC.

For the specific 2001 vehicle/engine family data you are looking for check with:

Focus & Escape----Tim Diaz x-39927
Explorer-------------Bruce Collins x-24552
F-Series-------------Larry Boguslawski x-53296.

Tim/Bruce/Larry -- If you don't have the data, and you can tell me what vehicle #(s) that we tested with the engine family Jim is looking for, maybe I can cross-reference the TestNet order number (Mxxxxx) to find the raw J551 data on the hard drive at the RFI site computer. Thanks for your assistance.

EN02-027-C 3377

-----Original Message-----
From: McCoy, James (J.D.)
Sent: Tuesday, October 08, 2002 9:12 AM
To: Kern, Bob (R.S.)
Cc: McCoy, James (J.D.)
Subject: FW: Access to PDC00024 MPG Data

Bob, sorry to bug you again. Would it be possible to get J551 plots of the following vehicles? I struck out with EESE. Let me know. Thanks. Jim.

2001 2.0L Zetec Focus
2001 3.0L DOHC Escape
2001 4.0L Explorer
2001 4.2L F-Series

Regards,
Jim McCoy
Fuel Metering, Emissions & Ignition Systems Engineering
Hardware Control Interface Group
V-Engine Engineering
POEE - MD#69 - Rm. D142 - Cube DF186
Phone (313) 33-79690 / Fax (313) 39-04084
E-Mail: jmccoy1@ford.com

-----Original Message-----
From: Frazier, Keith (R.K.)
Sent: Monday, October 07, 2002 10:18 AM
To: McCoy, James (J.D.)
Subject: RE: Access to PDC00024 MPG Data

I will not be able to help you on this one. I would spend more time trying to figure out what to do than it would take to drive to MPG and physically review the data. I suggest you ask Bob to forward the relevent data to you via normal email.

Regards,
R. Keith Frazier
Staff Technical Specialist (EMC)
Cross Vehicle EMC Technology & Applications
Electrical Electronic Systems Engineering, RVT
Phone: 313-322-3150
email: kfrazie1@ford.com

-----Original Message-----
From: McCoy, James (J.D.)
Sent: Monday, October 07, 2002 8:41 AM
To: Frazier, Keith (R.K.)
Subject: FW: Access to PDC00024 MPG Data

Keith, I see Tom is out until the 11th. Any chance you can help me out gaining access? I need to complete all my work by Friday.

Regards,

Jim McCoy

Fuel Metering, Emissions & Ignition Systems Engineering
Hardware Control Interface Group
V-Engine Engineering
POEE - MD#69 - Rm. D142 - Cube DF186
Phone (313) 33-79690 / Fax (313) 39-04084
E-Mail: jmccoy1@ford.com

-----Original Message-----
From: McCoy, James (J.D.)
Sent: Monday, October 07, 2002 8:39 AM
To: Hermann, Thomas (T.J.)
Cc: Allen, Sharon (S.A.); Freeland, Mark (M.); Maurer, James (J.B.); O'Neill, Jim (J.D.)
Subject: Access to PDC00024 MPG Data

Hi Tom,

I am investigating an issue across multiple vehicle lines and need to compare BBRE plots for the 2001 MY. I spoke to Bob Kern about reviewing the J551 traces and he suggested it would be easier to view them on line and print out what I needed. I agree it would save a lot of time. Would it be possible to get access to the PDC00024 server and the MPGRPT directory?

Thanks Tom.

Regards,

Jim McCoy

Fuel Metering, Emissions & Ignition Systems Engineering
Hardware Control Interface Group
V-Engine Engineering
POEE - MD#69 - Rm. D142 - Cube DF186
Phone (313) 33-79690 / Fax (313) 39-04084
E-Mail: jmccoy1@ford.com

Freeland, Mark (M.)

From: Verner, Carol (C.J.)
Sent: Tuesday, October 08, 2002 11:47 AM
To: Chen, Smith S N (S.); Freeland, Mark (M.)
Subject: RE: U204 Stall Meeting (Field issue update: Engine stall -> No restart (DPFE shortage))

Good Morning Smith Chen,

I am very, very sorry I have not been able to send you a PCM by now. The vendor, Visteon will not ship the PCMs to us because of an administrative issue. As a result, I have asked my management if it is ok to 1) have you by a PCM and charge it back to our department, or 2) we buy one at a dealership here and send it to you. On this one I am not sure if it will have the correct calibration programmed into it.

Hopefully I will have an answer from management by Friday.
Carol

-----Original Message-----
From: schen16 [mailto:schen16@ford.com]
Sent: Tuesday, October 08, 2002 4:37 AM
To: Verner, Carol (C.J.); Freeland, Mark (M.)
Subject: Re: U204 Stall Meeting (Field issue update: Engine stall -> No restart (DPFE shortage))

Carol:

We did not receive the PCM so far, can you advise when we can have your mail for this PCM?

Regards,
----- Original Message -----
From: "Verner, Carol (C.J.)" <cverner@ford.com>
To: "Chen, Smith S N (S.)" <schen16@ford.com>; "Freeland, Mark (M.)" <mfreela1@ford.com>
Sent: Monday, May 06, 2002 7:40 PM
Subject: RE: U204 Stall Meeting (Field issue update: Engine stall -> No restart (DPFE shortage))

> Smith Chen,
>
> Thank you very much for the information on the PCM.
>
> Regards,
> Carol
>
> -----Original Message-----
> From: schen16 [mailto:schen16@ford.com]
> Sent: Monday, May 06, 2002 2:38 AM
> To: Verner, Carol (C.J.)
> Cc: Jao, Jack (J.); Chang, Chia Kai (C.); Kanai, Shinji (S.); Maurer,
> James (J.B.)
> Subject: Re: U204 Stall Meeting (Field issue update: Engine stall -> No
> restart (DPFE shortage))

>
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> Carol:
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> I have asked the MC service people and confirmed the PCM of this
> vehicle,
> the PCM which I sent to Mark is the original one, no any record for
> replacement.
>
> Regards,
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> S. N. Chen
> ----- Original Message -----
> From: "Verner, Carol (C.J.)" <cverner@ford.com>
> To: "Chen, Smith S N (S.)" <schen16@ford.com>; "Verner, Carol (C.J.)"
> <cverner@ford.com>
> Cc: "Jao, Jack (J.)" <jjao@ford.com>; "Chang, Chia Kai (C.)"
> <cchang9@ford.com>; "Kanai, Shinji (S.)" <kanai.sh@sv.mazda.co.jp>;
> "Maurer,
> James (J.B.)" <jmaurer@ford.com>
> Sent: Tuesday, April 23, 2002 7:20 PM
> Subject: RE: U204 Stall Meeting (Field issue update: Engine stall -> No
> restart (DPFE shortage))
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>
> > Good Day S. N. Chen,
> >
> > This information should be helpful for me to order a PCM. Can you or
> > someone at Mazda let me know if the PCM you have is the orignal one or
> > is it a replacement. The part number YL8F-12A650-TG suggests that it
> is
> > a replacement. Please confirm.
> >
> > Regards
> > Carol
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> > -----Original Message-----
> > From: schen16 [mailto:schen16@ford.com]
> > Sent: Sunday, April 21, 2002 11:29 PM
> > To: Verner, Carol (C.J.)
> > Cc: Jack Jao; Chang C.K; Kanai, Shinji (S.); Maurer, James (J.B.)
> > Subject: Re: U204 Stall Meeting (Field issue update: Engine stall ->
> No
> > restart (DPFE shortage))
> >
> >
> > Carol:
> >
> > It's nice to have your assistance, this vehicle is Mazda Tribute 2.0L
> > with
> > automatic transmission, I have got this PCM and attached the label of
> > this
> > PCM for your reference. I hope this can help you to order the PCM.
> >
> > Regards,
> >
> > S. N. Chen
> >
> >

> > ----- Original Message -----
> > From: "Verner, Carol (C.J.)" <cverner@ford.com>
> > To: "Chen, Smith S N (S.)" <schen16@ford.com>
> > Cc: "Maurer, James (J.B.)" <jmaurer@ford.com>; "Kanai, Shinji (S.)"
> > <kanai.sh@sv.mazda.co.jp>
> > Sent: Saturday, April 20, 2002 3:01 AM
> > Subject: FW: U204 Stall Meeting (Field issue update: Engine stall ->
> No
> > restart (DPFE shortage))
> >
> >
> > > Good Morning Mr. Chen,
> > >
> > > I am a member of a Team working on the dpfe sensor and stall issues
> > > regarding the Tribute/Escapes. Mark Freeland is a member of the
> team
> > as
> > > well. I have the assignment to order a PCM to replace the one Mark
> has
> > > asked you to send to him. Before I can order one I need some more
> > > information about the vehicle. Attached is a memo from Kanai-san in
> > > Kansas City which list the VIN and vehicle build date.
> > >
> > > I am attaching an excel spreadsheet from the Design Engineer at
> > Visteon
> > > with the part numbers for the all PCMs (EEC) across the world. You
> > will
> > > see that there are different part numbers depending on vehicle
> > content.
> > > I would like you help to make sure I have enough information to
> order
> > > the correct PCM from Visteon. If I use the part number you sent
> Mark
> > > Freeland (YL8Z-12A650-TG) it will take another 2 - 3 weeks to get
> the
> > > part. This is a Service part number and unfortunately they do not
> > stock
> > > the part. They would have to order it from Visteon as well. This
> is
> > > why I have decided to try and order from Visteon myself to save
> time.
> > >
> > > Based on all the information I have the vehicle is a Model Year 2002
> > > Mazda Tribute with a 2.0L Zetec engine with VIN provided by
> Kanai-san.
> > I
> > > need to know if I should buy PCM for a manual transmission (MTX,
> Part
> > > Number YL8F-12A650-PD) or automatic transmission (ATX, Part Number
> > > YL8A-12A650-AA) for the Taiwan market?
> > >
> > > If you have any questions about the information I am asking for,
> > please
> > > send back a note.
> > >
> > >
> > > Thank you
> > > Carol Verner
> > > FMEI Component Engineer

> > >
> > > -----Original Message-----
> > > From: Freeland, Mark (M.)
> > > Sent: Friday, April 19, 2002 12:36 PM
> > > To: Verner, Carol (C.J.)
> > > Subject: FW: U204 Stall Meeting (Field issue update: Engine stall ->
> > No
> > > restart (DPFE shortage))
> > >
> > >
> > >
> > >
> > > Regards
> > >
> > > Mark Freeland
> > >
> > > > 6-Sigma Black Belt
> > > > Engine Research Department
> > > > Ford Research Laboratory
> > > > P.O. Box 2053
> > > > MD 2629 - SRL - Room 1517
> > > > Dearborn, MI 48121-2053 USA
> > > email: mfreela1@ford.com
> > > Tel.:   (313) 594-7645
> > >
> > >
> > > -----Original Message-----
> > > From: Shinji Kanai [mailto:kanai.sh@sv.mazda.co.jp]
> > > Sent: Wednesday, April 10, 2002 6:59 PM
> > > To: 'Sanders, Muriel (M.S.)'; 'Altoonian, Don (D.J.)'; 'Badgley,
> Joel
> > > (J.K.)'; 'Bauer, Scott (S.C.)'; 'Bhojwani, Kamal (K.)'; 'Blackburn,
> > > Thomas (T.J.)'; 'Bogema, John (P.)'; 'Cary Powell'; 'Chick, John
> > (J.)';
> > > 'Chih, Ming-Niu (M.N.)'; 'Chin, Darrel (D.)'; 'Corbett, Sandra
> > (S.M.)';
> > > 'Dalbo, Bob (R.J.)'; 'Dan Rothweiler'; 'De Pena, Juan (J.E.)';
> 'Diez,
> > > Timothy (T.P.)'; 'Fascetti, Bob (R.J.)'; 'Fournelle, Gilbert (G.)';
> > > 'Freeland, Mark (M.)'; 'Giles, Stuart (S.)'; 'Gokhale, Renuka
> (R.V.)';
> > > 'Grimes, Jeff (J.R.)'; 'Hansen, George (G.C.)'; 'Herr, George
> (G.J.)';
> > > 'Hofman, Michael (M.V.)'; 'Holmes, Jeffrey (J.R.)'; 'Ichikawa,
> > > Jiyunichiro (J.)'; 'Jensen, Ted (T.E.)'; 'John McDonald'; 'Jones,
> > Andy';
> > > 'Jordan, Donald (D.E.)'; 'Kanai, Shinji (S.)'; 'King, Robert
> (R.F.)';
> > > 'Klostermann, Eric (E.)'; 'Kosko, Jeff (J.R.)'; 'Kwon, Soon (S.K.)';
> > > 'Limtiaco, Steven (S.)'; 'Linde, Peter (P.A.)'; 'Liu, Jane (J.)';
> > > 'Luehrsen, Eric (E.A.)'; 'Marck, Edmond (E.C.)'; 'Matesa, John
> (J.)';
> > > 'Maurer, James (J.B.)'; 'Mazzella, Gary (G.R.)'; 'Mooney, Larry
> (L.)';
> > > 'Moorhouse, Scott (S.R.)'; 'Morgan, Tom'; 'Morishima, Shigeki (S.)';
> > > 'Naveed Khan'; 'Nematollahi, Sonya (S.)'; 'Nikolai, Bernie';
> > 'Noteboom,
> > > Jim (J.E.)'; 'Ortman, James (J.W.)'; 'Powers, Ken (K.W.)'; 'Price,
> > > Martin (M.)'; 'Raquepau, Alden (A.P.)'; 'Shah, Kiran (K.C.)';

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> > > 'Shiraishi, Masaru (M.)'; 'Stilgenbauer, Jeffrey (J.R.)'; 'Suarez,
> > Rhae
> > > (R.)'; 'Sullivan, Jamie (J.P.)'; 'Takasawa, Keith (K.D.)'; 'Takubo,
> > > Hiroichi (H.)'; 'Vecchio, Anne Marie (A.)'; 'Wakenell, Ray (R.A.)';
> > > 'Wettach, Bill (B.)'; 'Williams, Les (LHW.)'; 'Williamson, David
> > > (D.E.)'; 'Yeung, Lem (.)'
> > > Subject: U204 Stall Meeting (Field issue update: Engine stall -> No
> > > restart (DPFE shortage))
> > >
> > >
> > > I update Taiwan case as follows.
> > >
> > > VIN:5F2CU08B81KM71661
> > > Prod. July,2001 at Hofu. Sale: Sep. 24,2001.
> > >
> > > Stall occurred on Mar. 01, 2002, 6937km.
> > > Before the case, the car had no problem (back to the dealer for
> 1000
> > &
> > > 5000KM regular maintainence only.)
> > > When the car picked back to the dealer:
> > >   1. can't start again.
> > >   2. can't communicate with WDS.
> > >   3. replacing another PCM (from anothe same model
> > car),can't
> > > communicate with WDS.
> > >   4. with original PCM, communicate with WDS by using "
> > Manual
> > > Entry" function of WDS.
> > >   5. WDS showed DTC : B1681/B1401/U1262
> > >   6. diagnoze the DTCs with " Probe test" function of WDS,
> > > everything seemed OK.
> > >   7. because the connector of DPFE was disconnected in
> "Probe
> > > test", the technician tried to
> > >   start again after the test, the car started, then
> found
> > > the DPFE was disconnected.
> > >   8. try several times, all the same, when the connector
> was
> > > connected, can't start. when disconnecting,
> > >   can start again.
> > >   9. change another new DPFE, the problem was disappeared.
> > >
> > > Shinji Kanai
> > > -----Original Message-----
> > > From:
> > > Sent: Monday, April 08, 2002 9:16 PM
> > > Subject: U204 Stall Meeting (Field issue update: Engine stall -> No
> > > restart (DPFE shortage))
> > >
> > >
> > > I update concern which I reported Stall meeting in last week. Failed
> > > DPFE sensors were scrapped at dealers in all cases.
> > >
> > > CASE 1 (Japan)
> > > VIN: EPEW-101286, Hofu build: 2000/12/13, Retail 2000/12/26
> > > (1) First repair 2001/4/9   4,893km
> > > DTC P0401 and P1408 illuminated. DPFE output Voltage was 0.122V

> > > (standard 0.95 - 1.05V).
> > > Replace DPFE sensor with new one. Problem was solved.
> > > (2) Second repair 2001/8/20   11,084km
> > > Engine stall during normal operating temp. Starter was clanking but
> > > engine did not start.
> > > WDS tester could not communicate with PCM. BUS(-) terminal voltage
> > > showed 1.9V (standard 4.5V) causing NO communication.
> > > Vref was 2.0V (standard 4.0 - 6.0V). When DPFE sensor connector was
> > > disconnected, Vref increased to 5V.
> > > Same time Click sound was observed from Fuel pump relay and fuel
> > > pressure was increased to normal range.
> > > Also BUS(-) terminal voltage was returned 4.5V at same time, and WDS
> > can
> > > communicate with PCM.
> > > Replace DPFE sensor with new one. Problem was solved.
> > > <<<DPFE sensor lot number is unknown. According to second repair
> date,
> > > it might be pre CM part.>>>
> > >
> > > CASE 2 (Taiwan)
> > > We are contacting Taiwan continuously.
> > >
> > > CASE 3 (Australia)
> > > Attachment is the information from Australia (VIN:
> JM0YU06BY11100053,
> > > Hofu build 2001/01/09).
> > > In addition to this report;
> > > (1) Vref was 2.1 V (standard 4.0 - 6.0V) during NO start condition.
> > > (2) Vref returned standard value and engine started immediately
> after
> > > disconnect DPFE connector.
> > > (3) In this DPFE internal shortage case, WDS cannot communicate to
> > PCM.
> > > Replace DPFE sensor with new one. Problem was solved.
> > > <<<DPFE sensor lot number is unknown. According to build date, it
> > might
> > > be pre CM part.>>>
> > >
> > >

> > > Shinji Kanai
> > > Manager, Tribute Plant QA
> > > Mazda North American Operations
> > >
> > > Ford Kansas City Assembly Plant
> > > Plant Vehicle Team
> > > 8121 N.E. Hwy. 69, Claycomo, MO 64119 USA
> > > Tel: 816-459-1623/ Fax: -1726/ e-mail: kanai.sh@sv.mazda.co.jp
> > > Local Text Pager: 9135677156@alphapage.airtouch.com

> > >
> > >

Freeland, Mark (M.)

From:	Johnson, Joe (J.H.)
Sent:	Wednesday, October 16, 2002 7:16 AM
To:	Surti, P. J. (P.J.); Gates, Freeman (F.C.); Freeland, Mark (M.); Boyk, Greg (G.J.); Levergood, Rich (R.); Adams, Kerry (K.N.); Dakhlallah, Hassan (H.A.); Billingslea, Charles (C.F.); Michalowicz, Cheryl (C.C.); Sloan, Burt (B.E.); Hart, Jenny (J.)
Cc:	DiAngelo, Renaldo (R.); Noteboom, Jim (J.E.); Pepitone, Gil (J.); Vroman, Dennis (D.A.); King II, Lamar (L.L.)
Subject:	RE: STRANGE EGR SYSTEM FAILURE MODE ON A NEW 2002 EXPLORER

P.J., please send the parts to me. I am very interested in this failure. Thanks in advance for your help because its this kind of feedback that help us to resolve these issues.

Joe Johnson
Supervisor, EGR Systems, FMEI Dept
V-Engine Engineering, Powertrain Operations
POEE Bldg, Mail Drop 69
21500 Oakwood Blvd
Dearborn, Mich 48124-4091

Ph: (313) 845-6292
Fax: (313) 390-4084
e-mail: jjohnson@ford.com

-----Original Message-----

From:	Surti, P. J. (P.J.)
Sent:	Tuesday, October 15, 2002 8:46 PM
To:	Johnson, Joe (J.H.); Gates, Freeman (F.C.); Freeland, Mark (M.); Boyk, Greg (G.J.); Levergood, Rich (R.); Adams, Kerry (K.N.); Dakhlallah, Hassan (H.A.); Billingslea, Charles (C.F.); Michalowicz, Cheryl (C.C.); Sloan, Burt (B.E.); Hart, Jenny (J.)
Cc:	DiAngelo, Renaldo (R.); Noteboom, Jim (J.E.); Pepitone, Gil (J.); Surti, P. J. (P.J.)
Subject:	STRANGE EGR SYSTEM FAILURE MODE ON A NEW 2002 EXPLORER

Pl. see the attached CQIS report on EGR tubes concern which might damage the DPFE sensors. This happened to be a Motorola sensor. The
sensor was reading out of spec. when trouble was identified but later it read 1.03 Volt on KOEO test,within spec.. In any event, the sensor was replaced,
as intermittently it went out of spec. and so it may require to be analyzed on a test vehicle. Both the sensor and the tube are available for further test
analysis. Pl. let me know where to ship these parts. Thanks...

CSQI002 CQIS Indicator Summary 10/15/02 20:13:00
==> ____ 1 of 1
Rpt#: 2JOI4001 PTOFSE Rpt: 10/15/2002 Odom: 73 M
Rvwd: File: _ Folder: ________ Attchmnts: 0 Print Smy/Disp Detail(P/D): _
Vehicle: 2002 EXPLORER 4X2,2DR ,SPORT 1FMYU60E42UD73085 Bld: 06/14/2002
Engine: 4.0L SOHC Calb: 2U71AG0A Trans: A5LDE Axle: 3200F3.73L A/C: YES
Dealer Id: 05517 Sunset Ford Ph#: (714) 372-4520
State: California City: Westminster Orig/Caller: P. J. SURTI
Symptom: 6 96 2 00 DRVABL,INDICATOR,CHECK ENGINE,OTHER-CODE NA
Addl Sym: St: CCRG/EPRC: _ Rvwd: Dt:
Fix: Caus. Comp: SENSOR ASY EGR PR VL -- RPL Condition Code: 42
PSURTI (714) 962-3227 FAX: MIL? Y ABA? Symp Vf? Survey? N
EO: EC: Prt St: O
ER: CB: Intmit? N
CONCER CHECK ENGINE LIGHT STAYS ON.

REPAIR VERIFIED THE MIL CONCERN. HOOKED UP WDS AND RETRIEVED THE DTCS P1400 FOR KOEO HARD FAULT AND P0401 FOR KOEO-C TESTS, INDICATING EGR SYSTEM CONCERN. RAN DCL DISPLAY AND MONITORED DPFE SENSOR READING. IT READ AROUND 0.1 VOLT, OUT OF SPEC.. REPLACED THE DPFE SENSOR. THIS HAPPENED TO BE A MOTOROLA SENSOR. WHEN TRIED ANOTHER SENSOR, IT READ 2.1 VOLT, WITH EGR TUBE CONNECTED, AGAIN OUT OF SPEC.. SO TRIED ANOTHER DPFE SENSOR. IT ALSO READ THE SAME 2.1 VOLT. SUSPECTED THE PROBLEM IN TUBE. PUT THE SECOND SENSOR BACK IN THE STOCK. TESTED THE EGR TUBE WITH VACUUM PUMP AND FOUND BLOCKAGE IN THE DOWNSTREAM(BIGGER DIA, HI) TUBE. IT APPEARS THAT THE TUBE WAS PLUGGED IN THE WELDED AREA. WE COULD NOT PINPOINT THE REASON OF THE BLOCKAGE. REPLACED THE EGR TUBE AND THE ORIGINAL DPFE SENSOR. ALTHOUGH THE ORIGINAL SENSOR STARTED TO READ NORMAL WHEN WE TESTED IT AGAIN BUT IT SEEMED TO BE VERY SENSETIVE AND CHANGING VOLTAGE WITH VERY SMALL VACUUM SIGNAL, USING EXTERNAL VACUUUM PUMP. THERE WAS A FEELING THAT THE SENSOR MAY HAVE BEEN DAMAGED BY THE BLOCKED SIGNAL AND INTERMITTENTLY MAY BE ACTING UP. BOTH THE PARTS ARE AVAILABLE FROM THE FQS FOR FURTHER TEST ANALYSIS.

P. J. [illegible]
Powertrain FQS
T. No. (714) [illegible]
Fax No. (714) [illegible]

EA02-027-C 3387

Freeland, Mark (M.)

From:	Fournelle, Gilbert (G.)
Sent:	Wednesday, October 16, 2002 11:06 AM
To:	Alsoonian, Don (D.J.); Sauer, Scott (S.C.); Bhojwani, Kamal (K.); Blackburn, Thomas (T.J.); Bogema, John (P.); Cary Powell (E-mail); Chick, John (J.); Chih, Ming-Niu (M.N.); Chin, Darrel (D.); Corbett, Sandra (S.M.); Dalbo, Bob (R.J.); De Pena, Juan (J.E.); Diez, Timothy (T.P.); Duvall, Allen (A.W.); Fascetti, Bob (R.J.); Fournelle, Gilbert (G.); Freeland, Mark (M.); Giles, Stuart (S.); Gokhale, Renuka (R.V.); Goodwin, William (W.R.); Grewal, Bill (B.S.); Grimes, Jeff (J.R.); Hansen, George (G.C.); Herr, George (G.J.); Hofman, Michael (M.V.); Holmes, Jeffrey (J.R.); Hoshino, Jun (J.); Ishikawa, Jiyunichiro (J.); Jensen, Ted (T.E.); Jones, Andy; Jordan, Donald (D.E.); Kanai, Shinji (S.); Khan, Naveed; Kosko, Jeff (J.R.); Kwon, Soon (S.K.); Lawler, Dave (D.A.); Le, Dzung (D.H.); Limtiaco, Steven (S.); Linde, Peter (P.A.); Liu, Jane (J.); Marck, Edmond (E.C.); Marianos, Tom (T.E.); Matesa, John (J.); Maurer, James (J.B.); Mazzella, Gary (G.R.); Mcdonald, John; McGee, Brett (B.L.); Mooney, Larry (L.); Moorhouse, Scott (S.R.); Morgan, Tomiko (T.T.); Morishima, Shigeki (S.); Nakano, Hideki (H.); Nematollahi, Sonya (S.); Nikolai, bernie; Noteboom, Jim (J.E.); Ortman, James (J.W.); Powers, Ken (K.W.); Price, Martin (M.); Raquepau, Alden (A.P.); Rothweiler, Daniel (D.); Shah, Kiran (K.C.); Shiraishi, Masaru (M.); Stilgenbauer, Jeffrey (J.R.); Suarez, Rhea (R.); Takasawa, Keith (K.D.); Takubo, Hiroichi (H.); Veenstra, Tim (T.W.); Wakenell, Ray (R.A.); Wettach, Bill (B.); Williams, Lee (LHW.)
Subject:	Phantom stall meeting for 10/17/02 cancelled

The phantom stall meeting is cancelled for tomorrow 10/17/02 due to the fact that the calibration group is on a hot weather test trip. Meeting notices will be sent out next week for future stall meetings.

Regards,

Gilbert Fournelle
V6 U204 Calibration Engineering
1AE27 Truck Engine Engineering (TEE)
Phone:(313)3904968 Fax:(313)3231786

ER02-027-C 3388

Freeland, Mark (M.)

From: Oboza, Doran (D.)
Sent: Friday, October 18, 2002 12:05 PM
To: Agarwal, Apoorva (A.); Banke, Nermine (N.B.); Coryea, Kevin (K.W.); Cvetkovski, Peter (P.); Deegan, Mike (M.D.); Falls, Stephen (S.W.); Feshina, Ayodeji (A.); Fodera, Michael (M.J.); Foust - Smith, Susan (S.L.); Freeland, Mark (M.); Giannamore, Armand (A.A.); Ivaniszyn, Teri (T.E.); Kalamdani, Rajeev (R.S.); Matt Morin; Morton, Michael (M.F.); Motley, Lesia (L.M.); Norman, Ingrid (I.); Odum, Ike (I.C.); Prater, Joseph (J.A.); Rezaes, John (J.H.); Selleck, Beth (B.); Stearns, Pamm (P.V.); Tedone, Damian (D.J.); Tobie, Bruce (B.J.); Trombetta, Christopher (C.B.); Winakoff, Bryan (B.D.); Zubeck, Michael (M.W.); Abbas, Jehad (J.F.); Acuff Jr., Melvin (M.); Ahmed, Kamal (K.); Ajulufoh, Bert (S.O.); Anderson, Johnny (J.D.); Arszulowicz, Ken (K.J.); August, Dan (D.); Balls, Don (D.W.); Baum, Joe (J.M.); Bednarek, Mark (M.P.); Bostner, Derryle (D.R.); Brian Johnson; Brockette, Ronald (R.K.); Broski, James (J.W.); Brown, Mark (M.D.); Campbell, Aindrea (A.M.); Campbell, Donald (D.C.); Caruso, Barry (B.); Castleman, William (W.G.); Centivre, James (J.C.); Cervantes, Eduardo (E.J.); Chris Campbell; Ciechanowski, Mark (M.S.); Clugston, Shane (S.A.); Coale, Richard (R.M.); Colatruglio, Vince (V.E.); Cox, Tom (T.T.); D'Agostino, Antonio (A.); Davis, Jerry (J.W.); Debbie Paliani; Dhaliwal, Dave (B.S.); Duneske, Dennis (D.R.); Dyson, Simon (S.C.); Fike, Barbara (B.G.); Fluker, James (J.A.); Fowlkes, Michael (M.S.); Francisco Fernandez (E-mail); Franklin, Taj (T.); Gamble, Craig (C.R.); Gazdecki, Timothy (T.A.); Gee, Sterling; Gerke, David (D.W.); Giles, Anthony (A.T.); Gilmer, David (D.C.); Giordano, Mike (M.A.); Goulet, Michele (M.A.); Grace, John (J.E.); Granados, Rodolfo (R.); Groom, Reginald (R.); Gucciardo, Steve (S.P.); Hegde, Damodar (D.M.); Helmstadter, Donald (D.G.); Hettie, Bruce (B.W.); Holloway, Scott (J.S.); Hopkins II, Harry (H.S.); J. Sowards; Jahshan, John; Jeff Palmer; King, Steve (S.J.); Kinnie, Brian (B.W.); Kircal, Iain (I.G.); Kline, Denise (D.M.); Koch, Thomas (T.P.); Kunde, Olaf (O.); Lardizabal, Sergio (S.); Lizotte, Brian (B.W.); Longwell, Christine (C.); Lubo Djuric; MacDonald, George (G.F.); Madej Jr., Stan (S.P.); Marsac, Lance (L.D.); Matthews, Gary (G.); Matyslewicz, Edwin (E.J.); McCowin, Enoch (E.G.); Mihora, Bob (R.S.); Mitchell, Carole (C.A.); Morabito, Mike (M.P.); Moses, Edwin (E.D.); Nemeth, Steve (S.L.); Nguyen, Thien (T.M.); O'Connor, Jim (James W.); Patel, Praful (P.J.); Plasencia, David (D.B.); Post-barnes, Donna (D.F.); Pope, Colin (C.M.); Popenas, Michael (M.J.); Pullela, Ananth (A.); Purvis, Bruce; Ramey, George (G.); Reichenbach, Ronald (R.W.); Rossman, Michael (M.D.); Sands, Roger (R.P.); Sheridan, Richard (R.D.); Shopp, James (J.J.); Singley, Rogers (R.W.); Smith, David (D.A.); Smith, Tennille (T.C.); Soulliere, James (J.K.); Spaniak, Terrence (T.E.); Stevenson, Ethel (E.E.); Stojov, Tony (T.); Stump, Steven (S.M.); Swick, Curt (C.); Sykora, Andrew (A.D.); Szczepaniak, Gerard (G.); Taraszkiewicz, Alexande (A.S.); Thomas, Ken (K.C.); Torosian, David (D.A.); Tourco, Lyle (L.W.); Tucker, Shanise (S.M.); Vangavolu, Sreedhar (.); Vinogradov, Alex (A.); Walker, Cheryl (C.); Walsh, Gerald (G.); Washington, Eric (E.D.); Wegrzyn, Michael (M.J.); Wepler, Ron (R.J.); Werner, Barbara (B.R.); White, Christopher (C.); Wistr, Joseph (J.M.); Wiedmeyer, Robert (R.J.); Williams, Anthony (A.J.); Williams, Elizabeth (E.P.); Williams, Michael (M.T.); Williams, Robert (R.L.); Willis, Deon (D.G.)
Cc: Samoluk, Kenneth (K.F.)
Subject: Powertrain PQR Agenda for 10/23/02

Agenda for 10/23/02

FACTS Update	C. White/R. Wepler
Yard Audit Review	G. MacDonald
Early Warranty Review	D. Oboza
Fuel Pump Update	K. Samoluk/D. Oboza
Roadmaps Overview	D. Oboza
C90 Connector Update	A. D'Agostino/S. Holloway
Gas Caps - Six Sigma	D. Tedone
VMV Six Sigma Project	K. Coryea
PCM - P0605	J. Jahshan

PQR Meeting time is 9:30 - 10:30 in the WSAP Chart room
VRT meeting is 10:30 - 11:30 in the Maverick room

Doran Oboza
Powertrain Quality Analyst - Wayne Assembly Plant
Phone - 734-467-0604
Pager - 734-296-5439
email - doboza1@ford.com

"I would rather wake up in the middle of nowhere, than in any city in the world."
Steve McQueen

Freeland, Mark (M.)

From: O'Neall, Jim (J.D.)
Sent: Monday, October 21, 2002 6:28 PM
To: 'kpark@kavlico.com'
Cc: Freeland, Mark (M.)
Subject: FW: dPFE Filter Test Results to date

Here is some of the test data from Mark Freeland that we feel is pertinent to the discussion we had today. Mark asked that I forward it to you.

J. D. O'Neall
Manager, Fuel Metering, Emissions, and Ignition Dept
V-Engine Engineering, Ford Motor Company
joneall@ford.com, 313-322-6839

-----Original Message-----
From: Freeland, Mark (M.)
Sent: Thursday, October 10, 2002 8:35 PM
To: Kozowarik, John (J.J.); O'Neall, Jim (J.D.)
Cc: Davis, George (G.C.); Maurer, James (J.B.); Gates, Freeman (F.C.); Verner, Carol (C.J.); Alles, Sharon (S.A.); Kobwick, Allan (A.J.); Bryant, Bruce (B.D.); McCoy, James (J.D.)
Subject: dPFE Filter Test Results to date

John,

The attached workbook summarizes the testing that I have conducted to date on the proposed filter design Rev. 1.5.
I have tested back to back 2001 MY dPFE, the current production dPFE, and two copies of the Rev 1.5 filter (one with the original MOV and the other with Kavlico's proposed silicon drop in replacement).

I do not have the multi point vehicle failure mode test data nor the ESD test data yet. For the tests that I have conducted to date the Rev. 1.5 filter is "bullet proof". I have catastrophically failed a number of the 2001 MY and current production devices, but have not yet to observe any degradation in either of the two parts which are protected with the Rev. 1.5 filter.

I have also attached the complete set of results with raw data for the SCR Latch Threshold Statistics, which compares the 2001 MY, the current production Delsa die parts and the ESM. The data set also includes the die level latch threshold for the 2001 MY die.

Filter Rev 1_5 Test Results.xl... SCR Latch Threshold Statistics...

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com

EA02-027-C 3391

Freeland, Mark (M.)

From:	Power, James (J.H.)
Sent:	Tuesday, October 22, 2002 10:45 AM
To:	Freeland, Mark (M.); Platta, Shari Finn (S.F.)
Subject:	RE: Effect of changing the spark plugs on the Mountaineer

Mark, Shari is developing a vested interest in this subject. You should talk. Shari, read Mark's note below.

Jim, Dennis, or Gary,

Could any of you spare 30 minutes - 1 hour to help me determine what systems might be affected by low resistance (>2kOhms) spark plugs? Specifically, I would want to know what signals I could read that might be changed by the reflected noise. We currently know that there is some quantity of low resistance plugs in the field, but I'm unable to determine the size of the potential problem.

Thanks, in advance.

Regards,
Shari (Finn) Platta

-----Original Message-----

From:	Freeland, Mark (M.)
Sent:	Tuesday, October 22, 2002 10:26 AM
To:	Maurer, James (J.B.); Alles, Sharon (S.A.); McCoy, James (J.D.)
Cc:	Kobwick, Allan (A.J.); Gates, Freeman (F.C.); O'Neall, Jim (J.D.); Elwell, Fred (F.); Power, James (J.H.); Boran, Lisa (L.T.)
Subject:	Effect of changing the spark plugs on the Mountaineer

Jim,

As you know Fred Elwell and Jim Power replaced the spark plugs on my lease Mountaineer yesterday. They confirmed that the "bad" plug still had a resistance of less than 200 ohms, (I think the number they measured was 194 ohms for #4 plug).

The result on my drive evaluation last night was as follows:

The maximum Peak to Peak amplitude of the HF noise on Vref (as measured by the instrumentation set up) during accelerations reduced from 41 volts to 17 volts. This was a tremendous reduction.

I can no longer find the micro latch events which I have being recording with my instrument pick ups located between the filter and the unprotected dPFE (i.e. C2, C5 & Z1 removed from a 2001 MY sensor).

We should discuss the possibility of replacing spark plugs as part of the fix package. Perhaps there is some simple tool which could be used to identify if a vehicle has noisy plugs without removing the plugs? Does anyone know of such a tool, perhaps an RF "sniffer"?

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory

EA02-027-C 3382

P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: rnfreela1@ford.com
Tel.: (313) 594-7645

Structured Inventive Thinking at work

Freeland, Mark (M.)

From:	Verner, Carol (C.J.)
Sent:	Friday, October 25, 2002 2:15 PM
To:	Freeland, Mark (M.)
Subject:	RE: MPG Focus Testing

Mark,

Jim is on vacation and will be back on Monday. I have not received the sample yet.

Carol

-----Original Message-----

From:	Freeland, Mark (M.)
Sent:	Friday, October 25, 2002 1:25 PM
To:	Duncan, Jack (J.L.); Verner, Carol (C.J.); Maurer, James (J.B.)
Cc:	Gates, Freeman (F.C.); McCoy, James (J.D.)
Subject:	RE: MPG Focus Testing

Thanks Jack, I will follow up with Carol and Jim.

Carol & Jim, would you like SRL's assistance in examining the part for symptoms, both electrical and visual?

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

-----Original Message-----

From:	Duncan, Jack (J.L.)
Sent:	Friday, October 25, 2002 1:14 PM
To:	Freeland, Mark (M.); McCoy, James (J.D.); Maurer, James (J.B.); Gates, Freeman (F.C.)
Cc:	Verner, Carol (C.J.)
Subject:	RE: MPG Focus Testing

FYI, the sensor was sent to Carol Verner Wednesday. Either she has it now, or it is sitting at POEE shipping & receiving.

Jack Duncan	jduncan1@ford.com
MI Proving Ground	
74240 Fisher Rd	(586) 75-28563 (w)
Romeo, MI 48065	(586) 75-28683 (f)

-----Original Message-----

From:	Freeland, Mark (M.)
Sent:	Friday, October 25, 2002 1:02 PM

To: McCoy, James (J.D.); Maurer, James (J.B.); Gates, Freeman (F.C.)
Cc: Duncan, Jack (J.L.)
Subject: RE: MPG Focus Testing

If you would like the sensor looked at for failure mode and symptoms, I would be happy to offer the services of the lab. Just let me know when you would like us to look at it.

Did anyone figure out what the "noise" on the Iref signal is exactly? It should be predominantly about 8 mA with downward deviations to about 6 or 7 mA. There should be no positive deviations above 8 mA if everything is normal.

Other comment is, we don't know what happened between the readings which were taken at 1 minute intervals.

Regards

Mark Freeland

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Engine Research Department
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Tel.: (313) 594-7645

-----Original Message-----
From: McCoy, James (J.D.)
Sent: Thursday, October 24, 2002 1:53 PM
To: Maurer, James (J.B.); Freeland, Mark (M.); Gates, Freeman (F.C.)
Cc: Duncan, Jack (J.L.)
Subject: MPG Focus Testing

<< File: m8cyo4551.xls >>
Data sent by Jack Duncan on the Focus from MPG.

Chart shows VREF, DPFE out, and VREF current with reference to the DPFE failure.

Regards,
Jim McCoy

Fuel Metering, Emissions & Ignition Systems Engineering
Hardware Control Interface Group
V-Engine Engineering
POEE - MD#69 - Rm. D142 - Cube DF186
Phone (313) 33-79690 / Fax (313) 39-04084
E-Mail: jmccoy1@ford.com

Freeland, Mark (M.)

From: Maurer, James (J.B.)
Sent: Thursday, October 17, 2002 11:16 AM
To: Freeland, Mark (M.)
Subject: SRL Involvement in analysis of DPFE failures

Mark,
Some members of our senior management team are not aware of all the efforts that SRL has made in behalf of the analysis of warranty returns and test parts. I want to make a slide for a presentation tomorrow that would list the people who have been involved. The names I have are you (of course), Jon Hangas, Tim Potter, Roscoe Carter, Dalrene Uy, Al Kotwicki, and Lebzy Gonzales. I am sure there are more. Do you have any other names?

Regards,
Jim Maurer
James B. Maurer
V-Engine 6-Sigma Team Leader
Fuel Metering Dept. V Engine Engineering
Phone (313) 390-3672, Fax (313) 390-4084
Text Page: (313) 795-5219
Email: jmaurer@Ford.com

Freeland, Mark (M.)

From: McCoy, James (J.D.)
Sent: Thursday, October 17, 2002 11:27 AM
To: Freeland, Mark (M.)
Subject: DPFE date code

Mark, Sorry for the delay. Date code of "01 Tribute DPFE is 1H27B (August 27, 2001?)

Regards,
Jim McCoy
Fuel Metering, Emissions & Ignition Systems Engineering
Hardware Control Interface Group
V-Engine Engineering
POEE - MD#69 - Rm. D142 - Cube DF186
Phone (313) 33-79690 / Fax (313) 39-04094
E-Mail: jmccoy1@ford.com

Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Wednesday, October 02, 2002 1:06 PM
To: O'Neall, Jim (J.D.)
Subject: Accepted: DPFE circuit changes

Freeland, Mark (M.)

From:	Freeland, Mark (M.)
Sent:	Wednesday, October 02, 2002 1:39 PM
To:	Akolkar, Shrikant (S.V.)
Cc:	Verner, Carol (C.J.); Maurer, James (J.B.)
Subject:	Failed part from Roush

Shri,

The part you showed me in the lab today which has the RML number 6798-011 inscribed on the case was a Lima Engine Plant Warranty Return which was logged into Kavlico's data base on 4/25/2001. It was working when it was tested at Kavlico then.

I guess it had an intermittent fault before you put it onto the test, so not surprisingly it has shown up as a failure.

Regards

Mark Freeland

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MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Friday, October 04, 2002 1:27 PM
To: Akolkar, Shrikant (S.V.)
Subject: RE: Failed part from Roush

Shri,

Thanks for the feedback. I appreciate being kept in the loop.

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
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MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

-----Original Message-----
From: Akolkar, Shrikant (S.V.)
Sent: Thursday, October 03, 2002 10:27 AM
To: Freeland, Mark (M.)
Cc: Verner, Carol (C.J.); Maurer, James (J.B.); Gates, Freeman (F.C.); Bersie, Anita (A.); Robinson, John (J.W.)
Subject: RE: Failed part from Roush

Thanks Mark for digging into the database.

That makes one fact clear that we haven't seen any failure yet at Roush or MPG after running 100 to 200 cycles (~hours) in tests. But I feel we should continue up to 500 cycles on few sensors. I have some ideas to make test more severe. Jim, do you want me to set up meeting to review the test results so far & discuss the test severity issue?

-----Original Message-----
From: Freeland, Mark (M.)
Sent: Wednesday, October 02, 2002 1:39 PM
To: Akolkar, Shrikant (S.V.)
Cc: Verner, Carol (C.J.); Maurer, James (J.B.)
Subject: Failed part from Roush

Shri,

The part you showed me in the lab today which has the RML number 8798-011 inscribed on the case was a Lima Engine Plant Warranty Return which was logged into Kavlico's data base on 4/25/2001. It was working when it was tested at Kavlico then.

I guess it had an intermittent fault before you put it onto the test, so not surprisingly it has shown up as a failure.

Regards

Mark Freeland

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Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Wednesday, October 09, 2002 9:56 AM
To: McCoy, James (J.D.)
Subject: RE: Access to PDC00024 MPG Data

Jim,

So I see!

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
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MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

-----Original Message-----
From: McCoy, James (J.D.)
Sent: Tuesday, October 08, 2002 1:55 PM
To: Freeland, Mark (M.); Alles, Sharon (S.A.)
Subject: FW: Access to PDC00024 MPG Data

I'm running into problems getting data.....................................My buddy Bob is trying hard to help us out.

Regards,
Jim McCoy
Fuel Metering, Emissions & Ignition Systems Engineering
Hardware Control Interface Group
V-Engine Engineering
POEE - MD#69 - Rm. D142 - Cube DF186
Phone (313) 33-79690 / Fax (313) 39-04084
E-Mail: jmccoy1@ford.com

-----Original Message-----
From: Diaz, Timothy (T.P.)
Sent: Tuesday, October 08, 2002 10:32 AM
To: Kern, Bob (R.S.); McCoy, James (J.D.)
Subject: RE: Access to PDC00024 MPG Data

Jim,

The 2001 Focus was engineered in Europe. The 2001 Escape was engineered by Mazda in Japan. I have data for neither vehicle.

Sincerely,
Timothy Diaz
Cross Vehicle EMC Technology Applications
313-32-39927, Fax: 313-322-1692

e-mail: tdiez@ford.com

-----Original Message-----
From: Kern, Bob (R.S.)
Sent: Tuesday, October 08, 2002 9:55 AM
To: McCoy, James (J.D.)
Cc: Diez, Timothy (T.P.); Collins, Bruce (B.R.); Boguslawski, Larry (L.J.)
Subject: RE: Access to PDC00024 MPG Data

Jim,
There are no 2001 vehicles in the pdc00024/proj/mpgrpt/ directory.
We don't keep reports for more than 1 yr here at EMC.

For the specific 2001 vehicle/engine family data you are looking for check with:

Focus & Escape----Tim Diez x-39927
Explorer-----------Bruce Collins x-24552
F-Series-----------Larry Boguslawski x-63296.

Tim/Bruce/Larry -- If you don't have the data, and you can tell me what vehicle #(s) that we tested with the engine family Jim is looking for, maybe I can cross-reference the TestNet order number (Mxxxxx) to find the raw J551 data on the hard drive at the RFI site computer. Thanks for your assistance.

-----Original Message-----
From: McCoy, James (J.D.)
Sent: Tuesday, October 08, 2002 9:12 AM
To: Kern, Bob (R.S.)
Cc: McCoy, James (J.D.)
Subject: FW: Access to PDC00024 MPG Data

Bob, sorry to bug you again. Would it be possible to get J551 plots of the following vehicles? I struck out with EESE. Let me know. Thanks. Jim.

2001 2.0L Zetec Focus
2001 3.0L DOHC Escape
2001 4.0L Explorer
2001 4.2L F-Series

Regards,
Jim McCoy
Fuel Metering, Emissions & Ignition Systems Engineering
Hardware Control Interface Group
V-Engine Engineering
POEE - MD#69 - Rm. D142 - Cube DF186
Phone (313) 33-79690 / Fax (313) 39-04084
E-Mail: jmccoy1@ford.com

-----Original Message-----
From: Frazier, Keith (R.K.)
Sent: Monday, October 07, 2002 10:18 AM
To: McCoy, James (J.D.)
Subject: RE: Access to PDC00024 MPG Data

I will not be able to help you on this one. I would spend more time trying to figure out what to do than it would take to drive to MPG and physically review the data. I suggest you ask Bob to forward the relavent data to you via normal email.

Regards,
R. Keith Frazier

Staff Technical Specialist (EMC)
Cross Vehicle EMC Technology & Applications
Electrical Electronic Systems Engineering, RVT
Phone: 313-322-3150
email: kfrazie1@ford.com

-----Original Message-----
From: McCoy, James (J.D.)
Sent: Monday, October 07, 2002 8:41 AM
To: Frazier, Keith (R.K.)
Subject: FW: Access to PDC00024 MPG Data

Keith, I see Tom is out until the 11th. Any chance you can help me out gaining access? I need to complete all my work by Friday.

Regards,
Jim McCoy

Fuel Metering, Emissions & Ignition Systems Engineering
Hardware Control Interface Group
V-Engine Engineering
POEE - MD#69 - Rm. D142 - Cube DF186
Phone (313) 33-79690 / Fax (313) 39-04084
E-Mail: jmccoy1@ford.com

-----Original Message-----
From: McCoy, James (J.D.)
Sent: Monday, October 07, 2002 8:39 AM
To: Hermann, Thomas (T.J.)
Cc: Alles, Sharon (S.A.); Freeland, Mark (M.); Maurer, James (J.R.); O'Neill, Jim (J.D.)
Subject: Access to PDC00024 MPG Data

Hi Tom,

I am investigating an issue across multiple vehicle lines and need to compare BBRE plots for the 2001 MY. I spoke to Bob Kern about reviewing the J551 traces and he suggested it would be easier to view them on line and print out what I needed. I agree it would save a lot of time. Would it be possible to get access to the PDC00024 server and the MPGRPT directory?

Thanks Tom.
Regards,
Jim McCoy

Fuel Metering, Emissions & Ignition Systems Engineering
Hardware Control Interface Group
V-Engine Engineering
POEE - MD#69 - Rm. D142 - Cube DF186
Phone (313) 33-79690 / Fax (313) 39-04084
E-Mail: jmccoy1@ford.com

Freeland, Mark (M.)

From:	Freeland, Mark (M.)
Sent:	Monday, October 14, 2002 5:38 PM
To:	Alles, Sheran (S.A.); Kotwicki, Allan (A.J.)
Subject:	Simulation answer required

i. Although the TVS has a much slower response time than the TBZ, when combined with the time constant provided by the R9/C5 low pass filter we believe that it's response time is adequately fast. (Sheran Alles & Al Kotwicki will verify this in their simulation).

Al, this will be a surprise for you, but not for Sheran, he will get with you and discuss tomorrow.

Sheran, this is a polite reminder of the item we were discussing when you had to leave this afternoon.

The rest of the discussion on the MOV is in the document which I will forward shortly.

Thanks for you're help on this one.

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
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MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

Freeland, Mark (M.)

From:	Freeland, Mark (M.)
Sent:	Monday, October 14, 2002 5:38 PM
To:	Alles, Sharan (S.A.); Kotwicki, Allan (A.J.)
Subject:	Spec sheet for the TBZ

[illegible].pdf

Regards

Mark Freeland

6-Sigma Black Belt
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Tel.: (313) 594-7645

Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Monday, October 14, 2002 7:27 PM
To: O'Neall, Jim (J.D.); Maurer, James (J.B.); Kotwicki, Allen (A.J.); Alles, Sheran (S.A.); Gates, Freeman (F.C.); Awad, Mahmoud (M.I.); McCoy, James (J.D.)
Cc: Davis, George (G.C.)
Subject: Discussion document on Rev. 1.51 with attachments

Jim et. al.

Attached is the document I committed to prepare by close of business today. Sheran has reviewed most of it, but still has to review the Z1, D1, D2 and the Ground plane discussions.

Please review and let me know if you need anything changed before you forward it to Kavlico.

Explanation of the proposed l... [illegible] Filter for 15_1.pdf [illegible].pdf

Regards

Mark Freeland

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email: mfreela1@ford.com
Tel.: (313) 594-7645

Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Tuesday, October 15, 2002 9:19 AM
To: Jensen, Ted (T.E.)
Cc: Limtiaco, Steven (S.)
Subject: Spark Plugs from Tributes

Ted,

Just to let you know that I followed up with Steve on Friday evening. He has committed to get me 10 sets of plugs with matching dPFE from randomly selected vehicles, within two weeks.

I will keep you posted on what I find from the returned components when I get them.

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
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email: mfreela1@ford.com
Tel.: (313) 594-7645

Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Thursday, October 17, 2002 11:33 AM
To: Maurer, James (J.B.)
Subject: RE: SRL Involvement in analysis of DPFE failures

Jim,
In addition to the names mentioned already;
Steve Simko did all the Auger analysis on the parts that we worked with.
Ed Slokafus as he is a FRL retiree.

Please send me a copy of the presentation when it is available, so that I can share it with my management also.

Thanks

Regards

Mark Freeland

6-Sigma Black Belt
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Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

-----Original Message-----
From: Maurer, James (J.B.)
Sent: Thursday, October 17, 2002 11:16 AM
To: Freeland, Mark (M.)
Subject: SRL Involvement in analysis of DPFE failures

Mark,
Some members of our senior management team are not aware of all the efforts that SRL has made in behalf of the analysis of warranty returns and test parts. I want to make a slide for a presentation tomorrow that would list the people who have been involved. The names I have are you (of course), Jon Hangas, Tim Potter, Roscoe Carter, Dairene Uy, Al Kotwicki, and Lebzy Gonzales. I am sure there are more. Do you have any other names?

Regards,
Jim Maurer
James B. Maurer
V-Engine 6-Sigma Team Leader
Fuel Metering Dept. V Engine Engineering
Phone (313) 390-3672, Fax (313) 390-4084
Text Page: (313) 795-5219
Email: jmaurer@Ford.com

Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Thursday, October 17, 2002 12:14 PM
To: McCoy, James (J.D.)
Subject: RE: DPFE date code

Thanks Jim,

Correct August 27th 2001.

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

-----Original Message-----
From: McCoy, James (J.D.)
Sent: Thursday, October 17, 2002 11:27 AM
To: Freeland, Mark (M.)
Subject: DPFE date code

Mark, Sorry for the delay. Date code of '01 Tribute DPFE is 1H27B (August 27, 2001?)

Regards,
Jim McCoy

Fuel Metering, Emissions & Ignition Systems Engineering
Hardware Control Interface Group
V-Engine Engineering
POEB - MD#69 - Rm. D142 - Cube DF186
Phone (313) 33-79690 / Fax (313) 39-04084
E-Mail: jmccoy1@ford.com

Freeland, Mark (M.)

From:	Freeland, Mark (M.)
Sent:	Friday, October 18, 2002 9:31 AM
To:	Kotwicki, Allan (A.J.); Maurer, James (J.B.)
Cc:	Alfes, Sharan (S.A.); McCoy, James (J.D.)
Subject:	Prototypes

Al,

What was the name of the individual you said could make surface mount mods to the substrates. I think it is time to try and fabricate some parts which are not breadboards.

Currently we have available 4 Rev 1.5 breadboard parts with the AVX TVS, and 1 Rev 1.5 with the Diodes Incorporated TBZ.

No one has asked for prototypes yet, except for Jim McCoy, but I know that eventually they will.

Jim,

Do you have a need for any prototypes?

Regards

Mark Freeland

6-Sigma Black Belt
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Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Friday, October 18, 2002 9:49 AM
To: Maurer, James (J.B.)
Subject: RE: Prototypes

Jim,

Is there a conference call with Kavlico which I should attend? If so, what time and where are you grouping.

Also, There may be some development verification tests which could be done with bread boarded parts, for example, the OBD II crew might want to test for power up time. We certainly do need Kavlico lay outs and proper parts, but if there is anything we can accomplish with SRL parts, then we could possibly catch a foo-pa or two before Kavlico get too far down the road. Let me know if there are any tests you might recommend, and who should conduct them. To date, not much testing has been done other than what I have personally undertaken.

Thanks

Regards

Mark Freeland

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email: mfreela1@ford.com
Tel.: (313) 594-7645

-----Original Message-----
From: Maurer, James (J.B.)
Sent: Friday, October 18, 2002 9:37 AM
To: Freeland, Mark (M.)
Subject: RE: Prototypes

Mark,
We are expecting some feedback today from Kavlico on the changes that were proposed for the circuit. I would prefer to get their comments and discuss them before we made any prototypes. Also, I think we should have Kavlico make them with their preferred board layout, since capacitor placement will effect noise filtering, and the layout may affect the EMC results.

I hope Kavlico can get us some timing for representative parts today also.

Regards,
Jim Maurer
James B. Maurer
V-Engine 6-Sigma Team Leader
Fuel Metering Dept. V Engine Engineering
Phone (313) 390-3672, Fax (313) 390-4094
Text Page: (313) 795-5219
Email: jmaurer@Ford.com

-----Original Message-----
From: Freeland, Mark (M.)
Sent: Friday, October 18, 2002 9:31 AM
To: Kotwicki, Allan (A.J.); Maurer, James (J.B.)
Cc: Allen, Sharon (S.A.); McCoy, James (J.D.)
Subject: Prototypes

Al,

What was the name of the individual you said could make surface mount mods to the substrates. I think it is time to try and fabricate some parts which are not breadboards.

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Mark Freeland

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email: mfreela1@ford.com
Tel.: (313) 594-7645

Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Friday, October 18, 2002 11:21 AM
To: Maurer, James (J.B.)
Subject: RE: Prototypes

Jim,

I'll be there. Consider it done, I will bring two bread boards for you. However, I do not have enough "clamps", do you have access to a machine shop to make small hardware? We will discuss when I get over there.

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

-----Original Message-----
From: Maurer, James (J.B.)
Sent: Friday, October 18, 2002 10:41 AM
To: Freeland, Mark (M.)
Subject: RE: Prototypes

Mark,
We are going to have a conference call with Kavlico at 12:30 today in Jim O'Neall's office. There is no meeting notice to forward, so consider this to be the notice.

I am interested in the sensor response with temperature changes and at the various pressures with the new circuit, but we probably want sensors trimmed by Kavlico for that data as well.

A breadboard or 2 might be valuable for putting on a couple of vehicles just to drive and make sure nothing happens.

Regards,
Jim Maurer
James B. Maurer
V-Engine 6-Sigma Team Leader
Fuel Metering Dept. V Engine Engineering
Phone (313) 390-3672, Fax (313) 390-4084
Text Page: (313) 795-6219
Email: jmaurer@Ford.com

-----Original Message-----
From: Freeland, Mark (M.)
Sent: Friday, October 18, 2002 9:49 AM
To: Maurer, James (J.B.)

EA02-027-C 3419

Subject: RE: Prototypes

Jim,

Is there a conference call with Kavlico which I should attend? If so, what time and where are you grouping.

Also, There may be some development verification tests which could be done with bread boarded parts, for example, the OBD II crew might want to test for power up time. We certainly do need Kavlico lay outs and proper parts, but if there is anything we can accomplish with SRL parts, then we could possibly catch a foo-pa or two before Kavlico get too far down the road. Let me know if there are any tests you might recommend, and who should conduct them. To date, not much testing has been done other than what I have personally undertaken.

Thanks

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
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Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

-----Original Message-----
From: Maurer, James (J.B.)
Sent: Friday, October 18, 2002 9:37 AM
To: Freeland, Mark (M.)
Subject: RE: Prototypes

Mark,
We are expecting some feedback today from Kavlico on the changes that were proposed for the circuit. I would prefer to get their comments and discuss them before we made any prototypes. Also, I think we should have Kavlico make them with their preferred board layout, since capacitor placement will effect noise filtering, and the layout may affect the EMC results.

I hope Kavlico can get us some timing for representative parts today also.

Regards,
Jim Maurer
James B. Maurer

V-Engine 6-Sigma Team Leader
Fuel Metering Dept. V Engine Engineering
Phone (313) 390-3672, Fax (313) 390-4084
Text Page: (313) 795-5219
Email: jmaurer@Ford.com

-----Original Message-----
From: Freeland, Mark (M.)
Sent: Friday, October 18, 2002 9:31 AM
To: Kobwick, Allan (A.J.); Maurer, James (J.B.)
Cc: Alles, Sharon (S.A.); McCoy, James (J.C.)
Subject: Prototypes

Al,

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No one has asked for prototypes yet, except for Jim McCoy, but I know that eventually they will.

Jim,

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Regards

Mark Freeland

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Tel.: (313) 594-7645

Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Friday, October 18, 2002 4:23 PM
To: O'Neall, Jim (J.D.); Maurer, James (J.B.); Allee, Sharan (B.A.); Kotwicki, Allan (A.J.); Gates, Freeman (F.C.); McCoy, James (J.O.)
Subject: Filter Rev 1.7 drawing

Attached is a modified version of the filter design based on today's meeting with Kavlico. It is a poscript print file, so hopefully you can print it off.

I would appreciate you're thoughts on the changes.

Filter17.ps

Regards

Mark Freeland

6-Sigma Black Belt
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Freeland, Mark (M.)

From:	Freeland, Mark (M.)
Sent:	Friday, October 18, 2002 4:27 PM
To:	Kotwicki, Allan (A.J.)
Subject:	Request for pdf service.

Al, could you convert the file I sent with the last message and return it to me. Thanks

Regards

Mark Freeland

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Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Monday, October 21, 2002 4:53 PM
To: Alles, Sheran (S.A.); Kotwicki, Allan (A.J.)
Subject: Check out this site,

http://www.component.tdk.com/emc.asp

Al & Sheran,

Kyong Park suggested we check out what TDK have to offer in the way of band pass filters. Would you look at what they have and let me know if there is anything which may be of assistance, ore should we stick with what we are currently doing?

Thanks

Regards

Mark Freeland

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Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Tuesday, October 22, 2002 10:34 AM
To: O'Neall, Jim (J.D.)
Subject: RE: dPFE Filter Test Results to date

Jim,

I have attached the latest copy of the worksheet, as the 10/10 version does not contain the simulations which we were discussing on Friday and yesterday Filter Rev 1_5 Test Results.xl... , perhaps you would forward this also to Kyong.

Thanks

Regards

Mark Freeland

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-----Original Message-----
From: O'Neall, Jim (J.D.)
Sent: Monday, October 21, 2002 6:28 PM
To: 'kpark@kavlico.com'
Cc: Freeland, Mark (M.)
Subject: FW: dPFE Filter Test Results to date

Here is some of the test data from Mark Freeland that we feel is pertinent to the discussion we had today. Mark asked that I forward it to you.

J. D. O'Neall
Manager, Fuel Metering, Emissions, and Ignition Dept
V-Engine Engineering, Ford Motor Company
joneall@ford.com, 313-322-6839

-----Original Message-----
From: Freeland, Mark (M.)
Sent: Thursday, October 10, 2002 8:35 PM
To: Kozowník, John (J.J.); O'Neall, Jim (J.D.)
Cc: Davis, George (G.C.); Maurer, James (J.B.); Gates, Freeman (F.C.); Verner, Carol (C.J.); Alles, Sharon (S.A.); Kotwicki, Allan (A.J.); Bryant, Bruce (B.D.); McCoy, James (J.D.)
Subject: dPFE Filter Test Results to date

John,

The attached workbook summarizes the testing that I have conducted to date on the proposed filter design Rev. 1.5.
I have tested back to back 2001 MY dPFE, the current production dPFE, and two copies of the Rev 1.5 filter

(one with the original MOV and the other with Kavlico's proposed silicon drop in replacement).

I do not have the multi point vehicle failure mode test data nor the ESD test data yet. For the tests that I have conducted to date the Rev. 1.5 filter is "bullet proof". I have catastrophically failed a number of the 2001 MY and current production devices, but have not yet to observe any degradation in either of the two parts which are protected with the Rev. 1.5 filter.

I have also attached the complete set of results with raw data for the SCR Latch Threshold Statistics, which compares the 2001 MY, the current production Dalsa die parts and the ESM. The data set also includes the die level latch threshold for the 2001 MY die.

<< File: Filter Rev 1_5 Test Results.xls >> << File: SCR Latch Threshold Statistics.rtf >>

Regards

Mark Freeland

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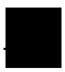
Freeland, Mark (M.)

From:	Freeland, Mark (M.)
Sent:	Tuesday, October 29, 2002 10:16 AM
To:	Maurer, James (J.B.); Gates, Freeman (F.C.); McCoy, James (J.D.); Elwell, Fred (F.); Power, James (J.H.); Pietta, Shari Finn (S.F.)
Cc:	Hangas, Jon (.)
Subject:	Data from Spark Plug Change on the Mountaineer

The attached document shows the worst case "noise" on bVref (the clean 5.0 volt supply) which I recorded before and after the spark plugs were changed by Fred last Monday.

Please call if you have any questions regarding the data.



Effect of [illegible] Resistance.d...

Sheri, these are the same traces you copied on Friday, but I have scanned them and annotated them.

Regards

Mark Freeland

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EA02-027-C 3427

Freeland, Mark (M.)

From:	Freeland, Mark (M.)
Sent:	Wednesday, October 30, 2002 9:59 AM
To:	McCoy, James (J.D.); Maurer, James (J.B.); Gates, Freeman (F.C.)
Cc:	Duncan, Jack (J.L.); Verner, Carol (C.J.)
Subject:	RE: MPG Focus Testing

Carol Verner and I examined the M6 sensor which failed on this vehicle yesterday.

The observed symptoms were:

The output was saturated low.
The power to ground impedance was unstable.
The ref. die has a dark discoloration of the gold on the Vro, the Hpos and the Hneg bond pads.
The HI die had a large bubble (about 90% of the die area) at the interface between the surface of the die and the potting gel, this is consistent with the die having passed a large current for a short period of time.

I understand that the oscilloscope never triggered, but I have to report that I believe that this part experienced a short duration, high current event.

The unstable Iref data form the data logger may be a significant clue and should be looked at again.

Jack,

Can you give me the VIN number, the ODO and date at which the M6 part was installed and the ODO and date at the time it was removed, for my records.

Thanks

Regards

Mark Freeland

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-----Original Message-----

From:	McCoy, James (J.D.)
Sent:	Thursday, October 24, 2002 1:53 PM
To:	Maurer, James (J.B.); Freeland, Mark (M.); Gates, Freeman (F.C.)
Cc:	Duncan, Jack (J.L.)
Subject:	MPG Focus Testing

<< File: m6oyo4551.xls >>
Data sent by Jack Duncan on the Focus from MPG.

Chart shows VREF, DPFE out, and VREF current with reference to the DPFE failure.

Regards,

Jim McCoy

Fuel Metering, Emissions & Ignition Systems Engineering
Hardware Control Interface Group
V-Engine Engineering
POEE - MD#69 - Rm. D142 - Cube DF186
Phone (313) 33-79690 / Fax (313) 39-04084
E-Mail: jmccoy1@ford.com

Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Wednesday, October 30, 2002 10:19 AM
To: Duncan, Jack (J.L.)
Subject: RE: MPG Focus Testing

Jack, Thanks for the prompt response.

Regards

Mark Freeland

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Freeland, Mark (M.)

From:	Freeland, Mark (M.)
Sent:	Friday, September 20, 2002 9:52 AM
To:	Akolkar, Shrikant (S.V.); Maurer, James (J.B.); O'Neill, Jim (J.D.); Varner, Carol (C.J.)
Cc:	Gates, Freeman (F.C.); Hangas, Jon (.)
Subject:	RE: Windstar Sensor #99

[illegible] deposit.JPG... [illegible] deposit on gel.JPG [illegible] inside [illegible]...

Attached are the pictures of the soot like deposit from the sensor.

I would like to have you're information regarding any other symptoms this vehicle may have exhibited while this sensor was installed, I wish to consolidate this data with the test data from yesterday. It seems to me that the engine must have been running very rich, or misfiring a lot, based on the deposits observed.

Regards

Mark Freeland

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-----Original Message-----

From:	Akolkar, Shrikant (S.V.)
Sent:	Thursday, September 19, 2002 7:01 PM
To:	Maurer, James (J.B.); O'Neill, Jim (J.D.)
Cc:	Gates, Freeman (F.C.); Freeland, Mark (M.); Hangas, Jon (.)
Subject:	FW: Windstar Sensor #99

Jim & Jim;

Thanks to Mark & John for prompt help they provided today for ele testing & gel removal.

- Sensor is electrically dead/out of spec. Vout is low & impendence are completely beyond limits
- Gel surface & tubes had layer of carbon over 1mm thick implying poorly performing engine. Mark has photos. Ultrasonic alcohol cleaning did not removal the carbon. It had to be mechanically removed which probably damaged bond pad wires
- I am leaving die photos & ele report on Jim Maurer's desk. There is no obvious visible damage. Some bubble anomalies are visible on REF die.

-----Original Message-----

From:	Freeland, Mark (M.)
Sent:	Thursday, September 19, 2002 3:07 PM
To:	O'Neill, Jim (J.D.)
Cc:	Akolkar, Shrikant (S.V.)

Subject: Windstar Sensor #99

Jim,

Please forward me all info you have regarding the sensor Shri brought me to test this afternoon. I would like to make sure the document I send you is clear and concise.

Can you provide the following:

VIN #
Mileage accumulated on the sensor.
Date the sensor was removed.
Were there any stored codes in the PCM, all codes are of interest, not just the dPFE codes?
What is the full repair history for this vehicle from the date the sensor was installed until the date it was removed? I suspect that the engine has a misfire history, of some sort.
Do we have Kavlico's parametric test data for the part.

Thanks

Regards

Mark Freeland

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Freeland, Mark (M.)

From:	Akolkar, Shrikant (S.V.)
Sent:	Thursday, September 19, 2002 7:01 PM
To:	Maurer, James (J.B.); O'Neall, Jim (J.D.)
Cc:	Gates, Freeman (F.C.); Freeland, Mark (M.); Hangas, Jon (.)
Subject:	FW: Windstar Sensor #99

Jim & Jim;

Thanks to Mark & John for prompt help they provided today for ele testing & gel removal.

- Sensor is electrically dead/out of spec. Vout is low & impendence are completely beyond limits
- Gel surface & tubes had layer of carbon over 1mm thick implying poorly performing engine. Mark has photos. Ultrasonic alcohol cleaning did not removal the carbon. It had to be mechanically removed which probably damaged bond pad wires
- I am leaving die photos & ele report on Jim Maurer's desk. There is no obvious visible damage. Some bubble anomalies are visible on REF die.

-----Original Message-----

From:	Freeland, Mark (M.)
Sent:	Thursday, September 19, 2002 3:07 PM
To:	O'Neall, Jim (J.D.)
Cc:	Akolkar, Shrikant (S.V.)
Subject:	Windstar Sensor #99

Jim,

Please forward me all info you have regarding the sensor Shri brought me to test this afternoon. I would like to make sure the document I send you is clear and concise.

Can you provide the following:

VIN #
Mileage accumulated on the sensor.
Date the sensor was removed.
Were there any stored codes in the PCM, all codes are of interest, not just the dPFE codes?
What is the full repair history for this vehicle from the date the sensor was installed until the date it was removed? I suspect that the engine has a misfire history, of some sort.
Do we have Kavlico's parametric test data for the part.

Thanks

Regards

Mark Freeland

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Tel.: (313) 594-7645

Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Tuesday, September 10, 2002 11:56 AM
To: Hangas, Jon (.)
Subject: FW: Spark plug resistance checks

Spark plug person

Regards

Mark Freeland

6-Sigma Black Belt
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-----Original Message-----
From: Ewell, Fred (F.)
Sent: Wednesday, September 04, 2002 4:03 PM
To: Freeland, Mark (M.)
Cc: McCoy, James (J.D.); Power, James (J.H.)
Subject: RE: Spark plug resistance checks

Mark,
We will be visiting Essex Engine plant tomorrow morning. If you can leave the vehicle here on Friday, I should be able to measure the plugs sometime during the day.

-----Original Message-----
From: Freeland, Mark (M.)
Sent: Tuesday, September 03, 2002 12:38 PM
To: Ewell, Fred (F.)
Cc: McCoy, James (J.D.)
Subject: FW: Spark plug resistance checks

Fred,

When would be a good time for you to check out the plugs on the Mountaineer? If you would like I could come over to you're garage tomorrow morning or afternoon. If it will only take an hour I will stay with you, or if a lot longer then I can leave the vehicle with you and borrow wheels from Jim McCoy.

Thanks

Regards

Mark Freeland

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email: mfreela1@ford.com
Tel.: (313) 594-7645

-----Original Message-----
From: Elwell, Fred (F.)
Sent: Thursday, August 29, 2002 2:15 PM
To: Freeland, Mark (M.)
Cc: Power, James (J.H.)
Subject: Spark plug resistance checks

I was unable to pry Jim McCoy away from the vehicle long enough to get the plugs removed and checked for resistance. Please make arrangements with Jim Power and/or me next week after the labor day holiday. Have a good weekend.

Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Thursday, September 12, 2002 11:44 AM
To: McCoy, James (J.D.)
Subject: Fouled plugs

Jim,

Got a Blues Clue,

What does the ignition noise on the Vref look like when you have a fouled plug?
Can you try it and see, (but not on the Mountaineer as I want to be able to drive it on Tuesday night).

The Mustang has a good number of low mileage failures for the months that it had the fuel/plug fouling issue (10/2001 - 12/2001)

Sheran will discuss further with you later today.

Regards

Mark Freeland

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Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Thursday, September 19, 2002 3:07 PM
To: O'Neall, Jim (J.D.)
Cc: Akolkar, Shrikant (S.V.)
Subject: Windstar Sensor #99

Jim,

Please forward me all info you have regarding the sensor Shri brought me to test this afternoon. I would like to make sure the document I send you is clear and concise.

Can you provide the following:

VIN #
Mileage accumulated on the sensor.
Date the sensor was removed.
Were there any stored codes in the PCM, all codes are of interest, not just the dPFE codes?
What is the full repair history for this vehicle from the date the sensor was installed until the date it was removed? I suspect that the engine has a misfire history, of some sort.
Do we have Kavlico's parametric test data for the part.

Thanks

Regards

Mark Freeland

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Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Tuesday, September 10, 2002 2:59 PM
To: O'Neall, Jim (J.D.)
Subject: RE: Pool Vehicle

Jim,

Thanks, Jim McCoy has the mountaineer and I have a pool car.

Regards

Mark Freeland

6-Sigma Black Belt
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-----Original Message-----
From: O'Neall, Jim (J.D.)
Sent: Tuesday, September 10, 2002 1:12 PM
To: Koszewnik, John (J.J.); King, Sandra (S.M.)
Cc: Freeland, Mark (M.); McCoy, James (J.D.)
Subject: FW: Pool Vehicle

John - Please forward the below note to Dbnpool@ford.com this afternoon. Thanks.
Sandra - can you follow up with John's admin (I think her name is Jan) to make sure this happens.

I approve Mark Freeland's use of a pool car while his lease car is being evaluated for Delta PFE EGR sensor issues. He will need a pool car from Sept 11th at 2PM to Sept 13th at 4PM. Thanks

J. D. O'Neall
Manager, Fuel Metering, Emissions, and Ignition Dept
V-Engine Engineering, Ford Motor Company
joneall@ford.com, 313-322-6839

-----Original Message-----
From: Mack, Ed (E.T.)
Sent: Tuesday, September 10, 2002 9:27 AM
To: McCoy, James (J.D.)
Cc: O'Neall, Jim (J.D.); Freeland, Mark (M.)
Subject: RE: Pool Vehicle

Yes, with LL4 approval. Send to Dbnpool@ford.com

-----Original Message-----
From: McCoy, James (J.D.)
Sent: Tuesday, September 10, 2002 9:26 AM
To: Mack, Ed (E.T.)
Cc: O'Neall, Jim (J.D.); Freeland, Mark (M.)
Subject: FW: Pool Vehicle

Ed, Can you provide an answer our question listed below?

Thanks. Jim.

Regards,
Jim McCoy
Fuel Metering, Emissions & Ignition Systems Engineering
Hardware Control Interface Group
V-Engine Engineering
POEE - MD#69 - Rm. D142 - Cube DF186
Phone (313) 33-79690 / Fax (313) 39-04084
E-Mail: jmccoy1@ford.com

-----Original Message-----
From: Tokarczyk, Jim (J.J.)
Sent: Tuesday, September 10, 2002 9:02 AM
To: McCoy, James (J.D.)
Subject: RE: Pool Vehicle

Need to contact Ed Mack in Vehicle Programs (he controls the pool vehicles).

Thank You
Jim Tokarczyk
Product Development Vehicle Control
phone x76943, fax 23311
GMP 408
Vehicle Services WEB Site:
http://www.dearborn.ford.com/tppb/PPPBV/VehicleControl/vehiclecontrol.html

-----Original Message-----
From: McCoy, James (J.D.)
Sent: Tuesday, September 10, 2002 9:00 AM
To: Tokarczyk, Jim (J.J.)
Cc: O'Neill, Jim (J.D.); Freeland, Mark (M.)
Subject: Pool Vehicle

Jim,

We are currently working on a warranty issue and have a vehicle which is exhibiting concerns and needs to be investigated. The vehicle we need to test is a lease vehicle that belongs to an employee, Mark Freeland, here at Ford. Mark has volunteered his vehicle for testing which will take about a week.

Would it be possible to provide a pool vehicle for Mark's use while we test his vehicle? Could you let me know if this is something we can do?

Thanks Jim.

Regards,
Jim McCoy
Fuel Metering, Emissions & Ignition Systems Engineering
Hardware Control Interface Group
V-Engine Engineering
POEE - MD#69 - Rm. D142 - Cube DF186

Phone (313) 33-79690 / Fax (313) 39-04084
E-Mail: jmccoy1@ford.com

Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Friday, September 20, 2002 10:20 AM
To: Verner, Carol (C.J.)
Subject: RE: Windstar Sensor #99

Carol,

I understand that this is not a warranty return part, but I still want to know about the vehicle's history. Can you please contact the fleet manager and ask him/her about this vehicle, has it had any other ailments, like running rich, HEGO problems, Fuel problems, ignition problems, drive symptoms, etc. I think we need to know why the sensor had the excessive sooty deposit in both ports. Any intelligence you can gather on the vehicle may be valuable.

Also, can you contact Kavlico and ask them for their test data for this part. I can not test slope, they probably have the data for this already.

Regards

Mark Freeland

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-----Original Message-----
From: Verner, Carol (C.J.)
Sent: Friday, September 20, 2002 10:10 AM
To: O'Neall, Jim (J.D.)
Cc: Freeland, Mark (M.)
Subject: RE: Windstar Sensor #99

Mark,

See comments in blue below.

-----Original Message-----
From: O'Neall, Jim (J.D.)
Sent: Thursday, September 19, 2002 3:12 PM
To: Verner, Carol (C.J.)
Cc: Freeland, Mark (M.)
Subject: FW: Windstar Sensor #99

Please provide the info requested by Mark. This is one of two sensors that failed (low I believe) from the Vegas fleet that you inspected shipped back by Kyong.

J. D. O'Neall
Manager, Fuel Metering, Emissions, and Ignition Dept
V-Engine Engineering, Ford Motor Company
joneall@ford.com, 313-322-6839

-----Original Message-----
From: Freeland, Mark (M.)
Sent: Thursday, September 19, 2002 3:57 PM
To: O'Neal, Jim (J.D.)
Cc: Akolkar, Shrikant (S.V.)
Subject: Windstar Sensor #99

Jim,

Please forward me all info you have regarding the sensor Shri brought me to test this afternoon. I would like to make sure the document I send you is clear and concise.

Can you provide the following: **Sensor #99 is not a warranty return. It was a parlyene coated sensor placed on a 3.8L Windstar belonging to a taxi cab fleet in Las Vegas, NV so there are no PCM codes to have for reference. Vo readings were made with 5V power supply and digital multimeter. Sensor was removed from vehicle and allowed to cool for 1hr in a/c room. At time of measurement room temp was 23 degrees C. No Check Engine Light was observed.**

VIN #: **I can provide this next week. The Fleet Engineer who I work with is out of the office until Monday.**
Mileage accumulated on the sensor. **22,624 miles.**
Date the sensor was removed. **Date Installed: 5/28/02. Initial Vo = 1.033 v. Date removed: 9/6/02. Vo = 0.520 v. Both dies responsive.**
Were there any stored codes in the PCM, all codes are of interest, not just the dPFE codes? **N/A. Not a warranty return sensor.**
What is the full repair history for this vehicle from the date the sensor was installed until the date it was removed? I suspect that the engine has a misfire history, of some sort. **N/A. Not a warranty return sensor.**
Do we have Kavlico's parametric test data for the part. **Not sure. Kavlico may have performed some parametric test before removing the ports and sending the sensor to us for futher analysis.**

Thanks

Regards

Mark Freeland

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email: mfreela1@ford.com
Tel.: (313) 594-7645

Freeland, Mark (M.)

From:	McCoy, James (J.D.)
Sent:	Tuesday, September 24, 2002 9:41 AM
To:	Duncan, Jack (J.L.)
Cc:	Maurer, James (J.B.); Freeland, Mark (M.)
Subject:	MPG Focus

Jack, Can you have the tech pull the plugs from the Focus, after an overnight soak, and measure and record the static resistance of each plug. Put the plugs back in the same cylinders when complete. Send the results to Mark Freeland. Thanks. Jim.

Regards,

Jim McCoy
Fuel Metering, Emissions & Ignition Systems Engineering
Hardware Control Interface Group
V-Engine Engineering
POEB - MD#69 - Rm. D142 - Cube DF186
Phone (313) 33-79690 / Fax (313) 39-04084
E-Mail: jmccoy1@ford.com

Freeland, Mark (M.)

From: Koszewnik, John (J.J.)
Sent: Monday, September 23, 2002 7:00 PM
To: Freeland, Mark (M.)
Subject: FW: Latch protection for DPFE

Mark,

As promised, I ran out the question we discussed in my office today.

I'll let you know if Jim provides me any additional feedback to my note below.

Thanks for our meeting. See you sometime early next week.

John Koszewnik
Chief Engineer
V-Engine Engineering
Ph. 32-28973
Fx. 24-66067
jkoszewn@ford.com

-----Original Message-----
From: Koszewnik, John (J.J.)
Sent: Monday, September 23, 2002 6:59 PM
To: O'Neill, Jim (J.D.)
Subject: RE: Latch protection for DPFE

Jim,

Noted and understood. Thanks for running this out for me.

My takeaway is that the ESM has the same overvoltage protection on Vref and Vout as the tube-mounted DPFE sensor.... no better, no worse.

Hence, we cannot say that the improved field performance of the ESM (versus tube-mounted DPFE) results from reduced sensitivity to latch-ups.

The remaining hypothesis for its improved field performance is that it sees less corrosive exhaust constituents due to being downstream of the EGR valve.

Let me know if I'm incorrect in the above. Thanks again for running this out.

John Koszewnik
Chief Engineer
V-Engine Engineering
Ph. 32-28973
Fx. 24-66067
jkoszewn@ford.com

-----Original Message-----
From: O'Neill, Jim (J.D.)
Sent: Monday, September 23, 2002 5:58 PM
To: Koszewnik, John (J.J.)

Cc: Maurer, James (J.B.); Gates, Freeman (F.C.)
Subject: Latch protection for DPFE

John - the latch protection you see in the schematics you had in hand this PM are for tube mount. The ESM did implement a similar effort right after Job 1 (implemented around May of this year at the same time we implemented the Dalsa die and the Microlyne gold sputtering) except the test data dictated the use of a Zener diode. So both have the protection. Freeman can give you more specifics if you need it or call me at home at 734-667-2966 or cell - 734-748-7761.

J. D. O'Neall
Manager, Fuel Metering, Emissions, and Ignition Dept
V-Engine Engineering, Ford Motor Company
joneall@ford.com, 313-322-6839

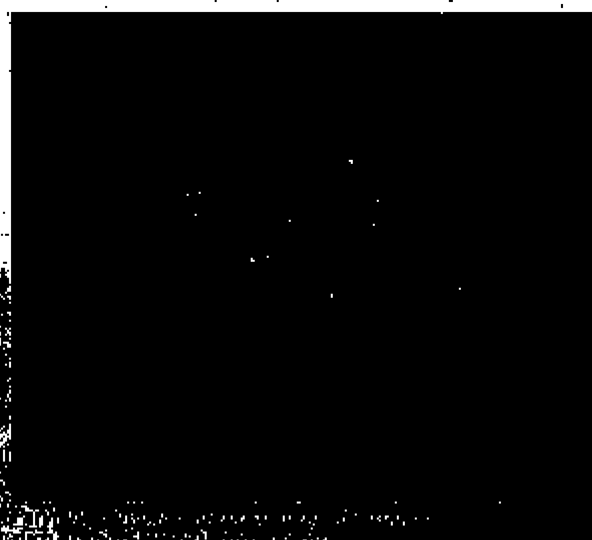
Polymer film's thinly veiled design disguises strength

If it's possible for a product to be considered a breakthrough technology four decades removed from its first application—and **Specialty Coating Systems** (SCS) of Indianapolis does—a thinly veiled polymer film known as Parylene coating is on its way to becoming a hot trend for automotive manufacturers interested in providing a reliable measure of protection for components exposed to the harsh environment of today's sophisticated engines.

For years, the company says, designers have explored various options for protecting electronic engine devices, including protective housings, liquid coatings, and encapsulation. Unsealed housings also have been examined and proved to be largely ineffective, allowing contaminants and moisture to reach into and damage critical devices. By comparison, viscous liquid coatings pose [illegible] differences in thermal coefficient of expansion which exist between the coating and the device [illegible] condition often results in [illegible] leads and [illegible] sulated parts [illegible] similar thermal [illegible] well as poor heat [illegible]

In its place, the vacuum-deposited polymer film—first discovered some 40 years ago by **Union Carbide Corp.**—is gaining recognition with component manufacturers, primarily because it possesses good barrier properties in extremely thin layers, SCS says. Proved effective in numerous aviation, aerospace, and medical device applications, it resists chemical attack from organic solvents, inorganic reagents, and acids. The dielectric strength [redacted] a layer 25.4 µm (1000 µin) thick is greater than 5000 V.

[redacted] xylylene, [illegible] film applied to [illegible] deposition chamber [illegible] gas phase polymerization. There is no liquid phase in the process, and no catalysts, solvents, or other environmentally restricted materials are required. The average cured thickness of a conventional liquid conformal coating is generally in the range of 0.005-0.010 in (0.13-0.25 mm). Flat surfaces are often treated at that



[illegible] such as [illegible] and around [illegible]

Complete protective encapsulation of an object [illegible] thickness of 0.75 µm [illegible] Because the coating is nonliquid, it does not pool, bridge, or exhibit meniscus properties when applied to surfaces. Film thickness varies little from point to point, whether measured on planar surfaces, in crevices, or on outside corners. In addition to its dielectric and barrier properties per unit thickness, Parylene coating offers extreme chemical inertness and freedom from pinholes, according to SCS. Parylene is easily deposited on such diverse substrates as

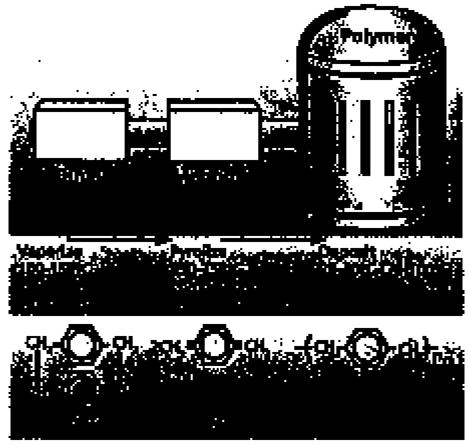
ED02-027-C 3481

silicon, glass, metal, paper, resin, plastics, ceramic, and ferrites. Its mechanical damping and loading effects are minimal due to its extremely low mass.

The Parylene raw material, di-para-xylylene dimer, is a white crystalline powder. Dimer is first vaporized at approximately 150°C (300°F) before being molecularly cleaved or pyrolyzed in a second process phase at about 680°C (1250°F). This forms the diradical, para-xylylene, which is introduced into the room-temperature vacuum deposition chamber as a monomeric gas that polymerizes evenly on substrates.

Substrate temperatures remain at a near-ambient level in this gaseous process, and the coating grows as a conformal film on all exposed surfaces. There are no cure-related hydraulic or liquid surface tension forces in the Parylene coating cycle.

Parylene thickness is related to the amount of vaporized dimer and [illegible] in the vacuum chamber and can be controlled accurately to ±10% of its final [illegible]. Film thicknesses from 4.0-3000 µin (0.1-75.0 µm) can be applied in a single operation at a typical rate of 0.200 µin/h (5.08 µm/h).



A three-step process is used by SCS to produce Parylene.

Parylene coating exists in four variations known as N, C, D, and SCS Nova I-II. Each of these polymer precursors has a unique molecular form and particular strengths. They are all applied in the same manner, with minor differences in the rate of polymerization. Several benefits exist with each of the variations including:

- [redacted] Because of its molecular activity in the monomer state, [redacted] has the highest penetrating power of the Parylenes and is able to coat relatively deep recesses and blind holes.
- [redacted] possesses a chlorine atom on the benzene ring, giving this variant a combination of electrical and physical properties that include very low permeability to moisture and corrosive gases.
- [redacted] with two chlorine atoms on the benzene ring.

EA02-827-C 3452

offers increased temperature performance compared to Parylenes N and C.

- Extended temperature range—SCS Nova HT, a proprietary fluorinated Parylene developed by SCS, has advanced properties for demanding applications requiring higher temperature performance and resistance to ultraviolet radiation.

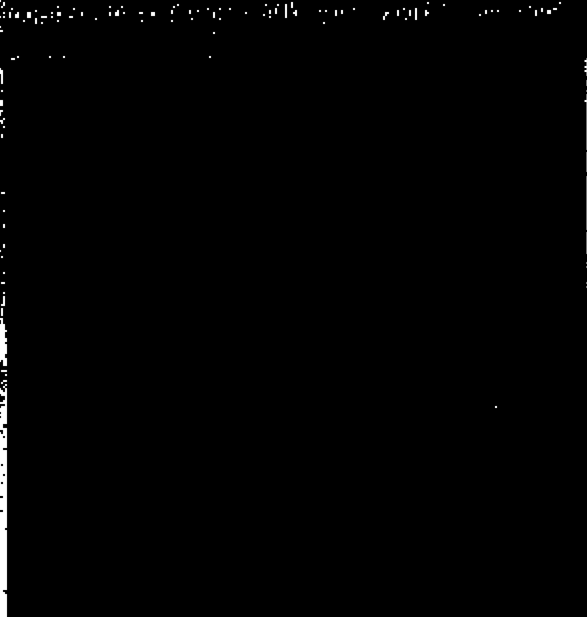
One of the earliest automotive applications of Parylene was as a coating for a pressure sensor used in monitoring the air/fuel mixture in intake manifolds. The hydrocarbon resistance of Parylene film in a very thin layer allowed the delicate electronic sensors to continue to operate accurately.

The material is appropriate for extending racing engine oil pan and valve cover gasket life. Frequent disassembly of racing engine components leads to gasket damage, as does normal thermal cycling.

Parylene has been key to the performance of many spacecraft components, including elements of the Mars Global Surveyor spacecraft camera, the International Space Station vision system, and the ion engine in NASA's Deep Space probe.

Patrick Ponticel

Side mirror foam from Schefenacker



This foam-filled exterior mirror weighs 20-30% less than a conventional one.

ER02-827-C 3483

Freeland, Mark (M.)

From:	Elwell, Fred (F.)
Sent:	Wednesday, September 04, 2002 4:03 PM
To:	Freeland, Mark (M.)
Cc:	McCoy, James (J.D.); Power, James (J.H.)
Subject:	RE: Spark plug resistance checks

Mark,
We will be visiting Essex Engine plant tomorrow morning. If you can leave the vehicle here on Friday, I should be able to measure the plugs sometime during the day.

-----Original Message-----

From:	Freeland, Mark (M.)
Sent:	Tuesday, September 03, 2002 12:38 PM
To:	Elwell, Fred (F.)
Cc:	McCoy, James (J.D.)
Subject:	FW: Spark plug resistance checks

Fred,

When would be a good time for you to check out the plugs on the Mountaineer? If you would like I could come over to you're garage tomorrow morning or afternoon. If it will only take an hour I will stay with you, or if a lot longer then I can leave the vehicle with you and borrow wheels from Jim McCoy.

Thanks

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

-----Original Message-----

From:	Elwell, Fred (F.)
Sent:	Thursday, August 29, 2002 2:15 PM
To:	Freeland, Mark (M.)
Cc:	Power, James (J.H.)
Subject:	Spark plug resistance checks

I was unable to pry Jim McCoy away from the vehicle long enough to get the plugs removed and checked for resistance. Please make arrangements with Jim Power and/or me next week after the labor day holiday. Have a good weekend.

Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Friday, September 20, 2002 5:00 PM
To: Alles, Sheran (S.A.); Kotwicki, Allan (A.J.); McCoy, James (J.D.)
Cc: Maurer, James (J.B.); O'Neall, Jim (J.D.)
Subject: The anatomy of a SCR latch in the Kavlico TM dPFE

Sheran, Al & Jim,

I have been able to reproduce the SCR Latch condition in a controlled and reproducible fashion. And thus can now define what is needed at the Vdd to the die to induce an SCR latch condition.

Simply put, if the Vdd relative to Vss exceeds 16 V for more than 500 nsec then an SCR Latch will result. The higher the voltage above the 16 V threshold the shorter the duration required to induce the SCR latch.

When the SCR Latch occurs there is an initial inrush of current to the die followed by a dip in the current for some micro seconds, followed by a sustained current level which can be much lower then the initial inrush.

Thus, any filter design should aim to eliminate any sustained excursions above 16 volts.

Suggested design philosophy:

If we use a high value of capacitance to prop up the 5 Volts, then we must also use a high impedance to prevent the capacitor from charging high enough to hold the Vdd above 16 volts for 500 nsec, with a current draw of say 10 mA.

Let's discuss on Monday morning.

Regards

Mark Freeland

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Tel.: (313) 594-7645

Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Friday, September 20, 2002 5:04 PM
To: Grandas, Joseph (J.M.)
Subject: FW: FYI

Joe,

Please call me at the number below, so that I can share my learning's with you.

Thanks

Regards

Mark Freeland

> 6-Sigma Black Belt
> Engine Research Department
> Ford Research Laboratory
> P.O. Box 2053
> MD 2629 - SRL - Room 1517
> Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

-----Original Message-----
From: Ayers, Don [mailto:DAyers@kavlico.com]
Sent: Friday, September 20, 2002 2:34 PM
To: Mark Freeland (E-mail)
Subject: FYI

Hi Mark -

Long time no see/speak. I hope all is going well with you.

I just wanted to make you aware of two things. You may already know these and I'm assuming you are still working on transients.

1. We are starting to embark on a series of failure analysis meetings on ESM with Ford/Siemens participation. Joe Grandas (in EGR Engineering) had some questions pertaining to voltage transients. We suggested he discuss these with you to understand the testing and results you've observed. If he hasn't called you, you may want to give him a call as time permits.

2. Finally, I came across an interesting document on vehicle transients. You may want to obtain a copy. It is ISO 7637-1, title is 'Road Vehicles - Electrical disturbance by conduction and coupling - Part 1: Passenger cars and light commercial vehicles with nominal 12V supply voltage - Electrical transient conduction along supply lines only.

3. Really this is finally, there's a Part 3 to the above which addresses "Electrical transient transmission by capacitive and inductive coupling via lines other than supply lines".

If you want, I can fax these to you.

Take care.
Don

Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Friday, September 20, 2002 5:22 PM
To: Lee, Pamela (P.F.)
Subject: FW: TWO DIFFERENT DPFE CONCERNS FOR DTC P0401

Pam,

I think Mike forgot to copy you on this note. Can you provide the data. Thanks

Regards

Mark Freeland

6-Sigma Black Belt
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Tel.: (313) 594-7645

-----Original Message-----
From: Giordano, Mike (M.A.)
Sent: Friday, September 20, 2002 5:03 PM
To: Freeland, Mark (M.)
Subject: RE: TWO DIFFERENT DPFE CONCERNS FOR DTC P0401

Mark,
SPI is the prime bad actor (as I recall due to less robust elbow material) but I believe Zetec is worse than V6/V8 configurations for failure rate. Pam Lee might be able to quantify relatively or accidentally the amount of "acidic aqueous condensates" generated by engine type. Seemed to me there might be a link being involved in both issues somewhat.

Pam,
Can you help Mark at all with the mechanics of generation or relative generation rates SPI vs. Zetec or I-4 versus other configurations of "acidic aqueous condensates" ?
Mike Giordano
Focus Powertrain Quality
32-20925
"If you plan to fail, it will be easy to accomplish your goals !"

-----Original Message-----
From: Freeland, Mark (M.)
Sent: Friday, September 20, 2002 4:36 PM
To: Giordano, Mike (M.A.); Johnson, Joe (J.H.); Surti, P. J. (P.J.); MacDonald, George (G.F.); Shopp, James (J.J.); Uzotta, Brian (B.W.)
Cc: DiAngelo, Renaldo (R.); Notebaum, Jim (J.E.); Papitone, Gil (J.); Gates, Freeman (F.C.); Whitworth, Rudy (A.R.); Stump, Steven (S.M.); Dhaliwal, Dave (B.S.); Malloy, Gene (E.E.); Thomas, Ken (K.C.)
Subject: RE: TWO DIFFERENT DPFE CONCERNS FOR DTC P0401

Mike, is it the 2.0L SPI or is it the 2.0L Zetec that has the high level of PCV failure. The wording in you're note leaves me in some doubt. Also, if is the Zetec that has the high PCV failure rate, is that on all 2.0 L Zetec applications, i.e. Focus and Escape?

Thanks

Regards

Mark Freeland

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Tel.: (313) 594-7645

-----Original Message-----
From: Giordano, Mike (M.A.)
Sent: Friday, September 20, 2002 4:23 PM
To: Johnson, Joe (J.H.); Surti, P. J. (P.J.); MacDonald, George (G.F.); Shopp, James (J.J.); Lizotte, Brian (B.W.); Freeland, Mark (M.)
Cc: DiAngelo, Renaldo (R.); Noteboom, Jim (J.E.); Pepitone, Gil (J.); Gates, Freeman (F.C.); Whitworth, Rudy (A. R.); Stump, Steven (S.M.); Dhaliwal, Dave (B.S.); Malloy, Gene (E.E.); Thomas, Ken (K.C.)
Subject: RE: TWO DIFFERENT DPFE CONCERNS FOR DTC P0401

Joe, et,al.

I was wondering if the higher concentration of "acidic aqueous condensates" in I-4's (vs 6 and 8 cylinder) as **discussed in Pam Lee's 8D on PCV elbow deterioration**) has a significant impact higher failure rate on Focus for DPFE ? (Reference Global 8D # 22223.) According to failures on PCV components, 2.0L SPI (Zetec ?) have significantly more failures than other engines. Any thoughts ?

Mike Giordano
Focus Powertrain Quality
32-20825
"If you plan to fail, it will be easy to accomplish your goals !"

-----Original Message-----
From: Johnson, Joe (J.H.)
Sent: Thursday, September 19, 2002 6:59 AM
To: Surti, P. J. (P.J.); MacDonald, George (G.F.); Shopp, James (J.J.); Lizotte, Brian (B.W.); Freeland, Mark (M.)
Cc: DiAngelo, Renaldo (R.); Noteboom, Jim (J.E.); Pepitone, Gil (J.); Gates, Freeman (F.C.); Whitworth, Rudy (A. R.); Giordano, Mike (M.A.); Stump, Steven (S.M.); Dhaliwal, Dave (B.S.); Malloy, Gene (E.E.); Thomas, Ken (K.C.)
Subject: RE: TWO DIFFERENT DPFE CONCERNS FOR DTC P0401

The moisture will be in the sensor of all vehicles and is to be expected.

The issue is that the sensor manufacturing process is not robust enough to insure.that the protective layers are applied in a uniform manner so that the acid, which is always present in the moisture, will not attack the sensitive electronics underneath. The Focus gets a double whammy, we believe, because of the grounding issues and other things that are still not understood. Drying out the sensor will not result in a fix .... it is best to replace it.

Kavlico has resourced the die and processing of same in what we believe is a positve step for quality. The new sensor part number is 2F1E-9J460-AB and was PSW'd 5/1/02. An earlier version which had the latch-up protection against voltage spikes was implemented 1/7/02 carrying PN 2F1E-9J460-AA.

There is a team still working on service fixes.

EA02-027-C 3458

PJ, I won't need that sensor back since it is before the corrective action dates listed above; however, I would like to get back any of the 2F1E-AB level parts.

Joe Johnson
Supervisor, EGR Systems, FMEI Dept
V-Engine Engineering, Powertrain Operations
POEE Bldg, Mail Drop 69
21500 Oakwood Blvd
Dearborn, Mich 48124-4091

Ph: (313) 845-8292
Fax: (313) 390-4084
e-mail: jjohnson@ford.com

-----Original Message-----
From: Surti, P. J. (P.J.)
Sent: Thursday, September 19, 2002 4:05 AM
To: MacDonald, George (G.F.); Shopp, James (J.J.); Lizotte, Brian (B.W.); Freeland, Mark (M.)
Cc: DiAngelo, Renaldo (R.); Noteboom, Jim (J.E.); Peplione, Gil (J.); Johnson, Joe (J.H.); Gates, Freeman (F.C.); Whitworth, Rudy (A.R.); Giordano, Mike (M.A.); Stump, Steven (S.M.); Dhaliwal, Dave (B.S.); Malloy, Gene (E.E.); Thomas, Ken (K.C.)
Subject: RE: TWO DIFFERENT DPFE CONCERNS FOR DTC P0401

George - The concern I had described in the attached CQIS report is different than what you are referring to for EVR hose melting. My concern had
DPFE sensor reading of less than 0.1 volt(normal reading should be around 1.0 Volt at KOEO or KOER at idle). This indicates that it has the concern
in the internal electronics interface of the sensor itself. My concern is very well described by Joe Johnson in his earlier note of water from the exhaust,
carring acid into the sensor elecronics interface, causing the concern. Also, I have been surveying the water migration issue with dealers and I am
finding that it is going on Explorers, Mustangs, Expeditions and other applications too. I feel that the **repeat repairs of DPFE sensors** due to MIL is a big
concern. **Rudy - This can be a good project for your High MIL repair rates, prevention task.** You probably may be already involved on this ongoing
issue. The real problem is that the warranty data may not tell us the clear picture as most of times, the techs. do not mention the cause of the failure mode,
i.e. water migration in the sensor. So, it may be difficult to isolate this data from the original defective sensors data.

Joe - I still have the sensor and will be happy to ship it to you, Freeman or Mark Freeland for further test analysis. Pl. let me know. Thanks...

P. J. Surti
Powertrain FQE
T. No. (714) 963-8227
Fax No. (714) 963-4448

-----Original Message-----
From: MacDonald, George (G.F.)
Sent: Tuesday, September 17, 2002 1:28 PM
To: Surti, P. J. (P.J.); Shopp, James (J.J.); Lizotte, Brian (B.W.)
Cc: DiAngelo, Renaldo (R.); Noteboom, Jim (J.E.); Peplione, Gil (J.); Johnson, Joe (J.H.); Gates, Freeman (F.C.); Whitworth, Rudy (A.R.); Giordano, Mike (M.A.); Stump, Steven (S.M.); Dhaliwal, Dave (B.S.); Malloy, Gene (E.E.); Thomas, Ken (K.C.)
Subject: RE: REPEAT REPAIRS OF DPFE SENSOR FOR MILCONCERN

PJ,
One additional comment. . .At WSAP, with the help of Gil Pepitone, we discovered a routing issue that creates a touch condition of the EVR vacuum hose to the EGR. This melts the hose, creates a vacuum leak & a p0401 insufficient EGR flow MIL code. In looking at the data (Zetec only concern) and our past DPFE history, dealers are swapping out good Motorola sensors. This accounts for a good portion of the latest DPFE warranty for vehicles with the Motorola DPFE's.

Brian Lizotte's group is working on a message to the field hightlighting this special cause.

Brian, Jim,
Any comment on the status of the message on EVR hose routing issue?

George F. MacDonald
Wayne Stamping & Assembly Plant - Powertrain Resident Engineer
Phone: 734-46-70196
Mobile: 734-730-8174
Textpager: 313-795-7969 mailto:3137957969@alphapage.airtouch.com
gmacdona@ford.com

-----Original Message-----
From: Surti, P. J. (P.J.)
Sent: Tuesday, September 17, 2002 10:53 AM
To: Johnson, Joe (J.H.); Gates, Freeman (F.C.); Whitworth, Rudy (A.R.); Giordano, Mike (M.A.); MacDonald, George (G.F.); Stump, Steven (S.M.); Dhaliwal, Dave (B.S.); Malloy, Gene (E.E.); Thomas, Ken (K.C.)
Cc: DiAngelo, Renaldo (R.); Noteboom, Jim (J.E.); Pepitone, Gil (J.); Surti, P. J. (P.J.)
Subject: REPEAT REPAIRS OF DPFE SENSOR FOR MILCONCERN

Hello Joe - I know you are not involved with Focus EGR system, but the attached CQIS report concern can happen to other vehicle lines too. We have
seen this concern in past, but I like to know what to advise the techs. in this type of case. The DPFE was replaced due to the inside electronics issue
more than year ago. So, the current sensor is better design sensor. But the vehicle came back due to water in the sensor. If this sensor would have
been dried and cleaned, it probably would have worked. Although, due to the bad reputation of the sensor, the techs., just replace them. And this is
happening on other applications too. One of the biggest MIL concerns at dealerships is the DPFE sensor MIL. And unfortunately,the concern
repeats again.. It seems that this past big concern does not seem to go away. Any advice/suggestion on such repeatr repairs will be appreciated. Thanks...

```
CSQI002          CQIS Indicator Summary          09/17/02 10:29:24
==> ________ ______________________________________         1 of   1
Rpt#: 2IQIV001 PTOFSE              Rpt: 09/17/2002  Odom: 36,596 M
Rvwd: File: _ Folder: ________  Images: 0  Print Smy/Disp Detail(P/D): _
Vehicle: 2001 FOCUS,ZX3   ,COUPE         3FAFP31341R108239 Bld: 09/07/2000
Engine: 2.0L ZTECH  Calb:      Trans: MTX-75 E  Axle: FWD 3.82  A/C: YES
Dealer Id: 05517  Sunset Ford            Ph#: (714) 372-4520
State: California  City: Westminster    Orig/Caller: P. J. SURTI
Symptom: 6 98 2 00  DRVABL,INDICATOR,CHECK ENGINE,OTHER-CODE NA
Addl Sym:                    St:  CCRG/EPRC: _ Rvwd:  Dt:
Fix:  Caus. Comp: SENSOR ASY EGR PR VL       -- RPL   Condition Code: 42
PSURTI   (714) 962-3227 FAX:           MIL? Y ABA?  Symp Vf?  Survey? N
EO:                  EC:                  Prt St: O
ER:                  CB:                  Intmit? N
CONCER   CHECK ENGINE LIGHT STAYS ON.
REPAIR   HOOKED UP WDS AND RAN EEC SELF TEST. RETRIEVED THE KOEO-C DTC P0401.
```

RAN DCL DISPLAY. MONITORED THE EGR SYSTEM. DPFE SENSOR WAS READING 0.1 VOLT WITH KOEO AND ALSO WHILE RUNNING AT IDLE. AS PER PREVIOUS EXPERIENCE, THE TECH. REMOVED THE DPFE SENSOR AND FOUND WATER IN THE SENSOR. THE SENSOR HAD BEEN REPLACED ABOUT ONE YEAR AGO. AND NOW IT WAS ACTING UP AGAIN DUE TO WATER IN THE SENSOR. THE TECH. REPLACED THE SENSOR. THE MIL CONCERN IS RESOLVED AFTER THE REPAIR.

P. J. Smith
Powertrain FOS
T. No. (714) [illegible]-9227
Fax No. (714) [illegible]-4442

Freeland, Mark (M.)

From:	Freeland, Mark (M.)
Sent:	Friday, September 20, 2002 6:26 PM
To:	Bryant, Bruce (B.D.)
Cc:	Wei, Kuang (K.C.)
Subject:	RE: service procedure changes

Bruce,

You need to get with the supervisor of the appropriate vehicle office(s), they can initiate a TSB (Technical Service Bulletin), which the dealers can be referred to when addressing a specific customer concern.

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

-----Original Message-----

From:	Bryant, Bruce (B.D.)
Sent:	Friday, September 20, 2002 6:14 PM
To:	Freeland, Mark (M.)
Cc:	Wei, Kuang (K.C.)
Subject:	service procedure changes

Mark:

Kuang Wei, another FRL BB, and I are wondering how to get a service fix/procedure change implemented. He has a project at Wixom for which he has a fix, but we'd also like to get the fix into the dealers' hands.

Specifically, a plastic tether on the (+) lead from the starter can point in one of two directions when it is installed. In one orientation, there's no problem, but in the other, it blocks a drain hole and causes water to build up and come in contact with the passenger compartment air filter, causing musty odor and defogging problems. We'd like to get two procedure changes in place at the dealer--one to show them how to correctly orient the tether when replacing a starter, and the other to have them correct the tether position when customers complain of musty odor.

Since you've had substantial dealings with dealers in the course of your dPFE sensor projects, we were wondering if you could direct us in getting these service policy changes instantiated.

Cordially,

Bruce Bryant, 6 Sigma Master Blackbelt, Ford Research Laboratory
bbryant2@ford.com 001-313-390-6750

Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Tuesday, September 24, 2002 9:25 AM
To: Gates, Freeman (F.C.)
Subject: Latch Susceptibility Testing

Freeman,

I have additional data from testing 20 + more dPFE's without the Z1 (MOV) which I would like to share with you in person. When would you like to get together?

Also,

John Koszewnick has asked me to take a look at the ESM to see how it compares in terms of it's robustness to Transient Voltages.
Can you provide me with a sampling of say 30 current production ESM's for similar testing. I will also need the current circuit diagram and component layout for the boards.

Thanks

Regards

Mark Freeland

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Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

Freeland, Mark (M.)

From:	Freeland, Mark (M.)
Sent:	Tuesday, September 24, 2002 9:31 AM
To:	Koszewnik, John (J.J.)
Cc:	Davis, George (G.C.)
Subject:	RE: Latch protection for DPFE

Thanks John.

I have requested a sampling of 30 ESM's from Freeman Gates to perform transient susceptibility testing on.

Yesterday afternoon I tested 20 parts for the internal (die level) threshold voltage. (I plan on at least 30 for the statistic). Then I will follow up with a larger sample for the external threshold voltage statistic, as we discussed yesterday.
I will feed you the results by email as I complete each group.

Regards

Mark Freeland

6-Sigma Black Belt
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Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

-----Original Message-----

From:	Koszewnik, John (J.J.)
Sent:	Monday, September 23, 2002 7:00 PM
To:	Freeland, Mark (M.)
Subject:	FW: Latch protection for DPFE

Mark,

As promised, I ran out the question we discussed in my office today.

I'll let you know if Jim provides me any additional feedback to my note below.

Thanks for our meeting. See you sometime early next week.

John Koszewnik

Chief Engineer
V-Engine Engineering
Ph. 32-28973
Fx. 24-66067
jkoszewn@ford.com

-----Original Message-----

From: Koszewnik, John (J.J.)

Sent: Monday, September 23, 2002 6:59 PM
To: O'Neall, Jim (J.D.)
Subject: RE: Latch protection for DPFE

Jim,

Noted and understood. Thanks for running this out for me.

My takeaway is that the ESM has the same overvoltage protection on Vref and Vout as the tube-mounted DPFE sensor.... no better, no worse.

Hence, we cannot say that the improved field performance of the ESM (versus tube-mounted DPFE) results from reduced sensitivity to latch-ups.

The remaining hypothesis for its improved field performance is that it sees less corrosive exhaust constituents due to being downstream of the EGR valve.

Let me know if I'm incorrect in the above. Thanks again for running this out.

John Koszewnik
Chief Engineer
V-Engine Engineering
Ph. 32-26973
Fx. 24-86067
jkoszewn@ford.com

-----Original Message-----
From: O'Neall, Jim (J.D.)
Sent: Monday, September 23, 2002 5:56 PM
To: Koszewnik, John (J.J.)
Cc: Maurer, James (J.B.); Gates, Freeman (F.C.)
Subject: Latch protection for DPFE

John - the latch protection you see in the schematics you had in hand this PM are for tube mount. The ESM did implement a similar effort right after Job 1 (implemented around May of this year at the same time we implemented the Dalsa die and the Microlyne gold sputtering) except the test data dictated the use of a Zener diode. So both have the protection. Freeman can give you more specifics if you need it or call me at home at 734-667-2966 or cell - 734-748-7781.

J. D. O'Neall
Manager, Fuel Metering, Emissions, and Ignition Dept
V-Engine Engineering, Ford Motor Company
joneall@ford.com, 313-322-6839

Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Tuesday, September 24, 2002 1:30 PM
To: Akolkar, Shrikant (S.V.)
Cc: Maurer, James (J.B.); Verner, Carol (C.J.)
Subject: RE: Windstar Sensor #99

Shri,
I would be glad to, but am waiting on the VIN number and the complete service history for this vehicle from Carol. Her contact was apperantly out of town last week.

Carol,
Any luck with you're contact today?

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

-----Original Message-----
From: Akolkar, Shrikant (S.V.)
Sent: Tuesday, September 24, 2002 1:15 PM
To: Freeland, Mark (M.)
Cc: Maurer, James (J.B.); Verner, Carol (C.J.)
Subject: FW: Windstar Sensor #99

Mark,

Can you pl. send electrical report to Jim Maurer. I sent photos for your record yesterday. Carol may have sent the vehicle info you requested.

-----Original Message-----
From: Maurer, James (J.B.)
Sent: Monday, September 23, 2002 3:08 PM
To: Akolkar, Shrikant (S.V.)
Subject: RE: Windstar Sensor #99

Shri,
Is there an electronic copy of the pictures and single record report that I could send to Jim O'Neall and Kyong Park.

Regards,
Jim Maurer
James B. Maurer
V-Engine 6-Sigma Team Leader
Fuel Metering Dept. V Engine Engineering

E662-027-C 3487

Phone (313) 390-3672, Fax (313) 390-4084
Text Page: (313) 795-6219
Email: jmaurer@Ford.com

-----Original Message-----
From: Akolkar, Shrikant (S.V.)
Sent: Thursday, September 19, 2002 7:01 PM
To: Maurer, James (J.B.); O'Neall, Jim (J.D.)
Cc: Gates, Freeman (F.C.); Freeland, Mark (M.); Hangas, Jon (.)
Subject: FW: Windstar Sensor #99

Jim & Jim;

Thanks to Mark & John for prompt help they provided today for ele testing & gel removal.

- Sensor is electrically dead/out of spec. Vout is low & impendence are completely beyond limits
- Gel surface & tubes had layer of carbon over 1mm thick implying poorly performing engine. Mark has photos. Ultrasonic alcohol cleaning did not removal the carbon. It had to be mechanically removed which probably damaged bond pad wires
- I am leaving die photos & ele report on Jim Maurer's desk. There is no obvious visible damage. Some bubble anomalies are visible on REF die.

-----Original Message-----
From: Freeland, Mark (M.)
Sent: Thursday, September 19, 2002 3:07 PM
To: O'Neall, Jim (J.D.)
Cc: Akolkar, Shrikant (S.V.)
Subject: Windstar Sensor #99

Jim,

Please forward me all info you have regarding the sensor Shri brought me to test this afternoon. I would like to make sure the document I send you is clear and concise.

Can you provide the following:

VIN #
Mileage accumulated on the sensor.
Date the sensor was removed.
Were there any stored codes in the PCM, all codes are of interest, not just the dPFE codes?
What is the full repair history for this vehicle from the date the sensor was installed until the date it was removed? I suspect that the engine has a misfire history, of some sort.
Do we have Kavlico's parametric test data for the part.

Thanks

Regards

Mark Freeland

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email: mfreela1@ford.com

Tel.: (313) 594-7645

Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Wednesday, September 25, 2002 4:23 PM
To: Verner, Carol (C.J.)
Cc: Maurer, James (J.B.); Akolkar, Shrikant (S.V.)
Subject: RE: Windstar Sensor #99

Carol, Thank you for the data.

First I checked the AWS record for the vin number. There have been two warranty claims, unrelated to my area of interest.
Second, the data from Kyong is the initial data before the part was put into service. Did Kavlico test the part after it was taken off the vehicle? If so, then please ask for that data also.

The data is unusual, in that it does not give the separate transfer function for each die, the way they used to report. So I assume that they held the reference die at ambient and measured the transfer function of the hi die. Can you try and confirm if this is the case.

Thanks

Regards

Mark Freeland

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email: mfreela1@ford.com
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Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Wednesday, September 25, 2002 4:31 PM
To: Maurer, James (J.B.); Akolkar, Shrikant (S.V.)
Cc: Verner, Carol (C.J.)
Subject: SRL346 Report

Jim & Shri,

Attached is my data sheet for the #99 (Kavlico number) part from the 3.8L Windstar. I have included all info which was forwarded to me to date.

I have not entered anything in the die inspection or gel inspection, as I did not inspect them myself. But, if you would like to fill in you're results & return to me I will enter them in my database.

Shri, The SRL number is incorrect on the photos you sent me it should read SRL346 instead of 349.

Also, Carol sent me the "new" parametric data from Kavlico, but I do not have the Final parametric data.

srl346.xls

Regards

Mark Freeland

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Tel.: (313) 594-7645

Thanks John.

I have requested a sampling of 30 ESM's from Freeman Gates to perform transient susceptibility testing on.

Yesterday afternoon I tested 20 parts for the internal (die level) threshold voltage. (I plan on at least 30 for the statistic). Then I will follow up with a larger sample for the external threshold voltage statistic, as we discussed yesterday.
I will feed you the results by email as I complete each group.

Regards

Mark Freeland

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email: mfreela1@ford.com
Tel.: (313) 594-7645

-----Original Message-----
From: Koszewnik, John (J.J.)
Sent: Monday, September 23, 2002 7:00 PM
To: Freeland, Mark (M.)
Subject: FW: Latch protection for DPFE

Mark,

As promised, I ran out the question we discussed in my office today.

I'll let you know if Jim provides me any additional feedback to my note below.

Thanks for our meeting. See you sometime early next week.

John Koszewnik
Chief Engineer
V-Engine Engineering
Ph. 32-28973
Fx. 24-86067
jkoszewn@ford.com

-----Original Message-----
From: Koszewnik, John (J.J.)
Sent: Monday, September 23, 2002 6:59 PM
To: O'Neall, Jim (J.D.)
Subject: RE: Latch protection for DPFE

Jim,

Noted and understood. Thanks for running this out for me.

My takeaway is that the ESM has the same overvoltage protection on Vref and Vout as the tube-mounted

DPFE sensor.... no better, no worse.

Hence, we cannot say that the improved field performance of the ESM (versus tube-mounted DPFE) results from reduced sensitivity to latch-ups.

The remaining hypothesis for its improved field performance is that it sees less corrosive exhaust constituents due to being downstream of the EGR valve.

Let me know if I'm incorrect in the above. Thanks again for running this out.

John Koszewnik
Chief Engineer
V-Engine Engineering
Ph. 32-28973
Fx. 24-86067
jkoszewn@ford.com

-----Original Message-----
From: O'Neall, Jim (J.D.)
Sent: Monday, September 23, 2002 5:58 PM
To: Koszewnik, John (J.J.)
Cc: Maurer, James (J.B.); Gates, Freeman (F.C.)
Subject: Latch protection for DPFE

John - the latch protection you see in the schematics you had in hand this PM are for tube mount. The ESM did implement a similar effort right after Job 1 (implemented around May of this year at the same time we implemented the Dalsa die and the Microlyne gold sputtering) except the test data dictated the use of a Zener diode. So both have the protection. Freeman can give you more specifics if you need it or call me at home at 734-667-2968 or cell - 734-748-7781.

J. D. O'Neall
Manager, Fuel Metering, Emissions, and Ignition Dept
V-Engine Engineering, Ford Motor Company
joneall@ford.com, 313-322-6839

Freeland, Mark (M.)

From:	Freeland, Mark (M.)
Sent:	Thursday, September 26, 2002 9:35 AM
To:	Koszewnik, John (J.J.)
Subject:	RE: Updated: Mtg w/M. Freeland

John,

9:30 works for me, Thanks

Regards

Mark Freeland

6-Sigma Black Belt
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Dearborn, MI 48121-2053 USA
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Tel.: (313) 594-7645

-----Original Message-----

From:	Wadlow, Janice (J.K.) On Behalf Of Koszewnik, John (J.J.)
Sent:	Thursday, September 26, 2002 9:34 AM
To:	Freeland, Mark (M.)
Subject:	RE: Updated: Mtg w/M. Freeland

Mark, I changed it to 9:30 on 10/2.

Thanks,
Jan

-----Original Appointment-----

From:	Freeland, Mark (M.)
Sent:	Thursday, September 26, 2002 9:25 AM
To:	Wadlow, Janice (J.K.); Porosky, Sue (S.E.); Novak, Michele (M.)
Subject:	Declined: Updated: Mtg w/M. Freeland
When:	Wednesday, October 02, 2002 5:30 PM-6:00 PM (GMT-05:00) Eastern Time (US & Canada).
Where:	JJK's ofc

John,
Can we make it a different time please, as I have to pick up my children in Farmington Hills by 6:00 pm on Wednesday.

Thanks

Mark Freeland

Freeland, Mark (M.)

From:	Freeland, Mark (M.)
Sent:	Thursday, September 26, 2002 1:48 PM
To:	Akolkar, Shrikant (S.V.); McCoy, James (J.D.)
Cc:	Maurer, James (J.B.); Gates, Freeman (F.C.); Duncan, Jack (J.L.)
Subject:	RE: Iref spikes-MPG Focus MZ4 sensor

All,

No the reported dPFE current is not normal. I ref should be quite steady at about 7 - 8 mA with a slight drop of up to about 1.2 mA as the dP increases toward 100 inches. It is also a weak function of die temperature, which changes only slowly. The slope of the temperature response is about-0.0277 mA per deg. C. If the reported current is real, there is something significant going on.

I would suggest returning the vehicle to Dearborn, so that the EE folks can sus it out in a location where they have access to all the right gear. I would be happy to help out if you like.

Regards

Mark Freeland

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-----Original Message-----

From	Akolkar, Shrikant (S.V.)
Sent:	Thursday, September 26, 2002 1:11 PM
To:	McCoy, James (J.D.)
Cc:	Maurer, James (J.B.); Gates, Freeman (F.C.); Duncan, Jack (J.L.); Freeland, Mark (M.)
Subject:	FW: Iref spikes-MPG Focus MZ4 sensor

Jim,

Where are buddy? You didn't call or respond. I need your opinion on continuous current fluctuations I am seeing all the time. This ~20ma fluctuation is normal, only on Focus, harmful for sensor? Pl. comment. Pl. ignore Ref pressure plot here. I had axis error. When EGR flows, HI-REF pressure is about ~4"Hg.

Mark, your comments?

-----Original Message-----

From:	Akolkar, Shrikant (S.V.)
Sent:	Wednesday, September 18, 2002 9:56 AM
To:	Duncan, Jack (J.L.); McCoy, James (J.D.)
Cc:	Maurer, James (J.B.); Gates, Freeman (F.C.)
Subject:	Iref spikes-MPG Focus MZ4 sensor

Jack/Jim,

Iref is dark blue line with spikes from beginning to end. Can you check wiring, connection etc. Jim Mccoy, can you suggest remedy or is it how sensor is behaving? I am looking at this sensor data from beginning & other sensors data. I will let you know.

<< OLE Object: Microsoft Excel Chart >>

With Regards,

Shrikant Akolkar
sakolkar@ford.com Ph:(313) 594-1908, Fax:390-1229
Ford Motor Co. POEE Buldg. AQ077
21500, Oakwood Blvd. P.O.Box 2053, MD#36
Dearborn, MI 48124 U.S.A.

Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Monday, September 30, 2002 1:29 PM
To: Kotwicki, Allan (A.J.)
Subject: Drawing

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
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MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Monday, September 30, 2002 2:38 PM
To: Kotwicki, Allan (A.J.)
Cc: Alles, Sheran (S.A.)
Subject: Latest design thoughts

Al,

Can you please pdf this one and send it back to me, and also copy Sheran, so that he has a hard copy.

[illegible]

Thanks

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Monday, September 30, 2002 3:27 PM
To: Allee, Sheran (S.A.)
Subject: FW: filter15.pdf

Sheran,

This is the mode we discussed this morning.

Thanks for you're help.

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
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P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

-----Original Message-----
From: Kotwicki, Allan (A.J.)
Sent: Monday, September 30, 2002 3:21 PM
To: Freeland, Mark (M.)
Subject: filter15.pdf

filter15.pdf

next time, change the extension to .ps so that I can do it without fiddling about ...
Thanks in advance for your help,

Allan J. Kotwicki
59-41277
akotwick@ford.com
MD 3619 SRL

Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Monday, September 30, 2002 3:28 PM
To: Kotwicki, Allan (A.J.)
Subject: RE: filter15.pdf

Thanks Al,

Will use .ps next time, sorry for the inconvenience.

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
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P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

-----Original Message-----
From: Kotwicki, Allan (A.J.)
Sent: Monday, September 30, 2002 3:21 PM
To: Freeland, Mark (M.)
Subject: filter15.pdf

<< File: Filter15.pdf >>
next time, change the extension to .ps so that I can do it without fiddling about ...
Thanks in advance for your help,

Allan J. Kotwicki
59-41277
akotwick@ford.com
MD 3619 SRL

EA02-027-C 3461

Freeland, Mark (M.)

From:	Kotwicki, Allan (A.J.)
Sent:	Thursday, September 26, 2002 2:16 PM
To:	Freeland, Mark (M.)
Cc:	Kotwicki, Allan (A.J.)
Subject:	RE: Output Clamping

yes, this would create problems, not the least of which would be how to create those hard limits.

Thanks in advance for your help,

Allan J. Kotwicki
59-41277
akotwick@ford.com
MD 3019 SRL

-----Original Message-----

From:	Freeland, Mark (M.)
Sent:	Thursday, September 26, 2002 2:14 PM
To:	Gates, Freeman (F.C.)
Cc:	Kotwicki, Allan (A.J.); Alles, Sharon (S.A.); McCoy, James (J.D.); Maurer, James (J.B.)
Subject:	Output Clamping

Freeman,

We need you're input regarding a possible solution for the Vref dipping issue from the PTEC.

The concept under consideration would limit the output of the sensor from 0.4 volts to a maximum of 4.6 volts. These would be hard limits, with tight tolerances, irregardless of any calibration offset/slope error of the sensor, and irregardless of any failure mode of the sensor.

Would this create any new problems for the system, particularly for the OBD II fault diagnostics?

Regards

Mark Freeland

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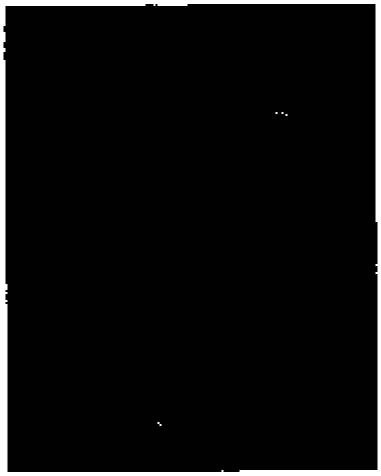
tyco / Electronics Raychem CIRCUIT PROTECTION

9/02
CONSIDER



PolySwitch Resettable Devices

Short-Form Catalog November 2001

Overview
Raychem's families of PolySwitch resettable devices continue to expand to include devices with wider voltage, current, and temperature ranges. Sixteen standard product families of PolySwitch devices are available in leaded, axial, and surface-mount configurations. Many have received UL component recognition and meet the requirements of other agencies, including CSA and TÜV. Technically, these devices are thermistor-type devices based on a polymer positive temperature coefficient material.

PolySwitch devices are used in a wide variety of applications:

Automotive
- Actuators and medium motors
- Trace protection
- Wire harnesses

Battery Protection
- Lithium cells and battery packs
- Rechargeable battery packs
- Chargers

Computers and Peripherals
- DDC.2 computer video ports
- Hard disk drives/storage devices
- IEEE 1394 ports
- Mouse and keyboard ports
- USB (Universal Serial Bus) ports
- PC (PCMCIA) cards and sockets
- SCSI

Industrial
- MOSFET device protection
- Motors, fans, and blowers
- POS equipment
- Process and industrial controls
- Security and fire alarm systems
- Test and measurement equipment
- Transformers
- Medical electronics

Consumer
- Loudspeakers
- Satellite video receivers

Telecommunications & Networking
- Customer premise equipment
- Primary protection: MDF modules, Network Interface Devices (NIDs)
- Analog modems, ISDN and xDSL equipment
- WAN, LAN, T1 Equipment
- Access network equipment, Central Office switches
- Cable power passing taps
- UL 1950, Telcordia GR-1089, GR-974 power fault protection
- ITU-T K.20, K.21, K.45 resistability requirements

PolySwitch Resettable Device Benefits:
- Reduced warranty and service costs
- Increased reliability
- Superior shock and vibration withstand
- Automated insertion
- Wide variety of applications

Features:
- Remotely resettable
- Testable
- Solid-state
- Tape and reel
- Variety of form factors
- Low resistance

What's New Inside:
- nanoSMD Products
- miniSMD Products
- RHE Products
- VLR Products
- Auto Products
  - -AHR
  - -AGR
  - -ASMD
  - -AHS
- RXE Products
- Lead Free nanoSMD, miniSMD Products

Standard PolySwitch product families include RGE, RHE, RTE, RUE, RXE, SMD, nanoSMD, microSMD, miniSMD, TS, BBR, TR, LR4, LTP, SRP, TAC, VTP, AHR, AGR, ASMD, and AHS devices. In addition, special devices, such as speaker devices (SPK), terminal devices (TD) and custom chip devices, can be manufactured to meet performance requirements that could be outside of the performance band of the standard products listed in this short-form catalog. Please contact a Raychem Circuit Protection Customer Service representative to discuss your special product needs.

ER02-027-C 3483

60V - 72V

This product line can be used in a wide variety of automotive, computer and general electronics applications. The RXE devices feature high current carrying capability (up to 14 Amps) in a small package with fast trip times. The RHE devices can be used at temperatures up to 125°C.

Figure 1

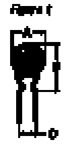


Figure 2

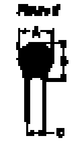
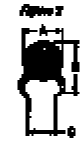


Figure 3

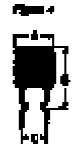


Part number	I_H* (A)	V max. (V)	I max.** (A)	R_1 max. (Ω)	Agency recognition	A (max.)	B (max.)	C (nom.)	Fig.
						Dimensions (millimeters/inches)			
RXE005	0.05	60	40	20.00	UL, TÜV, CSA	6.0 (0.316)	9.2 (0.320)	5.08 (0.20)	3
RXE010	0.10	60	40	7.50	UL, TÜV, CSA	7.4 (0.29)	11.6 (0.46)	5.08 (0.20)	1
RXE017	0.17	60	40	[illegible]	UL, TÜV, CSA	7.4 (0.29)	12.7 (0.50)	5.08 (0.20)	1
RXE020	0.20	72	40	4.40	UL, TÜV, CSA	7.4 (0.29)	11.7 (0.46)	5.08 (0.20)	1
RXE025	0.25	72	40	3.00	UL, TÜV, CSA	7.4 (0.29)	12.7 (0.50)	5.08 (0.20)	1
RXE030	0.30	72	40	2.10	UL, TÜV, CSA	7.4 (0.29)	12.7 (0.50)	5.08 (0.20)	1
RXE040	0.40	72	40	1.[illegible]	UL, TÜV, CSA	7.6 (0.30)	13.5 (0.53)	5.08 (0.20)	1
RXE050	0.50	72	40	1.17	UL, TÜV, CSA	7.9 (0.31)	13.7 (0.54)	5.08 (0.20)	1
RXE065	0.65	72	40	0.72	UL, TÜV, CSA	9.4 (0.37)	14.5 (0.57)	5.08 (0.20)	1
RXE075	0.75	72	40	[illegible]	UL, TÜV, CSA	10.2 (0.40)	15.4 (0.60)	5.08 (0.20)	1
RXE090	0.90	72	40	0.47	UL, TÜV, CSA	11.2 (0.44)	15.6 (0.62)	5.08 (0.20)	1
RXE110	1.10	72	40	[illegible]	UL, TÜV, CSA	12.6 (0.50)	17.5 (0.69)	5.08 (0.20)	2
RXE135	1.35	72	40	[illegible]	UL, TÜV, CSA	14.5 (0.57)	18.1 (0.71)	5.08 (0.20)	2
RXE160	1.60	72	40	[illegible]	UL, TÜV, CSA	15.2 (0.60)	20.0 (0.79)	5.08 (0.20)	2
RXE185	1.85	72	40	0.19	UL, TÜV, CSA	17.5 (0.69)	22.3 (0.88)	5.08 (0.20)	2
RXE250	2.50	72	40	0.13	UL, TÜV, CSA	20.9 (0.82)	25.4 (1.00)	10.2 (0.40)	2
RXE300	3.00	72	40	0.10	UL, TÜV, CSA	23.9 (0.94)	28.4 (1.12)	10.2 (0.40)	2
RXE375	3.75	72	40	[illegible]	UL, TÜV, CSA	27.2 (1.07)	31.5 (1.24)	10.2 (0.40)	2

*Hold current 20°C.
**Device may withstand higher interrupt current at lower voltages. Each application will need to be individually evaluated.

[illegible]

Figure 4



Part number	I_H* (A)	V max. (Vdc)	I max.** (A)	R_1 max. (Ω)	Agency*** recognition	A (max.)	B (max.)	C (nom.)	Fig.
						Dimensions (millimeters/inches)			
RTE1[illegible]	1.20	[illegible]	40	0.180	UL, TÜV, CSA	7.4 (0.29)	12.2 (0.48)	5.08 (0.20)	4
RTE1[illegible]	1.35	[illegible]	40	0.145	UL, TÜV, CSA	7.4 (0.29)	14.2 (0.56)	5.08 (0.20)	4
RTE1[illegible]	1.60	33	40	0.092	UL, TÜV, CSA	8.9 (0.35)	13.5 (0.53)	5.08 (0.20)	4

*Hold current 20°C.
**Device may withstand higher interrupt current at lower voltages. Each application will need to be individually evaluated.

30V

Figure 5

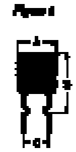
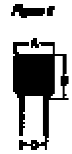


Figure 6

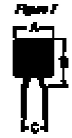


Part number	I_H* (A)	V max. (Vdc)	I max.** (A)	R_1 max. (Ω)	Agency recognition	A (max.)	B (max.)	C (nom.)	Fig.
						Dimensions (millimeters/inches)			
RUE090	0.90	30	40	0.22	UL, TÜV, CSA	7.4 (0.29)	12.2 (0.48)	5.08 (0.20)	5
RUE110	1.10	30	40	0.17	UL, TÜV, CSA	7.4 (0.29)	14.2 (0.56)	5.08 (0.20)	5
RUE135	1.35	30	40	0.13	UL, TÜV, CSA	8.9 (0.35)	13.5 (0.53)	5.08 (0.20)	5
RUE160	1.60	30	40	0.11	UL, TÜV, CSA	8.9 (0.35)	15.2 (0.60)	5.08 (0.20)	5
RUE185	1.85	30	40	0.09	UL, TÜV, CSA	10.2 (0.40)	15.7 (0.62)	5.08 (0.20)	5
RUE250	2.50	30	40	0.07	UL, TÜV, CSA	11.4 (0.45)	18.3 (0.72)	5.08 (0.20)	5
RUE300	3.00	30	40	0.05	UL, TÜV, CSA	11.4 (0.45)	17.3 (0.68)	5.08 (0.20)	6
RUE400	4.00	30	40	0.05	UL, TÜV, CSA	14.0 (0.55)	20.1 (0.79)	5.08 (0.20)	6
RUE500	5.00	30	40	0.05	UL, TÜV, CSA	14.0 (0.55)	24.9 (0.98)	10.2 (0.40)	6
RUE600	6.00	30	40	0.04	UL, TÜV, CSA	16.5 (0.65)	24.9 (0.98)	10.2 (0.40)	6
RUE700	7.00	30	40	0.03	UL, TÜV, CSA	19.1 (0.75)	26.7 (1.05)	10.2 (0.40)	6
RUE800	8.00	30	40	0.02	UL, TÜV, CSA	21.6 (0.85)	29.0 (1.14)	10.2 (0.40)	6
RUE900	9.00	30	40	0.02	UL, TÜV, CSA	24.1 (0.95)	29.7 (1.17)	10.2 (0.40)	6

*Hold current 20°C.
**Device may withstand higher interrupt current at lower voltages. Each application will need to be individually evaluated.

16V High Temperature

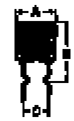
Figure 7



Lead size

Lead size

Figure 8



Lead size

Part number	I_H* (A)	V max. (Vdc)	I max.** (A)	R_1 max. (Ω)	Agency recognition	Dimensions (millimeters/inches) A (max.)		B (max.)		C (nom.)		Fig.
RHE070	0.7	16	40	[illegible]	UL, TÜV, CSA	6.86	(0.27)	10.8	(0.425)	5.08	(0.20)	8
RHE400	4.0	16	100	0.044	UL, TÜV, CSA	11.4	(0.45)	18.0	(0.71)	5.08	(0.20)	7
RHE450	4.5	16	100	0.034	UL, TÜV, CSA	10.4	(0.41)	15.5	(0.61)	5.08	(0.20)	7
RHE500	5.0	16	100	0.032	UL, TÜV, CSA	11.2	(0.44)	21.0	(0.83)	5.08	(0.20)	7
RHE650	6.5	16	100	0.026	UL, TÜV, CSA	12.7	(0.50)	22.2	(0.88)	5.08	(0.20)	7
RHE750	7.5	16	100	0.022	UL, TÜV, CSA	14.0	(0.55)	22.5	(0.89)	5.08	(0.20)	7
RHE1000	10.0	16	100	0.015	UL, TÜV, CSA	17.5	(0.69)	26.5	(1.04)	10.2	(0.40)	7
RHE1300	13.0	16	100	0.010	UL, TÜV, CSA	23.5	(0.925)	28.7	(1.13)	10.2	(0.40)	7
RHE1500	15.0	16	100	0.0082	Pending	23.5	(0.925)	28.7	(1.13)	10.2	(0.40)	7

*Hold current 20°C.

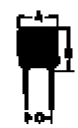
**Device may withstand higher interrupt current at lower voltages. Each application will need to be individually evaluated.

16V

Figure 9

Lead size

Figure 10



Lead size

Lead size

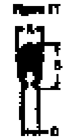
Part number	I_H (A)	V max. (V)	I max.** (A)	R_1 max. (Ω)	Agency recognition	Dimensions (millimeters/inches) A (max.)		B (max.)		C (nom.)		Fig.
RUSB090*	0.90	16	40	0.15	UL, TÜV, CSA	7.4	(0.29)	12.2	(0.48)	5.08	(0.20)	9
RUSB110*	1.10	16	40	0.14	UL, TÜV, CSA	7.4	(0.29)	14.2	(0.56)	5.08	(0.20)	9
RUSB135*	1.35	16	40	0.115	UL, TÜV, CSA	8.9	(0.35)	13.6	(0.54)	5.08	(0.20)	9
RUSB160*	1.60	16	40	0.11	UL, TÜV, CSA	8.9	(0.35)	15.2	(0.60)	5.08	(0.20)	9
RUSB185*	1.85	16	40	0.09	UL, TÜV, CSA	10.2	(0.40)	16.7	(0.66)	5.08	(0.20)	9
RUSB250*	2.5	16	40	0.08	UL, TÜV, CSA	11.4	(0.45)	18.3	(0.72)	5.08	(0.20)	9
RGE300	3.0	16	100	[illegible]	UL, TÜV, CSA	7.1	(0.28)	11.0	(0.43)	5.08	(0.20)	10
RGE400	4.0	16	100	0.050	UL, TÜV, CSA	8.9	(0.35)	12.6	(0.50)	5.08	(0.20)	10
RGE500	5.0	16	100	0.034	UL, TÜV, CSA	10.4	(0.41)	14.3	(0.56)	5.08	(0.20)	10
RGE600	6.0	16	100	0.026	UL, TÜV, CSA	10.7	(0.42)	17.1	(0.67)	5.08	(0.20)	10
RGE700	7.0	16	100	0.022	UL, TÜV, CSA	11.2	(0.44)	19.7	(0.78)	5.08	(0.20)	10
RGE800	8.0	16	100	0.0178	UL, TÜV, CSA	12.7	(0.50)	20.8	(0.82)	5.08	(0.20)	10
RGE900	9.0	16	100	0.0136	UL, TÜV, CSA	14.0	(0.55)	21.7	(0.85)	5.08	(0.20)	10
RGE1000	10.0	16	100	0.0106	UL, TÜV, CSA	16.5	(0.65)	25.2	(0.99)	5.08	(0.20)	10
RGE1100	11.0	16	100	0.0088	UL, TÜV, CSA	17.5	(0.69)	26.0	(1.02)	5.08	(0.20)	10
RGE1200	12.0	16	100	0.0084	UL, TÜV, CSA	17.8	(0.70)	28.0	(1.10)	10.2	(0.40)	10
RGE1400	14.0	16	100	0.0064	UL, TÜV, CSA	23.5	(0.925)	27.9	(1.10)	10.2	(0.40)	10

*Hold current 20°C.

**Device may withstand higher interrupt current at lower voltages. Each application will need to be individually evaluated.

6V

Figure 11



Lead size

Part number	I_H* (A)	V max. (Vdc)	I max.** (A)	R_1 max. (Ω)	Agency recognition	Dimensions (millimeters/inches) A (max.)		B (max.)		C (nom.)		Fig.
RUSB075	0.75	6	40	0.22	UL, TÜV, CSA	6.8	(0.27)	11.4	(0.45)	5.08	(0.20)	11
RUSB120	1.20	6	40	0.14	UL, TÜV, CSA	6.8	(0.27)	11.7	(0.46)	5.08	(0.20)	11
RUSB185	1.85	6	40	0.10	UL, TÜV, CSA	6.8	(0.27)	11.7	(0.46)	5.08	(0.20)	11

*Hold current 20°C.

**Device may withstand higher interrupt current at lower voltages. Each application will need to be individually evaluated.

[illegible]

These product lines consist of radial leaded and surface mount devices that protect against short duration high voltage faults (300-400V/rms). TR and TS products are designed to meet the protection needs of telecommunications applications. BBR devices provide overcurrent protection of the power tap in hybrid-coaxial applications.

TR, TS and BBR devices are not intended for continuous utility line voltage operation (i.e. 120v or 240V).

Figure 1

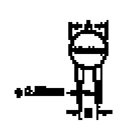
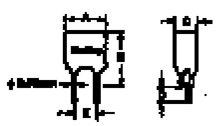


Figure 2



TR250

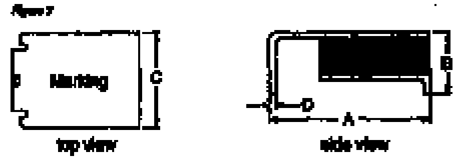
Part number	Ih (A)	V max. (Vrms)	I max. (A)	R min. (Ω)	R max. (Ω)	R_1 max. (Ω)	Agency recognition	Fig.
TR250-080T	0.080	250	3.0	16.0	22.0	33.0	UL, TÜV, CSA	1
TR250-080U	0.080	250	3.0	14.5	20.0	28.0	UL, TÜV, CSA	1
TR250-110U	0.110	250	3.0	5.0	9.0	14.0	UL, TÜV, CSA	1
TR250-120	0.120	250	3.0	4.0	8.0	16.0	UL, TÜV, CSA	2
TR250-120T	0.120	250	3.0	7.0	12.0	16.0	UL, TÜV, CSA	2
TR250-120T-RA	0.120	250	3.0	7.0	9.0	16.0	UL, TÜV, CSA	2
TR250-120T-RC	0.120	250	3.0	6.4	7.5	14.0	UL, TÜV, CSA	2
TR250-120T-RF	0.120	250	3.0	9.0	10.5	18.0	UL, TÜV, CSA	2
TR250-120T-R1	0.120	250	3.0	6.0	9.0	16.0	UL, TÜV, CSA	2
TR250-120T-R2	0.120	250	3.0	9.0	12.0	18.0	UL, TÜV, CSA	2
TR250-120U	0.120	250	3.0	6.0	10.0	18.0	UL, TÜV, CSA	2
TR250-120UT	0.120	250	3.0	7.0	12.0	18.0	UL, TÜV, CSA	2
TR250-145	0.145	250	3.0	4.0	8.0	14.0	UL, TÜV, CSA	2
TR250-145-RA	0.145	250	3.0	3.0	6.0	12.0	UL, TÜV, CSA	2
TR250-145-RB	0.145	250	3.0	4.5	6.0	12.0	UL, TÜV, CSA	2
TR250-145T	0.145	250	3.0	6.4	7.5	14.0	UL, TÜV, CSA	2
TR250-145U	0.145	250	3.0	3.5	6.5	10.0	UL, TÜV, CSA	2
TR250-180U	0.180	250	10.0	0.8	2.0	4.0	UL, TÜV, CSA	2

*These products are intended for telecom applications. Please see the Raychem Circuit Protection Databook for application details. Products are available in binned versions for resistance-matched applications. See Raychem Circuit Protection Databook for performance details.

Part number	Dimensions (millimeters/inches) A (max.)	B (max.)	C (max.)	D (min.)	E (typ.)	Fig.
TR250-080T	6.5 (0.256)	8.0 (0.315)	4.6 (0.181)	4.7 (0.185)	5.0 (0.197)	1
TR250-080U	4.8 (0.189)	8.8 (0.346)	3.8 (0.150)	4.7 (0.185)	5.0 (0.197)	1
TR250-110U	6.5 (0.256)	9.4 (0.370)	3.8 (0.150)	4.7 (0.185)	5.0 (0.197)	1
TR250-120	6.5 (0.256)	11.4 (0.449)	4.6 (0.181)	4.7 (0.185)	5.0 (0.197)	2
TR250-120U	6.0 (0.236)	10.0 (0.394)	3.8 (0.150)	4.7 (0.185)	5.0 (0.197)	2
TR250-145	6.5 (0.256)	11.0 (0.433)	4.6 (0.181)	4.7 (0.185)	5.0 (0.197)	2
TR250-145U	6.0 (0.236)	10.0 (0.394)	3.8 (0.150)	4.7 (0.185)	5.0 (0.197)	2
TR250-180U	10.4 (0.410)	12.8 (0.488)	3.6 (0.140)	4.7 (0.185)	5.0 (0.197)	2

TS250

Figure 3



Part number	Ih (A)	V max. (Vrms)	I max. (A)	R min. (Ω)	R max. (Ω)	R_1 max. (Ω)	Agency recognition	Fig.
TS250-130	0.130	250(600)	3.0(1.1)	6.5	12.0	20.0	UL, TÜV, CSA	3
TS250-130-RA	0.130	250(600)	3.0(1.1)	6.5	9.0	16.0	UL, TÜV, CSA	3
TS250-130-RB	0.130	250(600)	3.0(1.1)	6.5	12.0	20.0	UL, TÜV, CSA	3
TS250-130-RC-B-0.5	0.130	250(600)	3.0(1.1)	7.0	10.0	17.0	UL, TÜV, CSA	3

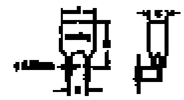
*These products are intended for telecom applications. Please see the Raychem Circuit Protection Databook for application details.

Part number	Dimensions (millimeters/inches) A (max.)	B (max.)	C (max.)	D (typ.)	Fig.
TS250-130	9.4 (0.370)	3.4 (0.134)	7.4 (0.291)	0.3 (0.011)	3
TS250-130-RA	9.4 (0.370)	3.4 (0.134)	7.4 (0.291)	0.3 (0.011)	3
TS250-130-RB	9.4 (0.370)	3.4 (0.134)	7.4 (0.291)	0.3 (0.011)	3
TS250-130-RC-B-0.5	9.4 (0.370)	3.4 (0.134)	7.4 (0.291)	0.3 (0.011)	3

EA62-827-C 3488

TR600

Figure 4



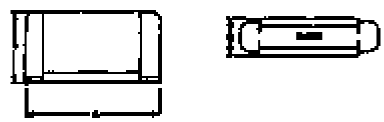
Part number	I_H (A)	V max. (Vrms)	I max. (A)	R min. (Ω)	R max. (Ω)	R_1 max. (Ω)	Agency recognition	Fig.
TR600-150	0.150	600	3.0	6.0	12.0	20.0	UL, CSA	4
TR600-150-RA	0.150	600	3.0	7.0	10.0	20.0	UL, CSA	4
TR600-150-RB	0.150	600	3.0	9.0	12.0	22.0	UL, CSA	4
TR600-160	0.160	600	3.0	4.0	10.0	18.0	UL, CSA	4
TR600-160-RA	0.160	600	3.0	4.0	7.0	16.0	UL, CSA	4
TR600-160-R1	0.160	600	3.0	4.0	6.0	17.0	UL, CSA	4

*These products are intended for telecom applications. [illegible]

Part number	Dimensions (millimeters/inches)					Fig.
	A (max.)	B (max.)	C (max.)	D (min.)	E (max.)	
TR600-150	12.5 (0.492)	12.5 (0.492)	6.0 (0.236)	4.7 (0.185)	5.0 (0.197)	4
TR600-160	12.5 (0.492)	12.5 (0.492)	6.0 (0.236)	4.7 (0.185)	5.0 (0.197)	4

TS600

Figure 5



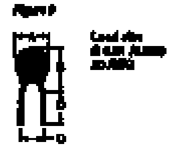
Part number	I_H (A)	V max. (Vrms)	I max. (A)	R min. (Ω)	R max. (Ω)	R_1 max. (Ω)	Agency recognition	Fig.
TS600-170	0.170	600	3.0	4.0	8.0	16.0	UL, CSA	5
TS600-200-RA-B-0.5	0.200	600	3.0	4.0	7.5	13.5	UL, CSA	5

*These products are intended for telecom applications. Please see the Raychem Circuit Protection Databook for application details.

Part number	Dimensions (millimeters/inches)			Fig.
	A (max.)	B (max.)	C (max.)	
TS600-170	19.4 (0.763)	12.5 (0.492)	8.5 (0.335)	5
TS600-200-RA-B-0.5	19.4 (0.763)	12.5 (0.492)	8.5 (0.335)	5

SSR

Figure 6



Part number	I_H (A)	V max. (V_{dc})	I max. (A)	R min. (Ω)	R max. (Ω)	R_1 max. (Ω)	Agency recognition	Fig.
SSR650	0.65	60	20	0.45	0.90	1.5	UL, CSA	6
SSR750	0.75	60	20	0.40	0.75	1.2	UL, CSA	6

*These products are intended for telecom applications. Please see the Raychem Circuit Protection Databook for application details.

Part number	Dimensions (millimeters/inches)				Fig.
	A (max.)	B (max.)	C (nom.)	D (min.)	
SSR650	10.9 (0.43)	14.6 (0.58)	5.08 (0.2)	7.6 (0.3)	6
SSR750	11.9 (0.47)	15.6 (0.61)	5.08 (0.2)	7.6 (0.3)	6

EA92-827-C 3497

This product line is designed for surface-mount applications. The variety of sizes enables installation in limited space applications such as crowded printed circuit boards, digital cameras, PC cards, subnotebook computers, computer peripheral equipment, and general electronics. These devices are designed for applications where such space is constrained and resettable circuit protection is desired.

Figure 1

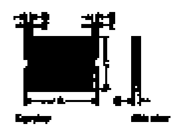


Figure 2

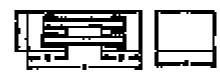


Figure 3

nanoSMD Size: 3216 (mm), 1206 (mils)

Part number**	I_H* (A)	V max. (Vdc)	I max. (A)	R_{typ} (Ω)	R_1 max. (Ω)	Agency recognition	Dimensions (millimeters/inches) A (max.)	B (max.)	C (nom.)	D (min.)	Fig.
nanoSMDM012F†	0.125	30	10	—	6.0	pending	3.4 (0.134)	1.2 (0.047)	1.8 (0.071)	0.75 (0.030)	2
nanoSMDM012F†	0.125	30	10	—	4.5	pending	3.4 (0.134)	1.2 (0.047)	1.8 (0.071)	0.75 (0.030)	3
nanoSMDM050†	0.50	6	40	0.40	0.70	UL, TÜV, CSA	3.4 (0.134)	1.2 (0.047)	1.8 (0.071)	0.75 (0.030)	2
nanoSMDM050F†	0.50	6	40	—	0.70	UL, TÜV, CSA	3.4 (0.134)	1.2 (0.047)	1.8 (0.071)	0.75 (0.030)	3
nanoSMDM075†	0.75	6	40	0.20	0.29	UL, TÜV, CSA	3.4 (0.134)	1.2 (0.047)	1.8 (0.071)	0.75 (0.030)	2
nanoSMDM075F†	0.75	6	40	—	0.29	UL, TÜV, CSA	3.4 (0.134)	1.2 (0.047)	1.8 (0.071)	0.75 (0.030)	3
nanoSMDM100†	1.00	6	40	0.15	0.21	UL, TÜV, CSA	3.4 (0.134)	1.2 (0.047)	1.8 (0.071)	0.75 (0.030)	2
nanoSMDM100F†	1.00	6	40	—	0.21	UL, TÜV, CSA	3.4 (0.134)	1.2 (0.047)	1.8 (0.071)	0.75 (0.030)	3
nanoSMDC150†	1.50	6	40	0.08	0.11	UL, TÜV, CSA	3.4 (0.134)	1.4 (0.055)	1.90 (0.075)	0.25 (0.010)	1

microSMD Size: 3225 (mm), 1210 (mils)

Part number	I_H* (A)	V max. (Vdc)	I max. (A)	R_{typ} (Ω)	R_1 max. (Ω)	Agency recognition	Dimensions (millimeters/inches) A (max.)	B (max.)	C (max.)	D (min.)	E (min.)	Fig.
microSMD005	0.05	30	10	20.00	50.0	UL, TÜV, CSA	3.43 (0.135)	0.85 (0.034)	2.80 (0.111)	0.30 (0.012)	0.20 (0.008)	1
microSMD010	0.10	30	10	—	15.0	UL, TÜV, CSA	3.43 (0.135)	0.85 (0.034)	2.80 (0.111)	0.35 (0.014)	0.20 (0.008)	1
microSMD035	0.35	6	40	0.81	1.300	UL, TÜV, CSA	3.43 (0.135)	0.62 (0.024)	2.80 (0.111)	0.30 (0.012)	0.35 (0.014)	1
microSMD050	0.50	13.2	40	0.50	0.900	UL, TÜV, CSA	3.43 (0.135)	0.62 (0.024)	2.80 (0.111)	0.30 (0.012)	0.25 (0.010)	1
microSMD075	0.75	6	40	0.29	0.450	UL, TÜV, CSA	3.43 (0.135)	0.62 (0.024)	2.80 (0.111)	0.30 (0.012)	0.25 (0.010)	1
microSMD110	1.10	6	40	0.14	0.210	UL, TÜV, CSA	3.43 (0.135)	0.48 (0.019)	2.80 (0.111)	0.30 (0.012)	0.25 (0.010)	1
microSMD150	1.50	6	40	0.07	0.110	UL, TÜV, CSA	3.43 (0.135)	1.22 (0.048)	2.80 (0.111)	0.30 (0.012)	0.25 (0.010)	1

miniSMD Size: 4532 (mm), 1812 (mils)

Part number	I_H* (A)	V max. (Vdc)	I max. (A)	R_{typ} (Ω)	R_1 max. (Ω)	Agency recognition	Dimensions (millimeters/inches) A (max.)	B (max.)	C (max.)	D (min.)	E (min.)	Fig.
miniSMDC014	0.14	60	10	4.0	6.000	UL, TÜV, CSA	4.73 (0.186)	0.89 (0.035)	3.41 (0.134)	0.30 (0.012)	0.25 (0.01)	1
miniSMDC020	0.20	30	10	2.6	4.500	UL, TÜV, CSA	4.73 (0.186)	0.89 (0.035)	3.41 (0.134)	0.30 (0.012)	0.25 (0.01)	1
miniSMDC050	0.50	15	40	0.50	1.00	UL, TÜV, CSA	4.73 (0.186)	0.62 (0.024)	3.41 (0.134)	0.30 (0.012)	0.25 (0.01)	1
miniSMDC075	0.75	13.2	40	0.28	0.450	UL, TÜV, CSA	4.73 (0.186)	0.62 (0.024)	3.41 (0.134)	0.30 (0.012)	0.25 (0.01)	1
miniSMDM075†	0.75	13.2	40	0.23	0.350	UL, TÜV, CSA	4.75 (0.187)	2.00 (0.079)	3.60 (0.142)	1.4 (0.055)	—	3
miniSMDM075/24†	0.75	24	40	0.20	0.290	UL, TÜV, CSA	4.75 (0.187)	2.00 (0.079)	3.60 (0.142)	1.4 (0.055)	—	2
miniSMDM075F/24†	0.75	24	40	0.29	[illegible]	UL, TÜV, CSA	4.75 (0.187)	2.00 (0.079)	3.60 (0.142)	1.4 (0.055)	—	2
miniSMDC110	1.10	6	40	0.12	0.210	UL, TÜV, CSA	4.73 (0.186)	0.62 (0.024)	3.41 (0.134)	0.30 (0.012)	0.25 (0.01)	1
miniSMDM110†	1.10	6	40	0.11	0.180	UL, TÜV, CSA	4.75 (0.187)	2.00 (0.079)	3.60 (0.142)	1.4 (0.055)	—	2
miniSMDM110/16†	1.10	16	40	0.13	0.180	UL, TÜV, CSA	4.75 (0.187)	2.00 (0.079)	3.60 (0.142)	1.4 (0.055)	—	2
miniSMDM110F/16†	1.10	16	40	—	0.180	UL, TÜV, CSA	4.75 (0.187)	2.00 (0.079)	3.60 (0.142)	1.4 (0.055)	—	2
miniSMDC125	1.25	6	40	0.09	0.140	UL, TÜV, CSA	4.73 (0.186)	0.48 (0.019)	3.41 (0.134)	0.25 (0.010)	0.20 (0.008)	1
miniSMDC150	1.50	6	40	0.07	0.110	UL, TÜV, CSA	4.73 (0.186)	0.48 (0.019)	3.41 (0.134)	0.25 (0.010)	0.20 (0.008)	1
miniSMDM150†	1.50	6	40	0.060	0.090	UL, TÜV, CSA	4.75 (0.187)	2.00 (0.079)	3.60 (0.142)	1.4 (0.055)	—	2
miniSMDC150F	1.50	6	40	—	0.10	UL, TÜV, CSA	4.73 (0.186)	0.48 (0.019)	3.41 (0.134)	0.25 (0.010)	0.20 (0.008)	1
miniSMDC200	2.00	6	40	0.050	0.070	UL, TÜV, CSA	4.73 (0.186)	1.02 (0.040)	3.41 (0.134)	0.30 (0.012)	0.25 (0.01)	1
miniSMDM200†	2.00	6	40	0.040	0.050	UL, TÜV, CSA	4.75 (0.187)	2.00 (0.079)	3.60 (0.142)	1.4 (0.055)	—	2
miniSMDM200F†	2.00	6	40	—	0.050	UL, TÜV, CSA	4.75 (0.187)	2.00 (0.079)	3.60 (0.142)	1.4 (0.055)	—	2
miniSMDC260	2.60	6	40	0.035	0.047	UL, TÜV, CSA	4.73 (0.186)	1.55 (0.061)	3.41 (0.134)	0.30 (0.012)	0.25 (0.01)	1
miniSMDM260†	2.60	6	40	0.030	0.048	UL, TÜV, CSA	4.75 (0.187)	2.00 (0.079)	3.60 (0.142)	1.4 (0.055)	—	2
miniSMDM260F†	2.60	6	40	—	0.045	UL, TÜV, CSA	4.75 (0.187)	2.00 (0.079)	3.60 (0.142)	1.4 (0.055)	—	2

midiSMD Size: 11630 (mm), 4420 (mils)

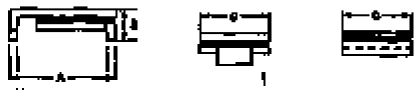
Part number	I_H* (A)	V max. (Vdc)	I max. (A)	R_{typ} (Ω)	R_1 max. (Ω)	Agency recognition	Dimensions (millimeters/inches) A (max.)	B (max.)	C (min.)	D (min.)	E (min.)	Fig.
midiSMDE190	1.90	16	100	0.080	0.08	UL, TÜV, CSA	11.51 (0.453)	4.59 (0.181)	5.35 (0.210)	0.81 (0.032)	—	1

* Hold current, 20°C.
** F is for Pb-free devices.
† Hold current, 20°C.

ER82–027–C 3488

This product line is also designed for surface-mount applications. The products range in hold currents from 0.3 Amps to 3.0 Amps and voltages from 6 Volts to 60 Volts. These devices are suited for high-density board applications in computer and computer peripheral products, telecommunications, and general electronics applications. They are designed to be reflowed onto a printed circuit board using standard surface-mount processes.

Figure 4



Side view   End view   End view (miniSMD products only)

microSMD Size: 5045 (mm), 2018 (mils)

Part number	I_H* (A)	V max. (Vdc)	I max. (A)	R_{typ} (Ω)	R_1 max. (Ω)	Agency recognition	Dimensions (millimeters/inches) A (max.)	B (max.)	C (max.)	Fig.
SMD050-2018	0.5	60	20	1.40	3.50	UL	5.44 (0.214)	1.73 (0.07)	4.93 (0.194)	4
[illegible]-2018	0.[illegible]	60	30	–	1.8	pending	5.44 (0.214)	1.73 (0.07)	4.93 (0.194)	4
SMD100-2018	1.10	15	40	0.20	0.400	UL, TÜV, CSA	5.44 (0.214)	1.52 (0.06)	4.93 (0.194)	4
SMD150-2018	1.50	15	40	0.12	0.150	UL, TÜV, CSA	5.44 (0.214)	1.52 (0.06)	4.93 (0.194)	4
SMD200-2018	2.00	8	40	0.07	0.100	UL, TÜV, CSA	5.44 (0.214)	1.52 (0.06)	4.93 (0.194)	4

SMD Size: 7555 (mm), 2920 (mils)

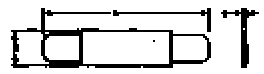
Part number	I_H* (A)	V max. (Vdc)	I max. (A)	R_{typ} (Ω)	R_1 max. (Ω)	Agency recognition	Dimensions (millimeters/inches) A (max.)	B (max.)	C (max.)	Fig.
SMD030	0.30	60	10	3.0	4.800	UL, TÜV, CSA	7.98 (0.314)	3.18 (0.125)	5.44 (0.214)	4
SMD050	0.50	60	10	0.97	1.400	UL, TÜV, CSA	7.98 (0.314)	3.18 (0.125)	5.44 (0.214)	4
SMD075	0.75	30	40	0.57	1.000	UL, TÜV, CSA	7.98 (0.314)	3.18 (0.125)	5.44 (0.214)	4
SMD100	1.10	30	40	0.30	0.480	UL, TÜV, CSA	7.98 (0.314)	3.0 (0.118)	5.44 (0.214)	4
SMD100/33	1.10	33	40	0.27	0.410	UL, TÜV, CSA	7.98 (0.314)	3.0 (0.118)	5.44 (0.214)	4
SMD125	1.25	15	40	0.18	0.250	UL, TÜV, CSA	7.98 (0.314)	3.0 (0.118)	5.44 (0.214)	4
SMD200	2.00	8	40	0.05	0.075	UL, TÜV, CSA	7.98 (0.314)	3.0 (0.118)	5.44 (0.214)	4
SMD260-RD	2.60	6	40	0.035	0.075	UL, TÜV, CSA	7.98 (0.314)	3.0 (0.118)	5.44 (0.214)	4
SMD300	3.00	6	40	0.025	0.048	UL, TÜV, CSA	7.98 (0.314)	3.0 (0.118)	5.44 (0.214)	4

SMDC Size: 8763 (mm), 3425 (mils)

Part number	I_H* (A)	V max. (Vdc)	I max. (A)	R_{typ} (Ω)	R_1 max. (Ω)	Agency recognition	Dimensions (millimeters/inches) A (max.)	B (max.)	C (max.)	Fig.
SMD150	1.50	15	40	0.16	0.250	UL, TÜV, CSA	9.4 (0.370)	3.00 (0.118)	6.71 (0.264)	4
SMD150/33	1.50	33	40	0.18	0.230	UL, TÜV, CSA	9.4 (0.370)	3.00 (0.118)	6.71 (0.264)	4
SMDH160	1.60	15	70	0.10	0.160	—	9.4 (0.370)	3.00 (0.118)	6.71 (0.264)	4
SMD185	1.85	33	40	0.12	0.180	UL, TÜV, CSA	9.4 (0.370)	3.00 (0.118)	6.71 (0.264)	4
SMD250	2.50	15	40	0.09	0.125	UL, TÜV, CSA	9.4 (0.370)	3.00 (0.118)	6.71 (0.264)	4
SMD260	2.60	15	40	0.05	0.085	UL, TÜV, CSA	9.4 (0.370)	3.00 (0.118)	6.71 (0.264)	4

VLR: [illegible]°C Activation

Figure 1



Top View Side View

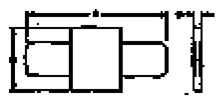
Part number	I_H* (A)	V max. (Vdc)	I max. (A)	R min. initial (Ω)	Agency recognition	Dimensions (millimeters/inches) A (max.)	B (max.)	C (max.)	Fig.
VLR170	1.7	12	70	0.032	UL, TÜV, CSA	23.5 (0.915)	3.0 (0.120)	0.8 (0.031)	1
VLR230	2.3	12	100	0.018	UL, TÜV, CSA	23.1 (0.909)	5.3 (0.208)	0.8 (0.031)	1

* Hold current, 20°C.

VTP: [illegible]°C Activation

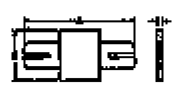
The conductive polymer composite in the VTP battery overcurrent protection devices provides increased safety with extended battery run time. These devices reach a high-resistance state at lower temperatures in NiMH and rechargeable lithium temperature-sensitive chemistries.

Figure 1



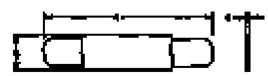
Top View Side View

Figure 2



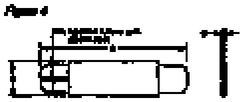
Top View Side View

Figure 3



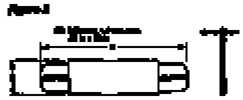
Top View Side View

Figure 4



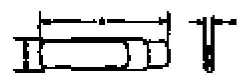
Top View Side View

Figure 5



Top View Side View

Figure 6



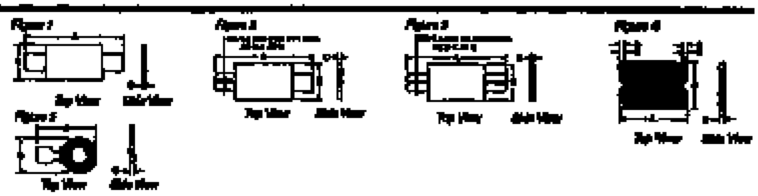
Top View Side View

Part number	I_H* (A)	V max. (Vdc)	I max. (A)	R max. initial (Ω)	Agency recognition	Dimensions (millimeters/inches) A (max.)	B (max.)	C (max.)	Fig.
VTP110	1.1	16	100	0.070	pending	25.6 (1.007)	2.9 (0.114)	0.7 (0.027)	6
VTP170	1.7	16	100	0.052	UL, TÜV, CSA	17.5 (0.690)	7.4 (0.290)	0.5 (0.02)	1
VTP170SS	1.7	16	100	0.052	UL, TÜV, CSA	17.5 (0.690)	7.4 (0.290)	0.5 (0.02)	2
VTP170X	1.7	16	100	0.052	UL, TÜV, CSA	22.9 (0.90)	5.3 (0.21)	0.5 (0.02)	3
VTP170XS	1.7	16	100	0.052	UL, TÜV, CSA	22.9 (0.90)	5.3 (0.21)	0.5 (0.02)	3
VTP175L	1.75	16	100	0.051	UL	28.0 (1.10)	3.8 (0.15)	0.5 (0.02)	4
VTP175U	1.75	16	100	0.051	UL	22.2 (0.87)	2.7 (0.10)	0.7 (0.03)	6
VTP200G	2.0	16	100	0.050	UL, TÜV, CSA	23.1 (0.91)	4.6 (0.18)	0.5 (0.02)	3
VTP200U	2.0	16	100	0.050	UL, TÜV, CSA	23.1 (0.91)	4.3 (0.17)	0.7 (0.03)	6
VTP210G	2.1	16	100	0.050	UL, TÜV, CSA	23.1 (0.91)	5.3 (0.21)	0.5 (0.02)	3
VTP210GU	2.1	16	100	0.050	UL, TÜV, CSA	22.2 (0.87)	5.1 (0.20)	0.5 (0.02)	6
VTP210L	2.1	16	100	0.050	UL, TÜV, CSA	38.0 (1.49)	5.3 (0.21)	0.5 (0.02)	5
VTP210S	2.1	16	100	0.050	UL, TÜV, CSA	24.1 (0.95)	5.3 (0.21)	0.5 (0.02)	4
VTP210SL	2.1	16	100	0.030	UL, TÜV, CSA	32.4 (1.28)	5.3 (0.21)	0.5 (0.02)	4
VTP210SL-[illegible]	2.1	16	100	0.030	UL, TÜV, CSA	37.0 (1.46)	5.3 (0.21)	0.5 (0.02)	4
VTP210SS	2.1	16	100	0.030	UL, TÜV, CSA	23.1 (0.91)	5.3 (0.21)	0.5 (0.02)	5
VTP210ULD	2.1	16	100	0.030	UL, TÜV, CSA	28.2 (1.05)	5.1 (0.20)	0.5 (0.02)	6
VTP240	2.4	16	100	0.020	CSA UL, (TÜV pending)	25.2 (1.03)	5.3 (0.21)	0.5 (0.02)	3

* Hold current, 20°C.

LTP, miniSMDC, TAC: 110°C Activation

LTP and TAC devices provide reliable, nonrecycling protection for rechargeable batteries. LTP devices also offer additional protection at elevated temperatures. The TAC devices' unique strap design makes them easy to install directly on AAA size battery cells.

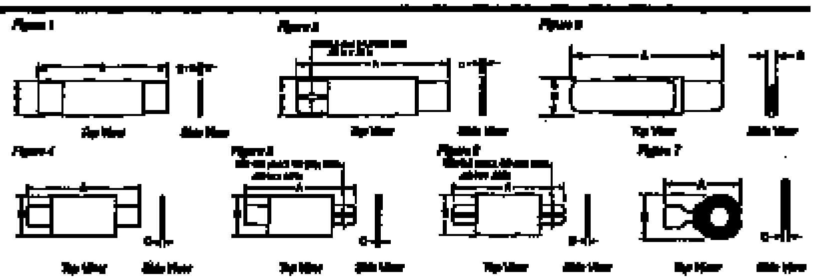


Part number	I_H* (A)	V max. (Vdc)	I max. (A)	R max. initial (Ω)	Agency recognition	Dimensions (millimeters/inches) A (max.)	B (max.)	C (max.)	Fig.
LTP									
LTP070	0.7	15	100	[illegible]	UL, TÜV, CSA	22.1 (0.87)	5.8 (0.20)	1.2 (0.048)	1
LTP070S	0.7	15	100	0.30	UL, TÜV, CSA	22.1 (0.87)	5.2 (0.20)	1.2 (0.048)	2
LTP100	1.0	24	100	[illegible]	UL, TÜV, CSA	23.1 (0.91)	5.2 (0.20)	1.0 (0.04)	1
LTP100S	1.0	24	100	0.150	UL, TÜV, CSA	23.1 (0.91)	5.2 (0.20)	1.0 (0.04)	2
LTP100SL	1.0	24	100	0.130	UL, TÜV, CSA	32.0 (1.26)	5.2 (0.20)	1.0 (0.04)	2
LTP100SS	1.0	24	100	0.100	UL, TÜV, CSA	23.1 (0.91)	5.2 (0.20)	1.0 (0.04)	3
LTP150	1.5	24	100	0.065	UL, TÜV, CSA	36.0 (1.42)	[illegible]	1.0 (0.04)	1
LTP150L	1.5	24	100	0.065	UL, TÜV, CSA	37.5 (1.48)	5.2 (0.20)	1.0 (0.04)	1
LTP150S	1.5	24	100	[illegible]	UL, TÜV, CSA	36.0 (1.42)	[illegible]	1.0 (0.04)	2
LTP1[illegible]	1.[illegible]	24	100	0.057	UL, TÜV, CSA	23.4 (0.92)	11.0 (0.43)	1.1 (0.04)	1
LTP2[illegible]	[illegible]	24	100	0.048	UL, TÜV, CSA	26.0 (1.02)	11.0 (0.43)	1.0 (0.04)	1
LTP300	[illegible]	24	100	0.031	UL, TÜV, CSA	31.6 (1.25)	12.[illegible]	1.1 (0.04)	1
LTP340	3.4	24	100	0.027	UL, TÜV, CSA	26.5 (1.05)	16.[illegible]	1.0 (0.04)	1
miniSMDC									
miniSMDC190	1.9	[illegible]	100	0.040	UL, TÜV, CSA	11.51 (0.453)	5.33 (0.21)	0.63 (0.027)	4
TAC									
TAC100-[illegible]	1.0	15	50	0.1[illegible]	UL	17.5 (0.69)	10.5 (0.42)	0.8 (0.04)	5

* Hold current, 20°C.

LR4, SRP, TAC: 120°C Activation

The LR4 devices' smaller thermal mass results in reduced reaction time to overcurrent events. The LR4 devices are suited for battery packs intended for computer and camcorder applications. The SRP products provide reliable, nonrecycling protection for rechargeable batteries. Weldable nickel leads and a narrow, low-profile design make these devices easy to install directly onto battery cells.



Part number	I_H* (A)	V max. (Vdc)	I max. (A)	R max. initial (Ω)	Agency recognition	Dimensions (millimeters/inches) A (max.)	B (max.)	C (max.)	Fig.
LR4									
LR4-170U	1.7	15	100	0.078	Pending	21.0 (0.83)	4.5 (0.18)	0.7 (0.03)	3
LR4-190	1.9	15	100	0.072	UL, TÜV, CSA	22.1 (0.87)	5.4 (0.22)	1.0 (0.04)	1
LR4-190S	1.9	15	100	0.072	UL, TÜV, CSA	22.1 (0.87)	5.4 (0.22)	1.0 (0.04)	2
LR4-260	2.6	15	100	0.042	UL, TÜV, CSA	23.1 (0.91)	5.6 (0.22)	1.0 (0.04)	1
LR4-260S	2.6	15	100	0.042	UL, TÜV, CSA	23.1 (0.91)	5.6 (0.22)	1.0 (0.04)	2
LR4-380	3.8	15	100	0.028	UL, TÜV, CSA	26.5 (1.05)	7.5 (0.30)	1.0 (0.04)	1
LR4-450	4.5	20	100	[illegible]	UL, TÜV, CSA	28.0 (1.10)	10.5 (0.41)	1.0 (0.04)	1
LR4-550	5.5	20	100	0.018	UL, TÜV, CSA	37.5 (1.48)	7.5 (0.30)	1.0 (0.04)	1
LR4-600	6.0	20	100	0.014	UL, TÜV, CSA	28.0 (1.10)	14.8 (0.57)	1.0 (0.04)	1
LR4-730	7.3	20	100	0.012	UL, TÜV, CSA	30.1 (1.19)	14.5 (0.57)	1.0 (0.04)	1
SRP									
SRP120	1.2	15	100	0.160	UL, TÜV, CSA	22.1 (0.87)	5.2 (0.20)	1.0 (0.04)	4
SRP120L	1.2	15	100	0.160	UL, TÜV, CSA	27.1 (1.07)	5.2 (0.20)	1.0 (0.04)	4
SRP120S	1.2	15	100	0.160	UL, TÜV, CSA	22.1 (0.87)	5.2 (0.20)	1.0 (0.04)	5
SRP175	1.75	15	100	0.080	UL, TÜV, CSA	23.1 (0.91)	6.2 (0.25)	1.0 (0.04)	4
SRP175L	1.75	15	100	0.080	UL, TÜV, CSA	32.1 (1.26)	6.2 (0.25)	1.0 (0.04)	4
SRP175S	1.75	15	100	0.080	UL, TÜV, CSA	23.1 (0.91)	6.2 (0.25)	1.0 (0.04)	5
SRP175SS	1.75	15	100	0.080	UL, TÜV, CSA	23.1 (0.91)	6.2 (0.25)	1.0 (0.04)	6
SRP200	2.0	30	100	0.080	UL, TÜV, CSA	23.4 (0.92)	11.0 (0.43)	1.1 (0.04)	4
SRP350	3.5	30	100	0.031	UL, TÜV, CSA	31.6 (1.25)	13.5 (0.53)	1.1 (0.04)	4
SRP420	4.2	30	100	0.024	UL, TÜV, CSA	32.4 (1.28)	13.5 (0.53)	1.1 (0.04)	4
TAC									
TAC170-[illegible]	1.7	15	50	0.086	UL	17.5 (0.69)	10.5 (0.42)	0.8 (0.03)	7
TAC[illegible]	[illegible]	15	50	[illegible]	UL, TÜV, CSA	17.5 (0.69)	10.5 (0.42)	0.8 (0.03)	7

* Hold current, 20°C.

EAB2-627-C 3401

These product lines are qualified to operate in Automotive environments and are compliant with QS-9000 AEC and Raychem Circuit Protection specified tests.

AGR: Radial-Leaded

Part number	I_H* (A) R_1 max.	I_H* (A) R_2 max.	V max. (Vdc)	I max. (A)	R min. (Ω)	R_1 max. (Ω)	R_2 max. (Ω)	Dimensions (millimeters/inches) A (max.)	B (max.)	C (typ.)	Fig.
AGR400	4.0	3.0	16	100	0.0186	[illegible]	[illegible]	[illegible]	14.1 [illegible]	5.08 (0.2)	1
AGR[illegible]	5.0	4.3	16	100	0.0140	0.034	0.043	10.4 (0.41)	15.5 (0.61)	5.08 (0.2)	1
AGR600	6.0	[illegible]	16	100	[illegible]	[illegible]	[illegible]	10.7 (0.42)	18.4 (0.72)	5.08 (0.2)	1
AGR700	7.0	6.5	16	100	[illegible]	[illegible]	[illegible]	11.2 (0.44)	21.0 [illegible]	5.08 (0.2)	1
AGR800	8.0	7.5	16	100	[illegible]	0.0176	0.0181	12.7 [illegible]	22.8 [illegible]	5.08 (0.2)	1
AGR900	[illegible]	[illegible]	16	100	0.0041	0.0138	0.0140	14.0 [illegible]	23.0 [illegible]	5.08 (0.2)	1
AGR1000	10.0	[illegible]	16	100	0.0034	0.0102	0.0105	16.51 [illegible]	[illegible] (1.01)	5.08 (0.2)	1
AGR1100	11.0	10.5	16	100	0.0035	0.0089	0.0096	17.5 [illegible]	26.6 (1.04)	5.08 (0.2)	1
AGR1200	12.0	11.5	16	100	0.0030	0.0088	0.0091	17.5 [illegible]	28.8 (1.14)	10.2 (0.4)	1
AGR1400	14.0	13.0	16	100	0.0022	0.0064	0.0067	23.5 [illegible]	28.7 (1.13)	10.2 (0.4)	1

AHR: High Temp Radial-Leaded

Part number	I_H* (A) R_1 max.	I_H* (A) R_2 max.	V max. (Vdc)	I max. (A)	R min. (Ω)	R_1 max. (Ω)	R_2 max. (Ω)	Dimensions (millimeters/inches) A (max.)	B (max.)	C (typ.)	Fig.
AHR400	4.5	4.5	16	100	0.0170	0.054	0.054	10.4 (0.41)	15.5 (0.61)	5.08 (0.2)	2
AHR600	6.0	6.0	16	100	0.0100	[illegible]	[illegible]	11.2 (0.44)	[illegible]	5.08 (0.2)	2
AHR[illegible]	6.5	6.5	16	100	[illegible]	[illegible]	[illegible]	12.7 [illegible]	[illegible]	5.08 (0.2)	2
AHR750	7.5	7.5	16	100	0.0074	[illegible]	[illegible]	14.0 [illegible]	[illegible]	5.08 (0.2)	2
AHR1000	10.0	10.0	16	100	0.0051	0.016	0.016	17.5 [illegible]	26.6 (1.04)	10.2 (0.4)	2
AHR1300	13.0	13.0	16	100	0.0034	0.010	0.010	23.5 [illegible]	28.7 (1.13)	10.2 (0.4)	2

AHS: High Temp Surface-Mount

Part number	I_H* (A) R_1 max.	I_H* (A) R_2 max.	V max. (Vdc)	I max. (A)	R min. (Ω)	R_1 max. (Ω)	R_2 max. (Ω)	Dimensions (millimeters/inches) A (max.)	B (max.)	C (typ.)	Fig.
AHS030-2018	0.3	0.3	16	70	0.170	0.550	0.550	5.44 (0.214)	4.93 (0.194)	1.02 (0.040)	3
AHS160	1.60	1.6	16	70	0.050	0.160	0.160	9.40 (0.370)	6.60 (0.260)	3.00 (0.118)	3

ASMD: Surface-Mount

Part number	I_H* (A) R_1 max.	I_H* (A) R_2 max.	V max. (Vdc)	I max. (A)	R min. (Ω)	R_1 max. (Ω)	R_2 max. (Ω)	Dimensions (millimeters/inches) A (max.)	B (max.)	C (typ.)	Fig.
ASMD[illegible]	[illegible]	[illegible]	[illegible]	10	[illegible]	[illegible]	[illegible]	7.9 (0.31)	5.4 (0.21)	3.2 (0.126)	3
ASMD[illegible]	[illegible]	[illegible]	[illegible]	10	[illegible]	1.400	1.40	7.9 (0.31)	5.4 (0.21)	3.2 (0.126)	3
ASMD[illegible]	0.60	0.60	30	40	[illegible]	[illegible]	[illegible]	7.9 (0.31)	5.4 (0.21)	3.2 (0.126)	3
ASMD100	0.90	0.90	30	40	[illegible]	0.480	0.48	7.9 (0.31)	5.4 (0.21)	3.00 (0.118)	3
ASMD125	1.04	1.04	15	40	0.057	0.280	0.28	7.9 (0.31)	5.4 (0.21)	3.00 (0.118)	3
ASMD150	1.27	1.27	15	40	0.049	0.250	0.25	9.4 (0.370)	[illegible]	3.00 (0.118)	3
ASMD[illegible]	1.73	1.73	15	40	0.05	0.120	0.120	9.4 (0.370)	6.71 (0.264)	3.00 (0.118)	3
ASMD250	1.97	1.97	15	40	0.055	0.085	0.085	9.4 (0.370)	6.71 (0.264)	3.00 (0.118)	3

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Definitions

I_H = Hold current—maximum current at which the device will not trip under specified conditions.

$I_{max.}$ = The highest fault current that can safely be used to trip a PolySwitch device under specified conditions.

$V_{max.}$ = The highest voltage that can safely be dropped across a PolySwitch device in its tripped state under specified fault conditions.

$R_1max.$ = Maximum device resistance under specified conditions measured 1 hour post trip or post reflow.

$R_Tmax.$ = Maximum device resistance under automotive conditions specified in PS400 measured 1 hour after stress has been removed.

Rmax. Initial = Maximum device resistance under specified conditions as supplied.

Trip Current = Minimum current at which a device will trip under specified conditions.

⚠ **WARNING**

- Operation beyond maximum ratings or improper use may result in device damage and possible electrical arcing and flame.
- These devices are intended for protection against occasional overcurrent or overtemperature fault conditions, and should not be used when repeated fault conditions are anticipated.
- TR and TS devices are not intended for continuous utility line voltage such as 120/220 V or 240 V.

Voltage Rating for Telecom Devices

For Raychem Circuit Protection telecom devices (TC, TGC, TRx, TSx) there are two applicable voltage ratings. These are $V_{max.}$ Operating and $V_{max.}$ Interrupt. To help understand the nature of these two different voltage ratings the following definitions are provided:

$V_{max.}$ Interrupt: Under specified conditions this is the highest voltage that can be applied to the device at the maximum current. Devices have been designed to trip safely under higher power level cross conditions, as listed above, to assist equipment in meeting the appropriate industry conditions.

$V_{max.}$ Operating: For telecom devices this is the voltage we have used to obtain component recognition under UL1434. Raychem Circuit Protection devices (TC, TGC, TRx, TSx) are certified at 60V but can withstand higher Vmax. Interrupt conditions as noted above.

For the purpose of this brochure we have included in the table of electrical ratings the more applicable $V_{max.}$ Interrupt value.

Agency approvals for PolySwitch devices:

PolySwitch devices, where appropriate, have been tested and have gained the following safety agency approvals:

- UL Component Recognition in Category XGPU2, Thermistor Type Devices
- CSA Component Acceptance Class 0078 52, Thermistors—PTC Type
- TÜV Rheinland Certification, PTC Resistors

tyco / Electronics Raychem CIRCUIT PROTECTION

Worldwide Headquarters
308 Constitution Drive
Menlo Park, CA 94025-1164
Tel (800) 227-7040
(650) 361-6900
Fax (650) 361-2606

www.circuitprotection.com
www.circuitprotection.com.hk (Chinese)
www.raychem.com/po/jpn/polyswitch (Japanese)

South America

Argentina
Tel 54-11-4394-6150
Fax 54-11-4326-8865

Brazil
Tel 55-11-5181-4768
Fax 55-11-5181-4790

Chile
Tel 56-2-209-8211
Fax 56-2-223-1477

Colombia
Tel 57-1-216-2460
Fax 57-1-216-2472

Peru
Tel 51-1-221-4165
Fax 51-1-421-0368

Uruguay
Tel 59-8-982-2428
Fax 59-8-982-2430

Venezuela
Tel 58-2-242-6475
Fax 58-2-241-5260

Europe

UK/EIRE/ Nordic Countries
Tel (44)-1793-572-244
Fax (44)-1793-573-178

Germany/Austria/ Switzerland/ Eastern Europe
Tel (49)-89-608-9386
Fax (49)-89-606-6384

France/Benelux/ Italy/Iberia
Tel (33)-1-3440-7269
Fax (33)-1-3440-7258

Other Countries
Tel (32)-16-351-321
Fax (32)-16-351-319

Asia/Pacific

Australia, Sydney
Tel 61-2-9590-3944
Fax 61-2-9550-3977

China, Beijing
Tel 86-10-6581-5806
Fax 86-10-6581-5809

China, Guangzhou
Tel 86-20-8330-9833
Fax 86-20-8365-6139

China, Hong Kong
Tel 852-2736-3401
Fax 852-2735-1185

China, Shanghai
Tel 86-21-6485-3288
Fax 86-21-6485-5109

India, Bangalore
Tel 91-80-559-1486
Fax 91-80-555-6036

Japan
Tel 81-44-900-5110
Fax 81-44-900-5140

Korea
Tel 82-2-3415-4654
Fax 82-2-3486-1786

Malaysia
Tel 6-04-644-0931
Fax 6-04-644-0521

Philippines
Tel 63-2-867-6841
Fax 63-2-867-6661

Singapore
Tel 65-486-8126
Fax 65-484-0661

Taiwan
Tel 886-2-2662-9788
Fax 886-2-2662-4984

Thailand
Tel 66-2-617-1936
Fax 66-2-617-1939

Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Wednesday, September 25, 2002 4:43 PM
To: Kotwicki, Allan (A.J.)
Subject: RE: Ionizing radiation effect on Ford Power train electronics from new US Customs Vehicle and Cargo Inspection System

Al,

The sensor is assembled in Moorpark, CA.

The die used to be built in Long Island NY and in CA with loads of trips back and forth.
The new supplier of the die is in Canada.

The finished sensor is shipped to US, Europe & Asia before use. Some come back from Europe on engines for domestic applications (4.0L Explorer is an example of this).

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

-----Original Message-----
From: Kotwicki, Allan (A.J.)
Sent: Tuesday, September 24, 2002 2:51 PM
To: Koneda, Philip (P.T.); Freeland, Mark (M.)
Cc: Kotwicki, Allan (A.J.)
Subject: FW: Ionizing radiation effect on Ford Power train electronics from new US Customs Vehicle and Cargo Inspection System

An interesting result of 9/11. Phil: I think Roy imputes magic powers to me, believing I have some influence around here. Mark: where are the DPFE sensors manufactured, how are they shipped into the US?

Thanks in advance for your help,

Allan J. Kotwicki
59-41277
akotwick@ford.com
MD 3619 SRL

-----Original Message-----
From: Dolley, Roy (R.)
Sent: Tuesday, September 24, 2002 1:19 PM
To: Kotwicki, Allan (A.J.)
Cc: Dolley, Roy (R.)
Subject: Ionizing radiation effect on Ford Power train electronics from new US Customs Vehicle and Cargo Inspection System

Al:
I have detected a possible problem from the US Government's implementation of a Vehicle and Cargo Inspection System after the 9-11 problem last fall. I have asked Motorola to do the preliminary investigation. I will need your help if they find a problem as I believe they will. I have attached a Presentation that I gave my supervisor. Please provide comment on the approach and information. Thanks, Looking forward to possibly working with you again

Roy Dolley
FSS Decision Maker
PEAD/Dept. T321
313-5942497
Fax 313-390-3630
POEE Bldg. Mail Drop 76 Cube AW049

<< File: VACIS.ppt >>

Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Thursday, September 26, 2002 9:33 AM
To: Koszewnik, John (J.J.)
Cc: Davis, George (G.C.)
Subject: RE: Latch protection for DPFE

John,

With the prototype I have in hand (Signal diodes instead of Schottky), there is a significant reduction in the fuzz. It is not totally eliminated. The magnitude of the output drop off is reduced as well as frequency with which it occurs. When I have the Schottky diodes I will test to see if it does better.

I have the external transient threshold data for 35 "used" parts as of last night. I will run the stats and forward to you when have the data for 50 - 60 parts.

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

-----Original Message-----
From: Koszewnik, John (J.J.)
Sent: Tuesday, September 24, 2002 1:26 PM
To: Freeland, Mark (M.)
Subject: RE: Latch protection for DPFE

Mark,

Great. Thanks for the update.

One more question though. When you make the changes we discussed yesterday to the transient voltage protection on Vref and Vout, do we have any impact on the fuzz we saw on Vout?

John Koszewnik

Chief Engineer
V-Engine Engineering
Ph. 32-28973
Fx. 24-96067
jkoszewn@ford.com

-----Original Message-----
From: Freeland, Mark (M.)
Sent: Tuesday, September 24, 2002 9:31 AM
To: Koszewnik, John (J.J.)
Cc: Davis, George (G.C.)
Subject: RE: Latch protection for DPFE

Freeland, Mark (M.)

From: Freeland, Mark (M.)
Sent: Thursday, September 26, 2002 1:49 PM
To: 'E-mail center'
Subject: RE: E-Mail Eng Kit Confirmation

Thank you.

I appreciate you're help and fast response.

Regards

Mark Freeland

> 6-Sigma Black Belt
> Engine Research Department
> Ford Research Laboratory
> P.O. Box 2053
> MD 2629 - SRL - Room 1517
> Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

-----Original Message-----
From: E-mail center [mailto:emailcenter@inductor.com]
Sent: Thursday, September 26, 2002 12:57 PM
To: Mark Freeland
Subject: E-Mail Eng Kit Confirmation

Inductors Inc.
5 Technology Drive,
Irvine, CA 92618
Phone: 800-533-8295
Fax: 949-623-1401
www.inductor.com

09/26/02

Mark Freeland
Ford Motor Company
2101 Village Road, SRL Rm. 1517
Dearborn, MI 48121

Dear Mark:

Congratulations on taking advantage of our limited time offer of FREE engineering kits. You should be receiving the kits you requested via ups in the next couple of days. Please don't hesitate to call me for any of your inductor needs

Sincerely,

Clay Boxley
Sales Representative

NTELLECK, LLC

Creative Thinking

April 21, 2002

To: Paul Plante (pplante@ford.com), James Maurer (jmaurer@ford.com), Mark Freeland (mfreela1@ford.com, Jon Hangas (jhangas@ford.com)

Subject: Testing and Analytical Solutions, Inc.

The analyticalsol.com website is very informative. They appear to have capabilities appropriate for our current needs. However, it may require an effort on our part to identify and apportion needed testing in some appropriate manner.

Analytical Solutions, Inc. offer three types of failure analysis capability:

1. Failure analysis (FA): "... the device under investigation is carefully analyzed to establish a link between the electrical failure mode reported by the customer to a *physical* failure mechanism on the device ..."
2. Destructive physical analysis (DPA): "... is performed to evaluate the quality of construction of a particular lot of electronic devices ..."
3. Construction analysis (CA): "... to evaluate the process design and if any inherent reliability problems are present."

It doesn't appear that their FA is what we think of as FMEA (see below).

Analytical Solutions, Inc. has the following analytical tools: Optical Microscopy (IR not indicated), X-radiography, In-SEM probing, E-Beam Techniques including Electron Beam Induced Current and Voltage Contrast imaging (static and dynamic), Electrical Characterization, Micro-Probing, Precision Cross-Sectioning, Chemical Etching including Selective wet/dry etching. These tools, plus CMOS device experience, should prove very fruitful in aiding our analyses.

I. Electrical failure mode: we have devices, which upon laboratory testing show a "high-current state" without destroying the devices. These are of two types: devices removed from field service and devices overstressed in the laboratory. Since these are CMOS devices, it is plausible that the high-current state may arise from a parasitic SCR condition. It is also possible, but not yet determined, that the high-current state is root cause of field failures.

II. Independent laboratory testing is needed to determine whether the high-current state is an SCR condition or if other causes exist on a device: probe-test equipment can probably do this type of analysis.

1. If it is an SCR condition this raises at least three possible causes,
    a. overstressing* of the device with high voltage (V),
    b. overstressing* of the device with high rate of voltage rise (dV/dt),
    c. overstressing* of the device with the sequence of voltages applied to the device (V_a ... V_n). (* Overstressing refers to field conditions and the

EA02-027-C 3490

response of a device to these conditions. Device capability, vis-à-vis field conditions, relates to performance specifications, circuit design, fabrication, and manufacturing variability.)

   d. An independent laboratory may have CMOS experience indicating that other SCR causes are plausible [temperature, vibration (erratic make/break contacts), corrosion, irradiation, etc.].

2. If it is determined that no SCR condition is present then physical examination of high-current devices is needed. Imaging methods would be an appropriate starting point; imaging of non-activated devices, and imaging of devices held in a high-current state. The device's gold over-layer presents a problem because of possible damage to underlying structure during its removal. It will be of interest to see how an independent laboratory will propose to remove it or make images with it in place. Optical microscopies in the visible band and in the infrared are likely candidates for these imaging exercises. If Au and other passivation layers can be removed, scanning electron microscopy can be used to examine for physical defects.
3. If examination of images produces no clues then other overstress parameters may need to be simulated (temperature, vibration, etc.).

III. If an SCR-condition, along with particular overstress parameters (V, dV/dt, V_a ... V_n, other), is determined to be root cause then an FMEA should be executed to determine relationships between these SCR-conditions and "engine-light on". I should think the supplier would want to do a similar analysis relative to the circuit design and the fabrication process as relates to a high-current state. An independent laboratory might be able to do an FMEA relating the high-current state to design and/or processes issues if given the supporting design/process fundamentals.

If an SCR-condition is determined, along with its overstress parameters, it may then be possible to estimate the probable frequency of such conditions as relate to design/fabrication variances and field application variances.

IV. If corrosion becomes suspect, with/without an SCR-condition, then gel analysis is one bit of information of interest. This might be available from the device supplier and/or the gel manufacturer. Interpretation of the data may need the above FMEA results.

From the information presented in Analytical Systems, Inc. website, it appears that they are capable of a large portion of the measurements suggested above.

Ed Sickafus, PhD, PD
President
Ntelleck, LLC
PO Box 193
Grosse Ile, MI 48138
Phone: (734) 676-3594
Email: Ntelleck@ic.net

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FMYU04121KF57116	Veh Line:	T/M1 - ESCAPE (U204) [2001]	Eng Serial No:	674079087
Model Year:	2001	Market Derived:	T/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	T	Drive Code:	T/F - 4 WHL L/H FULL TIME DRIVE	Engine:	T/LD - MOD 3.0L DOHC EFI NA
Inv. Dealer:	00998	Body Cab Style:	T/WD - 4 DOOR WAGON	Transmission:	T/DJ - 4 SPD AUTO TRANS NA
		Version/Series:	T/EP - FORD SERIES		

BUILD INFORMATION:

Region: NA - ######### Plant: AJ - KANSAS CITY PLANT BUILD
Country: USA - ######### Prod Date: 10-NOV-2000

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 131026 - *
Country: USA - ######### Selling Dlr St/Prov: NC
Buyer St/Prov: NC

Arrival Date:	27-NOV-2000	Red Carpet Lease:	*		
Sale Date:	11-DEC-2000	Fleet/Retail/Co. Lease:	R		
Warranty Start Date:	11-DEC-2000	Modified Vehicle:	*		
Orig Warranty Date:	11-DEC-2000	Reacquired Vehicle:	*	Vehicle Export Flag:	N

VOC/EOC:

```
---------1---------2---------3---------4---------5---------6---------7---------8---------9---------0
[illegible]
[illegible]
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/8 - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	C	GVW Class Code:	Y
Audio Disc:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	* - [N/A]	Mirror(Psngr Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	A	Paint:	PNPDW - DARK HIGHLAND GREEN C/C
Brake Code:	FEAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AT - ELETR PREM AM/FM STRO/CSTE/CLK
Calibration Code:	0M11A30A	Sound System:	AE - AUDIOPHILE SOUND SYSTEM
Color(Accent):	* - [N/A]	Suspn Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Manufacturer:	AB -
Delivery Type:	0	Tire Brand:	* -
Driveshaft Code:	D	Tire Size:	D3JUJ - P235/70R-16 OWL A-S
Front Seat:	* - [N/A]	Traction Control:	* - [N/A]
Fuel Type:	* - [N/A]	Wheel Base:	* - [N/A]

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*	DOT Plant Manufacturer:	* - *

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	• Emission Code:	T/B - T/B
ESP Coverage(Miles):	• Emission Cert Type:	5
ESP Coverage(Time):	• Emission Decal Suffix:	HK2
ESP Plan Year:	• Engine Family:	1FMXT0501F6
ESP Signature Date:		

Any comments? You can contact

webmaster

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FMYU04121KF57116	Veh Line:	T/M1 - ESCAPE (U204) [2001]	Eng Serial No:	674079087
Model Year:	2001	Market Derived:	T/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	T	Drive Code:	T/F - 4 WHL L/H FULL TIME DRIVE	Engine:	T/LD - MOD 3.0L DOHC EFI NA
Inv. Dealer:	00998	Body Cab Style:	T/WD - 4 DOOR WAGON	Transmission:	T/DJ - 4 SPD AUTO TRANS NA.
		Version/Series:	T/EF - FORD SERIES		

BUILD INFORMATION:

Region: NA - ######### Plant: AJ - KANSAS CITY PLANT BUILD
Country: USA - ######### Prod Date: 10-NOV-2000

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 121026 - *
Country: USA - ######### Selling Dlr St/Prov: NC
Buyer St/Prov: NC

Arrival Date: 27-NOV-2000 Red Carpet Lease: *
Sale Date: 11-DEC-2000 Fleet/Retail/Co. Lease: R
Warranty Start Date: 11-DEC-2000 Modified Vehicle: *
Orig Warranty Date: 11-DEC-2000 Reacquired Vehicle: * Vehicle Export Flag: N

VOC/EOC:

```
+---------1---------2---------3---------4---------5---------6---------7---------8---------9---------0
U041KF57116103179  V 2 23B2760      CY X  B468 63  M63  385 5 4K3ANW 21K826  3  FX  A  KB364 3 2  11
MB2 9   1        914KC F  Y                                5B
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	C	GVW Class Code:	Y
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	* - [N/A]	Mirror(Psngr Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	A	Paint:	PNPDW - DARK HIGHLAND GREEN C/C
Brake Code:	FBAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AT - ELETR PREM AM/FM STRO/CSTE/CLK
Calibration Code:	0M11A30A	Sound System:	AE - AUDIOPHILE SOUND SYSTEM
Color(Accent):	* - [N/A]	Susp Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Manufacturer:	AB -
Delivery Type:	0	Tire Brand:	* -
Driveshaft Code:	D	Tire Size:	D3JUJ - P235/70R-16 OWL A-S
Front Seat:	* - [N/A]	Traction Control:	* - [N/A]
Fuel Type:	* - [N/A]	Wheel Base:	* - [N/A]

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*	DOT Plant Manufacturer:	* - *

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	• Emission Code:	T/B - T/B
ESP Coverage(Miles):	• Emission Cert Type:	5
ESP Coverage(Time):	• Emission Decal Suffix:	HX5
ESP Plan Year:	• Engine Family:	1FMXT0201F6
ESP Signature Date:		

Any comments? You can contact

webmaster

Ford

MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective:	**Establish and implement corrective and containment actions for Kavlico TM dPFE Sensor**

Meeting Logistics

Subject:	Kavlico TM dPFE Sensor Core Team
Dates:	April 9, 2002
Time:	1-2:30 p.m.
Location:	POEE, DI-196 (FMEI War Room)
Called By:	Jim Maurer, Team Leader: (313) 39-03672
Next Meeting (s):	April 11, 2002, Core Team Meeting April 16, 2002
Conference Call-in Number(s):	9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436# Kavlico Fax: 805-531-6574

Core Team Participants

Black Belts	Kavlico	V-Engine	Quality Office	EESE	Purchasing
Mark Freeland	Mary Akins	Jim O'Neall	Mahmoud Awad	Sheran Alles	Chris Nielsen
Shri Akolkar	Don Ayers	Freeman Gates		Robert Rossi	Bill McCarty
Jon Janda		Chris Panaretos			Patrice White-Johnson
		Paul Plante		**PCSE**	
Team Leader		Carol Verner		Ken Arnold	
Jim Maurer				Brian Perry	

Meeting Agenda –4/09/02

Order of Agenda Items	Corr. Issue #	Person(s) Responsible	Time Allocated
1. Introductions		All	5 minutes
2. Service Part Volume Projections – Kit vs. One part	I16, A2	John Shore	10 minutes
3. Update on Wiring Harness Root Causes / findings	various	Sheran Alles, Robert Rossi	15 minutes
4. STA Update	I20	Patrice White-Johnson	10 minutes
5. Update on FRL Scientific Evaluation – progress to date	I3, A2	Mark Freeland	10 minutes
6. GQRS Data on 21 platforms – Status	I3, A9	Jon Janda, Mahmood Awad	10 minutes
7. Outside Lab – Non disclosure agreement, work plan, objectives	I5, A5	Kyong Park Freeman Gates	10 minutes
8. Update on Body and Assembly plant failures	I3, A3	Terry Tamashiro	10 minutes
9. Walk-ins		All	10 minutes
10. Next Meeting Agenda Items		All	10 minutes

Proposed Next Meeting Agenda 4/11/02	Person(s) Responsible	Time Estimated
PCM solder crack issue (J1 connector) & current draw to stall the vehicle	John Jasban	10 minutes

Notes

Bring handouts (paper copies) for all presentations
Provide electronic copies of presentations to CPANARET (no later than 1 hour prior to the meeting)
Please be on time as we have a full agenda

Jim Maurer/cp: 4/8/02
Kavlico dPFE Sensor Core Team

EM02-027-C 3586

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FAFP55271G246328	Veh Line:	C/DD - TAURUS/SABLE (D186) [00-02]	Eng Serial No:	030000DM
Model Year:	2001	Market Derived:	C/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	C	Drive Code:	C/A - 2 WHL L/H FRONT DRIVE	Engine:	C/LA - VULC 3.0L OHV EFI
Inv. Dealer:	01174	Body Cab Style:	C/FC - 4 DOOR SEDAN-6 LITE	Transmission:	C/DT - 4 SPD AUTO TRANS
		Version/Series	C/FB - TAURUS S VERSION		

BUILD INFORMATION:

Region: NA - ######### Plant: AD - CHICAGO PLANT BUILD
Country: USA - ######### Prod Date: 24-MAY-2001

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 141843 - *
Country: USA - ######### Selling Dlr St/Prov: OK
Buyer St/Prov: OK

Arrival Date:	29-MAY-2001	Red Carpet Lease:	*		
Sale Date:	08-JUN-2001	Fleet/Retail/Co. Lease:	F		
Warranty Start Date:	08-JUN-2001	Modified Vehicle:	*		
Orig Warranty Date:	08-JUN-2001	Reacquired Vehicle:	*	Vehicle Export Flag:	N

VOC/EOC:

```
----+----1----+----2----+----3----+----4----+----5----+----6----+----7----+----8----+----9----+----0
P55102246328T 3    4  ALA2600812        SC F 31L38 22  3  20N5     18  N415843  1WAFF     K22       21
FAFT 7     27 A    2LTL                      4080L88081         14
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	C/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	FA	GVW Class Code:	F
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	* - [N/A]
Axle Type:	* - [N/A]	Mirror(Psngr Side):	* - [N/A]
Battery Amp Rating:	MU	Paint:	FN2GC - PERFORMANCE WHITE C/C
Brake Code:	FEAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AU - ELITE PREM AM/FM STRO/DISC
Calibration Code:	1DD1P50A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Suspn Tandem Axle:	* - [N/A]
Color(Trim):	000ZV -	Tire Manufacturer:	AP - CONTINENTAL
Delivery Type:	H	Tire Brand:	A3X844P - TOURINGCONTACT AS MT
Driveshaft Code:	*	Tire Size:	D3JSZ - P215/60R-16 BSW ALL SEASON
Front Seat:	* - [N/A]	Traction Control:	* - [N/A]
Fuel Type:	AK - FLEX FUEL ETHANOL	Wheel Base:	* - [N/A]

TIRE DOT INFORMATION:

LF:	A3X844P1501	RF:	A3X844P1501
LR:	A3X844P1501	RR:	A3X844P1501
LI:	*	RI:	*

SPARE: FCW7H9B1901 DOT Plant Manufacturer: A3 - GENERAL TIRE & RUBBER CO ; MOUNT VERNON ; ILLINOIS ; UNITED STATES

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	• **Emission Code:**	C/B - C/B
ESP Coverage(Miles):	• **Emission Cert Type:**	5
ESP Coverage(Time):	• **Emission Decal Suffix:**	HZZ
ESP Plan Year:	• **Engine Family:**	1FMXV030VF9
ESP Signature Date:		

Any comments? You can contact

webmaster

ER02-027-C 3507

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Located in Colorado Springs (map to our location) at the f
Pikes Peak, Insight Analytical Labs (IAL) was created in 1
address the failure analysis and reliability needs of the
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Although IAL was started by Tom Paquette, it has been th
addition of its key people, their talents and dedication, wh
have made it so successful in so few years. Your business
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performing the analysis for you.

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- TDDB lifetime studies
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- Parametric testing
- Training (general o house)
- Reliability consultir testing

- Hot carrier lifetime studies

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- Hewlett Packard
- Keithley Instruments
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- Ramtron
- Rockwell
- Simtek
- TAEUS
- Texas Instruments
- United Memories

What our Customers Say:

"One of the most important services IAL provides for us is consultation on the best techniques and approach to a problem. Often we are not sure of the right question to ask. Our own lack of expertise can result in asking the wrong question and getting data that does not help us resolve the root cause."

- A. Y., Hewlett Packar

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- A. M., Hewlett Packar

EA02-827-C 3569

Insight Analytical Labs, Inc.
Colorado Springs, CO – 719-570-9540
Email: info@ial-fa.com

Freeland, Mark (M.)

From: Williamson, Richard (E.)
Sent: Wednesday, March 20, 2002 10:16 AM
To: Awad, Mahmoud (M.I.); Plante, Paul (P.G.)
Cc: Freeland, Mark (M.); Bissl, Gerry (G.)
Subject: AWS Claims List 9J460 and Accidents

Hi Mahmoud!
As requested I have searched my AWS files for accidents caused by the dPFE sensor. I could not find any reports that alleged that the dPFE caused an accident or that the vehicle was in an accident due to the stalling or no start condition etc that the vehicle was in due to dPFE failure.

All my files are on Excel. I used the word search function of Excel to look for "accident" in any of the text of the several thousand reports of the five selected vehicles lines(2.0L Escape; 3.0L Escape; 4.6L F-150; 3.0L DT Taurus; and 2.0L Z-Tech Focus).

Any questions or comments please feel free to contact me.

Regards,

RICK WILLIAMSON
Product Concern Analyst-Powertrain
Enhanced Concern Identification
313-248-6348
rwill110@ford.com

Freeland, Mark (M.)

'om:	Muter, Doreen (D.J.)
Sent:	Wednesday, March 20, 2002 8:05 AM
To:	Verner, Carol (C.J.); Mercier, Julie (J.A.)
Cc:	Muter, Doreen (D.J.); Maurer, James (J.B.); Freeland, Mark (M.); Akins, Mary (M.); Plante, Paul (P.G.); Esch, Becky (B.)
Subject:	RE: 14D Vehicles Affected Update

Julie, if you can, would you please pull 2002 volumes with the information for the vehicles listed below. I have not seen an update 14D since 12/3/01, so this is all we have to work with. This is for the dPFE issue.

Caorl, as we discussed yesterday, in order to pull accurate volumes for this program we need the 14D updated with all of the vheicle lines, engines, model year, assy. plants and production date ranges affected by the TM dPFE. If Julie can pull the volumes they will be inaccurate until the listed information is provided by engineering, thank you.

NOTE: It is imparitive that we receive a copy of the 14D as it is updated, please forward the lasted version to Becky Esch.

Doreen J. Muter
Recall & Service Programs--FCSD
Diagnostic Service Center II, Cube 793
Phone #:313-248-9391
dmuter@ford.com

-----Original Message-----

From:	Verner, Carol (C.J.)
Sent:	Tuesday, March 19, 2002 3:53 PM
To:	Muter, Doreen (D.J.)
Subject:	14D Vehicles Affected Update

Doreen,

Per our conversation here is the information I am requesting to update the 14D Vehicles affected list for the John Koe review on Friday:

1) Moder Year: 2002, complete volume for this year up to right now (As you recommended I will note that this is volume from Job 1 to now)

2) Vehicles/Engine Code:

CARS:
* Cougar/ L
* Taurus/Sable/U (Vulcan Engine)
* Taurus/Sable/S (Duratec Engine)
*Mustang/4
*Crown Vic/W
*Grand Marquis/W
*Town Car/W
*Focus/3

Trucks:
*Escape/B
*Tribute/B

EA02-027-C 3512

*Escape/1
*Tribute/1
*Windstar/4
Explorer&Mountaineer/E
*Explorer Sport/E
*Explorer Sport Trac/E
*Explorer Postal Stripped Chassis/K
*Ranger/E
*Econoline/2
*F150 Series/2
*F150 Series/W
*F150 Series/6
*Explorer&Mountaineer/W
*Expedition/W

Thanks
Carol Any questions, 313-390-7180

After the tech review on 3/25/02, I would like to meet with you to discuss your proposal of a more detailed approach for gathering this information. I will contact you to set up a meeting.

Freeland, Mark (M.)

From:	Plante, Paul (P.G.)
Sent:	Thursday, May 23, 2002 10:53 AM
To:	Poma, Amy (A.)
Cc:	Janda, Jon (J.M.); Rossi, Roberto (R.A.); Maurer, James (J.B.); Freeland, Mark (M.); Frazier, Keith (R.K.); Plante, Paul (P.G.); Gates, Freeman (F.C.)
Subject:	DPFE Sensor Failure Monday Meeting Agenda

Amy, please add these items to agenda for 6/3/02, 1:00 PM and send official meeting notice to Kleth Frazier (KFRAZIE1).

Main agenda item for 1:00 PM start: "EESE Issues Resolution for Is-Is Not", Robert Rossi and Kleth Frazier lead.

Future agenda item: "Sensor ES Spec Robustness to V Transient Failures" F. Gates and Kleth Frazier lead.

Kleth, Jim Maurer, sensor team leader, and myself discussed this issue with Robert this AM. He will stop by your desk and update you and Tom Herman before the Monday meeting. We meet every Monday to discuss vehicle related failure modes for the sensor. There is no meeting Memorial day. Thanks in advance for you participation!

Paul Plante
V Engine Campaign Prevention Specialist
POEE Building, Drop 20, Cube 8G049, Pillar D5
Tele. 313-84-54138; Fax 39-02513
Text Pager: 734-296-1905
E Mail: pplante@ford.cm (CDS ID PPLANTE)

EA02-027-C 3521

Mark

Please get me a
Work Task # for the
lab work. If none
at hand call Julie
Anderman (67392)
– no # no work!

[illegible] 31733

Freeland, Mark (M.)

From:	Plante, Paul (P.G.)
Sent:	Monday, April 29, 2002 12:10 PM
To:	Freeland, Mark (M.)
Subject:	RE: No Start Car at SRL

Interesting. Further discussion Thursday at 1:00PM Stall meeting.

-----Original Message-----

From:	Freeland, Mark (M.)
Sent:	Monday, April 29, 2002 11:25 AM
To:	Gates, Freeman (F.C.); Maurer, James (J.S.); Plante, Paul (P.G.); Rossi, Roberto (R.A.)
Cc:	Mozurkewich, George (G.); Potter, Timothy (T.J.)
Subject:	No Start Car at SRL

Freeman et al.

We have a new mystery.

Last October George Mozurkewich's wife had a dPFE failure on her 2.0L Zetec Focus, VIN 1FAFP38301W196354. We replaced the sensor with one of the prototype V Transient hardened sensors, Sn. SRL123.

Yesterday her car would not crank or start for her. After several attempts to start the car, George unplugged the dPFE sensor and the car started.

This morning Tim & I bench tested the sensor removed from the car. It appeared from the results to behave normally, and had normal current draw and impedances. We then deliberately latched the sensor on the bench. The maximum latched current we drew was238 mA, which by itself is not sufficient to stop the PCM from functioning normally.

Using a Star tester we checked for PCM Codes, and only found a P1401 code. (This would be expected as George drove the car for several drive cycles with the dPFE sensor unplugged).

The above scenario would suggest one possibility is the following:

1) the dPFE had something to do with the car not starting, possibly by drawing up to 238 mA.
2) something else was drawing a high also from the Vref line such that the combined current was in excess of 690 mA, but less than 928 mA.
3) when George unplugged the dPFE sensor the total current draw from the Vref fell to below 690mA and so the car could be started.

Question:

Is it possible to latch the Fuel Rail Pressure Sensor and/or the Fuel Tank Vapor Pressure Sensor such that either or both sensors draw a high current?

Can you suggest any alternate reasons why the car did not start, but then did after the dPFE was unplugged?

In the mean time, until we decide what else to look at, Tim Potter is going to install a new production V Transient improved part in the car.

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

May 13 - May 19

May 2002						
S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

June 2002						
S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

Monday, May 13

- 8:00am 9:00am OCM 6 Sigma Presentation next week
- 9:00am 10:30am Kavlico dPFE meeting (SRL Conf Room 2243 (10))
- 9:00am 10:00am Canceled: Group Meeting (SRL CR 3621)
- 10:30am 1:00pm Kavlico dPFE meeting (SRL Conf Room 2643 (12))
- 10:30am 1:00pm Selection of dPFEs for the outside lab (SRL Conf Room 2643 (12))
- 1:00pm 3:00pm DPFE Sensor Vehicle Issues Meeting (POEE, E103A (Pillar L10))

Tuesday, May 14

- 8:30am 9:00am OCM 6 Sigma Presentation next week
- 1:00pm 2:30pm Kavlico dPFE Sensor Core Team Meeting (POEE D1186 (War Room in FMEI Dept.))
- 3:30pm 4:00pm Updated: Need to discuss Mark Freeland's project on dPFE sensor (SRL CR 2243)

Wednesday, May 15

- 8:30am 9:00am OCM 6 Sigma Presentation next week
- 4:00pm 6:00pm Leave on time to pick children up for normal Wednesday night

Thursday, May 16

- 8:30am 9:00am OCM 6 Sigma Presentation next week
- 10:00am 11:00am Weekly Meeting Notice (WSAP Lynx)
- 1:00pm 3:00pm Kavlico dPFE Sensor Core Team Meeting (POEE D1186 (War Room in FMEI Dept.))
- 3:00pm 5:00pm Updated: Gasket Sealing - Problem Solving Room 1529 (SRL - SCIENTIFIC RESEARCH LABORATORY)
- 7:30pm 10:00pm P EAA Chapter meeting

Friday, May 17

- 8:30am 9:00am OCM 6 Sigma Presentation next week

Saturday, May 18

Sunday, May 19

E002-027-C 3526

TAIWAN TRIBUTE STALLER

Freeland, Mark (M.)

From:	Freeland, Mark (M.)
Sent:	Tuesday, May 07, 2002 12:30 PM
To:	Chen, Smith S N (S.); Freeland, Mark (M.); Maurer, James (J.B.)
Cc:	Gates, Freeman (F.C.); Plante, Paul (P.G.); Awad, Mahmoud (M.I.); O'Neal, Jim (J.D.)
Subject:	RE: Shorted dPFE Sensor

Smith,

Yes I have the PCM safely here.

I am waiting for the Powertrain group to provide the test vehicle to run the PCM on before it is passed to the Visteon people who will do the analysis at the component level. I will keep you informed if we find anything significant.

Regards

Mark Freeland

> 6-Sigma Black Belt
> Engine Research Department
> Ford Research Laboratory
> P.O. Box 2053
> MD 2629 - SRL - Room 1517
> Dearborn, MI 48121-2053 USA

email: mfreela1@ford.com
Tel.: (313) 594-7645

-----Original Message-----
From: schen16 [mailto:schen16@ford.com]
Sent: Tuesday, May 07, 2002 12:45 AM
To: Freeland, Mark (M.); Maurer, James (J.B.)
Cc: Gates, Freeman (F.C.); Plante, Paul (P.G.); Awad, Mahmoud (M.I.)
Subject: Re: Shorted dPFE Sensor

Mark:
How are you. Do you receive the PCM? and can you advise us what you find?
James:
Regarding to this concern can you provide your 8D report for our reference?
I will appreciate your assistance.

Regards,

----- Original Message -----
From: "schen16" <schen16@ford.com>
To: "Freeland, Mark (M.)" <mfreela1@ford.com>
Cc: "Gates, Freeman (F.C.)" <fgates@ford.com>; "Maurer, James (J.B.)" <jmaurer@ford.com>; "Plante, Paul (P.G.)" <pplante@ford.com>; "Awad, Mahmoud (M.I.)" <mawad@ford.com>
Sent: Monday, April 22, 2002 3:28 PM
Subject: Re: Shorted dPFE Sensor

Mark:
>
> The PCM was disassembled from the concern vehicle and will send to you
> through the DHL express shipment, the shipment no. is "2647750033" for
your
> reference.
>
> Regards,
>
> ----- Original Message -----
> From: "Freeland, Mark (M.)" <mfreela1@ford.com>
> To: "Chen, Smith S N (S.)" <schen16@ford.com>
> Cc: "Gates, Freeman (F.C.)" <fgates@ford.com>; "Maurer, James (J.B.)"
> <jmaurer@ford.com>; "Plante, Paul (P.G.)" <pplante@ford.com>; "Awad,
Mahmoud
> (M.I.)" <mawad@ford.com>
> Sent: Tuesday, April 16, 2002 12:48 AM
> Subject: Shorted dPFE Sensor
>
>
> > Smith,
> >
> > Thank you for the failed dPFE sensor from the buy back tribute. It
> > arrived this morning.
> > Initial lab testing confirms that this failed sensor is "Short
> > Circuited", with a power to ground impedance of 3.66 ohms. With a
> > supply voltage of 1.58V it draws 714 mA. I did not attempt to test the
> > current draw at 5.0 V as this would likely change the state of the
> > sensor. Based on the preliminary test I would fully expect this sensor
> > to cause a stall followed by a no start on any of the applications
> > vehicles which take this part.
> >
> > Please keep me posted on when you expect to get the PCM from this
> > vehicle.
> >
> > Thanks
> >
> >
> > Regards
> >
> > Mark Freeland
> >
> > > 6-Sigma Black Belt
> > > Engine Research Department
> > > Ford Research Laboratory
> > > P.O. Box 2053
> > > MD 2629 - SRL - Room 1517
> > > Dearborn, MI 48121-2053 USA
> > email: mfreela1@ford.com
> > Tel.: (313) 594-7645
> >
>

Freeland, Mark (M.)

From:	schen16 [schen16@ford.com]
Sent:	Monday, April 22, 2002 3:29 AM
To:	Freeland, Mark (M.)
Cc:	Gates, Freeman (F.C.); Maurer, James (J.B.); Plante, Paul (P.G.); Awad, Mahmoud (M.I.)
Subject:	Re: Shorted dPFE Sensor

Mark:

The PCM was disassembled from the concern vehicle and will send to you through the DHL express shipment, the shipment no. is "2647750033" for your reference.

Regards,

----- Original Message -----
From: "Freeland, Mark (M.)" <mfreela1@ford.com>
To: "Chen, Smith S N (S.)" <schen16@ford.com>
Cc: "Gates, Freeman (F.C.)" <fgates@ford.com>; "Maurer, James (J.B.)" <jmaurer@ford.com>; "Plante, Paul (P.G.)" <pplante@ford.com>; "Awad, Mahmoud (M.I.)" <mawad@ford.com>
Sent: Tuesday, April 16, 2002 12:48 AM
Subject: Shorted dPFE Sensor

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> arrived this morning.
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> Regards
>
> Mark Freeland
>

> > 6-Sigma Black Belt
> > Engine Research Department
> > Ford Research Laboratory
> > P.O. Box 2053
> > MD 2629 - SRL - Room 1517
> > Dearborn, MI 48121-2053 USA
> email: mfreela1@ford.com
> Tel.: (313) 594-7645

>

Quality Report

mazda

NATIONAL SERVICE DEPT, MAZDA AUSTRALIA PTY. LTD, PH. [illegible], FAX [illegible], E-mail (serviceqr@mazda.com.au) VER: [illegible]

QR Ref No. :	NR0014/02	Trader Ref. :	DM0202	Date Submit. :	13-MAR-2002
Subject :	VEHICLE STALLED - NO RESTART			Trader Code :	M443442
Model(s) :	TRIBUTE (YU06BY)	Related :		Trader Name :	Mazda (Qld)
QR Priority :	P2 (Requires CASE)	QR Rating :	QH - High (2)	Writer's Name :	Don Mohr

V. I. N. :	JM0YU06BY11100053		Kilometres :	13,351		Date of Sale :	06-APR-2001
MC Code :	XEP10A00S00XYF008000		Mod. Code :	SUVA5W5D20		Date Occurred :	05-MAR-2002
RO/Clm No. :		None	Amb Temp :	29	°C	Insp/Rep Date :	11-MAR-2002
Cases Rptd :	1	(eg: Nbr Reported)	Sym. Freq. :	C - Constant		Concern code :	1 - Claims veh undrivable
A/C Fitted :	YES	(Yes / No)	Other Acc. :	Towbar	(eg: alarm, phone)		
Classify Rpt. :	01 Urgent Reply in 2 Hrs		Reason for Quality Rpt. Submission :	I - Diagnostic Assistance with Repair			

DESCRIPTION OF SYMPTOM(S) & CONDITION(S)

Vehicle stalled at traffic lights - would not restart or even crank.

Vehicle towed to Gold Coast Mazda workshop.

Did you work on the vehicle ? (Yes / No) YES Were the above symptoms duplicated ? (Yes / No) : YES

CAUSE OF SYMPTOM(S)

WDS diagnosis conducted - PCM would not communicate with WDS until manual entry performed. System self-test revealed DTC U1262 - SCP Communication Bus fault in system.

CORRECTIVE ACTION(S)

Followed diagnosis on pages 418-00-20 to 418-00-25 of WSM (for SCP network fault). Checked continuity on BUS + & BUS - to PCM, ICM & DLC - OK. Checked continuity on Flash EEPROM power supply circuit between DLC (pin 13) & PCM - OK.

Replaced ICM and reprogrammed new unit successfully. Fitted new PCM but programming unable to be completed due to no response from PCM. Possible causes "FEPS open circuit" or "Ign switch in position 0".

Was the concern solved ? (Yes / No) NO If not solved, what was repair effectiveness? : 0 %

WRITER'S COMMENTS *(Including expanded Reason for Report submission)*

Checked the following which all passed OK: Permanent +v at PCM pin 55, Ign+v at PCM pins 71 & 97, ground at pins 24, 51, 77, 103, 76, 33 & 23. All terminals on DLC checked for correct operation. The only issues that appear obvious are - 1. No communication with PCM 2. Odometer goes blank (dashes instead of numbers) when ignition is switched ON and numbers return when ignition is OFF. Assistance required urgently as customer is extremely unhappy with this situation, having purchased this vehicle as a used car only one day before it failed.

Quality Report

mazda

NATIONAL SERVICE DEPT, MAZDA AUSTRALIA PTY. LTD, TEL [illegible], FAX [illegible], E-mail [illegible] VER [illegible]

REPORT DESCRIPTION CODINGS

Category :	F - Fuel Emis. Con << Body Listing >> << Body Elect. Listing >>				
Sym Type(s) :	DRV - DRIVEABILITY		Sym code(s) :	04A - STALL NO RESTART	
Cond code(s) :	Driving	AZA - NOT DEPENDENT ON DRV	Cond code(s) :	Eng Tmp.	FZA - NOT DEPENDENT ON ENG
	Eng Spd.	BZA - NOT DEPENDENT ON ENG		Fuel Use	HZA - NOT DEPENDENT ON FUEL
	Drv Ctrls.	CZA - NOT DEPEND ON DRV CONT		Shifting	KZA - NOT DEPENDENT ON SHFT
	Road	DZA - NOT DEPENDENT ON RD		Weather	LZA - NOT DEPENDENT ON WEA
	Eng Load	EZA - NOT DEPENDENT ON ENG		Other	MZA - NOT DEPEND ON OTHER
Dam. Type :	ELE - ELECTRICAL		Damage code :	9R - OPEN CIRCUIT	
Cause code :	SRA - OPEN CIRCUIT				

ADDITIONAL VEHICLES

	Vehicle Identification No. (WMI-VDS-VIS)	KMS	MC Specification Code	Repair date (DD-mmm-yyyy)	Date of Sale (DD-mmm-yyyy)	Q 1, Q 2, Q 3 (Refer below)
1						
2						
3						
4						
5						
6						
7						

Q 1 : Did you work on the vehicle?
Q 2 : Did you duplicate the symptoms / conditions, as described on page 1?
Q 3 : Was the problem solved by the corrective action, as described on page 1?

PARTS INFORMATION

	Part name	Part Number	Qty	Location / Avail.
PNMC. :	Unit Powertrain Control	YF24-18-881D	1	Not Avail.
Related :				

Quality Report

mazda

NATIONAL SERVICE DEPT, MAZDA AUSTRALIA PTY. LTD, PH. [illegible], FAX [illegible], E-mail [illegible] VER: [illegible]

SUPPORTIVE MEDIA AND/OR ADDITIONAL INFO. (eg. Photo., drawing, video, audio, additional details.)

Photograph, Drawing or Information

NO ATTACHED IMAGES OR FILES

Comments:

PROGRESS COMMENTS (MA USE ONLY)

CASE Info. : 13-MAR-2002 OPEN

Database Info. : QBR - Branch, Fw CASE (Std)

Date (dd-mmm-yyyy)	Comments / Improvement Progress	Handle Codings (MA USE ONLY)
13-MAR-2002 **Writer Init.** NSJLB	UNRESOLVED ISSUE FOR MC ATTENTION << URGENT ATTENTION PLEASE >> (VEHICLE OFF ROAD).	W - Forward **Parts Code** U - Unavailable **Responsible** MCJ - Mazda Japan

Freeland, Mark (M.)

From: Shinji Kanai [kanai.sh@ev.mazda.co.jp]
Sent: Monday, April 08, 2002 10:16 PM
To: 'Sanders, Muriel (M.S.)'; 'Akoonian, Don (D.J.)'; 'Badgley, Joel (J.K.)'; 'Bauer, Scott (S.C.)'; 'Bhojwani, Kamal (K.)'; 'Blackburn, Thomas (T.J.)'; 'Bogema, John (P.)'; 'Cary Powell'; 'Chick, John (J.)'; 'Chih, Ming-Niu (M.N.)'; 'Chin, Darrel (D.)'; 'Corbett, Sandra (S.M.)'; 'Dalbo, Bob (R.J.)'; 'Dan Rothweiler'; 'De Pena, Juan (J.E.)'; 'Diaz, Timothy (T.P.)'; 'Fascetti, Bob (R.J.)'; 'Fournelle, Gilbert (G.)'; 'Freeland, Mark (M.)'; 'Giles, Stuart (S.)'; 'Gokhale, Renuka (R.V.)'; 'Grimes, Jeff (J.R.)'; 'Hansen, George (G.C.)'; 'Herr, George (G.J.)'; 'Hofman, Michael (M.V.)'; 'Holmes, Jeffrey (J.R.)'; 'Ichikawa, Jiyunichiro (J.)'; 'Jensen, Ted (T.E.)'; 'John McDonald'; 'Jones, Andy'; 'Jordan, Donald (D.E.)'; 'Kanai, Shinji (S.)'; 'King, Robert (R.F.)'; 'Klostermann, Eric (E.)'; 'Kosko, Jeff (J.R.)'; 'Kwon, Soon (S.K.)'; 'Limtiaco, Steven (S.)'; 'Linde, Peter (P.A.)'; 'Liu, Jane (J.)'; 'Luehrsen, Eric (E.A.)'; 'Marck, Edmond (E.C.)'; 'Matesa, John (J.)'; 'Maurer, James (J.B.)'; 'Mazzella, Gary (G.R.)'; 'Mooney, Larry (L.)'; 'Moorhouse, Scott (S.R.)'; 'Morgan, Tom'; 'Morishima, Shigeki (S.)'; 'Naveed Khan'; 'Nematollahi, Sonya (S.)'; 'Nikolai, Bernie'; 'Noteboom, Jim (J.E.)'; 'Ortman, James (J.W.)'; 'Powers, Ken (K.W.)'; 'Price, Martin (M.)'; 'Raquepau, Alden (A.P.)'; 'Shah, Kiran (K.C.)'; 'Shiraishi, Masaru (M.)'; 'Stilgenbauer, Jeffrey (J.R.)'; 'Suarez, Rhae (R.)'; 'Sullivan, Jamie (J.P.)'; 'Takasawa, Keith (K.D.)'; 'Takubo, Hiroichi (H.)'; 'Vecchio, Anna Marie (A.)'; 'Wakenell, Ray (R.A.)'; 'Wettach, Bill (B.)'; 'Williams, Lee (LHW.)'; 'Williamson, David (D.E.)'; 'Yeung, Lam (.)'
Subject: U204 Stall Meeting (Field issue update: Engine stall -> No restart (DPFE shortage))

M014_03.doc

I update concern which I reported Stall meeting in last week. Failed DPFE sensors were scrapped at dealers in all cases.

CASE 1 (Japan)
VIN: EPEW-101286, Hofu build: 2000/12/13, Retail 2000/12/26
(1) First repair 2001/4/9 4,893km
DTC P0401 and P1408 illuminated. DPFE output Voltage was 0.122V (standard 0.95 - 1.05V).
Replace DPFE sensor with new one. Problem was solved.
(2) Second repair 2001/8/20 11,084km
Engine stall during normal operating temp. Starter was clanking but engine did not start.
WDS tester could not communicate with PCM. BUS(-) terminal voltage showed 1.9V (standard 4.5V) causing NO communication.
Vref was 2.0V (standard 4.0 - 6.0V). When DPFE sensor connector was disconnected, Vref increased to 5V.
Same time Click sound was observed from Fuel pump relay and fuel pressure was increased to normal range.
Also BUS(-) terminal voltage was returned 4.5V at same time, and WDS can communicate with PCM.
Replace DPFE sensor with new one. Problem was solved.
<<<DPFE sensor lot number is unknown. According to second repair date, it might be pre CM part.>>>

CASE 2 (Taiwan)
We are contacting Taiwan continuously.

CASE 3 (Australia)
Attachment is the information from Australia (VIN: JM0YU06BY11100053, Hofu build 2001/01/09).
In addition to this report;
(1) Vref was 2.1 V (standard 4.0 - 6.0V) during NO start condition.
(2) Vref returned standard value and engine started immediately after disconnect

ER02-027-C 3887

DPFE connector.
(3) In this DPFE internal shortage case, WDS cannot communicate to PCM.
Replace DPFE sensor with new one. Problem was solved.
<<<DPFE sensor lot number is unknown. According to build date, it might be pre CM
art.>>>

Shinji Kanai
Manager, Tribute Plant QA
Mazda North American Operations

Ford Kansas City Assembly Plant
Plant Vehicle Team
8121 N.E. Hwy. 69, Claycomo, MO 64119 USA
Tel: 816-459-1623/ Fax: -1726/ e-mail: kanai.sh@sv.mazda.co.jp
Local Text Pager: 9135677156@alphapage.airtouch.com

Freeland, Mark (M.)

From:	Neutgens, Kurt (K.J.)
Sent:	Thursday, February 21, 2002 11:49 AM
To:	Schleding, Kurt (K.J.)
Cc:	Awad, Mahmoud (M.I.); Freeland, Mark (M.)
Subject:	RE: PCM issue affecting... HEGO Heater, MAF, IAC, Fuel Injectors, Fuel Pump, Shift Solenoids

I don't know for sure. You might want to look at 60 day logic warranty data and see if the issue has improved for Oct and Nov. That might indicate an interaction.

Thanks again for your support!

Kurt Neutgens
Ranger Powertrain Quality Supervisor (PTSE)
PDC 2G-D42, Phone & Fax 313-39-07220
kneutgen@ford.com

-----Original Message-----

From:	Schleding, Kurt (K.J.)
Sent:	Thursday, February 21, 2002 11:12 AM
To:	Neutgens, Kurt (K.J.)
Cc:	Awad, Mahmoud (M.I.); Freeland, Mark (M.)
Subject:	FW: PCM Issue affecting... HEGO Heater, MAF, IAC, Fuel Injectors, Fuel Pump, Shift Solenoids

Kurt,

Could this issue also impact DPFE operation? As we try to solve DPFE issue, we're finding that there are system interactions with wiring systems and PCM that play a role....

Any thoughts?

Kurt Schleding
Supervisor, V-Engine Reliability and Robustness
Phone: 313-337-5449
email: kschledi@ford.com
Reliability: Plan for it. Design for it. Demonstrate it.

-----Original Message-----

From:	Fullerton, Lisa (L.M.)
Sent:	Thursday, February 21, 2002 8:45 AM
To:	Schleding, Kurt (K.J.)
Subject:	FW: PCM Issue affecting... HEGO Heater, MAF, IAC, Fuel Injectors, Fuel Pump, Shift Solenoids

Didn't see you copied on this. Is this dPFE related or in addition to? Have fun with the warranty breakdowns!

-----Original Message-----

From:	Neutgens, Kurt (K.J.)
Sent:	Thursday, February 21, 2002 8:23 AM
To:	Michalowicz, Cheryl (C.C.); Youngren, Dave (D.M.); Ostmek, Ronald (R.G.); Campau, Lawrence (L.J.); Davis, Alice (A.J.); Anderson, Jeff (J.W.); Conroy, Jerry (J.R.); Corbett, Sandra (S.M.); Dakhlallah, Hassan (H.A.); Froney, Jayne (J.R.); Fullerton, Lisa (L.M.); Giordano, Mike (M.A.); Godlewski, Ed (E.V.); Grewal, Bill (B.S.); Hanley, James (J.); Hansen, George (G.C.); Hollister, Dave (D.); Kramer, Michael (M.T.); Miller, Cary (C.D.); Schmidt, Gregory (G.A.); Thompson, Greg (G.); Welzder, Mitchell (Mitch.); Pratt, Joe

	(J.W.); Crudo, Frank (F.J.); Mitchell, Harold (H.J.); Jofroix, Sebastien (S.); Lilly, Kenneth (K.A.); Holmes, Douglas (D.A.); Matkovich, Dale (D.M.); Whitworth, Rudy (A.R.)
Cc:	Lowman, Harold (H.R.); Guys, Philip (P.R.); Gomez-Mesquita, Art (A.B.); Chamberlain, Steve (S.J.); Youngren, Dave (D.M.); Fischer, Troy (T.A.); Stelmaszczak, Robert (R.); Campau, Lawrence (L.J.); Cervenan, Neil (N.J.); Green, Tamra (T.K.); Khoe, Henky (H.); Neutgens, Kurt (K.J.); Deeb, Joe (J.S.); Di Ponio, Rosario (R.); Corpolongo, Kerry (K.); Hornsey, Tim (T.W.); Whitehead, Joe (J.P.); Treharne, David (W.D.); Patel, Anup (A.M.); Allen, Bill (William R.); Orris Sr., Steve (S.J.); 'Brent.Barnes@motorola.com'; Nader, Robert (R.N.); Turek, Larry (L.P.); Caesar, Cynthia (C.L.); Thompson, Lena (L.M.); DeBorde, Timothy (T.B.); 'Mark.Cooper@motorola.com'; 'David.A.Williams@motorola.com'; 'G11486@Motorola.Com'; Hille, Kevin (K.T.); White-Johnson, Patrice (P.); Goldfarb, Sarah (S.E.); Trower, Ron (R.D.); Dihle, Ken (K.M.); Van Wiemeersch, John (J.R.); Caesar, Cynthia (C.L.); Jadan, Terry (T.); Turek, Larry (L.P.)
Subject:	PCM Issue affecting... HEGO Heater, MAF, IAC, Fuel Injectors, Fuel Pump, Shift Solenoids

To whom it may concern,
I wanted to bring to your attention an issue Terry Jadan and his team have discovered during his weekly Ranger PCM Swat Team Meetings.

Terry has set up the Ranger PCM Swat Team including Ford Ranger PTSE, FCSD, PATS, Powertrain Electronics, and PCM people as well as Motorola people that have been tracking specific PCM's from the field in an effort to understand Ranger's stall or hard to start customer concerns. They have been able to improve the diagnostics of issues by tracking a specific PCM known to cause a specific problem and bring it back to the experts to do in depth analysis.

During this effort it has come to our attention that Motorola has had an issue with a component in their processor (4 per processor) that can affect the following components and their operation: HEGO Heater, MAF, IAC, Fuel Injectors, Fuel Pump, Shift Solenoids. The dates relayed by Motorola for the known concern are from the last week in April to the first week in Oct. I have been promised an 8D from Motorola in the near future so I will send out more information then.

I don't know yet how much this has affected our warranty of these parts, but I wanted to make you all aware so you could look at your issues across this time frame to see if there is an improvement in October, and if this is a major contributor to your issue, you may be able to inform the field of this issue as well as reduce resources to understand the uptick in these items.

I would like to thank Motorola and all of the Ford Engineers who have been very supportive and helpful in our efforts to understand and correct Ranger issues.
Participating Team Members:
Chamberlain, Steve (S.J.); Youngren, Dave (D.M.); Fischer, Troy (T.A.); Stelmaszczak, Robert (R.); Campau, Lawrence (L.J.); Cervenan, Neil (N.J.); Green, Tamra (T.K.); Khoe, Henky (H.); Neutgens, Kurt (K.J.); Deeb, Joe (J.S.); Di Ponio, Rosario (R.); Corpolongo, Kerry (K.); Hornsey, Tim (T.W.); Whitehead, Joe (J.P.); Treharne, David (W.D.); Patel, Anup (A.M.); Allen, Bill (William R.); Orris Sr., Steve (S.J.); 'Brent.Barnes@motorola.com'; Nader, Robert (R.N.); Turek, Larry (L.P.); Caesar, Cynthia (C.L.); Thompson, Lena (L.M.); 'Salvaggio Joseph-G12264'; 'Smith Erick-G10759'; 'Cristian John-G10430'; DeBorde, Timothy (T.B.); 'Mark.Cooper@motorola.com'; 'David.A.Williams@motorola.com'; 'G11486@Motorola.Com'; Hille, Kevin (K.T.); White-Johnson, Patrice (P.); Goldfarb, Sarah (S.E.); Trower, Ron (R.D.); Dihle, Ken (K.M.); Van Wiemeersch, John (J.R.)

Thanks again for your support!

Kurt Neutgens
Ranger Powertrain Quality Supervisor (PTSE)
PDC 2G-D42, Phone & Fax 313-39-07220
kneutgen@ford.com

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FMYU03161KB83170	Veh Line:	T/M1 - ESCAPE (U204) [2001]	Eng Serial No:	568904038
Model Year:	2001	Market Derivative:	T/P - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	T	Drive Code:	T/A - 2 WHL L/H FRONT DRIVE	Engine:	T/LD - MOD 3.0L DOHC EFI
Inv. Dealer:	G0482	Body Cab Style:	T/WD - 4 DOOR WAGON	Transmission:	T/XJ - 4 SPD AUTO TRANS
		Version/Series:	TIEF - FORD SERIES		

BUILD INFORMATION:

Region: NA - ######### Plant: AJ - KANSAS CITY PLANT BUILD
Country: USA - ######### Prod Date: 12-SEP-2000

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 121005 - *
Country: USA - ######### Selling Dlr St/Prov: GA
Buyer St/Prov: GA

Arrival Date: 22-SEP-2000 Red Carpet Lease: *
Sale Date: 29-SEP-2000 Fleet/Retail/Co. Lease: R
Warranty Start Date: 29-SEP-2000 Modified Vehicle: *
Orig Warranty Date: 29-SEP-2000 Reacquired Vehicle: * Vehicle Export Flag: N

VOC/EOC:

---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

[illegible]

[illegible]

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	C	GVW Class Code:	Y
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	* - [N/A]	Mirror(Pass Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	A	Paint:	FNLDS - MEDIUM WEDGEWOOD C/C
Brake Code:	FEAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AT - ELETR PREM AM/FM STRO/CSTE/CLK
Calibration Code:	0M11A30A	Sound System:	AB - AUDIOPHILE SOUND SYSTEM
Color(Accent):	* - [N/A]	Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Manufacturer:	AD - GENERAL
Delivery Type:	0	Tire Brand:	* - *
Driveshaft Code:	D	Tire Size:	D3OTI - P225/70R 15 BSW A-S OWL
Front Seats:	* - [N/A]	Traction Control:	* - [N/A]
Fuel Type:	* - [N/A]	Wheel Base:	* - [N/A]

EA02-027-C 3571

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*	DOT Plant Manufacturer:	* - *

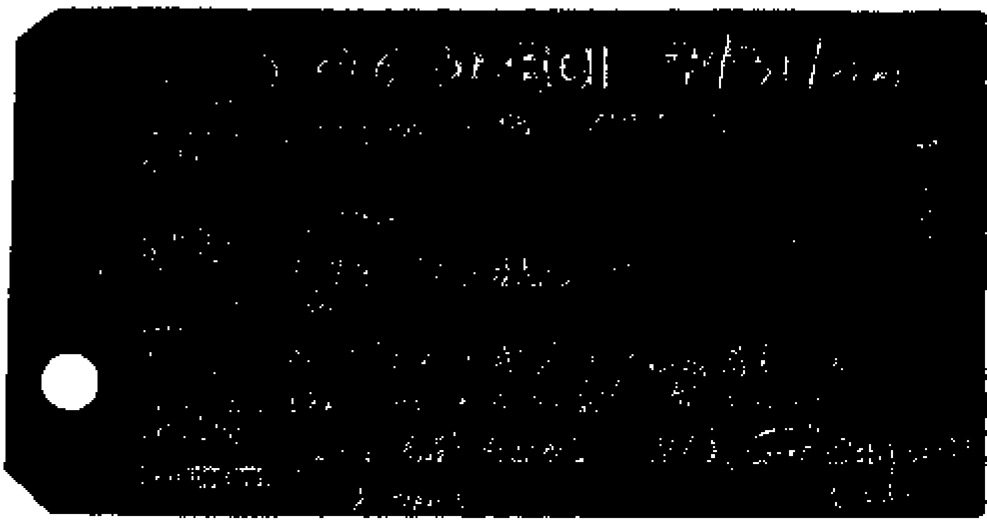
ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	T7B - T7B
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Decal Suffix:	19MA
ESP Plan Year:	*	Engine Family:	1FMXT0501F6
ESP Signature Date:			

Any comments? You can contact

webmaster

EA02-027-C 3572



Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1LNHM83WX1Y625636	Veh Line:	C/VC - LINCOLN TOWN CAR (FN145) (98-02)	Eng Serial No:	*
Model Year:	2001	Market Derived:	C/M - L-M DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	C	Drive Code:	C/B - 2 WHL L/H REAR DRIVE	Engine:	C/VN - R-M 4.6L SOHC EFI NA
Inv. Dealer:	10167	Body Cab Style:	C/FL - 4 DOOR SEDAN STRETCH-6 LITE	Transmission:	C/DU - 4 SPD AUTO TR NAAG
		Version/Series:	C/BS - CARTIER VERSION		

BUILD INFORMATION:

Region:	NA - #########	Plant:	EA - WIXOM PLANT BUILD
Country:	USA - #########	Prod Date:	20-SEP-2000

SALE INFORMATION:

Region:	NA - #########	Selling Dealer:	347081 - *
Country:	USA - #########	Selling Dlr St/Prov:	TX
		Buyer St/Prov:	TX
Arrival Date:	16-OCT-2000	Red Carpet Lease:	*
Sale Date:	16-JUL-2001	Fleet/Retail/Co. Lease:	R
Warranty Start Date:	16-JUL-2001	Modified Vehicle:	*
Orig Warranty Date:	16-JUL-2001	Reacquired Vehicle:	* Vehicle Export Flag: N

VOC/EOC:

---------1---------2---------3---------4---------5---------6---------7---------8---------

[illegible] 1 2 1171401 [illegible] [illegible] 3 LLK A R R 47C081 J VA [illegible] N

[illegible] 3 [illegible] A

INSTALLED OPTION INFORMATION:

Air Conditioning:	C/C - ATC AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	*	GVW Class Code:	H
Audio Disk:	AC - AUDIO DISC CHANGER PLAYER	Instrumentation:	AB - CONVENTIONAL INSTRUMENTATION
Axle Ratio:	EGACC - 3.08 FINAL DRIVE RATIO	Mirror(Driver Side):	* - [N/A]
Axle Type:	EOSAB - NON-LIMITED SLIP REAR AXLE	Mirror(Psngr Side):	* - [N/A]
Battery Amp Rating:	75	Paint:	PMUAA - EBONY SOLID C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	BP - ELE LUX/DIG SIGNAL STR/CST/CLK
Calibration Code:	1VC1SEDA	Sound System:	AE - AUDIOPHILE SOUND SYSTEM
Color(Accent):	* - [N/A]	Susp. Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Manufacturer:	AJ - MICHELIN
Delivery Type:	0	Tire Brand:	* - *
Driveshaft Code:	*	Tire Size:	D5I76 - P225/70SR-16 WSW TIRE
Front Seat:	* - [N/A]	Traction Control:	AB - ANTI-SPIN TRACT BRAKES W/O IVD
Fuel Type:	* - [N/A]	Wheel Base:	* - [N/A]

5002-027-C 3574

TIRE DOT INFORMATION:

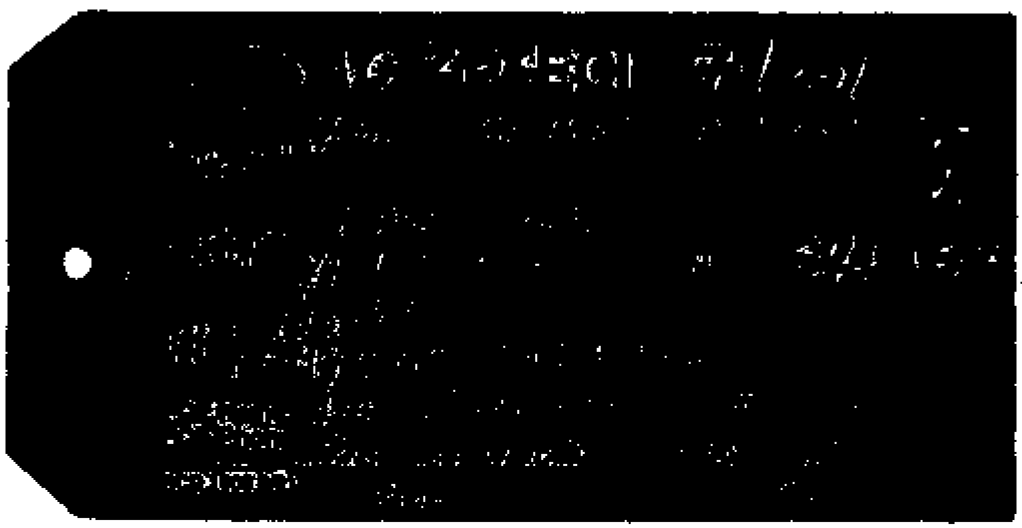
LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*	DOT Plant Manufacturer:	* - *

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	C/8 - C/8
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Decal Suffix:	HSZ
ESP Plan Year:	*	Engine Family:	1FMXV046VF5
ESP Signature Date:			

Any comments? You can contact

webmaster



Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FMYU03172KA27081	Veh Line:	T/M1 - ESCAPE (U204) [2001]	Eng Serial No:	035176087
Model Year:	2002	Market Derivat:	T/P - FORD DIVISION DERIVATIVE	Body Style:	*
Veh Type:	T	Drive Code:	T/A - 2 WHL L/H FRONT DRIVE	Engine:	T/LD - MOD 3.0L DOHC EFI
Inv. Dealer:	06947	Body Cab Style:	T/WD - 4 DOOR WAGON	Transmission:	T/DJ - 4 SPD AUTO TRANS K
		Version/Series:	T/EF - FORD SERIES		

BUILD INFORMATION:

Region: NA - ######### Plant: AJ - KANSAS CITY PLANT BUILD
Country: USA - ######### Prod Date: 20-AUG-2001

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 15025 - *
Country: USA - ######### Selling Dlr St/Prov: TX
Buyer St/Prov: TX

Arrival Date: 30-AUG-2001 Red Carpet Lease: *
Sale Date: 19-OCT-2001 Fleet/Retail/Co. Lease: R
Warranty Start Date: 19-OCT-2001 Modified Vehicle: *
Orig Warranty Date: 19-OCT-2001 Reacquired Vehicle: * Vehicle Report Flag: N

VOC/EOC:

```
---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

U032KA27081120237 6 C 2 2879740     3F 5 3016 63  N63  385 5 40?A?? 5280298 2  24     M21 4 3 2  1

1FMT?06        320A 710?X                      63
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/H - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	C	GVW Class Code:	Y
Audio Disc:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	* - [N/A]	Mirror(Psngr Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	A	Paint:	PNBOC - VERMILION SOLID C/C
Brake Code:	FEAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AT - ELECTR PREM AM/FM STEREO/CSTE/CLK
Calibration Code:	0M11A30A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Swept Traction Axle:	* - [N/A]
Color(Trim):	600ZV -	Tire Manufacturer:	AP - CONTINENTAL
Delivery Type:	0	Tire Brand:	A306453 - CONTITRAC SUV 104T
Driveshaft Code:	D	Tire Size:	D3JUT - P235/70R-16 OWL A-S
Front Seat:	* - [N/A]	Traction Control:	* - [N/A]
Fuel Type:	* - [N/A]	Wheel Base:	* - [N/A]

EA02-027-C 3577

TIRE DOT INFORMATION:

LF:	A3084533001	RF:	A3084533001
LR:	A3084533001	RR:	A3084533001
LI:	*	RI:	*

SPARE: HYEA1BS3001 DOT Plant Manufacturer: A3 - GENERAL TIRE & RUBBER CO ; MOUNT VERNON ; ILLINOIS ; UNITED STATES

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	T/B - T/B
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Decal Suffix:	JMF
ESP Plan Year:	*	Engine Family:	2FMXT0301F6
ESP Signature Date:			

Any comments? You can contact

webmaster

EA02-027-C 3578

JPFE RET.

SRL 138
(GEORGE'S WIFE)

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FAFP38301W196854	Veh Line:	C/AK - FOCUS (CW170) [99-02]	Eng Serial No:	*
Model Year:	2001	Market Derivative:	C/F - FORD DIVISION DERIVATIVE	Body Style:	*
Veh Type:	C	Drive Code:	C/A - 2 WHL LH FRONT DRIVE	Engine:	C/BQ - ZETEC 2.0L DOHC I
Inv. Dealer:	02745	Body Cab Style:	C/FC - 4 DOOR SEDAN-6 LITE	Transmission:	C/D2 - 4-SPD AUTO TRAN
		Version/Series:	C/DF - SERIES 30		

BUILD INFORMATION:

Region:	NA - #########	Plant:	AZ - WAYNE PLANT BUILD
Country:	USA - #########	Prod Date:	14-DEC-2000

SALE INFORMATION:

Region:	NA - #########	Selling Dealer:	148046 - *
Country:	USA - #########	Selling Dlr St/Prov:	MI
		Buyer St/Prov:	MI

Arrival Date:	19-DEC-2000	Red Carpet Lease:	L		
Sale Date:	19-FEB-2001	Fleet/Retail/Co. Lease:	R		
Warranty Start Date:	19-FEB-2001	Modified Vehicle:	*		
Orig Warranty Date:	19-FEB-2001	Reacquired Vehicle:	*	Vehicle Export Flag:	N

VOC/EOC:

---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

[illegible] 40 [illegible] 2 [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] 1 [illegible] 4 [illegible] [illegible] 3

[illegible] 2 [illegible] 1R

INSTALLED OPTION INFORMATION:

Air Conditioning:	C/8 - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	A	GVW Class Code:	P
Audio Unit:	* - [N/A]	Instrumentation:	AE - TACHOMETER INSTRUMENTATION
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	* - [N/A]	Mirror(Psngr Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	58	Paint:	PNARQ - HARVEST GOLD C/C
Brake Code:	FEAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radios:	BQ -
Calibration Code:	1AK1AZOA	Sound Systems:	* - [N/A]
Color(Accent):	* - [N/A]	Suspn Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Brand:	AC - FIRESTONE
Delivery Type:	P	Tire Size:	DSJAQ - 205/50VR-16 BSW RUN FLAT
Driveshaft Code:	*	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

E002-027-C 3578

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	C/B - C/B
ESP Coverage(Miles):	*	Emission Cert Type:	1
ESP Coverage(Years):	*	Emission Decal Suffix:	HLG
ESP Plan Year:	*	Engine Family:	1FMXV020VF3
ESP Signature Date:			

Any comments? You can contact

webmaster

EA02-027-C 3588

2PFE RPT.
SRL 140

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FMYU041X2KA80485	Veh Line:	T/M1 - ESCAPE (U204) [2001]	Eng Serial No:	11T362087
Model Year:	2002	Market Derived:	T/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	T	Drive Code:	T/F - 4 WHL L/H FULL TIME DRIVE	Engine:	T/LD - MOD 3.0L DOHC EFI
Inv. Dealer:	04143	Body Cab Style:	T/WD - 4 DOOR WAGON	Transmission:	T/DJ - 4 SPD AUTO TRANS
		Version/Series:	T/BF - FORD SERIES		

BUILD INFORMATION:

Region: NA - ######### Plant: AJ - KANSAS CITY PLANT BUILD
Country: USA - ######### Prod Date: 15-OCT-2001

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 121764 - *
Country: USA - ######### Selling Dlr St/Prov: TN
Buyer St/Prov: TN

Arrival Date: 24-OCT-2001 Red Carpet Lease: *
Sale Date: 29-OCT-2001 Fleet/Retail/Co. Lease: R
Warranty Start Date: 29-OCT-2001 Modified Vehicle: *
Orig Warranty Date: 29-OCT-2001 Reacquired Vehicle: * Vehicle Export Flag: N

VOC/EOC:

---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

[illegible] 6 4 2 [illegible] [illegible] 3 [illegible] 43 [illegible] [illegible] 5 [illegible] [illegible] 3 [illegible] [illegible] 6 3 2 1

[illegible] 420A [illegible] 43

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	C	GVW Class Code:	Y
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	* - [N/A]	Mirror(Pasgr Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	A	Paint:	* - [N/A]
Brake Code:	PEAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	PA - CDX6 RADIO WITH 6 DISC CHANGER
Calibration Code:	2M11A30A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Susp. Tandem Axle:	* - [N/A]
Color(Trim):	000ZV -	Tire Brand:	AJ - MICHELIN - RECYCLABLE
Delivery Type:	0	Tire Size:	D5JUJ - P235/70R-16 OWL A-S
Driveshaft Code:	D	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	A308453????	RF:	A308453????
LR:	A308453????	RR:	A308453????
LI:	*	RI:	*
SPARE:	HYBA1R83701		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	T/S - T/B
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Dept Suffix:	JPD
ESP Plan Year:	*	Engine Family:	2FMXT030LF7
ESP Signature Date:			

Any comments? You can contact

webmaster

E002-627-C 3582

dPFE RET.

SRL 139

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FMYU03131KB61130	Veh Line:	T/M1 - ESCAPE (U204) [2001]	Eng Serial No:	67049008?
Model Year:	2001	Market Derived:	T/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	T	Drive Code:	T/A - 2 WHL L/H FRONT DRIVE	Engine:	T/LD - MOD 3.0L DOHC EFI
Inv. Dealer:	04230	Body Cab Style:	T/WD - 4 DOOR WAGON	Transmission:	T/DJ - 4 SPD AUTO TRANS K
		Version/Series:	T/EF - FORD SERIES		

BUILD INFORMATION:

Region: NA - ######### Plant: AJ - KANSAS CITY PLANT BUILD

Country: USA - ######### Prod Date: 30-APR-2001

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 121024 - *

Country: USA - ######### Selling Dlr St/Prov: GA

Buyer St/Prov: GA

Arrival Date:	09-MAY-2001	Red Carpet Lease:	*
Sale Date:	30-MAY-2001	Fleet/Retail/Co. Lease:	R
Warranty Start Date:	30-MAY-2001	Modified Vehicle:	*
Orig Warranty Date:	30-MAY-2001	Reacquired Vehicle:	* Vehicle Export Flag: N

VOC/EOC:

---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

[illegible]

[illegible]

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	C	GVW Class Code:	Y
Audio Disc:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	* - [N/A]	Mirror(Psngr Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	A	Paint:	FNLDB - MEDIUM WEDGEWOOD C/C
Brake Code:	FBAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	BB - ELETR PREM STRO/CST/DISC/CLK
Calibration Code:	0N11A50A	Sound System:	AB - AUDIOPHILE SOUND SYSTEM
Color(Accent):	* - [N/A]	Susp Tandem Axle:	* - [N/A]
Color(Trim):	000ZV -	Tire Brand:	* - [N/A]
Delivery Type:	0	Tire Size:	D3JUJ - P235/70R-16 OWL A-S
Driveshaft Code:	D	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

EA02-027-C 3583

TIRE DOT INFORMATION:

LF: W2 8AWM1601 RF: W2 8AWM1601
LR: W2 8AWM1601 RR: W2 8AWM1601
LI: * RI: *
SPARE: HY8A1R81201

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	• Emission Code:	T/B - T/B
ESP Coverage(Miles):	• Emission Cert Type:	5
ESP Coverage(Time):	• Emission Decal Suffix:	HMA
ESP Plan Years:	• Engine Family:	1FMXT0301F6
ESP Signature Date:		

Any comments? You can contact webmaster

Freeland, Mark (M.)

From:	Williamson, Richard (E.)
Sent:	Tuesday, February 26, 2002 7:57 AM
To:	Freeland, Mark (M.)
Cc:	Awad, Mahmoud (M.I.); Plante, Paul (P.G.); Biesl, Gerry (G.)
Subject:	VOQ results
Importance:	High

Hi Mark,
In answer to your question: " How many NHTSA reports (Vehicle Owner Questionnaire - NHTSA Data Base) reports are there on Focus stalls?"
2001 Model Year:
There were 14 total Focus reports for stalling - 11 on the Z-Tech, 2 SPI and 1 unknown.
There were no VOQ reports for stalling on the 2002 MY.
We expect a new batch of VOQ reports sometime this week and I will update these numbers.

When we presented our ECI paper to the CCRG in November there were only 6 Z-Tech reports.

I will try and run the other 4 model lines sometime today.

Regards,

RICK WILLIAMSON
Product Concern Analyst-Powertrain
Enhanced Concern Identification
313-248-6348
rwill110@ford.com

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FAFP34351W122045	Veh Line:	C/AK - FOCUS (CW170) (99-02)	Eng Serial No:	*
Model Year:	2001	Market Derivat:	C/F - FORD DIVISION DERIVATIVE	Body Style:	*
Veh Type:	C	Drive Code:	C/A - 2 WHL LH FRONT DRIVE	Engine:	C/SQ - ZETEC 2.0L DOHC EH NA I4 GFLC
Int. Dealer:	01928	Body Cab Style:	C/FC - 4 DOOR SEDAN-5 LITE	Transmission:	C/XX - 4-SPD AUTO TRANS 4F27E
		Version/Series:	C/DH - SERIES 25		

BUILD INFORMATION:

Region: NA - ######### Plant: AZ - WAYNE PLANT BUILD
Country: USA - ######### Prod Date: 13-SEP-2000

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 147204 - *
Country: USA - ######### Selling Dlr St/Prov: WV
Buyer St/Prov: WV

Arrival Date: 15-SEP-2000 Red Carpet Lease: *
Sale Date: 16-SEP-2000 Fleet/Retail/Cx. Lease: R
Warranty Start Date: 16-SEP-2000 Modified Vehicle: *
Orig Warranty Date: 16-SEP-2000 Recaptured Vehicle: * Vehicle Report Flag: N

VOC/EOC:

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--------+1---------2---------3---------4---------5---------6---------7---------8---------9---------
P141W1320405T116  6   2 2XXW015      CF X  DRXW 3XA49 J  XXLAX  7     4TX2X4  5  XX      XXX        1
1FAF6 6    1         1AXW    Y                              1H
```


E002-027-C 3886

INSTALLED OPTION INFORMATION:

Air Conditioning:	C/6 - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	A	GVW Class Code:	F
Audio Units:	* - [N/A]	Instrumentation:	AJ - HIGH SERIES ANALOG CLUSTER
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	* - [N/A]	Mirror(Pass Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	[illegible]	Paint:	PN1JAA - EBONY SOLID C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	BQ -
Calibration Code:	1AK1AZDA	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Single Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Brand:	CC - FIRESTONE/GOODYEAR
Delivery Type:	0	Tire Size:	D3GNT - 195/60R15-S BSW
Driveshaft Code:	*	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	C/B - C/B
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Decal Suffix:	HLG
ESP Plan Year:	*	Engine Family:	1FMXV020VF3
ESP Signature Date:			

Any comments? You can contact

webmaster

EM02-027-C 3857

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FAFP31361R128752	Veh Line:	C/AK - FOCUS (CW170) (99-02)	Eng Serial No:	*
Model Year:	2001	Market Derivati:	C/F - FORD DIVISION DERIVATIVE	Body Mods:	*
Veh Type:	C	Drive Code:	C/A - 2 WHL LHD FRONT DRIVE	Engine:	CJBQ - ZETEC 2.0L DOHC EFI NA I4 O*LC
Inv. Dealer:	00537	Body Cab Style:	C/DA - 3 DOOR SEDAN-4 LITE	Transmission:	CJRP - 5 SPD MAN TRANS A EAO MTX75
		Version/Series:	C/DR - SERIES 23		

BUILD INFORMATION:

Region: NA - ######### Plant: A3 - HERMOSILLO PLANT BUILD
Country: MEX - ######### Prod Date: 03-OCT-2000

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 112570 - *
Country: USA - ######### Selling Dlr St/Prov: NY
Buyer St/Prov: NY

Arrival Date: 17-OCT-2000 Red Carpet Lease: *
Sale Date: 08-NOV-2000 Fleet/Retail/Co. Lease: R
Warranty Start Date: 08-NOV-2000 Modified Vehicle: *
Orig Warranty Date: 08-NOV-2000 Reacquired Vehicle: * Vehicle Export Flag: N

VOC/EOC:

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--------1---------2---------3---------4---------5---------6---------7---------8---------9---------

F01131207537 6 0 2 0473012 10 H 2 500 3024P Z3L E 1 132570 3 OL OA 2

3EAP8 4 1 103537
```


EN02-027-C 3586

INSTALLED OPTION INFORMATION:

Air Conditioning:	C6 - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	A	GVW Class Code:	F
Audio Disk:	* - [N/A]	Instrumentation:	AJ - HIGH SERIES ANALOG CLUSTER
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	* - [N/A]
Axle Type:	* - [N/A]	Mirror(Psngr Side):	* - [N/A]
Battery Amp Rating:	58	Paint:	PNUAA - EBONY SOLID C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	SQ -
Calibration Code:	1AK1AZ8A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Super Tandem Axle:	* - [N/A]
Color(Trim):	00002 -	Tire Brand:	AC - FIRESTONE
Delivery Type:	0	Tire Size:	D3JAQ - 205/50VR-16 BSW RUN FLAT
Driveshaft Code:	*	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	C/C - C/C
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Decal Suffix:	HFZ
ESP Plan Year:	*	Engine Family:	1FMXV020VF3
ESP Signature Date:			

Any comments? You can contact webmaster

EA02-027-C 3969

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FAHP34381W109807	Veh Line:	C/AE - FOCUS (CW170) [99-02]	Eng Serial No:	*
Model Year:	2001	Market Derivat:	CF - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	C	Drive Code:	C/A - 2 WHL LH FRONT DRIVE	Engine:	C/SQ - ZETEC 2.0L DOHC EFI NA I4 0*LC
Ins. Dealer:	01442	Body Cab Style:	C/FC - 4 DOOR SEDAN-6 LITE	Transmission:	C/D2 - 4-SPD AUTO TRANS 4F27E
		Version/Series:	C/DS - SERIES 25		

BUILD INFORMATION:

Region: NA - ######### Plant: AZ - WAYNE PLANT BUILD
Country: USA - ######### Prod Date: 25-AUG-2000

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 171092 - *
Country: USA - ######### Selling Dlr St/Prov: CA
Buyer St/Prov: CA

Arrival Date: 26-SEP-2000 Red Carpet Lease: *
Sale Date: 30-SEP-2000 Fleet/Retail/Co. Lease: R
Warranty Start Date: 30-SEP-2000 Modified Vehicle: *
Orig Warranty Date: 30-SEP-2000 Reacquired Vehicle: * Vehicle Report Flag: N

VOC/EOC:

----------1----------2----------3----------4----------5----------6----------7----------8----------9--------

[illegible]

[illegible]

0880 C-0271-8663

INSTALLED OPTION INFORMATION:

Air Conditioning:	C8 - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	A	GVW Class Code:	P
Audio Disk:	* - [N/A]	Instrumentation:	AJ - HIGH SERIES ANALOG CLUSTER
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	* - [N/A]	Mirror(Psngr Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	SB	Paint:	PNUAA - EBONY SOLID C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	EQ -
Calibration Code:	1AK1A2SA	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Susp Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Brand:	CC - FIRESTONE/GOODYEAR
Delivery Type:	0	Tire Size:	DSGNT - 195/60R15-4 B SW
Driveshaft Code:	*	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LB:	*	RB:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	C/C - C/C
ESP Coverage(Miles):	*	Emission Cert Type:	C
ESP Coverage(Time):	*	Emission Decal Suffix:	HMJ
ESP Plan Year:	*	Engine Family:	1FMXV020V72
ESP Signature Date:			

Any comments? You can contact

webmaster

E082-627-C 3891

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FAFP34391W205598	Veh Line:	C/AK - FOCUS (CW170) (99-02)	Eng Serial No:	*
Model Year:	2001	Market Derivati:	C/P - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	C	Drive Code:	C/A - 2 WHL LH FRONT DRIVE	Engine:	CHQ - ZETEC 2.0L DOHC EFI NA I4 G*LC
Inv. Dealer:	01508	Body Cab Style:	C/FC - 4 DOOR SEDAN-6 LTIS	Transmission:	CK2 - 4-SPD AUTO TRANS 4F27E
		Version/Series:	CDP - SERIES 30		

BUILD INFORMATION:

Region:	NA - #########	Plant:	AZ - WAYNE PLANT BUILD
Country:	USA - #########	Prod Date:	15-DEC-2000

SALE INFORMATION:

Region:	NA - #########	Selling Dealer:	14106R - *
Country:	USA - #########	Selling Dlr St/Prov:	IL
		Buyer St/Prov:	IL

Arrival Date:	22-DEC-2000	Red Carpet Lease:	*
Sale Date:	06-JAN-2001	Fleet/Retail/Co. Lease:	R
Warranty Start Date:	06-JAN-2001	Modified Vehicle:	*
Orig Warranty Date:	06-JAN-2001	Reacquired Vehicle:	* Vehicle Export Flag: N

VOC/EOC:

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---------1---------2---------3---------4---------5---------6---------7---------8---------9---------
P041N2045R4T 46  8   2 021A048      UK 0  2A00 J8M4P 02 X3LAX  1     41B048  4  9K     CA2        3

1FAF9 4            83A4L                            1H
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	C/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	A	GVW Class Code:	F
Audio Disk:	* - [N/A]	Instrumentation:	AJ - HIGH SERIES ANALOG CLUSTER
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	* - [N/A]	Mirror(Pass Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	5B	Paint:	PNZIF - SILVER FROST C/C
Brake Code:	JBAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	BQ -
Calibration Code:	1AK1A20A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Suspn Tandem Axle:	* - [N/A]
Color(Trim):	00052 -	Tire Brand:	AC - FIRESTONE
Delivery Type:	0	Tire Size:	D3JAQ - 255/55VR-16 BSW RUN FLAT
Driveshaft Code:	*	Traction Control:	* - [N/A]
Front Seats:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	E	Emission Code:	C/B - C/B
ESP Coverage(Miles):	060	Emission Cert Type:	5
ESP Coverage(Time):	072	Emission Fuel Suffix:	H,O
ESP Plan Year:	2001	Engine Family:	1FMXV02.0VF3
ESP Signature Date:	05-JAN-2001		

Any comments? You can contact

webmaster

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FAHP34331W[illegible]	Veh Line:	C/AE - FOCUS (CW170) [99-02]	Eng Serial Num:	*
Model Year:	2001	Market Derivative:	C/F - FORD DIVISION DERIVATIVE	Body Shell:	*-
Veh Type:	C	Drive Code:	C/A - 2 WHL LHD FRONT DRIVE	Engine:	C/HQ - ZETEC 2.0L DOHC SFI NA I4 CPLC
Inv-Dealer:	03750	Body Cab Style:	C/FC - 4 DOOR SEDAN-6 LITE	Transmission:	C/D2 - 4-SPD AUTO TRANS 4F27E
		Version/Series:	C/DS - SERIES 23		

BUILD INFORMATION:

Region: NA - [illegible] Plant: AZ - WAYNE PLANT BUILD
Country: USA - [illegible] Prod Date: 18-APR-2001

SALE INFORMATION:

Region: NA - [illegible] Selling Dealer: 14002[illegible] - *
Country: USA - [illegible] Selling Dlr St/Prov: MI
Buyer St/Prov: MI

Arrival Date: 27-APR-2001 Red Carpet Lease: *
Sale Date: 09-MAY-2001 Fleet/Retail/Co. Lease: R
Warranty Start Date: 09-MAY-2001 Modified Vehicle: *
Orig Warranty Date: 09-MAY-2001 Reacquired Vehicle: * Vehicle Export Flag: N

VOC/EOC:

---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

[illegible]

[illegible]

0427-C 2682

INSTALLED OPTION INFORMATION:

Air Conditioning:	C9 - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	A	GVW Class Code:	H
Audio Disk:	* - [N/A]	Instrumentation:	AJ - HIGH SERIES ANALOG CLUSTER
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	* - [N/A]	Mirror(Pass Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	6B	Paint:	FNA8S - SUNRAY GOLD
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	BQ -
Calibration Code:	1AK1AZDA	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Stage Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Brand:	CC - FIRESTONE/GOODYEAR
Delivery Type:	0	Tire Size:	D3GNY - 195/60R15-S BSW
Driveshaft Code:	*	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	M6V9LNB 1201	RF:	M6V9LNB 1201
LR:	M6V9LNB 1201	RR:	M6V9LNB 1201
LI:	*	RI:	*
SPARE:	T7P5BAH 0501		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	C/C - CC
ESP Coverage(Miles):	*	Emission Cert Type:	C
ESP Coverage(Time):	*	Emission Dual Suffix:	HMU
ESP Plan Year:	*	Engine Family:	1FMXV02.0VJ2
ESP Signature Date:			

Any comments? You can contact

webmaster

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FAFP34361W109807	Veh Line:	C/AK - FOCUS (CW170) [99-02]	Eng Serial No:	*
Model Year:	2001	Market Derivat:	C/F - FORD DIVISION DERIVATIVE	Body Build:	*
Veh Type:	C	Drive Code:	C/A - 2 WHL L/H FRONT DRIVE	Engine:	C/HQ - ZETEC 2.0L DOHC I
Inv. Dealer:	01442	Body Cab Style:	C/TC - 4 DOOR SEDAN-6 LITE	Transmission:	C/I2 - 4-SPD AUTO TRANS
		Version/Series:	C/DS - SERIES 25		

BUILD INFORMATION:

Region:	NA - ########	Plant:	AZ - WAYNE PLANT BUILD
Country:	USA - ########	Prod Date:	29-AUG-2000

SALE INFORMATION:

Region:	NA - ########	Selling Dealer:	171092 - *
Country:	USA - ########	Selling Dlr St/Prov:	CA
		Buyer St/Prov:	CA

Arrival Date:	25-SEP-2000	Red Carpet Lease:	*		
Sale Date:	30-SEP-2000	Fleet/Retail/Co. Lease:	R		
Warranty Start Date:	30-SEP-2000	Modified Vehicle:	*		
Orig Warranty Date:	30-SEP-2000	Reacquired Vehicle:	*	Vehicle Export Flag:	N

VOC/EOC:

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---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

2341H109807YMJ5  1   2 21HA001      EF 0 20000 3HA42 J  E1LAE  T      710092  2V UA      5N2         3

1FAFB 4            693ACA    Y                               11
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	C/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	A	GVW Class Code:	F
Audio Disk:	* - [N/A]	Instrumentation:	AB - TACHOMETER INSTRUMENTATION
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	* - [N/A]	Mirror(Passgr Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	EB	Paint:	PNUAA - EBONY SOLID C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	BQ -
Calibration Code:	1AK1A20A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Susp Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Brand:	CC - FIRESTONE/GOODYEAR
Delivery Type:	0	Tire Size:	D3GNY - 195/60R15-8 BSW
Driveshaft Code:	*	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	C/C - C/C
ESP Coverage(Miles):	*	Emission Cert Type:	C
ESP Coverage(Time):	*	Emission Decal Suffix:	HM0
ESP Plan Years	*	Engine Family:	1FMXV020VZ3
ESP Signature Date:			

Any comments? You can contact webmaster

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FAFP36371W166111	Veh Line:	C/AK - FOCUS (CW170) [99-03]	Eng Serial No:	*
Model Year:	2001	Market Derived:	C/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	C	Drive Code:	C/A - 2 WHL L/H FRONT DRIVE	Engine:	C/GQ - ZETEC 2.0L DOHC I
Inv. Dealer:	09619	Body Cab Style:	C/FF - 4 DOOR STATION WAGON	Transmission:	C/HP - 5 SPD MAN TRANS
		Version/Series:	C/DE - SERIES 25		

BUILD INFORMATION:

Region:	NA - #########	Plant:	AZ - WAYNE PLANT BUILD
Country:	USA - #########	Prod Date:	02-NOV-2000

SALE INFORMATION:

Region:	NA - #########	Selling Dealer:	1[illegible] - *
Country:	USA - #########	Selling Dlr St/Prov:	MI
		Buyer St/Prov:	MI

Arrival Date:	08-NOV-2000	Red Carpet Lease:	*		
Sale Date:	10-NOV-2000	Fleet/Retail/Co. Lease:	R		
Warranty Start Date:	10-NOV-2000	Modified Vehicle:	*		
Orig Warranty Date:	10-NOV-2000	Reacquired Vehicle:	*	Vehicle Export Flag:	N

VOC/EOC:

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[illegible]

[illegible]

INSTALLED OPTION INFORMATION:

Air Conditioning:	C/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	A	GVW Class Code:	F
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	* - [N/A]	Mirror(Pssgr Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	IB	Paint:	PN7JA - MED. TOREADOR C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	BQ -
Calibration Code:	1A5C1A20A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Susp Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Brand:	CC - FIRESTONE/GOODYEAR
Delivery Type:	*	Tire Size:	DSONY - 195/60R15-S BSW
Driveshaft Code:	*	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	C/S - C/S
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Decal Suffix:	HFZ
ESP Plan Years:	*	Engine Family:	1FMXV020VJ3
ESP Signature Date:			

Any comments? You can contact

webmaster

EA02-027-C 3589

Vehicle Information Report

GENERAL VEHICLE INFORMATION:

(Related Claims)

VIN:	1FTRX18W01NA34336	Veh Line:	TF5 - F150/250(PHO6)/F233-FORD [97-02]	Eng Serial No:	*
Model Year:	2001	Market Derivaiv:	* - [NA]	Body Style:	*
Veh Type:	T	Drive Code:	TSS - 4 WHL L/H PART TIME DRIVE	Engine:	T/VN - R-M 4.6L SOHC SN NA CIVS G-NP
Inv. Dealer:	01125	Body Cab Style:	TDD - SUPER SINGLE CAB (SUPER CAB)	Transmission:	TADU - 4 SPD AUTO TR NAAO AODEW/4R70W
		Version/Series:	T/AM - 150 SERIES		

BUILD INFORMATION:

Region: NA - ######## Plant: AR - NORFOLK PLANT BUILD
Country: USA - ######## Prod Date: 08-SEP-2000

SALE INFORMATION:

Region: NA - ######## Selling Dealer: 121290 - *
Country: USA - ######## Selling Dlr St/Prov: SC
Buyer St/Prov: *

Arrival Date: 09-SEP-2000 Red Carpet Lease: *
Sale Date: Fleet/Retail/Co. Lease: F
Warranty Start Date: 29-DEC-2000 Modified Vehicle: 6075
Orig Warranty Date: 01-SEP-2000 Reacquired Vehicle: * Vehicle Export Flag: N

VOC/EOC:

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[illegible]            [illegible]          FG  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  7  [illegible] 321[illegible]  [illegible]      [illegible]  4   5  [illegible]

1[illegible] 3 0       [illegible]  [illegible]                    [illegible]100        [illegible]
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EA02-027-C 3866

INSTALLED OPTION INFORMATION:

Air Conditioning:	TJB - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	BA	GVW Class Code:	E
Audio Units:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratios:	BGAHD - 3.55 FINAL DRIVE RATIO	Mirrors(Driver Side):	* - [N/A]
Axle Types:	BGHAC - LIMITED SLIP REAR AXLE	Mirrors(Passgr Side):	* - [N/A]
Battery Amp Rating:	BL	Paints:	PNRUA - MED. TOREADOR C/C
Brake Codes:	BRAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AU - ELETR PREM AM/FM STRO/DISC
Calibration Code:	1F51G99A	Sound Systems:	* - [N/A]
Color(Accent):	* - [N/A]	Super Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Manufacturer:	AG - GOODYEAR
Delivery Type:	*	Tire Brand:	* - *
Driveshaft Code:	F	Tire Size:	DJKRE - LT265/75R 17 A/T OWL
Front Seats:	* - [N/A]	Traction Controls:	* - [N/A]
Fuel Type:	* - [N/A]	Wheel Base:	* - [N/A]

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*	DOT Plant Manufacturer:	* - *

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	T/B - T/B
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Decal Suffix:	BCD
ESP Plan Year:	*	Engine Family:	1FMXT04.6PF6
ESP Signature Date:			

Any comments? You can contact

webmaster

E862-027-C 3881

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1MEFM5[illegible]4YG619109	Veh Line:	C[illegible]D - TAURUS/SABLE (D[illegible]) [00-0[illegible]]	Eng Serial No:	*
Model Year:	2000	Market Derivat:	C[illegible] - L-M DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	C	Drive Code:	C/A - 2 WHL L/H FRONT DRIVE	Engine:	C[illegible]LD - MOD 3.[illegible]L DOHC [illegible] NA V6 G*NAAO
Inv. Dealer:	10480	Body Cab Style:	CFA - 4 DOOR SEDAN-4 LITE	Transmission:	C[illegible]DX - 4 SPD AUTO TRANS NAAO AX4N
		Version/Series:	CXB - SABLE B VERSION		

BUILD INFORMATION:

Region: NA - ######### Plant: AD - CHICAGO PLANT BUILD
Country: USA - ######### Prod Date: 21-FEB-2000

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 314566 - *
Country: USA - ######### Selling Mkt St/Prov: NY
Buyer St/Prov: NY

Arrival Date: 0[illegible]-MAR-2000 Red Carpet Lease: [illegible]
Sale Date: 31-MAY-2000 Fleet/Retail/Ca. Lease: R
Warranty Start Date: 31-MAY-2000 Modified Vehicle: *
Orig Warranty Date: 31-MAY-2000 Reacquired Vehicle: * Vehicle Export Flag: N

YOC/EOC:

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[illegible]

[illegible] 24

2002 C-1270-2002

INSTALLED OPTION INFORMATION:

Air Conditioning:	C/C - ATC AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	*	GVW Class Code:	F
Audio Disk:	AC - AUDIO DISC CHANGER PLAYER	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	BA - DRIVER POWER/HEATED MIRROR
Axle Type:	* - [N/A]	Mirror(Psngr Side):	BA - PASS POWER/HEATED CONVEX MIRR
Battery Amp Rating:	RO	Paint:	FN/YA - MED. TOREADOR C/C
Brake Code:	FHAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AE - ELECTRONIC AM/FM STRO/CASSETTE
Calibration Code:	6DD14NDA	Sound System:	AB - AUDIOPHILE SOUND SYSTEM
Color(Accent):	* - [N/A]	Super Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Manufacturer:	AD - GENERAL
Delivery Type:	R	Tire Brand:	* - *
Driveshaft Code:	*	Tire Size:	D3HZ - P215/60R-16 BSW ALL SEASON
Front Seats:	* - [N/A]	Traction Control:	AB - ANTI-SPIN TRACT BRAKES W/O IVD
Fuel Type:	* - [N/A]	Wheel Base:	* - [N/A]

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LL:	*	RL:	*
SPARE:	*	DOT Plant Manufacturer:	* - *

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	C/C - C/C
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Decal Suffix:	G8Z
ESP Plan Years:	*	Engine Family:	YFMXV03.0VF3
ESP Signature Date:			

Any comments? You can contact

webmaster

3693 C-0227-2002

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FMYU03101KB80734	Veh Line:	TM1 - ESCAPE (U204) [2001]	Eng Serial No:	590816086
Model Year:	2001	Market Derivtv:	TIF - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	T	Drive Code:	TIA - 2 WHL LH FRONT DRIVE	Engine:	TJLD - MOD 3.0L DOHC EFI NA V6 G*NAAO
Inv. Dealer:	03415	Body Cab Style:	TYWD - 4 DOOR WAGON	Transmission:	TJDJ - 4 SPD AUTO TRANS NAAO CD4E
		Version/Series:	TSF - FORD SERIES .		

BUILD INFORMATION:

Region: NA - ######### Plant: AJ - KANSAS CITY PLANT BUILD
Country: USA - ######### Prod Date: 21-SEP-2000

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 132012 - *
Country: USA - ######### Selling Dlr St/Prov: TX
Buyer St/Prov: TX

Arrival Date: 29-SEP-2000 Red Carpet Lease: *
Sale Date: 03-OCT-2000 Fleet/Retail/Co. Lease: R
Warranty Start Date: 03-OCT-2000 Modified Vehicle: *
Orig Warranty Date: 30-SEP-2000 Exceptional Vehicle: * Vehicle Export Flag: N

VOC/EOC:

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---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

V03IKB80734 10307  X 2 1400419     5C X   496 7A    3  345 X 05 AHH 52A012  2  VA     12  4      3

1MMEX 7             5147X E                          2
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	T[illegible] - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	C	GVW Class Code:	Y
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	* - [N/A]	Mirror(Pasgr Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	A	Paint:	PNUAA - EBONY SOLID C/C
Brake Code:	PEAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AQ - ELETR PREMIUM AM/FM STRO/CSTB
Calibration Code:	GM21A30A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Single Tandem Axle:	* - [N/A]
Color(Trim):	006ZV -	Tire Manufacturer:	AD - GENERAL
Delivery Type:	0	Tire Brand:	* - *
Driveshaft Code:	D	Tire Size:	D3GTI - P225/70R 15 BSW A-S OWL
Front Seat:	* - [N/A]	Traction Control:	* - [N/A]
Fuel Type:	* - [N/A]	Wheel Base:	* - [N/A]

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*	DOT Plant Manufacturer:	* - *

RSP INFORMATION: EMISSIONS INFORMATION:

RSP Code:	*	Emission Code:	T/8 - T/8
RSP Coverage(Miles):	*	Emission Cert Type:	5
RSP Coverage(Time):	*	Emission Decal Suffix:	HMA
RSP Plan Year:	*	Engine Family:	1FMXT0301F6
RSP Signature Date:			

Any comments? You can contact

webmaster

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FMYU03141KB[illegible]	Veh Line:	T/M1 - ESCAPE (U204) [2001]	Eng Serial No:	[illegible]
Model Year:	2001	Market Derivat:	T/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	T	Drive Code:	T/A - 2 WHL L/H FRONT DRIVE	Engine:	T/LD - MOD 3.0L DOHC EFI NA V6 G*NAAO
Svc. Dealer:	[illegible]	Body Cab Style:	T/WD - 4 DOOR WAGON	Transmission:	T/DJ - 4 SPD AUTO TRANS NAAO CD4E
		Version/Series:	T/SF - FORD SERIES		

BUILD INFORMATION:

Region: NA - ########## Plant: AJ - KANSAS CITY PLANT BUILD

Country: USA - ########## Prod Date: 16-SEP-2000

SALE INFORMATION:

Region: NA - ########## Selling Dealer: 127[illegible] - *

Country: USA - ########## Selling Dlr St/Prov: VA

Buyer St/Prov: VA

Arrival Date: 05-OCT-2000 Red Carpet Lease: *

Sale Date: 18-OCT-2000 Fleet/Retail/Co. Lease: R

Warranty Start Date: 18-OCT-2000 Modified Vehicle: *

Orig Warranty Date: 18-OCT-2000 Reacquired Vehicle: * Vehicle Report Flag: N

VOC/EOC:

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---------1---------2---------3---------4---------5---------6---------7---------8---------9---------
[illegible]
[illegible]
```

EA02-027-C 3696

INSTALLED OPTION INFORMATION:

Air Conditioning:	T8 - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	C	GVW Class Code:	Y
Audio Disc:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	* - [N/A]	Mirror(Psngr Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	A	Paint:	FNRIA - MED. TOREADOR C/C
Brake Code:	F8AAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AQ - ELETR PREMIUM AM/FM STRO/CSTE
Calibration Code:	0M11A38A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Susp Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Manufacturer:	AD - GENERAL
Delivery Type:	0	Tire Brand:	* - *
Driveshaft Code:	D	Tire Size:	D9GT1 - P225/70R 15 BSW A-S OWL
Front Seat:	* - [N/A]	Traction Control:	* - [N/A]
Fuel Type:	* - [N/A]	Wheel Base:	* - [N/A]

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*	DOT Plant Manufacturer:	* - *

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	T8 - T8
ESP Coverage(Miles):	*	Emission Cert Type:	3
ESP Coverage(Time):	*	Emission Decal Suffix:	HMA
ESP Plan Years:	*	Engine Family:	1FMXT0401F6
ESP Signature Date:			

Any comments? You can contact

webmaster

Freeland, Mark (M.)

From:	Williams, Les (LHW.)
Sent:	Wednesday, November 14, 2001 9:51 AM
To:	Freeland, Mark (M.)
Cc:	Dalbo, Bob (R.J.)
Subject:	RE: 10/18/2001 repair on 1FMYU04121KC21319, 3.0L Escape built 6/15/2001

TEE bldg.

1AE20

Let me know when you would like to come.

Thx,
Les

-----Original Message-----

From:	Freeland, Mark (M.)
Sent:	Wednesday, November 14, 2001 9:40 AM
To:	Williams, Les (LHW.)
Cc:	Akins, Mary (M.); Owens, Karen (K.E.)
Subject:	FW: 10/18/2001 repair on 1FMYU04121KC21319, 3.0L Escape built 6/15/2001

Les,
Yes please, I would like to evaluate it before giving it to Mary Akins from Kavlico. Where can I find you?
Thanks

Regards

Mark Freeland

6-Sigma Black Belt Candidate
Physics Department
Ford Research Laboratory
P.O. Box 2053
MD 3028 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

-----Original Message-----

From:	Williams, Les (LHW.)
Sent:	Wednesday, November 14, 2001 9:16 AM
To:	Freeland, Mark (M.)
Subject:	RE: 10/18/2001 repair on 1FMYU04121KC21319, 3.0L Escape built 6/15/2001

Hello Mark:

My name is Les Williams and I have a few DPFE sensors taken from vehicles experiencing stalls. Would you like to take a look at these? Let me know.

Thx,
Les

PS I spoke with Ted Jensen the other day as well concerning IACs.

-----Original Message-----
From: Myers, Dan (D.P.)
Sent: Tuesday, November 13, 2001 5:25 PM
To: Freeland, Mark (M.)
Cc: Owens, Karen (K.E.); Jensen, Ted (T.E.); Williams, Les (LHW.)
Subject: RE: 10/18/2001 repair on 1FMYU04121KC21319, 3.0L Escape built 6/15/2001

Mark,
All of the parts removed from the Escape stalls while driving issue are forwarded back to Les Williams at the TEE building. I just mailed two sets of parts back to Les but I will look around to make sure none have slipped through the cracks.

The parts are replaced as part of the stalls while driving checklist and are not necessarily failed parts.

Dan Myers

Field Quality Engineer - Iowa
Enhanced Concern Identification

dmyers4@ford.com

Cell	563-505-9002
Office	563-289-9991
Fax	563-289-1364

-----Original Message-----
From: Freeland, Mark (M.)
Sent: Tuesday, November 13, 2001 2:44 PM
To: Myers, Dan (D.P.)
Cc: Owens, Karen (K.E.); Jensen, Ted (T.E.)
Subject: 10/18/2001 repair on 1FMYU04121KC21319, 3.0L Escape built 6/15/2001

Dan,

I understand you were involved in the repair of the subject vehicle, where the customer concern was "TRUCK DIES INTERMITTEN.....".

I am the 6 Sigma BB candidate working on the EGR dPFE sensor which is used on that vehicle. I understand that the dPFE sensor was replaced along with the IAC valve.

There is a known failure mode for the dPFE sensor/Powertrain Control system which will result in the engine quitting. As such I am very interested in discussing this particular case with you and obtaining the dPFE sensor which was removed from the vehicle. Do you know the where abouts of the sensor?

Regards

Mark Freeland

6-Sigma Black Belt Candidate
Physics Department
Ford Research Laboratory
P.O. Box 2053
MD 3028 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com

Vehicle Information Report

GENERAL VEHICLE INFORMATION:

(Related Claims)

VIN:	1LNHM82W31Y612204	Veh Line:	C/VC - LINCOLN TOWN CAR (FN145) [98-02]	Eng Serial No:	*
Model Year:	2001	Market Derivat:	C/M - L-84 DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	C	Drive Code:	C/B - 2 WHL L/H REAR DRIVE	Engine:	C/VN - 8-M 4.6L SOHC EFI NA
Inv. Dealer:	10218	Body Cab Style:	C/FC - 4 DOOR SEDAN-6 LITE	Transmission:	C/DU - 4 SPD AUTO TR NAAO
		Version/Series:	C/SR - SIGNATURE VERSION		

BUILD INFORMATION:

Region:	NA - #########	Plant:	8A - WIXOM PLANT BUILD
Country:	USA - #########	Prod Date:	07-SEP-2000

SALE INFORMATION:

Region:	NA - #########	Selling Dealer:	554015 - *
Country:	USA - #########	Selling Dlr St/Prov:	CA
		Buyer St/Prov:	CA

Arrival Date:	19-OCT-2000	Red Carpet Lease:	I
Sale Date:	16-JAN-2001	Fleet/Retail/Co. Lease:	R
Warranty Start Date:	16-JAN-2001	Modified Vehicle:	*
Orig Warranty Date:	16-JAN-2001	Reacquired Vehicle:	* Vehicle Export Flag: N

VOC/EOC:

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---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

M82W31Y612201Y  3     2 14X7004     DCN R 2 UJY 303    3 LLM A  0     54A214  2V WF     02 R      N

11/MD 6          7MCA                             A
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	C/C - ATC AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	*	GVW Class Code:	H
Audio Disk:	AC - AUDIO DISC CHANGER PLAYER	Instrumentation:	* - [N/A]
Axle Ratio:	EGACC - 3.08 FINAL DRIVE RATIO	Mirror(Driver Side):	* - [N/A]
Axle Type:	EGIAB - NON-LIMITED SLIP REAR AXLE	Mirror(Psngr Side):	* - [N/A]
Battery Amp Rating:	65	Paint:	PNZTA - WHITE PEARL TRI COAT
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	BP - ELE LUX/DIG SIGNAL STR/CST/CLK
Calibration Code:	1VC1Z80A	Sound System:	AE - AUDIOPHILE SOUND SYSTEM
Color(Accent):	* - [N/A]	Susp Tandem Axle:	* - [N/A]
Color(Trim):	000ZV -	Tire Brand:	AJ - MICHELIN - RECYCLABLE
Delivery Type:	R	Tire Size:	D3JTU - P225/60R-16 BSW A-S
Driveshaft Code:	*	Traction Control:	AB - ANTI-SPIN TRACT BRAKES W/O IVD
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	C/C - C/C
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Decal Suffix:	HEZ
ESP Plan Year:	*	Engine Family:	1FMXV046VP5
ESP Signature Date:			

Any comments? You can contact *webmaster*

Vehicle Information Report

GENERAL VEHICLE INFORMATION:

(Related Claims)

VIN:	1LNHM82W31Y612201	Veh Line:	C/VC - LINCOLN TOWN CAR (FN145) (98-02)	Eng Serial No:	*
Model Year:	2001	Market Derivat:	C/M - L-M DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	C	Drive Code:	C/B - 2 WHL L/H REAR DRIVE	Engine:	C/VN - 8-M 4.6L SOHC EFI NA CIVS G-NF
Inv. Dealer:	10218	Body Cab Style:	C/FC - 4 DOOR SEDAN-6 LITE	Transmission:	C/DU - 4 SPD AUTO TR NAAO AODEW/4R70W
		Version/Series:	C/BR - SIGNATURE VERSION		

BUILD INFORMATION:

Region:	NA - #########	Plant:	RA - WIXOM PLANT BUILD
Country:	USA - #########	Prod Date:	07-SEP-2000

SALE INFORMATION:

Region:	NA - #########	Selling Dealer:	354015 - *
Country:	USA - #########	Selling Dlr St/Prov:	CA
		Buyer St/Prov:	CA

Arrival Date:	19-OCT-2000	Red Carpet Lease:	1	
Sale Date:	16-JAN-2001	Fleet/Retail/Co. Lease:	R	
Warranty Start Date:	16-JAN-2001	Modified Vehicle:	*	
Orig Warranty Date:	16-JAN-2001	Reacquired Vehicle:	*	Vehicle Export Flag: N

VOC/EOC:

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--------1---------2---------3---------4---------5---------6---------7---------8---------9---------
M831Y612201Y  3     2 16X7000    XXX E 7 GTY JTD    3 XXX A  U    548214  2V NP    02 R     N
1LNM3 #          7N0CA                              A
```

6902-027-C 3812

INSTALLED OPTION INFORMATION:

Air Conditioning:	C/C - ATC AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	*	GVW Class Code:	H
Audio Disk:	AC - AUDIO DISC CHANGER PLAYER	Instrumentation:	* - [N/A]
Axle Ratio:	BOACC - 3.08 FINAL DRIVE RATIO	Mirror(Driver Side):	* - [N/A]
Axle Type:	BGIAB - NON-LIMITED SLIP REAR AXLE	Mirror(Psngr Side):	* - [N/A]
Battery Amp Rating:	65	Paint:	PNZTA - WHITE PEARL TRI COAT
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	BF - ELE LUX/DIG SIGNAL STR/CST/CLK
Calibration Code:	1YC1S30A	Sound System:	AB - AUDIOPHILE SOUND SYSTEM
Color(Accent):	* - [N/A]	Susp. Tandem Axle:	* - [N/A]
Color(Trim):	000ZV -	Tire Brand:	AJ - MICHELIN - RECYCLABLE
Delivery Type:	R	Tire Size:	D3JTU - P225/60R-16 BSW A-S
Driveshaft Code:	*	Traction Control:	AB - ANTI-SPIN TRACT BRAKES W/O IVD
Front Seats:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	C/C - C/C
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Decal Suffix:	H3Z
ESP Plan Year:	*	Engine Family:	1FMXV04.6VF5
ESP Signature Date:			

Any comments? You can contact

webmaster

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FMYU01171KE79965	Veh Line:	T/M1 - ESCAPE (U204) [2001]	Eng Serial No:	37112608
Model Year:	2001	Market Derivat:	T/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	T	Drive Code:	T/A - 2 WHL L/H FRONT DRIVE	Engine:	T/LD - MOD 3.0L DOHC EFI
Inv. Dealer:	01521	Body Cab Style:	T/WD - 4 DOOR WAGON	Transmission:	T/DJ - 4 SPD AUTO TRANS N
		Version/Series:	T/EF - FORD SERIES		

BUILD INFORMATION:

Region: NA - ########## Plant: AJ - KANSAS CITY PLANT BUILD
Country: USA - ########## Prod Date: 11-SEP-2000

SALE INFORMATION:

Region: NA - ########## Selling Dealer: 141202 - *
Country: USA - ########## Selling Dlr St/Prov: IL
Buyer St/Prov: IL

Arrival Date:	02-OCT-2000	Red Carpet Lease:	*
Sale Date:	28-OCT-2000	Fleet/Retail/Co. Lease:	R
Warranty Start Date:	28-OCT-2000	Modified Vehicle:	*
Orig Warranty Date:	28-OCT-2000	Reacquired Vehicle:	* Vehicle Export Flag: N

VOC/EOC:

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---------1---------2---------3---------4---------5---------6---------7---------8---------9--------*

0011KE79985101337P  E 2 14NA086      50 0   496 73  5 3  36  5 833A N 418578  2  FL  A  Y2A   3    1

1FMYJ 7    1       19141L 2                            1
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	C	GVW Class Code:	Y
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	* - [N/A]	Mirror(Psngr Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	A	Paint:	PNFJA - MED. TORREADOR C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AQ - ELETR PREMIUM AM/FM STRO/CSTE
Calibration Code:	0M11A50A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Susp Tandem Axle:	* - [N/A]
Color(Trim):	00ZV -	Tire Brand:	AC - FIRESTONE
Delivery Type:	0	Tire Size:	DSGTQ - P225/70R 15 BSW A-S
Driveshaft Code:	D	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	P	Emission Code:	T/B - T/B
ESP Coverage(Miles):	060	Emission Cert Type:	5
ESP Coverage(Time):	060	Emission Decal Suffix:	HD4A
ESP Plan Year:	2001	Engine Family:	1FMXT0501F6
ESP Signature Date:	28-OCT-2000		

Any comments? You can contact

webmaster

ER02-027-C 3615

ANALYTICAL WARRANTY SYSTEM

Vehicle Information Report

VIRGINIA CAR

GENERAL VEHICLE INFORMATION:

(Related Claims)

VIN:	1FAFP313X1R108133	Veh Line:	C/AK - FOCUS (CW170) (99-02)	Eng Serial No:	*
Model Year:	2001	Market Derived:	C/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	C	Drive Code:	C/A - 2 WHL L/H FRONT DRIVE	Engine:	C/BQ - ZETEC 2.0L DOHC EFI N
Inv. Dealer:	00031	Body Cab Style:	C/DA - 3 DOOR SEDAN-4 LITE	Transmission:	C/D2 - 4-SPD AUTO TRANS 4F2
		Version/Series:	C/DR - SERIES 22		

BUILD INFORMATION:

Region:	NA - ##########	Plant:	A3 - HERMOSILLO PLANT BUILD
Country:	MEX - ##########	Prod Date:	01-SEP-2000

SALE INFORMATION:

Region:	NA - ##########	Selling Dealer:	127044 - *
Country:	USA - ##########	Selling Dlr St/Prov:	VA
		Buyer St/Prov:	VA

Arrival Date:	21-SEP-2000	Rail Carpet Lease:	*		
Sale Date:	01-OCT-2000	Fleet/Retail/Co. Lease:	R		
Warranty Start Date:	01-OCT-2000	Modified Vehicle:	*		
Orig Warranty Date:	01-OCT-2000	Reacquired Vehicle:	*	Vehicle Export Flag:	N

VOC/EOC:

```
------1-----2-----3-----4-----5-----6-----7-----8-----9-----
P313X1R08133Y  E  6   2 01SEA007      KF G   ANF 26P4P    X3L E  1     278044  3  TB     DN          A
3FAFX 5     1        6X1AVA    Y                              18
```

EA02-027-C 3818

INSTALLED OPTION INFORMATION:

Air Conditioning:	C/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	A	GVW Class Code:	F
Audio Disc:	* - [N/A]	Instrumentation:	AB - TACHOMETER INSTRUMENTATION
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	* - [N/A]
Axle Type:	* - [N/A]	Mirror(Pasgr Side):	* - [N/A]
Battery Amp Rating:	8B	Paint:	PNZJF - SILVER FROST C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	BQ -
Calibration Code:	1AK1AZBA	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Susp Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Brand:	AC - FIRESTONE
Delivery Type:	0	Tire Size:	D3JAQ - 205/50VR-16 BSW RUN FLAT
Driveshaft Code:	*	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	C/B - C/B
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Decal Suffix:	HLG
ESP Plan Year:	*	Engine Family:	1FMXV020VF3
ESP Signature Date:			

Any comments?

EA02-027-C 3817

F005

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FAFP36331W148560	Veh Line:	C/AK - FOCUS (CW170) [99-02]	Eng Serial No:	*
Model Year:	2001	Market Derived:	C/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	C	Drive Code:	C/A - 2 WHL L/H FRONT DRIVE	Engine:	C/BQ - ZETEC 2.0L DOHC I
Inv. Dealer:	02710	Body Cab Style:	C/FF - 4 DOOR STATION WAGON	Transmission:	C/D2 - 4-SPD AUTO TRAN
		Version/Series:	C/DE - SERIES 23		

BUILD INFORMATION:

Region:	NA - ########	Plant:	AZ - WAYNE PLANT BUILD
Country:	USA - ########	Prod Date:	11-OCT-2000

SALE INFORMATION:

Region:	NA - ########	Selling Dealer:	148051 - *
Country:	USA - ########	Selling Dlr St/Prov:	MI
		Buyer St/Prov:	MI

Arrival Date:	13-OCT-2000	Red Carpet Lease:	I		
Sale Date:	23-OCT-2000	Fleet/Retail/Co. Lease:	R		
Warranty Start Date:	23-OCT-2000	Modified Vehicle:	*		
Orig Warranty Date:	23-OCT-2000	Reacquired Vehicle:	*	Vehicle Export Flag:	N

VOC/EOC:

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---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

P161W148560Y 4   8   A 6671538      VO E  RANW 34A N J2 XXLAB  7      46C051  3 ALW     XX1          1

1FAP5 7          93ANE                                  13
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	C/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	A	GVW Class Code:	F
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	* - [N/A]	Mirror(Pssgr Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	58	Paint:	FNMLT - LIGHT SAPPHIRE BLUE
Brake Code:	FBAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	BQ -
Calibration Code:	1AK1AZDA	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Susp Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Brand:	CC - FIRESTONE/GOODYEAR
Delivery Type:	P	Tire Size:	DXKNY - 195/60R15-S BSW
Driveshaft Code:	*	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

ER02-027-C 3618

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	C/B - C/B
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Decal Suffix:	HLG
ESP Plan Year:	*	Engine Family:	1FMXV030VF3
ESP Signature Date:			

Any comments? You can contact *webmaster*

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FMZU73E62ZA47080	Veh Line:	T/U5 - EXPLORER (U152) [01-02]	Eng Serial No:	*
Model Year:	2002	Market Derivat:	T/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	T	Drive Code:	T/S - 4 WHL L/H PART TIME DRIVE	Engine:	T/NB - COLOGNE 4.0L SOF
Inv. Dealer:	06180	Body Cab Style:	T/WD - 4 DOOR WAGON	Transmission:	T/TJ - 5 SPD AUTO TRANS
		Version/Series:	T/EF - FORD SERIES		

BUILD INFORMATION:

Region:	NA - #########	Plant:	AV - ST. LOUIS PLANT BUILD
Country:	USA - #########	Prod Date:	03-MAY-2001

SALE INFORMATION:

Region:	NA - #########	Selling Dealer:	141058 - *
Country:	USA - #########	Selling Dlr St/Prov:	WI
		Buyer St/Prov:	WI

Arrival Date:	07-MAY-2001	Red Carpet Lease:	*		
Sale Date:	12-MAY-2001	Fleet/Retail/Co. Lease:	R		
Warranty Start Date:	12-MAY-2001	Modified Vehicle:	*		
Orig Warranty Date:	12-MAY-2001	Reacquired Vehicle:	*	Vehicle Export Flag:	N

VOC/EOC:

```
---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

U732EA47940114377N E 1 29C1347      OO EN  345 53K      21      38     410058  1  WK   E CF  4 K    X

17054 3             98002    M                                  A
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	BK	GVW Class Code:	Z
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	* - [N/A]
Axle Type:	* - [N/A]	Mirror(Psngr Side):	* - [N/A]
Battery Amp Rating:	EL	Paint:	PNZ8D - MINERAL GRAY C/C WB
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	MJ - AM/FM STRO/CD CHANGER/CLK
Calibration Code:	1U51AF0A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Susp Tandem Axle:	* - [N/A]
Color(Trim):	090HB -	Tire Brand:	AJ - MICHELIN - RECYCLABLE
Delivery Type:	0	Tire Size:	D3UUF - P235/70R-16 OWL A-S
Driveshaft Code:	D	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	M37PDH0X1601	RF:	*
LR:	M37PDH0X1601	RR:	*
LI:	*	RI:	*
SPARE:	M37PDH0X1601		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	T/8 - T/8
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Decal Suffix:	X.8
ESP Plan Year:	*	Engine Family:	2FMXT0402F8
ESP Signature Date:			

Any comments? You can contact

webmaster

EA02-027-C 3821

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FMZU73E[illegible]2ZA[illegible]	Veh Line:	T/U5 - EXPLORER (U152) [01-02]	Eng Serial No:	*
Model Year:	2002	Market Derived:	T/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	T	Drive Code:	T/6 - 4 WHL L/H PART TIME DRIVE	Engine:	T/NE - COLOGNE 4.0L SOE
Inv. Dealer:	02741	Body Cab Style:	T/WD - 4 DOOR WAGON	Transmission:	T/TI - 5 SPD AUTO TRANS
		Version/Series:	T/EF - FORD SERIES		

BUILD INFORMATION:

Region:	NA - #########	Plant:	AV - ST. LOUIS PLANT BUILD
Country:	USA - #########	Prod Date:	15-JUN-2001

SALE INFORMATION:

Region:	NA - #########	Selling Dealer:	149024 - *
Country:	USA - #########	Selling Dlr St/Prov:	MI
		Buyer St/Prov:	MI

Arrival Date:	10-JUL-2001	Red Carpet Lease:	J		
Sale Date:	19-JUL-2001	Fleet/Retail/Co. Lease:	R		
Warranty Start Date:	19-JUL-2001	Modified Vehicle:	*		
Orig Warranty Date:	19-JUL-2001	Reacquired Vehicle:	*	Vehicle Export Flag:	N

VOC/EOC:

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---------1---------2---------3---------4---------5---------6---------7---------8---------9---------
[illegible]0114 7V5 X 2 [illegible]      [illegible] 104 53N [illegible]  2K   R5   [illegible]  2 [illegible]  [illegible] 4 [illegible]   [illegible]
[illegible] 1        [illegible]   TH                   A
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	BK	GVW Class Code:	Z
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	* - [N/A]
Axle Type:	* - [N/A]	Mirror(Psngr Side):	* - [N/A]
Battery Amp Rating:	BL	Paint:	FNZ8C - MINERAL GRAY C/C WB
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	BE - ELETR PREM STRO/CSTE/DISC/CLK
Calibration Code:	1U51AF0A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Surge Tandem Axle:	* - [N/A]
Color(Trim):	000HH -	Tire Brand:	AJ - MICHELIN - RECYCLABLE
Delivery Type:	F	Tire Size:	D5JUJ - P235/70R-16 OWL A-S
Driveshaft Code:	D	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF: M37FDH8X2301 RF: M37FDH8X2301
LR: M37FDH8X2301 RR: M37FDH8X2301
LI: * RI: *
SPARE: M37FDH8X2301

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	T/B - T/B
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Decal Suffix:	JLS
ESP Plan Years	*	Engine Family:	2FMXT9402F8
ESP Signature Date:			

Any comments? You can contact *webmaster*

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	4M2ZU86W42ZJ17935	Veh Line:	T/U5 - EXPLORER (U152) [01-02]	Key Serial No:	*
Model Year:	2002	Market Derivat:	T/M - L-M DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	T	Drive Code:	T/E - 4 WHL L/H PART TIME DRIVE	Engine:	T/VN - R-M 4.6L SOHC EFI
Inv. Dealer:	10009	Body Cab Style:	T/WD - 4 DOOR WAGON	Transmission:	T/TJ - 5 SPD AUTO TRANS
		Version/Series:	T/RL - LINCOLN/MERCURY SERIES		

BUILD INFORMATION:

Region: NA - ######### Plant: AV - ST. LOUIS PLANT BUILD
Country: USA - ######### Prod Date: 18-JUL-2001

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 37&D65 - *
Country: USA - ######### Selling Dlr St/Prov: VA
Buyer St/Prov: VA

Arrival Date:	30-JUL-2001	Red Carpet Lease:	*
Sale Date:	12-AUG-2001	Fleet/Retail/Co. Lease:	R
Warranty Start Date:	12-AUG-2001	Modified Vehicle:	*
Orig Warranty Date:	12-AUG-2001	Reacquired Vehicle:	* Vehicle Export Flag: N

VOC/ROC:

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---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

[illegible]

[illegible]
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INSTALLED OPTION INFORMATION:

Air Conditioning:	T/G - DUAL ZONE AUTO TEMP CONTROL AC	GVW Code:	* - [N/A]
Alternator Amp Rating:	*	GVW Class Code:	Z
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	* - [N/A]
Axle Type:	* - [N/A]	Mirror(Psngr Side):	* - [N/A]
Battery Amp Rating:	BL	Paint:	PNFTA - MED. TOREADOR C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	MJ - AM/FM STRO/CD CHANGER/CLK
Calibration Code:	1U51A50A	Sound System:	AE - AUDIOPHILE SOUND SYSTEM
Color(Accent):	* - [N/A]	Scope Tandem Axle:	* - [N/A]
Color(Trim):	800HB -	Tire Brand:	AG - GOODYEAR
Delivery Type:	D	Tire Size:	DBIVD - P245/70R-16 BSW A-S
Driveshaft Code:	D	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

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TIRE DOT INFORMATION:

LF:	PD9LHMD1901	RF:	PD9LHMD1901
LR:	PD9LHMD1901	RR:	PD9LHMD1901
LI:	*	RI:	*
SPARE:	PD9LHMD1901		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:		*	Emission Code:	T/B - T/B
ESP Coverage(Miles):		*	Emission Cert Type:	5
ESP Coverage(Time):		*	Emission Decal Suffix:	JBY
ESP Plan Year:		*	Engine Family:	2FMXT0462P5
ESP Signature Date:				

Any comments? You can contact

webmaster

E002-027-C 3825

Vehicle Information Report

GENERAL VEHICLE INFORMATION:

(Related Claims)

VIN:	2FAFP71W61X114188	Veh Line:	C/PB - CROWN VIC (SNSWENI 14) [92-02]	Eng Serial No:	*
Model Year:	2001	Market Derivatv:	C/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	C	Drive Code:	C/B - 2 WHL L/H REAR DRIVE	Engine:	C/VN - R-M 4.6L SOHC EFI NA
Inv. Dealer:	08266	Body Cab Style:	C/PC - 4 DOOR SEDAN-6 LITE	Transmission:	C/DU - 4 SPD AUTO TR NAAO
		Version/Series:	C/AB - BASE VERSION - CAR		

BUILD INFORMATION:

Region:	NA - #########	Plant:	AW - ST. THOMAS PLANT BUILD
Country:	CAN - #########	Prod Date:	26-SEP-2000

SALE INFORMATION:

Region:	NA - #########	Selling Dealer:	153491 - *
Country:	USA - #########	Selling Dlr St/Prov:	IL
		Buyer St/Prov:	MO

Arrival Date:	20-OCT-2000	Red Carpet Lease:	*		
Sale Date:	21-MAR-2001	Fleet/Retail/Co. Lease:	F		
Warranty Start Date:	21-MAR-2001	Modified Vehicle:	*		
Orig Warranty Date:	21-MAR-2001	Reacquired Vehicle:	*	Vehicle Export Flag:	N

VOC/EOC:

---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

[illegible]

[illegible]

INSTALLED OPTION INFORMATION:

Air Conditioning:	C/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	*	GVW Class Code:	F
Audio Disc:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	BGAEC - 3.27 FINAL DRIVE RATIO	Mirror(Driver Side):	* - [N/A]
Axle Type:	BG/AB - NON-LIMITED SLIP REAR AXLE	Mirror(Psngr Side):	* - [N/A]
Battery Amp Rating:	M5	Paint:	PNZGC - PERFORMANCE WHITE C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AD - ELECTRONIC AM/FM STEREO RADIO
Calibration Code:	1F81GPGA	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Susp Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Brand:	AP - DUNLOP
Delivery Type:	5	Tire Size:	DS/TB - P225/60VR-16 BSW A-S
Driveshaft Code:	*	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

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TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	C/B - C/B
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Decal Suffix:	HDO
ESP Plan Years:	*	Engine Family:	1FMXV046VF5
ESP Signature Date:			

Any comments? You can contact

webmaster

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FMCU04141KF17100	Veh Line:	T/M1 - ESCAPE (U204) [2001]	Eng Serial No:	61B886067
Model Year:	2001	Market Derivath:	T/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	T	Drive Code:	T/F - 4 WHL L/H FULL TIME DRIVE	Engine:	T/LD - MOD 3.0L DOHC SFI I
Inv. Dealer:	08896	Body Cab Style:	T/WD - 4 DOOR WAGON	Transmission:	T/DJ - 4 SPD AUTO TRANS N
		Version/Series:	T/EF - FORD SERIES		

BUILD INFORMATION:

Region:	NA - #########	Plant:	AJ - KANSAS CITY PLANT BUILD
Country:	USA - #########	Prod Date:	16-OCT-2000

SALE INFORMATION:

Region:	NA - #########	Selling Dealer:	111221 - *
Country:	USA - #########	Selling Dlr St/Prov:	CT
		Buyer St/Prov:	CT

Arrival Date:	31-OCT-2000	Red Carpet Lease:	*
Sale Date:	03-NOV-2000	Fleet/Retail/Co. Lease:	R
Warranty Start Date:	03-NOV-2000	Modified Vehicle:	*
Orig Warranty Date:	03-NOV-2000	Reacquired Vehicle:	* Vehicle Export Flag: N

VOC/EOC:

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---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

U041KF17100103 37F  F 3 02KAD00       05 G 3K450 43   543   305 5 AK1A30 11C9SL   3   UA   A   12A46 3 3  1

1FMC4 5            92407 P                              1
```

INSTALLED OPTION INFORMATION:

Air Cond/Heating:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	C	GVW Class Code:	C
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	* - [N/A]	Mirror(Psngr Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	A	Paint:	PNUAA - EBONY SOLID C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AT - ELETR PREM AM/FM STRO/CSTE/CLK
Calibration Code:	0M11A30A	Sound System:	AB - AUDIOPHILE SOUND SYSTEM
Color(Accent):	* - [N/A]	Super Tandem Axle:	* - [N/A]
Color(Trim):	00XZV -	Tire Brand:	AC - FIRESTONE
Delivery Type:	B	Tire Size:	D3/UJ - P235/70R-16 OWL A-S
Driveshaft Code:	D	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

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TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	T/C - T/C
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Decal Suffix:	HES
ESP Plan Year:	*	Engine Family:	1FMXT030LP6
ESP Signature Date:			

Any comments? You can contact *webmaster*

ER02-027-C 3829

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FMYU01151KB78480	Veh Line:	T/M1 - ESCAPE (U204) [2001]	Eng Serial No:	547650038
Model Year:	2001	Market Derivat:	T/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	T	Drive Code:	T/A - 2 WHL L/H FRONT DRIVE	Engine:	T/LD - MOD 3.0L DOHC EFI I
Inv. Dealer:	02760	Body Cab Style:	T/WD - 4 DOOR WAGON	Transmission:	T/DJ - 4 SPD AUTO TRANS K
		Version/Series:	T/EF - FORD SERIES		

BUILD INFORMATION:

Region:	NA - #########	Plant:	AJ - KANSAS CITY PLANT BUILD
Country:	USA - #########	Prod Date:	29-AUG-2000

SALE INFORMATION:

Region:	NA - #########	Selling Dealer:	148017 - *
Country:	USA - #########	Selling Dlr St/Prov:	MI
		Buyer St/Prov:	MI

Arrival Date:	07-SEP-2000	Red Carpet Lease:	*		
Sale Date:	12-OCT-2000	Fleet/Retail/Co. Lease:	R		
Warranty Start Date:	12-OCT-2000	Modified Vehicle:	*		
Orig Warranty Date:	12-OCT-2000	Reacquired Vehicle:	*	Vehicle Export Flag:	N

VOC/EOC:

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---------1---------2---------3---------4---------5---------6---------7---------8---------9---------
U011KB78480103  9  X 2 2300708      EF I    404 7J     1  2E  5 E10  N 480017  2V FD  A  Y2    3    1
1FE73 6            91482 R                              2
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	C	GVW Class Code:	Y
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	* - [N/A]	Mirror(Psngr Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	A	Paint:	PNFTA - MED. TOREADOR C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AZ - ELETR AM/FM STRO/DISC/CLK
Calibration Code:	0M11AS0A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Susp Tandem Axle:	* - [N/A]
Color(Trim):	0002V -	Tire Brand:	AD - GENERAL
Delivery Type:	0	Tire Size:	DGGTQ - P225/70R 15 BSW A-S
Driveshaft Code:	D	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

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TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	K	Emission Code:	T/B - T/B
ESP Coverage(Miles):	075	Emission Cert Type:	5
ESP Coverage(Time):	060	Emission Decal Suffix:	HMA
ESP Plan Year:	2001	Engine Family:	1FMXT0504F6
ESP Signature Date:	12-OCT-2000		

Any comments? You can contact

webmaster

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FMYU02131KB80579	Veh Line:	T/M1 - ESCAPE (U204) [2001]	Eng Serial No:	5546I7R38
Model Year:	2001	Market Derived:	T/P - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	T	Drive Code:	T/F - 4 WHL L/H FULL TIME DRIVE	Engine:	T/LD - MOD 3.0L DOHC EFI
Inv. Dealer:	00012	Body Cab Style:	T/WD - 4 DOOR WAGON	Transmission:	T/DJ - 4 SPD AUTO TRANS N
		Version/Series:	T/EF - FORD SERIES		

BUILD INFORMATION:

Region:	NA - #########	Plant:	AJ - KANSAS CITY PLANT BUILD
Country:	USA - #########	Prod Date:	31-AUG-2000

SALE INFORMATION:

Region:	NA - #########	Selling Dealer:	127034 - *
Country:	USA - #########	Selling Dlr St/Prov:	VA
		Buyer St/Prov:	DC

Arrival Date:	15-SEP-2000	Red Carpet Lease:	*		
Sale Date:	27-OCT-2000	Fleet/Retail/Co. Lease:	R		
Warranty Start Date:	27-OCT-2000	Modified Vehicle:	*		
Orig Warranty Date:	19-SEP-2000	Reacquired Vehicle:	*	Vehicle Export Flag:	N

VOC/EOC:

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---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

D0S1xxx0057B103379  F 2 148A018      80 G   449 73  B 1  21  1 E3SA F 278014  2  0A  A  73A   3    1

1xxx1 7             914VA F                         2
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	C	GVW Class Code:	Y
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	* - [N/A]	Mirror(Psngr Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	A	Paint:	PNUAA - EBONY SOLID C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AQ - ELETR PREMIUM AM/FM STRO/CSTE
Calibration Code:	0M11A3GA	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Surpa Tandem Axle:	* - [N/A]
Color(Trim):	000ZV -	Tire Brand:	AD - GENERAL
Delivery Type:	0	Tire Size:	D3GTQ - P225/70R 15 BSW A-S
Driveshaft Code:	D	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

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TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	T/B - T/B
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Decal Suffix:	HK5
ESP Plan Years:	*	Engine Family:	1FMXT0301F6
ESP Signature Date:			

Any comments? You can contact *webmaster*

EA02-027-C 3833

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FMYU04161KF61634	Veh Line:	T/M1 - ESCAPE (U204) [2001]	Eng Serial No:	689579087
Model Year:	2001	Market Derivat:	T/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	T	Drive Code:	T/F - 4 WHL L/H FULL TIME DRIVE	Engine:	T/LD - MOD 3.0L DOHC EFI I
Inv. Dealer:	09007	Body Cab Style:	T/WD - 4 DOOR WAGON	Transmission:	T/DJ - 4 SPD AUTO TRANS N
		Version/Series:	T/EF - FORD SERIES		

BUILD INFORMATION:

Region: NA - ######### Plant: AJ - KANSAS CITY PLANT BUILD
Country: USA - ######### Prod Date: 28-NOV-2000

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 111067 - *
Country: USA - ######### Selling Dlr St/Prov: MA
Buyer St/Prov: MA

Arrival Date: 11-DEC-2000 Red Carpet Lease: *
Sale Date: 27-DEC-2000 Fleet/Retail/Co. Lease: R
Warranty Start Date: 27-DEC-2000 Modified Vehicle: *
Orig Warranty Date: 27-DEC-2000 Reacquired Vehicle: * Vehicle Export Flag: N

VOC/EOC:

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---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

[illegible]

[illegible]
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INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	C	GVW Class Code:	Y
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	* - [N/A]	Mirror(Psngr Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	A	Paint:	PNLDB - MEDIUM WEDGEWOOD C/C
Brake Code:	PBAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AQ - ELETR PREMIUM AM/FM STRO/CSTE
Calibration Code:	0M11A30A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Susp Tandem Axle:	* - [N/A]
Color(Trim):	000ZV -	Tire Brand:	AB - ANY BRAND
Delivery Type:	0	Tire Size:	D3IUT - P235/70R-16 OWL A-S
Driveshaft Code:	D	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

EA02-027-C 3834

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	T/C - T/C
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Decal Suffix:	HKS
ESP Plan Year:	*	Engine Family:	1FMXT050JF6
ESP Signature Date:			

Any comments? You can contact *webmaster*

ER02-027-C 3635

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FMYU04151KB63721	Veh Line:	T/M1 - ESCAPE (U204) [2001]	Eng Serial No:	670277087
Model Year:	2001	Market Derived:	T/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	T	Drive Code:	T/F - 4 WHL L/H FULL-TIME DRIVE	Engine:	T/LD - MOD 3.0L DOHC EFI
Inv. Dealer:	[illegible]	Body Cab Style:	T/WD - 4 DOOR WAGON	Transmission:	T/DJ - 4 SPD AUTO TRANS K
		Version/Series:	T/EF - FORD SERIES		

BUILD INFORMATION:

Region: NA - ######### Plant: AJ - KANSAS CITY PLANT BUILD
Country: USA - ######### Prod Date: 14-NOV-2000

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 111544 - *
Country: USA - ######### Selling Dlr St/Prov: NH
Buyer St/Prov: NH

Arrival Date: 18-NOV-2000 Red Carpet Lease: *
Sale Date: 01-DEC-2000 Fleet/Retail/Co. Lease: R
Warranty Start Date: 01-DEC-2000 Modified Vehicle: *
Orig Warranty Date: 01-DEC-2000 Reacquired Vehicle: * Vehicle Export Flag: N

VOC/EOC:

```
---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

[illegible] V 2 [illegible]   3K [illegible] 2 [illegible] 31  [illegible]  265 [illegible] 111544  4  [illegible]  A  12A [illegible] 2  1

[illegible]   [illegible] F   [illegible]
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	C	GVW Class Code:	Y
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	* - [N/A]	Mirror(Pass Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	A	Paint:	PNLDB - MEDIUM WEDGEWOOD C/C
Brake Code:	FEAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AQ - ELETR PREMIUM AM/FM STRO/CSTE
Calibration Code:	0M11A33A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Susp Tandem Axle:	* - [N/A]
Color(Trim):	000ZV -	Tire Brand:	AB - ANY BRAND
Delivery Type:	0	Tire Size:	D3JU - P235/70R-16 OWL A-S
Driveshaft Code:	D	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

E082-027-C 3838

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	T/C - T/C
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Decal Suffix:	HE8
ESP Plan Year:	*	Engine Family:	1FMXT02M1F6
ESP Signature Date:			

Any comments? You can contact

webmaster

E082-027-C 3837

#7

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN: 1FMCU04141KF17180 **Veh Line:** T/M1 - ESCAPE (U204) [2001] **Eng Serial No:** 42880087
Model Year: 2001 **Market Derived:** T/F - FORD DIVISION DERIVATIVE **Body Shell:** *
Veh Type: T **Drive Code:** T/P - 4 WHL L/H FULL TIME DRIVE **Engine:** T/LD - MOD 3.0L DOHC SFI NA V6 G*NAAO
Inv. Dealer: 08886 **Body Cab Style:** T/WD - 4 DOOR WAGON **Transmission:** T/DJ - 4 SPD AUTO TRANS NAAO CD4E
Version/Series: T/HF - FORD SERIES

BUILD INFORMATION:

Region: NA - ######## **Plant:** AJ - KANSAS CITY PLANT BUILD
Country: USA - ######## **Prod Date:** 16-OCT-2000

SALE INFORMATION:

Region: NA - ######## **Selling Dealer:** 11121 - *
Country: USA - ######## **Selling Dlr St/Prov:** CT
Buyer St/Prov: CT
Arrival Date: 31-OCT-2000 **Red Carpet Lease:** *
Sale Date: 03-NOV-2000 **Fleet/Retail/Co. Lease:** R
Warranty Start Date: 03-NOV-2000 **Modified Vehicle:** *
Orig Warranty Date: 03-NOV-2000 **Reacquired Vehicle:** * **Vehicle Export Flag:** N

VOC/EOC:

```
----------1---------2---------3---------4---------5---------6---------7---------8---------9---------

[illegible] F 2 [illegible]      [illegible] G [illegible] 53  563  295 5 [illegible] 11C221  ) UA  A  12A64 1 5  1

1[illegible] 5            91[illegible] 5                          1
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	C	GVW Class Code:	C
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	* - [N/A]	Mirror(Pasgr Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	A	Paint:	PNUAA - EBONY SOLID C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AT - ELETR PREM AM/FM STRO/CSTE/CLK
Calibration Code:	0M11A30A	Sound System:	AB - AUDIOPHILE SOUND SYSTEM
Color(Accent):	* - [N/A]	Susp. Tandem Axle:	* - [N/A]
Color(Trim):	000ZV -	Tire Brand:	AC - FIRESTONE
Delivery Type:	B	Tire Size:	D3RJ - P235/70R-16 OWL A-S
Driveshaft Code:	D	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

8962-827-C 3838

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	T/C - T/C
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Decal Suffix:	HKS
ESP Plan Year:	*	Engine Family:	1FMXT0301F6
ESP Signature Date:			

Any comments? You can contact

webmaster

ER02-027-C 3830

Vehicle Information Report

#8

GENERAL VEHICLE INFORMATION:

(Related Claims)

VIN:	1FMYU04151KB78480	Veh Line:	T/M1 - ESCAPE (U204) [2001]	Eng Serial No:	547650038
Model Year:	2001	Market Derivative:	T/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	T	Drive Code:	T/A - 2 WHL L/H FRONT DRIVE	Engine:	T/LD - MOD 3.0L DOHC EFI NA V6 G*NAAO
Inv. Dealer:	42740	Body Cab Style:	T/WD - 4 DOOR WAGON	Transmission:	T/DJ - 4 SPD AUTO TRANS NAAO CD4E
		Version/Series:	T/EP - FORD SERIES		

BUILD INFORMATION:

Region:	NA - #########	Plant:	AJ - KANSAS CITY PLANT BUILD
Country:	USA - #########	Prod Date:	29-AUG-2000

SALE INFORMATION:

Region:	NA - #########	Selling Dealer:	14807 - *
Country:	USA - #########	Selling Dlr St/Prov:	MI
		Buyer St/Prov:	MI
Arrival Date:	07-SEP-2000	Red Carpet Lease:	*
Sale Date:	12-OCT-2000	Fleet/Retail/Co. Lease:	R
Warranty Start Date:	12-OCT-2000	Modified Vehicle:	*
Orig Warranty Date:	12-OCT-2000	Reacquired Vehicle:	* Vehicle Export Flag: N

VOC/EOC:

---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

[illegible]

[illegible]

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	C	GVW Class Code:	Y
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	* - [N/A]	Mirror(Psngr Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	A	Paint:	PNFJA - MED. TOREADOR C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AZ - ELETR AM/FM STRO/DISC/CLK
Calibration Code:	0M11A30A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Susp Tandem Axle:	* - [N/A]
Color(Trim):	000ZV -	Tire Brand:	AD - GENERAL
Delivery Type:	0	Tire Size:	DSGTQ - P225/70R 15 BSW A-S
Driveunit Code:	D	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

E002-027-C 3640

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
Li:	*	Ri:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	K	Emission Code:	T/B - T/B
ESP Coverage(Miles):	075	Emission Cert Type:	5
ESP Coverage(Time):	060	Emission Decal Suffix:	HMA
ESP Plan Year:	2001	Engine Family:	1FMXT0301F6
ESP Signature Date:	12-OCT-2000		

Any comments? You can contact webmaster

EA02-027-C 3641

Vehicle Information Report

#9

GENERAL VEHICLE INFORMATION:

(Related Claims)

VIN:	1FMYU02131KB90379	Veh Line:	T/M1 - ESCAPE (U204) [2001]	Eng Serial No:	354617806
Model Year:	2001	Market Derivative:	T/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	T	Drive Code:	T/F - 4 WHL L/H FULL TIME DRIVE	Engine:	T/LD - MOD 3.0L DOHC SFI NA V6 G*NAAO
Inv. Dealer:	00012	Body Cab Style:	T/WD - 4 DOOR WAGON	Transmission:	T/TM - 4 SPD AUTO TRANS NAAO CD4E
		Version/Series:	T/EF - FORD SERIES		

BUILD INFORMATION:

Region: NA - ######### Plant: AJ - KANSAS CITY PLANT BUILD
Country: USA - ######### Prod Date: 31-AUG-2000

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 127014 - *
Country: USA - ######### Selling Dlr St/Prov: VA
Buyer St/Prov: DC

Arrival Date: 15-SEP-2000 Red Carpet Lease: *
Sale Date: 27-OCT-2000 Fleet/Retail/Co. Lease: R
Warranty Start Date: 27-OCT-2000 Modified Vehicle: *
Orig Warranty Date: 19-SEP-2000 Reacquired Vehicle: * Vehicle Export Flag: N

VOC/EOC:

---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

U0310K0057P19337P F 2 14FOU15 50 0 415 7Z 3 5 26 5 433A N 278014 2 UL A T3A 5 1

1RWV3 7 51VOL P 5

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/8 - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	C	GVW Class Code:	Y
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	* - [N/A]	Mirror(Pasgr Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	A	Paint:	PNUAA - EBONY SOLID C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AQ - ELSTR PREMIUM AM/FM STRO/CSTE
Calibration Code:	0M01A30A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Surge Tandem Axle:	* - [N/A]
Color(Trim):	00EV -	Tire Brand:	AD - GENERAL
Delivery Type:	O	Tire Size:	D3GTQ - P225/70R 15 BSW A-S
Driveshaft Code:	D	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

E002-027-C 3642

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	T/B - T/B
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Decal Suffix:	HX3
ESP Max Year:	*	Engine Family:	1FMXT0501F6
ESP Signature Date:			

Any comments? You can contact

webmaster

E062-027-C 3643

Vehicle Information Report

GENERAL VEHICLE INFORMATION:

(Related Claims)

VIN:	1FTYR14E71PA70107	Veh Line:	T/R3 - RANGER (P150/151) [98-03]	Eng Serial No:	*
Model Year:	2001	Market Derived:	* - [N/A]	Body Shell:	*
Veh Type:	T	Drive Code:	T/B - 2 WHL L/H REAR DRIVE	Engine:	T/NE - COLOGNE 4.0L SOHC
Inv. Dealer:	04522	Body Cab Style:	T/BD - SUPER SINGLE CAB (SUPER CAB)	Transmission:	T/TC - 5 SPD AT EAO A5LDI
		Version/Series:	T/EF - FORD SERIES		

BUILD INFORMATION:

Region: NA - ########## Plant: AX - TWIN CITIES PLANT BUILD

Country: USA - ########## Prod Date: 11-JAN-2001

SALE INFORMATION:

Region: NA - ########## Selling Dealer: 124224 - *

Country: USA - ########## Selling Dlr St/Prov: FL

Buyer St/Prov: FL

Arrival Date:	30-JAN-2001	Red Carpet Lease:	L
Sale Date:	18-APR-2001	Fleet/Retail/Co. Lease:	R
Warranty Start Date:	18-APR-2001	Modified Vehicle:	*
Orig Warranty Date:	18-APR-2001	Reacquired Vehicle:	* Vehicle Export Flag: N

VOC/EOC:

```
---------1---------2---------3---------4---------5---------6---------7---------8---------9---------0
R142PA7010712658X  R 2 0912698     6K R  209507K 78 V  21     NOE R  240224 R4  TX      3E7A        R1
FTTT 3 N      387A 980FL     N                                   1
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	AY	GVW Class Code:	Y
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	EGAHD - 3.55 FINAL DRIVE RATIO	Mirror(Driver Side):	AC - DRIVER HAND SET MIRROR
Axle Type:	EGUAB - NON-LIMITED SLIP REAR AXLE	Mirror(Pasgr Side):	AF - PASS HAND SET FLAT MIRROR
Battery Amp Rating:	MB	Paint:	PNYW3 - OXFORD WHITE SOLID C/C
Brake Code:	FBAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	KJ - AM/FM STEO/CD CHANGER/CLK
Calibration Code:	1R31B40A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Susp Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Manufacturer:	AC -
Delivery Type:	L	Tire Brand:	* -
Driveshaft Code:	D	Tire Size:	D3GTW - P225/70R15 SL ST BELT OWL A-S
Front Seat:	* - [N/A]	Traction Control:	* - [N/A]
Fuel Type:	* - [N/A]	Wheel Base:	T/G - 125" (3151MM) WHEELBASE

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*	DOT Plant Manufacturer:	* - *

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	**Emission Code:**	T/B - T/B
ESP Coverage(Miles):	*	**Emission Cert Type:**	5
ESP Coverage(Time):	*	**Emission Decal Suffix:**	HTC
ESP Plan Year:	*	**Engine Family:**	IFMXT0402F5
ESP Signature Date:			

Any comments? You can contact

webmaster

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FAFP53UD1G130859	Veh Line:	C/DD - TAURUS/SABLE (D186) [00-03]	Eng Serial No:	*
Model Year:	2001	Market Derived:	C/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	C	Drive Code:	C/A - 2 WHL L/H FRONT DRIVE	Engine:	C/LA - VULC 3.0L OHV EFI
Inv. Dealer:	02715	Body Cab Style:	C/PC - 4 DOOR SEDAN-6 LITE	Transmission:	C/DT - 4 SPD AUTO TRANS
		Version/Series:	C/FB - TAURUS B VERSION		

BUILD INFORMATION:

Region: NA - ######### Plant: AD - CHICAGO PLANT BUILD
Country: USA - ######### Prod Date: 28-SEP-2000

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 148029 - *
Country: USA - ######### Selling Dlr St/Prov: MI
Buyer St/Prov: MI

Arrival Date:	04-OCT-2000	Red Carpet Lease:	I		
Sale Date:	29-DEC-2000	Fleet/Retail/Co. Lease:	R		
Warranty Start Date:	29-DEC-2000	Modified Vehicle:	*		
Orig Warranty Date:	29-DEC-2000	Reacquired Vehicle:	*	Vehicle Export Flag:	N

VOC/EOC:

```
---------1---------2---------3---------4---------5---------6---------7---------8---------9---------0
P53101308S0Y 3    1  A3 G2X000B        CJ B  LL3A 22  3      RKC      I       48C029  3  UA      XM2        U1
FAF0 7            9ULAX                                      24
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	C/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	FA	GVW Class Code:	F
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	* - [N/A]
Axle Type:	* - [N/A]	Mirror(Passgr Side):	* - [N/A]
Battery Amp Rating:	MU	Paint:	PNUAA - EBONY SOLID C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AB - ELECTRONIC AM/FM STRO/CASSETTE
Calibration Code:	1DD1250A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Suspn Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Manufacturer:	AD - GENERAL
Delivery Type:	R	Tire Brand:	* - *
Driveshaft Code:	*	Tire Size:	D3ISZ - P215/60R-16 BSW ALL SEASON
Front Seat:	* - [N/A]	Traction Control:	* - [N/A]
Fuel Type:	* - [N/A]	Wheel Base:	* - [N/A]

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*	DOT Plant Manufacturer:	* - *

ESP INFORMATION: EMISSIONS INFORMATION:

EA02-027-C 3846

ESP Code:	▪	**Emission Code:**	C/B - C/B
ESP Coverage(Miles):	▪	**Emission Cert Type:**	5
ESP Coverage(Time):	▪	**Emission Decal Suffix:**	HFP
ESP Plan Year:	▪	**Engine Family:**	1FMXV030VF3
ESP Signature Date:			

Any comments? You can contact

webmaster

EA02-027-C 3847

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FMCU70E31UB52835	Veh Line:	T/U7 - EXPLORER SPORT (U207) [01-03]	Eng Serial No:	*
Model Year:	2001	Market Derived:	T/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	T	Drive Code:	T/E - 4 WHL L/H PART TIME DRIVE	Engine:	T/NE - COLOGNE 4.0L SOHC
Inv. Dealer:	840SK	Body Cab Style:	T/WC - 2 DOOR WAGON	Transmission:	T/TC - 5 SPD AT EAO ASLDE
		Version/Series:	T/EP - FORD SERIES		

BUILD INFORMATION:

Region: NA - ######### Plant: AN - LOUISVILLE PLANT BUILD
Country: USA - ######### Prod Date: 06-OCT-2000

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 10903K - *
Country: USA - ######### Selling Dlr St/Prov: *
Buyer St/Prov: *

Arrival Date:	12-OCT-2000	Red Carpet Lease:	*
Sale Date:	06-OCT-2000	Fleet/Retail/Co. Lease:	L
Warranty Start Date:	12-OCT-2000	Modified Vehicle:	*
Orig Warranty Date:	06-OCT-2000	Reacquired Vehicle:	* Vehicle Export Flag: N

VOC/EOC:

```
---------1---------2---------3---------4---------5---------6---------7---------8---------9---------0
07010U52835102373 NAB 04J9386       KU KW 9046965  BF43 215A45 0    3192084  3YALA      9906  3     B1
FEC3 0    Y        HXXX                                     1
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	BK	GVW Class Code:	C
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	EGAJB - 3.73 FINAL DRIVE RATIO	Mirror(Driver Side):	AW - DRVR HD SET SAIL CHROME MIRROR
Axle Type:	EGIAB - NON-LIMITED SLIP REAR AXLE	Mirror(Psngr Side):	AW - PASS HAND SET SAIL MIR-CONVEX
Battery Amp Rating:	MK	Paint:	PNLDZ - DEEP WEDGEWOOD BLUE C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	MJ - AM/FM STRO/CD CHANGER/CLK
Calibration Code:	1U71AG0A	Sound System:	AB - AUDIOPHILE SOUND SYSTEM
Color(Accent):	* - [N/A].	Susp Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Manufacturer:	AC - FIRESTONE
Delivery Type:	*	Tire Brand:	* - *
Driveshaft Code:	D	Tire Size:	D3JWA - P235/70R-16 OWL A-T
Front Seat:	* - [N/A]	Traction Control:	* - [N/A]
Fuel Type:	* - [N/A]	Wheel Base:	* - [N/A]

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*	DOT Plant Manufacturer:	* - *

ESP INFORMATION: EMISSIONS INFORMATION:

EA02-027-C 3848

ESP Code:	• **Emission Code:**	T/8 - T78
ESP Coverage(Miles):	• **Emission Cert Type:**	3
ESP Coverage(Time):	• **Emission Decal Suffix:**	HPL
ESP Plan Year:	• **Engine Family:**	1FMXT0402F4
ESP Signature Date:		

Any comments? You can contact

webmaster

E082-027-C 3848

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FMYU60E31UC50067	Veh Line:	T/U7 - EXPLORER SPORT (U207) [01-03]	Eng Serial No:	*
Model Year:	2001	Market Derived:	T/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	T	Drive Code:	T/B - 2 WHL L/H REAR DRIVE	Engine:	T/NE - COLOGNE 4.0L SOHC
Inv. Dealer:	03048	Body Cab Style:	T/WC - 2 DOOR WAGON	Transmission:	T/TC - 5 SPD AT EAO A5LDX
		Version/Series:	T/SF - FORD SERIES		

BUILD INFORMATION:

Region: NA - ######### Plant: AN - LOUISVILLE PLANT BUILD
Country: USA - ######### Prod Date: 14-MAR-2001

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 152047 - *
Country: USA - ######### Selling Dlr St/Prov: TX
Buyer St/Prov: TX

Arrival Date:	31-MAR-2001	Red Carpet Lease:	*		
Sale Date:	31-MAR-2001	Fleet/Retail/Co. Lease:	R		
Warranty Start Date:	31-MAR-2001	Modified Vehicle:	*		
Orig Warranty Date:	31-MAR-2001	Reacquired Vehicle:	*	Vehicle Export Flag:	N

VOC/EOC:

---------1---------2---------3---------4---------5---------6---------7---------8---------9---------0
[illegible] R 3 [illegible] [illegible] D44 TR # 43 2X 15 9 52C047 # Y8 [illegible] 3 [illegible]
[illegible] 4 [illegible] 1

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	BK	GVW Class Code:	Y
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	BOAJB - 3.73 FINAL DRIVE RATIO	Mirror(Driver Side):	AW - DRVR HD SET SAIL CHROME MIRROR
Axle Type:	BOJAB - NON-LIMITED SLIP REAR AXLE	Mirror(Psngr Side):	AW - PASS HAND SET SAIL MIR-CONVEX
Battery Amp Rating:	MK	Paint:	PNYW3 - OXFORD WHITE SOLID C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	BB - ELETR PREM STRO/CSTE/DISC/CLK
Calibration Code:	1U71ACDA	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Susps Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Manufacturer:	AC -
Delivery Type:	0	Tire Brand:	8XHL1PY -
Driveshaft Code:	F	Tire Size:	D3GUI - P235/75R15SL SBLT OWL A-T
Front Seat:	* - [N/A]	Traction Control:	* - [N/A]
Fuel Type:	* - [N/A]	Wheel Base:	* - [N/A]

TIRE DOT INFORMATION:

LF:	8XHL1PY0901	RF:	8XHL1PY0801
LR:	8XHL1PY0901	RR:	8XHL1PY0801
LI:	*	RI:	*
SPARE:	*	DOT Plant Manufacturer:	6X - AILEN PLANT (FIRESTONE) ; GRANITEVILLE ; SC ; *

ESP INFORMATION: EMISSIONS INFORMATION:

EA02-027-C 3850

ESP Code:	*	Emission Code:	T/8 - T/8
ESP Coverage(Miles):	*	Emission Cert Type:	3
ESP Coverage(Time):	*	Emission Decal Suffix:	HPL
ESP Plan Year:	*	Engine Family:	1FMXT0402F4
ESP Signature Date:			

Any comments? You can contact

webmaster

EA02-027-C 3851

Vehicle Information Report

GENERAL VEHICLE INFORMATION:

(Related Claims)

VIN:	2FAFP74W31X141358	Veh Line:	C/FB - CROWN VIC (EN53/EN114) [92-03]	Eng Serial No:	*
Model Year:	2001	Market Derived:	C/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	C	Drive Code:	C/B - 2 WHL L/H REAR DRIVE	Engine:	C/VN - R-M 4.6L SOHC EFI NA C
Inv. Dealer:	8416K	Body Cab Style:	C/FC - 4 DOOR SEDAN-6 LITE	Transmission:	C/DU - 4 SPD AUTO TR NAAO A
		Version/Series:	C/AI - LX VERSION - CAR		

BUILD INFORMATION:

Region: NA - ######### Plant: AW - ST. THOMAS PLANT BUILD
Country: CAN - ######### Prod Date: 11-JAN-2001

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 18916K - *
Country: USA - ######### Selling Dlr St/Prov: *
Buyer St/Prov: *

Arrival Date:	16-JAN-2001	Red Carpet Lease:	*
Sale Date:	11-JAN-2001	Fleet/Retail/Co. Lease:	L
Warranty Start Date:	16-JAN-2001	Modified Vehicle:	*
Orig Warranty Date:	11-JAN-2001	Reacquired Vehicle:	* Vehicle Export Flag: N

VOC/EOC:

```
---------1---------2---------3---------4---------5---------6---------7---------8---------9---------0
[illegible]
[illegible]
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	C/C - ATC AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	*	GVW Class Code:	F
Audio Disc:	* - [N/A]	Instrumentation:	AC - ELECTRONIC INSTRUMENTATION
Axle Ratio:	EGABC - 3.27 FINAL DRIVE RATIO	Mirror(Driver Side):	* - [N/A]
Axle Type:	EGJAB - NON-LIMITED SLIP REAR AXLE	Mirror(Psngr Side):	* - [N/A]
Battery Amp Rating:	MR	Paint:	PNZ0C - PERFORMANCE WHITE C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AQ - ELETR PREMIUM AM/FM STRO/CSTE
Calibration Code:	1F81H5DA	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Susp Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Manufacturer:	AG - GOODYEAR
Delivery Type:	*	Tire Brand:	* - *
Driveshaft Code:	*	Tire Size:	D3JTP - P225/60TR-16 BSW A-S
Front Seat:	* - [N/A]	Traction Control:	AB - ANTI-SPIN TRACT BRAKES W/O IVD
Fuel Type:	* - [N/A]	Wheel Base:	* - [N/A]

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*	DOT Plant Manufacturer:	* - *

ER02-027-C 3652

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	H	Emission Code:	C/B - C/B
ESP Coverage(Miles):	100	Emission Cert Type:	5
ESP Coverage(Time):	072	Emission Decal Suffix:	HDD
ESP Plan Year:	2001	Engine Family:	1FMXV046VF5
ESP Signature Date:	12-JAN-2001		

Any comments? You can contact

webmaster

EA02-027-C 3653

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FAFP40431F172352	Veh Line:	C/2B - MUSTANG (SN95) [94-03]	Eng Serial No:	83569209
Model Year:	2001	Market Derived:	C/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	C	Drive Code:	C/B - 2 WHL LH REAR DRIVE	Engine:	C/LM - 3.8L OHV EFI NA V6 GAS
Inv. Dealer:	01172	Body Cab Style:	C/BJ - 2 DOOR COUPE-4 LITE	Transmission:	C/DU - 4 SPD AUTO TR NAAO A
		Version/Series:	C/AB - BASE VERSION - CAR		

BUILD INFORMATION:

Region: NA - ######### Plant: AF - DEARBORN PLANT BUILD
Country: USA - ######### Prod Date: 07-MAR-2001

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 134225 - *
Country: USA - ######### Selling Div St/Prov: FL
Buyer St/Prov: FL

Arrival Date:	15-MAR-2001	Red Carpet Lease:	*
Sale Date:	19-SEP-2001	Fleet/Retail/Co. Lease:	R
Warranty Start Date:	19-SEP-2001	Modified Vehicle:	*
Orig Warranty Date:	19-SEP-2001	Reacquired Vehicle:	* Vehicle Report Flag: N

VOC/EOC:

```
---------1---------2---------3---------4---------5---------6---------7---------8---------9---------0
1431F172352XX        A2 12A4002        AA X    UMX 27  7 V6 RX       X      140013  4  OU  X  9X 2        41
XXF9 2 2       110A 94DPL    Y                             4
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	C/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	V6	GVW Class Code:	F
Audio Disc:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	EQAEC - 3.27 FINAL DRIVE RATIO	Mirror(Driver Side):	* - [N/A]
Axle Type:	EQJAB - NON-LIMITED SLIP REAR AXLE	Mirror(Psngr Side):	* - [N/A]
Battery Amp Rating:	MI	Paint:	PNPE8 - AMAZON GREEN PEARL CLEAR COAT
Brake Code:	FEAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AL - LOW LINE AM/FM STRO/CASSETTE
Calibration Code:	1Z613P0A	Sound System:	AH - SUBWOOFER/AMP. SOUND SYSTEM
Color(Accent):	* - [N/A]	Susp Tandem Axle:	* - [N/A]
Color(Trim):	000HF -	Tire Manufacturer:	AF -
Delivery Type:	0	Tire Brand:	M6T48ME -
Driveshaft Code:	*	Tire Size:	D3JZG - P225/55TR-16 BSW
Front Seat:	* - [N/A]	Traction Control:	AB - ANTI-SPIN TRACT BRAKES W/O IVD
Fuel Type:	* - [N/A]	Wheel Base:	* - [N/A]

TIRE DOT INFORMATION:

LF:	M6T4BMB4600	RF:	M6T4BMB4600
LR:	M6T4BMB4600	RR:	M6T4BMB4600
LI:	*	RI:	*
SPARE:	HYPH1PC0601	DOT Plant Manufacturer:	M6 - THE GOODYEAR TIRE & RUBBER COMPANY ; LAWTON ; OKLAHOMA ; UNITED STATES

ESP INFORMATION: EMISSIONS INFORMATION:

EQ02-027-C 3884

ESP Code:	•	Emission Code:	C/8 - C/8
ESP Coverage(Miles):	•	Emission Cert Type:	F
ESP Coverage(Time):	•	Emission Decal Suffix:	HTJ
ESP Plan Year:	•	Engine Family:	1FMXV038VFA
ESP Signature Date:			

Any comments? You can contact

webmaster

ER02-027-C 3658

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FAFP36341W169359	Veh Line:	C/AK - FOCUS (CW170) [99-02]	Eng Serial No:	*
Model Year:	2001	Market Derived:	C/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	C	Drive Code:	C/A - 2 WHL L/H FRONT DRIVE	Engine:	C/BQ - ZETEC 2.0L DOHC EF
Inv. Dealer:	02516	Body Cab Style:	C/FF - 4 DOOR STATION WAGON	Transmission:	C/RP - 5 SPD MAN TRANS A
		Version/Series:	C/DE - SERIES 25		

BUILD INFORMATION:

Region: NA - ######### Plant: AZ - WAYNE PLANT BUILD
Country: USA - ######### Prod Date: 15-DEC-2000

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 158507 - *
Country: USA - ######### Selling Dlr St/Prov: MN
Buyer St/Prov: MA

Arrival Date: 22-DEC-2000 Red Carpet Lease: 2
Sale Date: 03-JAN-2001 Fleet/Retail/Co. Lease: F
Warranty Start Date: 03-JAN-2001 Modified Vehicle: *
Orig Warranty Date: 03-JAN-2001 Reacquired Vehicle: * Vehicle Export Flag: N

VOC/EOC:

```
---------1---------2---------3---------4---------5---------6---------7---------8---------9---------0
951YRL89151Y 4    9    1A1982755        RJ 8  3507 39A N J2XX3LA8   9    J506307  42A84      8A2        31
F8F4 2     1          925HT                     8060688505        1H
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	C/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	A	GVW Class Code:	F
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	* - [N/A]	Mirror(Psngr Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	6B	Paint:	FNBGC - VERMILION SOLID C/C
Brake Code:	FBAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	BQ -
Calibration Code:	1AK2AZ0A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Suspn Tandem Axle:	* - [N/A]
Color(Trim):	000S1 -	Tire Manufacturer:	CC -
Delivery Type:	D	Tire Brand:	* -
Driveshaft Code:	*	Tire Size:	D3GNY - 195/60R15-6 BSW
Front Seat:	* - [N/A]	Traction Control:	* - [N/A]
Fuel Type:	* - [N/A]	Wheel Base:	* - [N/A]

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*	DOT Plant Manufacturer:	* - *

ESP INFORMATION: EMISSIONS INFORMATION:

EA02-027-C 3656

ESP Code:	H	Emission Code:	C/B - C/B
ESP Coverage(Miles):	999	Emission Cert Type:	5
ESP Coverage(Time):	120	Emission Decal Suffix:	HFZ
ESP Plan Year:	2000	Engine Family:	1FMXV020VJ3
ESP Signature Date:	01-AUG-2000		

Any comments? You can contact

webmaster

Vehicle Information Report

GENERAL VEHICLE INFORMATION:

(Related Claims)

VIN:	1FMZU77EX2UB46190	Veh Line:	T/S1 - EXPLORER SPORT TRAC P207 (01-02)	Eng Serial No:	8600001049
Model Year:	2002	Market Derived:	T/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	T	Drive Code:	T/S - 4 WHL L/H PART TIME DRIVE	Engine:	T/NB - COLOGNE 4.0L SOHC
Inv. Dealer:	8416K	Body Cab Style:	T/WF - 4 DOOR W/PICKUP BOX	Transmission:	T/TC - 5 SPD AT BAO ASLD
		Version/Series:	T/EP - FORD SERIES		

BUILD INFORMATION:

Region: NA - ######### Plant: AN - LOUISVILLE PLANT BUILD

Country: USA - ######### Prod Date: 02-NOV-2001

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 18916K - *

Country: USA - ######### Selling Dlr St/Prov: *

Buyer St/Prov: *

Arrival Date:	07-NOV-2001	Red Carpet Lease:	*		
Sale Date:	05-NOV-2001	Fleet/Retail/Co. Lease:	L		
Warranty Start Date:	07-NOV-2001	Modified Vehicle:	*		
Orig Warranty Date:	05-NOV-2001	Reacquired Vehicle:	*	Vehicle Export Flag:	N

VOC/EOC:

```
---------1---------2---------3---------4---------5---------6---------7---------8---------9---------0
0772[illegible] 7H2 T E [illegible]   [illegible] [illegible] [illegible] [illegible] [illegible]   [illegible] [illegible]   [illegible]  3   21
[illegible]   4T  320A [illegible]   [illegible]   L
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	RK	GVW Class Code:	Z
Audio Disc:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	BGAMD - 4.10 FINAL DRIVE RATIO	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	BGJAB - NON-LIMITED SLIP REAR AXLE	Mirror(Psngr Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	MK	Paint:	PNZJF - SILVER FROST C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	BS - ELETR PREM STRO/CSTE/DISC/CLK
Calibration Code:	1S11A40A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Suspn Tandem Axle:	* - [N/A]
Color(Trim):	00ZB -	Tire Manufacturer:	AG - GOODYEAR
Delivery Type:	*	Tire Brand:	4BCUC6WR - WRANGLER RT/S 1088
Driveshaft Code:	D	Tire Size:	DJJWA - P255/70R-16 OWL A-T
Front Seat:	* - [N/A]	Traction Control:	* - [N/A]
Fuel Type:	AF - UNLEADED FUEL CAPABILITY	Wheel Base:	* - [N/A]

TIRE DOT INFORMATION:

LF:	4BCUC6WR3701	RF:	4BCUC6WR3701
LR:	4BCUC6WR3701	RR:	4BCUC6WR3701
LI:	*	RI:	*

SPARE: 4BCUC6WR3701 DOT Plant Manufacturer: 4B - GOODYEAR CANADA ; INC. ; NAPANEE ; ONTARIO

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	H	Emission Code:	T/B - T/B
ESP Coverage(Miles):	100	Emission Cert Type:	5
ESP Coverage(Time):	072	Emission Decal Suffix:	JLM
ESP Plan Year:	2001	Engine Family:	2FMXT040DP5
ESP Signature Date:	05-NOV-2001		

Any comments? You can contact

webmaster

EA02-027-C 3859

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FMCU70E11UB70587	Veh Line:	T/U7 - EXPLORER SPORT (U207) [01-02]	Eng Serial No:	*
Model Year:	2001	Market Derived:	T/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	T	Drive Code:	T/8 - 4 WHL L/H PART TIME DRIVE	Engine:	T/NE - COLOGNE 4.0L SOHC
Inv. Dealer:	84031	Body Cab Style:	T/WC - 2 DOOR WAGON	Transmission:	T/TC - 5 SPD AT 5AO A5L.DI
		Version/Series:	T/EF - FORD SERIES		

BUILD INFORMATION:

Region: NA - ######### Plant: AN - LOUISVILLE PLANT BUILD
Country: USA - ######### Prod Date: 22-SEP-2000

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 18903I - *
Country: USA - ######### Selling Dlr St/Prov: *
Buyer St/Prov: *

Arrival Date: Red Carpet Lease: *
Sale Date: 28-SEP-2000 Fleet/Retail/Co. Lease: L
Warranty Start Date: 28-SEP-2000 Modified Vehicle: *
Orig Warranty Date: 28-SEP-2000 Reacquired Vehicle: * Vehicle Export Flag: N

VOC/EOC:

---------1---------2---------3---------4---------5---------6---------7---------8---------9---------0
U701U070587100337?3 MAI 1100311 OO 3W D46065 9942 213845 4 3812030 3WAFL ST26 3 81
FMCL 2 1Y EONT 1

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	BK	GVW Class Code:	C
Audio Disc:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	EGAJB - 3.73 FINAL DRIVE RATIO	Mirror(Driver Side):	AW - DRVR HD SET SAIL CHROME MIRROR
Axle Type:	EGJAB - NON-LIMITED SLIP REAR AXLE	Mirror(Psngr Side):	AW - PASS HAND SET SAIL MIR-CONVEX
Battery Amp Rating:	MK	Paint:	FNFIA - MED. TOREADOR C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	MJ - AM/FM STRO/CD CHANGER/CLK
Calibration Code:	1U71AG0A	Sound System:	AB - AUDIOPHILE SOUND SYSTEM
Color(Accent):	* - [N/A]	Suspn Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Manufacturer:	AC - FIRESTONE
Delivery Type:	*	Tire Brand:	* - *
Driveshaft Code:	D	Tire Size:	D3JWA - P235/70R-16 OWL A-T
Front Seats:	* - [N/A]	Traction Control:	* - [N/A]
Fuel Type:	* - [N/A]	Wheel Base:	* - [N/A]

TIRE DOT INFORMATION:

LF: * RF: *
LR: * RR: *
LI: * RI: *
SPARE: * DOT Plant Manufacturer: * - *

ESP INFORMATION: EMISSIONS INFORMATION:

RQ2-027-C 3660

ESP Code:	H	Emission Code:	T/8 - T/8
ESP Coverage(Miles):	100	Emission Cert Type:	5
ESP Coverage(Time):	072	Emission Decal Suffix:	HPL
ESP Plan Year:	2000	Engine Family:	1FMXT04.2F4
ESP Signature Date:	28-SEP-2000		

Any comments? You can contact

webmaster

EA02-027-C 3881

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FMYU70E81UB80510	Veh Line:	T/U7 - EXPLORER SPORT (U207) [01-02]	Eng Serial No:	*
Model Year:	2001	Market Derived:	T/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	T	Drive Code:	T/E - 4 WHL L/S PART TIME DRIVE	Engine:	T/N E - COLOGNE 4.0L SOHC
Inv. Dealer:	8485J	Body Cab Style:	T/WC - 2 DOOR WAGON	Transmission:	T/TC - 5 SPD AT BAO A5LDE
		Version/Series:	T/EF - FORD SERIES		

BUILD INFORMATION:

Region: NA - ########## Plant: AN - LOUISVILLE PLANT BUILD
Country: USA - ########## Prod Date: 23-OCT-2000

SALE INFORMATION:

Region: NA - ########## Selling Dealer: 18985J - *
Country: USA - ########## Selling Dlr St/Prov: *
Buyer St/Prov: *

Arrival Date: 26-OCT-2000 Red Carpet Lease: *
Sale Date: 23-OCT-2000 Fleet/Retail/Co. Lease: L
Warranty Start Date: 25-OCT-2000 Modified Vehicle: *
Orig Warranty Date: 23-OCT-2000 Reacquired Vehicle: * Vehicle Export Flag: N

VOC/EOC:

```
---------1---------2---------3---------4---------5---------6---------7---------8---------9---------0
070100805101021761 M 8 0603150        3E E   D06F63  BT43 2X3 6E 8    3492885J  3V8R8     XY3  3   XL
R8T8 7    Y        8DMC                                      1
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	BK	GVW Class Code:	Y
Audio Disc:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	BGAJB - 3.73 FINAL DRIVE RATIO	Mirror(Driver Side):	AW - DRVR HD SET SAIL CHROME MIRROR
Axle Type:	BGDAC - LIMITED SLIP REAR AXLE	Mirror(Psngr Side):	AW - PASS HAND SET SAIL MIR-CONVEX
Battery Amp Rating:	MK	Paint:	PN2JF - SILVER FROST C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	BR - ELETR PREM STRO/CSTT/DISC/CLK
Calibration Code:	1U71A00A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Susp Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Manufacturer:	AC - FIRESTONE
Delivery Type:	*	Tire Brand:	* - *
Driveshaft Code:	D	Tire Size:	D3JWA - P255/70R-16 OWL A-T
Front Seat:	* - [N/A]	Traction Control:	* - [N/A]
Fuel Type:	* - [N/A]	Wheel Base:	* - [N/A]

TIRE DOT INFORMATION:

LF: * RF: *
LR: * RR: *
LI: * RI: *
SPARE: * DOT Plant Manufacturer: * - *

ESP INFORMATION: EMISSIONS INFORMATION:

EA02-027-C 3682

ESP Code:	H	**Emission Code:**	T/B - T/B
ESP Coverage(Miles):	100	**Emission Cert Type:**	1
ESP Coverage(Time):	072	**Emission Decal Suffix:**	HPL
ESP Plan Year:	2000	**Engine Family:**	1FMXT0402F4
ESP Signature Date:	25-OCT-2000		

Any comments? You can contact

webmaster

ER02-027-C 3883

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FMZU75E12ZA38307	Veh Line:	T/U5 - EXPLORER (U152) [01-02]	Eng Serial No:	*
Model Year:	2002	Market Derived:	T/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	T	Drive Code:	T/S - 4 WHL-L/H PART TIME DRIVE	Engine:	T/NE - COLOGNE 4.0L SOHC
Inv. Dealer:	8401J	Body Cab Style:	T/WD - 4 DOOR WAGON	Transmission:	T/TJ - 5 SPD AUTO TRANS N.
		Version/Series:	T/EP - FORD SERIES		

BUILD INFORMATION:

Region: NA - ######## Plant: AV - ST. LOUIS PLANT BUILD
Country: USA - ######## Prod Date: 09-APR-2001

SALE INFORMATION:

Region: NA - ######## Selling Dealer: 169015 - *
Country: USA - ######## Selling Dlr St/Prov: *
Buyer St/Prov: *

Arrival Date:	10-JUL-2001	Red Carpet Lease:	*
Sale Date:	25-JUN-2001	Fleet/Retail/Co. Lease:	L
Warranty Start Date:	10-JUL-2001	Modified Vehicle:	*
Orig Warranty Date:	25-JUN-2001	Reacquired Vehicle:	B Vehicle Export Flag: N

VOC/EOC:

```
---------1---------2---------3---------4---------5---------6---------7---------8---------9---------0
U75[illegible] [illegible]
[illegible]
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/G - DUAL ZONE AUTO TEMP CONTROL AC	GVW Code:	* - [N/A]
Alternator Amp Rating:	BK	GVW Class Code:	Z
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	* - [N/A]
Axle Type:	* - [N/A]	Mirror(Passgr Side):	* - [N/A]
Battery Amp Rating:	BL	Paint:	PNSP8 - ESTATE GREEN C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	MJ - AM/FM STRO/CD CHANGER/CLK
Calibration Code:	1U51AF0A	Sound System:	AB - AUDIOPHILE SOUND SYSTEM
Color(Accent):	* - [N/A]	Bogie Tandem Axle:	* - [N/A]
Color(Trim):	00HH -	Tire Manufacturer:	AG -
Delivery Type:	*	Tire Brand:	MK9L3NE -
Driveshaft Code:	D	Tire Size:	D3JVI - P245/70R-16 OWL A-S
Front Seat:	* - [N/A]	Traction Control:	* - [N/A]
Fuel Type:	* - [N/A]	Wheel Base:	* - [N/A]

TIRE DOT INFORMATION:

LF:	MK9L3NEB901	RF:	MK9L3NEB1601
LR:	MK9L3NEB901	RR:	MK9L3NEB1601
LI:	*	RI:	*
SPARE:	MK9L3NEB901	DOT Plant Manufacturer:	MK - THE GOODYEAR TIRE & RUBBER COMPANY ; UNION CITY ; TENNESSEE ; UNITED STATES

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	H	Emission Code:	T/H - T/H
ESP Coverage(Miles):	100	Emission Cert Type:	5
ESP Coverage(Time):	072	Emission Decal Suffix:	JLS
ESP Plan Year:	2001	Engine Family:	2FMXT0402F8
ESP Signature Date:	01-AUG-2000		

Any comments? You can contact

webmaster

E002-027-C 3965

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FMZU73E92ZA07938	Veh Line:	T/U5 - EXPLORER (U152) [01-02]	Eng Serial No:	*
Model Year:	2002	Market Derived:	T/F - FORD DIVISION DERIVATIVE	Body Stch:	*
Veh Type:	T	Drive Code:	T/E - 4 WHL L/H PART TIME DRIVE	Engine:	T/NE - COLOGNE 4.0L SOHC
Inv. Dealer:	54033	Body Cab Style:	T/WD - 4 DOOR WAGON	Transmission:	T/TJ - 5 SPD AUTO TRANS N
		Version/Series:	T/EF - FORD SERIES		

BUILD INFORMATION:

Region: NA - ######### Plant: AV - ST. LOUIS PLANT BUILD
Country: USA - ######### Prod Date: 23-JAN-2001

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 124125 - *
Country: USA - ######### Selling Dlr St/Prov: FL
Buyer St/Prov: FL

Arrival Date:	12-JUL-2001	Red Carpet Lease:	*
Sale Date:	26-APR-2001	Fleet/Retail/Co. Lease:	F
Warranty Start Date:	12-JUL-2001	Modified Vehicle:	*
Orig Warranty Date:	26-APR-2001	Reacquired Vehicle:	8 Vehicle Export Flag: N

VOC/EOC:

```
---------1---------2---------3---------4---------5---------6---------7---------8---------9---------0
Q732ZA07938114377 N 6821M0065       KB F98 R45 53R      A8K      E  C F092013  5VA8Q   HP9F  4 H    E1
FH09 1 K  2          8BC0      X            2001130004        A
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	BK	GVW Class Code:	Z
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	* - [N/A]
Axle Type:	* - [N/A]	Mirror(Passgr Side):	* - [N/A]
Battery Amp Rating:	BL	Paint:	PNARQ - HARVEST GOLD C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AZ - ELETR AM/FM STRO/DISC/CLK
Calibration Code:	1U51AP8A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Supps Tandem Axle:	* - [N/A]
Color(Trim):	9DHH -	Tire Manufacturer:	AJ - MICHELIN
Delivery Type:	M	Tire Brand:	* - *
Driveshaft Code:	D	Tire Size:	D3JUJ - P235/70R-16 OWL A-S
Front Seat:	* - [N/A]	Traction Control:	* - [N/A]
Fuel Type:	* - [N/A]	Wheel Base:	* - [N/A]

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*	DOT Plant Manufacturer:	* - *

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	T/H - T/H
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Decal Suffix:	JUC
ESP Plan Year:	*	Engine Family:	2FMXT0402F8
ESP Signature Date:			

Any comments? You can contact

webmaster

EA02-027-C 2887

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FMZU73E12ZA33790	Veh Line:	T/US - EXPLORER (U152) [01-02]	Eng Serial No:	*
Model Year:	2002	Market Derived:	T/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	T	Drive Code:	T/B - 4 WHL L/H PART TIME DRIVE	Engine:	T/NB - COLOGNE 4.0L SOHC
Inv. Dealer:	8445J	Body Cab Style:	T/WD - 4 DOOR WAGON	Transmission:	T/TJ - 5 SPD AUTO TRANS N.
		Version/Series:	T/EF - FORD SERIES		

BUILD INFORMATION:

Region: NA - ######### Plant: AY - ST. LOUIS PLANT BUILD
Country: USA - ######### Prod Date: 27-MAR-2001

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 18945J - *
Country: USA - ######### Selling Dlr St/Prov: *
Buyer St/Prov: *

Arrival Date:	11-JUL-2001	Red Carpet Lease:	*
Sale Date:	25-JUN-2001	Fleet/Retail/Co. Lease:	L
Warranty Start Date:	11-JUL-2001	Modified Vehicle:	*
Orig Warranty Date:	25-JUN-2001	Reacquired Vehicle:	B Vehicle Export Flag: N

VOC/EOC:

```
---------1---------2---------3---------4---------5---------6---------7---------8---------9---------0
u732aa12710114J7v6 m 8 42c1200     6x me   n84 53m   6    1K       a    1893453  9VAFL   HT8T  4 K    ML
MM1 5 K              BNIL     X                           A
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	BK	GVW Class Code:	Z
Audio Disc:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	* - [N/A]
Axle Type:	* - [N/A]	Mirror(Pass Side):	* - [N/A]
Battery Amp Rating:	BL	Paint:	PNFJA - MED. TOREADOR C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	BH - ELETR PREM STRO/CSTE/DISC/CLK
Calibration Code:	JUS1AFGA	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Suspn Tandem Axle:	* - [N/A]
Color(Trim):	0002S -	Tire Manufacturer:	AJ - MICHELIN
Delivery Type:	*	Tire Brand:	M37FDHEX - CROSS TERRAIN 1048
Driveshaft Code:	D	Tire Size:	D3JUJ - P235/70R-16 OWL A-S
Front Seat:	* - [N/A]	Traction Control:	* - [N/A]
Fuel Type:	* - [N/A]	Wheel Base:	* - [N/A]

TIRE DOT INFORMATION:

LF:	M37FDHSX1101	RF:	M37FDHSX1101
LR:	M37FDHSX1101	RR:	M37FDHSX1101
LI:	*	RI:	*

SPARE: M37FDHSX1101 DOT Plant Manufacturer: M3 - MICHELIN NORTH AMERICA ; INC. ; GREENVILLE ; SOUTH CAROLINA

ESP INFORMATION: EMISSIONS INFORMATION:

EA02-027-C 3688

ESP Code:	H	Emission Code:	T/B - T/B
ESP Coverage(Miles):	100	Emission Cert Type:	3
ESP Coverage(Time):	072	Emission Decal Suffix:	JLS
ESP Plan Year:	2001	Engine Family:	1FMXT0402F8
ESP Signature Date:	12-APR-2001		

Any comments? You can contact

webmaster

E002-027-C 3889

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FMYU70E71UB79963	Veh Line:	T/U7 - EXPLORER SPORT (U207) [01-02]	Eng Serial No:	*
Model Year:	2001	Market Derived:	T/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	T	Drive Code:	T/B - 4 WHL L/H PART TIME DRIVE	Engine:	T/NB - COLOGNE 4.0L SOHC
Inv. Dealer:	8477J	Body Cab Style:	T/WC - 2 DOOR WAGON	Transmission:	T/TC - 5 SPD AT BAO ASLDI
		Version/Series:	T/BF - FORD SERIES		

BUILD INFORMATION:

Region: NA - ######### Plant: AN - LOUISVILLE PLANT BUILD
Country: USA - ######### Prod Date: 25-OCT-2000

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 189771 - *
Country: USA - ######### Selling Dlr St/Prov: *
Buyer St/Prov: *

Arrival Date:	31-OCT-2000	Red Carpet Lease:	*		
Sale Date:	25-OCT-2000	Fleet/Retail/Co. Lease:	L		
Warranty Start Date:	31-OCT-2000	Modified Vehicle:	*		
Orig Warranty Date:	25-OCT-2000	Reacquired Vehicle:	*	Vehicle Export Flag:	N

VOC/EOC:

```
---------1---------2---------3---------4---------5---------6---------7---------8---------9---------0
[illegible]
[illegible]                                              1
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	BK	GVW Class Code:	Y
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	BGAJB - 3.73 FINAL DRIVE RATIO	Mirror(Driver Side):	AW - DRVR HD SET SAIL CHROME MIRROR
Axle Type:	BGJAB - NON-LIMITED SLIP REAR AXLE	Mirror(Pasgr Side):	AW - PASS HAND SET SAIL MIR-CONVEX
Battery Amp Rating:	MK	Paint:	FNUAA - EBONY SOLID C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	BE - ELETR PREM STRO/CSTB/DISC/CLK
Calibration Code:	1U71AG0A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Suspn Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Manufacturer:	AC - FIRESTONE
Delivery Type:	*	Tire Brand:	* - *
Driveshaft Code:	D	Tire Size:	D3JWA - P255/70R-16 OWL A-T
Front Seat:	* - [N/A]	Traction Control:	* - [N/A]
Fuel Type:	* - [N/A]	Wheel Base:	* - [N/A]

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*	DOT Plant Manufacturer:	* - *

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	H	Emission Code:	T/B - T/B
ESP Coverage(Miles):	100	Emission Cert Type:	5
ESP Coverage(Time):	072	Emission Decal Suffix:	HPL
ESP Plan Year:	2000	Engine Family:	1FMXT0402F4
ESP Signature Date:	27-OCT-2000		

Any comments? You can contact

webmaster

E082-027-C 3871

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FMYU70E81UB80345	Veh Line:	T/U7 - EXPLORER SPORT (U207) [01-02]	Eng Serial No:	*
Model Year:	2001	Market Derived:	T/P - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	T	Drive Code:	T/E - 4 WHL L/H PART TIME DRIVE	Engine:	T/NE - COLOGNE 4.0L SOHC
Inv. Dealer:	54883	Body Cab Style:	T/WC - 2 DOOR WAGON	Transmission:	T/TC - 5 SPD AT EAO ASLDE
		Version/Series:	T/EF - FORD SERIES		

BUILD INFORMATION:

Region: NA - ######### Plant: AN - LOUISVILLE PLANT BUILD
Country: USA - ######### Prod Date: 02-NOV-2000

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 18988J - *
Country: USA - ######### Selling Dlr St/Prov: *
Buyer St/Prov: *

Arrival Date:	08-NOV-2000	Red Carpet Lease:	*
Sale Date:	02-NOV-2000	Fleet/Retail/Co. Lease:	L
Warranty Start Date:	08-NOV-2000	Modified Vehicle:	*
Orig Warranty Date:	02-NOV-2000	Reacquired Vehicle:	* Vehicle Export Flag: N

VOC/EOC:

```
---------1---------2---------3---------4---------5---------6---------7---------8---------9---------0
U7610E80345102[illegible] [illegible] 49K3050    5H E   00AP[illegible]  9743 2K5 05 4   [illegible]  [illegible]    [illegible]   3    [illegible]
[illegible] 7     Y        NONE                                         1
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/R - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	BK	GVW Class Code:	Y
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	EGAJB - 3.73 FINAL DRIVE RATIO	Mirror(Driver Side):	AW - DRVR HD SET SAIL CHROME MIRROR
Axle Type:	EGJAC - LIMITED SLIP REAR AXLE	Mirror(Pasg Side):	AW - PASS HAND SET SAIL MIR-CONVEX
Battery Amp Rating:	MK	Paint:	PNLDZ - DEEP WEDGEWOOD BLUE C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	BB - ELETR PREM STRO/CSTE/DISC/CLK
Calibration Code:	1U71A00A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Suspn Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Manufacturer:	AC - FIRESTONE
Delivery Type:	*	Tire Brand:	* - *
Driveshaft Code:	D	Tire Size:	D3JWA - P255/70R-16 OWL A-T
Front Seat:	* - [N/A]	Traction Control:	* - [N/A]
Fuel Type:	* - [N/A]	Wheel Base:	* - [N/A]

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*	DOT Plant Manufacturer:	* - *

ESP INFORMATION: EMISSIONS INFORMATION:

EA02-027-C 3072

ESP Code:	6	Emission Code:	T78 - T78
ESP Coverage(Miles):	100	Emission Cert Type:	5
ESP Coverage(Time):	072	Emission Decal Suffix:	HPL
ESP Plan Year:	2000	Engine Family:	1FMXT0402F4
ESP Signature Date:	03-NOV-2000		

Any comments? You can contact

webmaster

E002-027-C 3873

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FAFP34331W200266	Veh Line:	C/AX - FOCUS (CW170) [99-02]	Eng Serial No:	*
Model Year:	2001	Market Derivati:	C/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	C	Drive Code:	C/A - 2 WHL L/H FRONT DRIVE	Engine:	C/EQ - 2BTSC 2.0L DOHC SF
Inv. Dealer:	02516	Body Cab Style:	C/FC - 4 DOOR SEDAN-4 LITE	Transmission:	C/D2 - 4-SPD AUTO TRANS 4
		Version/Series:	C/DP - SERIES 30		

BUILD INFORMATION:

Region: NA - ######## Plant: AZ - WAYNE PLANT BUILD

Country: USA - ######## Prod Date: 05-DEC-2000

SALE INFORMATION:

Region: NA - ######## Selling Dealer: 198307 - *

Country: USA - ######## Selling Dlr St/Prov: MN

Buyer St/Prov: MA

Arrival Date: 06-DEC-2000 Red Carpet Lease: 2

Sale Date: 03-JAN-2001 Fleet/Retail/Co. Lease: F

Warranty Start Date: 03-JAN-2001 Modified Vehicle: *

Orig Warranty Date: 03-JAN-2001 Reacquired Vehicle: * Vehicle Export Flag: N

VOC/EOC:

```
---------1---------2---------3---------4---------5---------6---------7---------8---------9---------0
[illegible]
[illegible]
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	C/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	A	GVW Class Code:	F
Audio Disc:	* - [N/A]	Instrumentation:	AJ - HIGH SERIES ANALOG CLUSTER
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	* - [N/A]	Mirror(Pasgr Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	48	Paint:	FNARQ - HARVEST GOLD C/C
Brake Code:	FEAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	RQ -
Calibration Code:	1AK1AZDA	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Susp. Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Manufacturer:	AC - FIRESTONE
Delivery Type:	D	Tire Brand:	* - *
Driveshaft Code:	*	Tire Size:	DJJAQ - 205/50VR-16 BSW RUN FLAT
Front Seat:	* - [N/A]	Traction Control:	* - [N/A]
Fuel Type:	* - [N/A]	Wheel Base:	* - [N/A]

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*	DOT Plant Manufacturer:	* - *

ESP INFORMATION: EMISSIONS INFORMATION:

EA02-027-C 3674

ESP Code:	H	Emission Code:	C/B - C/B
ESP Coverage(Miles):	999	Emission Cert Type:	5
ESP Coverage(Time):	120	Emission Decal Suffix:	HLG
ESP Plan Year:	2000	Engine Family:	1FMXV02DVF3
ESP Signature Date:	01-AUG-2000		

Any comments? You can contact

webmaster

E002-027-C 3675

10

Vehicle Information Report

GENERAL VEHICLE INFORMATION: **(Related Claims)**

VIN: 1FMYU04101KF61634 Veh Line: T/M1 - ESCAPE (U204) [2001] Eng Serial No: 689379087
Model Year: 2001 Market Deriv: T/F - FORD DIVISION DERIVATIVE Body Shell: *
Veh Type: T - Drive Code: T/F - 4 WHL L/H FULL TIME DRIVE Engine: T/LD - MOD 3.0L DOHC EFI NA V6 G*NAAO
Inv. Dealer: 09007 Body Cab Style: T/WD - 4 DOOR WAGON Transmission: T/DJ - 4 SPD AUTO TRANS NAAO CD4E
Version/Series: T/SF - FORD SERIES

BUILD INFORMATION:

Region: NA - ######### Plant: AJ - KANSAS CITY PLANT BUILD
Country: USA - ######### Prod Date: 28-NOV-2000

SALE INFORMATION:

WARRANTY CLAIMS

Region: NA - ######### Selling Dealer: 11107 - *
Country: USA - ######### Selling Dlr St/Prov: MA
Buyer St/Prov: MA
Arrival Date: 11-DEC-2000 Red Carpet Lease: *
Sale Date: 27-DEC-2000 Fleet/Retail/Co. Lease: R
Warranty Start Date: 27-DEC-2000 Modified Vehicle: *
Orig Warranty Date: 27-DEC-2000 Reacquired Vehicle: * Vehicle Export Flag: N

VOC/EOC:

STALL & NO START INCL

---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

[illegible]

[illegible]

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	C	GVW Char Code:	Y
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	* - [N/A]	Mirror(Pasgr Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	A	Paint:	PN.DS - MEDIUM WEDGEWOOD C/C
Brake Code:	FEAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AQ - ELETR PREMIUM AM/FM STRO/CSTE
Calibration Code:	0M11A30A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Susp Tandem Axle:	* - [N/A]
Color(Trim):	00ZV -	Tire Brand:	AB - ANY BRAND
Delivery Type:	0	Tire Size:	D3JUJ - P235/70R-16 OWL A-S
Driveshaft Code:	D	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

RQ02-027-C 3676

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	T/C - T/C
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Decal Suffix:	HK2
ESP Plan Years:	*	Engine Family:	1FMXT0301F6
ESP Signature Date:			

Any comments? You can contact

webmaster

EA02-027-C 3877

11

Vehicle Information Report

GENERAL VEHICLE INFORMATION:

(Related Claims)

VIN:	1FMYU04151KF63721	Veh Line:	T/M1 - ESCAPE (U204) [2001]	Eng Serial No:	678277967
Model Year:	2001	Market Derivative:	T/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	T	Drive Code:	T/F - 4 WHL L/H FULL TIME DRIVE	Engine:	T/LD - MOD 3.0L DOHC EFI NA V6 G*NAAO
Inv. Dealer:	08936	Body Cab Style:	T/WD - 4 DOOR WAGON	Transmission:	T/D# - 4 SPD AUTO TRANS NAAO CD4E
		Version/Series:	T/EF - FORD SERIES		

BUILD INFORMATION:

Region: NA - ######## Plant: AJ - KANSAS CITY PLANT BUILD
Country: USA - ######## Prod Date: 14-NOV-2000

SALE INFORMATION:

Region: NA - ######## Selling Dealer: 111544 - *
Country: USA - ######## Selling Dlr St/Prov: NH
Buyer St/Prov: NH

Arrival Date:	28-NOV-2000	Red Carpet Lease:	*
Sale Date:	01-DEC-2000	Fleet/Retail/Co. Lease:	R
Warranty Start Date:	01-DEC-2000	Modified Vehicle:	*
Orig Warranty Date:	01-DEC-2000	Reacquired Vehicle:	* Vehicle Export Flag N

VOC/EOC:

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---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

[illegible]

[illegible]                                                  58
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	C	GVW Class Code:	Y
Audio Disc:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	* - [N/A]	Mirror(Pasgr Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	A	Paint:	PNLDB - MEDIUM WEDGEWOOD C/C
Brake Code:	FBAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AQ - ELETR PREMIUM AM/FM STRO/CSTE
Calibration Code:	0M11A30A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Susp. Tandem Axle:	* - [N/A]
Color(Trim):	000ZV -	Tire Brand:	AB - ANY BRAND
Delivery Type:	0	Tire Size:	D3IUI - P235/70R-16 OWL A-S
Driveshaft Code:	D	Traction Control:	* - [N/A]
Front Seats:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

E002-027-C 3678

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	T/C - T/C
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Decal Suffix:	HKS
ESP Plan Year:	*	Engine Family:	1FMXT0301F6
ESP Signature Date:			

Any comments? You can contact *webmaster*

Vehicle Information Report

#12

GENERAL VEHICLE INFORMATION:

(Related Claims)

VIN:	1FMYU04191KB58292	Veh Line:	T/M1 - ESCAPE (U204) [2001]	Eng Serial No:	551535059
Model Year:	2001	Market Derived:	T/F - FORD DIVISION DERIVATIVE	Body Style:	*
Veh Type:	T	Drive Code:	T/F - 4 WHL L/H FULL TIME DRIVE	Engine:	T/LD - MOD 3.0L DOHC EFI NA V6 G*NAAO
Inv. Dealer:	00580	Body Cab Style:	T/WD - 4 DOOR WAGON	Transmission:	T/DJ - 4 SPD AUTO TRANS NAAO CD4E
		Version/Series:	T/SF - FORD SERIES		

BUILD INFORMATION:

Region:	NA - #########	Plant:	AJ - KANSAS CITY PLANT BUILD
Country:	USA - #########	Prod Date:	05-SEP-2000

SALE INFORMATION:

Region:	NA - #########	Selling Dealer:	113630 - *
Country:	USA - #########	Selling Dlr St/Prov:	NY
		Buyer St/Prov:	NY

Arrival Date:	18-SEP-2000	Red Carpet Lease:	*	
Sale Date:	27-OCT-2000	Fleet/Retail/Co. Lease:	R	
Warranty Start Date:	27-OCT-2000	Modified Vehicle:	*	
Orig Warranty Date:	27-OCT-2000	Reacquired Vehicle:	*	Vehicle Export Flag: N

VOC/EOC:

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---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

[illegible] F 7 [illegible]      CP B [illegible] 61 [illegible] [illegible] 3 [illegible] [illegible] 1 AYE A [illegible] 2 1

[illegible] 4 [illegible]       [illegible] F Y                    1
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INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	C	GVW Class Code:	Y
Audio Disc:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	* - [N/A]	Mirror(Psngr Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	A	Paint:	PNYW3 - OXFORD WHITE SOLID C/C
Brake Code:	FEAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	BB - ELETR PREM STRO/CSTE/DISC/CLK
Calibration Code:	4M11A30A	Sound System:	AE - AUDIOPHILE SOUND SYSTEM
Color(Accent):	* - [N/A]	Rear Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Brand:	AC - FIRESTONE
Delivery Type:	0	Tire Size:	D5JLD - P235/70R-16 OWL A-S
Driveshaft Code:	D	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

ER02-027-C 3656

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	T/C - T/C
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Decal Suffix:	HKS
ESP Plan Year:	*	Engine Family:	1FMXT0304F6
ESP Signature Date:			

Any comments? You can contact *webmaster*

E062-027-C 3861

#13

Vehicle Information Report

GENERAL VEHICLE INFORMATION:

(Related Claims)

VIN:	1FMYU041X1KA74825	Veh Line:	T/MI - ESCAPE (U204) (2001)	Eng Serial No:	7B0521087
Model Year:	2001	Market Derivat:	T/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	T	Drive Code:	T/F - 4 WHL L/H FULL TIME DRIVE	Engine:	T/LD - MOD 3.0L DOHC EFI NA V6 G*NAAC
Inv. Dealer:	01804	Body Cab Style:	T/WD - 4 DOOR WAGON	Transmission:	T/DJ - 4 SPD AUTO TRANS NAAO CD4E
		Version/Series:	T/EF - FORD SERIES		

BUILD INFORMATION:

Region: NA - ######### Plant: AJ - KANSAS CITY PLANT BUILD
Country: USA - ######### Prod Date: 15-FEB-2001

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 172444 - *
Country: USA - ######### Selling Dlr St/Prov: HI
Buyer St/Prov: HI

Arrival Date:	06-MAR-2001	Red Carpet Lease:	*
Sale Date:	09-AUG-2001	Fleet/Retail/Co. Lease:	R
Warranty Start Date:	09-AUG-2001	Modified Vehicle:	*
Orig Warranty Date:	09-AUG-2001	Reacquired Vehicle:	* Vehicle Export Flag: N

VOC/EOC:

---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

[illegible]

[illegible]

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	C	GVW Class Code:	Y
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	* - [N/A]	Mirror(Psngr Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	A	Paint:	FN8IG - LT. PARCHMENT GOLD C/C
Brake Code:	FKAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	BE - ELETR PREM STRO/CSTE/DISC/CLK
Calibration Code:	0M11A5GA	Sound System:	AE - AUDIOPHILE SOUND SYSTEM
Color(Accent):	* - [N/A]	Susp Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Brand:	AB - ANY BRAND
Delivery Type:	0	Tire Size:	D3JUJ - P235/70R-16 OWL A-S
Driveshaft Code:	D	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

E802-827-C 3882

TIRE DOT INFORMATION:

LF: W2 8AWM0501 RF: W2 8AWM0501
LR: W2 8AWM0501 RR: W2 8AWM0501
LI: * RI: *
SPARE: HY8A1R80301

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	M	Emission Code:	T/8 - T/8
ESP Coverage(Miles):	027	Emission Cert Type:	5
ESP Coverage(Time):	024	Emission Decal Suffix:	HK9
ESP Plan Year:	2001	Engine Family:	1FMXT0901F6
ESP Signature Date:	09-AUG-2001		

Any comments? You can contact

webmaster

EA02-027-C 3683

Vehicle Information Report

14

GENERAL VEHICLE INFORMATION:

(Related Claims)

VIN:	1FMNU40S31EB52065	Veh Line:	TXL1 - EXCURSION (U137) [2000]	Eng Serial No:	0032110408
Model Year:	2001	Market Derivat:	* - [N/A]	Body Shell:	*
Veh Type:	T	Drive Code:	T/B - 2 WHL L/H REAR DRIVE	Engine:	T/WA - 6.8L SOHC EFI NA V10 GAS
Inv. Dealer:	04521	Body Cab Style:	T/WD - 4 DOOR WAGON	Transmission:	T/DB - 4 SPD AUTO TR-NAAO E4OD(4R100)
		Version/Series:	T/CA -		

BUILD INFORMATION:

Region:	NA - #########	Plant:	A1 - KENTUCKY TRUCK PLANT BUILD
Country:	USA - #########	Prod Date:	04-DEC-2000

SALE INFORMATION:

Region:	NA - #########	Selling Dealer:	1527665 - *
Country:	USA - #########	Selling Dlr St/Prov:	TX
		Buyer St/Prov:	TX

Arrival Date:	28-DEC-2000	Red Carpet Lease:	*		
Sale Date:	14-JUN-2001	Fleet/Retail/Co. Lease:	R		
Warranty Start Date:	14-JUN-2001	Modified Vehicle:	*		
Orig Warranty Date:	14-JUN-2001	Reacquired Vehicle:	*	Vehicle Export Flag:	N

VOC/EOC:

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[illegible]

[illegible]                                   1
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INSTALLED OPTION INFORMATION:

Air Conditioning:	T/D - HIGH OUTPUT AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	5B	GVW Class Code:	N
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	EGAJB - 3.73 FINAL DRIVE RATIO	Mirror(Driver Side):	BA - DRIVER POWER/HEATED MIRROR
Axle Type:	EGJAC - LIMITED SLIP REAR AXLE	Mirror(Pass Side):	BA - PASS POWER/HEATED CONVEX MIRR
Battery Amp Rating:	BA	Paint:	FNZIC - SILVER MET C/C #4
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	BE - ELETR PREM STRO/CSTB/DISC/CLK
Calibration Code:	1LJ1BN0A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Single Tandem Axle:	* - [N/A]
Color(Trim):	6082V -	Tire Brand:	AC - FIRESTONE
Delivery Type:	4	Tire Size:	D3JYM - LT265/75R 16D A-T OWL
Driveshaft Code:	D	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

EA02-027-C 3884

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	K	Emission Code:	T/B - T/B
ESP Coverage(Miles):	060	Emission Cert Type:	F
ESP Coverage(Time):	060	Emission Decal Suffix:	HFH
ESP Plan Year:	2001	Engine Family:	1FMXH068CH5
ESP Signature Date:	14-JUN-2001		

Any comments? You can contact

webmaster

ER02-027-C 3685

#15

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FMEU15W41LB19615	Veh Line:	T/B3 - EXPEDITION (UN93) [97-02]	Eng Serial No:	707958283
Model Year:	2001	Market Derived:	* - [N/A]	Body Style:	*
Veh Type:	T	Drive Code:	T/8 - 2 WHL L/H REAR DRIVE	Engine:	T/VN - R-M 4.6L SOHC EFI NA CIV8 G-NP
Inv. Dealer:	07796	Body Cab Style:	T/WD - 4 DOOR WAGON	Transmission:	T/DU - 4 SPD AUTO TR NAAO AODE[illegible]
		Version/Series:	T/EF - FORD SERIES		

BUILD INFORMATION:

Region:	NA - #########	Plant:	AP - MICHIGAN PLANT BUILD
Country:	USA - #########	Prod Date:	05-MAR-2001

SALE INFORMATION:

Region:	NA - #########	Selling Dealer:	172409 - *
Country:	USA - #########	Selling Dlr St/Prov:	CA
		Buyer St/Prov:	CA
Arrival Date:	15-MAR-2001	Red Carpet Lease:	*
Sale Date:	24-MAR-2001	Fleet/Retail/Co. Lease:	R
Warranty Start Date:	24-MAR-2001	Modified Vehicle:	*
Orig Warranty Date:	24-MAR-2001	Reacquired Vehicle:	* Vehicle Export Flag: N

VOC/ROC:

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[illegible]

[illegible] 2

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/D - HIGH OUTPUT AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	C8	GVW Class Code:	E
Audio Disk:	AC - AUDIO DISC CHANGER PLAYER	Instrumentation:	* - [N/A]
Axle Ratio:	BGAFB - 3.31 FINAL DRIVE RATIO - S8	Mirror(Driver Side):	* - [N/A]
Axle Type:	BGJAB - NON-LIMITED SLIP REAR AXLE	Mirror(Psngr Side):	* - [N/A]
Battery Amp Rating:	MK	Paint:	FNUAA - EBONY SOLID C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AT - ELETR PREM AM/FM STRO/CSTE/CLK
Calibration Code:	1B3I6D0A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Susp Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Brand:	AD - GENERAL
Delivery Type:	0	Tire Size:	D3KVJ - P275/60R 17 A/S OWL
Driveshaft Code:	F	Traction Control:	AB - ANTI-SPIN TRACT BRAKES W/O IVD
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

ER02-027-C 3888

TIRE DOT INFORMATION:

LF:	ADT044T0501	RF:	ADT044T0501
LR:	ADT044T0501	RR:	ADT044T0501
LI:	*	RI:	*
SPARE:	ADT044T0501		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	•	Emission Code:	T/C - T/C
ESP Coverage(Miles):	•	Emission Cert Type:	5
ESP Coverage(Time):	•	Emission Decal Suffix:	HHA
ESP Plan Years:	•	Engine Family:	1FMXT0466F7
ESP Signature Date:			

Any comments? You can contact webmaster

Vehicle Information Report

#16

GENERAL VEHICLE INFORMATION:

(Related Claims)

VIN:	1FMRU15L51LB49780	Veh Line:	T/B3 - EXPEDITION (UN93) [97-02]	Eng Serial No:	010852482
Model Year:	2001	Market Derived:	* - [N/A]	Body Shell:	*
Veh Type:	T	Drive Code:	T/B - 2 WHL L/H REAR DRIVE	Engine:	T/VZ - MOD 5.4L SOHC EFI NA V8 G-NP
Inv. Dealer:	03042	Body Cab Style:	T/WD - 4 DOOR WAGON	Transmission:	T/DE - 4 SPD AUTO TR-NAAO E4OD(4R100)
		Version/Series:	T/EF - FORD SERIES		

BUILD INFORMATION:

Region:	NA - #########	Plant:	AP - MICHIGAN PLANT BUILD
Country:	USA - #########	Prod Date:	23-APR-2001

SALE INFORMATION:

Region:	NA - #########	Selling Dealer:	132764 - *
Country:	USA - #########	Selling Dlr St/Prov:	TX
		Buyer St/Prov:	TX
Arrival Date:	03-MAY-2001	Red Carpet Lease:	1
Sale Date:	07-JUL-2001	Fleet/Retail/Co. Lease:	R
Warranty Start Date:	07-JUL-2001	Modified Vehicle:	*
Orig Warranty Date:	07-JUL-2001	Reacquired Vehicle:	* Vehicle Export Flag: N

VOC/EOC:

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---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

01511A0978811193  6 7 3 2906477       EC 8   3HB 43    N  44     4 A   528764 31  87    E13 P4     L

17MM5 3            PLNTE                                 4
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/D - HIGH OUTPUT AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	CB	GVW Class Code:	R
Audio Disk:	AC - AUDIO DISC CHANGER PLAYER	Instrumentation:	* - [N/A]
Axle Ratio:	EGAHD - 3.55 FINAL DRIVE RATIO	Mirror(Driver Side):	BA - DRIVER POWER/HEATED MIRROR
Axle Type:	EGJAC - LIMITED SLIP REAR AXLE	Mirror(Pass Side):	BA - PASS POWER/HEATED CONVEX MIRR
Battery Amp Rating:	MK	Paint:	FN8P6 - ESTATE GREEN C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AT - ELETR PREM AM/FM STRO/CSTE/CLK
Calibration Code:	1B314B0A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Susp Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Brand:	AG - GOODYEAR
Delivery Type:	R	Tire Size:	D3UWA - P255/70R-16 OWL A-T
Driveshaft Code:	F	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF: 4BCUDW05100 RF: 4BCUDW05100
LR: 4BCUDW05100 RR: 4BCUDW05100
LI: * RI: *
SPARE: 4BCUDW05100

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	T/B - T/B
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Bond Suffix:	HBG
ESP Plan Years:	*	Engine Family:	1FMXT054RF8
ESP Signature Date:			

Any comments? You can contact *webmaster*

Vehicle Information Report #17

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FMRU15W51LB48459	Veh Line:	T/B3 - EXPEDITION (UN93) [97-02]	Eng Serial No:	79324039
Model Year:	2001	Market Derived:	* - [N/A]	Body Shell:	*
Veh Type:	T	Drive Code:	T/B - 2 WHL LH REAR DRIVE	Engine:	T/VN - R-M 4.6L SOHC EFI NA CIV8 G-NP
Inv. Dealer:	02830	Body Cab Style:	T/WD - 4 DOOR WAGON	Transmission:	T/DU - 4 SPD AUTO TR NAAO AODEW/4R70
		Version/Series:	T/HP - FORD SERIES		

BUILD INFORMATION:

Region:	NA - #########	Plant:	AP - MICHIGAN PLANT BUILD
Country:	USA - #########	Prod Date:	23-APR-2001

SALE INFORMATION:

Region:	NA - #########	Selling Dealer:	14904 - *
Country:	USA - #########	Selling Dlr St/Prov:	MI
		Buyer St/Prov:	MI
Arrival Date:	27-APR-2001	Red Carpet Lease:	*
Sale Date:	01-AUG-2001	Fleet/Retail/Co. Lease:	R
Warranty Start Date:	01-AUG-2001	Modified Vehicle:	*
Orig Warranty Date:	01-AUG-2001	Reacquired Vehicle:	* Vehicle Export Flag: N

VOC/EOC:

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---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

V151084B435115   6 3 2 20C9820      LC K    U17 65    K  40      6 A   4BA081 51  11     5P2  4       W

1FMRU 3          Secret                              4
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INSTALLED OPTION INFORMATION:

Air Conditioning:	T/D - HIGH OUTPUT AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	CB	GVW Class Code:	R
Audio Distr:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	BOAPB - 3.31 FINAL DRIVE RATIO - 35	Mirror(Driver Side):	BA - DRIVER POWER/HEATED MIRROR
Axle Type:	BOJAB - NON-LIMITED SLIP REAR AXLE	Mirror(Psngr Side):	BA - PASS POWER/HEATED CONVEX MIRR
Battery Amp Rating:	MX	Paint:	PNLDZ - DEEP WEDGEWOOD BLUE C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AT - ELETR PREM AM/FM STRO/CSTE/CLK
Calibration Code:	1B316D0A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Susp Tandem Axle:	* - [N/A]
Color(Trim):	000ZV -	Tire Brand:	AG - GOODYEAR
Delivery Type:	A	Tire Size:	D3JWA - P255/70R-16 OWL A-T
Driveshaft Code:	F	Traction Control:	* - [N/A]
Front Seats:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	4BCUDW05100	RF:	4BCUDW05100
LR:	4BCUDW05100	RR:	4BCUDW05100
LI:	*	RI:	*
SPARE:	4BCUDW05100		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	• Emission Code:	T/B - T/B
ESP Coverage(Miles):	• Emission Cert Type:	5
ESP Coverage(Time):	• Emission Decal Suffix:	HTS
ESP Plan Year:	• Engine Family:	1FMXT0400F7
ESP Signature Date:		

Any comments? You can contact

webmaster

#18

Vehicle Information Report

GENERAL VEHICLE INFORMATION:

(Related Claims)

VIN:	1FMZU62E31ZA47460	Veh Line:	TKJ3 - EXPLORER (U105/106/150) [95-01]	Eng Serial No:	*
Model Year:	2001	Market Derivat:	T/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	T	Drive Code:	T/B - 2 WHL L/H REAR DRIVE	Engine:	T/NB - COLOGNE 4.0L SOHC EFI NA V
Inv. Dealer:	04465	Body Cab Style:	T/WD - 4 DOOR WAGON	Transmission:	T/TC - 5 SPD AT EAO A5LDE-NR/5R44/
		Version/Series:	T/EF - FORD SERIES		

BUILD INFORMATION:

Region:	NA - #########	Plant:	AV - ST. LOUIS PLANT BUILD
Country:	USA - #########	Final Date:	26-OCT-2000

SALE INFORMATION:

Region:	NA - #########	Selling Dealer:	152300 - *		
Country:	USA - #########	Selling Dlr St/Prov:	TX		
		Buyer St/Prov:	*		
Arrival Date:	07-NOV-2000	Red Carpet Lease:	*		
Sale Date:		Fleet/Retail/Co. Lease:	R		
Warranty Start Date:		Modified Vehicle:	*		
Orig Warranty Date:		Reacquired Vehicle:	*	Vehicle Report Flag:	N

VOC/EOC:

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---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

V6218A474801123  3 N 3 0286736      89 B4  D45 78  N  G 265 90 658   528380 31  82      XX5 4   5  3

1N953 3             1N9XX     N
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	BP	GVW Class Code:	Z
Audio Units:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	BGAHD - 3.55 FINAL DRIVE RATIO	Mirror(Driver Side):	* - [N/A]
Axle Type:	BGJAB - NON-LIMITED SLIP REAR AXLE	Mirror(Psngr Side):	* - [N/A]
Battery Amp Rating:	BL	Paint:	PNARQ - HARVEST GOLD C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AZ - ELECTR AM/FM STRO/DISC/CLK
Calibration Code:	0U31A40A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Susp Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Brand:	* - [N/A]
Delivery Type:	*	Tire Size:	D3GUB - P235/75R15SL S/BLT OWL A-T
Driveshaft Code:	F	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	•	RF:	•
LR:	•	RR:	•
LI:	•	RI:	•
SPARE:	•		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	•	Emission Code:	T/B - T7B
ESP Coverage(Miles):	•	Emission Cert Type:	5
ESP Coverage(Time):	•	Emission Decal Suffix:	HFF
ESP Plan Years	•	Engine Family:	1FMXT0402F5
ESP Signature Date			

Any comments? You can contact webmaster

#19

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FMZU67E01UA80060	Veh Line:	T/S1 - EXPLORER SPORT TRAC P207 (01-02)	Eng Serial No:	*
Model Year:	2001	Market Derived:	T/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	T	Drive Code:	T/B - 2 WHL LH REAR DRIVE	Engine:	T/NE - COLOGNE 4.0L SOHC EFI N.
Inv. Dealer:	02761	Body Cab Style:	T/WF - 4 DOOR W/PICKUP BOX	Transmission:	T/TC - 5 SPD AT EAO A5LDE-N8/51
		Version/Series:	T/EF - FORD SERIES		

BUILD INFORMATION:

Region: NA - ######### Plant: AN - LOUISVILLE PLANT BUILD
Country: USA - ######### Prod Date: 21-JUN-2000

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 149026 - *
Country: USA - ######### Selling Dlr St/Prov: MI
Buyer St/Prov: MI

Arrival Date: 26-JUN-2000 Red Carpet Lease: I
Sale Date: 05-JUL-2000 Fleet/Retail/Co. Lease: R
Warranty Start Date: 05-JUL-2000 Modified Vehicle: *
Orig Warranty Date: 05-JUL-2000 Reacquired Vehicle: * Vehicle Export Flag: N

VOC/EOC:

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[illegible]

[illegible] 1

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	BF	GVW Class Code:	Z
Audio Unit:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	EGAMD - 4.10 FINAL DRIVE RATIO	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	EGJAB - NON-LIMITED SLIP REAR AXLE	Mirror(Psngr Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	MK	Paint:	PN6DZ - DARK TEAL C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	MJ - AM/FM STRO/CD CHANGER/CLK
Calibration Code:	0S11A40A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Susp Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Brand:	AC - FIRESTONE
Delivery Type:	P	Tire Size:	D3JWA - P255/70R-16 OWL A-T
Driveshaft Code:	D	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	T/B - T/B
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Decal Suffix:	HCA
ESP Plan Year:	*	Engine Family:	1FMXT0400F5
ESP Signature Date:			

Any comments? You can contact

webmaster

#20

Vehicle Information Report

GENERAL VEHICLE INFORMATION:

(Related Claims)

VIN:	1FMZU77EX1UC82383	Veh Line:	T/S1 - EXPLORER SPORT TRAC P207 [01-02]	Eng Serial No:	8660000329
Model Year:	2001	Market Derived:	T/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	T	Drive Code:	T/B - 2 WHL L/H REAR DRIVE	Engine:	T/NE - COLOGNE 4.0L SOHC EFI N
Inv. Dealer:	02486	Body Cab Style:	T/WF - 4 DOOR W/PICKUP BOX	Transmission:	T/TC - 5 SPD AT HAO A5LD8-N8/5
		Version/Series:	T/HP - FORD SERIES		

BUILD INFORMATION:

Region: NA - ######### Plant: AN - LOUISVILLE PLANT BUILD

Country: USA - ######### Prod Date: 02-AUG-2001

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 132029 - *

Country: USA - ######### Selling Dlr St/Prov: TX

Buyer St/Prov: TX

Arrival Date:	09-AUG-2001	Red Carpet Lease:	*		
Sale Date:	18-AUG-2001	Fleet/Retail/Co. Lease:	R		
Warranty Start Date:	18-AUG-2001	Modified Vehicle:	*		
Orig Warranty Date:	18-AUG-2001	Reacquired Vehicle:	*	Vehicle Export Flag:	N

VOC/EOC:

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[illegible]

[illegible] 1

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	BK	GVW Class Code:	Z
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	BGAMD - 4.10 FINAL DRIVE RATIO	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	BGJAB - NON-LIMITED SLIP REAR AXLE	Mirror(Psngr Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	MK	Paint:	FNYW3 - OXFORD WHITE SOLID C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	BB - ELETR PREM STRO/CSTT/DISC/CLK
Calibration Code:	1S11A40A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Suspn Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Brand:	AC - FIRESTONE
Delivery Type:	X	Tire Size:	DGJWA - P235/70R-16 OWL A-T
Driveshaft Code:	D	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF: 4BCUC6WR???? RF: 4BCUC6WR????
LR: 4BCUC6WR???? RR: 4BCUC6WR????
Lb: * RL: *
SPARE: 4BCUC6WR????

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	T/3 - T/3
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Decal Suffix:	HPL
ESP Plan Years:	*	Engine Family:	1FMXT0402F4
ESP Signature Date:			

Any comments? You can contact *webmaster*

#21

Vehicle Information Report

GENERAL VEHICLE INFORMATION:

(Related Claims)

VIN:	1FMZU73E41ZA26430	Veh Line:	T/U3 - EXPLORER (U1[05/106/150) [95-01]	Eng Serial No:	*
Model Year:	2001	Market Derived:	T/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	T	Drive Code:	T/F - 4 WHL L/H FULL TIME DRIVE	Engine:	T/NE - COLOGNE 4.0L SOHC EFI NA V6
Inv. Dealer:	08736	Body Cab Style:	T/WD - 4 DOOR WAGON	Transmission:	T/TC - 5 SPD AT EAO ASLDE-NR/5R44/
		Version/Series:	T/SF - FORD SERIES		

BUILD INFORMATION:

Region:	NA - #########	Plant:	AV - ST. LOUIS PLANT BUILD
Country:	USA - #########	Prod Date:	27-SEP-2000

SALE INFORMATION:

Region:	NA - #########	Selling Dealer:	174527 - *
Country:	USA - #########	Selling Dlr St/Prov:	WA
		Buyer St/Prov:	WA
Arrival Date:	30-OCT-2000	Red Carpet Lease:	1
Sale Date:	20-FEB-2001	Fleet/Retail/Co. Lease:	R
Warranty Start Date:	20-FEB-2001	Modified Vehicle:	*
Orig Warranty Date:	20-FEB-2001	Reacquired Vehicle:	* Vehicle Export Flag N

VOC/EOC:

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U731WA364101124OV6 X 2 01HL9C0 2K ML ID6 7A 9N 2XX 5 4S 74a024a53 AFL 93E 4 3 X

1PXXA 2 5E2AG K 4

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	8P	GVW Class Code:	Z
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	EGAJB - 3.73 FINAL DRIVE RATIO	Mirror(Driver Side):	* - [N/A]
Axle Type:	EGJAC - LIMITED SLIP REAR AXLE	Mirror(Psngr Side):	* - [N/A]
Battery Amp Rating:	EL	Paint:	PNFTA - MED. TOREADOR C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	8E - ELSTR PREM STRO/CSTE/DISC/CLK
Calibration Code:	0U31A40A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Pusher Tandem Axle:	* - [N/A]
Color(Trim):	000ZV -	Tire Brand:	AG - GOODYEAR
Delivery Type:	R	Tire Size:	D5GUI - P235/75R15XL S/BLT OWL A-T
Driveshaft Code:	F	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	M	Emission Code:	T/B - T/B
ESP Coverage(Miles):	027	Emission Cert Type:	5
ESP Coverage(Time):	024	Emission Decal Suffix:	HLA
ESP Plan Year:	2001	Engine Family:	1FMXT0403P5
ESP Signature Date:	20-FEB-2001		

Any comments? You can contact

webmaster

Vehicle Information Report

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GENERAL VEHICLE INFORMATION: **(Related Claims)**

VIN:	1FTRW08LX1KE26417	Veh Line:	T/F5 - F150/250(PN96)/F225-FORD [97-02]	Eng Serial No:	*
Model Year:	2001	Market Derived:	* - [N/A]	Body Shell:	*
Veh Type:	T	Drive Code:	T/E - 4 WHL L/H PART TIME DRIVE	Engine:	T/VZ - MOD 5.4L SOHC EFI NA V8 G-N
Inv. Dealer:	05317	Body Cab Style:	T/BC - DOUBLE CAB (CREW CAB)	Transmission:	T/DU - 4 SPD AUTO TR NAAO AODEW
		Version/Series:	T/AM - 150 SERIES		

BUILD INFORMATION:

Region:	NA - #########	Plant:	AJ - KANSAS CITY PLANT BUILD
Country:	USA - #########	Prod Date:	12-JUN-2000

SALE INFORMATION:

Region:	NA - #########	Selling Dealer:	133352 - *
Country:	USA - #########	Selling Dlr St/Prov:	IA
		Buyer St/Prov:	IA
Arrival Date:	16-JUN-2000	Red Carpet Lease:	*
Sale Date:	21-JUN-2000	Fleet/Retail/Co. Lease:	R
Warranty Start Date:	21-JUN-2000	Modified Vehicle:	*
Orig Warranty Date:	21-JUN-2000	Reacquired Vehicle:	* Vehicle Export Flag: N

VOC/EOC:

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[illegible]
[illegible]
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INSTALLED OPTION INFORMATION:

Air Conditioning:	T/8 - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	BA	GVW Class Code:	R
Audio Disk:	AC - AUDIO DISC CHANGER PLAYER	Instrumentation:	* - [N/A]
Axle Ratio:	EGAHD - 3.55 FINAL DRIVE RATIO	Mirror(Driver Side):	* - [N/A]
Axle Type:	EGJAC - LIMITED SLIP REAR AXLE	Mirror(Psngr Side):	* - [N/A]
Battery Amp Rating:	EL	Paint:	PNLDZ - DEEP WEDGEWOOD BLUE C/C
Brake Code:	FBAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AT - ELETR PREM AM/FM STRO/CSTE/CLK
Calibration Code:	0F514F0A	Sound System:	* - [N/A]
Color(Accent):	PNZJC - SILVER MET C/C #2	Susp. Tandem Axle:	* - [N/A]
Color(Trim):	00ZZV -	Tire Brand:	AD - GENERAL
Delivery Type:	C	Tire Size:	D3KFD - P265/70R 17 A/T OWL
Driveshaft Code:	F	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	T/8 - T/8
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Decal Suffix:	FKD
ESP Plan Year:	*	Engine Family:	1FMXT054RF7
ESP Signature Date:			

Any comments? You can contact

webmaster

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Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FTRX17W61NB15810	Veh Line:	T/F9 - F150/250(PN96)/F225-FORD [97-02]	Eng Serial No:	71138167Y
Model Year:	2001	Market Derived:	* - [N/A]	Body Shell:	*
Veh Type:	T	Drive Code:	T/B - 2 WHL L/H REAR DRIVE	Engine:	T/VN - 8-M 4.6L SOHC EFI NA CIVE G
Inv. Dealer:	09113	Body Cab Style:	T/BD - SUPER SINGLE CAB (SUPER CAB)	Transmission:	T/DU - 4 SPD AUTO TR NAAO AODE
		Version/Series:	T/AM - 150 SERIES		

BUILD INFORMATION:

Region:	NA - #########	Plant:	AR - NORFOLK PLANT BUILD
Country:	USA - #########	Prod Date:	09-MAR-2001

SALE INFORMATION:

Region:	NA - #########	Selling Dealer:	111206 - *
Country:	USA - #########	Selling Dlr St/Prov:	MA
		Buyer St/Prov:	MA
Arrival Date:	16-MAR-2001	Red Carpet Lease:	*
Sale Date:	16-JUL-2001	Fleet/Retail/Co. Lease:	R
Warranty Start Date:	16-JUL-2001	Modified Vehicle:	*
Orig Warranty Date:	16-JUL-2001	Reacquired Vehicle:	* Vehicle Export Flag: N

VOC/EOC:

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Z171001801011593 9 2 12A0003 CS XX 3018 53 9852 20 FF 2 3 11F204 40 FL # XX N

1FTRX 2 8 5028 9800XL 3

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	BA	GVW Class Code:	R
Audio Dish:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	BGACC - 3.08 FINAL DRIVE RATIO	Mirror(Driver Side):	AC - DRIVER HAND SET MIRROR
Axle Type:	BGHAB - NON-LIMITED SLIP REAR AXLE	Mirror(Psngr Side):	AB - PASS HAND SET CONVEX MIRROR
Battery Amp Rating:	BL	Paint:	PNFIA - MED. TOREADOR C/C
Brake Code:	FEAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AG - ELETR AM/FM/STRO/CSTE/CLOCK
Calibration Code:	1P516060A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Suspn Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Brand:	AE - GOODRICH
Delivery Type:	A	Tire Size:	D3JUJ - P235/70R-16 OWL A-S
Driveshaft Code:	F	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF: AP08HL514200 RF: AP08HL514200
LR: AP08HL514200 RR: AP08HL514200
LI: * RI: *
SPARE: AP08HL510801

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	T/B - T/B
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Decal Suffix:	HAT
ESP Plan Year:	*	Engine Family:	1FMXT054PFS
ESP Signature Date:			

Any comments? You can contact webmaster

#24

Vehicle Information Report

GENERAL VEHICLE INFORMATION:

(Related Claims)

VIN:	1FTRX18W51NA45005	Veh Line:	T/P5 - F150/250(PN96)/F225-FORD [97-02]	Eng Serial No:	*
Model Year:	2001	Market Derivative:	* - [N/A]	Body Shell:	*
Veh Type:	T	Drive Code:	T/B - 4 WHL L/H PART TIME DRIVE	Engine:	T/VN - R-M 4.6L SOHC EFI NA CIVI C
Inv. Dealer:	02743	Body Cab Style:	T/BD - SUPER SINGLE CAB (SUPER CAB)	Transmission:	T/DU - 4 SPD AUTO TR NAAO AODE
		Version/Series:	T/AM - 150 SERIES		

BUILD INFORMATION:

Region: NA - ########## Plant: AR - NORFOLK PLANT BUILD
Country: USA - ########## Prod Date: 03-OCT-2000

SALE INFORMATION:

Region: NA - ########## Selling Dealer: 148046 - *
Country: USA - ########## Selling Dir St/Prov: MI
Buyer St/Prov: MI

Arrival Date:	18-OCT-2000	Red Carpet Lease:	*	
Sale Date:	25-OCT-2000	Fleet/Retail/Co. Lease:	R	
Warranty Start Date:	25-OCT-2000	Modified Vehicle:	*	
Orig Warranty Date:	25-OCT-2000	Reacquired Vehicle:	*	Vehicle Export Flag: N

VOC/EOC:

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[illegible]

[illegible]

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	BA	GVW Class Code:	R
Audio Disk:	AC - AUDIO DISC CHANGER PLAYER	Instrumentation:	* - [N/A]
Axle Ratio:	EGABD - 3.55 FINAL DRIVE RATIO	Mirror(Driver Side):	* - [N/A]
Axle Type:	EGJAC - LIMITED SLIP REAR AXLE	Mirror(Pass Side):	* - [N/A]
Battery Amp Rating:	EL	Paint:	PNUAA - EBONY SOLID C/C
Brake Code:	FEAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AT - ELETR PREM AM/FM STRO/CST/CLK
Calibration Code:	1F516N0A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Susp. Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Brand:	AG - GOODYEAR
Delivery Type:	A	Tire Size:	D3KFD - P265/70R 17 A/T OWL
Driveshaft Code:	F	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	K	Emission Code:	T/B - T/B
ESP Coverage(Miles):	075	Emission Cert Type:	5
ESP Coverage(Time):	060	Emission Decal Suffix:	HCD
ESP Plan Year:	2001	Engine Family:	1FMXT046PF6
ESP Signature Date:	25-OCT-2000		

Any comments? You can contact

webmaster

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Vehicle Information Report

GENERAL VEHICLE INFORMATION:

(Related Claims)

VIN:	2FTZX072X1CA53423	Veh Line:	T/F3 - F150/250(PN96)/F225-FORD [97-02]	Eng Serial No:	*
Model Year:	2001	Market Derivat:	* - [N/A]	Body Shell:	*
Veh Type:	T	Drive Code:	T/B - 2 WHL L/H REAR DRIVE	Engine:	T/LY - 4.2L OHV EFI NA V6 GAS
Inv. Dealer:	01751	Body Cab Style:	T/BD - SUPER SINGLE CAB (SUPER CAB)	Transmission:	T/DU - 4 SPD AUTO TR NAAO ADDEV
		Version/Series:	T/AM - 150 SERIES		

BUILD INFORMATION:

Region:	NA - #########	Plant:	A4 - ONTARIO PLANT BUILD
Country:	CAN - #########	Prod Date:	09-MAR-2001

SALE INFORMATION:

Region:	NA - #########	Selling Dealer:	143508 - *		
Country:	USA - #########	Selling Dlr St/Prov:	MI		
		Buyer St/Prov:	MI		
Arrival Date:	13-MAR-2001	Red Carpet Lease:	I		
Sale Date:	23-JUN-2001	Fleet/Retail/Co. Lease:	R		
Warranty Start Date:	23-JUN-2001	Modified Vehicle:	*		
Orig Warranty Date:	23-JUN-2001	Reacquired Vehicle:	*	Vehicle Export Flag:	N

VOC/EOC:

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[illegible]

[illegible]

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	CA	GVW Class Code:	Z
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	BGAHD - 3.55 FINAL DRIVE RATIO	Mirror(Driver Side):	* - [N/A]
Axle Type:	BGJAC - LIMITED SLIP REAR AXLE	Mirror(Psngr Side):	* - [N/A]
Battery Amp Rating:	MK	Paint:	PN8GC - VERMILION SOLID C/C
Brake Code:	FBAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code/Service:	* - [N/A]	Radio:	AU - ELETR PREM AM/FM STRO/DISC
Calibration Code:	1P513C0A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Susp Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Brand:	AE - GOODRICH
Delivery Type:	F	Tire Size:	D3KVJ - P275/60R 17 A/S OWL
Driveshaft Code:	F	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	*	RF:	AP77HK514700
LR:	*	RR:	AP77HK514700
LI:	*	RI:	*
SPARE:	AP7HK514700		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	T/B - T/B
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Decal Suffix:	HLH
ESP Plan Year:	*	Engine Family:	1FMXT0422F5
ESP Signature Date:			

Any comments? You can contact

webmaster

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Vehicle Information Report

GENERAL VEHICLE INFORMATION:

(Related Claims)

VIN:	1FTNX21F21EC11256	Veh Line:	T/F7 - F250HD/350/450/550 (99-02)	Eng Serial No:	15734179
Model Year:	2001	Market Derivat:	* - (N/A)	Body Style:	*
Veh Type:	T	Drive Code:	T/E - 4 WHL L/H PART TIME DRIVE	Engine:	T/DS - NAVISTAR 7.3L OHV DI TC V8
Inv. Dealer:	03593	Body Cab Style:	T/BD - SUPER SINGLE CAB (SUPER CAB)	Transmission:	T/D2 - 4 SP AUTO 4R100 (DIESEL APPL
		Version/Series:	T/BD - 250 SERIES		

BUILD INFORMATION:

Region:	NA - #########	Plant:	A1 - KENTUCKY TRUCK PLANT BUILD
Country:	USA - #########	Prod Date:	05-FEB-2001

SALE INFORMATION:

Region:	NA - #########	Selling Dealer:	171151 - *
Country:	USA - #########	Selling Dlr St/Prov:	CA
		Buyer St/Prov:	CA
Arrival Date:	16-FEB-2001	Red Carpet Lease:	*
Sale Date:	10-JUN-2001	Fleet/Retail/Co. Lease:	R
Warranty Start Date:	10-JUN-2001	Modified Vehicle:	*
Orig Warranty Date:	10-JUN-2001	Reacquired Vehicle:	* Vehicle Export Flag: N

VOC/EOC:

```
---------1---------2---------3---------4---------5---------6---------7---------8---------9---------
[illegible]  1 132 11A1617      [illegible]    [illegible]    [illegible]  [illegible]  4 44    [illegible]
[illegible]        [illegible]                                  1
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	8B	GVW Class Code:	N
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratios:	EGAJB - 3.73 FINAL DRIVE RATIO	Mirror(Driver Side):	* - [N/A]
Axle Type:	EG/AC - LIMITED SLIP REAR AXLE	Mirror(Psngr Side):	* - [N/A]
Battery Amp Rating:	BA	Paint:	* - [N/A]
Brake Code:	FEAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	BE - ELETR PREM STRO/CSTE/DISC/CLK
Calibration Code:	1F719N0A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Susp Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Brand:	AC - FIRESTONE
Delivery Type:	0	Tire Size:	D3JYP - LT265/75R-16E A-S BSW
Driveshaft Code:	D	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	AJ - DIESEL FUEL CAPABILITY		

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	T/C - T/C
ESP Coverage(Miles):	*	Emission Cert Type:	*
ESP Coverage(Time):	*	Emission Decal Suffix:	HML
ESP Plan Year:	*	Engine Family:	*
ESP Signature Date:			

Any comments? You can contact *webmaster*

27

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FTNX21F41EC53553	Veh Line:	T/F7 - F250HD/350/450/550 [99-02]	Eng Serial No:	1600605
Model Year:	2001	Market Derived:	* - [N/A]	Body Shell:	*
Veh Type:	T	Drive Code:	T/B - 4 WHL L/H PART TIME DRIVE	Engine:	T/DS - NAVISTAR 7.3L OHV DI TC V8
Inv. Dealer:	08570	Body Cab Style:	T/BD - SUPER SINGLE CAB (SUPER CAB)	Transmission:	T/VF - 6 SPD MAN TRANS 2/F MSH[D-(
		Version/Series:	T/BD - 250 SERIES		

BUILD INFORMATION:

Region:	NA - ##########	Plant:	A1 - KENTUCKY TRUCK PLANT BUILD
Country:	USA - ##########	Prod Date:	06-MAR-2001

SALE INFORMATION:

Region:	NA - ##########	Selling Dealer:	174469 - *
Country:	USA - ##########	Selling Dlr St/Prov:	OR
		Buyer St/Prov:	OR

Arrival Date:	16-MAR-2001	Red Carpet Lease:	*	
Sale Date:	08-JUN-2001	Fleet/Retail/Co. Lease:	R	
Warranty Start Date:	08-JUN-2001	Modified Vehicle:	*	
Orig Warranty Date:	08-JUN-2001	Reacquired Vehicle:	*	Vehicle Export Flag: N

VOC/EOC:

```
---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

A211EC53553150J6 L 1EG 1501059      EB EB  5C1EXLAN1B2 27 E E CN E  7404E9540  FM   KMC3          P

1F730A7        450A E F6C2
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	5E	GVW Class Code:	N
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	EGAJB - 3.73 FINAL DRIVE RATIO	Mirror(Driver Side):	* - [N/A]
Axle Type:	EGJAC - LIMITED SLIP REAR AXLE	Mirror(Psngr Side):	* - [N/A]
Battery Amp Rating:	BA	Paint:	FNFIA - MED. TOREADOR C/C
Brake Code:	FEAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AP - ELECTRONIC AM/FM/STRO/CLOCK
Calibration Code:	1F729Q8A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Single Tandem Axle:	* - [N/A]
Color(Trim):	00IZV -	Tire Brand:	* - [N/A]
Delivery Type:	0	Tire Size:	D3JHB - LT235/85R-16E BSW A-T
Driveshaft Code:	D	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	AJ - DIESEL FUEL CAPABILITY		

E062-827-C 3719

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LL	*	RL	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	K	Emission Code:	T/B - T/B
ESP Coverage(Miles):	100	Emission Cert Type:	*
ESP Coverage(Time):	060	Emission Decal Suffix:	*
ESP Plan Year:	2001	Engine Family:	*
ESP Signature Date:	08-JUN-2001		

Any comments? You can contact

webmaster

EA02-027-C 3711

Vehicle Information Report

28

GENERAL VEHICLE INFORMATION:

(Related Claims)

VIN:	1FTSW31F51EA11205	Veh Line:	T/F7 - F250HD/350/450/550 [99-02]	Eng Serial No:	1422854F
Model Year:	2001	Market Derivatv:	* - [N/A]	Body Shell:	*
Veh Type:	T	Drive Code:	T/E - 4 WHL L/H PART TIME DRIVE	Engine:	T/DS - NAVISTAR 7.3L OHV DI TC V8 DSL
Inv. Dealer:	02707	Body Cab Style:	T/BC - DOUBLE CAB (CREW CAB)	Transmission:	T/DS - 4 SP AUTO 4R100 (DIESEL APPLI)
		Version/Series:	T/CD - 350 SERIES		

BUILD INFORMATION:

Region: NA - ######### Plant: A1 - KENTUCKY TRUCK PLANT BUILD
Country: USA - ######### Prod Date: 12-AUG-2000

SALE INFORMATION:

Region:	NA - #########	Selling Dealer:	148050 - *
Country:	USA - #########	Selling Dlr St/Prov:	MI
		Buyer St/Prov:	MI
Arrival Date:	17-AUG-2000	Red Carpet Lease:	*
Sale Date:	20-OCT-2000	Fleet/Retail/Co. Lease:	R
Warranty Start Date:	20-OCT-2000	Modified Vehicle:	*
Orig Warranty Date:	20-OCT-2000	Reacquired Vehicle:	* Vehicle Export Flag N

VOC/EOC:

```
--------1---------2---------3---------4---------5---------6---------7---------8---------9---------

W5110A312051563  X 33A 3162970      OF XX 350lxdx Sxqqy 210   AX X  4AE5087S20A81   X XXA 4 6    F

1F8S5 4 X      614A  FXXX                              1
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	8E	GVW Class Code:	3
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	BGAFB - 3.73 FINAL DRIVE RATIO	Mirror(Driver Side):	* - [N/A]
Axle Type:	BGJAC - LIMITED SLIP REAR AXLE	Mirror(Passgr Side):	* - [N/A]
Battery Amp Rating:	BA	Paint:	PNYW5 - OXFORD WHITE WB C/C-W/B
Brake Code:	FBAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	MJ - AM/FM STRO/CD CHANGER/CLK
Calibration Code:	1F71950A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Snow Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Brand:	AC - FIRESTONE
Delivery Type:	A	Tire Size:	D3/YK - LT265/75R-16E OWL A-T BSW
Driveshaft Code:	D	Traction Control:	* - [N/A]
Front Seats:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	AJ - DIESEL FUEL CAPABILITY		

ER02-027-C 3712

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	T/B - T/B
ESP Coverage(Miles):	*	Emission Cert Type:	*
ESP Coverage(Time):	*	Emission Decal Suffix:	*
ESP Plan Year:	*	Engine Family:	*
ESP Signature Date:			

Any comments? You can contact

webmaster

Vehicle Information Report

27

GENERAL VEHICLE INFORMATION:

(Related Claims)

VIN:	1FTSX31F71EB16352	Veh Line:	T/F7 - F250HD/350/450/550 [99-02]	Eng Serial No:	1510294F
Model Year:	2001	Market Derivative:	* - [N/A]	Body Shell:	*
Veh Type:	T	Drive Code:	T/E - 4 WHL L/H PART TIME DRIVE	Engine:	T/DS - NAVISTAR 7.3L OHV DI TC V8 I
Inv. Dealer:	01741	Body Cab Style:	T/BD - SUPER SINGLE CAB (SUPER CAB)	Transmission:	T/D6 - 4 SP AUTO 4R100 (DIESEL APPL
		Version/Series:	T/CD - 350 SERIES		

BUILD INFORMATION:

Region:	NA - #########	Plant:	A1 - KENTUCKY TRUCK PLANT BUILD
Country:	USA - #########	Prod Date:	03-NOV-2000

SALE INFORMATION:

Region:	NA - #########	Selling Dealer:	124476 - *
Country:	USA - #########	Selling Dlr St/Prov:	FL
		Buyer St/Prov:	FL

Arrival Date:	16-NOV-2000	Red Carpet Lease:	*	
Sale Date:	06-MAR-2001	Fleet/Retail/Co. Lease:	R	
Warranty Start Date:	06-MAR-2001	Modified Vehicle:	*	
Orig Warranty Date:	06-MAR-2001	Reacquired Vehicle:	*	Vehicle Export Flag: N

VOC/EOC:

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---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

[illegible]

[illegible]
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	8E	GVW Class Code:	8
Audio Disc:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	BOAB - 3.73 FINAL DRIVE RATIO	Mirror(Driver Side):	* - [N/A]
Axle Type:	BGJAB - NON-LIMITED SLIP REAR AXLE	Mirror(Psngr Side):	* - [N/A]
Battery Amp Rating:	8A	Paint:	FNNLW -
Brake Code:	FBAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	BB - ELETR PREM STRO/CSTM/D[B]C/CLK
Calibration Code:	1F71980A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Susp Tandem Axle:	* - [N/A]
Color(Trim):	00ZEV -	Tire Brand:	AC - FIRESTONE
Delivery Type:	0	Tire Size:	D5/YK - LT265/75R-16E OWL A-T B8W
Driveshaft Code:	D	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	AJ - DIESEL FUEL CAPABILITY		

5002-027-C 3714

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	T78 - T78
ESP Coverage(Miles):	*	Emission Cert Type:	*
ESP Coverage(Time):	*	Emission Decal Suffix:	*
ESP Plan Year:	*	Engine Family:	*
ESP Signature Date:			

Any comments? You can contact *webmaster*

EA02-027-C 3715

Vehicle Information Report

30

GENERAL VEHICLE INFORMATION:

(Related Claims)

VIN:	1FTWF33F41EA10402	Veh Line:	T/F7 - F250HD/350/450/550 (99-02)	Eng Serial No:	1437311F
Model Year:	2001	Market Derivative:	* - [N/A]	Body Shell:	*
Veh Type:	T	Drive Code:	T/E - 4 WHL L/H PART TIME DRIVE	Engine:	T/DS - NAVISTAR 7.3L OHV DI TC V8 DSL
Inv. Dealer:	03565	Body Cab Style:	T/BR - SINGLE CAB (REGULAR CAB)	Transmission:	T/D6 - 4 SP AUTO 4R100 (DIESEL APPL)
		Version/Series:	T/CD - 350 SERIES		

BUILD INFORMATION:

Region: NA - ########## Plant: A1 - KENTUCKY TRUCK PLANT BUILD

Country: USA - ########## Prod Date: 14-AUG-2000

SALE INFORMATION:

Region: NA - ########## Selling Dealer: 123052 - *

Country: USA - ########## Selling Dlr St/Prov: KY

Buyer St/Prov: KY

Arrival Date:	25-AUG-2000	Red Carpet Lease:	*
Sale Date:	02-DEC-2000	Fleet/Retail/Co. Lease:	R
Warranty Start Date:	02-DEC-2000	Modified Vehicle:	*
Orig Warranty Date:	02-DEC-2000	Reacquired Vehicle:	* Vehicle Export Flag: N

VOC/EOC:

---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

[illegible]

[illegible]

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	4E	GVW Class Code:	W
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	* - [N/A]
Axle Type:	* - [N/A]	Mirror(Psngr Side):	* - [N/A]
Battery Amp Rating:	BA	Paint:	PN/JA - MED. TORRADOR C/C
Brake Code:	FEAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	8E - ELETR PREM STEO/CSTE/DISC/CLK
Calibration Code:	1P71950A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Susp. Tandem Axle:	* - [N/A]
Color(Trim):	D0ZV -	Tire Brand:	AD - GENERAL
Delivery Type:	E	Tire Size:	D3R/C - LT235/85R-16E BSW A-S
Driveshaft Code:	D	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	AJ - DIESEL FUEL CAPABILITY		

EA02-027-C 3718

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	T/B - T/B
ESP Coverage(Miles):	*	Emission Cert Type:	*
ESP Coverage(Time):	*	Emission Decal Suffix:	*
ESP Plan Year:	*	Engine Family:	*
ESP Signature Date			

Any comments? You can contact

webmaster

EA02-027-C 3717

Vehicle Information Report

#31

GENERAL VEHICLE INFORMATION:

(Related Claims)

VIN:	1FTWW32F51ED72384	Veh Line:	T/F7 - F250HD/350/450/550 [99-02]	Eng Serial No:	1698278
Model Year:	2001	Market Derivat:	* - [N/A]	Body Shell:	*
Veh Type:	T	Drive Code:	T/B - 2 WHL L/H REAR DRIVE	Engine:	T/DS - NAVISTAR 7.3L OHV DI TC V8 DSL
Inv. Dealer:	01771	Body Cab Style:	T/BC - DOUBLE CAB (CREW CAB)	Transmission:	T/D8 - 4 SP AUTO 4R100 (DIESEL APPLI)
		Version/Series:	T/CD - 350 SERIES		

BUILD INFORMATION:

Region:	NA - #########	Plant:	A1 - KENTUCKY TRUCK PLANT BUILD
Country:	USA - #########	Prod Date:	21-JUN-2001

SALE INFORMATION:

Region:	NA - #########	Selling Dealer:	152803 - *
Country:	USA - #########	Selling Dlr St/Prov:	OK
		Buyer St/Prov:	OK
Arrival Date:	02-JUL-2001	Red Carpet Lease:	*
Sale Date:	09-AUG-2001	Fleet/Retail/Co. Lease:	R
Warranty Start Date:	09-AUG-2001	Modified Vehicle:	*
Orig Warranty Date:	09-AUG-2001	Reacquired Vehicle:	* Vehicle Export Flag N

VOC/EOC:

---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

M2120723441733 C 2 0388195 30 3N 3101a36L40V32 2x20 St 3 5301035S1 85 3 330 4 6 F

1FTW3 3 X 627A 0760X

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	IB	GVW Class Code:	W
Audio Disc:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	* - [N/A]
Axle Type:	* - [N/A]	Mirror(Psngr Side):	* - [N/A]
Battery Amp Rating:	BA	Paint:	PNAKT - HARVEST GOLD W/B
Brake Code:	FBAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	8E - ELSTR PREM STRO/CSTE/DISC/CLK
Calibration Code:	1F71980A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Bogie Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Brand:	* - [N/A]
Delivery Type:	#	Tire Size:	D3UUQ - LT235/85R-16E OWL A-S BSW
Driveshaft Code:	D	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	AJ - DIESEL FUEL CAPABILITY		

ER02-027-C 3718

TIRE DOT INFORMATION:

LF:	AD0RUC1901	RF:	AD0RUC????
LR:	AD0RUC1901	RR:	AD0RUC1901
LI:	AD0RUC2201	RI:	AD0RUC2201
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	K	Emission Code:	T/B - T/B
ESP Coverage(Miles):	100	Emission Cert Type:	*
ESP Coverage(Time):	036	Emission Decal Suffix:	*
ESP Plan Year:	2001	Engine Family:	*
ESP Signature Date:	09-AUG-2001		

Any comments? You can contact *webmaster*

ER02-027-C 3710

#32

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	3FTSW31F51MA61672	Veh Line:	T/F7 - F250HD/350/450/550 [99-02]	Eng Serial No:	55016753
Model Year:	2001	Market Derived:	* - [N/A]	Body Stall:	*
Veh Type:	T	Drive Code:	T/E - 4 WHL L/H PART TIME DRIVE	Engine:	T/D6 - NAVISTAR 7.3L OHV DI TC V8 DSL
Inv. Dealer:	04437	Body Cab Style:	T/BC - DOUBLE CAB (CREW CAB)	Transmission:	T/D8 - 4 SP AUTO 4R100 (DIESEL APPL)
		Version/Series:	T/CD - 350 SERIES		

BUILD INFORMATION:

Region: NA - ######### Plant: A2 - CUAUTITLAN PLANT BUILD
Country: MEX - ######### Prod Date: 04-APR-2001

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 151302 - *
Country: USA - ######### Selling Dlr St/Prov: TX
Buyer St/Prov: TX

Arrival Date:	13-APR-2001	Red Carpet Lease:	*
Sale Date:	20-APR-2001	Fleet/Retail/Co. Lease:	R
Warranty Start Date:	20-APR-2001	Modified Vehicle:	*
Orig Warranty Date:	20-APR-2001	Reacquired Vehicle:	* Vehicle Export Flag: N

VOC/EOC:

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---------1---------2---------3---------4---------5---------6---------7---------8---------9--------

W31[illegible]  X 331 [illegible]     [illegible]

3PT85 0 N     616A [illegible]                    1
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	03	GVW Class Code:	5
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	BGAIB - 3.73 FINAL DRIVE RATIO	Mirror(Driver Side):	* - [N/A]
Axle Type:	BGIAC - LIMITED SLIP REAR AXLE	Mirror(Pass Side):	* - [N/A]
Battery Amp Rating:	BA	Paint:	PNART - HARVEST GOLD W/B
Brake Code:	FBAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	BH - ELETR PREM STRO/CSTE/DISC/CLK
Calibration Code:	1F71956A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Susp Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Brand:	AC - FIRESTONE
Delivery Type:	0	Tire Size:	DSJYP - LT265/75R-16E A-S BSW
Driveshaft Code:	D	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	AJ - DIESEL FUEL CAPABILITY		

E002-027-C 3728

TIRE DOT INFORMATION:

LF:	VNW81XM0901	RF:	VNW81XM0901
LR:	*	RR:	VNW81XM0901
LI:	*	RI:	VNW81XM0901
SPARE:	VNW81XM0401		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	T/B - T/B
ESP Coverage(Miles):	*	Emission Cert Type:	*
ESP Coverage(Time):	*	Emission Decal Suffix:	*
ESP Plan Year:	*	Engine Family:	*
ESP Signature Date:			

Any comments? You can contact

webmaster

E002-027-C 3721

Freeland, Mark (M.)

From:	Dan Rothweiler [DRothwei@mazdausa.com]
Sent:	Friday, March 08, 2002 3:24 PM
To:	'Freeland, Mark (M.)'
Cc:	Steven Limtiaco; 'Don Altoonian'
Subject:	DPFE sensor evaluation

Mark, I received today 4 DPFE's from 2 different Tributes from New Hampshire.

2 of them are off of Customer Accetta VIN # 4F2CU081X1KM06730. They are the most recent 2 replacements of 4 total. Copies of the RO's are included with the parts.

Here is the text from the hotline file.

```
S20CCM1              HOTLINE RECORD (REVIEW1)            03/08/02
12:10:42
P296                                                          NOEP137

Hotline Ref No.: 0250034  Status: SG SUGGESTED     Customer Contacts:  2

PQI Ref No.....:          Caller: MANNY                  Time Zone: ET

Job Code.......: D331        TECHNICIAN                  Branded..: N

Location.......: 51516  TULLEY MAZDA         Phone: 603 888 - 0550 Ext:

VIN............: 4F2CU081X1KM06730  MDL/YR: TRX  ES  A  /01  Prod Dt:
09/11/00
Repair Mileage.: 23858  Cust: ACCETTA, JUNE                In Srvc:
10/24/00
Hotline Subject: 1/10 BK MIL ON P-0401

Category Code..: F    FUEL AND EMISSION

Symptom Codes..: 620  DOES NOT TURN OFF/NA        640  IMPROPER OPERATION

Condition Codes: 401  DTC                         402  DTC


Symptom Freq...: C    CONSTANT                    C    CONSTANT

Did you duplicate symptoms?: Y (Y or N)  Number of Repair Attempts:  3

Describe Symptoms and Conditions:

MIL ON P-0401

S20CDM1              HOTLINE RECORD (REVIEW2)            03/08/02
12:12:57
P296                                                          NOEP137

Hotline Ref No.: 0250034  Status: SG SUGGESTED   MDL/YR: TRX  ES  A  /01
```


ER02-027-C 3736

PQI Ref No.....:   Caller: MANNY

Location.......: 51516 TULLEY MAZDA   Phone: 603 888 - 0550 Ext:

Hotline Subject: 1/10 BK MIL ON P-0401

RI No for prior repair attempts:

Describe attempted repairs.....:

THIS THE THIRD TIME BACK WITH THIS CODE, REPAIR SEEMS TO BE EFFECTIVE FOR FOUR MONTHS. WATER WAS FOUND INSIDE SENSOR.

RI Ref No	Suggested Repairs	Try	Eff
0003529	P0401/P0402 - MIL ON DUE TO DPFE SENSORS		

S20CEM1   HOTLINE RECORD (REVIEW3)   03/08/02
12:13:28
P296   NOEP137

Hotline Ref No.: 0250034 Status: SG SUGGESTED MDL/YR: TRX ES A /01

PQI Ref No.....:   Caller: MANNY

Location.......: 51516 TULLEY MAZDA   Phone: 603 888 - 0550 Ext:

Hotline Subject: 1/10 BK MIL ON P-0401

Other suggested repairs:

REPLACE DPFE SENSOR.

Callback Date..........:

Entered By: KULP   01/10/02   Last Rev By: KULP   01/10/02

The 2nd set of 2 is off of another Tribute customer Hammond that had 2 DPFE replacements. VIN # 4F2CU081X1KM42319. This Tribute we don't have any hotline information on but the RO's are included as well.

I need an address to send these parts to you so if you can get it to me soon I will ship them to you.

Thanks,

Daniel H. Rothweiler
Mazda North American Operations
Fixed Operations Technical Specialist
Office: 732-868-2135

Fax: 214-442-5222
Cellular: 732-547-8578

Freeland, Mark (M.)

From:	Thomas, Ken (K.C.)
Sent:	Wednesday, February 06, 2002 11:36 AM
To:	Freeland, Mark (M.)
Subject:	Failed DPFE

On or about October 24th I was given a returned failed DPFE from the field. I installed this part on one of my 2002 1PP vehicles (576W845). After installing it on the vehicle I proceeded to evaluate it for drivability and any service codes. On the first trip out I could tell that in its state of failure the EEC was commanding full EGR flow though the system, due to heavy surge at road load speeds. On my drive home at the end of the day the "check engine" light came on (P0401) insufficient EGR flow.

The next morning after I drove about 7 miles at about 40-50 mph I came to a stop. I immediately did a quick accel (traffic) and the vehicle quit so I coasted off to the side of the road. After putting the selector in neutral I tried to do a restart but got nothing. The odo was all dashes and a no crank condition was observed. I got out of the vehicle and opened the hood and disconnected the DPFE, the vehicle would then crank and start. The vehicle was driven into work with the sensor disconnected.

Since that day the vehicle has been returned to the original production part and no reoccurrences have been noted.

That part was supplied to the OBD group along with a vehicle only to have no repeats, from there it went to Kavlico.

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FAHP34351W146704	Veh Line:	C/AK - FOCUS (CW170) [99-02]	Eng Serial No:	*
Model Year:	2001	Market Derived:	C/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	C	Drive Code:	C/A - 2 WHL L/H FRONT DRIVE	Engine:	C/EQ - ZETEC 2.0L DOHC SR
Inv. Dealer:	A7053	Body Cab Style:	C/FC - 4 DOOR SEDAN-4 LITE	Transmission:	C/D2 - 4-SPD AUTO TRANS 4
		Version/Series:	C/DF - SERIES 30		

BUILD INFORMATION:

Region: NA - ######### Plant: AZ - WAYNE PLANT BUILD
Country: USA - ######### Prod Date: 05-OCT-2000

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 487031 - *
Country: CAN - ######### Selling Dlr St/Prov: BC
Buyer St/Prov: BC

Arrival Date:	19-OCT-2000	Red Carpet Lease:	*		
Sale Date:	20-OCT-2000	Fleet/Retail/Co. Lease:	R		
Warranty Start Date:	20-OCT-2000	Modified Vehicle:	*		
Orig Warranty Date:	20-OCT-2000	Reacquired Vehicle:	*	Vehicle Export Flag:	N

VOC/EOC:

```
---------1---------2---------3---------4---------5---------6---------7---------8---------9---------0
[illegible]  8  2 [illegible]  [illegible]  1  AT0453  [illegible]  [illegible]  21
[illegible] 3  A010  7 [illegible]  1N
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	C/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	A	GVW Class Code:	H
Audio Disk:	* - [N/A]	Instrumentation:	AJ - HIGH SERIES ANALOG CLUSTER
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	* - [N/A]	Mirror(Psngr Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	58	Paint:	FN23F - SILVER FROST C/C
Brake Code:	FBAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	8Q -
Calibration Code:	1AK1AZ8A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Susp Tandem Axle:	* - [N/A]
Color(Trim):	00082 -	Tire Manufacturer:	AC - FIRESTONE
Delivery Type:	0	Tire Brand:	* - *
Driveshaft Code:	*	Tire Size:	D3IAQ - 205/50VR-16 BSW RUN FLAT
Front Seat:	* - [N/A]	Traction Control:	* - [N/A]
Fuel Type:	* - [N/A]	Wheel Base:	* - [N/A]

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*	DOT Plant Manufacturer:	* - *

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	•	Emission Code:	C/D - C/D
ESP Coverage(Miles):	•	Emission Cert Type:	5
ESP Coverage(Time):	•	Emission Decal Suffix:	HLG
ESP Plan Year:	•	Engine Family:	1FMXV020VF3
ESP Signature Date:			

Any comments? You can contact

webmaster

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FAFP40411F139123	Veh Line:	C/Z8 - MUSTANG (SN95) [94-03]	Eng Serial No:	*
Model Year:	2001	Market Derived:	C/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	C	Drive Code:	C/B - 2 WHL L/H REAR DRIVE	Engine:	C/LM - 3.8L OHV EFI NA V6 GAS
Inv. Dealer:	03082	Body Cab Style:	C/BJ - 2 DOOR COUPE-4 LITE	Transmission:	C/DU - 4 SPD AUTO TR NAAO A
		Version/Series:	C/AB - BASE VERSION - CAR		

BUILD INFORMATION:

Region: NA - ######### Plant: AF - DEARBORN PLANT BUILD

Country: USA - ######### Prod Date: 12-DEC-2000

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 121476 - *

Country: USA - ######### Selling Dlr St/Prov: GA

Buyer St/Prov: *

Arrival Date:	26-DEC-2000	Red Carpet Lease:	*
Sale Date:	13-FEB-2001	Fleet/Retail/Co. Lease:	R
Warranty Start Date:	13-FEB-2001	Modified Vehicle:	*
Orig Warranty Date:	13-FEB-2001	Reacquired Vehicle:	* Vehicle Export Flag: N

VOC/EOC:

```
---------1---------2---------3---------4---------5---------6---------7---------8---------9---------0
P401F139123RR        A2 Q5L100S       3F E   Q8S J2  5     RR      A       218476  4  YR      9W 1       41
PAF1 5 2       110A  400A                                      4
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	C/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	V6	GVW Class Code:	F
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	EGABC - 3.27 FINAL DRIVE RATIO	Mirror(Driver Side):	* - [N/A]
Axle Type:	EGJAB - NON-LIMITED SLIP REAR AXLE	Mirror(Psngr Side):	* - [N/A]
Battery Amp Rating:	MF	Paint:	PN2JC - SILVER MET C/C #2
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	FB - CDX6+ RADIO WITH 6 DISC CHGR
Calibration Code:	1Z813FOA	Sound System:	AH - SUBWOOFER/AMP. SOUND SYSTEM
Color(Accent):	* - [N/A]	Susp Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Manufacturer:	AF - DUNLOP TIRE
Delivery Type:	0	Tire Brand:	* - *
Driveshaft Code:	*	Tire Size:	D3GQ6 - 205/65TR-15 BSW
Front Seat:	* - [N/A]	Traction Control:	* - [N/A]
Fuel Type:	* - [N/A]	Wheel Base:	* - [N/A]

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*	DOT Plant Manufacturer:	* - *

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	• Emission Code: C/S - C/S
ESP Coverage(Miles):	• Emission Cert Type: F
ESP Coverage(Time):	• Emission Decal Suffix: H7J
ESP Plan Years:	• Engine Family: 1FMXV038VFA
ESP Signature Date:	

Any comments? You can contact

webmaster

AWS Online Reports

1. Vehicle Information Report | 2. Detail Claims List | 3. Reacquired Vehicle Repair Report | 4. Traceability

Vehicle Information Report :

Choose the Server: AWS 2.X Production

Model Year: 2001

Vin Code: 1FAFP40411F139123

(Reset Form)

Detailed Claim Information :

Choose the Server: AWS 2.X Production

Model Year: 1999

Claim Key:

(Reset Form)

Reacquired Vehicle Repair Report:

Choose the Server: AWS 2.X Production

VIN Code (US VIN only):

(Reset Form)

Traceability :

Choose the Server: AWS 2.X Production

Component Type: EN **Model Year:** Any **Serial Number*:**

***(use wildcards _ to match 1 character or % to match any sequence of characters)**

Submit Reset (Reset Form)

OR

Find Serial numbers for a given Vin

Vin Cd*:

***(use wildcards _ to match 1 character or % to match any sequence of characters)**

---

1. Vehicle Information Report | 2. Detail Claims List | 3. Reacquired Vehicle Repair Report | 4. Traceability

This site has been accessed times since May 18, 2001

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FAFP4049 1F136843	Veh Line:	C/ZB - MUSTANG (EN95) [94-03]	Eng Serial No:	*
Model Year:	2001	Market Derivat:	C/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	C	Drive Code:	C/B - 2 WHL L/H REAR DRIVE	Engine:	C/L4 - 3.8L OHV EFI NA V6 GAS
Inv. Dealer:	08845	Body Cab Style:	C/BJ - 2 DOOR COUPE-4 LITE	Transmission:	C/DU - 4 SPD AUTO TR NAAO A
		Version/Series:	C/AE - BASE VERSION - CAR		

BUILD INFORMATION:

Region: NA - ######### Plant: AF - DEARBORN PLANT BUILD
Country: USA - ######### Prod Date: 29-NOV-2000

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 111046 - *
Country: USA - ######### Selling Dlr St/Prov: MA
Buyer St/Prov: MA

Arrival Date:	10-DEC-2000	Red Carpet Lease:	*
Sale Date:	21-FEB-2001	Fleet/Retail/Co. Lease:	R
Warranty Start Date:	21-FEB-2001	Modified Vehicle:	*
Orig Warranty Date:	21-FEB-2001	Reacquired Vehicle:	* Vehicle Export Flag: N

VOC/EOC:

```
---------1---------2---------3---------4---------5---------6---------7---------8---------9---------0
P401F136843         5 0213442     PK E 2 UKS 32      E8     A     111046  4  V8     92 3       41
FAF9 4 1      180A 94DHA                              4
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	C/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	V6	GVW Class Code:	F
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	EGABC - 3.27 FINAL DRIVE RATIO	Mirror(Driver Side):	* - [N/A]
Axle Type:	EGJAB - NON-LIMITED SLIP REAR AXLE	Mirror(Psngr Side):	* - [N/A]
Battery Amp Rating:	MO	Paint:	PNZJC - SILVER MET C/C #2
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	ML - AM/FM CD CHGR/MULTI MEDIA
Calibration Code:	1ZEI3P0A	Sound System:	AB - PREMIUM SOUND SYSTEM
Color(Accent):	* - [N/A]	Susp Tandem Axle:	* - [N/A]
Color(Trim):	000ZY -	Tire Manufacturer:	AF - DUNLOP TIRE
Delivery Type:	0	Tire Brand:	* - *
Driveshaft Code:	*	Tire Size:	DXQQ6 - 205/65TR-15 BSW
Front Seat:	C/A - SEAT-SPORT-DRV/PASS	Traction Control:	* - [N/A]
Fuel Type:	* - [N/A]	Wheel Base:	* - [N/A]

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LL:	*	RL:	*
SPARE:	*	DOT Plant Manufacturer:	* - *

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	•	Emission Code:	C/C - C/C
ESP Coverage(Miles):	•	Emission Cert Type:	5
ESP Coverage(Time):	•	Emission Decal Suffix	HTO
ESP Plan Year:	•	Engine Family:	1FMXV03EVH5
ESP Signature Date:			

Any comments? You can contact

webmaster

PAUL PLANTE
- JIM MAURER - FREEMAN GATES.

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FAFP34391W123439	Veh Line:	C/AK - FOCUS (CW170) [99-02]	Eng Serial No:	*
Model Year:	2001	Market Derived:	C/P - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	C	Drive Code:	C/A - 2 WHL L/H FRONT DRIVE	Engine:	C/BQ - ZETEC 2.0L DOHC EF
Inv. Dealer:	07730	Body Cab Style:	C/FC - 4 DOOR SEDAN-4 LITE	Transmission:	C/DG - 4-SPD AUTO TRANS 4
		Version/Series:	C/DE - SERIES 23		

BUILD INFORMATION:

Region: NA - ######### Plant: AZ - WAYNE PLANT BUILD
Country: USA - ######### Prod Date: 13-SEP-2000

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 172420 - *
Country: USA - ######### Selling Dlr St/Prov: CA
Buyer St/Prov: CA

Arrival Date: 28-SEP-2000 Red Carpet Lease: *
Sale Date: 08-OCT-2000 Fleet/Retail/Co. Lease: R
Warranty Start Date: 08-OCT-2000 Modified Vehicle: *
Orig Warranty Date: 08-OCT-2000 Reacquired Vehicle: * Vehicle Report Flag: N

VOC/EOC:

---------1---------2---------3---------4---------5---------6---------7---------8---------9---------0
[illegible] 4 2 [illegible] BP 3 [illegible] 7 [illegible] 9 72PA20 2 [illegible] [illegible] 31
[illegible] 6 [illegible] Y 1X

INSTALLED OPTION INFORMATION:

Air Conditioning:	C/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	A	GVW Class Code:	F
Audio Disk:	* - [N/A]	Instrumentation:	AJ - HIGH SERIES ANALOG CLUSTER
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	* - [N/A]	Mirror(Pass Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	68	Paint:	PNZJP - SILVER FROST C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	BQ -
Calibration Code:	LAK1A2UA	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Single Tandem Axle:	* - [N/A]
Color(Trim):	0000Z -	Tire Manufacturer:	CC -
Delivery Type:	0	Tire Brand:	* -
Driveshaft Code:	*	Tire Size:	D5GNY - 195/60R15-8 BSW
Front Seat:	* - [N/A]	Traction Control:	* - [N/A]
Fuel Type:	* - [N/A]	Wheel Base:	* - [N/A]

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*	DOT Plant Manufacturer:	* - *

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	• Emission Code:	C/C - C/C
ESP Coverage(Miles):	• Emission Cert Type:	C
ESP Coverage(Time):	• Emission Decal Suffix:	HMI
ESP Plan Years	• Engine Family:	1FMXV02EVJ2
ESP Signature Date:		

Any comments? You can contact

webmaster

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN: 1FMYU04121KB70274 | Veh Line: TM1 - ESCAPE (U204) [2001] | Eng Serial No: 911157067
Model Year: 2001 | Market Derivat: TIF - FORD DIVISION DERIVATIVE | Body Style: *
Veh Type: T | Drive Code: TIF - 4 WHL LH FULL TIME DRIVE | Engine: TALD - MOD 3.0L DOHC EFI NA V6 G*NAAO
Inv. Dealer: 07797 | Body Cab Style: TWD - 4 DOOR WAGON | Transmission: TDJ - 4 SPD AUTO TRANS NAAO CD4E
Version/Series: TBF - FORD SERIES

BUILD INFORMATION:

Region: NA - ######### Plant: AJ - KANSAS CITY PLANT BUILD
Country: USA - ######### Prod Date: 16-MAY-2001

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 172434 - *
Country: USA - ######### Selling Dlr St/Prov: CA
Buyer St/Prov: CA

Arrival Date: 31-MAY-2001 Red Carpet Lease: *
Sale Date: 07-JUL-2001 Fleet/Retail/Co. Lease: R
Warranty Start Date: 07-JUL-2001 Modified Vehicle: *
Orig Warranty Date: 07-JUL-2001 Reacquired Vehicle: * Vehicle Export Flag: N

VOC/EOC:

```
---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

0041KB70274102379 V 1 1924517      QC X 2 469 61  5K3  265 5 0K3ABV 72E014  1  ZD  A  12A 4 2 2  1

17WT9 #             14CA F
```

DPE STAFFER

EA02-027-C 3780

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/S - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	C	GVW Class Code:	Y
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	* - [N/A]	Mirror(Passg Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	A	Paint:	PNLDB - MEDIUM WEDGEWOOD C/C
Brake Code:	FEAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AQ - ELETR PREMIUM AM/FM STRO/CSTE
Calibration Code:	0M11A30A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Surge Tandem Axle:	* - [N/A]
Color(Trim):	00ZV -	Tire Brand:	* - [N/A]
Delivery Type:	0	Tire Size:	D3KU - P235/70R-16 OWL A-S
Driveshaft Code:	D	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	A3084531601	RF:	A3084531601
LR:	A3084531601	RR:	A3084531601
Lh:	*	Rh:	*
SPARE:	HY8A1R31601		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	P	Emission Code:	T/C - T/C
ESP Coverage(Miles):	100	Emission Cert Type:	5
ESP Coverage(Time):	072	Emission Decal Suffix:	HE1
ESP Plan Year:	2001	Engine Family:	1FMXT0304F6
ESP Signature Date:	07-JUL-2001		

Any comments? You can contact webmaster

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	4M2ZU66W22ZJ07635	Veh Line:	T/U5 - EXPLORER (U152) [01-02]	Eng Serial No:	*
Model Year:	2002	Market Derived:	T/M - L-M DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	T	Drive Code:	T/B - 2 WHL L/H REAR DRIVE	Engine:	T/VN - R-M 4.6L SOHC EFI N
Inv. Dealer:	8407K	Body Cab Style:	T/WD - 4 DOOR WAGON	Transmission:	T/TJ - 5 SPD AUTO TRANS N
		Version/Series:	T/EL - LINCOLN/MERCURY SERIES		

BUILD INFORMATION:

Region: NA - ######### Plant: AV - ST. LOUIS PLANT BUILD
Country: USA - ######### Prod Date: 04-APR-2001

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 38407K - *
Country: USA - ######### Selling Dlr St/Prov: MI
Buyer St/Prov: *

Arrival Date:	16-JUL-2001	Red Carpet Lease:	*	
Sale Date:	28-JUN-2001	Fleet/Retail/Co. Lease:	L	
Warranty Start Date:	16-JUL-2001	Modified Vehicle:	*	
Orig Warranty Date:	28-JUN-2001	Reacquired Vehicle:	*	Vehicle Export Flag: N

VOC/EOC:

```
----------1----------2----------3----------4----------5----------6----------7----------8----------9----------0
0463AT0743611437W4 G B 01C6815        9K E 29RD4 44Y  G    6RB      P C  364207RR 0VA7W4 HW8P  4N     W4
NG82 # H           9WKA     T                               4
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/G - DUAL ZONE AUTO TEMP CONTROL AC	GVW Code:	* - [N/A]
Alternator Amp Rating:	*	GVW Class Code:	Z
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	* - [N/A]
Axle Type:	* - [N/A]	Mirror(Psngr Side):	* - [N/A]
Battery Amp Rating:	BL	Paint:	PNFIA - MED. TORRADOR C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	BE - ELETR PREM STRO/CSTE/DISC/CLK
Calibration Code:	1U51A50A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Suspn Tandem Axle:	* - [N/A]
Color(Trim):	0008H -	Tire Manufacturer:	AG -
Delivery Type:	*	Tire Brand:	PD9LHMD -
Driveshaft Code:	D	Tire Size:	D3JYD - P245/70R-16 BSW A-S
Front Seat:	* - [N/A]	Traction Control:	* - [N/A]
Fuel Type:	* - [N/A]	Wheel Base:	* - [N/A]

TIRE DOT INFORMATION:

LF:	PD9LHMD1101	RF:	PD9LHMD1101
LR:	PD9LHMD1101	RR:	PD9LHMD1101
LI:	*	RI:	*
SPARE:	PD9LHMD1001	DOT Plant Manufacturer:	PD -

ESP INFORMATION: EMISSIONS INFORMATION:

ER02-027-C 3782

ESP Code:	•	**Emission Code:**	T/C - T/C
ESP Coverage(Miles):	•	**Emission Cert Type:**	1
ESP Coverage(Time):	•	**Emission Decal Suffix:**	JTD
ESP Plan Year:	•	**Engine Family:**	2FMXT0461P5
ESP Signature Date:			

Any comments? You can contact

webmaster

EA02-027-C 3753

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FMYU03131KA20661	Veh Line:	T/M1 - ESCAPE (U204) (2001)	Eng Serial No:	731486066
Model Year:	2001	Market Derived:	T/P - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	T	Drive Code:	T/A - 2 WHL L/H FRONT DRIVE	Engine:	T/LD - MOD 3.0L DOHC EFI NA
Inv. Dealer:	00103	Body Cab Style:	T/WD - 4 DOOR WAGON	Transmission:	T/DJ - 4 SPD AUTO TRANS NA.
		Version/Series:	T/EP - FORD SERIES		

BUILD INFORMATION:

Region: NA - ######### Plant: AJ - KANSAS CITY PLANT BUILD
Country: USA - ######### Prod Date: 03-JAN-2001

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 113095 - *
Country: USA - ######### Selling Dlr St/Prov: NY
Buyer St/Prov: NY

Arrival Date:	12-JAN-2001	Red Carpet Lease:	*
Sale Date:	16-JAN-2001	Fleet/Retail/Co. Lease:	R
Warranty Start Date:	16-JAN-2001	Modified Vehicle:	*
Orig Warranty Date:	16-JAN-2001	Reacquired Vehicle:	* Vehicle Export Flag: N

VOC/EOC:

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---------1---------2---------3---------4---------5---------6---------7---------8---------9---------0
0031xa30461103379  H 1 22L6017     QK 2 1 4N6 61  5 1  2I5 5 481Ab1 138095  4  UA  A  12A64 1 2  11
FMY3 4             914NY R                               58
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INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	C	GVW Class Code:	Y
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	* - [N/A]	Mirror(Psngr Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	A	Paint:	PNUAA - EBONY SOLID C/C
Brake Code:	PEAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AT - ELETR PREM AM/FM STRO/CSTE/CLK
Calibration Code:	0M11A30A	Sound System:	AB - AUDIOPHILE SOUND SYSTEM
Color(Accent):	* - [N/A]	Susp Tandem Axle:	* - [N/A]
Color(Trim):	000ZV -	Tire Manufacturer:	AB -
Delivery Type:	0	Tire Brand:	* -
Driveshaft Code:	D	Tire Size:	D3JJD - P235/70R-16 OWL A-S
Front Seat:	* - [N/A]	Traction Control:	* - [N/A]
Fuel Type:	* - [N/A]	Wheel Base:	* - [N/A]

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*	DOT Plant Manufacturer:	* - *

RSP INFORMATION: EMISSIONS INFORMATION:

E082-827-C 3754

ESP Code:	K	Emission Code:	T/C - T/C
ESP Coverage(Miles):	100	Emission Cert Type:	5
ESP Coverage(Time):	048	Emission Decal Suffix:	HMA
ESP Plan Year:	2001	Engine Family:	1FMXT0301F6
ESP Signature Date:	16-JAN-2001		

Any comments? You can contact

webmaster

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Microelectronics Reliability 39 (1999) 863–868

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New Latchup Mechanism in Complementary Bipolar Power ICs Triggered by Backside Die Attach Glue

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Abstract

It is shown that in complementary bipolar power ICs latchup can be caused by a thyristor formed by the V-PNP power transistor at the frontside of the die and a Ag-filled glue die attach at the backside of the die (used to provide a good thermal contact between the die and the Cu-heatsink. The thyristor is triggered by saturation of the V-PNP power transistors or by forward biasing the backside diode between Ag-filled glue and p-type silicon. The effect is strongly temperature dependent. It can be eliminated by either leaving the backside floating or by applying backside metallization. Consequences for latchup qualification testing are discussed.

1. Introduction

Latchup [1] is a known reliability risk in complementary bipolar power processes (featuring both vertical-PNP and vertical-NPN power transistors) as thyristors are intrinsically present in these technologies, see fig. 1 and 2. Furthermore complementary bipolar processes are more susceptible to latchup than CMOS processes as the presence of n- and p-type buried layers prevents the use of p^- epi/p^{++} low ohmic ($\approx$ 0.01 Ωcm) bulk epitaxial substrates. The thyristors are located at the frontside (top side) of the die, see fig. 1 and 2, and can be triggered by currents injected by both external spikes as well as by saturation of internal bipolar transistors. Note that in harsh automotive application environments these injection currents can be well over 1 A. Generally many design and layout measures are taken to prevent latch-up from occurring like the use of guardrings, limitation of bipolar transistor saturation currents and by grounding the substrate as good as possible. Because of the above, latch-up testing is a routine part of product qualification programs for complementary bipolar power ICs as e.g. required by the Automotive Electronic Council (AEC).

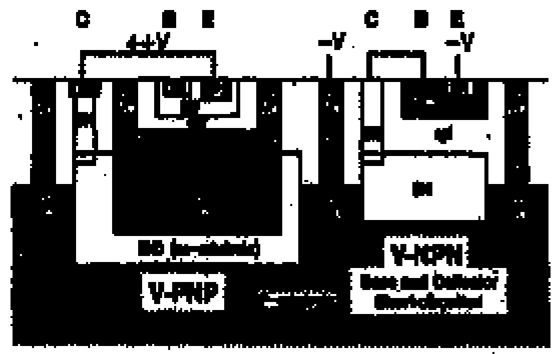

Fig. 1: Schematic view of a cross section of the complementary bipolar IC showing the V-PNP and V-NPN transistor.

Bipolar power ICs are often packaged in Single-In-Line (SIL) power packages where the low-doped p^--substrate is attached to a copper (Cu)-heatsink by a silver (Ag)-filled epoxy glue to achieve low thermal resistance values. In the application the Cu heatsink is generally contacted to the ground potential (just as the p^- substrate).

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PII: S0026-2714(99)00114-6

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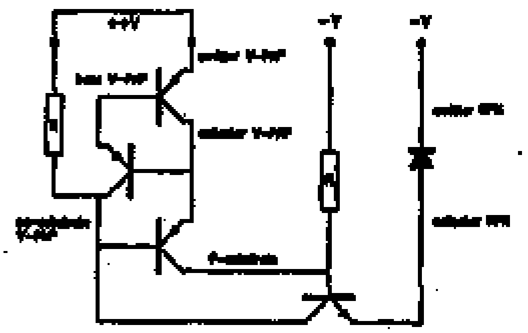

Fig. 2: Schematic view of an electrical scheme showing connections in fig. 1 between the various bipolar transistors forming a thyristor at the topside of the die.

In this paper we will show that this packaging method gives rise to a new latchup failure mechanism where latchup is not induced by triggering one of the known thyristors at the top side of the die but by triggering of an unexpectedly present parasitic thyristor located between the frontside and the (n-type) Ag-filled glue contacting the backside of the die, see fig. 3. The phenomenon will be described in more detail in the paper and options for its elimination will be presented. Consequences for qualification testing will be discussed.

2. Occurrence of a parasitic thyristor between frontside and backside of the die

The power ICs in our study are fabricated in a 2 µm double metal complementary bipolar process featuring both V-NPN and V-PNP power transistors. The transistors are build in a 10 µm thick, 2 Ωcm n-type epi layer on top of a 375 µm thick 4 Ωcm p-substrate. Isolation between different n^--epi islands is achieved by deep-P//buried-P (DP//BP) junction isolation. The base of the V-PNP transistor is formed by a N_{well} (NW) diffusion in the n^--epi layer and the transistor isolated from the p^- substrate by a deep buried-N (BND) diffusion, see fig. 3. The bipolar gains h_{fe} of the active V-PNP transistor T1 formed by the SP-(NW//n^--epi)-BP diffusions, the parasitic V-PNP transistor T3 formed by the BP-BND-p^--substrate and the parasitic V-NPN transistor T2 formed by the (NW//n^--epi)-BP-BND diffusions, see fig. 4, typically equal 60, 120 and 11 respectively at 25°C. At the end of the process all n-doped diffusion layers are removed from the backside of the die by a wet silicon etch using a SEZ spin etcher. The purpose of this is to eliminate unwanted pn-diodes that may be the source of minority carrier (electron) injection when the substrate potential is lifted e.g.due to saturation events of the V-PNP power transistor. These injected electrons may disturb the proper functioning of the circuit.

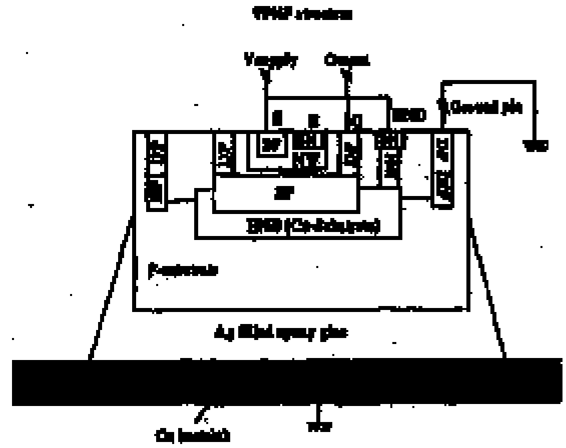

Fig. 3: Schematic view of a cross section of the complementary bipolar IC showing the V-PNP transistor as well as the Cu-heatsink and Ag-filled epoxy glue.

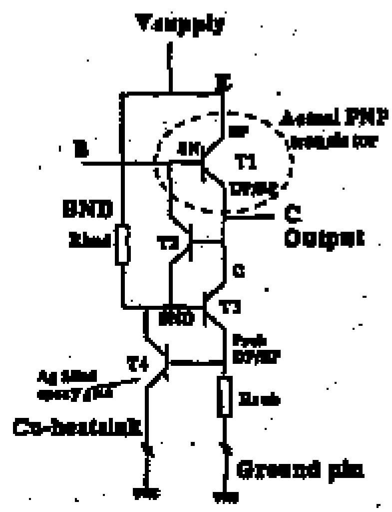

Fig. 4: Electrical scheme showing connections between the parasitic bipolar transistors, Cu-heatsink and Ag-filled epoxy glue that together form the thyristor between frontside and backside of the die.

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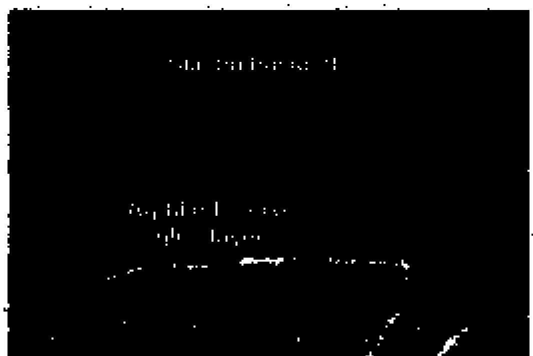
The ICs are subsequently packaged in a SIL-power package. Here the p^- substrate backside is attached to a Cu-heatsink by an epoxy glue containing Ag-fillers to achieve low thermal resistance values, see fig. 3 and 5.

(a)



(b)

Fig. 5: SEM cross section showing a) the backside of the die, the 6µm thick silver filled epoxy glue layer and the copper heatsink and b) in more detail the backside die - epoxy glue interface.

Unfortunately, it appears that this packaging method results in the formation of a diode between the n-type Ag-filled epoxy glue layer and the low doped p^- substrate, see fig. 4 and 6. Note that diode does not behave like a real Ag-Si Schottky diode. Fig. 6 shows that the diode forward voltage is >0.7V. Given the barrier height for an Ag to p-type silicon metal-semiconductor contact of 0.54 eV at 25°C [2], a good Ag-Si(p-type) Schottky diode should exhibit a much lower forward voltage than observed here. Furthermore, we find that the n-type Ag-filled glue layer also can act as the emitter of a parasitic NPN transistor (T4 in fig. 4) between the frontside and backside of the die where the the p^- substrate acts as the base and the deep buried-N (BND) isolation of the V-PNP transistor as collector, see fig. 4. Fig. 6 shows the bipolar gain of this transistor as a function of the emitter current for a small test structure. Despite the very thick base (≈ 375 µm), the NPN gain h_{fe} ranges from 10^{-4} to 10^{-2} at 25°C. Note that the h_{fe} scales with the collector area; in real circuits h_{fe} values up to 0.5 have been observed. Note that both the diode and the NPN characteristics are not well controlled as these are influenced by many parameters as e.g. the surface roughness of the backside of the silicon die, the thickness of native oxide layers on the silicon backside, the electron minority carrier lifetime in the p^- substrate, the thickness of the epoxy glue, the distribution and concentration of Ag-fillers in the epoxy glue. As a result, a large spread is observed in both the diode I(V) curves, see fig. 6, as well as the NPN current gain (h_{fe}) characteristics, see fig. 7, depending on the specific process flow. The fact that the NPN gain in fig. 7 increases with injected current is characteristic for metal-semiconductor junctions where the ratio of minority injection (electrons in this case) increases with current due to the enhancement of the drift-field component, which becomes much larger than the diffusion current [2].

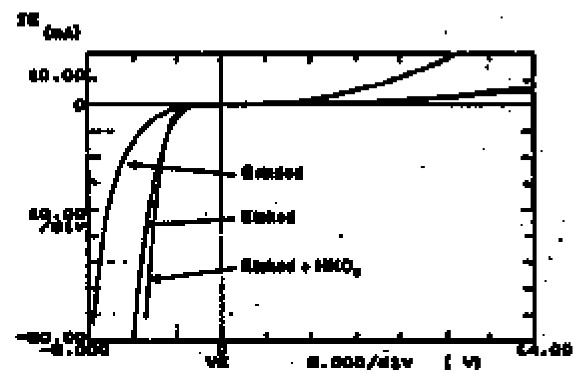


Fig. 6: I(V) characteristics at 25°C of the backside diode formed by the Ag-filled epoxy glue layer and the low doped p^--substrate for three different treatments of the backside of the wafer, a) grinded backside, b) wet etched backside and c) as b) but with an HNO_3 treatment resulting in a thicker native oxide layer on the wafer backside.

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As shown in fig. 4, the parasitic NPN transistor T4 forms in combination with the V-PNP transistor T1 a thyristor between the frontside and the backside of the die. As the parasitic V-PNP has high gain, the thyristor loop gain is larger than 1 and thus latchup can occur.

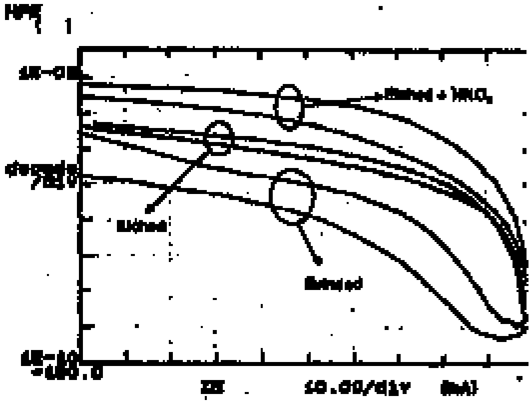


Fig. 7: Gain of the parasitic NPN transistor formed by the Ag-filled epoxy glue layer at the backside (emitter), p⁻ substrate (base) and BND-layer at the frontside (collector) as a function of the backside emitter current for the same treatments of the wafer backside as in fig. 6 (V_{base}=0V, $V_{collector}$=5V, T=25°C).

3. Latchup trigger mechanism

3.1 Backside current injection

One way to trigger the thyristor is by forcing the Cu-heatsink to a negative voltage and thus forward biasing the backside diode T4 and injecting electrons into the substrate. In table 1 typical trigger currents are shown for a typical product in this technology.

3.2 Saturation of V-PNP transistors

In a real automotive application, the thyristor can be triggered by severe saturation of the V-PNP power transistors. This occurs regularly during e.g. an engine start event of a car where the supply voltage can drop as low as 6V. In this case a large hole current is injected into the low doped p⁻-substrate resulting in a significant lifting of the substrate potential. Consequently, the backside diode T4 is forward biased and electrons are injected into the substrate and collected by the BND-layer, see fig. 3 and 4. This causes a voltage drop across R_{BND} which forces parasitic PNP transistor T3 to switch on. A current now flows from the emitter of the V-PNP power transistor T1 to the substrate via T3, causing a voltage drop across R_{sub}. When this voltage exceed the forward voltage of the backside diode, the parasitic NPN transistor T4 may remain conducting even when the V-PNP saturation event is over. Parasitic NPN transistor T2 then starts to operate in reverse and as a result the collector current of T4 will start to drive transistor T1 and a thyristor is being build-up.

Backside treatment Si wafer	Die attach	H_{fe} NPN T4	Backside latchup trigger current
Etched	Ag-filled epoxy	$0.8\cdot10^{-3}$	120 mA
Etched+ HNO3	Ag-filled epoxy	$3\text{-}7\cdot10^{-3}$	60 mA
Grinded	Ag-filled epoxy	$0.3\text{-}3\cdot10^{-3}$	130 mA
Etched	Ti/Ni/Ag backside metallization	$3\cdot10^{-6}$	>3 A

Table 1: Gain of the parasitic NPN T4 and latchup trigger current at 25°C for a typical product in case of injection from the backside diode for various treatments of the wafer backside as in fig. 6 and for various die attach materials.

The thyristor turns-on when the injected electron current from the backside diode $I_{backside}$ exceeds a certain trigger value I_{trig} while the back-tab is at 0V. The effect is strongly temperature dependent, see fig. 8, as both the saturation current of the V-PNP power transistors and the substrate resistivity increase with temperature resulting in an increased substrate potential lifting. In combination with the drop in backside diode forward voltage with temperature, this results in a strong increase of the current $I_{backside}$ injected by the backside diode. When it exceeds the latchup trigger current I_{trig} latchup will occur. Note that I_{trig} decreases with temperature due to the increase of the gain of the bipolars and the drop of diode forward voltages with temperature. Fig. 8 shows that for our typical product latchup will occur for T>105°.

4. Elimination of the backside triggered latchup mechanism

There exist several possibilities to prevent the above described latchup mechanism. The first is to disconnect the Cu-heatsink from the ground potential thereby forcing the emitter of T4 to be floating. This can be achieved by either leaving the external heatsink to which the Cu-heatsink is attached floating or by placing a thin electrically isolating sheet between them. This is a very robust solution but care must be taken not to deteriate the thermal impedance characteristics. The second is to use an isolating epoxy glue instead of a glue containing Ag-fillers.

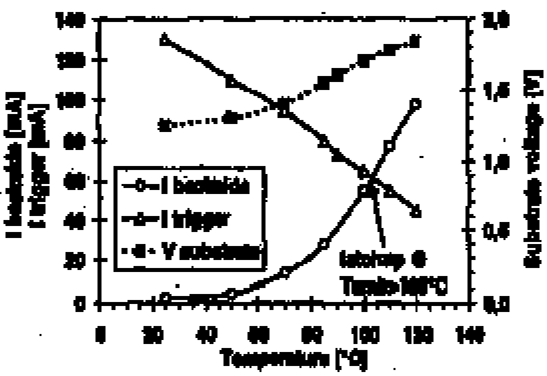
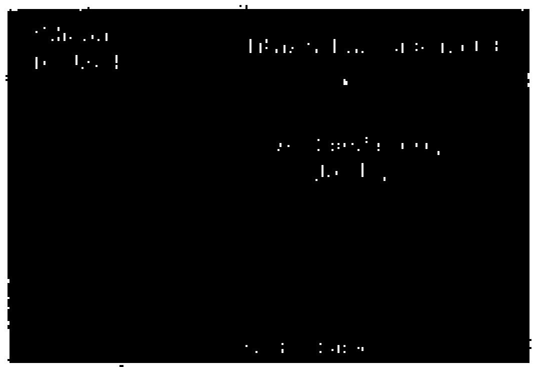
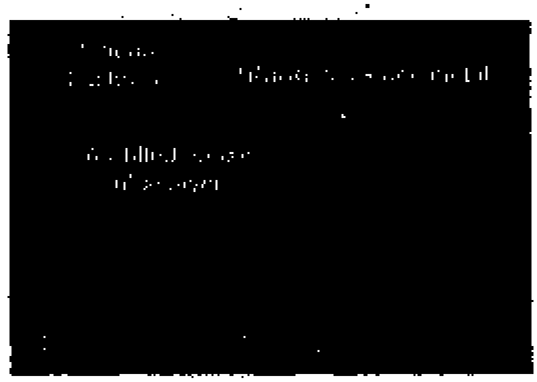


Fig. 8: Backside injection related latchup trigger current I_{trig} (triangles), substrate potential lifting (squares) and resulting backside diode injection current $I_{backside}$ (crosses) as a function of temperature for the case of a typical product during a V-PNP saturation event at V_{supply}= 7V; at T>105°C current $I_{backside}$ > I_{trig} and latchup will occur.

Again thermal impedance characteristics will determine the feasibility of this solution. The third option is to lower the resistivity of the p⁻ substrate, thereby reducing both the substrate potential lifting in case of saturation as well as the bipolar gain of the parasitic NPN transistor T4. If the loop gains remains <1 no latchup will occur. It is however difficult to prove that this a 100% robust solution up to 150°C for all designs at all application conditions. The final solution is to apply a Ti-Ni-Ag backside metallization to the low doped p-type wafer backside, see fig. 9. The Ti-Si interface forms a kind of a Schottky diode with a barrier height of 0.61 eV [2]. The corresponding I(V) characteristics are shown in fig. 10 and it can be clearly seen that the diode forward voltage is reduced to about 0.3V. Furthermore, as the Schottky diode is a majority carrier device [2], the TiNiAg backside metallization decreases the bipolar gain of the parasitic NPN transistor T4 by more than a factor 100, see table 1. This is probably caused by a strongly reduced emitter efficiency in the case of the backside metal. As a result, the thyristor loop gain is effectively reduced to much lower than 1 thus preventing the occurrence of latchup. Furthermore the backside metallization also strongly reduces the substrate resistance R_{sub}. Table 1 shows indeed that no latchup is observed up to backside injection currents exceeding 3A.



(a)



(b)

Fig. 9: SEM cross section showing a) the backside of the die, the 100nm thick TiNiAg backside metallization, the 10μm thick silver filled epoxy glue layer and the copper heatsink and b) in more detail the backside die - TiNiAg interface.

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5. Impact on latchup qualification testing

Our results clearly suggest that a number of improvements are required for the latchup test procedure of (medium) power ICs. Firstly we recommend that during the standard latchup test procedure the backside of the die (or any leadfinger that makes electrical contacted to the diepad as in the case of certain medium power packages) must be contacted to ground potential. Secondly we recommend also a measurement of the latchup trigger current while injecting from the backside diode at maximum application temperature. The trigger current pass/fail criteria for this case are subject of discussion but probably should be >500mA.

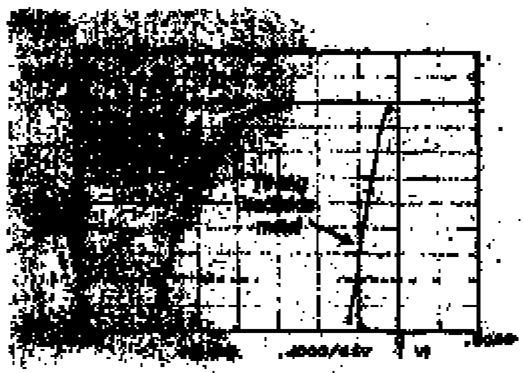

Fig. 10: I(V) characteristics at 25°C of the backside diode formed by a) the TiNiAg backside metal and the low doped p^--substrate and b) the Ag-filled epoxy glue layer and the low doped p^--substrate. In both cases the backside was wet etched.

6. Conclusions

A new latchup failure mechanism in complementary bipolar power ICs has been described. Latchup is caused by a thyristor constituted by the V-PNP power transistor at the frontside of the die and a parasitic NPN transistor between the frontside and the backside of the die. The emitter of this NPN transistor is formed by the Ag fillers in the die attach glue at the backside of the die, its base by the p^- substrate and its collector by the n-type BND isolation of the V-PNP transistor. The thyristor is triggered by saturation of the V-PNP power transistors or by forward biasing the backside diode between Ag-filled glue and p-type silicon. The effect is strongly temperature dependent. It can be eliminated by either leaving the backside floating, thus eliminating the parasitic NPN, or by applying backside metallization which strongly reduces the bipolar gain of the parasitic NPN.

Consequences for latchup qualification testing are that during the standard latchup test procedure the backside of the die (or any leadfinger that makes electrical contacted to the diepad as in the case of certain medium power packages) must be contacted to ground potential. This is currently not prescribed in the existing latchup test specifications. Furthermore it would make sense to an additional test where the latchup trigger current is measured while injecting from the backside diode (all at maximum application temperature).

7. References

[1] R.R. Troutman, 'Latchup in CMOS technology', Kluwer Academic Publishers, Boston, (1986)

[2] S.M. Sze, 'Physics of Semiconductor devices', 2nd edition, John Wiley & Sons, New York, (1981)

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MITEL

Application Note MSAN-107

Understanding and Eliminating Latch-Up in CMOS Applications

ISSUE 1 July [illegible]

Contents

Introduction

The purpose of this Application Note is to assist both those designers who are familiar with the use of CMOS devices as well as those considering CMOS designs for the first time.

Attracted by the many advantages offered by CMOS devices, designers using them for the first time are often unaware of, or are overly sensitive to the phenomenom of latch-up. Understanding a few facts will resolve both of these situations. Basically speaking, any analog or digital device fabricated in one of the many CMOS processes available, can be made to latch-up if stressed severely enough. However, when properly applied, CMOS devices are quite insensitive to actual conditions that exist in most systems. Further, if a few simple precautions are taken at the design stage, then latch-up can be completely avoided.

Latch-up is defined as the creation of a low impedance path between the power supply rails by the triggering of parasitic, four-layer bipolar structures (SCR's) inherent in CMOS input and output circuitry. In this note, details of these SCR structures are examined in the context of Mitel's ISO-CMOS technology. By developing an understanding of the aspects of circuit and system design related to the triggering of these SCR's, design methods and guidelines can be acquired to greatly reduce the probability of latch-up occurrence. By implementing the suggested techniques and circuitry, the designer can gain the advantages of CMOS circuitry without major concern about latch-up related problems.

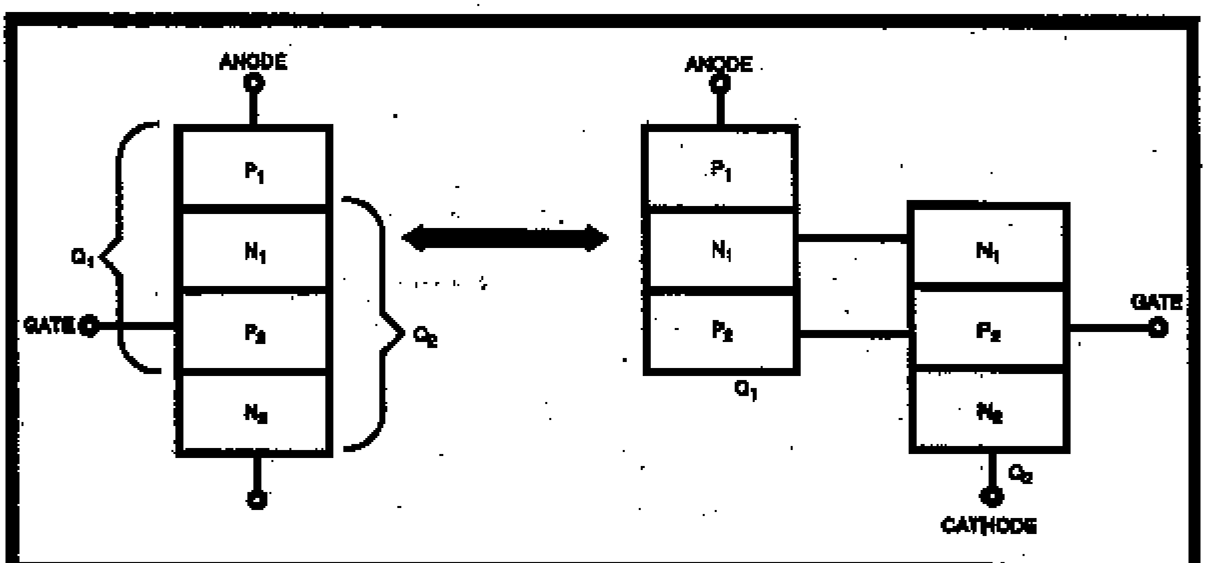

Figure 1 - Four-Layer SCR Structure

Semiconductor Device Considerations

Background on SCR's

Prior to discussing latch-up in CMOS devices, it is advantageous to briefly review the basic theory of SCR operation. This will be helpful in developing an understanding of the relationships between external circuit and system conditions and the resultant triggering of latch-up in CMOS devices. The basic SCR structure is that of a four-layer device as shown in Fig. 1. The device has three terminals: Anode, Cathode and Gate. Fig. 2 shows how the SCR can be modelled with two bipolar transistors, one NPN and one PNP. In the normal mode of operation, the SCR is turned on by injecting sufficient current into the base of Q_2 to turn this transistor on. When this is done, Q_2 begins to draw collector current via the base-emitter junction of Q_1. As a result Q_1 also turns on, injecting additional current into Q_2's base. This in turn causes Q_2 to turn on harder, supplying more base current to Q_1. This positive feedback arrangement sustains conduction, and ensures that the SCR continues to conduct even if the gate current is interrupted.

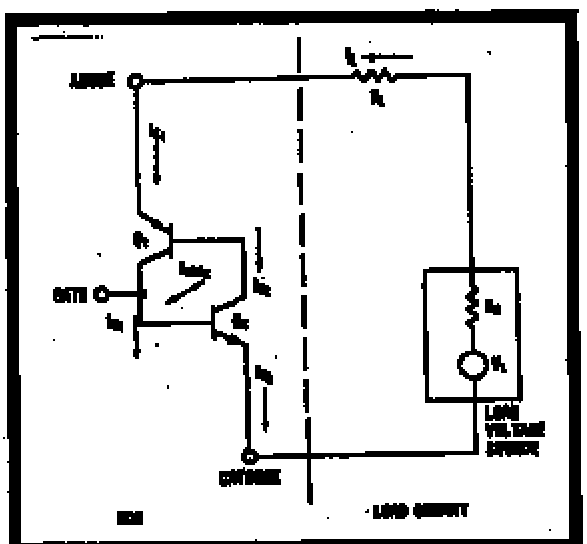
Figure 2 - Bipolar Model of an SCR

The device will remain in this latched state indefinitely. To turn the SCR off, one of two things can be done. If the voltage applied across the SCR is reduced to the point where Q_1's base-emitter junction turns off (V_{Sus}), then Q_2 will be starved of base current and the SCR will turn off. Alternatively, if the current through the SCR is reduced below its holding current then it will also turn off. The holding current is the minimum current required to sustain conduction and is a function of the physical dimensions of the device and the transistor gains (Fig. 3). As mentioned, this is the way that the SCR is controlled in normal applications. There are various other ways that an SCR may be triggered. These must be examined as they are directly related to latch-up problems.

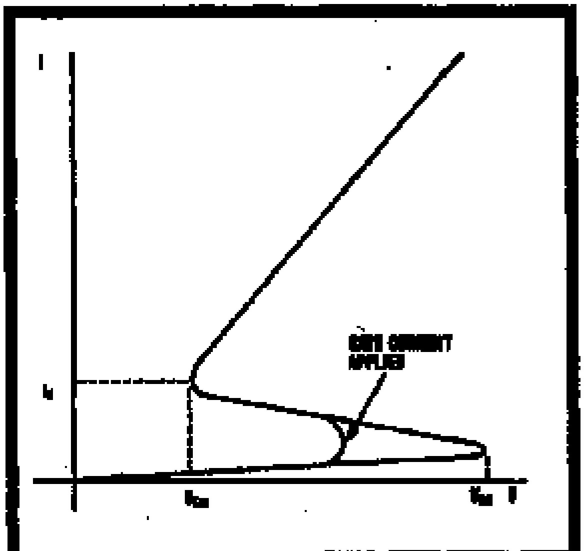
Figure 3 - SCR Current-Voltage Characteristic

Looking at Fig. 2, it can be seen that the load current and the two emitter currents of Q_1 and Q_2 are all equal. Also the load current is equal to the sums of the two collector currents and a leakage current from Q_2's collector to its base (I_{CBO2}). It can be shown (refer to Appendix) that:

$$I_L = I_{CBO_2}\left[\frac{(1+B_1)(1+B_2)}{(1-B_1B_2)}\right] \quad (1)$$

Where B_1 and B_2 are the current gains of Q_1 and Q_2 respectively.

Normally, with no base current supplied to Q_2, the load current will be small since the leakage I_{CBO2} is small, as are the current gains (B_1, B_2) at this low value of collector current. If however, the current gains increase to the point where the product, $B_1 B_2$, approaches unity, then the load current will become very large, limited only by the load impedance, the series impedance of the SCR, and source impedance of the power supply.There are various applied conditions that will cause this to happen. Increasing the load voltage beyond the breakover voltage, V_{BO}, will have this effect. As the anode-cathode voltage across the SCR increases, the collector-emitter voltages of Q_1 and Q_2 also increase. This corresponds to increases in the collector-base reverse biases. The collector-base junctions of the two transistors are physically the same area, the N_1-P_2 junction (Fig. 1). As the reverse bias increases, the energy of the minority carriers increases causing more carriers to be dislodged, which in turn pick up energy. This continues until the junction undergoes an avalanche breakdown resulting in an increase in the collector currents of Q_1 and Q_2. The resulting increase in B_1 and B_2 cause the SCR to latch on.

A very rapid change in the anode to cathode voltage of an SCR can also cause it to trigger. This is known as the "dV/dt" effect. The N_1-P_2 junction, being reversed biased, exhibits a capacitance. This capacitance varies with the reverse bias voltage applied across the junction. Hence the current through the capacitor is described by:

$$\frac{d(C_j V_{AK})}{dt} \quad (2)$$

$$= \frac{C_j dV_{AK}}{dt} + \frac{V_{AK} dC_j}{dt} \quad (3)$$

The junction capacitance, C_j decreases with increasing reverse bias and hence the second term of equation (3) is negative. If, however, the rate of change of applied voltage is large enough, the first term of equation (3) will dominate and the current through the SCR will increase. If the current increases sufficiently to cause the B_1B_2 product to approach unity, then the SCR will latch on.

The effects of temperature must also be noted at this point. Increasing temperature will cause an increase in both the leakage current through the SCR and in the current gains B_1 B_2 of the two bipolar transistors. As such, the magnitude of the driving force required to turn the SCR on will decrease with increasing temperature. In other words, the SCR will be more easily triggered as temperature increases for any of the triggering mechanisms described.

Corollaries exist between each of the three methods of turning an SCR on as described, and the ways in which the parasitic SCR structures of CMOS devices are triggered. The normal mode of triggering an SCR is by injecting current into its gate terminal. This corresponds to forcing current into the inputs or outputs of a CMOS device by applying voltages that go outside of the power supply rails. This is by far the most common form of latch-up triggering. The avalanche breakdown mechanism described also applies directly to CMOS devices, although its occurrence is far less prevelant. Excessive voltage on the power supply pins, whether continuous or transient, may result in latch-up occurrence. It is also theoretically possible to trigger parasitic SCR devices by the dV/dt method as a result of high speed transients on the supply rails. However, this will rarely happen in a real application. Each of these triggering methods will be examined in the next section in the context of the ISO-CMOS topology for both the output and input structures.

Parasitic Bipolar Structures in the ISO-CMOS Topology

As with any CMOS technology, ISO-CMOS contains certain parasitic bipolar structures associated with its output devices and input protection circuitry. These parasitic transistors are interconnected in such a way as to form four-layer devices. As such, SCR devices are present at both the inputs and outputs of ISO-CMOS circuits. These devices are normally in their off state and will remain off as long as the absolute maximum ratings of the devices are not exceeded.

Output SCR Structures

A typical ISO-CMOS output driver contains one N-channel MOSFET with its source tied to V_{SS} and one P-channel MOSFET with its source tied to V_{DD}. The drains of the two transistors are connected together to form the output and the gates are commoned to form the input (Fig. 4). The fabrication of these transistors in close proximity results in the formation of a parasitic SCR connected directly across the power supply rails. When triggered, this SCR presents a low impedance to the power supply causing excessive current to flow. This situation is potentially destructive, resulting in damage to bond wires or metal supply tracks on the die due to localized overheating. The SCR is formed as follows. A vertical NPN transistor results from the fabrication of the N-channel device. The N- substrate serves as the collector and is biased at V_{DD}. The P- well acts as the base and the source and drain N- diffusions are the emitters of the transistor. One emitter is tied to V_{SS} and the other to the output. A wide base lateral PNP transistor is formed when a P-channel device is located close to a N-channel transistor. The P-channel source and

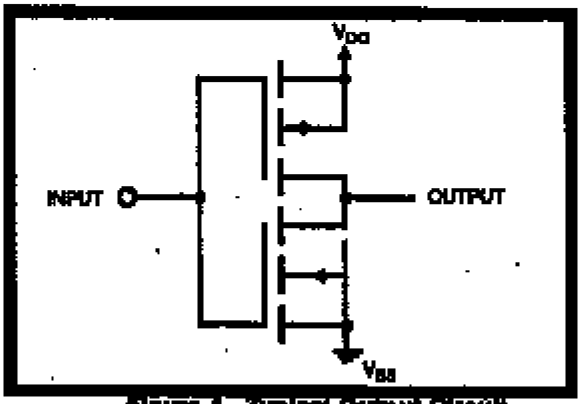

Figure 4 - Typical Output Circuit

drain diffusions are two emitters of the transistor: one tied to V_{DD} and the other to the output. The N-substrate acts as the base and hence, is in common with the collector of the vertical NPN. The P- well is the collector of the PNP which is also base of the NPN. Due to the shared diffusions, the vertical NPN and lateral PNP transistors are effectively connected as an SCR (Fig. 5). This parasitic SCR is connected directly across the supply rails. Hence, when triggered, it can cause excessive current to flow. The SCR is normally turned off for nominal operating supply voltages and with all output voltages within the power supply limits. This SCR may be externally triggered causing the output structure to latch-up. The triggering mechanism can be any one of those mentioned in the previous section.

Output voltages being forced outside of the power supply limits is the most common cause of output latch-up. Two parameters are defined at this point for use in subsequent discussions. These are I_{LU} and V_{LU}. I_{LU} is the current which must flow through the output structure to cause latch-up to occur. V_{LU} is the voltage excursion outside of the power supply rails at the output pin that results in I_{LU} flowing through the output structure. In other words I_{LU} and V_{LU} are the conditions at the output pin that will result in latch-up triggering. These same parameters also apply to input latch-up (see next section). Consider first an output voltage which goes below V_{SS} by more than V_{LU}. This causes the P- well to output base-emitter junction of the vertical NPN transistor to become forward biased. Since this acts as the SCR gate, triggering occurs. Current is pulled from V_{DD} through the lateral PNP and is injected into the P- well, causing a localized drop across this diffusion. This voltage drop will forward bias the base-emitter junction of the NPN which is referenced to V_{SS}. Once this occurs, latch-up will be sustained and a low impedance path is created from V_{DD} to V_{SS}.

A note must be taken here in regard to the amount of over-voltage required to trigger latch-up. In the above paragraph, it was mentioned that voltages exceeding the supply rails by more than V_{LU} will cause a current I_{LU} to flow and hence trigger latch-up. The guaranteed values quoted in the data sheet are 0.3V and 10mA respectively for these parameters. These limits are used in production testing and hence, appear in the Absolute Maximum Ratings for MITEL devices. In practice, it is more likely to require from 0.6V to 2V of over-voltage and from 50 to several hundred milliamps of current to cause output latch-up to occur. For input latch-up to occur, it can take several volts of over-voltage and similar currents to induce latch-up due to the series resistance of the input protection circuitry (Fig. 6).

When the V_{DD} supply rail is exceeded by a voltage greater than V_{LU}, a similar set of events occurs. In this case, the output to substrate base-emitter junction of the lateral PNP becomes forward biased. Collector current from this transistors injected into the P- well, again causing a lateral voltage drop. This voltage drop causes the P- well to V_{SS} referenced base-emitter junction of the NPN to become forward biased. This transistor's collector current, pulled from the substrate, causes a lateral voltage drop across the substrate. This voltage drop, in turn, will forward bias the V_{DD} to substrate base-emitter junction of the PNP. Thus, latch-up will be sustained even if the output over-voltage condition is removed and a low impedance path again exists between V_{DD} and V_{SS}.

There are two other causes of output latch-up that are less likely to occur, but nonetheless must be noted. The first of these is the result of over-voltages on the power supply pins. Excessive voltage between V_{DD} and V_{SS} (i.e., greater than the absolute maximum rating) can cause an avalanche breakdown of the reverse biased substrate to P- well collector base junction of the bipolar transistors.

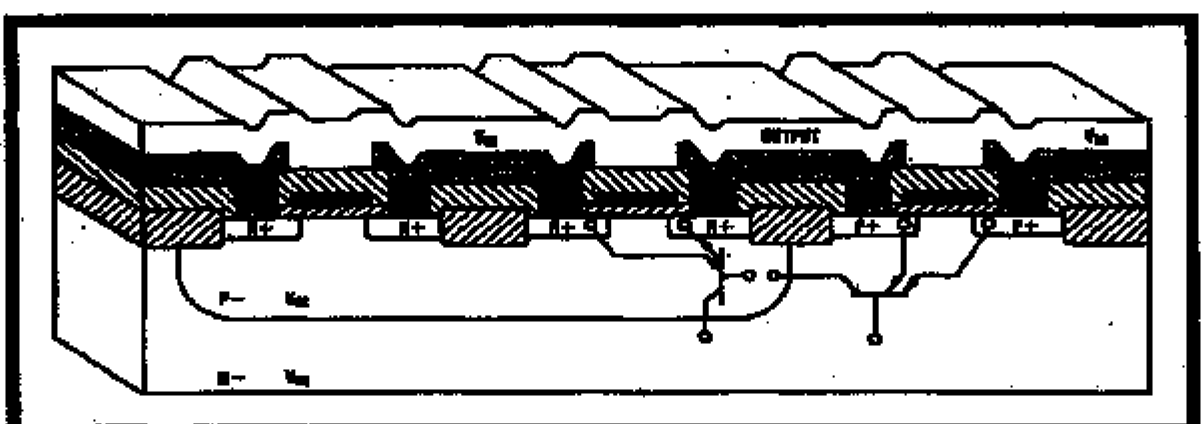

Figure 5 - Output SCR Structures

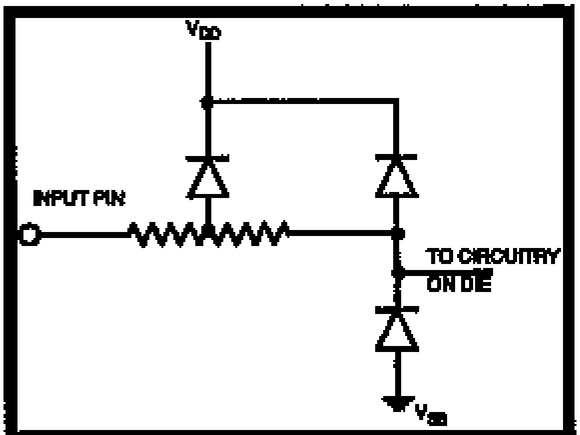

Figure 6 - Input Protection Circuit Schematic

This will cause the SCR to trigger as outlined in the previous section. The second triggering mechanism will be apparent in very few systems. Very fast voltage spikes on the power supply rails can induce a "dV/dt" triggering of the SCR, also as outlined earlier. This can potentially result in circuit damage by transients which in themselves would not have sufficient energy to cause damage due to localized power dissipation. Once triggered, the SCR may remain latched on until the supply voltage is reduced below its sustaining voltage or if the current is reduced below its holding current.

Input SCR Structures

Parasitic SCR structures can also result due to the fabrication of CMOS input protection circuitry. The ISO-CMOS input protection circuit schematic is shown in Fig. 6. As shown, there is a distributed diode connected to V_{DD} and another diode to V_{SS}. The series resistor is primarily intended for static protection, but also provides latch-up protection. The diodes are connected together at the input node. An SCR structure results when the V_{DD} referenced diode is fabricated in close proximity to an N-channel transistor (Fig. 7) or when the V_{SS} referenced diode is located close to a P-channel device. (Fig. 8).

It is important to note here the difference between input and output SCR structures. The output SCR was connected directly between V_{DD} and V_{SS}, and hence, is more likely to be destructive once triggered. The input SCR structure is connected from the input node to one of the supply rails. Thus, for an input to remain latched, the circuitry driving the input must be capable of supplying the sustaining current of the SCR. For this latch-up to be destructive, the input driver must be capable of supplying large amounts of current. A potentially more dangerous situation occurs when a complimentary transistor, to the one forming the SCR, is located nearby. A secondary SCR structure results from this and it is connected across the supply rails (Figs. 7 and 8).

Consider the V_{SS} referenced diode situation first. The source and drain diffusions of the P-channel transistor form the emitters of a lateral PNP transistor. The substrate acts as the base and the P-diffusion of the diode is the collector. This diode, with the substrate, forms a vertical NPN transistor. The two transistors are interconnected as an SCR due to common diffusion areas. If an applied input voltage is below V_{SS} by more than V_{LU}, then the gate-cathode junction of the SCR will become forward biased and turn the SCR on. This latch-up condition will continue as long as this input condition persists or if the input circuitry can supply the minimum holding current. As mentioned, a potentially more hazardous situation can develop if an N-channel transistor is also located nearby. The P-well of this transistor serves as a second collector of the lateral PNP transistor. When the input voltage goes negative, the gate of the SCR is turned on as mentioned. However, this second collector now injects current into the P- well causing a second SCR

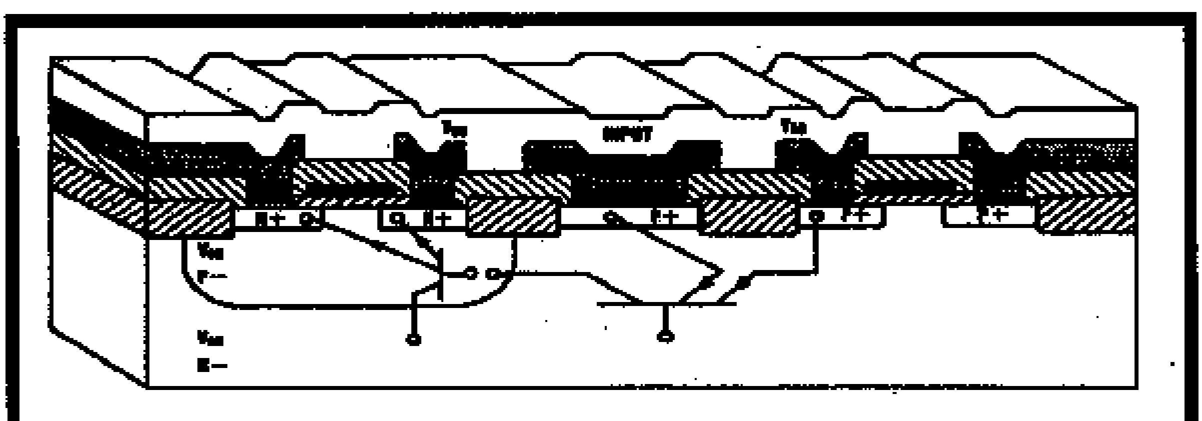

Figure 7 - Input SCR Structure with V_{DD} Diode

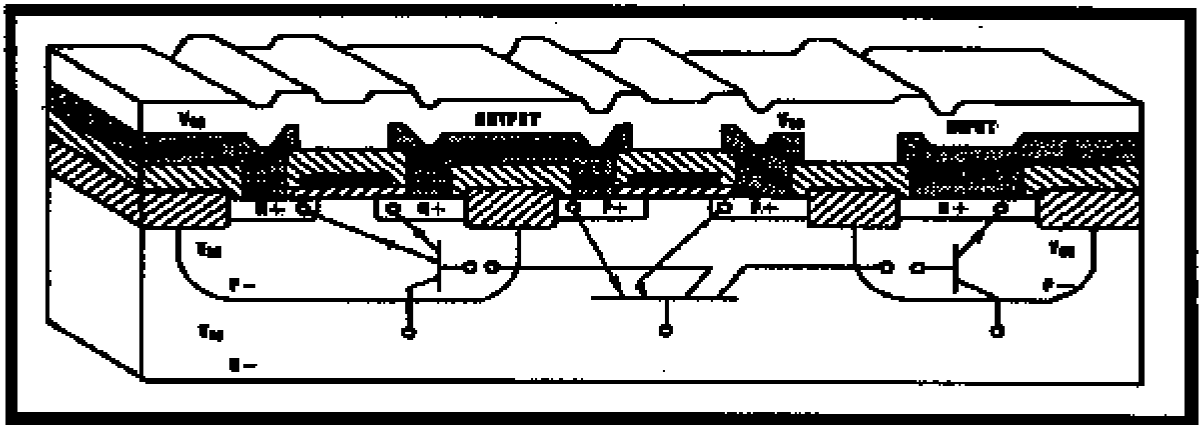

Figure 6 - Input SCR Structure with V_{SS} Diode

Forced I/O Condition	Latch-Up Inducing Conditions	
	V_{LU} (Volts)	I_{LU} (mA)
Outputs above V_{DD}	1.9	200
Outputs below V_{SS}	1.0	90
Inputs above V_{DD}	1.9	80
Inputs below V_{SS}	25.0	25

Table 1. MD74SC540AC Latch-up Inducing Voltages and Currents

structure to latch on. This device is connected across the power supply rails and hence, can be destructive. This same situation can result with the V_{DD} referenced protection diode. In this case, SCR structures will be triggered by voltages which exceed V_{DD} by more than V_{LU}.

As was mentioned earlier, the actual values of V_{LU} and I_{LU} are typically much greater than the 0.3V and 10mA limits on the data sheets. Table 1 shows some of the numbers pertaining to the current production version of the MD74SC540AC, one of MITEL's Octal Interface devices. As can be seen it requires voltages from 1.0V to 1.9V and currents from 90 to 200mA to trigger output latch-up. On the input side, it requires 1.9V for V_{LU} and 80mA for I_{LU} in the V_{DD} case. For the V_{SS} case, I_{LU} is only 25mA, but V_{LU} is 25V and hence this situation would virtually never exist in a system. It has been empirically determined that if a device exhibits values of I_{LU} exceeding a few volts, then this device will be extremely insensitive to latch-up in the majority of circuits and systems. A severe system fault would be required to induce latch-up in such devices.

System and Circuit Considerations

In the majority of systems and circuits using CMOS devices, latch-up should not be a major cause for concern. Being aware of the sources of latch-up problems will aid the designer in even further reducing the probability of latch-up damage to his circuits. Implementing some of the precautionary measures suggested in the following sections will ensure a trouble-free system.

The aspects of system and circuit design that can result in latch-up occurrence will be examined in the context of a "worst case" system example. In other words, systems containing combinations of the attributes of the example system will be more likely to experience latch-up problems. The relationships between these systems aspects and the resultant latch-up triggering mechanisms will be described. Suggestions will be made intent upon reducing the risk of triggering the parasitic SCR's through careful design techniques. The protection circuits, which will be illustrated, should help in preventing circuit damage in case latch-up occurs. It should be noted at this point, that in systems where the input and output pins of the CMOS devices never go outside of the power supply rails either during power-up or in continuous operation, latch-up is not likely to ever occour. The first step, then, is to define a system which contains various components that qualify it for a "worst case" rating in a latch-up sense.

A "Worst Case" System

A circuit or system which has all of the following attributes and/or capabilities is more likely to experience latch-up problems. This is not to say that latch-up is inevitable in systems containing many of these attributes, only that the designer must be aware of potential problems and take steps at the design stage to avoid them. The following list summarizes the system aspects most likely to be associated with latch-up problems:

1) System operation/maintenance procedures allow insertion or removal of printed circuit cards with system power applied.

2) The system is powered by multiple supply voltages (e.g. ± 12V, + 5V, and Gnd) or has a multi-supply at same voltage (e.g. +5V regulated, +5V unregulated).

3) Circuits utilize complex capacitive decoupling techniques particularly associated with multiple power supply voltages.

4) Integrated circuits on one system PCB drive other devices on different PCB's via a backplane, ribbon cable, etc.

5) Devices drive high capacitive loads such as long data or address busses.

6) System contains high speed address and/or data buses of sufficient length to cause their inductive properties to become significant at the frequencies in question (ribbon cables are a prime example).

7) System has electronic inputs that are directly accessible by the end user of the system.

8) Digital devices are driven from analog devices powered from higher supply voltages, utilizing input diodes for clamping.

Each of the above entries will now be examined in terms of its potential for triggering latch-up. The first four items are very interdependent. While each of these will be given consideration in separate sections, cross referencing will be extensive. The remaining items are relatively independent and thus, will be looked at in relative isolation.

Insertion/Removal of System PBC's "Live"

Inserting or removing printed circuit cards from a powered-up system can trigger latch-up in several different ways if certain precautions are not taken. One potential hazard that can occur is for an input or output edge terminal to make contact before the power supply pins are connected. If driven by a device on another circuit card, this input/output pin could have a voltage applied to it with no supply voltage to the device. Even if this situation exists for only a short period of time, then latch-up may be triggered when the power supply pin is connected. It is important to note that three-state outputs are also vulnerable in this situation. Such output drivers only present a high impedance to voltages within the device supply rails. Voltages on these outputs exceeding the supply can indeed trigger latch-up.

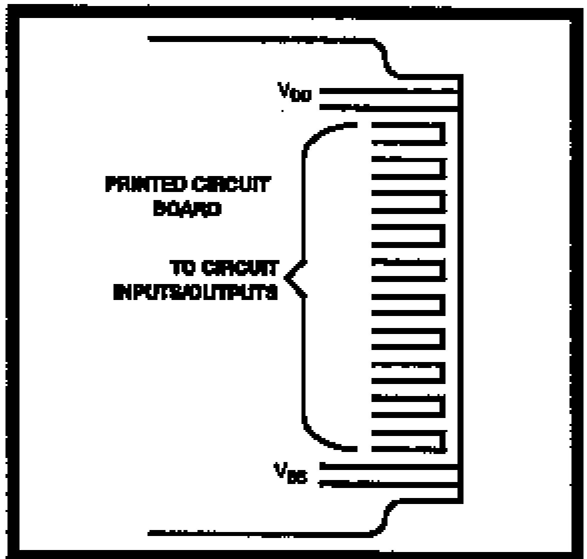

Figure 9 - PCB with Inset I/O Edge Terminals

One solution to this problem is to slightly extend the power supply terminals with respect to the remaining edge terminals on the PCB (Fig. 9). This will ensure that power supply connections are the first made and last broken on insertion and removal of the PCB respectively.

Plugging a circuit card live into a system with multi-power supply voltages can result in the application of power supply over-voltages to certain devices. Consider the local decoupling scheme shown in Fig. 10. If a PCB containing such decoupling was plugged into a system live, then the following situation could result. Assume that all capacitors are discharged and that C_1 is much greater than C_2. It is possible that when the PCB is inserted, the +12V terminal makes connection first, then the ground, and lastly the +5V connection is made. In this situation, C_1 and C_2 are momentarily connected in series. The +12 volts applied to C_1 causes the voltage at the ground point to increase in

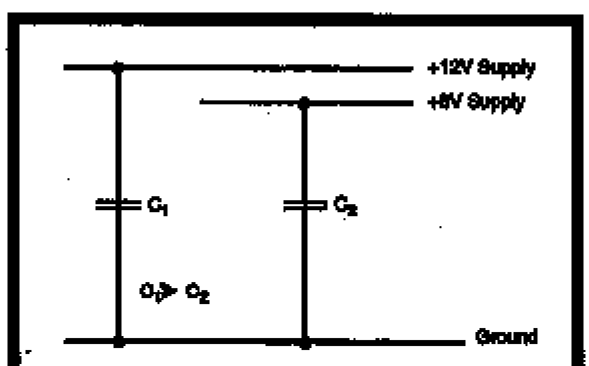

Figure 10 - Local Decoupling Scheme in Multi-Supply System

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accordance with the charge sharing between C_1 and C_2. This voltage could approach 12 volts since $C_1 \gg C_2$. When the ground terminal makes connection, the voltage at the nominal 5V rail will jump up by the amount of voltage initially present at the ground point (i.e. almost 12V). This results in an over-voltage condition being applied to the devices supplied by the 5V rail. If the applied voltage exceeds the absolute maximum rating for these devices then latch-up may be triggered by the avalanche breakdown mechanism described in an earlier section. This problem is more likely to be evident in systems with power supplies differing greatly in magnitude since potential over-voltages can become quite large. A prime example is a telephone switching system which would typically contain a -48V supply as well as +5V and other supply voltages.

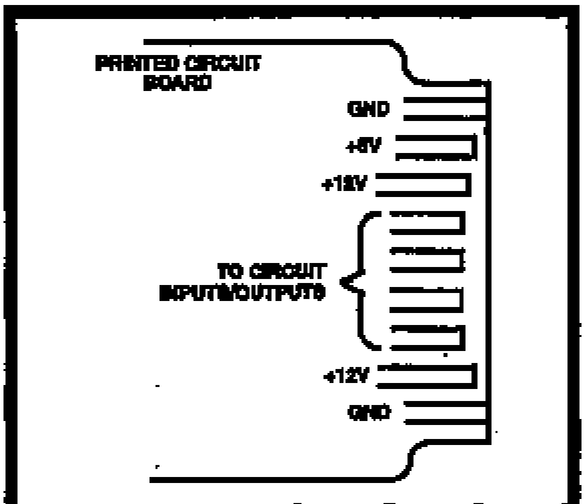

Figure 11 - Multi-Level Indentations of I/O Edge Terminals

This problem can also be overcome by indenting the edge terminals on PCB's. In this case, there must be more than one level of indentation to ensure that the power supply connections are made in a sequence that will alleviate this problem. The safest way to accomplish this is to have power supply connections made in the order of ascending voltage magnitude (Fig. 11). For example, in a system with a +5V supply and ±12V supplies, the ground line should make connection first, the +5V supply next and finally, the +12V and -12V supplies at the same time. This ascending order of magnitudes ensures that no over-voltages occur even if one of the power supplies pulls the other through the decoupling capacitors. The ground line should always make connection first to ensure that a positive supply does not pull a negative one or vice versa. Connecting opposing power supplies (e.g. ±12V) at the same time will ensure cancellation of the effects of their connection.

In systems which have large number of power supplies to contend with, it may not be feasible to provide the required number of indentations on the PCB. In this case, a careful analysis of the decoupling used must be done to establish potential problem areas. Where possible, decoupling capacitors on different supplies should be of equal magnitude. This will tend to minimize over-voltages due to equal charge sharing between the capacitors. If after all possible precautions have been taken, there is still a possibility of power supply over-voltages occurring, then it may be necessary to provide some form of current limiting or local regulation to prevent circuit damage.

The simplest form of protection is to connect a resistor in series with the power supply (V_{DD} or V_{SS}) pin of the devices in question (Fig. 12a). The size of this resistor can be chosen to either prevent latch-up from occurring or to prevent circuit damage when latch-up does occur. If latch-up is to be prevented then the minimum resistor value is chosen as follows:

$$R = \frac{V_{Supply} - V_{DD_{Max}}}{I_{DD_{Max}}}$$

where V_{Supply} = Maximum Supply Voltage Generated

V_{DDMax} = Absolute Maximum Rating for V_{DD}

I_{DDMax} = Supply Current at V_{DDMax}

This will ensure that V_{DDMax} is never exceeded at the device.

To simply prevent damage due to latch-up, the resistor is chosen to limit the supply current to a few hundred milliamps at the maximum applied voltage. There are a few factors which must be taken into consideration when the maximum value for this resistor is selected. The source impedance of the power supply will be increased by the amount of the added resistance. This will result in a decrease in the current sourcing or sinking capacity of the device, depending on whether the resistor is in the V_{DD} or V_{SS} line respectively. There is also a corresponding increase in the output propagation delay, proportional to product of the protection resistor and the load capacitance. Finally there is a decrease in the noise immunity of the device proportional to the product of this resistor and the total instantaneous supply current (including the output currents). For devices such as the MD74SCXXX, it is recommended that this resistor be placed in the V_{DD} line as there is more available noise immunity for high level outputs (when driving TTL or other MD74SCXXX devices).

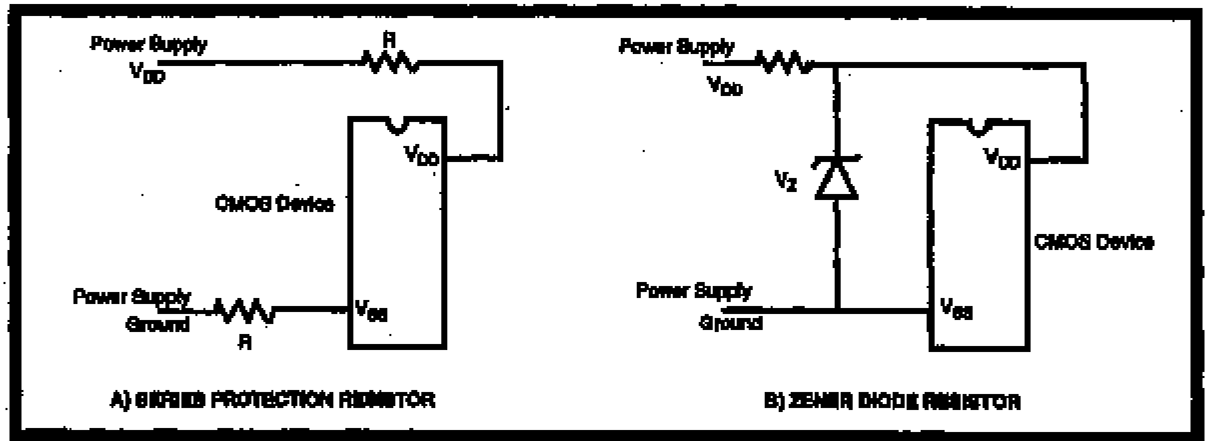

Figure 12 - Power Supply Over-Voltage Protection

If a current-limiting resistor cannot be used due to constraints on output drive, speed or noise immunity, then the alternative is to connect a zener diode between V_{DD} and V_{SS} to prevent over-voltages across the device (Fig. 12b). A current-limiting resistor may still be necessary, but its value can be very small, limited only by the power handling capacity of the zener diode.

There is one last potential hazard that can develop due to "live" insertion of PCB's. On boards with little local decoupling, plugging the card in can result in an extremely fast transient on the power supply leads of devices on the board. These transients could theoretically result in triggering latch-up due to the dV/dt effect described earlier. This problem can be avoided by decoupling the power supply on the board with sufficiently large capacitors to slow down the power supply ramp up when the board is plugged in. These capacitors must be chosen to be compatible with the overall decoupling scheme to prevent the over-voltage problem just described.

Similar transients on the power supply can be generated due to switching of high speed, high current devices such as ECL and Schottky TTL circuits driving heavy DC current loads. Also, back EMF generated by opening of inductive loads such as realys can induce nasty voltage spikes. Adequate high frequency decoupling will usually remedy the problem. A 0.01 to 0.1µF ceramic capacitor connected as close to the device as possible across the power supply pins will shunt most of this high frequency energy to ground (Fig. 13). Connection of flyback diodes around inductive loads is also recommended to limit back EMF surges.

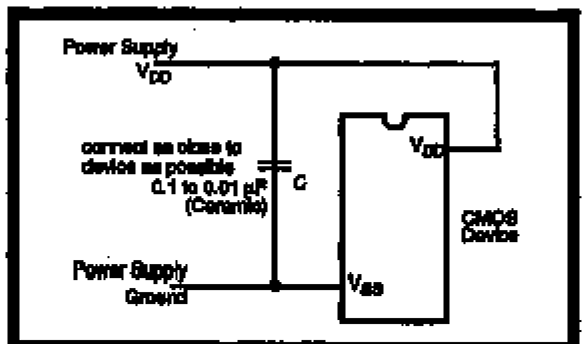

Fig. 13-High Frequency Power Supply Decoupling

Problems Associated with Multi-Power Supply Voltages and Associated Decoupling Circuitry

In systems that have more than one independent power supply, care must be taken to ensure correct sequencing during power-up and power-down cycles. This is required to prevent input and output over-voltage conditions from developing. Consider, for example, a device powered from a +5V supply that has its outputs connected to a device powered from a +7V supply. Under steady state conditions, the output levels from the 5V devices would lie well within the supply voltage of the 7V device. However, if during power-up the 5V supply was to exceed the 7V supply, then the output voltage of the 5V device could exceed the instantaneous supply voltage of the 7V device (Fig. 14). This over-voltage could cause the 7V device to latch-up. A similar situation can occur between two devices powered by separate supplies of equal magnitude such as 5V regulated and 5V unregulated supplies. In this case there is the added concern when three-state outputs are tied together. These outputs are also subject to over-voltage triggering of latch-up. Such outputs present a high impedance only to signals lying within the power supply voltages. It must be stressed that

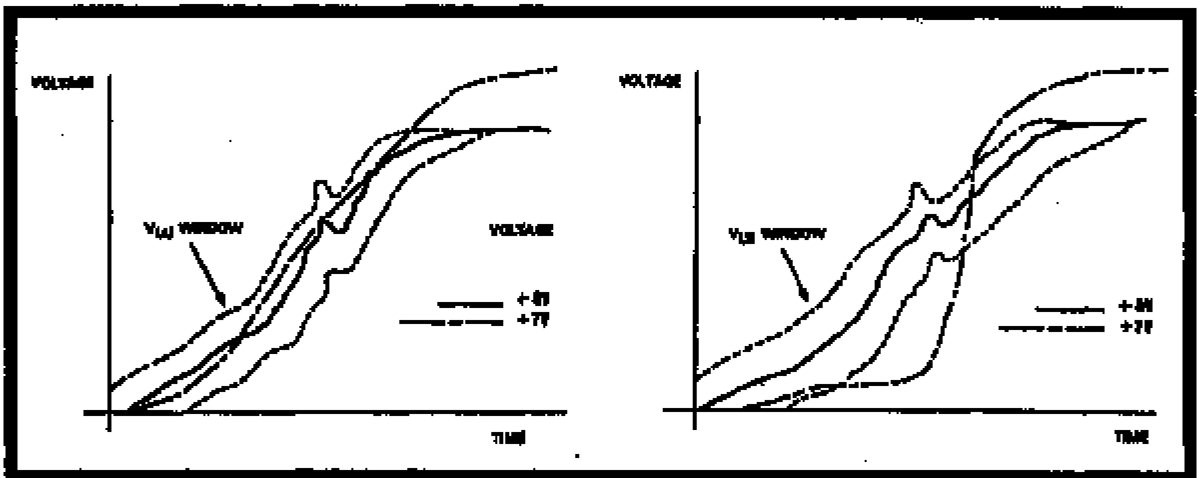

Figure 14 - Power Supply Sequencing

these over-voltage conditions need only exist for a very brief period of time to trigger latch-up. Thus, even transient over-voltages during power-up may pose a problem.

To ensure proper power supply sequencing, careful attention must be paid to the selection of decoupling components both at the initial design stage and when design revisions are done. This applies to both main power supply decoupling as well as local board decoupling. While proper sequencing may be evident at main distribution points, local sequencing can be altered by large capacitors on individual boards. Boards which have a large DC power requirement are likely to have such decoupling and hence, must be looked at carefully.

One way of ensuring that power supplies track when turning on or off is to connect a diode from the lower supply voltage to the higher one in the case of unequal supplies (Fig. 15). This will cause the supplies to track within one diode drop until they attain proper levels. In the case of two equal supplies, two diodes can be connected back to back, forcing supplies to track, independent of which supply comes up first.

Devices Driving Others on Separate PCBs

When integrated circuits in a system drive other devices on separate PCB's (via a backplane for example), then the considerations given in the previous two sections must be applied globally to the system. This was already mentioned in the section on plugging in PCB's "live". That is, when a PCB is plugged into a backplane with the system power applied, there is the danger that an input or output pin will contact an active line on the backplane

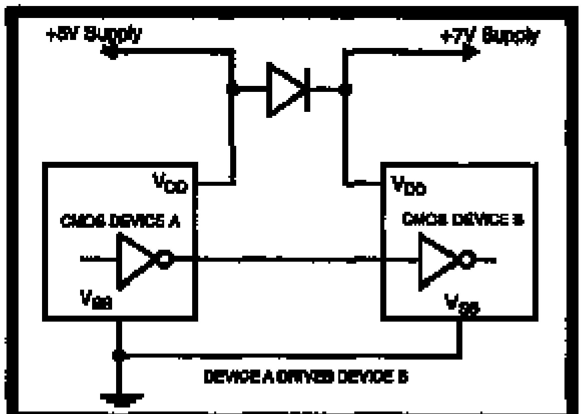

Fig. 15 - Forced Power Supply Tracking with Clamping Diode

before the power supply connection is made. The solution to this problem, as mentioned, lies in indenting the I/O edge terminations with respect to power supply terminals on the PCB.

Power supply sequencing should be given special attention in systems with devices that drive off-board. The same criteria applies here as was described for multi-supply systems. However, care must also be taken in single supply systems. In this case, large amounts of local decoupling can cause the supply voltages on some boards in the system to ramp up slower than on others. Devices on boards whose power supply ramps up quickly, can impress an over-voltage on devices on other boards. If this over-voltage is large enough, then latch-up may be triggered.

Whenever possible, local decoupling should be equalized on all boards within the system to minimize these effects. In systems where all off-board drivers are three-state devices, a simple solution exists. All outputs should be kept in a high impedance state during power-up and power-down. Thus, no current will be available to trigger latch-up even if differential supply voltages develop from board to board. Alternatively, current limiting resistors can be connected in series with any inputs or outputs that may be subjected to over-voltages. These resistors are sized to limit current to less than 10mA:

$$R = \frac{(V_{Diff} - 0.3V)}{10mA}$$

where V_{Diff} = maximum instantaneous voltage differential between power supplies

The side effects of connecting these resistors are the same as mentioned previously for power supply over-voltage protection. There will be reductions in current drive from outputs, in speed, and in noise immunity on outputs driving DC loads through these resistors.

Devices Driving Long Address or Data Buses

Long address and data buses can exhibit quite large capacitances. Devices which drive such buses or have their inputs tied to one, can be subjected to over-voltage conditions. This is especially true if large DC current loads are switched on the same PCB (e.g. a group of LED's during a lamp test). Over-voltages can develop as follows. The change in the power supply current causes a localized voltage drop on the supply pins of the devices near to the device drawing the load current. This is a result of the finite resistance of the power supply tracks and contact resistance of any connectors. At the same time, the bus capacitance tends to hold the voltage on the inputs and outputs connected to the bus at the full supply voltage. If a sufficient voltage differential develops between the bus and the local power supply, then the bus capacitance will discharge via the input and output structures. This current can attain a magnitude of tens of milliamps and hence trigger latch-up (Fig. 16).

Various precautions can be taken to reduce the chances of this problem occurring. Reducing the power supply resistance and bus capacitances can be done at the time of initial design. Wide power supply tracks and low contact resistance connectors should be used whenever possible. Buses should be kept as short as possible and have the largest possible spacings between the lines. If this problem still results due to system restraints on PCB layout, then the connection of a decoupling capacitor across the power supply pins of the devices latching-up should help (Fig. 17). The size of the capacitor depends upon the magnitude of the local current and the local resistance of the power supply. Normally a 10µF capacitor will clear up such problems and should not interfere with the local power supply sequencing on most PCB's.

There is one other way in which an input/output over-voltage can occur on long buses. There exists, on such buses, intertrack capacitance as well as capacitance to ground. When two adjacent tracks are at opposite logic levels (one at 5V, the other at ground), this capacitance charges to the full supply voltage. When the track initially at ground potential suddenly goes high, the signal is coupled through the capacitor to the other track. The voltage on this track increases from its initial value of 5V, impressing over-voltages on any devices connected to this track.

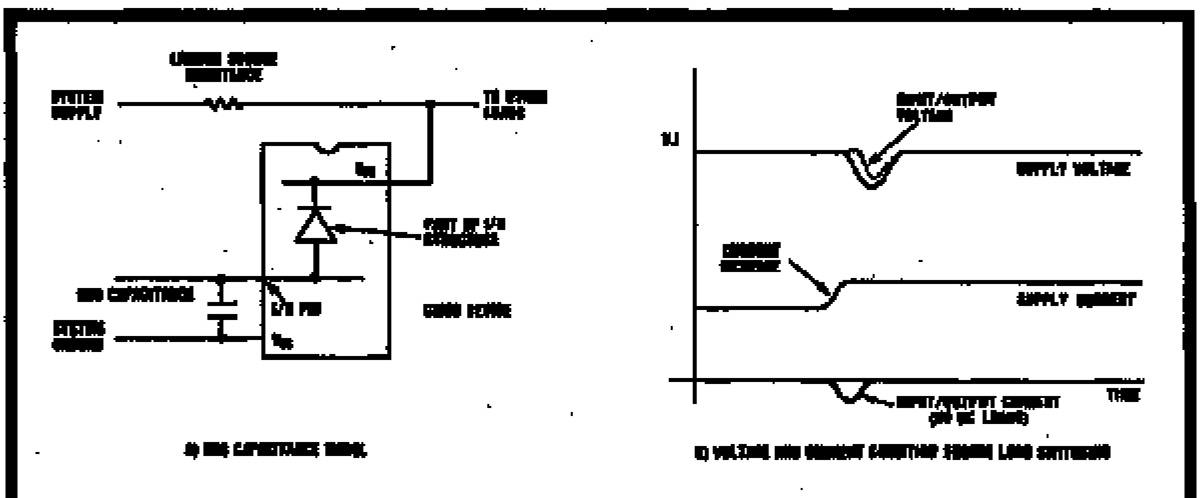

Figure 16 - Effects of Switching DC Loads Combined with Large Bus Capacitors

Minimizing intertrack capacitance by interleaving signal and ground tracks should be done wherever board space permits. Alternatively, external clamping diodes can be connected on tracks exhibiting these voltage excursions. The diodes may need be Schottky diodes if regular ones do not clamp soon enough toprevent current flow through

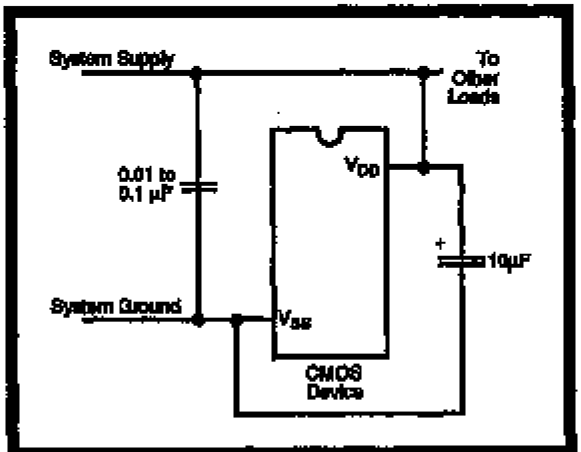

Fig. 17 - Local Decoupling to Offset Load Switching Effects

I/O structures. Regular silicon diodes may still be used if they are referenced to voltages inset by 0.7V from the supply rails. The clamping circuit shown in Fig. 18 should be quite effective, but as can be seen, this circuit will dissipate power. This may or may not be a problem depending on the overall system requirements. The decoupling capacitors help to absorb the high frequency energy. The resistor values shown are selected for a 5V supply and should be scaled for other supply voltages.

Ribbon Cables - A Special Case

A ribbon cable is a special case of long bus structure. The problems mentioned in the previous section also apply here. However, if the ribbon cable is of sufficient length, then its inductive properties become significant. The distributed inductance and capacitance form a second order circuit which can "ring" when driven by fast, digital signals. The result is the generation of damped oscillations centered about the positive and negative supply rails (Fig. 19). The positive and negative excursions outside of the supply rails impress over-voltages on inputs and outputs connected to the ribbon cable. If of sufficient amplitude, these over-voltages may trigger latch-up.

Solving the problem can be as simple as terminating each end of such cables with resistors to reduce the ringing voltages. However, these resistors will dissipate extra power. An alternative is to connect external protection diodes as shown in Fig. 20.

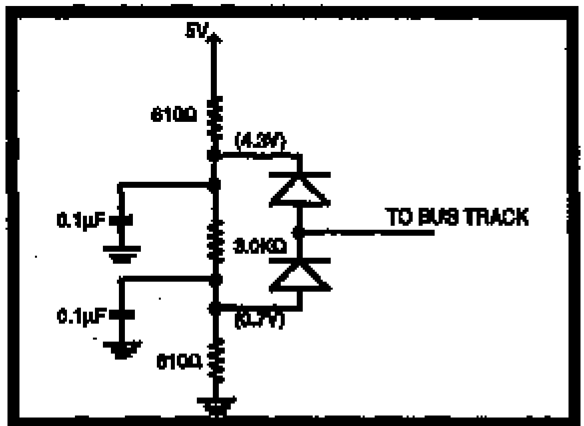

Fig. 18 - Clamping Circuit for Long Buses

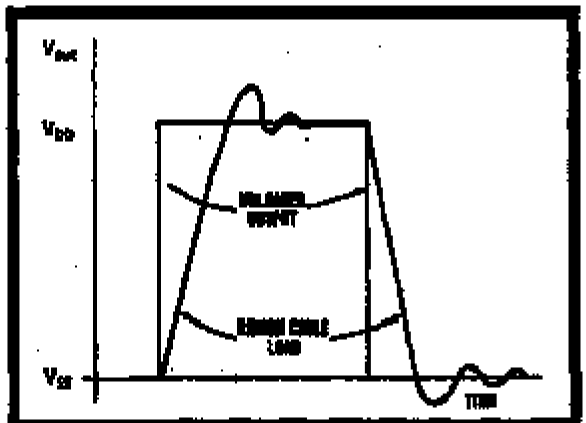

Fig. 19-Ringing Effect Due to Driving Ribbon Cable

These diodes will clamp any generated over-voltages. If the problem persists, it may be necessary to use Schottky diodes to ensure that the external diodes conduct before the input/output structures do.

Systems with End-User Accessible Inputs/ Outputs

An extreme condition of input/output over-voltage can develop in systems which have end user accessible I/O ports. The user may apply signals to these ports when the system power supply is not turned on. Devices in the system connected to these ports are likely to latch-up when the power is turned on due to the current flowing through the I/O structures. Resistors can be connected in series with these I/O's to limit the current during these periods. As mentioned, these resistors will have direct effect on the speed and noise performance of these ports. Latch-up may also be triggered if the end user applies voltages to the I/O ports which exceed the system power supply voltages. The protection resistors suggested above may provide adequate protection against this hazard as well.

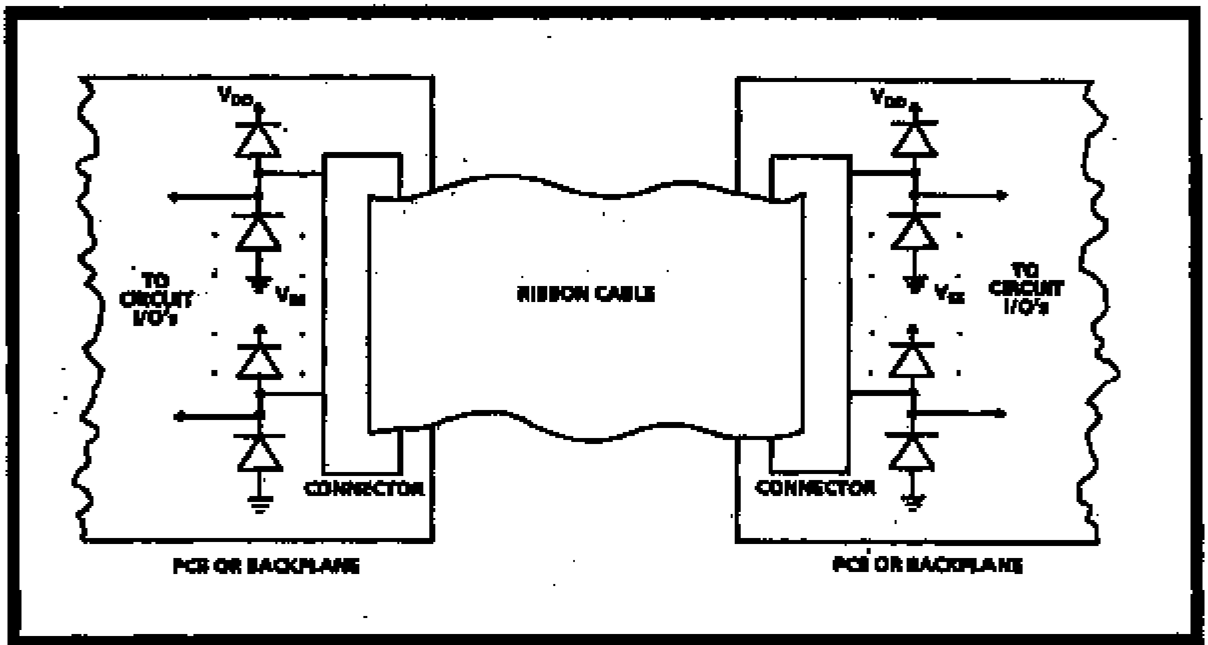

Figure 20 - External Clamping Diodes

However, performance constraints on the port may be such that the current-limiting resistors chosen are too small to protect against severe faults such as accidental connection of the AC mains supply. Protection against such faults can be provided by connection of external clamping diodes in the manner outlined for ribbon cables. Again, Schottky diodes may be required.

If fault conditions are likely to be very severe, it may be necessary to reference external clamping diodes to voltages inset by 0.7V from the power supply (Fig. 21). These diodes will conduct before the input/output structures of the device on the port whenever an over-voltage condition exists. Thus, no current will flow to trigger latch-up. The reference voltages are inset by 0.7V to allow the use of regular, low-cost diodes. Due to the potentially large currents flowing through the protection diodes, a clamping circuit similar to the one in Fig. 18 is not feasible. The output resistance in this case needs to be substantially lower.

Digital and Analog Devices in Same System

In systems which have digital and analog devices powered by different supply voltages, there is the

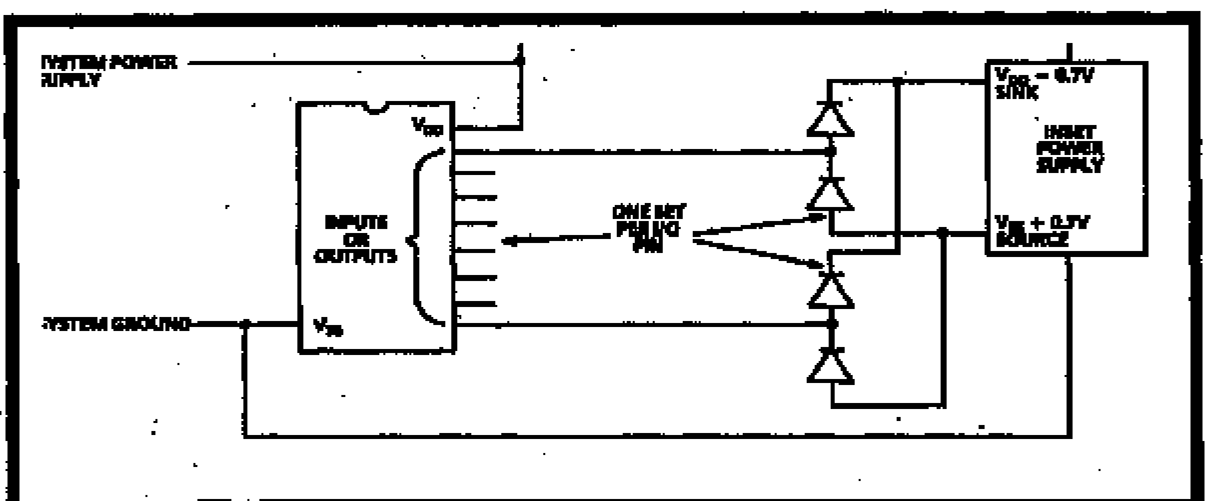

Figure 21 - Inset Supply Voltages for External Clamping

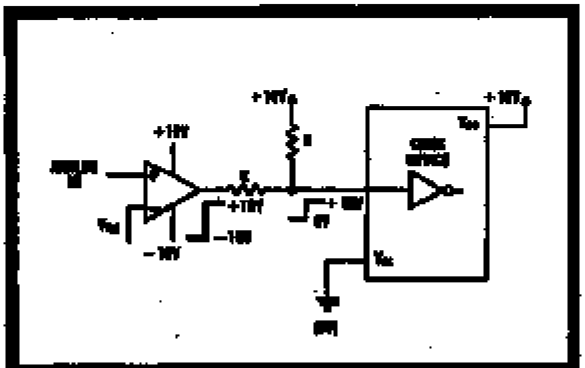

Fig. 22 - Voltage Divider to Limit Voltage Swing on CMOS Input

potential hazard of over-voltage conditions developing. Consider, for example, the case of an analog comparator powered from ±10V driving a digital device powered from a +10V supply. When the comparator output goes low, it will approach -10V and pull the digital input below V_{SS} (0V). If the comparator can pull enough current, then latch-up may be triggered. Putting a resistor in series with the input will limit the current and prevent latch-up. However, it is not a recommended procedure to use the input diodes as clamping circuits. A more advisable solution is to use a resistive divider as shown in Fig. 22. When the comparator output goes low, the divider will have 20V across it. Half of this voltage will be dropped across each resistor so that the digital input sits at 0V. When the comparator output goes high, no current flows through the divider so that the digital input sits at V_{DD}. Since the CMOS input has an extremely high input impedance, the value of these resistors can be very large (>100K) to minimize power consumption.

Conclusion

In the vast majority of circuits and systems employing CMOS devices, latch-up will not be a major concern. When simply applied according to manufacturers' recommendations, CMOS devices are not overly sensitive to the normal circuit conditions that exist within a system. What has been attempted in this application note is to develop an understanding of the latch-up phenomenon and its causes to assist designers in avoiding potential pitfalls caused by a simple lack of knowledge.

Having briefly reviewed the basic theory of SCR operation in general, and as it applies to CMOS input and output structures, an understanding of the mechanism of latch-up was developed. Taking a close look at various aspects of system and circuit design has revealed that various precautionary measures taken at the design stage can greatly reduce the risk of latch-up occurrences. In cases where system performance or features create potentially hazardous situations beyond the designer's control, the implementation of simple protection circuitry will again minimize problems.

Through the use of careful design practices, augmented by protection circuitry when needed, the designer can use CMOS analog and digital integrated circuits extensively. System and circuit reliability will no longer be a function of latch-up related problems.

Reference

1. S.B. Dewan and A. Straughen, "Power Semiconductor Circuits", pp. 77-84, John Wiley and Sons, 1975.

Appendix

The following is a derivation of equation (1) of the main text. Fig. 2 is referenced for this purpose.

The collector and emitter currents of Q_1 and Q_2 are related by:

$$I_{C_1} = \alpha_1 I_{E_1} \qquad I_{C_2} = \alpha_2 I_{E_2}$$

Looking at Fig. 2, it can be seen that the load current and the emitter currents of Q1 and Q2 are all equal. Also the load current is equal to the sums of the two collector currents and a leakage current from Q_2's collector to its base (I_{CBO2}). Therefore:

$$\begin{aligned} I_L &= I_{C_1} + I_{C_2} + I_{CBO_2} \\ &= \alpha_1 I_{E_1} + \alpha_2 I_{E_2} + I_{CBO_2} \\ &= (\alpha_1 + \alpha_2) I_L + I_{CBO_2} \\ &= \frac{I_{CBO_2}}{1-(\alpha_1+\alpha_2)} \end{aligned}$$

The collector-emitter current gains (α_1, α_2) can be expressed in terms of the collector-base current gains (B_1, B_2) as:

$$\alpha_1 = \frac{B_1}{1+B_1} \qquad \alpha_2 = \frac{B_2}{1+B_2}$$

Substituting these into the equation above yields:

$$I_L = \frac{I_{CBO_2}}{1-\left(\frac{B_1}{1+B_1} + \frac{B_2}{1+B_2}\right)}$$

$$I_L = I_{CBO_2}\left[\frac{(1+B_1)(1+B_2)}{1-B_1B_2}\right]$$

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Temperature Coefficient		Resistivity OHMS / CMF	Thermal EMF *	Maximum Resistance Factor **
-55 deg C. to +25 deg C.	+25 deg C. to +125 deg C.			
+5 +/- 10 ***	+5 +/- 10	800	+ 2.5	1.0
0 +/- 20 ***	0 +/- 20	300	- 45	0.38
+60 +/- 20	+60 +/- 20	650	+ 6.0	0.81
+140 +/- 30	+140 +/- 30	675	+ 2.0	0.84
+180 +/- 30	+180 +/- 30	180	- 37	0.23
+400 +/- 40	+380 +/- 40	610	+ 2.0	0.76
+450 +/- 50	+450 +/- 50	90	- 28	0.11
+700 +/- 200	+700 +/- 200	60	- 22	0.08
+850 +/- 80	+850 +/- 80	470	- 3.0	0.59
+1000 +/- 100	+1000 +/- 100	420	- 22	0.53
+1400 +/- 300	+1400 +/- 300	30	- 14	0.04
+1500 +/- 200	+1400 +/- 200	500	+ 9.0	0.63
+2600 +/- 200	+2600 +/- 200	420	- 27	0.53
+3500 +/- 300	+3500 +/- 300	294	-35	0.37
+3700 +/- 300	+3900 +/- 300	10	Ref	0.01
+3700 +/- 300	+4300 +/- 300	120	- 40	0.15
+4000 +/- 500	+5000 +/- 500	60	- 22	0.08
+5000 +/- 300	+6000 +/- 300	42	- 22	0.05

* Thermal EMF µV / °C referenced to copper at 0 °C.

**To obtain max resistance available, multiply the maximum value found for type chosen by this factor.

***Preferred Temperature Coefficient wire is readily available for most resistance ranges. The other alloys may require longer delivery times and higher minimum quantities. *Consult Factory.*

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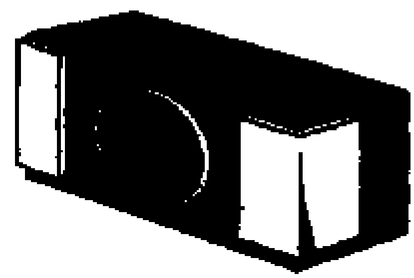
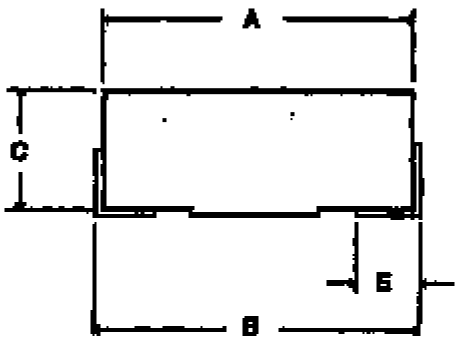
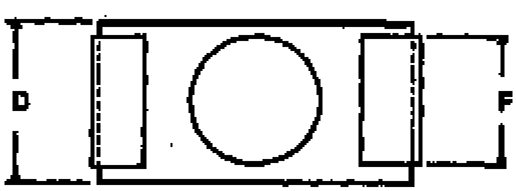






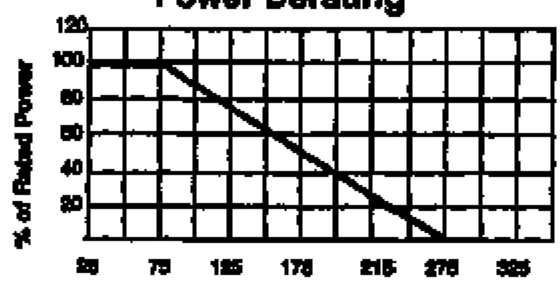
Features

High temperature molded encapsulation
All welded construction
Flex termination for absorbing thermal expansion
Tinned copper terminals
Available in non-inductive styles

Electrical Specification

Power Rating: .5 to 2 watts
Resistance Range: 0.01 ohm to 2 K ohms
zero ohm (jumpers) available
Tolerance: .1% to 5%
Temperature Coefficient:
+/- 100 PPM/°C from 0.1 to 10 ohms
+/- 20 PPM/°C from 10 ohms to 2 K ohms
Load Life: 1% ΔR maximum
Short Time Overload: .5% ΔR maximum
Temperature Cycling: .5% ΔR maximum
Moisture Resistance: 1% ΔR maximum

Power Derating



Ambient Temp. Deg. Celsius
Max. Recommended Ambient Operating Temperature 150 °C

Type	Power Rating (watts)	Std. Resistance Range* (ohms)	Maximum Working Voltage**	Dimensions A	B	C	D	E	F
SMH	.5	.1 to 400	22.9	.200	.210	.110	.150	.040	.060
SM1	1.0	.01 to 1K	28.2	.250	.260	.140	.150	.090	.100
SM2	2.0	.01 to 2K	52.4	.410	.435	.180	.240	.100	.115
SM2A	2.0	.01 to .1 ohm	n/a	.475	.500	.140	.295	.110	.445

*Ranges are limited by tolerances **Maximum working voltage determined by using .0006 diameter wire

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2. Resistance Value
3. Tolerance
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1 2 3 4

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- Magazine pack (tubes)
- Tape and reel
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- Custom packaging upon request

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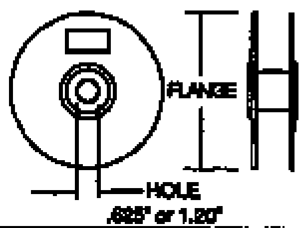
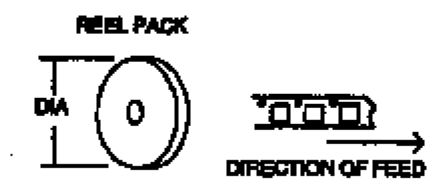


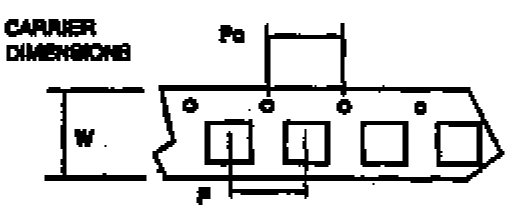
Reel to the latest revision of "EIA-296"
Other tape spacing and pitch available on request

Type	Max. Units per Reel		Pitch	Tape Spacing
	11" Flange	14" Flange		
WWH, WW1, WW1A, MR1A	3000	4500	.200	2.062
WW2, WW2A, GP1, GP2, MR1	2500	4000	.200	2.062
WW3, GP3	2000	3000	.200	2.062
WW3A,	750	1500	.400	2.062
MR3	750	1500	.400	2.500
WW4, WW5, WW7, MR5	500	1000	.400	2.670

Surface Mount Tape & Reel

Reel to the latest revision of "EIA-481"





Type	Reel Size	Units per Reel	[illegible]		
			[illegible]	Po	[illegible]
SMH	13"	3000	.315 (8mm)	.157 (4mm)	.472 (12mm)
SM1	13"	1500	.315 (8mm)	.157 (4mm)	.630 (16mm)
SM2	13"	1000	.472 (12mm)	.157 (4mm)	.945 (24mm)
SM2A	13"	1250	.472 (12mm)	.157 (4mm)	.945 (24mm)

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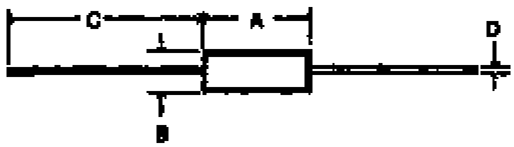
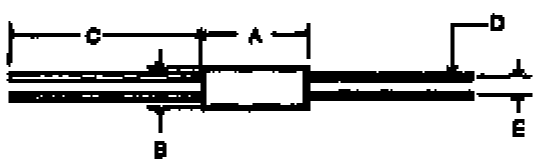
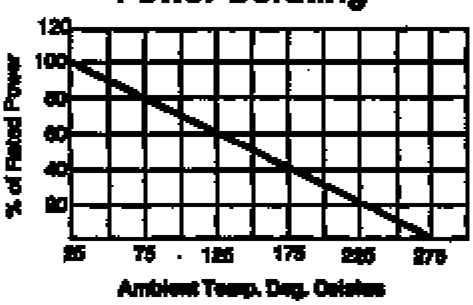
Series MR



Series TMR



Power Derating



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Resistance Range: .005 to 0.5 ohm
Tolerance: 1% to 10%
Temperature Coefficient:
Series MR: 50 to 400 PPM/°C
Series TMR: 40 PPM/°C max.
Max. Operating Temperature: 275° C
Dielectric Strength: 500 VAC
Short Time Overload:
5 seconds at 5x Rated Power
Insulation Resistance: 10,000 MΩ dry

Type	Power Rating (Watts)	Std. Resistance Range (ohms)	Dimensions				
			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MR1	1	.01 to .1	.355	.135	1.375	.032	n/a
MR1A	1	.01 to .1	.427	.115	1.375	.025	n/a
MR3	3	.025 to .2	.550	.205	1.375	.032	n/a
MR5	5	.005 to .3	.825	.330	1.375	.036	n/a
MR10	10	.01 to .5	1.025	.392	1.375	.036	n/a
TMR3	3	.005 to 0.2	.625	.205	1.375	.032	.125
TMR5	5	.005 to 0.3	.940	.330	1.375	.036	.200

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[redacted]	Competitor's Series						page
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[redacted]	7000	500		MA	SM		3
[redacted]	4000	PC		PC	PC	TBX	4
[redacted]					RL	TBR	4
[redacted]	LO	NP	10		MT		5
[redacted]	[redacted]				MT-4T		5
[redacted]	[redacted]	S	CA/CB		S	7KW	6
[redacted]	[redacted]	C	40	100	UT	TS	7
[redacted]	[redacted]	P	WP			TSM	8
[redacted]	[redacted]	KW / AT	89	600	UAL	TM	9
[redacted]	[redacted]	T		RW			10
[redacted]	[redacted]	CB		PW		TC	11
[redacted]	[redacted]						12
[redacted]	[redacted]						13
[redacted]	[redacted]	LB (4)		LVF		TCK	13
[redacted]	[redacted]	LB		ULV		TC	14
[redacted]	[redacted]	KPC					14
[redacted]	[redacted]	V	TW	PV		TCV	15
[redacted]	[redacted]						15
[redacted]	[redacted]	V				TCV	16
[redacted]	[redacted]						16
[redacted]	[redacted]						17
[redacted]	[redacted]					LFR2	18

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New Latchup Mechanism in Complementary Bipolar Power ICs Triggered by Backside Die Attach Glue

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Philips Semiconductors, Gerstweg 2, 6534AE Nijmegen, The Netherlands

Abstract

It is shown that in complementary bipolar power ICs latchup can be caused by a thyristor formed by the V-PNP power transistor at the frontside of the die and a Ag-filled glue die attach at the backside of the die (used to provide a good thermal contact between the die and the Cu-heatsink. The thyristor is triggered by saturation of the V-PNP power transistors or by forward biasing the backside diode between Ag-filled glue and p-type silicon. The effect is strongly temperature dependent. It can be eliminated by either leaving the backside floating or by applying backside metallization. Consequences for latchup qualification testing are discussed.

1. Introduction

Latchup [1] is a known reliability risk in complementary bipolar power processes (featuring both vertical-PNP and vertical-NPN power transistors) as thyristors are intrinsically present in these technologies, see fig. 1 and 2. Furthermore complementary bipolar processes are more susceptible to latchup than CMOS processes as the presence of n- and p-type buried layers prevents the use of p⁻ epi/p⁺⁺ low ohmic (≈ 0.01 Ωcm) bulk epitaxial substrates. The thyristors are located at the frontside (top side) of the die, see fig. 1 and 2, and can be triggered by currents injected by both external spikes as well as by saturation of internal bipolar transistors. Note that in harsh automotive application environments these injection currents can be well over 1 A. Generally many design and layout measures are taken to prevent latch-up from occurring like the use of guardrings, limitation of bipolar transistor saturation currents and by grounding the substrate as good as possible. Because of the above, latch-up testing is a routine part of product qualification programs for complementary bipolar power ICs as e.g. required by the Automotive Electronic Council (AEC).

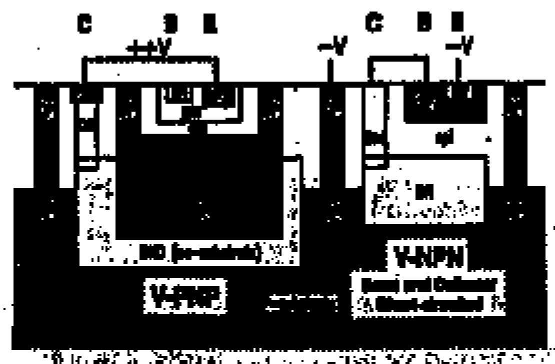

Fig. 1: Schematic view of a cross section of the complementary bipolar IC showing the V-PNP and V-NPN transistor.

Bipolar power ICs are often packaged in Single-In-Line (SIL) power packages where the low-doped p⁻-substrate is attached to a copper (Cu)-heatsink by a silver (Ag)-filled epoxy glue to achieve low thermal resistance values. In the application the Cu heatsink is generally contacted to the ground potential (just as the p⁻ substrate).

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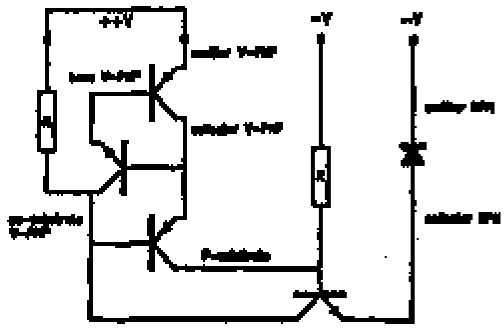


Fig. 2: Schematic view of an electrical scheme showing connections in fig. 1 between the various bipolar transistors forming a thyristor at the topside of the die.

In this paper we will show that this packaging method gives rise to a new latchup failure mechanism where latchup is not induced by triggering one of the known thyristors at the top side of the die but by triggering of an unexpectedly present parasitic thyristor located between the frontside and the (n-type) Ag-filled glue contacting the backside of the die, see fig. 3. The phenomenon will be described in more detail in the paper and options for its elimination will be presented. Consequences for qualification testing will be discussed.

2. Occurrence of a parasitic thyristor between frontside and backside of the die

The power ICs in our study are fabricated in a 2 µm double metal complementary bipolar process featuring both V-NPN and V-PNP power transistors. The transistors are build in a 10 µm thick, 2 Ωcm n-type epi layer on top of a 375 µm thick 4 Ωcm p-substrate. Isolation between different n^--epi islands is achieved by deep-P//buried-P (DP//BP) junction isolation. The base of the V-PNP transistor is formed by a N_{well} (NW) diffusion in the n^--epi layer and the transistor isolated from the p^- substrate by a deep buried-N (BND) diffusion, see fig. 3. The bipolar gains h_{fe} of the active V-PNP transistor T1 formed by the SP-(NW//n^--epi)-BP diffusions, the parasitic V-PNP transistor T3 formed by the BP-BND-p^--substrate and the parasitic V-NPN transistor T2 formed by the (NW//n^--epi)-BP-BND diffusions, see fig. 4, typically equal 60, 120 and 11 respectively at 25°C. At the end of the process all n-doped diffusion layers are removed from the backside of the die by a wet silicon etch using a SEZ spin etcher. The purpose of this is to eliminate unwanted pn-diodes that may be the source of minority carrier (electron) injection when the substrate potential is lifted e.g. due to saturation events of the V-PNP power transistor. These injected electrons may disturb the proper functioning of the circuit.

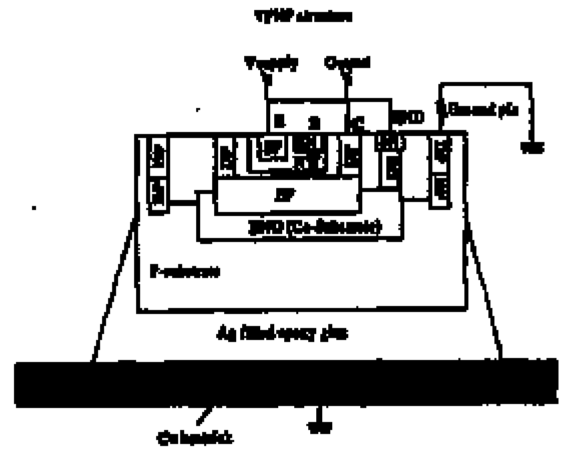


Fig. 3: Schematic view of a cross section of the complementary bipolar IC showing the V-PNP transistor as well as the Cu-heatsink and Ag-filled epoxy glue.

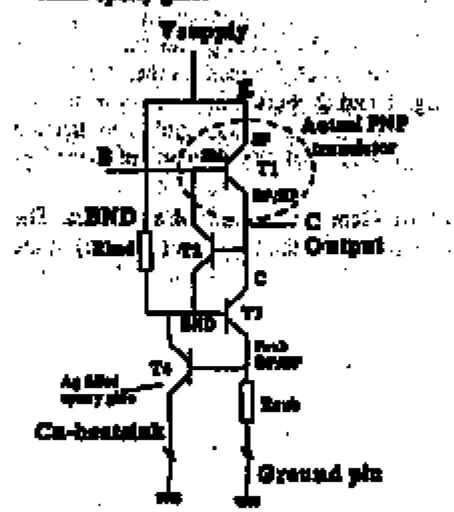
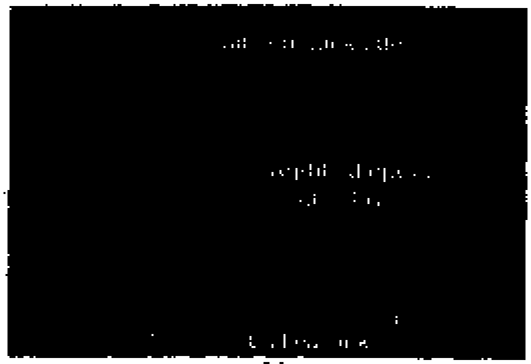
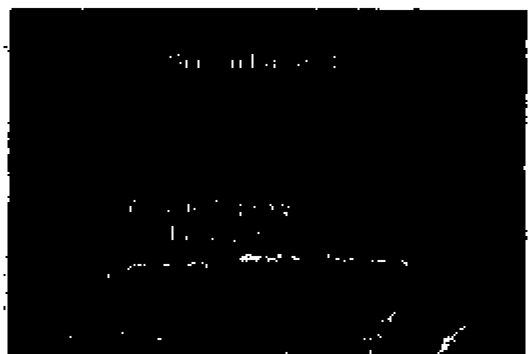


Fig. 4: Electrical scheme showing connections between the parasitic bipolar transistors, Cu-heatsink and Ag-filled epoxy glue that together form the thyristor between frontside and backside of the die.

The ICs are subsequently packaged in a SIL-power package. Here the p^- substrate backside is attached to a Cu-heatsink by an epoxy glue containing Ag-fillers to achieve low thermal resistance values, see fig. 3 and 5.



(a)



(b)

Fig. 5: SEM cross section showing a) the backside of the die, the 5µm thick silver filled epoxy glue layer and the copper heatsink and b) in more detail the backside die - epoxy glue interface.

Unfortunately, it appears that this packaging method results in the formation of a diode between the n-type Ag-filled epoxy glue layer and the low doped p^- substrate, see fig. 4 and 6. Note that diode does not behave like a real Ag-Si Schottky diode. Fig. 6 shows that the diode forward voltage is >0.7V. Given the barrier height for an Ag to p-type silicon metal-semiconductor contact of 0.54 eV at 25°C [2], a good Ag-Si(p-type) Schottky diode should exhibit a much lower forward voltage than observed here. Furthermore, we find that the n-type Ag-filled glue layer also can act as the emitter of a parasitic NPN transistor (T4 in fig. 4) between the frontside and backside of the die where the the p^- substrate acts as the base and the deep buried-N (BND) isolation of the V-PNP transistor as collector, see fig. 4. Fig. 6 shows the bipolar gain of this transistor as a function of the emitter current for a small test structure. Despite the very thick base (≈ 375 µm), the NPN gain h_{fe} ranges from 10^{-4} to 10^{-2} at 25°C. Note that the h_{fe} scales with the collector area; in real circuits h_{fe} values up to 0.5 have been observed. Note that both the diode and the NPN characteristics are not well controlled as these are influenced by many parameters as e.g. the surface roughness of the backside of the silicon die, the thickness of native oxide layers on the silicon backside, the electron minority carrier lifetime in the p^- substrate, the thickness of the epoxy glue, the distribution and concentration of Ag-fillers in the epoxy glue. As a result, a large spread is observed in both the diode I(V) curves, see fig. 6, as well as the NPN current gain (h_{fe}) characteristics, see fig. 7, depending on the specific process flow. The fact that the NPN gain in fig. 7 increases with injected current is characteristic for metal-semiconductor junctions where the ratio of minority injection (electrons in this case) increases with current due to the enhancement of the drift-field component, which becomes much larger than the diffusion current [2].

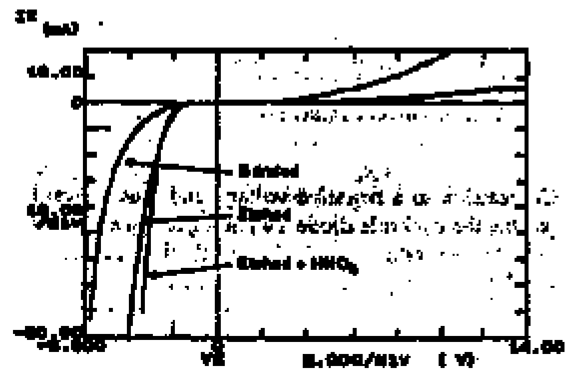


Fig. 6: I(V) characteristics at 25°C of the backside diode formed by the Ag-filled epoxy glue layer and the low doped p^--substrate for three different treatments of the backside of the wafer, a) grinded backside, b) wet etched backside and c) as b) but with an HNO_3 treatment resulting in a thicker native oxide layer on the wafer backside.

As shown in fig. 4, the parasitic NPN transistor T4 forms in combination with the V-PNP transistor T1 a thyristor between the frontside and the backside of the die. As the parasitic V-PNP has high gain, the thyristor loop gain is larger than 1 and thus latchup can occur.

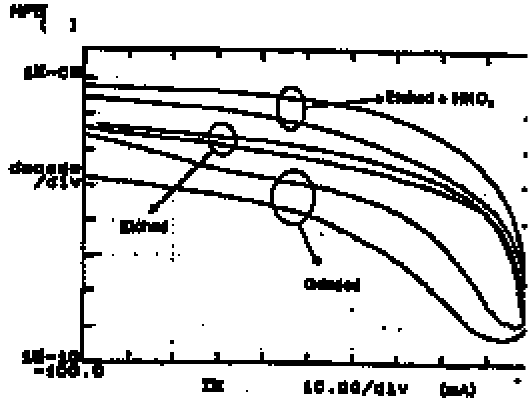


Fig. 7: Gain of the parasitic NPN transistor formed by the Ag-filled epoxy glue layer at the backside (emitter), p⁻ substrate (base) and BND-layer at the frontside (collector) as a function of the backside emitter current for the same treatments of the wafer backside as in fig. 6 (V_{base}=0V, $V_{collector}$=5V, T=25°C).

3. Latchup trigger mechanism

3.1 Backside current injection

One way to trigger the thyristor is by forcing the Cu-heatsink to a negative voltage and thus forward biasing the backside diode T4 and injecting electrons into the substrate. In table 1 typical trigger currents are shown for a typical product in this technology.

3.2 Saturation of V-PNP transistors

In a real automotive application, the thyristor can be triggered by severe saturation of the V-PNP power transistors. This occurs regularly during e.g. an engine start event of a car where the supply voltage can drop as low as 6V. In this case a large hole current is injected into the low doped p⁻-substrate resulting in a significant lifting of the substrate potential. Consequently, the backside diode T4 is forward biased and electrons are injected into the substrate and collected by the BND-layer, see fig. 3 and 4. This causes a voltage drop across R_{BND} which forces parasitic PNP translator T3 to switch on. A current now flows from the emitter of the V-PNP power transistor T1 to the substrate via T3, causing a voltage drop across R_{sub}. When this voltage exceed the forward voltage of the backside diode, the parasitic NPN transistor T4 may remain conducting even when the V-PNP saturation event is over. Parasitic NPN transistor T2 then starts to operate in reverse and as a result the collector current of T4 will start to drive transistor T1 and a thyristor is being build-up.

Backside treatment Si wafer	Die attach	H_{fe} NPN T4	Backside latchup trigger current
Etched	Ag-filled epoxy	$0.8 \cdot 10^{-3}$	120 mA
Etched+ HNO3	Ag-filled epoxy	$3\text{-}7 \cdot 10^{-3}$	60 mA
Grinded	Ag-filled epoxy	$0.3\text{-}3 \cdot 10^{-3}$	130 mA
Etched	Ti/Ni/Ag backside metallization	$3 \cdot 10^{-6}$	>3 A

Table 1: Gain of the parasitic NPN T4 and latchup trigger current at 25°C for a typical product in case of injection from the backside diode for various treatments of the wafer backside as in fig. 6 and for various die attach materials.

The thyristor turns-on when the injected electron current from the backside diode $I_{backside}$ exceeds a certain trigger value I_{trig} while the back-tab is at 0V. The effect is strongly temperature dependent, see fig. 8, as both the saturation current of the V-PNP power transistors and the substrate resistivity increase with temperature resulting in an increased substrate potential lifting. In combination with the drop in backside diode forward voltage with temperature, this results in a strong increase of the current $I_{backside}$ injected by the backside diode. When it exceeds the latchup trigger current I_{trig} latchup will occur. Note that I_{trig} decreases with temperature due to the increase of the gain of the bipolars and the drop of diode forward voltages with temperature. Fig. 8 shows that for our typical product latchup will occur for T>105°.

4. Elimination of the backside triggered latchup mechanism

There exist several possibilities to prevent the above described latchup mechanism. The first is to disconnect the Cu-heatsink from the ground potential thereby forcing the emitter of T4 to be floating. This can be achieved by either leaving the external heatsink to which the Cu-heatsink is attached floating or by placing a thin electrically isolating sheet between them. This is a very robust solution but care must be taken not to deteriorate the thermal impedance characteristics. The second is to use an isolating epoxy glue instead of a glue containing Ag-fillers.

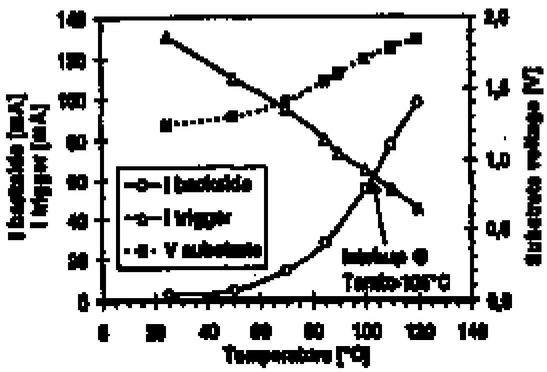
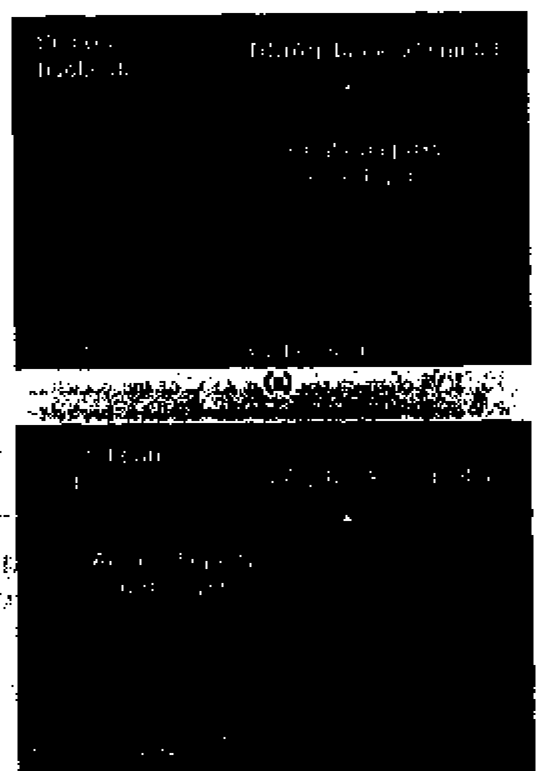


Fig. 8: Backside injection related latchup trigger current I_{trig} (triangles), substrate potential lifting (squares) and resulting backside diode injection current $I_{backside}$ (crosses) as a function of temperature for the case of a typical product during a V-PNP saturation event at V_{supply}= 7V; at T>105°C current $I_{backside}$ > I_{trig} and latchup will occur.

Again thermal impedance characteristics will determine the feasibility of this solution. The third option is to lower the resistivity of the p⁻ substrate, thereby reducing both the substrate potential lifting in case of saturation as well as the bipolar gain of the parasitic NPN transistor T4. If the loop gains remains <1 no latchup will occur. It is however difficult to prove that this a 100% robust solution up to 150°C for all designs at all application conditions. The final solution is to apply a Ti-Ni-Ag backside metallization to the low doped p-type wafer backside, see fig. 9. The Ti-Si interface forms a kind of a Schottky diode with a barrier height of 0.61 eV [2]. The corresponding I(V) characteristics are shown in fig. 10 and it can be clearly seen that the diode forward voltage is reduced to about 0.3V. Furthermore, as the Schottky diode is a majority carrier device [2], the TiNiAg backside metallization decreases the bipolar gain of the parasitic NPN transistor T4 by more than a factor 100, see table 1. This is probably caused by a strongly reduced emitter efficiency in the case of the backside metal. As a result, the thyristor loop gain is effectively reduced to much lower than 1 thus preventing the occurrence of latchup. Furthermore the backside metallization also strongly reduces the substrate resistance R_{sub}. Table 1 shows indeed that no latchup is observed up to backside injection currents exceeding 3A.



(a)

(b)

Fig. 9: SEM cross section showing a) the backside of the die, the 100nm thick TiNiAg backside metallization, the 10µm thick silver filled epoxy glue layer and the copper heatsink and b) in more detail the backside die - TiNiAg interface.

5. Impact on latchup qualification testing

Our results clearly suggest that a number of improvements are required for the latchup test procedure of (medium) power ICs. Firstly we recommend that during the standard latchup test procedure the backside of the die (or any leadfinger that makes electrical contacted to the diepad as in the case of certain medium power packages) must be contacted to ground potential. Secondly we recommend also a measurement of the latchup trigger current while injecting from the backside diode at maximum application temperature. The trigger current pass/fail criteria for this case are subject of discussion but probably should be >500mA.

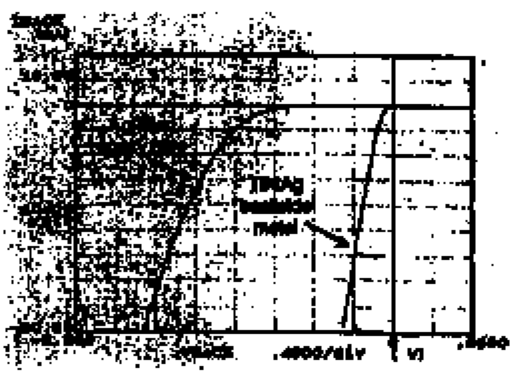


Fig. 10: I(V) characteristics at 25°C of the backside diode formed by a) the TiNiAg backside metal and the low doped p^--substrate and b) the Ag-filled epoxy glue layer and the low doped p^--substrate. In both cases the backside was wet etched.

6. Conclusions

A new latchup failure mechanism in complementary bipolar power ICs has been described. Latchup is caused by a thyristor constituted by the V-PNP power transistor at the frontside of the die and a parasitic NPN transistor between the frontside and the backside of the die. The emitter of this NPN transistor is formed by the Ag fillers in the die attach glue at the backside of the die, its base by the p^- substrate and its collector by the n-type BND isolation of the V-PNP transistor. The thyristor is triggered by saturation of the V-PNP power transistors or by forward biasing the backside diode between Ag-filled glue and p-type silicon. The effect is strongly temperature dependent. It can be eliminated by either leaving the backside floating, thus eliminating the parasitic NPN, or by applying backside metallization which strongly reduces the bipolar gain of the parasitic NPN.

Consequences for latchup qualification testing are that during the standard latchup test procedure the backside of the die (or any leadfinger that makes electrical contacted to the diepad as in the case of certain medium power packages) must be contacted to ground potential. This is currently not prescribed in the existing latchup test specifications. Furthermore it would make sense to an additional test where the latchup trigger current is measured while injecting from the backside diode (all at maximum application temperature).

7. References

[1] R.R. Troutman, 'Latchup in CMOS technology', Kluwer Academic Publishers, Boston, (1986)

[2] S.M. Sze, 'Physics of Semiconductor devices', 2nd edition, John Wiley & Sons, New York, (1981)

Polymer film's thinly veiled design disguises strength

If it's possible for a product to be considered a breakthrough technology four decades removed from its first application—and **Specialty Coating Systems** (SCS) of Indianapolis does—a thinly veiled polymer film known as Parylene coating is on its way to becoming a hot trend for automotive manufacturers interested in providing a reliable measure of protection for components exposed to the harsh environment of today's sophisticated engines.

For years, the company says, designers have explored various options for protecting electronic engine devices, including protective housings, liquid coatings, and encapsulation. Unsealed housings also have been examined and proved to be largely ineffective, allowing contaminants and moisture to reach into and damage critical devices. By comparison, viscous liquid coatings pose mechanical challenges due to differences in the thermal coefficient of expansion, which exist between any coating and the device itself. This condition often results in fractured leads and mechanical damage. Encapsulated parts may also suffer from similar thermal expansion problems, as well as poor heat dissipation.

In its place, the vacuum-deposited polymer film—first discovered some 40 years ago by **Union Carbide** Corp.—is gaining recognition with component manufacturers, primarily because it possesses good barrier properties in extremely thin layers, SCS says. Proved effective in numerous aviation, aerospace, and medical device applications, it resists chemical attack from organic solvents, inorganic reagents, and acids. The dielectric strength [redacted] a layer 25.4 µm (1000 µin) thick is greater than 5000 V.

Defined chemically as poly-para-xylylene, it is a transparent film applied to substrates in an evacuated deposition chamber by means of gas phase polymerization. There is no liquid phase in the process, and no catalysts, solvents, or other environmentally restricted materials are required. The average cured thickness of a conventional liquid conformal coating is generally in the range of 0.005-0.010 in (0.13-0.25 mm). Flat surfaces are often treated at that thickness for hard-to-reach applications such as outside corners, sharp points, and around edges.

*Parylene can be used for coating electronics, such as this **Sauer-Danfoss** sensor.*

Complete protective encapsulation of an object is achieved with a Parylene film thickness of 0.75 µm (30 µin) or less. Because the coating is nonliquid, it does not pool, bridge, or exhibit meniscus properties when applied to surfaces. Film thickness varies little from point to point, whether measured on planar surfaces, in crevices, or on outside corners. In addition to its dielectric and barrier properties per unit thickness, Parylene coating offers extreme chemical inertness and freedom from pinholes, according to SCS. Parylene is easily deposited on such diverse substrates as

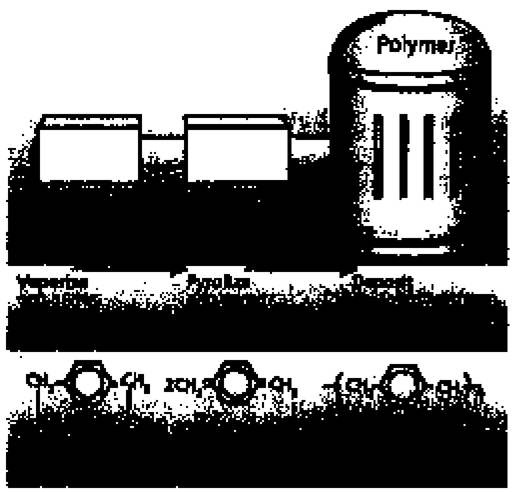
EA02-027-C 3790

silicon, glass, metal, paper, resin, plastics, ceramic, and ferrites. Its mechanical damping and loading effects are minimal due to its extremely low mass.

The Parylene raw material, di-para-xylylene dimer, is a white crystalline powder. Dimer is first vaporized at approximately 150°C (300°F) before being molecularly cleaved or pyrolyzed in a second process phase at about 680°C (1250°F). This forms the diradical, para-xylylene, which is introduced into the room-temperature vacuum deposition chamber as a monomeric gas that polymerizes evenly on substrates.

Substrate temperatures remain at a near-ambient level in this gaseous process, and the coating grows as a conformal film on all exposed surfaces. There are no cure-related hydraulic or liquid surface tension forces in the Parylene coating cycle.

Parylene thickness is related to the amount of vaporized dimer and dwell time in the vacuum chamber and can be controlled accurately to ±10% of its final thickness. Film thicknesses from 4.0-3000 µin (0.1-76.0 µm) can be applied in a single operation at a typical rate of 0.200 µin/h (5.08 µm/h).



A three-step process is used by SCS to produce Parylene.

Parylene coating exists in four variations known as N, C, D, and SCS Nova HT. Each of these polymer precursors has a unique molecular form and particular strengths. They are all applied in the same manner, with minor differences in the rate of polymerization. Several benefits exist with each of the variations including:

- High [redacted] Because of its [redacted] the monomer [redacted] the highest penetrating power of the Parylenes and is able to coat relatively deep recesses and blind holes.
- [redacted] possesses a chlorine atom on the benzene ring, giving this variant a combination of electrical and physical properties that include very low permeability to moisture and corrosive gases.
- [redacted] with two chlorine atoms on the benzene ring,-

E002-027-C 3808

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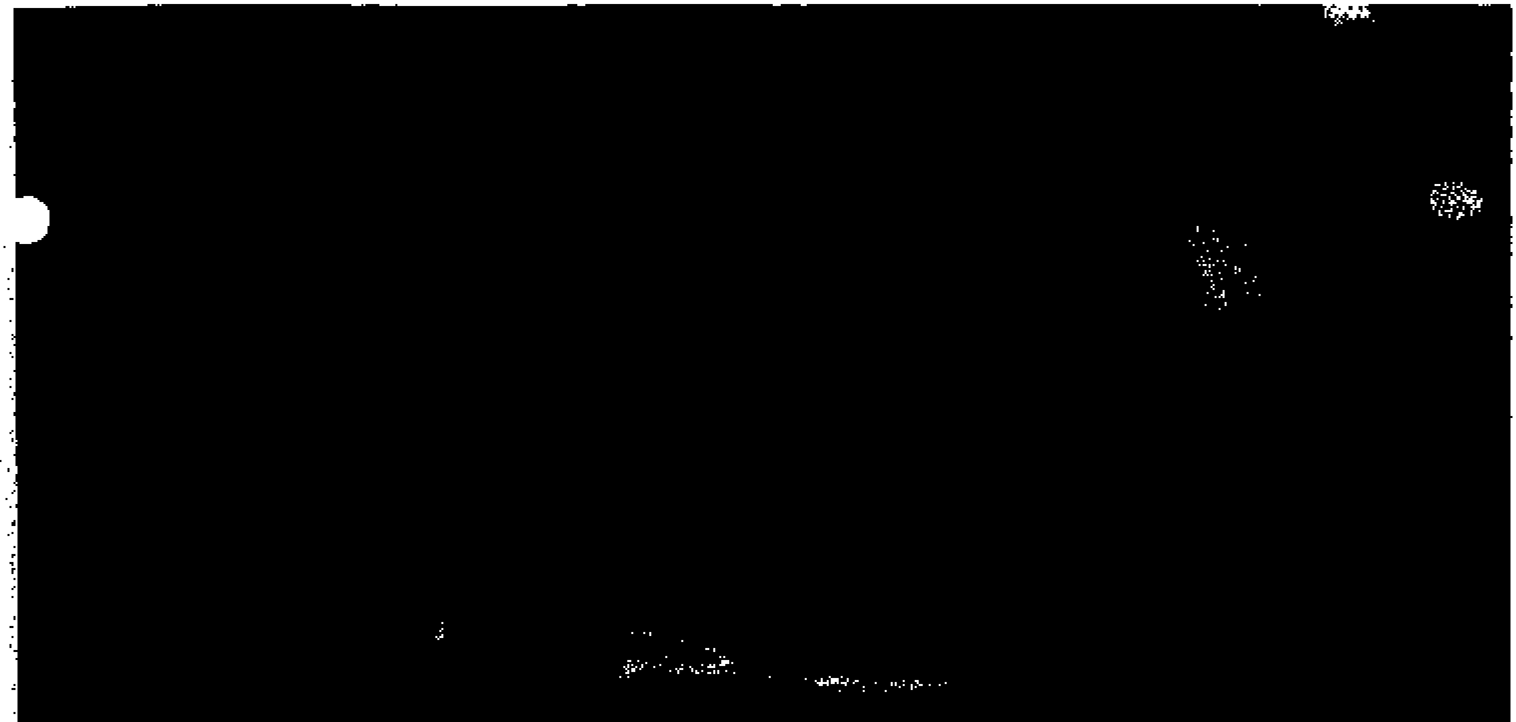



New

offers increased temperature performance compared to Parylenes N and C.

- Extended temperature range—SCS Nova I-IT, a proprietary fluorinated Parylene developed by SCS, has advanced properties for demanding applications requiring higher temperature performance and resistance to ultraviolet radiation.

One of the earliest automotive applications of Parylene was as a coating for a pressure sensor used in monitoring the air/fuel mixture in intake manifolds. The hydrocarbon resistance of Parylene film in a very thin layer allowed the delicate electronic sensors to continue to operate accurately.

The material is appropriate for extending racing engine oil pan and valve cover gasket life. Frequent disassembly of racing engine components leads to gasket damage, as does normal thermal cycling.

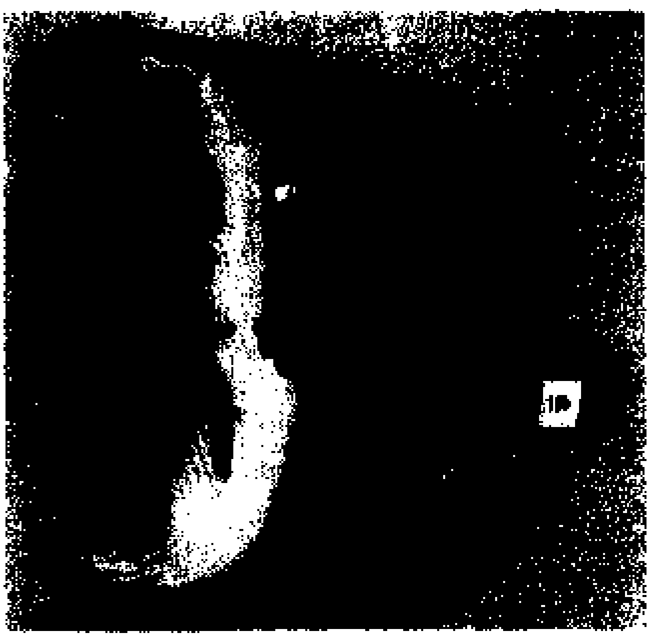
Parylene has been key to the performance of many spacecraft components, including elements of the Mars Global Surveyor spacecraft camera, the International Space Station vision system, and the ion engine in NASA's Deep Space probe.

Patrick Ponticel

Side mirror foam from Schefenacker

An exterior mirror using foam for the structural housing is a lightweight solution has debuted on a passenger vehicle in Australia.

"Foam supports the plastic surface and unites the two parts together with no fasteners, making it very rigid to withstand



This foam-filled exterior mirror weighs 20-30% less than a conventional one.

vibrations," Rob Gilbert, Regional Managing Director-The Americas for **Schefenacker** International, said during a technology showcase event at the company's Marysville, MI, exterior mirror manufacturing center.

Without the usual mirror frame's structural elements, the foam version weighs about 20-30% less than a conventional side mirror. "Ultimately, although not a reality yet, we intend to make the product for less money than today's production costs," said Gilbert, adding, "We're already quoting customers in North America, and we anticipate that North America will be the next market introduction."

Second-generation technology will use a foam bracket base, which attaches to the vehicle. A third-generation of the foam-filled frame will replace the molded, painted exterior with a colored pressure-formed film, which is attached and supported by the foam. "So we'll have a foam core, and a colored environmentally resistant exterior film surface," said Gilbert, noting the third-generation product is likely to be seen around MY 2007.

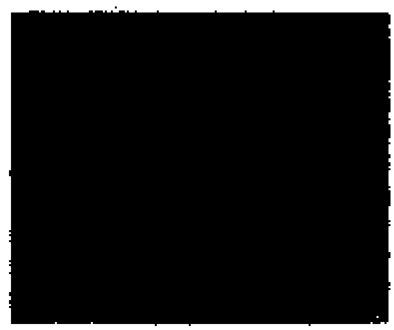
Schefenacker claims about a 30% share of the world automotive interior and exterior mirror market.

Kami Buchholz

Leather-like coverstock material

An automotive interior material described as a breakthrough by the company that has exclusive rights to market and make it in North America can be used for seating surfaces as well as door trim, instrument panels, steering wheels, consoles, and shift knobs. A comfortable feel with good moisture-absorption and release properties make the **Canadian General-Tower** Ltd. polymer the most leather-like nonleather material available, according to the company. It will be offered as both a PVC and thermoplastic polyolefin coverstock.

Canadian General-Tower's new interior coverstock is designed for use in instrument panel and other applications.



The polymer is the most leather-like of nonleather materials, says Canadian General-Tower.

Canadian General-Tower was granted rights for the product from Tokyo-based **Idemitsu Technofine** Co. Ltd., which introduced it to the Japanese automakers.

To make the unique converstock, naturally occurring organic materials are produced in a patented process and combined with special resins. Good moisture absorption and release properties reduce damminess, providing comfort and functionality close to those of the natural materials.

Patrick Ponticel

EA02-027-C 3004

NEW PRODUCT

TBZ363C5V5-TBZ363C20V8

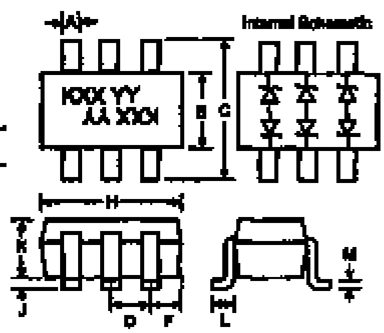
TRIPLE BI-DIRECTIONAL SURFACE MOUNT ZENER DIODE ARRAY

Features

- Nominal Zener Voltages: 5.5V, 6.4V, 7.0V, 20.8V
- Ultra-Small Surface Mount Package
- Ideal For Transient Suppression

Mechanical Data

- Case: SOT-363, Molded Plastic
- Terminals: Solderable per MIL-STD-202, Method 208
- Marking: See Table Below
- Weight: 0.006 grams (approx.)



KXX: Part Marking (See Table Below)
YY: Date Code

SOT-363		
Dim	Min	Max
A	0.10	0.30
B	1.15	1.35
C	2.00	2.20
D	0.65 Nominal	
F	0.30	0.40
H	1.80	2.20
J	—	0.10
K	0.90	1.00
L	0.25	0.40
M	0.10	0.25
All Dimensions in mm		

Maximum Ratings @ T_A = 25°C unless otherwise specified

Characteristic	Symbol	Value	Unit
Power Dissipation (Note 1)	P_d	200	mW
Thermal Resistance, Junction to Ambient Air (Note 1)	$R_{\theta JA}$	625	°C/W
Operating and Storage Temperature Range	T_j, T_{STG}	-65 to +150	°C

Type Number	Marking Code	Zener Voltage Range (Note 2)			Maximum Zener Impedance				Maximum Reverse Current		Temperature Coefficient	
		V_Z @ I_{ZT}			Z_{ZT} @ I_{ZT}		Z_{ZK} @ I_{ZK}		I_R @ V_R		TC (mV/°C)	
		Nom (V)	Min (V)	Max (V)	Ω	mA	Ω	mA	µA	V	Min	Max
TBZ363C5V5	KL1	5.5	5.22	5.78	80	5.0	500	1.0	1.0	2.0	-5.5	-2.2
TBZ363C6V4	KL3	6.4	6.08	6.72	50	5.0	400	1.0	2.0	3.0	-4.0	0.5
TBZ363C7V0	KL5	7.0	6.65	7.35	16	5.0	200	1.0	2.0	4.0	-1.6	1.7
TBZ363C20V8	KV7	20.8	19.76	21.84	60	5.0	225	1.0	0.1	14	12.4	16.6

Notes: 1. Valid provided that device terminals are kept at ambient temperature.
2. V_Z measured @ I_{ZT} using a short duration pulse. Standard voltage tolerance is 5%.

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ER82-827-C 3817

FLORIDA TRIP REP.

Trip Report
Focus—No Crank
Melbourne, FL
July 11, 2001

Attendees were Enrique Gandaria from Kavlico, and Jim Ogazaly and Cathy Banesk from Ford. The technician at Kelly Ford was Kevin Phillips, Master Technician. The team worked on the vehicle on July 9 and 10.

Prior to our arrival

The Focus was located at Kelly Ford. It had a no crank report. Kevin stated that the vehicle was not purchased at Kelly Ford but at Palm Bay Ford. The vehicle was first taken to Palm Bay Ford due to a check engine light. Palm Bay Ford did not look at the vehicle, and the owner continued to drive the vehicle for a week. The vehicle no longer operated while driving in the city, and it was towed to Kelly Ford.

The technician could not get an odometer reading from the vehicle. The technician replaced the PCM, however it was not the correct PCM for the vehicle. This PCM was for a split port engine. If the technician could obtain an odometer reading, he could get the engine to start by going through a procedure. He would have to download the vehicle configuration into the PCM and then it would start. However, once the vehicle was turned off, it would not turn on. He also stated that he would have to short out the PAT? (electronic security) through a breakout box. The short would bypass security.

A third PCM was installed into the vehicle. The engine would not start. There was an odometer reading. One week prior, the technician was instructed to pull all sensors connected to Vref. The engine would still not start. The vehicle was purchased back from the customer.

Team Present

Cathy and Enrique arrived at the Kelly Ford. The car would not start. The DP sensor was disconnected, yet the car would not start. A jumper cable was installed to measure readings. The power supply input was reading 4.3V, while the sensor reading was 194 mV. The odometer was blank. The sensor was disconnected and the odometer read 4786 miles.

The sensor pin-pin Resistance measurements are as follows.

Power to Gnd: 166.9 ohm
Gnd to Output: 874 Kohm
Power to Output: 874 kohm

A sensor brought from Kavlico Factory had the following readings:
Power to Gnd: 4.3 kohm
Gnd to Output: 12.3 Mohm
Power to Output: 12.3 Mohm

The harness without our sensor had a reading of 5 Volts at input to our sensor and the output line was reading 5 volts. The harness did have a pull-up resistor of 4.7 kohm. A new sensor was installed however, the vehicle still did not start. The original sensor was tested for current draw on the druck. It pulled 30 mA, which is the maximum reading the druck allows. A sensor from the factory was tested and had a reading of approximately 7 mA.. The original sensor was determined to have a problem.

Jim Ogazaly arrived after the sensor was determined to have a problem.

The technician came with the NGS (New Generation Start Tester). He was now able to communicate with the vehicle. Kevin is only able to communicate once an odometer is present. The PCM had its original programming code in it, which was not the case with the 2nd PCM. He downloaded the error code but it was associated with a fuel rail sensor. The sensor was disconnected. The sensor was reconnected. He cleared the code. The engine did not crank. The vehicle was pulled into the shop, due to a storm arriving.

Once in the shop, he connected the car's computer to another piece of equipment, but was not needed because it had its original code. The technician stated that an engine no crank was a new problem. The no crank was associated to a transmission sensor that had its connector off as well. Once the transmission sensor was connected, it would start. The vehicle now had a 3rd PCM and a new DP sensor. The vehicle was turned off and on several times with no problems. The other mechanics were amazed that the cursed vehicle was alive.

The original PCM was installed and the keys were re-programmed to match. The vehicle started. The original sensor was installed and the odometer went blank and the vehicle did not start and not even crank. Once removed, the vehicle would start.

The new sensor was installed once more. An oscilloscope was connected to Gnd of the sensor and chassis ground. The oscilloscope was operated in battery mode in order to have a floating Gnd. There were no fluctuations in the signal. Next both the 5 volts supply and the output of the sensor were displayed on the oscilloscope. The vehicle was turned on and off several times. The AC, windshield wipers, Rear defroster, and headlights were all turned on. No unusual signals were recorded.

The suspect sensor was then placed into a Grand Marquis. The vehicle started.

The Focus was taken for a test drive with the original PCM and new sensor. The terrain was mostly flat. The only incline taken was on the causeway. The vehicle was driven for 15 miles. The team would pull the vehicle over turn it on and off several times to try to induce a failure. Hard accelerations were also attempted, but no failure was generated.

<u>Following Day</u>

The original PCM and Sensor were picked up by Ford. The Parts and Service inventory was inspected for date codes earlier than 1B15. All sensors were of a later vintage. Ford stated that they would attempt to place this sensor on several vehicles to determine if they are susceptible to a short.

PLANT RETURNS

Freeland, Mark (M.)

From:	Maurer, James (J.B.)
Sent:	Thursday, May 10, 2001 11:57 AM
To:	Freeland, Mark (M.)
Subject:	RE: Six Sigma TMDP Die Improvement Actions

Mark,
Lima has rejected over 60 parts for failing their end of line test. It appears that the voltage as measured in A/D counts is out of range and in some cases as high as 1023 counts.

The sensors were given a quick check at the FMEI dept at room temp and the readings were normal on all but 1 sensor, which was returned to Kavlico. All the other sensors are still with Ian Crawley.

Ian is planning on taking a trip to Lima at some point to see how they are tested. The strategy they are using on the stand is leaving the valve closed for about the first 100 seconds of the test, applying full vacuum to the valve for 4 seconds, and looking at the sensor output, then returning the valve to the closed position.

Ian is also planning on reviewing the hot test stand strategy and calibration with the hot test engineer.

It seems Cathy Baneek is having similar issues with the 3.8L Essex engine.

At the moment, I would have to say the investigation has yielded no results, but more investigation is needed.

Regards,
Jim Maurer
James B. Maurer
V-Engine 6-Sigma Team Leader
Fuel Metering Dept. V Engine Engineering
Phone (313) 390-3672, Fax (313) 390-4064
Text Page: (313) 795-5219
Email: jmaurer@Ford.com

-----Original Message-----

From:	Freeland, Mark (M.)
Sent:	Wednesday, May 09, 2001 1:46 PM
To:	Maurer, James (J.B.)
Subject:	FW: Six Sigma TMDP Die Improvement Actions

Jim,

Do you know Ian Crawley? Could you follow up wit him to find out what has transpired about the Lima plant returns?

Thanks

Mark

-----Original Message-----

From:	Don Ayers [mailto:DAyers@kavlico.com]
Sent:	Monday, May 07, 2001 12:11 PM
To:	Bob Weikel; Mark Freeland (E-mail)
Cc:	makins@ford.com
Subject:	RE: Six Sigma TMDP Die Improvement Actions

Mark -

ER02-027-C 3896

The high number of plant returns you noted are mainly from Lima Engine Plant. We have had a few from other plants from time to time. The analysis of the parts from Lima at our facility have shown them to be TNI. I believe Ian Crawley in the EGR systems group has been working on determining the problem at Lima. You may want to contact him.

Regards,
Don

-----Original Message-----
From: Bob Weikel
Sent: Thursday, May 03, 2001 6:45 PM
To: Don Ayers
Cc: Mark Freeland, Ford Motor Co (E-mail)
Subject: RE: Six Sigma TMDP Die Improvement Actions

Don,

How would you answer Mark's question?

Bob

-----Original Message-----
From: Freeland, Mark (M.) [SMTP:mfreela1@ford.com]
Sent: Thursday, May 03, 2001 9:00 AM
To: 'Bob Weikel'
Subject: RE: Six Sigma TMDP Die Improvement Actions

Thanks Bob,

Can you give me the story on the engine plant returns, there are a lot of them! Has anyone from you're shop had any discussions with the plants and if so what have we learnt?

I also forwarded the info on the returns to Jim Maurer.

Regards

Mark Freeland

6-Sigma Black Belt Candidate
Physics Department
Ford Research Laboratory
P.O. Box 2053
MD 3028 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

FM	COMMENTS	SUMMARY OF FINDINGS TO DATE	CURRENT & NEXT ACTION Including location & who's responsible	RML		REPORTED FAILURE	RECD	VIN	MILES	2k MY	VM	MFRD	REPAIR_D
TNI				8830-176	x	ENGINE STALLS	5/15/01	1MEFM 5536YA 657563	17096	0	3.0L TAURUS/SABLE	4/14/00	4/6/01
TNI				8841-146	x	ENGINE STALLS	5/21/01	1FMYU 04141K F61233	6072	1	3.0L ESCAPE	11/17/00	3/14/01
TBD	Current @ Null = 6.87mA OHMS = Output to Grd = Infinite Input to Grd = 4.01k			8830-091	x	ENGINE STALLS	5/15/01	1FMYU 04131K F06950	3305	1	3.0L ESCAPE	8/30/00	4/11/01
TBD	Current @ Null = 7.2mA OHMS = Output to Grd = Infinite Input to Grd =4.3k			8841-097	x	ENGINE STALLS	5/21/01	1FMYU 70E71U B72995	5430	1	4.0L EXPLORER	8/14/00	3/22/01
TBD	Current @ Null = 3.13mA OHMS = Output to Grd = Infinite Input to Grd = 6.9k			8841-101	x	ENGINE STALLS	5/21/01	1FAFPS 6391W 113627	33157	1	2.0L FOCUS	8/24/00	3/12/01
TBD	Current @ Null =3.4mA OHMS = Output to Grd = Infinite Input to Grd = 7.82k			8856-033	x	ENGINE STALLS	6/1/01	1FAFPS 4391W 134108	9461	1	2.0L FOCUS	9/12/00	4/4/01
TBD	Current @ Null = 10.71mA OHMS = Output to Grd = Infinite Input to Grd = 6.14k			8856-304	x	ENGINE WOULD NOT START	6/1/01	1MEFM 5580YA 693754	12217	0	3.0L TAURUS/SABLE	3/7/00	4/2/01
TBD	Current @ Null = 8.40 mA OHMS = Output to Grd = Infinite Input to Grd = 4.10 k			8856-576	x	ENGINE STALLS	6/1/01	1FMYU 04131K E64029	5476	1	3.0L ESCAPE	8/8/00	3/28/01
TBD	Current @ Null = 6.01mA OHMS = Output to Grd = Infinite Input to Grd = 4.98k			8856-705	x	ENGINE STALLS	6/1/01	1FAFP3 48X1W 118024	7001	1	2.0L FOCUS	8/21/00	4/10/01
TBD	Grd to Supply short reads 180 ohms, Also at 5Vin current was at 400mV approx. After 1min Sensor went back to a proper output and short was gone. Parametrics test showed sensor to fail at hot temp now sensor is saturated low and Sensor measures 7.2 k ohm			8884-001	x	ENGINE WOULD NOT START	6/19/01	1FAFP3 4341W 150217	17991	1	2.0L FOCUS	12/1/00	6/6/01

CQUIS REPORTS

Freeland, Mark (M.)

From:	Gates, Freeman (F.C.)
Sent:	Friday, November 30, 2001 11:15 AM
To:	Gates, Freeman (F.C.); Freeland, Mark (M.); Johnson, Joe (J.H.); Akins, Mary (M.); Verner, Carol (C.J.); Owens, Karen (K.E.)
Cc:	Schleding, Kurt (K.J.); Klostermeyer, Ken (K.P.); Giordano, Mike (M.A.); Popoff, Daniel (D.M.); Hermann, Thomas (T.J.); Alles, Sheran (S.A.); Kunde, Olaf (O.)
Subject:	RE: Fairlane Ford Focus w/ multiple DPFE sensor replacements

We were successful in securing the vehicle over the weekend for further analysis by providing the customer with a rental. Sharan Alles and I will be picking up the car early this afternoon.

Freeman Gates
Senior EGR Systems Technical Specialist
Tel (313)32-24807 Fax (313)39-04084
POEE Rm D-138 CM-173

-----Original Message-----

From:	Gates, Freeman (F.C.)
Sent:	Thursday, November 29, 2001 3:17 PM
To:	Freeland, Mark (M.); Johnson, Joe (J.H.); Akins, Mary (M.); Verner, Carol (C.J.); Owens, Karen (K.E.)
Cc:	Schleding, Kurt (K.J.); Klostermeyer, Ken (K.P.); Giordano, Mike (M.A.); Popoff, Daniel (D.M.)
Subject:	Fairlane Ford Focus w/ multiple DPFE sensor replacements

As a result of the special service message we have initiated to the field, I just got a call from Fairlane Ford on Michigan Ave. here in Dearborn. This vehicle has had 4 DPFE sensor replacements, all P0401 codes MIL only, no driveability complaints. The mileage and dates of repair are as follows:

Aug 7 -- 6155 mi.
Oct 2 -- 10,939 mi.
Oct17-- 11,815 mi.
Today - 14, 753mi.

The vehicle is still at the dealer awaiting instructions for disposition. Additionally, the service tech. has replaced the sensor again (4th) but came across the special service message and decided to call before he gave the vehicle back to the customer.

Since the failure interval is very short, I am tempted to supply the dealer with the revised sensor (anti-latch) and keep track of the performance. We also potentially have the option of looking at the vehicle to examine the wiring etc... to suppliment the work that has been done on the other "buyback" vehicles

Any comments??

Freeman Gates
Senior EGR Systems Technical Specialist
Tel (313)32-24807 Fax (313)39-04084
POEE Rm D-138 CM-173

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1MEFM55S7YA614442	Veh Line:	C4DD - TAURUS/SABLE (DN101) [00-02]	Eng Serial No:	*
Model Year:	2000	Market Derived:	CM - L-M DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	C	Drive Code:	C/A - 2 WHL L/H FRONT DRIVE	Engine:	CLD - MOD 3.0L DOHC EFI NA V6 G*NAAO
Inv. Dealer:	10135	Body Cab Style:	CFA - 4 DOOR SEDAN-4 LITE	Transmission:	CDX - 4 SPD AUTO TRANS NAAO AX4N
		Version/Series:	CXB - SABLE B VERSION		

BUILD INFORMATION:

Region: NA - [illegible] Plant: AB - ATLANTA PLANT BUILD
Country: USA - [illegible] Prod Date: 27-JAN-2000

SALE INFORMATION:

Region: NA - [illegible] Selling Dealer: 22215 - *
Country: USA - [illegible] Selling Dlr St/Prov: GA
Buyer St/Prov: GA

Arrival Date: 25-JAN-2000 Red Carpet Lease: *
Sale Date: 01-JUL-2000 Fleet/Retail/Co. Lease: R
Warranty Start Date: 01-JUL-2000 Modified Vehicle: *
Orig Warranty Date: 01-JUL-2000 Reacquired Vehicle: * Vehicle Export Flag: N

VOC/EOC:

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[illegible]
[illegible]                                                10
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INSTALLED OPTION INFORMATION:

Air Conditioning:	C/C - ATC AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	*	GVW Class Code:	F
Audio Disk:	AC - AUDIO DISC CHANGER PLAYER	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	BA - DRIVER POWER/HEATED MIRROR
Axle Type:	* - [N/A]	Mirror(Psngr Side):	BA - PASS POWER/HEATED CONVEX MIRR
Battery Amp Rating:	0O	Paint:	PNOAA - EBONY SOLID C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AE - ELECTRONIC AM/FM STRO/CASSETTE
Calibration Code:	0DD14NDA	Sound System:	AE - AUDIOPHILE SOUND SYSTEM
Color(Accent):	* - [N/A]	Super Tandem Axle:	* - [N/A]
Color(Trim):	00ZY -	Tire Brand:	AC - FIRESTONE
Delivery Type:	X	Tire Size:	DBBZ - P215/60R-16 BSW ALL SEASON
Driveshaft Code:	*	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	C/S - C/S
ESP Coverage(Miles):	*	Emission Cert Type:	F
ESP Coverage(Time):	*	Emission Decal Suffix:	G0S
ESP Plan Year:	*	Engine Family:	YFMXV03VEK
ESP Signature Date:			

Any comments? You can contact webmaster

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FMYU03141KB83708	Veh Lines:	T941 - ESCAPE (U204) [2001]	Eng Serial No:	589461087
Model Year:	2001	Market Derived:	T9F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	T	Drive Code:	T/A - 2 WHL L/H FRONT DRIVE	Engine:	T7LD - MOD 3.0L DOHC EFI NA V6 G*NAAO
Inv. Dealer:	05556	Body Cab Style:	TWD - 4 DOOR WAGON	Transmission:	T9DJ - 4 SPD AUTO TRANS NAAO CD4E
		Version/Series:	T9F - FORD SERIES		

BUILD INFORMATION:

Region: NA - ######### Plant: AJ - KANSAS CITY PLANT BUILD

Country: USA - ######### Prod Date: 26-SEP-2000

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 171069 - *

Country: USA - ######### Selling Dlr St/Prov: CA

Buyer St/Prov: CA

Arrival Date: 05-OCT-2000 Red Carpet Lease: *

Sale Date: 06-OCT-2000 Fleet/Retail/Co. Lease: R

Warranty Start Date: 06-OCT-2000 Modified Vehicle: *

Orig Warranty Date: 06-OCT-2000 Reacquired Vehicle: * Vehicle Report Flag: N

VOC/EOC:

---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

U01KB83708L0337 6 E 1 1433599 68 B 28496 43 S63 235 5 44 ABE 710048 IV 30 W0154 2 1

1FM74 8 914CA E T

-1-

EB02-027-C 3863

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	C	GVW Class Code:	Y
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	* - [N/A]	Mirror(Psngr Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	A	Paint:	PNBJG - LT. PARCHMENT GOLD C/C
Brake Code:	FBAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	RB - ELETR PREM STRO/CSTE/DISC/CLK
Calibration Code:	0M11A30A	Sound System:	AB - AUDIOPHILE SOUND SYSTEM
Color(Accent):	* - [N/A]	Susp. Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Brand:	AC - FIRESTONE
Delivery Type:	0	Tire Size:	D3UU - P235/70R-16 OWL A-S
Driveshaft Code:	D	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	T/C - T/C
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Decal Suffix:	HMA
ESP Plan Year:	*	Engine Family:	1FMXT[illegible]
ESP Signature Date:			

Any comments? You can contact

webmaster

EA02-027-C 3894

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FMYU05141KB85700	Veh Line:	TM1 - ESCAPE (U204) [2001]	Eng Serial No:	309451007
Model Year:	2001	Market Derivative:	TF - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	T	Drive Code:	TA - 2 WHL LH FRONT DRIVE	Engine:	TLD - MOD 3.0L DOHC EFI NA V6 (P)NAAO -
Inv. Dealer:	05556	Body Cab Style:	TWD - 4 DOOR WAGON	Transmission:	TMJ - 4 SPD AUTO TRANS NAAO CD4E
		Version/Series:	TSP - FORD SERIES		

BUILD INFORMATION:

Region: NA - ######### Plant: AJ - KANSAS CITY PLANT BUILD
Country: USA - ######### Prod Date: 26-SEP-2000

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 171089 - *
Country: USA - ######### Selling Dlr St/Prov: CA
Buyer St/Prov: CA

Arrival Date: 05-OCT-2000 Red Carpet Lease: *
Sale Date: 06-OCT-2000 Fleet/Retail/Co. Lease: R
Warranty Start Date: 06-OCT-2000 Modified Vehicle: *
Orig Warranty Date: 06-OCT-2000 Reacquired Vehicle: * Vehicle Export Flag: N

VOC/EOC:

---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

[illegible]

[illegible] 1

3862 C-427-0283

INSTALLED OPTION INFORMATION:

Air Conditioning:	TH - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	C	GVW Class Code:	Y
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	* - [N/A]	Mirror(Psngr Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	A	Paint:	PNBIG - LT. PARCHMENT GOLD C/C
Brake Code:	FHAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	5S - ELETR PREM STRO/CSTB/DSC/CLK
Calibration Code:	0M11A30A	Sound System:	A8 - AUDIOPHILE SOUND SYSTEM
Color(Accent):	* - [N/A]	Susp Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Brand:	AC - FIRESTONE
Delivery Type:	0	Tire Size:	D3UU - P235/70R-16 OWL A-S
Driveshaft Code:	D	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	T/C - T/C
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Decal Suffix:	JMA
ESP Plan Year:	*	Engine Family:	1FMXT030JFG
ESP Signature Date:			

Any comments? You can contact webmaster

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FAFP55S6YG190974	Veh Line:	CDD - TAURUS/SABLE (D186) [00-02]	Eng Serial No:	*
Model Year:	2000	Market Derivative	C6F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	C	Drive Code	C9A - 2 WHL LH FRONT DRIVE	Engine:	C4D - MOD 3.0L DOHC EFI NA V6 G*HAAO
Init. Dealer:	02/41	Body Cab Style	CFC - 4 DOOR SEDAN-6 LITE	Transmission:	CDX - 4 SPD AUTO TRANS HAAO AX4N
		Version/Series	CFB - TAURUS B VERSION		

BUILD INFORMATION:

Region:	NA - ########	Plant:	AD - CHICAGO PLANT BUILD
Country:	USA - ########	Prod Date:	07-MAR-2000

SALE INFORMATION:

Region:	NA - ########	Selling Dealer:	14R026 - *
Country:	USA - ########	Selling Dlr St/Prov:	MI
		Buyer St/Prov:	MI

Arrival Date:	13-MAR-2000	Red Carpet Lease:	1		
Sale Date:	23-JUN-2000	Fleet/Retail/Co. Lease:	R		
Warranty Start Date:	23-JUN-2000	Modified Vehicle:	*		
Orig Warranty Date:	23-JUN-2000	Reacquired Vehicle:	*	Vehicle Export Flag:	N

VOC/EOC:

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---------1---------2---------3---------4---------5---------6---------7---------8---------9---------
[illegible] 3   4  A2 [illegible]      [illegible] 6  12/4X 23  5A 5 [illegible]   Z6  A 4ED056  B  36    [illegible]     #

17AP6 4            [illegible]                        24
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INSTALLED OPTION INFORMATION:

Air Conditioning:	CH - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	*	GVW Class Code:	F
Audio Disk:	AC - AUDIO DISC CHANGER PLAYER	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	* - [N/A]
Axle Type:	* - [N/A]	Mirror(Psngr Side):	* - [N/A]
Battery Amp Rating:	BO	Paint:	PNARQ - HARVEST GOLD C/C
Brake Code:	BRAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AE - ELECTRONIC AM/FM STRO/CASSETTE
Calibration Code:	0DD1S00A	Sound System:	AB - AUDIOPHILE SOUND SYSTEM
Color(Accent):	* - [N/A]	Scope Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Brand:	AD - GENERAL
Delivery Type:	P	Tire Size:	D5RZ - P215/60R-16 BSW ALL SEASON
Driveshaft Code:	*	Traction Control:	AB - ANTI-SPIN TRACT BRAKES W/O IVD
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	L	Emission Code:	C/B - C/B
ESP Coverage(Miles):	036	Emission Cert Type:	F
ESP Coverage(Time):	024	Emission Decal Suffix:	GLU
ESP Plan Year:	2000	Engine Family:	YFMXV03OVBA
ESP Signature Date:	23-JUN-2000		

Any comments? You can contact

webmaster

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FAFP34301W121384	Veh Line:	C/AK - FOCUS (CW170) [99-02]	Eng Serial No:	*
Model Year:	2001	Market Derived:	C/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	C	Drive Code:	C/A - 2 WHL L4H FRONT DRIVE	Engine:	C/EQ - ZETEC 2.0L DOHC SFI NA I4 G*LC
Inv. Dealer:	20301	Body Cab Style:	C/FC - 4 DOOR SEDAN-6 LITE	Transmission:	C/D2 - 4-SPD AUTO TRANS 4F27E
		Version/Series:	C/DE - SERIES 25		

BUILD INFORMATION:

Region: NA - ######### Plant: AZ - WAYNE PLANT BUILD
Country: USA - ######### Prod Date: 14-SEP-2000

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 171171 - *
Country: USA - ######### Selling Dlr St/Prov: AZ
Buyer St/Prov: AZ

Arrival Date: 25-SEP-2000 Red Carpet Lease: *
Sale Date: 14-OCT-2000 Fleet/Retail/Ca. Lease: R
Warranty Start Date: 14-OCT-2000 Modified Vehicle: *
Orig Warranty Date: 14-OCT-2000 Reacquired Vehicle: * Vehicle Report Flag: N

VOC/EOC:

---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

[illegible] 2 [illegible] [illegible] 171171 [illegible] 1

[illegible] Y 1E

EM02-027-C 3868

INSTALLED OPTION INFORMATION:

Air Conditioning:	C/S - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	A	GVW Class Code:	F
Audio Disk:	* - [N/A]	Instrumentation:	AJ - HIGH SERIES ANALOG CLUSTER
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	* - [N/A]	Mirror(Pass Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	95	Paint:	PMARQ - HARVEST GOLD C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	BQ -
Calibration Code:	1AK1AZ0A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Single Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Manufacturer:	CC -
Delivery Type:	0	Tire Brand:	* -
Driveshaft Code:	*	Tire Size:	D3GNY - 195/60R15-S BSW
Front Seat:	* - [N/A]	Traction Control:	* - [N/A]
Fuel Type:	* - [N/A]	Wheel Base:	* - [N/A]

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*	DOT Plant Manufacturer:	* - *

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	E	Emission Code:	C/S - C/S
ESP Coverage(Miles):	060	Emission Cert Type:	5
ESP Coverage(Time):	060	Emission Decal Suffix:	HLG
ESP Plan Year:	2001	Engine Family:	1FMXV04.0VF0
ESP Signature Date:	14-OCT-2000		

Any comments? You can contact

webmaster

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FAFP36351W185798	Veh Line:	C/AE - FOCUS (CW170) [99-02]	Eng Serial No:	*
Model Year:	2001	Market Derivatv:	C/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	C	Drive Code:	C/A - 2 WHL LH FRONT DRIVE	Engine:	C/EQ - ZETEC 2.0L DOHC [illegible] NA I4 G*LC
Inv. Dealer:	01415	Body Cab Style:	C/EF - 4 DOOR STATION WAGON	Transmission:	C/D2 - 4-SPD AUTO TRANS 4F27E
		Version/Series:	C/DR - SERIES 25		

BUILD INFORMATION:

Region: NA - [illegible] Plant: AZ - WAYNE PLANT BUILD
Country: USA - [illegible] Prod Date: 04-DEC-2000

SALE INFORMATION:

Region: NA - [illegible] Selling Dealer: 141693 - *
Country: USA - [illegible] Selling Dlr St/Prov: GA
Buyer St/Prov: GA

Arrival Date: 19-DEC-2000 Red Carpet Lease: 2
Sale Date: 19-DEC-2000 Fleet/Retail/Co. Lease: F
Warranty Start Date: 19-DEC-2000 Modified Vehicle: *
Orig Warranty Date: 19-DEC-2000 Reacquired Vehicle: * Vehicle Export Flag: N

VOC/EOC:

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---------1---------2---------3---------4---------5---------6---------7---------8---------9--------
[illegible] 4 0 [illegible] CK [illegible] 38 [illegible] T [illegible] [illegible] [illegible] 3 3
1FAFS 1 2 [illegible] [illegible] 1H
```

E802-027-C 3911

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	2FAFP71W11X133747	Veh Line:	CFB - CROWN VIC (ENS,MEN114) [92-03]	Eng Serial No:	*
Model Year:	2001	Market Derivech	CFF - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	C	Drive Code:	CB - 2 WHL LH REAR DRIVE	Engine:	CVN - B-M 4.6L SOHC EFI NA CIV8 G-NP
Inv. Dealer:	05943	Body Cab Style:	CFC - 4 DOOR SEDAN-6 LITE	Transmission:	CXU - 4 SPD AUTO TR NAAO ADDEW-4R70W
		Verdantification	CAB - BASE VERSION - CAR		

BUILD INFORMATION:

Region: NA - ######## Plant: AW - ST. THOMAS PLANT BUILD
Country: CAN - ######## Prod Date: 18-DEC-2000

SALE INFORMATION:

Region: NA - ######## Selling Dealer: 111114 - *
Country: USA - ######## Selling Dlr St/Prov: CT
Buyer St/Prov: CT

Arrival Date:	10-JAN-2001	Red Carpet Lease:	*	
Sale Date:	25-JAN-2001	Fleet/Retail/Ca. Lease:	F	
Warranty Start Date:	25-JAN-2001	Modified Vehicle:	*	
Orig Warranty Date:	25-JAN-2001	Reacquired Vehicle:	*	Vehicle Export Flag: N

VOC/EOC:

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---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

FT11EL337477  3     ASB06L0041       3J E 3[illegible] M D 2FL   1C 15 T11C114  441WT       1B3  6  B  N

2FAF1 4     2  A    00FCT                [illegible]        44
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	C/H - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	*	GVW Class Code:	F
Audio Disk:	* - [N/A]	Instrumentation:	AB - CONVENTIONAL INSTRUMENTATION
Axle Ratio:	HOABC - 3.27 FINAL DRIVE RATIO	Mirror(Driver Side):	* - [N/A]
Axle Type:	HCHAB - NON-LIMITED SLIP REAR AXLE	Mirror(Psngr Side):	* - [N/A]
Battery Amp Rating:	MB	Paint:	PNZGC - PERFORMANCE WHITE C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AD - ELECTRONIC AM/FM STEREO RADIO
Calibration Code:	1F81GPUA	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Suspn Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Brand:	AP - DUNLOP
Delivery Type:	3	Tire Size:	D3JTE - P225/60VR-16 BSW A-S
Driveshaft Code:	*	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	C/B - C/R
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Decal Suffix:	HDD
ESP Plan Year:	*	Engine Family:	1FMXV046VP4
ESP Signature Date:			

Any comments? You can contact webmaster

GM02-027-C 3813

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FMYU04121KA20671	Veh Line:	TM1 - ESCAPE (U204) [2001]	Eng Serial No:	735910086
Model Year:	2001	Market Derivative:	TF - FORD DIVISION DERIVATIVE	Body Style:	*
Veh Type:	T	Drive Code:	TJA - 2 WHL LH FRONT DRIVE	Engine:	TLD - MOD 3.0L DOHC EFI NA V6 G*NAAO
Inv. Dealer:	03285	Body Cab Style:	TWD - 4 DOOR WAGON	Transmission:	TDJ - 4 SPD AUTO TRANS NAAO CD4E
		Version/Series:	TEF - FORD SERIES		

BUILD INFORMATION:

Region: NA - [illegible] Plant: AJ - KANSAS CITY PLANT BUILD
Country: USA - [illegible] Prod Date: 04-JAN-2001

SALE INFORMATION:

Region: NA - [illegible] Selling Dealer: 159292 - *
Country: USA - [illegible] Selling Dlr St/Prov: MN
Buyer St/Prov: MN

Arrival Date: 17-JAN-2001 Red Carpet Lease: 2
Sale Date: 20-JAN-2001 Fleet/Retail/Co. Lease: F
Warranty Start Date: 20-JAN-2001 Modified Vehicle: *
Orig Warranty Date: 20-JAN-2001 Reacquired Vehicle: * Vehicle Export Flag: N

VOC/EOC:

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---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

[illegible] P M [illegible] [illegible] [illegible] 3 [illegible] 5 [illegible] [illegible] 4 [illegible] A T2 3 1

[illegible] 6 2 [illegible] [illegible] [illegible]
```

INSTALLED OPTION INFORMATION:

Air-Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	C	GVW Class Code:	Y
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	* - [N/A]	Mirror(Psngr Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	A	Paint:	PNYW3 - OXFORD WHITE SOLID C/C
Brake Code:	FBAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AZ - ELECTR AM/FM STRO/DISC/CLK
Calibration Code:	0M11A30A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Susp: Tandem Axle:	* - [N/A]
Color(Trim):	00ZV -	Tire Brand:	AB - ANY BRAND
Delivery Type:	D	Tire Size:	DSGTQ - P225/70R 15 BSW A-S
Driveshaft Code:	D	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	K	Emission Code:	T/B - T/B
ESP Coverage(Miles):	075	Emission Cert Type:	5
ESP Coverage(Time):	036	Emission Decal Suffix:	EMA
ESP Plan Year:	2001	Engine Family:	1FMXT[illegible]
ESP Signature Date:	05-FEB-2001		

Any comments? You can contact

webmaster

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FAFP44441F141938	Veh Line:	CZB - MUSTANG (SN95) (94-02)	Key Serial No:	*
Model Year:	2001	Market Derived:	CF - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	C	Drive Code:	CR - 2 WHL LH REAR DRIVE	Engine:	CLM - 3.8L OHV EFI NA V6 GAS
Inv. Dealer:	04843	Body Cab Style:	CSH - 2 DOOR CONVERTIBLE	Transmission:	CDU - 4 SPD AUTO TR NAAO ACEEW
		Version/Series:	CAB - BASE VERSION - CAR		

BUILD INFORMATION:

Region: NA - ######### Plant: AF - DEARBORN PLANT BUILD
Country: USA - ######### Prod Date: 05-JAN-2001

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 124773 - *
Country: USA - ######### Selling Dlr St/Prov: FL
Buyer St/Prov: FL

Arrival Date: 10-JAN-2001 Red Carpet Lease: *
Sale Date: 10-JAN-2001 Fleet/Retail/Co. Lease: F
Warranty Start Date: 10-JAN-2001 Modified Vehicle: *
Orig Warranty Date: 10-JAN-2001 Reacquired Vehicle: * Vehicle Export Flag: N

VOC/EOC:

--------1--------2--------3--------4--------5--------6--------7--------8--------9--------

F441F141938K ALE161.0073 61 X TED 32 5 50KB A 7 T124773 4 AEM AATW 3 1 4

17RF4 6 6 2 A110A JEFL 0801572461 4

INSTALLED OPTION INFORMATION:

Air Conditioning:	C/B - MANUAL AIR CONDITIONER
Alternator Amp Rating:	V6
Audio Disks:	* - [N/A]
Axle Ratio:	BGABC - 3.27 FINAL DRIVE RATIO
Axle Type:	BGJAB - NON-LIMITED SLIP REAR AXLE
Battery Amp Rating:	M7
Brake Code:	FBAAB - 4 WHL ANTI-LOCK BRAKES
Brake Code(Service):	* - [N/A]
Calibration Code:	1ZE15P0A
Color(Accent):	* - [N/A]
Color(Trim):	* - [N/A]
Delivery Type:	4
Driveshaft Code:	*
Front Seats:	* - [N/A]
Fuel Type:	* - [N/A]
GVW Code:	* - [N/A]
GVW Class Code:	F
Instrumentation:	* - [N/A]
Mirror(Driver Side):	* - [N/A]
Mirror(Pass Side):	* - [N/A]
Paint:	PN5DY - ELECTRIC GREEN C/C
Power Antenna:	* - [N/A]
Radio:	ML - AM/FM CD CHGR/MULTI MEDIA
Sound System:	AB - PREMIUM SOUND SYSTEM
Susp Tandem Axle:	* - [N/A]
Tire Brand:	AF - DUNLOP
Tire Size:	J30Q6 - 205/65TR-15 BSW
Traction Control:	AB - ANTI-SPIN TRACT BRAKES W/O IVD
Wheel Base:	* - [N/A]

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	C/B - C/B
ESP Coverage(Miles):	*	Emission Cert Type:	F
ESP Coverage(Time):	*	Emission Decal Suffix:	H17
ESP Plan Year:	*	Engine Family:	1FMXV03VFA
ESP Signature Date:			

Any comments? You can contact webmaster

E002-027-C 3817

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FAFP5553YA159781	Veh Line:	CDD - TAURUS/SABLE (D186) [00-02]	Eng Serial No:	*
Model Year:	2000	Market Derivative:	CF - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	C	Drive Code:	C/A - 2 WHL LH FRONT DRIVE	Engine:	C4LD - MOD 3.0L DOHC EFI NA V6 G*HAAO
Inv. Dealer:	07809	Body Cab Style:	C/FC - 4 DOOR SEDAN-6 LITE	Transmission:	CXDX - 4 SPD AUTO TRANS NAAO AX4N
		Version/Series:	CF8 - TAURUS S VERSION		

BUILD INFORMATION:

Region: NA - [illegible] Plant: AS - ATLANTA PLANT BUILD
Country: USA - [illegible] Prod Date: 06-MAR-2000

SALE INFORMATION:

Region: NA - [illegible] Selling Dealer: 172404 - *
Country: USA - [illegible] Selling Dlr St/Prov: NV
Buyer St/Prov: NV

Arrival Date: 23-MAR-2000 Red Carpet Lease: I
Sale Date: 29-MAY-2000 Fleet/Rental/Co. Lease: R
Warranty Start Date: 29-MAY-2000 Modified Vehicle: *
Orig Warranty Date: 29-MAY-2000 Reacquired Vehicle: * Vehicle Export Flag: N

VOC/EOC:

----+----1----+----2----+----3----+----4----+----5----+----6----+----7----+----8----+----9--------

[illegible] 3 4 A2 [illegible] AS [illegible] 231 [illegible] 18 A [illegible] 0 [illegible] N 8

[illegible] 7 [illegible]

EA02-027-C 3816

INSTALLED OPTION INFORMATION:

Air Conditioning:	CH - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	*	GVW Class Code:	F
Audio Unit:	AC - AUDIO DISC CHANGER PLAYER	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	BA - DRIVER POWER/HEATED MIRROR
Axle Type:	* - [N/A]	Mirror(Pass Side):	BA - PASS POWER/HEATED CONVEX MIRR
Battery Amp Rating:	RO	Paint:	PNZIF - SILVER FROST C/C
Brake Code:	PEAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AB - ELECTRONIC AM/FM STRO/CASSETTE
Calibration Code:	0DD140DA	Sound System:	AB - AUDIOPHILE SOUND SYSTEM
Color(Accent):	* - [N/A]	Single Tandem Axle:	* - [N/A]
Color(Trim):	40ZV -	Tire Brand:	AC - FIRESTONE
Delivery Type:	R	Tire Size:	D3RZ - P215/60R-16 BSW ALL SEASON
Driveshaft Code:	*	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LR:	*	RR:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	C/C - C/C
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Decal Suffix:	GRZ
ESP Plan Years:	*	Engine Family:	YFMXV03OVFO
ESP Signature Date:			

Any comments? You can contact

webmaster

EN02-027-C 3019

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FAFP53U51A203001	Veh Line:	ODD - TAURUS/SABLE (D186) [00-02]	Eng Serial No:	*
Model Year:	2001	Market Derivati	OF - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	C	Drive Code:	CA - 2 WHL LH FRONT DRIVE	Engine:	CLA - VULC 3.0L OHV EFI NA V6 0*12V
Jurn Dealer:	03974	Body Cab Style:	CFC - 4 DOOR SEDAN-6 LITE	Transmission:	CDT - 4 SPD AUTO TRANS NAAO AX4S
		Version/Series:	CSB - TAURUS SE VERSION		

BUILD INFORMATION:

Region: NA - [illegible] Plant: AD - ATLANTA PLANT FORD
Country: USA - [illegible] Prod Date: 31-JAN-2001

SALE INFORMATION:

Region: NA - [illegible] Selling Dealer: 124325 - *
Country: USA - [illegible] Selling Dlr St/Prov: FL
Buyer St/Prov: FL

Arrival Date: 05-FEB-2001 Red Carpet Lease: *
Sale Date: 15-FEB-2001 Fleet/Retail/Co. Lease: F
Warranty Start Date: 15-FEB-2001 Modified Vehicle: *
Orig Warranty Date: 15-FEB-2001 Reacquired Vehicle: * Vehicle Report Flag: N

VOC/EOC:

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--------1---------2---------3---------4---------5---------6---------7---------8---------9---------
[illegible]    3    4    [illegible]    [illegible] F    [illegible] 22    5    [illegible]    [illegible]    [illegible]    5 [illegible]    [illegible]    1    T

[illegible] 4    3  A    [illegible]    [illegible]    10
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EB02-027-C 3828

INSTALLED OPTION INFORMATION:

Air Conditioning:	C/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	FA	GVW Class Code:	F
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	* - [N/A]
Axle Type:	* - [N/A]	Mirror(Psngr Side):	* - [N/A]
Battery Amp Rating:	MU -	Paint:	PHARQ - HARVEST GOLD C/C
Brake Code:	PEAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AU - ELECTR PREM AM/FM STEREO/CD
Calibration Code:	1DD12RDA	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Susp Traction Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Brand:	AC - FIRESTONE
Delivery Type:	M	Tire Size:	D3RZ - P215/60R-16 BSW ALL SEASON
Driveshaft Code:	*	Traction Control:	* - [N/A]
Front Seats:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	C/B - C/B
ESP Coverage(Miles):	*	Emission Cert Type:	3
ESP Coverage(Time):	*	Emission Decal Suffix:	HFF
ESP Plan Year:	*	Engine Family:	1FMXV03.0VF3
ESP Signature Date:			

Any comments? You can contact webmaster

Vehicle Information Report

GENERAL VEHICLE INFORMATION:

(Related Claims)

VIN:	2FTZX07221CA42934	Veh Line:	T895 - F150/250(PN96)/P225-FORD [97-02]	Eng Serial No:	*
Model Year:	2001	Market Derivative:	* - [NA]	Body Shell:	*
Veh Type:	T	Drive Code:	T/B - 2 WHL L/H REAR DRIVE	Engine:	TILY - 4.2L OHV EFI NA V6 GAS
Inv. Dealer:	04446	Body Cab Style:	TBD - SUPER SINGLE CAB (SUPER CAB)	Transmission:	TIDU - 4 SPD AUTO TR NAAO [illegible]
		Version/Series:	TIAM - 150 SERIES		

BUILD INFORMATION:

Region: NA - [illegible] Plant: A4 - ONTARIO PLANT BUILD
Country: CAN - [illegible] Prod Date: 02-JAN-2001

SALE INFORMATION:

Region: NA - [illegible] Selling Dealer: 152772 - *
Country: USA - [illegible] Selling Dlr St/Prov: TX
Buyer St/Prov: TX

Arrival Date:	15-JAN-2001	Red Carpet Lease:	I
Sale Date:	22-FEB-2001	Fleet/Retail/Co. Lease:	R
Warranty Start Date:	22-FEB-2001	Modified Vehicle:	*
Orig Warranty Date:	22-FEB-2001	Reacquired Vehicle:	* Vehicle Export Flag: N

VOC/EOC:

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---------1---------2---------3---------4---------5---------6---------7---------8---------9---------
[illegible]
[illegible]
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EA02-027-C 3822

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/8 - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	CA	GVW Class Code:	Z
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	BGAHD - 3.55 FINAL DRIVE RATIO	Mirror(Driver Side):	* - [N/A]
Axle Type:	BGJAB - NON-LIMITED SLIP REAR AXLE	Mirror(Psngr Side):	* - [N/A]
Battery Amp Rating:	MJ	Paint:	PNYW3 - OXFORD WHITE SOLID C/C
Brake Code:	FBAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AU - ELETR PREM AM/FM STRO/DISC
Calibration Code:	1X512CBA	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Susp Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Brand:	AD - GENERAL
Delivery Type:	L	Tire Size:	D2JWC - P235/70R-16 OWL A-S
Driveshaft Code:	F	Traction Control:	* - [N/A]
Front Seats:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	T/8 - T/8
ESP Coverage(Miles):	*	Emission Cert Type:	3
ESP Coverage(Time):	*	Emission Decal Suffix:	HLH
ESP Plan Term:	*	Engine Family:	1FMXT0422F5
ESP Signature Date:			

Any comments? You can contact webmaster

6R82-827-C 3823

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	[illegible]	Veh Line:	COD - TAURUS/SABLE (D186) [00-02]	Eng Serial No:	*
Model Year:	2000	Market Derivative:	CF - FORD DIVISION DERIVATIVE	Body Style:	*
Veh Type:	C	Drive Code:	C/A - 2 WHL LH FRONT DRIVE	Engine:	CLD - MOD 3.0L DOHC EFI NA V6 G*NAAO
Inv. Dealer:	03902	Body Cab Style:	CFC - 4 DOOR SEDAN-6 LITE	Transmission:	CDX - 4 SPD AUTO TRANS NAAO AX4N
		Version/Series:	CF8 - TAURUS B VERSION		

BUILD INFORMATION:

Region: NA - ######## Plant: AB - ATLANTA PLANT BUILD
Country: USA - ######## Prod Date: 06-MAR-2000

SALE INFORMATION:

Region: NA - ######## Selling Dealer: 121401 - *
Country: USA - ######## Selling Dlr St/Prov: AL
Buyer St/Prov: AL

Arrival Date: 10-MAR-2000 Red Carpet Lease: *
Sale Date: 12-OCT-2000 Fleet/Retail/Co. Lease: R
Warranty Start Date: 12-OCT-2000 Modified Vehicle: *
Orig Warranty Date: 12-OCT-2000 Reacquired Vehicle: * Vehicle Report Flag: N

VOC/EOC:

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---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

[illegible]

[illegible]
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E002-027-C 3924

INSTALLED OPTION INFORMATION:

Air Conditioning:	C8 - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	*	GVW Class Code:	F
Audio Disk:	AC - AUDIO DISC CHANGER PLAYER	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	* - [N/A]
Axle Type:	* - [N/A]	Mirror(Psngr Side):	* - [N/A]
Battery Amp Rating:	BO	Paint:	PNUAA - EBONY SOLID C/C
Brake Code:	FHAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AB - ELECTRONIC AM/FM STRO/CASSETTE
Calibration Code:	6CD15N8A	Sound System:	AB - AUDIOPHILE SOUND SYSTEM
Color(Accent):	* - [N/A]	Snow Traction Axle:	* - [N/A]
Color(Trim):	60IZV -	Tire Brand:	AC - FIRESTONE
Delivery Type:	*	Tire Size:	D3SZ - P215/60R-16 BSW ALL SEASON
Driveshaft Code:	*	Traction Control:	* - [N/A]
Front Seats:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	C/B - C/B
ESP Coverage(Miles):	*	Emission Cert Type:	F
ESP Coverage(Time):	*	Emission Decal Suffix:	GLU
ESP Plan Year:	*	Engine Family:	YFMXV03FVEA
ESP Signature Date:			

Any comments? You can contact

webmaster

Vehicle Information Report

GENERAL VEHICLE INFORMATION:

(Related Claims)

VIN:	1FMZU77E31[illegible]	Veh Line:	T81 - EXPLORER SPORT TRAC P207 [01-02]	Eng Serial No:	*
Model Year:	2001	Market Derivative:	TF - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	T	Drive Code:	T8E - 4 WHL L/H PART TIME DRIVE	Engine:	T9NE - COLOGNE 4.0L SOHC EFI NA V6 G
Inv. Dealer:	02537	Body Cab Style:	TWF - 4 DOOR W/PICKUP BOX	Transmission:	TJTC - 5 SPD AT UAO A5LDE-5R/5R44/55E
		Version/Series:	TSF - FORD SERIES		

BUILD INFORMATION:

Region: NA - ######### Plant: AN - LOUISVILLE PLANT BUILD
Country: USA - ######### Prod Date: 26-SEP-2000

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 147421 - *
Country: USA - ######### Selling Dlr St/Prov: OH
Buyer St/Prov: OH

Arrival Date: 26-SEP-2000 End Output Lease: *
Sale Date: 26-OCT-2000 Fleet/Retail/Co. Lease: R
Warranty Start Date: 26-OCT-2000 Modified Vehicle: *
Orig Warranty Date: 26-OCT-2000 Reacquired Vehicle: * Vehicle Export Flag: N

VOC/EOC:

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---------1---------2---------3---------4---------5---------6---------7---------8---------9---------
[illegible] 4 1 11/2001     [illegible] [illegible] [illegible]   [illegible] [illegible]     [illegible] 1  [illegible]   T [illegible]  1    F
[illegible] 1           [illegible]                           1
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	TB - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	HK	GVW Class Code:	Z
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	EGAMD - 4.10 FINAL DRIVE RATIO	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	EGIAC - LIMITED SLIP REAR AXLE	Mirror(Pass Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	MK	Paint:	FNZJF - SILVER FROST C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	MJ - AM/FM STEREO/CD CHANGER/CLK
Calibration Code:	1S11A40A	Sound System:	AE - AUDIOPHILE SOUND SYSTEM
Color(Accent):	* - [N/A]	Steps Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Brand:	AC - FIRESTONE
Delivery Type:	0	Tire Size:	DSJWA - P255/70R-16 OWL A-T
Driveshaft Code:	D	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	T/B - T/B
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Dual Suffix:	HCA
ESP Plan Year:	*	Engine Family:	1FMXT0402F5
ESP Signature Date:			

Any comments? You can contact webmaster

EN02-027-C 3027

Vehicle Information Report

GENERAL VEHICLE INFORMATION:

(Related Claims)

VIN:	2MEFM75W61X671209	Veh Line:	C/PP - GRAND MARQ (HN53/EN114) [92-02]	Eng Serial No:	*
Model Year:	2001	Market Deriv:	C/M - L-M DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	C	Drive Code:	C/8 - 2 WHL LH REAR DRIVE	Engine:	C/VN - R-M 4.6L SOHC EFI NA CIV8 G-NP
Inv. Dealer:	10712	Body Cab Style:	C/FA - 4 DOOR SEDAN-4 LITE	Transmission:	C/DU - 4 SPD AUTO TR NAAO AODEW/4R70W
		Version/Series:	C/AJ - LS VERSION - CAR		

BUILD INFORMATION:

Region: NA - ######### Plant: AW - ST. THOMAS PLANT BUILD
Country: CAN - ######### Prod Date: 27-FEB-2001

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 545070 - *
Country: USA - ######### Selling Dlr St/Prov: MI
Buyer St/Prov: MI

Arrival Date: 06-MAR-2001 Red Carpet Lease: *
Sale Date: 12-MAR-2001 Fleet/Retail/Co. Lease: R
Warranty Start Date: 12-MAR-2001 Modified Vehicle: *
Orig Warranty Date: 12-MAR-2001 Reacquired Vehicle: * Vehicle Export Flag: N

VOC/EOC:

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----+----1----+----2----+----3----+----4----+----5----+----6----+----7----+----8----+----9---------

[illegible]

[illegible]
```

EA02-027-C 3628

INSTALLED OPTION INFORMATION:

Air Conditioning:	C/C - ATC AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	*	GVW Class Code:	F
Audio Unit:	AC - AUDIO DISC CHANGER PLAYER	Instrumentation:	AC - ELECTRONIC INSTRUMENTATION
Axle Ratio:	BGABC - 3.27 FINAL DRIVE RATIO	Mirror(Driver Side):	* - [N/A]
Axle Type:	BGHAB - NON-LIMITED SLIP REAR AXLE	Mirror(Psngr Side):	* - [N/A]
Battery Amp Rating:	MR	Paint:	PNUAA - EBONY SOLID C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AQ - ELETR PREMIUM AM/FM STRO/CSTE
Calibration Code:	1FB1H1DA	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Single Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Brand:	AG - GOODYEAR
Delivery Type:	A	Tire Size:	D3JTP - P225/60TR-16 BSW A-S
Driveshaft Code:	*	Traction Control:	AB - ANTI-SPIN TRACT BRAKES W/O IVD
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	C/B - C/B
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Decal Suffix:	HOD
ESP Plan Years:	*	Engine Family:	1FMXV04.5VPF
ESP Signature Date:			

Any comments? You can contact

webmaster

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FMCU03171KA16283	Veh Line:	T/M1 - ESCAPE (U204) [2001]	Eng Serial No:	740326087
Model Year:	2001	Market Derived:	T/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	T	Drive Code:	T/A - 2 WHL LH FRONT DRIVE	Engine:	T/LD - MOD 3.0L DOHC EFI NA V6 G*NAAO
Inv. Dealer:	05412	Body Cab Style:	T/WD - 4 DOOR WAGON	Transmission:	T/DJ - 4 SPD AUTO TRANS NAAO CD4E
		Version/Series:	T/EF - FORD SERIES		

BUILD INFORMATION:

Region: NA - ########## Plant: AJ - KANSAS CITY PLANT BUILD
Country: USA - ########## Prod Date: 08-JAN-2001

SALE INFORMATION:

Region: NA - ########## Selling Dealer: 171052 - *
Country: USA - ########## Selling Dlr St/Prov: CA
Buyer St/Prov: CA

Arrival Date: 25-JAN-2001 Red Carpet Lease: *
Sale Date: 04-FEB-2001 Fleet/Retail/Co. Lease: R
Warranty Start Date: 04-FEB-2001 Modified Vehicle: *
Orig Warranty Date: 04-FEB-2001 Reacquired Vehicle: * Vehicle Export Flag: N

VOC/EOC:

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---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

U031KA16283L0337 6 H 2 16L7857      2C 1M1 400 43  N88  265 5 48 A2F 71E052  4V 8Q    MK164   2  1

1F8C7 4    1        914CA E  Y                            5a
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	TB - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	C	GVW Class Code:	C
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	* - [N/A]	Mirror(Psngr Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	A	Paint:	PNBJG - LT. PARCHMENT GOLD C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AT - ELECTR PREM-AM/FM STEO/CSTE/CLK
Calibration Code:	0M11A30A	Sound System:	AB - AUDIOPHILE SOUND SYSTEM
Color(Accent):	* - [N/A]	Susp. Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Brand:	AB - ANY BRAND
Delivery Type:	0	Tire Size:	D5JUJ - P235/70R-16 OWL A-S
Driveshaft Code:	D	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	T/C - T/C
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Decal Suffix:	HMA
ESP Plan Year:	*	Engine Family:	1FMXT030126
ESP Signature Date:			

Any comments? You can contact webmaster

E062-027-C 3831

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1ZWFT61L915610653	Veh Line:	CZN - COUGAR (SW164) (99-02)	Eng Serial No:	999999
Model Year:	2001	Market Derivative:	CM - L-M DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	C	Drive Code:	CIA - 2 WHL LH FRONT DRIVE	Engine:	CLC - MOD 2.5L RFF DOHC NA V6 O*NAAO
Inv. Dealer:	11492	Body Cab Style:	CDG -	Transmission:	CHP - 5 SPD MAN TRANS A BAO MTX75
		Vendor/Series:	CVS -		

BUILD INFORMATION:

Region:	NA - [illegible]	Plant:	CL - FLATROCK ASSEMBLY PLANT - USA
Country:	USA - [illegible]	Prod Date:	19-JAN-2001

SALE INFORMATION:

Region:	NA - [illegible]	Selling Dealer:	347162 - *
Country:	USA - [illegible]	Selling Dlr St/Prov:	TX
		Buyer St/Prov:	TX

Arrival Date:	02-FEB-2001	Red Carpet Lease:	*		
Sale Date:	31-MAY-2001	Fleet/Retail/Co. Lease:	R		
Warranty Start Date:	15-MAR-2001	Modified Vehicle:	*		
Orig Warranty Date:	15-MAR-2001	Reacquired Vehicle:	*	Vehicle Export Flag:	N

VOC/ROC:

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---------1---------2---------3---------4---------5---------6---------7---------8---------9---------
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[illegible]

[illegible] 11

INSTALLED OPTION INFORMATION:

Air Conditioning:	* - [N/A]	GVW Code:	* - [N/A]
Alternator Amp Rating:	*	GVW Class Code:	F
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	* - [N/A]
Axle Type:	* - [N/A]	Mirror(Pass. Side):	* - [N/A]
Battery Amp Rating:	*	Paint:	* - [N/A]
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AQ - ELETR PREMIUM AM/FM STRO/CSTE
Calibration Code:	1ZNRADOA	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Singe Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Brand:	CB - FIRESTONE/MICHELIN
Delivery Type:	X	Tire Size:	D3RK - P215/70VR 16 BSW
Driveshaft Code:	*	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	CB - CB
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Band Suffix:	HBY
ESP Plan Year:	*	Engine Family:	1FMXV0S5VD5
ESP Signature Date:			

Any comments? You can contact

webmaster

EM02-827-C 3633

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1MERM59S?YA??????	Veh Line:	C?DD - TAURUS/SABLE (D186) [00-02]	Eng Serial No:	*
Model Year:	2000	Market Derivat:	C?M - L-M DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	C	Drive Code:	C?A - 2 WHL L?H FRONT DRIVE	Engine:	C?LD - MOD 3.0L DOHC SFI NA V6 G*NAAO
Inv. Dealer:	11659	Body Cab Style:	C?FF - 4 DOOR STATION WAGON	Transmission:	C?DX - 4 SPD AUTO TRANS NAAO AX4N
		Version/Series:	C?GB - SABLE B VERSION		

BUILD INFORMATION:

Region: NA - ######## Plant: AB - ATLANTA PLANT BUILD
Country: USA - ######## Prod Date: 06-MAR-2000

SALE INFORMATION:

Region: NA - ######## Selling Dealer: 225113 - *
Country: USA - ######## Selling Dlr St/Prov: FL
Buyer St/Prov: FL

Arrival Date: 11-MAR-2000 Red Carpet Lease: *
Sale Date: 19-APR-2000 Fleet/Retail/Co. Lease: R
Warranty Start Date: 19-APR-2000 Modified Vehicle: *
Orig Warranty Date: 19-APR-2000 Exempted Vehicle: * Vehicle Export Flag: N

VOC/EOC:

---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

[illegible]

[illegible]

EA02-027-C 3684

INSTALLED OPTION INFORMATION:

Air Conditioning:	C/C - ATC AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	*	GVW Class Code:	F
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	BA - DRIVER POWER/HEATED MIRROR
Axle Type:	* - [N/A]	Mirror(Pass Side):	BA - PASS POWER/HEATED CONVEX MIRR
Battery Amp Rating:	BD	Paint:	PN2GC - PERFORMANCE WHITE C/C
Brake Code:	HAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	AB - POWER TELESCOPIC RADIO ANTENNA
Brake Code(Service):	* - [N/A]	Radio:	AB - ELECTRONIC AM/FM STEO/CASSETTE
Calibration Code:	0DD15RA	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Steps Trackless Axle:	* - [N/A]
Color(Trim):	00IZV -	Tire Brand:	AC - FIRESTONE
Delivery Type:	0	Tire Size:	D3SZ - P215/60R-16 BSW ALL SEASON
Driveshaft Code:	*	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	C/B - C/B
ESP Coverage(Miles):	*	Emission Cert Type:	F
ESP Coverage(Time):	*	Emission Decal Suffix:	GLU
ESP Plan Year:	*	Engine Family:	YFMXV03UVEA
ESP Signature Date:			

Any comments? You can contact

webmaster

0962-027-C 3628

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FTZF17281NA39745	Veh Line:	TW5 - F150/250(PN96)/F225-FORD [97-02]	Eng Serial No:	*
Model Year:	2001	Market Derivative:	* - [NA]	Body Style:	*
Veh Type:	T	Drive Code:	T/B - 2 WHL LH REAR DRIVE	Engine:	T/LY - 4.2L OHV EFI NA V6 GAS
Inv. Dealer:	04798	Body Cab Style:	T/SB - SINGLE CAB (REGULAR CAB)	Transmission:	T/DU - 4 SPD AUTO TR NAAO AODE/4R70W
		Version/Series:	T/AM - 150 SERIES		

BUILD INFORMATION:

Region: NA - ######## Plant: AR - NORFOLK PLANT BUILD
Country: USA - ######## Prod Date: 26-SEP-2000

SALE INFORMATION:

Region: NA - ######## Selling Dealer: 724453 - *
Country: USA - ######## Selling Dlr St/Prov: FL
Buyer St/Prov: FL

Arrival Date: 12-OCT-2000 Red Carpet Lease: *
Sale Date: 20-OCT-2000 Fleet/Retail/Co. Lease: F
Warranty Start Date: 20-OCT-2000 Modified Vehicle: *
Orig Warranty Date: 20-OCT-2000 Reacquired Vehicle: * Vehicle Export Flag: N

VOC/EOC:

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---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

F171XA3F7651393    1 XXXA78031      C4 E   VHH 52   13  29     1  9 T248493 224172      AT    2    1

1FTZA 4 2  2  A5G4A 97XF1L                 0XX2500635        3
```


3696 C-729-2863

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	CA	GVW Class Code:	Z
Audio Disc:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	EGAHD - 3.55 FINAL DRIVE RATIO	Mirror(Driver Side):	AC - DRIVER HAND SET MIRROR
Axle Type:	EGAAC - LIMITED SLIP REAR AXLE	Mirror(Pass Side):	AB - PASS HAND SET CONVEX MIRROR
Battery Amp Rating:	EL	Paint:	PNYW5 - OXFORD WHITE SOLID C/C
Brake Code:	FEAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AG - ELETR AM/FM/STRO/CSTE/CLOCK
Calibration Code:	1F012C0A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Single Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Brand:	AE - GOODRICH
Delivery Type:	3	Tire Size:	D3JCH - P235/70R-16 BSW A-S
Driveshaft Code:	F	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	T78 - T78
ESP Coverage(Miles):	*	Emission Cert Type:	3
ESP Coverage(Time):	*	Emission Decal Suffix:	ELH
ESP Plan Year:	*	Engine Family:	1FMXT0422F5
ESP Signature Date:			

Any comments? You can contact

webmaster

E002-827-C 3837

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FMRU15W11LA14930	Veh Line:	T/83 - EXPEDITION (UN93) [97-02]	Eng Serial No:	*
Model Year:	2001	Market Derivative:	* - [N/A]	Body Shell:	*
Veh Type:	T	Drive Code:	T/B - 2 WHL LH REAR DRIVE	Engine:	T/VN - R-M 4.6L SOHC EFI NA CIV8 G-NF
Inst. Dealer:	02586	Body Cab Style:	T/WD - 4 DOOR WAGON	Transmission:	T/DU - 4 SPD AUTO TR NAAO AODSWNEOW
		Version/Series:	T/BP - FORD SERIES		

BUILD INFORMATION:

Region: NA - ######### Plant: AP - MICHIGAN PLANT BUILD
Country: USA - ######### Prod Date: 18-SEP-2000

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 152013 - *
Country: USA - ######### Selling Dlr St/Prov: TX
Buyer St/Prov: TX

Arrival Date: 26-SEP-2000 Red Carpet Lease: 1
Sale Date: 16-OCT-2000 Fleet/Retail/Co. Lease: R
Warranty Start Date: 16-OCT-2000 Modified Vehicle: *
Orig Warranty Date: 16-OCT-2000 Exempted Vehicle: * Vehicle Report Flag: N

VOC/EOC:

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---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

01511A16X281180   6 3 2 07X0050      DF E   U17 65    K  40      6 A   5X0513 52  LD     SPB P4       T

1FMR1 S     4       TMPZX                              1
```


FORD 0-1279-2898

INSTALLED OPTION INFORMATION:

Air Conditioning:	TJD - HIGH OUTPUT AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	C3	GVW Class Code:	R
Audio Disk:	AC - AUDIO DISC CHANGER PLAYER	Instrumentation:	* - [N/A]
Axle Ratio:	BGAFB - 3.31 FINAL DRIVE RATIO - 68	Mirror(Driver Side):	BA - DRIVER POWER/HEATED MIRROR
Axle Type:	BGHAB - NON-LIMITED SLIP REAR AXLE	Mirror(Pass Side):	BA - PASS POWER/HEATED CONVEX MIRR
Battery Amp Rating:	MK	Paint:	PNLEB - MEDIUM WEDGEWOOD C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AT - ELECTR PREM AM/FM STRO/CST/CLK
Calibration Code:	1R316D4A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Susp Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Brand:	AC - FIRESTONE
Delivery Type:	R	Tire Size:	D3FWA - P255/70R-16 OWL A-T
Driveshaft Code:	F	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	T/B - T/B
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Decal Suffix:	HJP
ESP Plan Year:	*	Engine Family:	1FMXT04.6GF5
ESP Signature Date:			

Any comments? You can contact webmaster

EN02-827-C 3636

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FMCU04121KA70568	Veh Line:	YM1 - ESCAPE (U204) [2001]	Eng Serial No:	790550087
Model Year:	2001	Market Derivat:	TF - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	T	Drive Code:	TIF - 4 WHL L4H FULL TIME DRIVE	Engine:	TVLD - MOD 3.0L DOHC EFI NA V6 G*NAAO
Inv. Dealer:	07842	Body Cab Style:	DWD - 4 DOOR WAGON	Transmission:	TJDJ - 4 SPD AUTO TRANS NAAO CD4E
		Version/Series:	TEF - FORD SERIES		

BUILD INFORMATION:

Region:	NA - #########	Plant:	AJ - KANSAS CITY PLANT BUILD
Country:	USA - #########	Prod Date:	12-FEB-2001

SALE INFORMATION:

Region:	NA - #########	Selling Dealer:	172039 - *
Country:	USA - #########	Selling Dlr St/Prov:	CA
		Buyer St/Prov:	CA

Arrival Date:	05-MAR-2001	Red Carpet Lease:	1
Sale Date:	10-APR-2001	Fleet/Retail/Co. Lease:	R
Warranty Start Date:	10-APR-2001	Modified Vehicle:	*
Orig Warranty Date:	10-APR-2001	Reacquired Vehicle:	* Vehicle Export Flag: N

VOC/EOC:

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--------1---------2---------3---------4---------5---------6---------7---------8---------9---------
[illegible]
1RMCI 1    1         914GA #                    5B
```


E002-027-C 3840

INSTALLED OPTION INFORMATION:

Air Conditioning:	TB - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	C	GVW Class Code:	C
Audio Disks:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	* - [N/A]	Mirror(Pass Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	A	Paint:	PNTW3 - OXFORD WHITE SOLID C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AT - ELETR PREM AM/FM STRO/CSTE/CLK
Calibration Code:	0M11A30A	Sound System:	AE - AUDIOPHILE SOUND SYSTEM
Color(Accent):	* - [N/A]	Swaps Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Brand:	AB - ANY BRAND
Delivery Type:	R	Tire Size:	D9UJ - P235/70R-16 OWL A-S
Driveshaft Code:	D	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	M	Emission Code:	TC - TC
ESP Coverage(Miles):	037	Emission Cert Type:	5
ESP Coverage(Time):	036	Emission Decal Suffix:	HKS
ESP Plan Year:	2001	Engine Family:	1FMXT0501F6
ESP Signature Date:	10-APR-2001		

Any comments? You can contact webmaster

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FAHP5620YA186967	Veh Line:	C0D - TAURUS/SABLE (D186) [00-02]	Eng Serial No:	*
Model Year:	2000	Market Derivat:	C0F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	C	Drive Code:	C0A - 2 WHL LH FRONT DRIVE	Engine:	C0LD - MOD 3.0L DOHC EFI NA V6 G*NAAO
Inv. Dealer:	05695	Body Cab Style:	C0FC - 4 DOOR SEDAN-6 LITE	Transmission:	C0DX - 4 SPD AUTO TRANS NAAO AX4N
		Version/Series:	C0FB - TAURUS E VERSION		

BUILD INFORMATION:

Region: NA - ######## Plant: AB - ATLANTA PLANT BUILD
Country: USA - ######## Final Date: 21-FEB-2000

SALE INFORMATION:

Region: NA - ######## Selling Dealer: 147022 - *
Country: USA - ######## Selling Dlr St/Prov: KY
Buyer St/Prov: KY

Arrival Date:	03-MAR-2000	Red Carpet Lease:	1
Sale Date:	10-MAR-2000	Fleet/Retail/Ch. Lease:	R
Warranty Start Date:	10-MAR-2000	Modified Vehicle:	*
Orig Warranty Date:	10-MAR-2000	Reacquired Vehicle:	* Vehicle Export Flag: N

VOC/EOC:

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--------1---------2---------3---------4---------5---------6---------7---------8---------9---------
[illegible] 4  T  A2 [illegible]  [illegible] [illegible]  22  7 [illegible]  [illegible]  A 477022  0 [illegible]  [illegible]  9
[illegible] 5  [illegible]  16
```


EP02-027-C 3942

INSTALLED OPTION INFORMATION:

Air Conditioning:	C/C - ATC AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	*	GVW Class Code:	F
Audio Disc:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	BA - DRIVER POWER/HEATED MIRROR
Axle Type:	* - [N/A]	Mirror(Pass Side):	BA - PASS POWER/HEATED CONVEX MIRR
Battery Amp Rating:	RO	Paint:	PNARQ - HARVEST GOLD C/C
Brake Code:	PBAAB - 4 WHL ANTI-LOCK BRAKES	Power Assistance:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AB - ELECTRONIC AM/FM STRO/CASSETTE
Calibration Code:	0D15N0A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Single Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Brand:	AC - FIRESTONE
Delivery Type:	P	Tire Size:	D3RZ - P215/60R-16 BSW ALL SEASON
Driveshaft Code:	*	Traction Control:	AB - ANTI-SPIN TRACT BRAKES W/O IVD
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	L	Emission Code:	C8 - C8
ESP Coverage(Miles):	036	Emission Cert Type:	F
ESP Coverage(Time):	024	Emission Dual Suffix:	GLU
ESP Plan Year:	2000	Engine Family:	YFMXV03.8VBA
ESP Signature Date:	13-MAR-2000		

Any comments? You can contact

webmaster

EA02-027-C 3943

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FTRE14261HB17757	Veh Line:	TEM - ECONOLINE (VN127) [97-02]	Eng Serial No:	*
Model Year:	2001	Market Derived:	* - [N/A]	Body Shell:	*
Veh Type:	T	Drive Code:	TVB - 2 WHL L/H REAR DRIVE	Engine:	TALT - 4.2L OHV EFI NA V6 GAS
Inv. Dealer:	47750	Body Cab Style:	TVVC - REGULAR VAN	Transmission:	TADU - 4 SPD AUTO TR NAAO AODE/W/4R70W
		Version/Series:	T/AM - 150 SERIES		

BUILD INFORMATION:

Region: NA - [illegible] Plant: AM - LORAIN PLANT BUILD
Country: USA - [illegible] Prod Date: 03-MAR-2001

SALE INFORMATION:

Region: NA - [illegible] Selling Dealer: 11[illegible] - *
Country: USA - [illegible] Selling Mr St/Prov: NJ
Buyer St/Prov: NJ

Arrival Date:	19-MAR-2001	Red Carpet Lease:	2
Sale Date:	17-MAR-2001	Fleet/Retail/Co. Lease:	F
Warranty Start Date:	19-MAR-2001	Modified Vehicle:	*
Orig Warranty Date:	17-MAR-2001	Reacquired Vehicle:	* Vehicle Export Flag: N

YOC/EOC:

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---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

[illegible] 04 [illegible] CA D 4[illegible] 77 A 47 A[illegible] 3 J1[illegible] F [illegible] 3

1F[illegible] 2 74[illegible] [illegible] [illegible] A
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	AB	GVW Class Code:	B
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	BGAHD - 3.55 FINAL DRIVE RATIO	Mirror(Driver Side):	AV - DRIVER HAND SET SAIL MIRROR
Axle Type:	BGIAB - NON-LIMITED SLIP REAR AXLE	Mirror(Psngr Side):	AW - PASS HAND SET SAIL MIR-CONVEX
Battery Amp Rating:	MB	Paint:	PNYW3 - OXFORD WHITE SOLID C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AF - ELECTRONIC AM/FM/STEREO/CLOCK
Calibration Code:	1E412D0A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Susp Tandem Axle:	* - [N/A]
Color(Trim):	800ZV -	Tire Brand:	AJ - MICHELIN - RECYCLABLE
Delivery Type:	D	Tire Size:	D9GUB - P235/75R15XL BSW A-S
Driveshaft Code:	P	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	B3DD462X5000	RF:	B3DD462X5000
LR:	B3DD462X5000	RR:	B3DD462X5000
LI:	*	RI:	*
SPARE:	7HL1XD5800		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	T/B - T/B
ESP Coverage(Miles):	*	Emission Cert Type:	F
ESP Coverage(Time):	*	Emission Decal Suffix:	HCT
ESP Plan Year:	*	Engine Family:	1FMXT0425BP
ESP Signature Date:			

Any comments? You can contact

webmaster

E02-027-C 3945

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1MEHM5[illegible]YG[illegible]	Veh Line:	C[illegible] - TAURUS/SABLE (D186) [00-02]	Eng Serial No:	*
Model Year:	2000	Market Derivatv:	CM - L-M DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	C	Drive Code:	CJA - 2 WHL LH FRONT DRIVE	Engine:	CLD - MOD 3.0L DOHC [illegible] NA V6 G*NAAO
Inst. Dealer:	12934	Body Cab Style:	CSF - 4 DOOR STATION WAGON	Transmission:	CDX - 4 SPD AUTO TRANS NAAO AX4N
		Version/Series:	CXB - SABLE [illegible] VERSION		

BUILD INFORMATION:

Region: NA - [illegible] Plant: AD - CHICAGO PLANT BUILD
Country: USA - [illegible] Prod Date: 04-NOV-1999

SALE INFORMATION:

Region: NA - [illegible] Selling Dealer: 32[illegible]23 - *
Country: USA - [illegible] Selling Dlr St/Prov: VA
Buyer St/Prov: VA

Arrival Date: 22-NOV-1999 Red Carpet Lease: *
Sale Date: 22-FEB-2000 Fleet/Retail/Co. Lease: R
Warranty Start Date: 22-FEB-2000 Modified Vehicle: *
Orig Warranty Date: 22-FEB-2000 Reacquired Vehicle: * Vehicle Export Flag: N

VOC/EOC:

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---------1---------2---------3---------4---------5---------6---------7---------8---------9--------

[illegible]

[illegible]                                  24
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INSTALLED OPTION INFORMATION:

Air Conditioning:	C/C - ATC AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	*	GVW Class Code:	F
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	BA - DRIVER POWER/HEATED MIRROR
Axle Type:	* - [N/A]	Mirror(Pass Side):	BA - PASS POWER/HEATED CONVEX MIRR
Battery Amp Rating:	BO	Paint:	FMHA - MED. TOREADOR C/C
Brake Code:	FBAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	AB - POWER TELESCOPIC RADIO ANTENNA
Brake Code(Service):	* - [N/A]	Radio:	AB - ELECTRONIC AM/FM STEREO/CASSETTE
Calibration Code:	1XD1406A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Swap Tandem Axle:	* - [N/A]
Color(Trim):	000ZY -	Tire Brand:	AD - GENERAL
Delivery Type:	0	Tire Size:	D5RZ - P215/60R-16 BSW ALL SEASON
Driveshaft Code:	*	Traction Control:	AB - ANTI-SPIN TRACT BRAKES W/O IVD
Front Seats:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	C/C - C/C
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Decal Suffix:	GHZ
ESP Plan Years:	*	Engine Family:	YFMXV030VF3
ESP Signature Date:			

Any comments? You can contact webmaster

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FMRU15W81LA08227	Veh Line:	T/B3 - EXPEDITION (UN93) [97-02]	Eng Serial No:	*
Model Year:	2001	Market Derivate:	* - [N/A]	Body Style:	*
Veh Type:	T	Drive Code:	T/B - 2 WHL L/H REAR DRIVE	Engine:	T/VN - B-M 4.6L SOHC EFI NA CIV8 G-NP
Inv. Dealer:	05433	Body Cab Style:	T/WD - 4 DOOR WAGON	Transmission:	T/OU - 4 SPD AUTO TR NAAO AODE/4R70W
		Version/Series:	T/SF - FORD SERIES		

BUILD INFORMATION:

Region: NA - ######## Plant: AP - MICHIGAN PLANT BUILD
Country: USA - ######## Prod Date: 18-AUG-2000

SALE INFORMATION:

Region: NA - ######## Selling Dealer: 17[illegible] - *
Country: USA - ######## Selling Dlr St/Prov: CA
Buyer St/Prov: CA

Arrival Date: 25-SEP-2000 Red Carpet Lease: *
Sale Date: 29-SEP-2000 Fleet/Retail/Co. Lease: R
Warranty Start Date: 29-SEP-2000 Modified Vehicle: *
Orig Warranty Date: 29-SEP-2000 Reacquired Vehicle: * Vehicle Export Flag: N

VOC/EOC:

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---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

[illegible]

[illegible]                                                            1
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INSTALLED OPTION INFORMATION:

Air Conditioning:	T2D - HIGH OUTPUT AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	C8	GVW Class Code:	R
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	BOAFB - 3.31 FINAL DRIVE RATIO - 53	Mirror(Driver Side):	BA - DRIVER POWER/HEATED MIRROR
Axle Type:	BOVAB - NON-LIMITED SLIP REAR AXLE	Mirror(Psngr Side):	BA - PASS POWER/HEATED CONVEX MIRR
Battery Amp Rating:	MK	Paint:	PNUAA - EBONY SOLID C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AT - ELETR PREM AM/FM STRO/CSTH/CLK
Calibration Code:	1E316C8A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Super Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Brand:	AC - FIRESTONE
Delivery Type:	6	Tire Size:	D3WA - P235/70R-16 OWL A-T
Driveshaft Code:	F	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	F	Emission Code:	T/C - T/C
ESP Coverage(Miles):	050	Emission Cert Type:	5
ESP Coverage(Time):	060	Emission Decal Suffix:	E3F
ESP Plan Year:	2001	Engine Family:	1FMXT0466P5
ESP Signature Date:	29-SEP-2000		

Any comments? You can contact

webmaster

3949 C-0227-E062

Vehicle Information Report

GENERAL VEHICLE INFORMATION:

(Related Claims)

VIN:	2MEFM75W91X670720	Veh Line:	CFP - GRAND MARQ (ENGMEN14) [93-02]	Eng Serial No:	*
Model Year:	2001	Market Derivat:	CM - L-M DIVISION DERIVATIVE	Body Style:	*
Veh Type:	C	Drive Code:	CB - 2 WHL LH REAR DRIVE	Engine:	CVN - R-M 4.6L SOHC EFI NA CV8 G-NP
Inv. Dealer:	10636	Body Cab Style:	CFA - 4 DOOR SEDAN-4 LITE	Transmission:	CDS - 4 SP AT NAAO AODEW4R70W*SVIL
		Version/Series:	CAJ - LS VERSION - CAR		

BUILD INFORMATION:

Region: NA - [illegible] Plant: AW - ST. THOMAS PLANT BUILD
Country: CAN - [illegible] Prod Date: 01-MAR-2001

SALE INFORMATION:

Region: NA - [illegible] Selling Dealer: 515305 - *
Country: USA - [illegible] Selling Dlr St/Prov: PA
Buyer St/Prov: [illegible]

Arrival Date:	14-MAR-2001	Red Carpet Lease:	*
Sale Date:	09-MAR-2001	Fleet/Retail/Co. Lease:	F
Warranty Start Date:	14-MAR-2001	Modified Vehicle:	*
Orig Warranty Date:	09-MAR-2001	Reacquired Vehicle:	* Vehicle Report Flag: N

VOC/ROC:

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---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

M751X670720Y 43      J312482436      SA E    VULJTA 07 C3CUUF 7   R    EF19C737   9 AFL      MO    3   3 M

EEEF9 4      3   A       VULA                 0062249106        AA
```

3669 C-827-2002

INSTALLED OPTION INFORMATION:

Air Conditioning:	CC - ATC AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	*	GVW Class Code:	F
Audio Disk:	* - [N/A]	Instrumentation:	AB - CONVENTIONAL INSTRUMENTATION
Axle Ratio:	BGABC - 3.27 FINAL DRIVE RATIO	Mirror(Driver Side):	* - [N/A]
Axle Type:	BGHAB - NON-LIMITED SLIP REAR AXLE	Mirror(Passgr Side):	* - [N/A]
Battery Amp Rating:	MR	Paint:	PNRIA - MED. TOREADOR C/C
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AS - ELECTRONIC AM/FM STRO/CASSETTE
Calibration Code:	1FB1G0A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Susp Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Brand:	AJ - MICHELIN - RECYCLABLE
Delivery Type:	4	Tire Size:	D3TTQ - P225/60R-16 WSW
Driveshaft Code:	*	Traction Controls:	AB - ANTI-SPIN TRACT BRAKES W/O IVD
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	C8 - C8
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Decal Suffix:	HDD
ESP Plan Years:	*	Engine Family:	1FMXV046VF5
ESP Signature Date:			

Any comments? You can contact webmaster

Vehicle Information Report

GENERAL VEHICLE INFORMATION:

(Related Claims)

VIN:	1FMZU77E71UB83263	Veh Line:	TS1 - EXPLORER SPORT TRAC P207 [01-02]	Eng Serial No:	*
Model Year:	2001	Market Derivati:	TSP - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	T	Drive Code:	T3B - 4 WHL L/H PART TIME DRIVE	Engine:	TNB - COLOGNE 4.0L SOHC EFI NA V6 G
Inv. Dealer:	07459	Body Cab Style:	TWF - 4 DOOR W/PICKUP BOX	Transmission:	TTC - 5 SPD AT BAO ASLDE-NR/5R44/55E
		Vendor/Series:	TBP - FORD SERIES		

BUILD INFORMATION:

Region: NA - ######### Plant: AN - LOUISVILLE PLANT BUILD
Country: USA - ######### Prod Date: 18-OCT-2000

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 116517 - *
Country: USA - ######### Selling Dlr St/Prov: PA
Buyer St/Prov: PA

Arrival Date: 26-OCT-2000 Red Carpet Lease: *
Sale Date: 02-JAN-2001 Fleet/Retail/Co. Lease: R
Warranty Start Date: 02-JAN-2001 Modified Vehicle: *
Orig Warranty Date: 02-JAN-2001 Reacquired Vehicle: * Vehicle Export Flag: N

VOC/EOC:

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---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

077108032031203722 6 2 10K4035      1F [illegible]  [illegible] 1      441047  3  32   T 030   1   2

10x17 7    1       F2D9A                           1
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	T09 - MANUAL AIR CONDITIONER
Alternator Amp Rating:	BK
Audio Disk:	* - [N/A]
Axle Ratio:	EGAMD - 4.10 FINAL DRIVE RATIO
Axle Type:	EGHAB - NON-LIMITED SLIP REAR AXLE
Battery Amp Rating:	MK
Brake Code:	* - [N/A]
Brake Code(Service):	* - [N/A]
Calibration Code:	1S11A40A
Color(Accent):	* - [N/A]
Color(Trim):	* - [N/A]
Delivery Type:	6
Driveshaft Code:	D
Front Seat:	* - [N/A]
Fuel Type:	* - [N/A]
GVW Code:	* - [N/A]
GVW Class Code:	Z
Instrumentation:	* - [N/A]
Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Mirror(Pasgr Side):	AD - PASS POWER CONVEX MIRROR
Paint:	PNARQ - HARVEST GOLD C/C
Power Antenna:	* - [N/A]
Radio:	BE - ELETR PREM STRO/CSTE/DISC/CLK
Sound System:	* - [N/A]
Suspn Tandem Axle:	* - [N/A]
Tire Brand:	AC - FIRESTONE
Tire Size:	D3JWA - P255/70R-16 OWL A-T
Traction Control:	* - [N/A]
Wheel Base:	* - [N/A]

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	T/C - T/C
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Decal Suffix:	HBS
ESP Plan Years:	*	Engine Family:	1FMXT04.0ZFJ
ESP Signature Date:			

Any comments? You can contact webmaster

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FMYU04[illegible]	Veh Line:	TM1 - ESCAPE (U204) (2001)	Eng Serial No:	[illegible]
Model Year:	2001	Market Derivative:	TF - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	T	Drive Code:	TF - 4 WHL LH FULL TIME DRIVE	Engine:	TLD - MOD 3.0L DOHC EN NA V6 G*NAAO
Inv. Dealer:	04112	Body Cab Style:	T/WD - 4 DOOR WAGON	Transmission:	TDJ - 4 SPD AUTO TRANS NAAO CD4E
		Version/Series:	TBF - FORD SERIES		

BUILD INFORMATION:

Region: NA - ######### Plant: AJ - KANSAS CITY PLANT BUILD
Country: USA - ######### Prod Date: 08-MAR-2001

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 113155 - *
Country: USA - ######### Selling Dlr St/Prov: NJ
Buyer St/Prov: NJ

Arrival Date: 21-MAR-2001 Red Carpet Lease: *
Sale Date: 23-MAR-2001 Fleet/Retail/Co. Lease: R
Warranty Start Date: 23-MAR-2001 Modified Vehicle: *
Orig Warranty Date: 23-MAR-2001 Recaptured Vehicle: * Vehicle Export Flag: N

VOC/EOC:

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--------1---------2---------3---------4---------5---------6---------7---------8---------9--------

[illegible] V 1 [illegible]      [illegible] 113155  0  [illegible]  A  [illegible] 1

[illegible] 7              [illegible]                       [illegible]
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	TIB - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	C	GVW Class Code:	T
Audio Unit:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	* - [N/A]	Mirror(Psngr Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	A	Paint:	PHLDS - MEDIUM WEDGEWOOD C/C
Brake Code:	BEAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AQ - ELECTR PREMIUM AM/FM STRO/CSTB
Calibration Code:	6A11A30A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Single Tandem Axle:	* - [N/A]
Color(Trim):	60IZV -	Tire Brand:	AB - ANY BRAND
Delivery Type:	0	Tire Size:	D40U7 - P235/70R-16 OWL A-S
Driveshaft Code:	D	Traction Control:	* - [N/A]
Front Seats:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	W2 8AWM0801	RF:	W2 8AWM0801
LR:	W2 8AWM0801	RR:	W2 8AWM0801
LI:	*	RI:	*
SPARE:	HY8AIE5????		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	T/C - T/C
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Decal Suffix:	HE9
ESP Plan Years:	*	Engine Family:	1FMXT0301F6
ESP Signature Date:			

Any comments? You can contact

webmaster

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FAFP56SXYG182548	Veh Line:	C/DD - TAURUS/SABLE (DN98) [00-02]	Eng Serial No:	*
Model Year:	2000	Market Derived:	C/F - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	C	Drive Code:	C/A - 2 WHL L/H FRONT DRIVE	Engine:	C/LD - MOD 3.0L DOHC EFI NA V6 O*NAAO
Inv. Dealer:	03549	Body Cab Style:	C/SC - 4 DOOR SEDAN-6 LITE	Transmission:	C/DX - 4 SPD AUTO TRANS NAAD AX4N
		Version/Series:	C/FB - TAURUS B VERSION		

BUILD INFORMATION:

Region: NA - ######## Plant: AD - CHICAGO PLANT BUILD
Country: USA - ######## Prod Date: 13-MAR-2000

SALE INFORMATION:

Region: NA - ######## Selling Dealer: 153031 - *
Country: USA - ######## Selling Dlr St/Prov: IA
Buyer St/Prov: IA

Arrival Date: 15-MAR-2000 Red Carpet Lease: *
Sale Date: 14-APR-2000 Fleet/Retail/Co. Lease: R
Warranty Start Date: 14-APR-2000 Modified Vehicle: *
Orig Warranty Date: 14-APR-2000 Reacquired Vehicle: * Vehicle Report Flag: N

VOC/EOC:

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---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

P54TC1L326407 4   3  A2 20020313       QA C  1L4R 32  7AP2 18      J8  2 153031  C  EX      X15A        8

1FAFP 5             96X1A                                   24
```


EA02-027-C 3958

INSTALLED OPTION INFORMATION:

Air Conditioning:	C/C - ATC AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	*	GVW Class Code:	P
Audio Disk:	AC - AUDIO DISC CHANGER PLAYER	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	RA - DRIVER POWER/HEATED MIRROR
Axle Type:	* - [N/A]	Mirror(Psngr Side):	RA - PASS POWER/HEATED CONVEX MIRR
Battery Amp Rating:	RO	Paint:	PNECD - GRAPHITE BLUE C/C
Brake Code:	FBAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AE - ELECTRONIC AM/FM STRO/CASSETTE
Calibration Code:	0DD15N0A	Sound System:	AE - AUDIOPHILE SOUND SYSTEM
Color(Accent):	* - [N/A]	Single Tandem Axle:	* - [N/A]
Color(Trim):	000ZV -	Tire Brand:	AD - GENERAL
Delivery Type:	0	Tire Size:	D3JBZ - P215/60R-16 BSW ALL SEASON
Driveshaft Code:	*	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	K	Emission Code:	C/S - C/S
ESP Coverage(Miles):	060	Emission Cert Type:	F
ESP Coverage(Time):	072	Emission Decal Suffix:	GLU
ESP Plan Year:	2000	Engine Family:	YFMXV030VBA
ESP Signature Date:	14-APR-2000		

Any comments? You can contact

webmaster

3867 C-427-2982

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	[illegible]	Veh Line:	CXD - TAURUS/SABLE (D186) [00-02]	Eng Serial No:	*
Model Year:	2000	Market Derivative:	CM - L-M DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	C	Drive Code:	C/A - 2 WHL LH FRONT DRIVE	Engine:	C/LD - MOD 3.0L DOHC SPI NA V6 G*NAAO
Inv. Dealer:	11650	Body Cab Style:	CFF - 4 DOOR STATION WAGON	Transmission:	C/DX - 4 SPD AUTO TRANS NAAO AX4N
		Version/Series:	CKB - SABLE B VERSION		

BUILD INFORMATION:

Region: NA - [illegible] Plant: AB - ATLANTA PLANT BUILD
Country: USA - [illegible] Prod Date: 06-MAR-2000

SALE INFORMATION:

Region: NA - [illegible] Selling Dealer: 325113 - *
Country: USA - [illegible] Selling Dlr St/Prov: FL
Buyer St/Prov: FL

Arrival Date: 11-MAR-2000 Red Carpet Lease: *
Sale Date: 19-APR-2000 Fleet/Retail/Co. Lease: R
Warranty Start Date: 19-APR-2000 Modified Vehicle: *
Orig Warranty Date: 19-APR-2000 Reacquired Vehicle: * Vehicle Export Flag: N

VOC/EOC:

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---------1---------2---------3---------4---------5---------6---------7---------8---------9---------
[illegible]

[illegible]
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	C/C - ATC AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	*	GVW Class Code:	F
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	* - [N/A]	Mirror(Driver Side):	BA - DRIVER POWER/HEATED MIRROR
Axle Type:	* - [N/A]	Mirror(Pass. Side):	BA - PASS POWER/HEATED CONVEX MIRR
Battery Amp Rating:	BO	Paint:	PNZ2C - PERFORMANCE WHITE C/C
Brake Code:	FEAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	AE - POWER TELESCOPIC RADIO ANTENNA
Brake Code(Service):	* - [N/A]	Radio:	AE - ELECTRONIC AM/FM STEO/CASSETTE
Calibration Code:	0D15N0A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Surge Tandem Axle:	* - [N/A]
Color(Trim):	00ZV -	Tire Brand:	AC - FIRESTONE
Delivery Type:	0	Tire Size:	DS3SZ - P215/60R-16 BSW ALL SEASON
Driveunit Code:	*	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	C/S - CS
ESP Coverage(Miles):	*	Emission Cert Type:	F
ESP Coverage(Time):	*	Emission Decal Suffix:	GLU
ESP Plan Years:	*	Engine Family:	YFMXV030VBA
ESP Signature Date:			

Any comments? You can contact

webmaster

EN02-027-C 3629

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FTRX17W31KF41357	Veh Line:	TH5 - F150/250(PN96)/F225-FORD [97-02]	Eng Serial No:	*
Model Year:	2001	Market Derivative:	* - [N/A]	Body Shell:	*
Veh Type:	T	Drive Code:	TB - 2 WHL LH REAR DRIVE	Engine:	TWN - 8-M 4.6L SOHC EFI NA CIVS G-NP
Inv. Dealer:	07749	Body Cab Style:	THD - SUPER SINGLE CAB (SUPER CAB)	Transmission:	TIDU - 4 SPD AUTO TR NAAO AODE[illegible]
		Version/Series:	TIAM - 150 SERIES		

BUILD INFORMATION:

Region: NA - [illegible] Plant: AJ - KANSAS CITY PLANT BUILD
Country: USA - [illegible] Prod Date: 16-OCT-2000

SALE INFORMATION:

Region: NA - [illegible] Selling Dealer: 172206 - *
Country: USA - [illegible] Selling Dlr St/Prov: CA
Buyer St/Prov: CA

Arrival Date: 04-NOV-2000 Red Carpet Lease: *
Sale Date: 23-MAR-2001 Fleet/Retail/Co. Lease: R
Warranty Start Date: 23-MAR-2001 Modified Vehicle: *
Orig Warranty Date: 23-MAR-2001 Recaptured Vehicle: * Vehicle Export Flag: N

VOC/EOC:

---------1---------2---------3---------4---------5---------6---------7---------8---------9---------

[illegible]

[illegible]

9686 C-427-0068

INSTALLED OPTION INFORMATION:

Air Conditioning:	TI3 - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	BA	GVW Class Code:	E
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	BGAHD - 3.55 FINAL DRIVE RATIO	Mirror(Driver Side):	AD - DRIVER POWER MIRROR
Axle Type:	BGSAC - LIMITED SLIP REAR AXLE	Mirror(Pass Side):	AD - PASS POWER CONVEX MIRROR
Battery Amp Rating:	BL	Paint:	PNTW3 - OXFORD WHITE SOLID C/C
Brake Code:	FBAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AU - ELETR PREM AM/FM STRO/DISC
Calibration Code:	1F516D0A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Super Tandem Axle:	* - [N/A]
Color(Trim):	00ZV -	Tire Brand:	AD - GENERAL
Delivery Type:	B	Tire Size:	D3JUH - P235/75R-16 BSW A-S
Driveshaft Code:	F	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	K	Emission Code:	T/C - T/C
ESP Coverage(Miles):	100	Emission Cert Type:	5
ESP Coverage(Time):	060	Emission Decal Suffix:	HCD
ESP Plan Year:	2001	Engine Family:	1FMXT04.6FF6
ESP Signature Date:	23-MAR-2001		

Any comments? You can contact

webmaster

Vehicle Information Report

GENERAL VEHICLE INFORMATION:

(Related Claims)

VIN:	1FTRF18W51NA21127	Veh Line:	TH5 - F150/250(PN96)/F225-FORD [97-00]	Eng Serial No:	*
Model Year:	2001	Matched Dealer:	* - [NA]	Body Shell:	*
Veh Type:	T	Drive Code:	T/B - 4 WHL LH PART TIME DRIVE	Engine:	TVN - B-M 4.6L SOHC EFI NA CIV8 G-NP
Inv. Dealer:	20411	Body Cab Style:	TBB - SINGLE CAB (REGULAR CAB)	Transmission:	T/DU - 4 SPD AUTO TR NAAO AODEW/4R70W
		Version/Series:	T/AM - 150 SERIES		

BUILD INFORMATION:

Region: NA - ######### Plant: AR - NORFOLK PLANT BUILD
Country: USA - ######### Prod Date: 01-SEP-2000

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 171174 - *
Country: USA - ######### Selling Dlr St/Prov: AZ
Buyer St/Prov: AZ

Arrival Date: 15-SEP-2000 Red Carpet Lease: *
Sale Date: 05-SEP-2000 Fleet/Retail/Co. Lease: F
Warranty Start Date: 15-SEP-2000 Modified Vehicle: *
Orig Warranty Date: 05-SEP-2000 Reacquired Vehicle: * Vehicle Export Flag: N

VOC/EOC:

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-------1---------2---------3---------4---------5---------6---------7---------8---------9--------
[illegible]    [illegible]    [illegible]    1    [illegible]    [illegible]    E W
1FTRF 1 C 2 507A [illegible]    1
```

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/B - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	EA	GVW Class Code:	R
Audio Disc:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	BGAFB - 3.31 FINAL DRIVE RATIO - SS	Mirror(Driver Side):	* - [N/A]
Axle Type:	BGFAB - NON-LIMITED SLIP REAR AXLE	Mirror(Pass Side):	* - [N/A]
Battery Amp Rating:	BL	Paint:	PNZJC - SILVER MET C/C #2
Brake Code:	FBAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AU - ELECTR PREM AM/FM STRO/DISC
Calibration Code:	1F51G30A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Surge Tandem Axle:	* - [N/A]
Color(Exterior):	00ZEV -	Tire Brand:	AB - GOODRICH
Delivery Type:	C	Tire Size:	DBJUJ - P215/70R-16 OWL A-S
Driveshaft Code:	D	Traction Control:	* - [N/A]
Front Seats:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	T/B - T/B
ESP Coverage(Miles):	*	Emission Cert Type:	$
ESP Coverage(Time):	*	Emission Dual Suffix:	HCD
ESP Plan Year:	*	Engine Family:	1FMXT04.0FF6
ESP Signature Date:			

Any comments? You can contact webmaster

E982-027-C 3863

Vehicle Information Report

1 out of 4
sensors + History

GENERAL VEHICLE INFORMATION:

(Related Claims)

VIN:	1LNHM82W31Y612281	Veh Line:	C/VC - LINCOLN TOWN CAR (FN145) (98-02)	Eng Serial No:	*
Model Year:	2001	Market Derivative:	C3M - L-M DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	C	Drive Code:	C3B - 2 WHL LH REAR DRIVE	Engine:	C/VN - 8-M 4.6L SOHC [illegible] NA CFV8 G-NP
Svc. Dealer:	10218	Body Cab Style:	CFC - 4 DOOR SEDAN-6 LITE	Transmission:	CKU - 4 SPD AUTO TR NAAO [illegible]
		Version/Series:	CBR - SIGNATURE VERSION		

BUILD INFORMATION:

Region: NA - ######## Plant: BA - WIXOM PLANT BUILD
Country: USA - ######## Prod Date: 07-SEP-2000

SALE INFORMATION:

Region: NA - ######## Selling Dealer: 354015 - *
Country: USA - ######## Selling Dlr St/Prov: CA
Buyer St/Prov: CA

Arrival Date: 19-OCT-2000 Red Carpet Lease: 1
Sale Date: 16-JAN-2001 Fleet/Retail/Co. Lease: R
Warranty Start Date: 16-JAN-2001 Modified Vehicle: *
Orig Warranty Date: 16-JAN-2001 Reacquired Vehicle: * Vehicle Export Flag: N

VOC/EOC:

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---------1---------2---------3---------4---------5---------6---------7---------8---------9---------
M821Y612281X  1     1 1437008    DOE E 2 B7Y 3H3   3 LEM A  W      5HA114  2V WP     E2 A       W

11883 6  .       TWCCA                             A
```


0663-027-C 3894

INSTALLED OPTION INFORMATION:

Air Conditioning:	CIC - ATC AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	*	GVW Class Code:	H
Audio Disks:	AC - AUDIO DISC CHANGER PLAYER	Instrumentation:	AB - CONVENTIONAL INSTRUMENTATION
Axle Ratio:	EGACC - 3.08 FINAL DRIVE RATIO	Mirror(Driver Side):	* - [N/A]
Axle Type:	EG1AB - NON-LIMITED SLIP REAR AXLE	Mirror(Pasngr Side):	* - [N/A]
Battery Amp Rating:	65	Paint:	PNZTA - WHITE PEARL TRI COAT
Brake Code:	* - [N/A]	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	BF - ELE LUXAMG SIGNAL STRACDCLK
Calibration Code:	1VC1SR0A	Sound System:	AE - AUDIOPHILE SOUND SYSTEM
Color(Accent):	* - [N/A]	Susp. Tandem Axle:	* - [N/A]
Color(Trim):	60ZV -	Tire Brand:	AJ - MICHELIN - RECYCLABLE
Delivery Type:	E	Tire Size:	D3JTU - P225/60R-16 BSW A-S
Driveshaft Code:	*	Traction Control:	AB - ANTI-SPIN TRACT BRAKES W/O IVD
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Fuel Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	CIC - CIC
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Decal Suffix:	HNZ
ESP Plan Years:	*	Engine Family:	1FMXV04.6VF5
ESP Signature Date:			

Any comments? You can contact webmaster

EA02-027-C 3695

Vehicle Information Report

GENERAL VEHICLE INFORMATION: **(Related Claims)**

VIN:	1FTZF1722INA33612	Veh Line:	TH5 - F150/250(PN96)/F225-FORD [97-02]	Eng Serial No:	*
Model Year:	2001	Market Dst/code:	* - [NA]	Body Shell:	*
Veh Type:	T	Drive Code:	T/B - 2 WHL L/H REAR DRIVE	Engine:	T1LY - 4.2L OHV EFI NA V6 GAS
Inv. Dealer:	03509	Body Cab Style:	TSEB - SINGLE CAB (REGULAR CAB)	Transmission:	TDU - 4 SPD AUTO TR NAAO AODEW/4R70W
		Version/Series:	TAM - 150 SERIES		

BUILD INFORMATION:

Region: NA - ######## Plant: AR - NORFOLK PLANT BUILD
Country: USA - ######## Prod Date: 05-SEP-2000

SALE INFORMATION:

Region: NA - ######## Selling Dealer: 113096 - *
Country: USA - ######## Selling Dlr St/Prov: NY
Buyer St/Prov: NY

Arrival Date: 15-SEP-2000 Red Carpet Lease: *
Sale Date: 22-SEP-2000 Fleet/Retail/Co. Lease: R
Warranty Start Date: 22-SEP-2000 Modified Vehicle: *
Orig Warranty Date: 22-SEP-2000 Reacquired Vehicle: * Vehicle Report Flag: N

VOC/EOC:

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---------1---------2---------3---------4---------5---------6---------7---------8---------9---------
F172[illegible]      1 1 11[illegible]      [illegible]      [illegible]      [illegible]      CT      2

1FTZ[illegible] 3 B      [illegible]      3
```


E9002-0227-C 3986

INSTALLED OPTION INFORMATION:

Air Conditioning:	T/S - MANUAL AIR CONDITIONER	GVW Code:	* - [N/A]
Alternator Amp Rating:	CA	GVW Class Code:	Z
Audio Disk:	* - [N/A]	Instrumentation:	* - [N/A]
Axle Ratio:	SOAF8 - 3.31 FINAL DRIVE RATIO - 8R	Mirror(Driver Side):	AC - DRIVER HAND SET MIRROR
Axle Type:	SOFAB - NON-LIMITED SLIP REAR AXLE	Mirror(Passg Side):	AB - PASS HAND SET CONVEX MIRROR
Battery Amp Rating:	MB	Paint:	PNFDW - DARK HIGHLAND GREEN C/C
Brake Code:	FSAAB - 4 WHL ANTI-LOCK BRAKES	Power Antenna:	* - [N/A]
Brake Code(Service):	* - [N/A]	Radio:	AO - ELECTR AM/FM/STEREO/CSTE/CLOCK
Calibration Code:	1FS12C8A	Sound System:	* - [N/A]
Color(Accent):	* - [N/A]	Susp Tandem Axle:	* - [N/A]
Color(Trim):	* - [N/A]	Tire Brand:	AE - GOODRICH
Delivery Type:	0	Tire Size:	D8RJH - P255/70R-16 BSW A-S
Driveshaft Code:	F	Traction Control:	* - [N/A]
Front Seat:	* - [N/A]	Wheel Base:	* - [N/A]
Seat Type:	* - [N/A]		

TIRE DOT INFORMATION:

LF:	*	RF:	*
LR:	*	RR:	*
LI:	*	RI:	*
SPARE:	*		

ESP INFORMATION: EMISSIONS INFORMATION:

ESP Code:	*	Emission Code:	T/C - T/C
ESP Coverage(Miles):	*	Emission Cert Type:	5
ESP Coverage(Time):	*	Emission Decal Suffix:	HLH
ESP Plan Year:	*	Engine Family:	1FMXT0422F5
ESP Signature Date:			

Any comments? You can contact

webmaster

Vehicle Information Report

GENERAL VEHICLE INFORMATION: (Related Claims)

VIN:	1FMYU01161KB71061	Veh Line:	TM1 - ESCAPE (U204) [2001]	Eng Serial No:	1S0500056
Model Year:	2001	Market Derivat:	TF - FORD DIVISION DERIVATIVE	Body Shell:	*
Veh Type:	T	Drive Code:	TA - 2 WHL LHS FRONT DRIVE	Engine:	TAD - MOD 3.0L DOHC EFI NA V6 G*NAAO
Inv. Dealer:	01104	Body Cab Style:	TWD - 4 DOOR WAGON	Transmission:	TAU - 4 SPD AUTO TRANS NAAO CD4E
		Version/Series:	TSP - FORD SERIES		

BUILD INFORMATION:

Region: NA - ######### Plant: AJ - KANSAS CITY PLANT BUILD
Country: USA - ######### Prod Date: 01-MAY-2001

SALE INFORMATION:

Region: NA - ######### Selling Dealer: 121724 - *
Country: USA - ######### Selling Dlr St/Prov: NC
Buyer St/Prov: NC

Arrival Date: 17-MAY-2001 Red Carpet Lease: *
Sale Date: 13-JUL-2001 Fleet/Retail/Co. Lease: R
Warranty Start Date: 13-JUL-2001 Modified Vehicle: *
Orig Warranty Date: 13-JUL-2001 Reacquired Vehicle: * Vehicle Export Flag: N

VOC/EOC:

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--------1--------2--------3--------4--------5--------6--------7--------8--------9--------
0011X091041140779  X 3 1005101      CD 3   496 7J  5 3  34  5 033A F 121724  1  LD  A  T2A   3    1

1TMY1 4             1BNC X
```