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An Analysis of On-Road Remote Sensing as a Tool for Automobile Emissions Control

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AN ANALYSIS OF ON-ROAD REMOTE SENSING AS A TOOL FOR AUTOMOBILE EMISSIONS CONTROL

Final Report

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Executive summary

The goal of this project was to demonstrate the ability of remote sensing to determine, and potentially lead to control of mobile source emissions in the Chicago metropolitan area. A remote sensor for on-road carbon monoxide motor vehicle emissions was used in conjunction with a video freeze-frame system which allows the instantaneous carbon monoxide emissions measurements obtained from passing vehicles to be superimposed on a picture of the vehicle and its license plate. The license plates can then be recorded and identified through state records and the emissions linked to that vehicle. The remote sensor for on-road carbon monoxide (CO) emissions has been developed at the University of Denver. The results have been verified by comparison to on-road and to on-dynamometer vehicle emissions readings.

The location for the initial study was west of the downtown Chicago area on the on-ramp to the eastbound Eisenhower expressway from Central Avenue. The measurements were made from the 7th through the 11th of August, 1989. 11,818 successful exhaust CO and license plate measurements were made. Half the CO measured was emitted by 8% of the vehicles termed "gross polluters" with exhaust %CO greater than 4.5 (equivalent to 1637 grams of CO emitted per gallon of fuel used). These findings are indistinguishable from data obtained in similar studies in the Denver, Colorado area. Although the gross polluters are 8% of the whole vehicle fleet, the percentage of gross polluters increases with age (3% of the 88 and 89 model year, 4.5% of all 83-89 vehicles, 14% of 1975-1982 vehicles, and 20% of 1974 and older cars). Most of the vehicles in all age groups are not in the gross polluting category. The major difference between Chicago and Denver data is the higher (3%) fraction of gross polluters in the 1988 and 1989 model year. In Denver studies, the ramps used were circular, the fraction of 1988 and 89 gross polluters was less than 0.6%. This difference may be attributable to "off cycle" emissions in which some new vehicles under full load are designed to run with rich air to fuel mixtures. It is less likely that one would observe full load conditions on the tightly curved ramps used in the Denver studies.

Of 671 vehicles measured four times or more, twelve (1.8%) were responsible for 13% of the CO emissions measured at that site. Data obtained on the variation of vehicle emissions with vehicle age agree with previous studies, but contradict the EPA model of motor vehicle emissions. Most old cars are quite clean. All the dirtiest cars are not old, and not all the cleanest cars are new.

Hydrocarbon (HC) emissions in Federal Test Procedure (FTP) tests are well correlated to CO emissions from vehicles with rich air/fuel mixtures and suboptimal emissions control systems. FTP testing indicates that a remote sensing program which detects only CO gross polluters will in fact detect 80% of the gross HC emitters. If gross CO emitters were detected and tuned up to emit

the mean of their model year, the CO emissions reduction would be about 40%. The correlation suggests that the HC reduction would be greater than 30%.

There is funding at the University of Denver from the American Petroleum Institute to develop a real-time HC remote sensing channel with a tested prototype anticipated in the fall of 1990. Control measures for HC and CO do not however depend on the availability of the device, in view of the correlations herein. In fact the use of CO remote sensing to detect vehicles with failed emissions system components will, when these components are repaired or replaced, result in lower emissions of all pollutants.

Nitrogen oxide (NOx) emissions on the FTP are not well correlated to HC or CO emissions. If remote sensing is considered as a part of a control program for NOx emissions, then a planned remote sensor for nitrogen oxides would need to be developed.

Two correlations between remote sensing and the Illinois Inspection and Maintenance (I/M) program were tested. In the first instance the Illinois idle standards were applied to the remotely measured fleet. Most new cars passed, similar to the I/M program, however a disproportionately large fraction (40%) of the 1981 vehicles would fail, and only a small (8-12%) fraction of the pre-1980 vehicles would have failed. A simpler standard uses the exact gross polluting criterion observed by remote sensing, namely 4.48 %CO as the standard irrespective of model year. The correlation is excellent between the Illinois I/M failure rate by model year and this remote sensing failure test.

There are many different techniques whereby the remote sensing information could be used as an air pollution control measure. A New York State mobile source expert suggested that, in real time, tolls could be assessed more heavily the more emissions the vehicle evidenced. In effect this would be a proportional pollution tax.

Another scheme places a single remote sensor at each centralized testing location, with all vehicles entering the remote sensing lane as they arrive. A fraction of the cleanest vehicles (70%) would be issued with a passing certificate, and would be allowed to go on their way. This procedure with a stop light and a single moving test lane would take approximately 15 seconds, would pass on to the current test all the dirty vehicles, and would save the public a great deal of time, frustration and an estimated $12 million per year in Illinois.

Remote sensing used on-road, with the dirtiest 10% sent on to centralized I/M would also save an estimated $12 million per year in Illinois, but would achieve a higher level of pollution control. Hydrocarbon reduction potential is estimated at 186 to 386 tons/day, with costs estimated between $100 and $248 per reduced ton. A feasibility study for such a program is recommended.

I. Introduction - History of Remote Sensing Technology

A. How it works

1. The FEAT system

a. Hardware and software

With initial support from the Colorado Office of Energy Conservation, the University of Denver (DU) has developed an infra-red remote monitoring system for automobile carbon monoxide (CO) exhaust emissions. In view of the fact that significant fuel economy results if rich-burning (high CO) vehicles are tuned to a more stoichiometric (and more efficient) Air/Fuel (A/F) ratio, the University of Denver CO remote sensor has been given the acronym Fuel Efficiency Automobile Test (FEAT). The basic instrument measures the carbon monoxide to carbon dioxide (CO/CO_2) ratio in the exhaust of any vehicle passing through an infrared light beam which is transmitted across a single lane of roadway. Figure 1 shows a schematic diagram of the instrument.

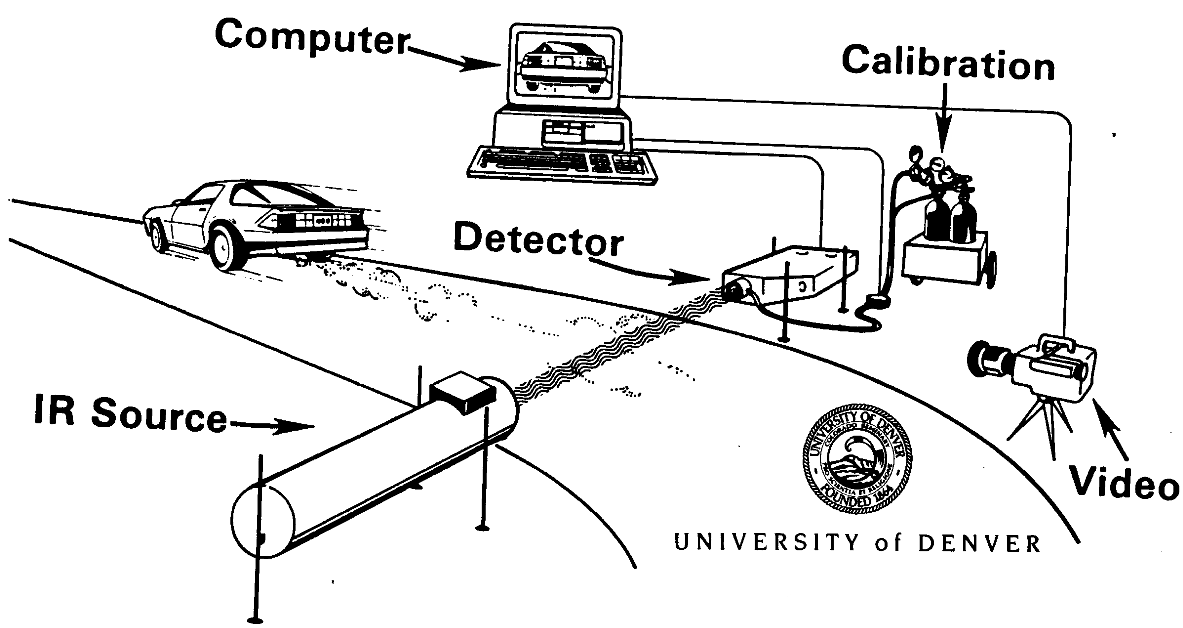

Figure 1: Schematic diagram of the University of Denver CO remote sensor.

The infra-red (IR) source sends a beam of radiation 10 inches above the road. This beam is picked up by the detector and split into three wavelength channels, CO, CO_2, and reference. Data from all three channels are fed to a computer for analysis. The calibration gases are used as a daily quality assurance (Q/A) check on the system.

The instrument determines the CO/CO_2 ratio (Q). Q itself is a useful parameter with which to describe the combustion system. Most vehicles show a Q of zero. To observe Q > 0, the engine must have a fuel rich air/fuel ratio, and the emission control system must not be fully operational. With the aid of a fundamental knowledge of combustion chemistry, many parameters of the vehicle/emissions system can be determined including the instantaneous air/fuel ratio, grams of CO emitted per gallon of gasoline (gm CO/gallon) emissions and the %CO which would be read by a tailpipe probe.

The mechanism by which the University of Denver CO remote sensing system measures Q is reprinted in Appendix A from a published article in Analytical Chemistry (1), a peer-reviewed journal of the American Chemical Society. The reprint describes how Q can be determined by remote sensing, independent of wind, temperature, and turbulence in 0.7 seconds per passing car. Two other peer-reviewed publications regarding remote sensing are in the scientific literature (2,3).

The detector is on line all the time once it is turned on. The exhaust gas analysis routines are triggered by the beam being blocked (for instance by a vehicle or pedestrian). If the beam is blocked and less than a preset minimum CO (0.04 cm at one atmosphere (atm)) or CO_2 (0.01 atm cm) increase is observed, then the computer gives a 990 XCL (eXceeds Confidence Limits) error code. This code is generated by the wheels of large trucks or tractor trailers, pedestrians, etc. If CO_2 and/or CO are observed, the computer plots deltaCO versus deltaCO_2 where delta indicates the increase in CO or CO_2 above that measured in the air just in front of the vehicle. The least squares slope of the line is Q. The computer also calculates the standard deviation of the slope σQ. For most vehicles, Q is close to zero and an XCL code of 991 arises if σQ is larger than 0.02 For vehicles where Q is > 0.1, the same error code arises if $\sigma Q > 0.2*Q$.

In total FEAT has measured over 250,000 vehicle emissions. In a study (2) of 20,200 beam blocks at a freeway on-ramp, exhaust gas measurements were reported for 18,510 vehicles; a 990 code for 655 vehicles and a 991 code for 1035 vehicles.

As discussed in Appendix A, the remote sensing measurement of Q is independent of instrument temperature. Wind and turbulence serve to dilute the exhaust behind the vehicle. This dilute exhaust is the material detected by the remote sensor and its further dilution is a necessary part of the measurement. As discussed above, the computer program is written so that only "valid data" is accepted. If wind, turbulence, or other factors such as exhaust from another vehicle were to perturb or eliminate the CO/CO_2 slope, then an XCL code is generated.

Recent testing at the University of Denver has involved a stationary pre-catalyst vehicle idling with various A/F ratios.

The remote sensor used a rotating ventilated exhaust beam chamber to measure the exhaust and to generate appropriate span and zero voltages using the exact program also used to measure vehicles on the road. Out of 486 measurements at one A/F ratio, six did not observe an adequate plume (990 code), the other 480 all fell within a total range of Q of 0.13 to 0.15. This demonstrates that the claimed precision of $\pm$ 20% is very conservative. The actual observed relative standard deviation of the data was <7%. This estimate of precision includes any drift in emissions from the parked vehicle.

b. Calibration

As described in Appendix A, after setup at a given location, the instrument is calibrated (zeroed and spanned) from the computer using three span gases in certified cylinders of known values of Q. A slope is derived from the observed straight line calibration readings. Readings from passing vehicles are directly compared to the span gas readings through this calibration curve.

The manufacturers of the calibration cylinders (CO and CO_2 in Nitrogen from Matheson Gas, Inc.) claim a traceable accuracy of $\pm$2% by a gravimetric cylinder filling procedure. All the data are compared to spans from these cylinders. The spans are obtained in the same day and using the same hardware and software as the on-road measurements.

c. The Chemistry of Motor Vehicle Exhaust

In this report, all ratios are in molar units. This simplifies the chemistry calculations, because molar units are the natural units in which to study chemical reactions such as combustion. The CO/CO_2 ratio by moles is abbreviated as Q.

Figure 2 shows a schematic diagram of an automobile. From the point of view of a remote sensor, an automobile is a device in which fuel containing carbon and hydrogen (formula CH_n) is burned with air (whose approximate formula for this purpose is given as ($0.21O_2$ + $0.79N_2$) in a combustion chamber to derive power. The products are sometimes further burned on a catalyst or in the exhaust system. However, all combustion processes (power or catalytic) are governed by the same combustion equation:

$$CH_n + m(0.21O_2 + 0.79N_2) \rightarrow \frac{n}{2}(H_2O) + aCO + bCO_2 + 0.79mN_2 \quad \textbf{(1)}$$

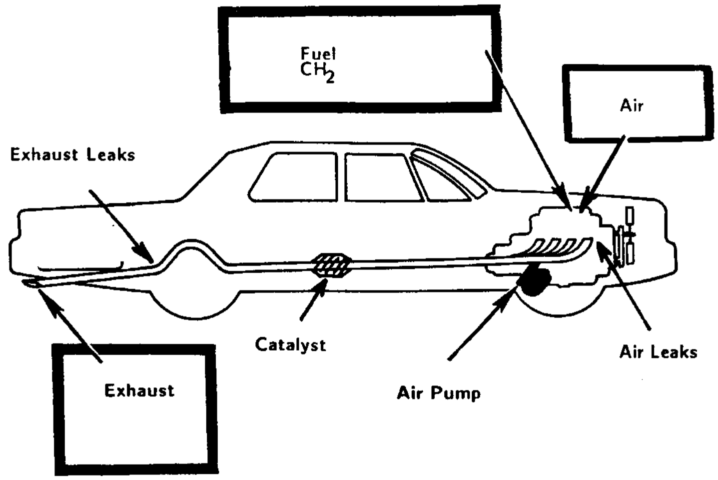

Figure 2: From the point of view of a remote sensor, the only source of excess CO or CO_2 in the exhaust is combustion of the carbon in the fuel, either in the engine or on the catalyst.

Figure 3 illustrates the chemistry arising from equation (1), and shows that a vehicle burning with too little air (rich combustion) makes up for the lack of air by not burning all the carbon in the fuel to CO_2. Some remains as CO. Any hydrogen in the fuel is burned to water. The remaining oxygen is partitioned between CO and CO_2 according to this graph. Molar A/F ratios less than 4.5 are so rich that there is not enough oxygen even to burn the fuel to CO and H_2O. Combustion is so poor under these circumstances that no vehicles operate in so rich a mode.

If the overall combustion process is complete, then all the fuel is burned to CO_2 and H_2O, $a = 0$, $a/b = 0$, $Q = 0$. If the overall combustion process is not complete, (ie the engine is getting more fuel than the air can fully combust and is in a rich burning mode), then some of the carbon will appear as CO. $a>0$, $Q>0$. The remote sensor measures the increase in CO and CO_2 behind the vehicle compared to in front of the same vehicle. Since the fuel is the only source of extra carbon either for CO_2 or CO, then a measure of Q amounts to a measure of any inefficiency with which the overall combustion system of that car converted the fuel carbon into CO_2. In a real system there are both unburnt hydrocarbons, and oxides of nitrogen. Both are at small enough levels that they do not effect the equations for the major species CO and CO_2. There is a proposal under consideration by the United States Environmental Protection Agency (USEPA) to develop techniques to measure remotely both hydrocarbons (HC) and nitrogen oxides (NOx) since they also are important air pollutants along with CO. The American Petroleum Institute (API) has initiated a program to develop an HC channel in combination with the current CO monitor.

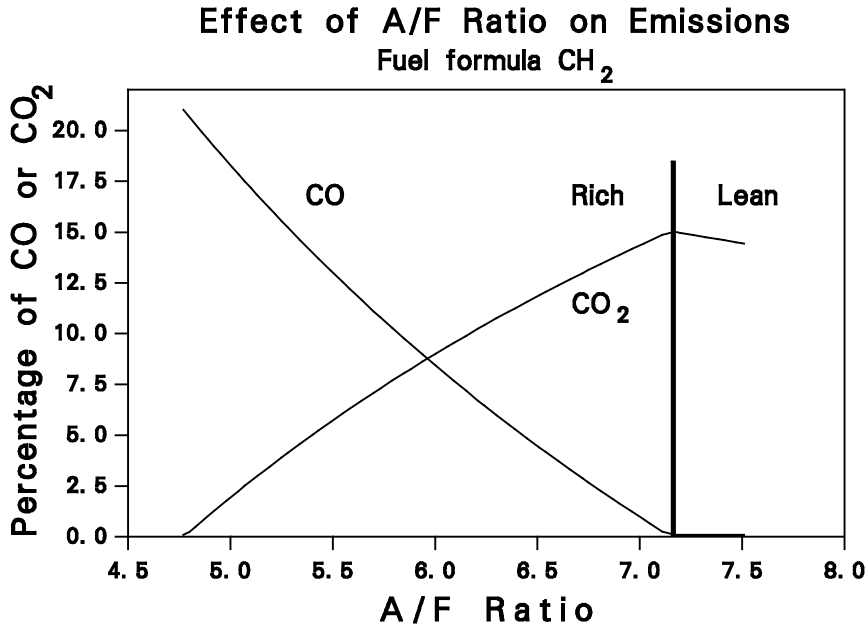

Figure 3: A gasoline engine combustion map showing CO and CO_2 emissions as a function of molar air to fuel ratio. The solid vertical line represents stoichiometry.

Table I shows that large values of Q can only be measured in the exhaust of a vehicle which has both a rich-burning engine and an incompletely effective emissions system.

Table I Relation of Engine status to CO/CO_2 ratio

TABLE I		
Engine Status	**Emission System**	**Q**
Lean	Operational	0
Lean	Not Operational	0
Rich	Operational	0
Rich	Not Operational	>0 as high as 4 in extreme cases

The CO/CO_2 ratio (Q) in vehicle exhaust emissions depends on the status of both the engine and the emissions system. Table I demonstrates that even without all the succeeding arithmetical derivations, a remote sensor which can quickly and accurately measure Q can be useful to determine the engine/emissions system status of a passing vehicle.

It is important that the fuel chemistry introduces no error into the remote determination of Q. Values of Q can be used directly when remote sensing is used in a gross emitter detection mode.

d. Determination of Effective Air/Fuel Ratio

Appendix B details the arithmetic by which the effective instantaneous A/F ratio of the overall combustion (engine plus emissions system) can be determined from a remote sensing measurement of Q. Gasoline is a mixture of many species including saturated hydrocarbons (for instance, hexane, C_6H_{14} with more than two hydrogens per carbon) and aromatic hydrocarbons (for instance, toluene (C_7H_8 with less than two hydrogens per carbon). The average comes out quite close to a ratio of two hydrogens per carbon (CH_2). Other calculations have used $CH_{1.85}$ as a representative fuel.

Using CH_2 as the formula for "gasoline", the resulting equation has the simple form:

$$Molar\ \frac{Air}{Fuel} = \frac{(3 + 2Q)}{0.42 * (1 + Q)}$$

For more than 70 percent of vehicles, $Q<0.1$. Appendix B shows that the A/F ratio is approximately proportional to $2 + n/2$ where n is the number of hydrogens in the fuel. Thus for n values close to two (namely all normal gasolines), any uncertainty in the value assigned to n is halved when the A/F calculation is carried out. Thus, if the fuel is really $CH_{1.85}$, the error in instantaneous molar A/F calculated from FEAT data would be less than 4%.

Air to fuel ratio and fuel efficiency are directly related because the vehicle is getting the most energy out of its fuel only if just enough air is present to burn the fuel fully to CO_2 and H_2O. An approximate solution to the energy balance from the combustion equation (1) above indicates that the combustion efficiency is decreased by approximately twice the observed %CO. Thus a gross polluting vehicle measured at a Q = 1 will have a molar A/F of a little under 6, and a %CO of 8.6. If this vehicle were tuned to have the necessary extra air, that is to the stoichiometry point, the combustion efficiency would improve by approximately 16%.

e. Determination of CO emissions in gmCO/gallon of fuel used

To derive from remotely sensed Q, the vehicle emissions in gm/gallon of fuel burned, the combustion equations are solved as before. However, a small correction arising from tailpipe hydrocarbon emissions is required. An approximate equation totally neglecting hydrocarbon emissions is:

$$\frac{gmCO}{gallon} = 5600 * \frac{Q}{(1 + Q)}$$

With a hydrocarbon correction factor based on FTP correlation between tailpipe CO and HC, one obtains:

$$\frac{gmCO}{gallon} = 5650 * \frac{Q}{(1 + 1.08 * Q)}$$

For normal values of Q, the differences between the two equations are small. When funding is available we plan to build an HC channel into the FEAT unit. A proposal to build such a unit has been funded by the API. When the HC channel is operational it will determine Q' = CO/HC. With this number, a complete solution of the gm CO/gallon equation is possible. It takes the form:

$$\frac{gmCO}{gallon} = 5650 * \frac{Q}{(1 + Q + \frac{Q}{Q'})}$$

These equations are not new to FEAT and are all derivable directly from the published US EPA gas mileage equations. Appendix B shows the calculations and shows that the error arising, even from total neglect of HC, is <<6 percent for most vehicles. For details see Appendix B.

f. Determination of the exhaust %CO

The exhaust %CO which would be obtained by a tailpipe probe, when corrected for excess air and after removal of water, is the result reported most frequently in the FEAT literature. The air correction could be termed a dilution correction, or an oxygen correction. It is the correction required to any tailpipe probe measurement to account for the fact that both CO and CO_2 readings are lowered by dilution if any unburned air is present. Q or gm/gallon are equally valid measures of the instantaneous vehicle emissions. FEAT literature reports %CO because many vehicle owners and mechanical engineers are familiar with the %CO readings used as the emissions measurement basis for most Inspection and Maintenance (I/M) programs.

The derivation of dry, air-corrected, mole %CO readings from the measurement of Q follows the same procedures discussed above and is detailed in Appendix B.

The final equation used is:

$$\%CO = 42 * \frac{Q}{(2.79 + 2 * Q)}$$

The equations and derivations in Appendix B are independent of the nature of the vehicle and of its emissions system. The equations are slightly dependent on the chemical nature of the fuel. For 80% of vehicles, if the C:H ratio is off by 8%, the %CO is off by 4%. For the few dirtiest vehicles, the percent errors become equal at 8% each.

Appendix B shows that the results from the equations which calculate %CO from measured Q are not going to vary by more than 0.5% CO for realistic fuel chemistry or exhaust system chemical equilibria.

Q is a very non-linear term and as such at increasing Q the error domains associated with Q increase very dramatically. This is not to imply that Q is a term which cannot be measured accurately or precisely, but that any term which converges to infinity will have an error space which also approaches infinity. Figure 4 graphically displays a typical error space for Q. A l:l line is shown along with upper and lower error regions delineated by the respective lines.

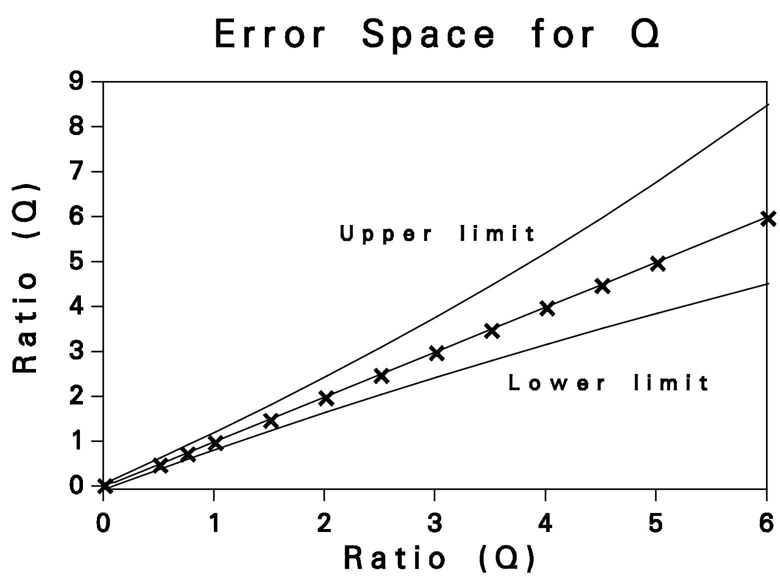

Figure 4: The error space for measurements of Q. The upper and lower limits are superimposed ± 1%CO errors plotted in terms of Q.

The error bounds have been generated by considering how Q maps onto %CO. The Q's from the 1:1 line have been converted into %CO and a ± 1% CO error introduced. The values are then converted back into Q and plotted as the upper and lower error lines. The lines show the accuracy required for the determination of Q if an accuracy of ± 1%CO is required.

2. Technology characteristics

The final section discusses the characteristics of the various current, and potential future remote sensing technologies to fleet emissions monitoring and gross emitter detection.

a. The Federal Test Procedure

The Federal Test Procedure (FTP) was designed in the early 1970's as a method whereby new vehicle emissions could be judged for compliance with the Clean Air Act Legislation. The vehicle is treated in a very specified way for specified periods of time on specified fuels and run on a dynamometer with specified loads (dependent on the vehicle) over a tightly controlled speed/time course. The emissions are collected in a Constant Volume Sampler (CVS) and divided into three bags (cold transient, cold stabilized, and hot transient). From the measured concentrations in the three bags and the mileage driven in each testing mode, the vehicle FTP emissions in gm/mile is calculated. For CO, reported data show a precision on repeat testing of the same vehicle of ±20%. This imprecision is stated to be the result of the nature of vehicles, not any reflection of the quality of the test.

It is important to note that the FTP test is the legal standard by which the vehicle and its compliance with Federal emissions laws is judged. The extent to which mobile source emissions have been reduced by these standards is strong evidence of the efficacy of the FTP in the role for which it was designed, namely new vehicle performance specification.

b. Speed dependence of gm/mile units

A major advantage of %CO or of gmCO/gallon readings over the conventional gm/mile units is that they depend only on the engine and emission system operating characteristics. Gram per mile emissions also depend on the vehicle transmission setting and speed. In fact, gm/mile has an infinite singularity at zero speed. The large variability of gm/mile emissions with speed may have given real-time emissions monitoring a bad name. In studies of individual vehicles on the road and on a dynamometer, the %CO varies little with speed and load above a load of about 10 hp. A similar conclusion can be drawn from the fact that measured fleet average emissions vary by only about a factor of two between a lightly loaded 25 mph average in Denver at 5,000 ft., and 45 mph up a 6% grade at 7,900 ft., west of Colorado Springs. The steep dependence of gm/mile emissions on vehicle speed is illustrated in data from a recent report by Zweidinger et al of the Environmental Protection Agency (4).

The State of California uses an approach to emissions modelling which avoids the infinite singularity in gm/mile units at zero speed. According to Seitz (5), FTP emissions are used, but all the data are transferred into gm/minute values.

c. Correlation of %CO to FTP gm/mile

If gm/mile estimates are desired as an input to an already existing regional model, they may be obtainable from a remote sensing study. This possibility arises from the results of a recent report by Austin et al (6). This report, a summary of which was published under the authorship of Austin and Sherwood in SAE, 891120, discusses the correlation between concentration emissions, (such as would be measured by a remote sensor), instantaneous mass emissions (gm/sec) and FTP gm/mile.

The report points out that concentration emissions might be expected to be better correlated to FTP than instantaneous mass emissions under some circumstances. The report also gives the equations whereby mass and instantaneous concentration emissions may be directly converted, using vehicle weight and engine displacement with a very high degree of correlation. In agreement with their theory, of the seven steady state measurement modes with correlation coefficients for CO greater than 0.7, for five modes the CO concentration was better correlated than instantaneous mass emissions to FTP, and for the other two modes, mass emissions correlated at 0.88 and 0.75 while concentration correlated at 0.86 and 0.75 respectively

d. Regional Fleet Emissions Modelling

According to a recent paper by Whitby et al (7):

> "Because the FTP has been a cornerstone in the FMVCP [Federal Motor Vehicle Control Program] for nearly two decades, the failure of many urban areas to achieve NAAQS [National Ambient Air Quality Standards] during that time has generated suggestions to replace or revise the FTP. Specifically, criticisms of the FTP suggest that fuel specifications, temperature, speed, acceleration, and load ranges used in FTP testing inadequately represent on-road driving conditions on urban and suburban roads and highways (8). It may be unrealistic to expect the FTP to meet the needs of vehicle certification and also fully simulate many on-road driving patterns."

States which have CO problems are required to model the CO emissions in the non-compliance region using some type of regional model. The regional models used require a grid to be placed over the region. The number of vehicle miles travelled (VMT) in each grid square is estimated. The USEPA MOBILE(N) model estimates the gm/mile for the estimated fleet in that grid square. These two values are multiplied and the gm/day for each square is obtained. The MOBILE(N) model is based on FTP gm/mile data, but applies corrections to enable the data to resemble more realistically the fleet on the road. Figure 5 shows the process in cartoon form.

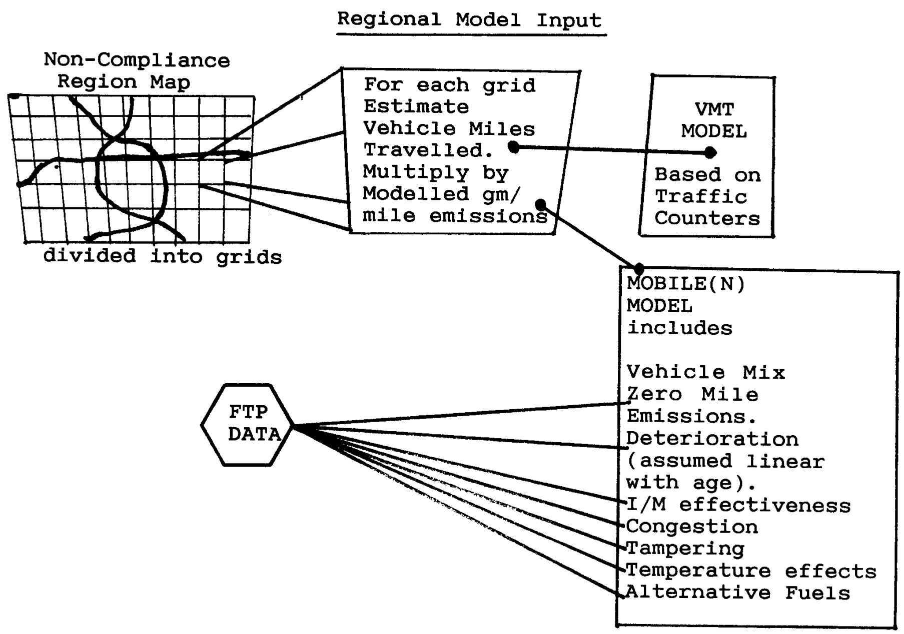

Figure 5: An illustration of the method by which gm/mile FTP emissions (which contribute to most of the MOBILE Model inputs) are used to obtain inputs to regional models.

Figure 5 shows that a large number of correction factors are used to get from FTP data to on-road emissions. The California approach is somewhat different from the above, because rather than determining the number of vehicle miles travelled in a given grid square, the model is based on the time spent in the square, and the gm/minute emissions.

e. The use of gm/gallon to obtain regional emissions

The remote sensor measures gm/gallon for a large number of vehicles. If this measurement is carried out at several locations in a non-compliance region, then the average gm/gallon can be multiplied by gallons sold (available from the State Revenue

Department without the use of VMT modelling). HC and NOx regional emissions can similarly be derived from the remote sensing observations when remote sensors for these species are available. This capability is important in a fleet emissions monitoring project, since fuel tax and, hence, fuel sales statistics are always available for any area. This allows remote sensing to contribute to a regional mobile source inventory without the need to carry out extensive (and often inaccurate) Vehicle Mile Travelled surveys.

If gridded data are required, the gridded fuel use data would be required analogous to the gridded time or VMT of the alternative methods.

It has been suggested that remote sensing cannot possibly be useful in view of the variability of on-road vehicle emissions. The questioners point out that instantaneous CO emissions vary enormously. The variation depends on the speed of the vehicle, the acceleration rate, the vehicle loading (including the number of passengers), the road grade, the condition of the engine, and the temperature of the engine. All of these variables must be known before a comparison on the effectiveness of any program can be determined. In fact this variability is the reason why remote sensing is bound to be superior to computer modelling.

Most of the potential sources of variability discussed above are intentionally eliminated in the FTP. To retrieve realistic fleet emissions, these sources of variability are parameterized in the Mobile models. It is apparent that actual on-road measurements of a statistically significant number of vehicles can investigate these variables at representative locations. Such a procedure would appear to be more likely to yield correct results than any attempt to parameterize the variability based on relatively few FTP studies.

f. Error bars in remote sensing fleet emissions

With the FEAT remote sensor, passing automobiles are directly compared by remote sensing to a set of certified and calibrated cylinders containing known amounts of CO and CO_2. Typical passing vehicles have %CO emissions varying from less than 1% to a high of 15%. At most locations, 75% of the vehicles are measured at or below 1%CO. Published evidence shows that the absolute error bars are less than $\pm$ 1%CO, but in view of the highly skewed distribution and the small number of gross polluters, it is not necessary to claim error bars less than $\pm$ 1%CO on an individual reading (gross emitter detection mode). For fleet studies (fleet emissions monitoring mode), the fact that large fleets can be observed each day (excess of 2000 vehicles) dramatically decreases the standard error of the mean. When daily means made up of 4,000 vehicles per day are averaged over five days (20,000 vehicles), typical mean and standard deviation values are 1.09 and ± 0.03 exhaust %CO.

g. Video camera

With the addition of a video camera and some copyrighted software, it is possible not only to measure the emissions of the passing vehicles, but also to record the image of each vehicle as it emerges from the FEAT beam position (see Figure 1.) The computer freezes the image of the vehicle as it exits the beam region. After the exhaust emissions calculation is completed, the computer writes the date, time, vehicle number, CO and CO_2 emissions on the video screen together with the vehicle image. The video information is recorded on a S-VHS videotape.

With this much information on the tapes, it is possible to read the tapes and enter any license plate information which is visible into the computerized database of emissions values. This procedure is however currently carried out manually and is very time consuming. It takes a careful investigator approximately a week to read the data from the videotape for an eight hour day. Once this reading and hand entry has been carried out, the license plate data are written onto a computer tape and submitted to the relevant State Motor Vehicle Licensing Department for determination of the make and model year of all the passing vehicles which are equipped with readable, in-state plates. From this information statistics can be determined relative to the make, model year, etc. distribution both of the whole fleet, and of the gross polluters.

There are two potential solutions to the problem of slow manual reading of videotapes. The first is to record the video images digitally, then purchase or develop software to locate and read the plates automatically. The second is to purchase a commercially available (Perceptics Corp. Knoxville Tenn.) device which reads the image of the vehicle in real time, carries out the required pattern recognition, and returns the license plate data in real time to an computer. The latter instrument is for sale at approximately $30,000. The former solution requires some very fast large scale digital video image storage capability, as well as software. Computer advances are such that this capability is probably now close to available, but the price may not be significantly less than outright purchase of the Perceptics unit.

3. Verification against FTP, dynamometer testing, and on-road tests

A comparison of FEAT measurements to those from a vehicle of instantaneously known (and operator controlled) emissions has been carried out in a true on-road comparison. Such a vehicle was available in January of 1989 when Dr. S. Cadle of General Motors conducted a blind, drive-through intercomparison (9). The GM vehicle was driving in the midst of normal traffic at the off-ramp from I-25 to Eastbound Speer Blvd. in Denver. The 42 data points which formed the comparison database were reported from the FEAT readings to GM without any knowledge of the vehicle status at the time of the measurement. The correlation study showed a slope of

1 and a correlation coefficient (R^2) of 0.95. A similar, successful, blind intercomparison has just been carried out in quite polluted air in Los Angeles by Dr. Douglas Lawson of the California Air Resources Board.

Dr. George Lauer of Atlantic Richfield Co commissioned a comparison between FEAT readings at low speed in a level parking lot and FTP readings conducted at the same site (National Institute for Petroleum Engineering Research in Oklahoma) on generally older, pre-control vehicles. Data were obtained by NIPER personnel after training by University of Denver staff, and reported to ARCO without any intervention by The University of Denver. Although the data are not yet fully analyzed, the correlation is said to be "good" between the FEAT %CO readings and the FTP results.

A draft report to EPA (Marc Pitchford EPA, EMSL, Las Vegas, Nevada, has recently been submitted in which it was demonstrated in a blind test that the FEAT unit could determine the emissions from a vehicle on a dynamometer with a precision of +/- 0.2%CO for a clean car and +/- 0.3%CO for a 10%CO (very dirty) car. The absolute accuracy of the FEAT readings depends on the calibration cylinders. The cylinders used are certified to +/- 2% accuracy. We have reason to believe that ±5% would be a more realistic assessment, and that on-road measurements may show more noise than the dynamometer studies.

B. Previous Findings from on-road studies

1. Denver

There is a published paper on a single site study of the 1988 Colorado oxygenated fuels program (2). In this study, half the CO was emitted by under 10% of the vehicles and the predicted beneficial effect of oxygenated fuels on CO emissions was detected, but was a factor of two smaller than EPA Mobile3 predictions. The following year another oxygenated fuels study was carried out at two locations in the Denver area with better agreement between the measured and predicted emissions (10).

2. Colorado Springs

The first application of the video system was to test the effectiveness of the Colorado Inspection and Maintenance program. It was conducted on an upgrade at 7,900 feet, about 15 miles west of the City of Colorado Springs in El Paso County (11). The site was inside the I/M program area, but was also subjected to a large fleet of vehicles from adjoining Teller County, outside the I/M program area. At that site, the apparent effect of the I/M program was one tenth of that claimed in the Mobile3 computer model. Again, half the CO was emitted by about 10% of the vehicles. For both of the 1989 studies the average emissions by vehicle model year could be obtained. These are shown in Figure 6.

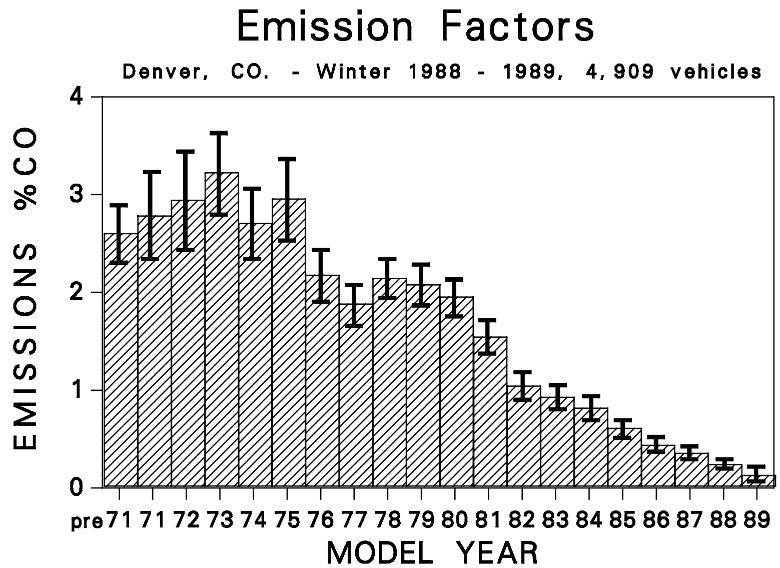

Figure 6a: Average %CO emissions by model year from University Blvd. and Speer Blvd. in Denver, CO. Error bars are ±1 standard error of the mean.

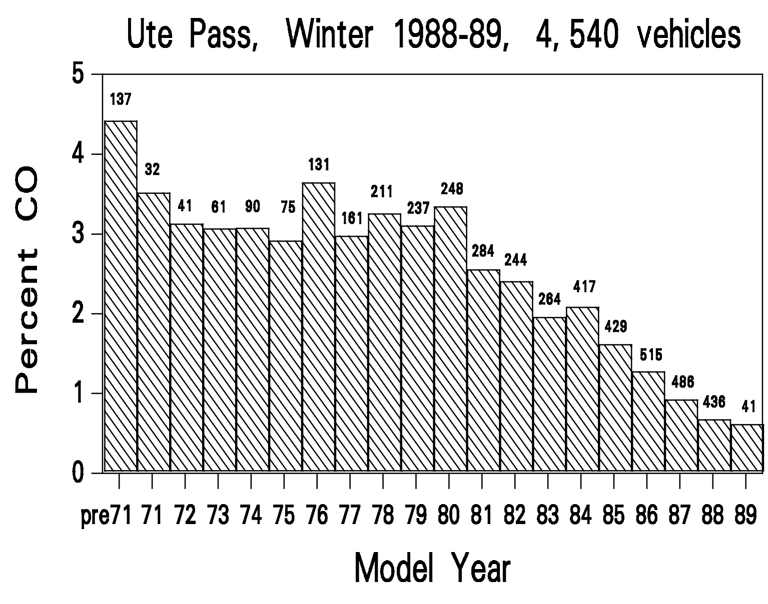

Figure 6b: Data from Ute Pass (U.S. 20, west of Colorado Springs, CO.). The number of vehicles included in each average are located above the bar.

3. Consistency

a. Non-random

There is no possibility that our data are chance occurrences from a random measurement system. there are several lines of evidence which validate this contention.

1) Calibration cylinders are measured routinely, as if they were automobiles, with the same hardware and software.

2) Two on-road blind intercomparisons have now been conducted, comparing, successfully, to a vehicle of known emissions in flowing traffic.

3) Studies supported by EPA have shown that blind comparisons with vehicles on a dynamometer show excellent agreement.

4) The observed data could not be obtained if the system were behaving randomly. The comparisons in Figure 6 show a steady increase in average emissions for vehicles of older model years. The FEAT software is quite independent of the license plate and video data. Such consistency could not be observed unless both the FEAT is operating correctly and older vehicles are, on average, dirtier for CO.

b. Real on-road emissions measurements

As discussed earlier, the FEAT system takes a snapshot of the CO emissions of a passing vehicle. In every location where we have measured (including California) half the CO emissions come from less than 18% of the vehicles, often less than 10%. This indicates that there are a few gross polluters on the road and that cost-effective CO control measures could be targeted at this small population of vehicles. As will be discussed in Section IV, the same conclusions are also appropriate for hydrocarbon emissions.

Since vehicles are measured under on-road conditions, the remote sensing measurements are an indication of the performance of the vehicle at that instant. As will be discussed, most vehicles are consistently clean, a few consistently dirty, and a few quite variable.

Automobile manufacturers have spent almost two decades manufacturing vehicles which pass the FTP test. The FTP test does not contain any hard accelerations at high speed. The manufacturers have taken this into account according to Austin, et.al. of Sierra Research (6):

> "Almost all late-model vehicles use mixture enrichment to increase engine power as the engine approaches wide-open-throttle conditions. This can cause a vehicle that emits less than 3.4 g/mi CO on the FTP to temporarily emit over 300 g/mi CO."

One can regard this fact either as the manufacturers "cheating" on the test, or as the manufacturers providing the extra power and acceleration necessary for the safety and well being of their customers.

II. Chicago Findings

A. Site

1. Description

Remote Sensing of the (CO) emissions from passing vehicles was carried out from August 7, 1989 to August 11, 1989 at the straight, uphill, eastbound on-ramp from Central Ave. to the East bound Eisenhower Expressway (I-290) in Chicago, Illinois. Figure 7 shows the location on an area map. Figure 8 illustrates the site. The east bound on-ramp was chosen to sample morning commuters headed into the city. This ramp was a straight uphill (4 - 5% grade), traffic light controlled on-ramp. The University of Denver’s instrumentation was set up approximately 50 yds beyond the traffic control light and measurements were made on five consecutive days, August 7, 1989 - August 11, 1989 between 6:00 a.m. and 1:00 p.m.

2. Data

The measurements were made using a control program with a half second of data collected for analysis. The instrument was calibrated before and after the measurements with three gas cylinders containing certified CO/CO_2 mixtures, 1:12.1 (0.0826), 1:1 and 4.96:1. The values measured for Q at the site with the respective standard deviations were, 0.097 ± 0.01, 1.09 ± 0.15 and 5.3 ± 1.02. From Figure 4 it is apparent that large variance of Q at large Q corresponds to small variance in the derived %CO. A Q of 5.3 ± 1.02 translates to a %CO of 16.6 (+0.6, -0.9). The measured values do fall on a straight line with the slope of that line being 1.07 ± 0.003. All of the collected data has been corrected according to this calibration curve.

Two of the days (8/10 & 8/11) a portable radar gun was used to determine average vehicle speeds for different times of the day. For the 10th speeds were checked for 26 vehicles each at 6:30, 10:30 and 11:30 with the averages being 23 ± 3.7, 26.7 ± 6.9 and 34.3 ± 4.5 mph respectively. On the 11th, 26 vehicles each were measured at 6:30 and 10:30. The averages were 21.8 ± 3.5 and 28.2 ± 5.2 mph. The traffic control light for this ramp operated approximately between the hours of 6:30 and 8:30 each day. This caused the lower speeds.

During the five days there were 16,260 blockages of the light beam followed by at least 0.5 seconds of non-blocked beam. The instrument records that event as a "vehicle count", although pedestrians and both the front and rear tires of large trucks are counted. Of these 16,260 counts, 523 were excluded as exceeding the preset confidence limits on the CO/CO_2 ratio and 735 were excluded because of the lack of sufficient exhaust to obtain a valid CO/CO_2 ratio. Exclusion (XCL) criteria were discussed earlier. This resulted in 14,997 valid exhaust measurements.

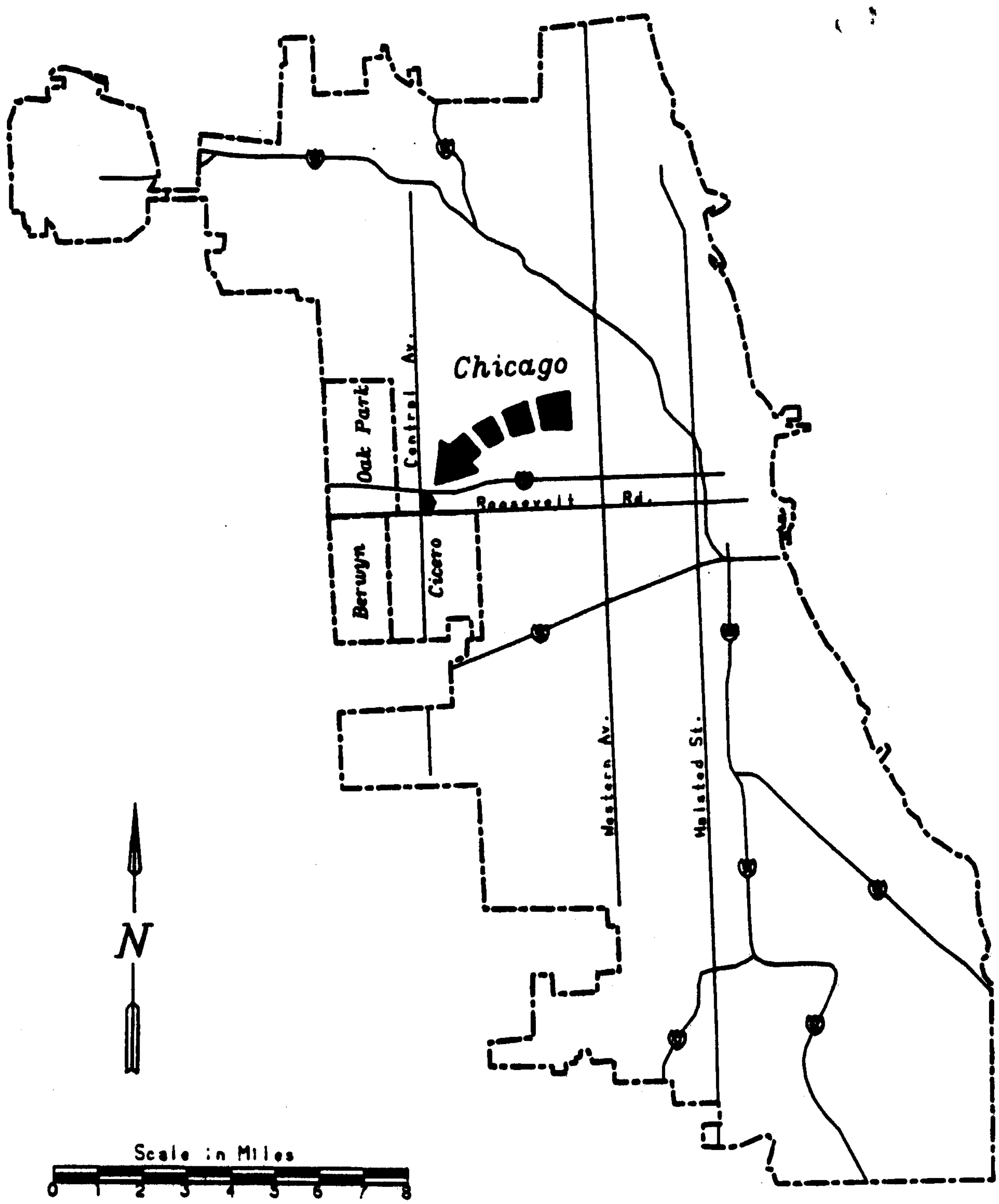

Figure 7 Location of the Remote Sensing Site

Figure 8: Photogragh of the site looking west.

The video tapes were reviewed and a total of 12,215 license plates were submitted to the office of the Illinois Secretary of State for data processing. Included in these 12,215 license plates were 456 license plates for which it was impossible to determine the year of registration. The approach taken was to submit those license plates in two sets, each with a different registration year, i.e. 1989 and 1990. Upon return of the tape the duplicates arising from this process were removed. The reduction from 14,997 to 12,215 arises from unreadable plates, out of state plates and missing or out of the field of view plates. After plate matching with the State of Illinois database, the final total population of readings with both CO emissions and license plates is 11,818.

There are many possible ways to analyze the database. A few are discussed herein and a few more are presented in the appendices. The database in ascii format on IBM-PC formatted diskettes is available from the Illinois Department of Energy and Natural Resources.

B. Day to day and overall findings

1. Data

Table II shows the number of measurements in each %CO category for each of the contiguous weekday periods at the site, the daily means and standard errors and the fraction of measurements responsible for fifty percent of the CO emissions. The overall means are also shown, calculated using a weighted average of the daily means with the weighting factor being the number of measurements. The standard error for the overall mean has been calculated using the variance of the daily means about the overall mean. This method is more conservative than using the standard error of the mean as calculated from the entire distribution. Figure 9 graphically displays the daily and overall means. In previous literature we have used the small fraction of vehicles responsible for half the pollution as an indication of the potential for selective control measures, as well as an operational definition of "gross polluters", as a member of the fraction of vehicles which cause half the emissions. In most cases measured to date this dubious distinction belongs to vehicles with emissions greater than about 4% CO.

2. Comparison to previous findings

Fleet average %CO measurements are not very variable wherever measured. In Colorado we have shown that the major differences between sites were caused by a difference in average vehicle age. The whole range of averages measured by FEAT varies from 0.85%CO at a tight circular ramp in Denver, to 2.1 %CO for a much older fleet, west of Colorado Springs. Preliminary unpublished data on vehicle fleets in California fall in similar ranges.

Table II: Daily results for all vehicles with measured exhaust %CO

Table II						
%CO Category	Central Ave. to Eastbound I-290 8/7	8/8	8/9	8/10	8/11	Overall
<1	1663	1703	1964	1530	1708	8568
1	221	218	226	200	223	1088
2	126	128	127	81	130	592
3	67	88	93	66	91	405
4	64	74	81	56	74	349
5	45	59	56	43	41	244
6	24	36	48	27	34	169
7	24	25	23	19	29	120
8	17	16	21	13	21	88
9	12	12	17	13	14	68
10	10	12	12	13	15	62
11	10	5	3	4	7	29
12	3	6	4	5	2	20
13	4	2	0	1	1	8
14	4	0	0	0	2	6
≥15	0	1	1	0	0	2
Totals	2294	2385	2676	2071	2392	11,818
Mean %CO	1.16	1.22	1.13	1.11	1.21	1.17
Standard Error	0.05	0.04	0.04	0.05	0.04	0.05
Mean gm/gal	418	439	409	402	434	420
Percent of Vehicles Responsible for 50% of CO Emissions	7.8	8.8	8.2	7.8	8.6	8.2

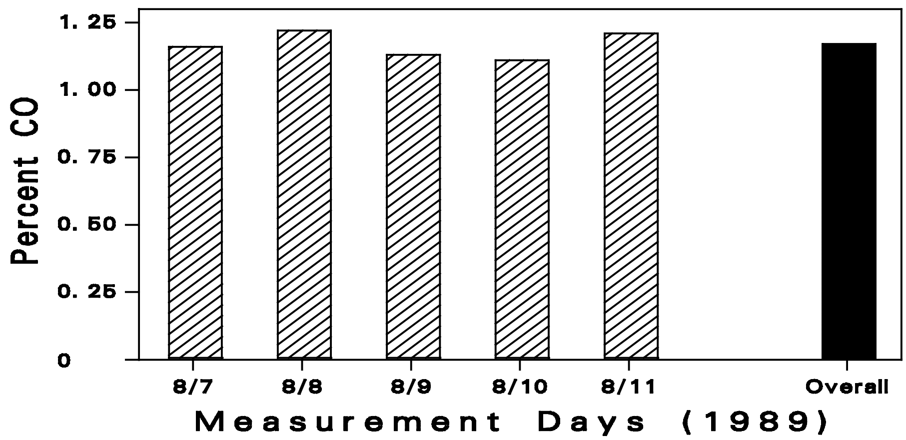

Figure 9: The daily percent CO Means for the vehicle measurements. The overall mean calculated as a weighted average of all of the daily means is given at the right. Data based on a total of 11,818 measurements.

C. Model year and fleet analysis

1. Data

A freeze-frame video system was used to collect the license plate numbers and subsequently registration information of the vehicles being measured. Figure 10 gives the distribution by model year obtained from the registration information. The mean model year and standard error of the mean are 1983.5 +/- 0.04. Figure 11 gives the average emissions as a function of model year.

Table III summarizes the breakdown by age of the gross polluting vehicles, those which are responsible for 50% of the carbon monoxide emissions. The cut point was at 4.48% CO and consisted of 8.23% (973) of the vehicle measurements.

A conservative method to estimate the errors on the given numbers is to treat each day as an independent sample and calculate the standard deviation (n-1) of the summary numbers from each day. The $\pm$ values were obtained in that way from the daily data given in Appendix F. The gross polluter percentage in the 1988 and 1989 age categories is 3%. This contrasts to the 0.3% measured at tight circular on-ramps in Denver. As discussed earlier, some automobiles drive in a full rich mode when accelerating hard at high speeds. This kind of driver behavior is less likely on a tight circular on-ramp than on the uphill straightaway ramp in Chicago.

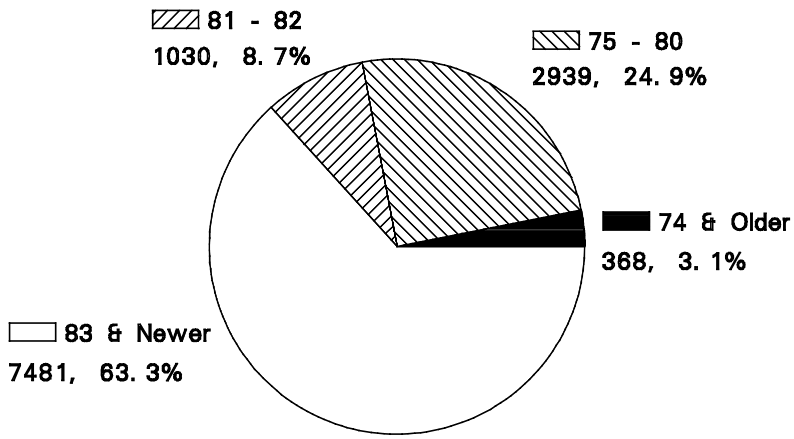

Figure 10: Distribution of vehicles by selected model year groupings. The groupings correspond to approximate timetable for the advent of the various vehicle emissions control technologies.

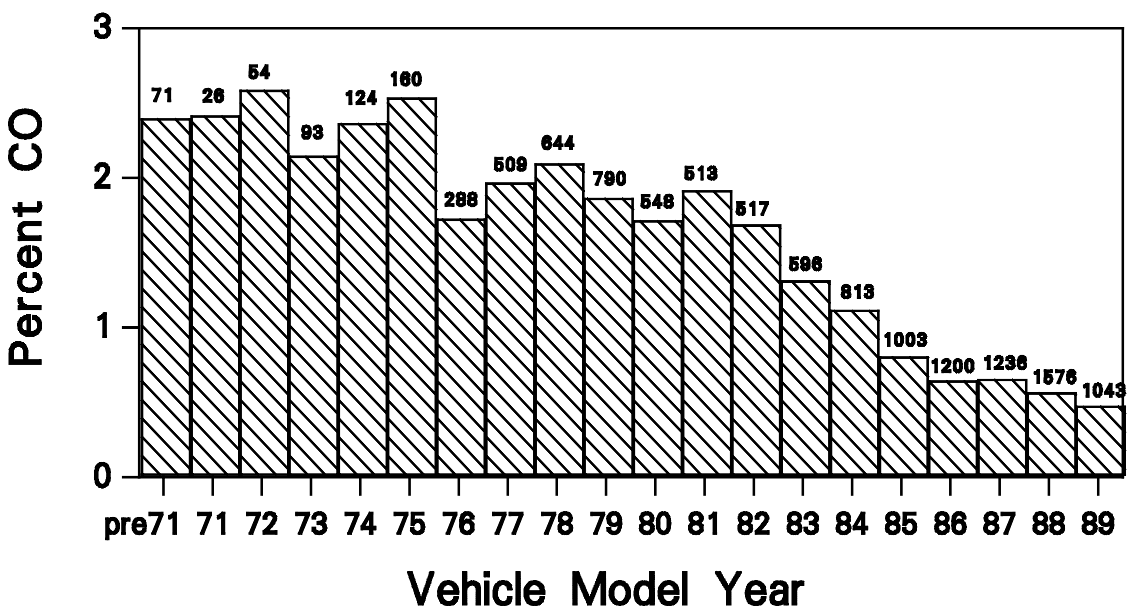

Figure 11: Average emission factors for the Chicago vehicle database. Number of vehicles which make up the average are located above each bar.

Table III Gross Polluters by Age

TABLE III		
Age Group	**Total Number of Vehicles**	**Percent Gross Polluters std error (# of Vehicles)**
83 & Newer	7481	4.49 ± 0.5 (336)
81 - 82	1030	14.17 ± 1.7 (146)
75 - 80	2939	14.26 ± 1.5 (419)
74 & Older	368	19.57 ± 4.0 (72)

Ownership codes from the motor vehicle registration database were used to separate the total fleet of vehicles into three groups by registered ownership. These groups are; private, corporate and government owned. Table IV summarizes the results for these groups.

Table IV Emissions by Age category

TABLE IV			
	Percent of Total (Number of Vehicles)	**Mean Model Year (Std error)**	**Mean Percent CO (Std error)**
Individual	89.72 (10,604)	1983.2 (0.04)	1.20 (0.02)
Corporate	9.68 (1,144)	1986.0 (0.11)	0.86 (0.05)
Government	0.60 (70)	1985.6 (0.32)	1.58 (0.34)

Unreadable and out-of-state plates do not bias the data. Of the 16,260 vehicle counts, 14,997 gave rise to readable %CO values. The mean for this total file was 1.21%, not very different from the 1.17% average for the 11,818 vehicle fleet whose license plates were readable on the Illinois data base. The average emissions of the unread vehicles can be computed from these values, it is 1.31%CO. Based on this analysis, CO emissions data at this site will not be seriously influenced if unreadable and out of state vehicles are not included in the database. From this observation it can also be concluded that the elimination of the unreadable vehicles from potential control measures would not have a significant influence on control program effectiveness.

2. Discussion

The basic finding of the in-use measurements conducted at the Central Ave. and Eisenhower freeway ramp is that a small minority (8.2%) of the vehicles is responsible for fifty percent of the carbon monoxide emissions. This is an identical finding to the previous studies conducted in Denver, CO. Very similar data has been obtained in California, and west of Colorado Springs.

Figure 12 gives the total histogram for the number of measurements in each percent CO category along with their total contribution in percent CO. The distribution is nearly exponential with the exception of the very clean cars, those which measured at less than 1% CO, which account for 72.5% of all of the vehicle measurements. Half of the CO emissions come from those vehicles which were measured at greater than 4.48% CO, which is almost four times the mean (1.17) at this location.

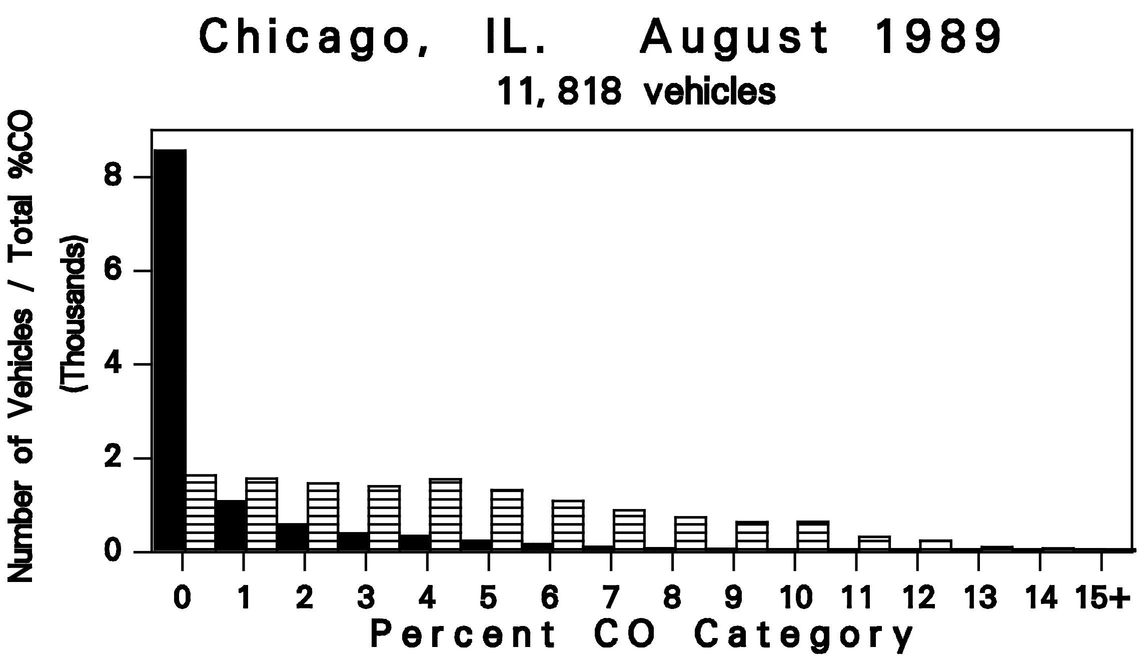

Figure 12: Observed vehicle numbers and their CO contribution. The solid bars represent the number of vehicles in each measured category (i.e. 0% is for 0% to 0.99% CO). The hatched bars represent the total sum of the %CO for each category.

Figure 13 shows the vehicle emissions distributed by percentile rankings. Each bar contains ten percent of the vehicle fleet, with the height of the bar representing the emissions from the respective percentile. The average vehicle emissions fall between the 70th and 80th percentile. This display also shows that the median vehicle (i.e. the 50th percentile, and the vehicle most likely to be observed in a random pullover program) does not emit

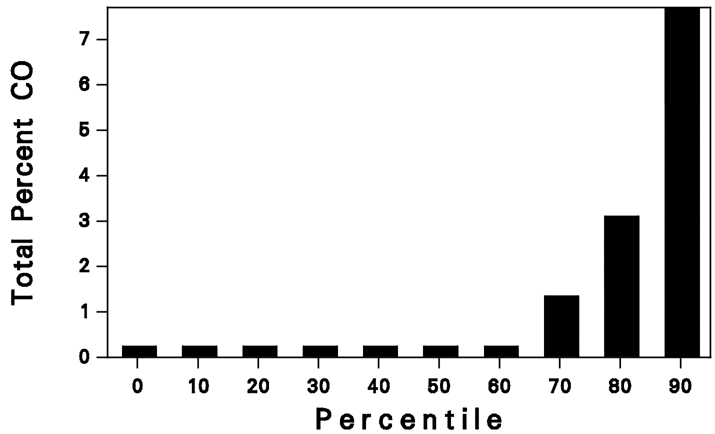

Figure 13: Percentile plot of the Chicago database with each bar representing 1182 vehicles. This plot also represents the emissions which would be observed from a random selection of ten vehicles.

the average CO. The median vehicle is much cleaner than the average because of the dominating influence of the few gross polluters (90th percentile vehicles) on the average emissions. These statistics are essentially identical to those found in the Denver area.

From the average age distribution given in Figure 11 and Table III it can be observed that a fairly modern fleet of vehicles was observed at this location. The average age of the observed vehicles is between four and five years old and very few vehicles are observed older than the 1975 model year. Nearly 97% of this fleet was originally purchased equipped with some form of emission control technology and more than 70% of the fleet (1981 & newer) potentially have the most current, closed loop control systems.

Figure 11 displays the average percent CO emissions as a function of model year. A very interesting observation, which has also been documented in Denver, is that average emissions increase almost linearly over the previous ten model years and then reach a plateau. Table III suggests that the majority of the increase is dominated by an increasing fraction of gross polluters and not by an increase in the emissions of the median vehicle. The majority of pre-control (<1975) vehicles are still low CO emitters. For comparison, Figures 6a and 6b in Section II of this report show the same plot as Figure 11, but for data taken at two locations in Colorado: Speer Blvd. and I-25 off-ramp close to downtown Denver at about 5,200 ft, and a site three miles east of Woodland Park, Colorado at about 8,000 ft where most vehicles were measured climbing a 3% grade.

We believe that the linear increase and the subsequent plateau are both measures of the extent to which the fleet contains vehicles which have not been adequately serviced. New cars are purchased in a well tuned condition, and only a few are not well maintained during the first five years. During the second five years the fraction of badly maintained vehicles increases, but after ten years, the maintenance status seems to be more nearly constant. The hypothesis is that the a fleet of vehicles more than ten years old has an approximately constant level of maintenance, since the less well maintained vehicles over ten years old will not remain long in the fleet.

In the Chicago data set there are many vehicles whose emissions were measured more than once. Appendices 3 and 4 respectively, give the data for the twelve vehicles which appeared four or more times in the gross polluter (>4.48%CO) category, and for all 617 vehicles which were measured more than four times. Most of the repeat vehicles are consistently clean. We computed the standard deviations of the emissions from all 617 vehicles which were measured four or more times. The average standard deviation is 1.2 $\pm$ 1 %CO. A few of the observed vehicles show highly variable CO emissions, and a few (the twelve listed in Appendix C) are consistently in the gross polluting category. The 1.8% of the fleet recorded in Appendix C are responsible for 13% of the CO emissions.

A computer program was written to tabulate the histogram of the differences between subsequent readings of the same vehicle. The program was written in such a way that three measurements of the same vehicle at 1, 5, 0%CO would register two differences, namely a 4 and a 5. The mean of the differences of 4,262 data pairs was 0.93%CO. The distribution of the differences is similar to the distribution of the data, namely a very large number of very small differences, and a few larger ones. Of 4,262 pairs, 3,297 differences were less than 1%. A large majority of vehicles are both clean, and remain so consistently.

Appendix E shows some analysis of the gross polluting vehicles observed on each day of the tests.

Appendix F gives tabulated details for each measurement day of the overall age breakdowns illustrated as Figures 10 and 111.

Appendix G shows all the measured emissions from the 70-vehicle count government fleet. The government fleet is on average more polluting than either of the other two ownership categories. The data serve to illustrate that an entire fleet can be embarrassed by the emissions of only a few vehicles.

Appendix H gives a listing of the fifty cleanest, oldest and dirtiest vehicles monitored on each sampling day. It is interesting to note that the highest emitting vehicle in the Friday list is the second highest on the Thursday. It was only observed twice. The cleanest vehicles are all listed at less than zero %CO emissions. This should not be taken to imply that these vehicles are somehow cleaning the air, rather that their emissions are so close to zero that the normal instrument noise can put them on either side of the zero line. In our analysis of the data it is essential for us to maintain the negative numbers, otherwise the average would be biassed high, since so many vehicles are measured at or close to zero. The tables in Appendix H show clearly that most old cars are quite clean, that not all the dirtiest cars are old, and not all the cleanest cars are new.

D. Unique 7456 vehicles findings

1. Data and comparison

There can be statistical problems when the same vehicle is measured more than once, and the results used to generate global conclusions. For this reason we restricted the overall database to include only the first time a vehicles CO emissions were measured. This reduced the total number of emission measurements to 7,456. The mean %CO and standard error of the mean for this data set is 1.24 ± 0.03. This compares to an overall mean %CO and standard error of the mean of 1.17 ± 0.05. The difference between these two values is within the experimental errors and is not statistically significant.

IV. Air Quality Control Implications

A. General Narrative

When there is the potential for a disease in a population, there are two potential public health response measures, namely universal prophylaxis, or targeted control measures. The current air quality control measures in Chicago are based on the universal prophylaxis theory, whereby every vehicle is required to pass a test once per year. In the West where the annual tests have not proven adequate for the job, there are now several cities where highly oxygenated fuel is required, again for all vehicles.

The data from all testing programs (State, Federal and Remote sensing) show that most vehicles are in fact quite clean, and that a few vehicles are responsible for most of the on-road pollution. For CO, all the data are in agreement that half the CO is emitted by about 10% of the vehicles. The State and Federal FTP testing programs in which hydrocarbon and nitric oxide (NO) emissions are measured also show a skewed distribution. For hydrocarbons, the distribution is almost as skewed as for CO, and indeed many of the same vehicles are in the gross polluter category for both species simultaneously. This fact is reflected in the statistics of the Illinois idle testing program which is passed by a large fraction of the vehicles (typically more than 80%).

FTP testing for NO shows a less skewed distribution, and the gross polluters for NO are frequently not those for CO or HC. Figure 3 showed the effect of air to fuel ratio on CO emissions. The curve for CO emissions is almost paralleled (at a lower level) by a curve for hydrocarbon emissions from the engine. If a catalyst is effective, but does not have enough air supply to burn all the CO to CO_2, then any hydrocarbon passed by the engine will be converted to CO. If however the catalyst is absent or ineffective, then HC and CO curves would be expected to be parallel. The richer the combustion, the more CO and HC emitted. If the processes described here were the only operative processes, then one would expect that a vehicle would emit zero CO and HC if clean, would emit CO for sure as the mixture was made richer, and depending on the catalyst status, might be expected to emit HC up to some proportion of the excess CO.

A large fraction of the gross HC emitters are probably in this category, however the situation is complicated by the fact that there is another important region of engine HC emissions on the lean side of the diagram, off the scale shown in Figure 3. This is the region of so called "lean burn misfire". In this air to fuel ratio region, one or several cylinders has so little fuel in the air that the spark fails to ignite the mixture at all, and a whole cylinder full of the air and fuel is emitted into the exhaust pipe. A functioning catalyst could take care of this problem for a few cycles, but would be severely overheated if the situation were to continue. For this reason, some catalyst systems are capable of bypassing themselves when overheated. In either case, persistent lean burn misfire will cause the emissions of a great deal of HC, without any significant CO.

The combustion processes leading to NO emission are discussed in great detail in the literature. The important features are that NO is caused by the heating of a mixture of nitrogen and oxygen to a high temperature. In an internal combustion engine, the highest temperatures only occur under load (when large volumes of fuel and air are entering the cylinders), and even then only when there is significant, but not too much excess oxygen. Thus, in a perfect engine, in which cylinder to cylinder differences are neglected, NO would only be emitted by operating just on the lean side of the stoichiometric line in Figure 3. From the arguments above, this region would be a minimum on the emissions of HC and CO. HC would increase if the mixture were to go a lot leaner (misfire), and HC and CO would increase together if the mixture became richer, but NO emissions would disappear.

Diesel engines operate at higher compression ratios, and thus higher temperatures than gasoline engines. They generally emit more NO. Because NO is only emitted under load, there are no idle testing methods for NO, thus all the data currently available are from the FTP studies. A remote sensor for NO would enable a large amount of on-road in-use vehicle emission data to be obtained. That data can not be obtained by any other method.

There are many ways to express the skewed nature of the observed distributions. Half the pollution is from 10% of the vehicles. 90% is from 30% of the vehicles. The mean emission is more than four times larger than the emissions of the median vehicle. However the point is made, it is apparent that there is tremendous opportunity for a cost-effective control measure if the few gross polluters can be cheaply identified, and somehow persuaded to reduce their emissions at least to the mean of their model year.

CO is not considered to be a major air quality problem in Chicago, however ozone is. Ozone is formed from NO and hydrocarbons by a series of complex photochemical reactions. An elegant synthesis of the results of this process comes from some recent innovative Australian work by Johnson and Quigley (12). Their results can be summarized thus:

> The reaction to make ozone proceeds at a rate proportional to the product of the amount of sunshine, reactive hydrocarbons and a temperature term.
>
> The maximum amount of ozone which will be formed provided that there is enough integrated solar intensity, is proportional to the total amount of NO present.

This realization leads to an interesting conclusion in terms of control measures, namely, if the ozone receptor is close to the NO and HC source, then NO control will be ineffective, and only HC control will help (Milwaukee for instance). If the receptor is a significant air travel time downwind (Muskegon perhaps), then HC control will be ineffective, and only NO control will help. Naturally there are intermediate cases, and recirculating air motions in which the ozone precursors might even return close to their point of origin many hours later. CO is important in ozone formation, but by no means as important as the reactive hydrocarbons.

B. Correlations between CO and HC emissions

As a part of this project, several available FTP studies were investigated, and the CO/HC correlation plots made.

Carbon monoxide to Hydrocarbon ratios have been analyzed from data of four sources. The Colorado Department of Health (13), General Motors (14), New York State Department of Environmental Conservation (15) and the United States Environmental Protection Agency (16). The Colorado Department of Health data is the entire database assembled since 1978 when the state began FTP testing for the EPA. This data includes several different oxygenated fuels. The data from General Motors is from their continuing in-use testing database. The data from New York State is real-time emission data from a single car during each phase of the three phase FTP test. The EPA database used is their largest database related to fuel oxygenation FTP studies.

All of the data give CO/HC ratios that cover the range of 9 - 16 with some data sets providing correlation coefficients (R^2) of up to 0.7. Most of the research today is conducted on clean vehicles (CO emissions < 50 grams/mile) while most of the potential reductions and therefore the more important data from a correlation point of view will be on vehicles with CO emissions greater than 150 grams per mile. The General Motors data (Figure 14) is totally lacking in this area while the data from the Colorado Department of Health (Figure 15) and the EPA data (Figure 16) contains a few significant vehicles.

As discussed earlier, perfect correlation is not expected. Some high HC emitting vehicles will emit very little CO (for instance the 5gm/mile HC car in the GM database). This can be explained by a vehicle which is running at stoichiometry in all but one cylinder which has a spark plug which is not firing for some reason.

The important conclusion to be drawn from the data is that the FTP testing indicates that a remote sensing program which detects only CO gross polluters will in fact detect 80% of the gross HC emitters. Thus if gross CO emitters were detected and tuned up to

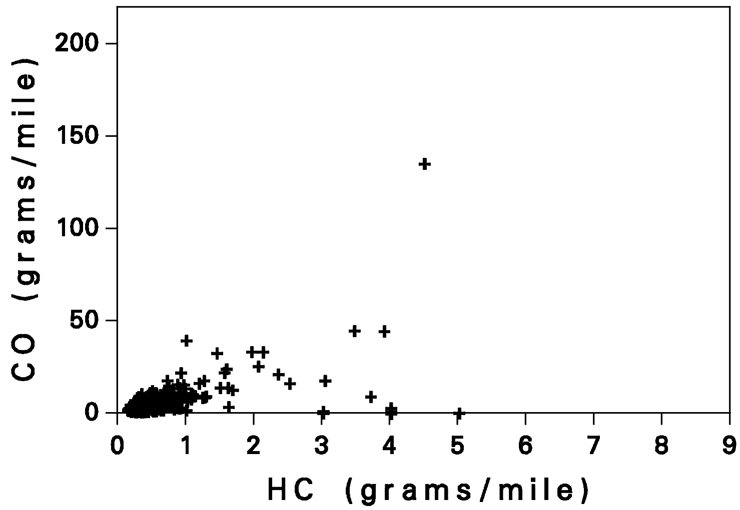

Figure 14: Data from General Motors in-use FTP testing.

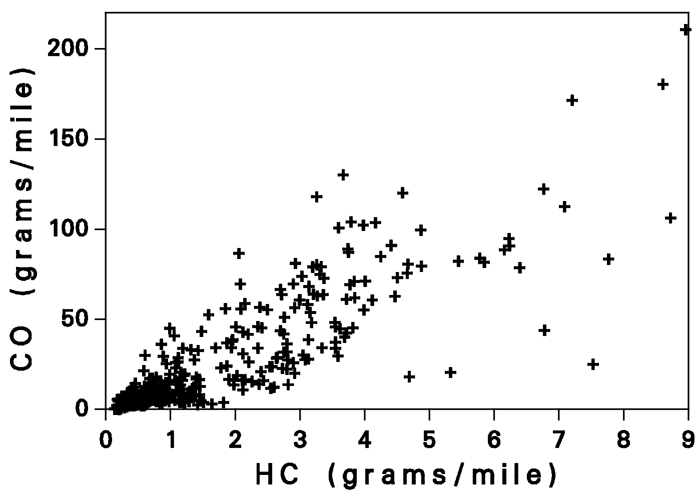

Figure 15: Colorado Department of Health FTP database. The slope is 16 with an r^2 of 0.74.

emit the mean of their model year, the CO mobile source emissions reduction would be about 40%. The correlation suggests that the HC reduction would be greater than 30%.

There is funding at the University of Denver from the American Petroleum Institute to develop a real-time HC remote sensing channel. This R&D program is underway, with a tested prototype anticipated in the fall of 1990. Remote sensing based emissions

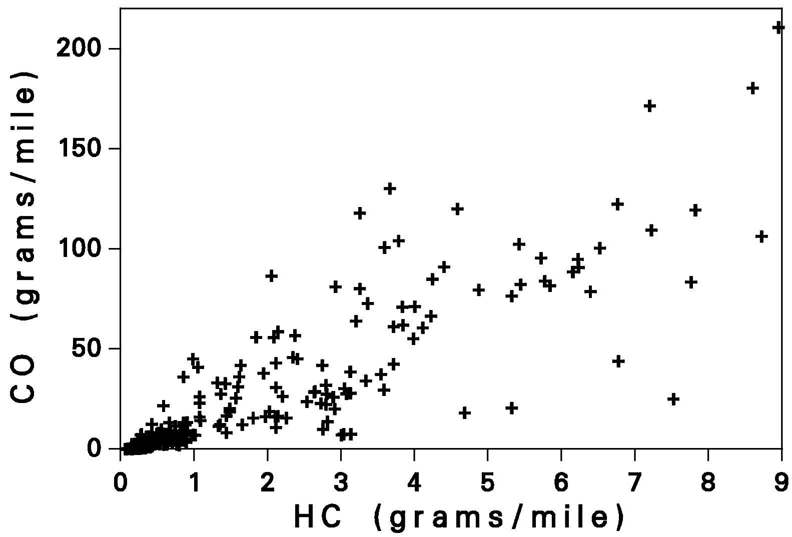

Figure 16: Data from the U. S. Environmental Protection Agency.

reductions for HC and CO do not however depend on the availability of the HC device, in view of the correlations herein.

C. Lack of CO/NO correlation

As discussed earlier, there is very little correlation between CO and NO emissions, indeed even the nature of the distribution function of on-road NO emissions is unknown. The complexity is exacerbated by the fact that every vehicle is expected to show very variable emissions as a function of load. There are extenuating circumstances. Modern closed-loop vehicles with functioning oxygen sensors, functioning catalysts, and not driven under so much load as to go into the off-cycle emissions mode discussed earlier, emit very little NO, CO or HC because they operate essentially at stoichiometry. If any HC and CO sneak down to the catalyst, they react with the NO to produce CO_2, N_2 and water. These vehicles are undoubtedly on the road, and will cause a large clump of points close to the origin when fleet on-road NO and CO data are available. For such data to become available, and to evaluate the potential of remote sensing to control NO emissions, it is essential that a remote sensing NO unit be developed. Designs for such a unit exist, and have been patented by the University of Denver, but no funding sources have been discovered which could enable a prototype to be constructed and tested.

There will be one failure mode in which CO monitoring, and repair of high CO emissions vehicles will control NO emissions. That is the failure mode for a modern closed loop, oxygen sensor equipped vehicle in which the oxygen sensor, or other aspects of the closed loop are out of control. The air to fuel ratio in these vehicles is likely to swing on either side of the desired stoichiometric ratio. When swinging to the rich side the vehicle will be a detectably high CO emitter. Under these conditions it will not be putting out NO, however when the ratio swings to the lean side it will become a high NO emitter. In other words, the use of CO remote sensing to detect vehicles with failed emission system components, will, when those components have been replaced, result in lowered emissions of all pollutants.

NO remote sensing has not developed to the extent that CO has. This is partly because the IR bands of NO are both weak and in a wavelength region in which water interferes. Our device will use ultraviolet wavelengths which show much more promise of meeting the challenging needs of the measurement.

D. Comparison of FEAT findings to MOBILE4 assumptions

As discussed earlier, essentially all the state mobile source vehicle control programs are evaluated by means of the EPA MOBILE (now 4) model. The model is essentially a spread sheet into which is entered the characteristics of the local fleet, and a set of assumptions, mostly grounded upon FTP testing, as to how the fleet emissions will differ from FTP emissions because of the various factors such as ambient temperature, altitude, tampering rate, deterioration, I/M programs, oxygenated fuels, etc.

1. Altitude

There is some data available on altitude dependence. Significant data sets from on-road remote sensing are available from Denver (5,000 ft), Woodland Park CO (7,900ft.), Los Angeles, close to sea level, and the current Chicago study. The average emissions from the various sites vary from as low as 0.9%CO to as high as 2.3%CO. The largest term causing these differences is the average age of the fleet. There is also an effect of vehicle load, higher load, higher average. The MOBILE4 model has a built-in altitude effect of greater than thirty percent between Chicago and Denver. This is not observed.

2. Temperature

The remote sensing data obtained so far by the University of Denver has intentionally avoided locations where vehicles are expected to be in a cold start mode. Possibly for that reason, remote sensing sees very little effect of temperature on fleet CO emissions. It is also worth pointing out that the FTP data on the effect of cold start emissions is uniformly misinterpreted. It is true that for most vehicles, 80% of the CO is emitted in a cold start mode, however these are the low emitting clean cars. For the gross polluters measured by FTP the CO emissions are much more evenly distributed between cold and hot cycles. Thus if the effect of cold start is averaged by vehicle, then the data show an average of 70% of the emissions from the cold start mode, however if the data are averaged in terms of the emissions, i.e. in proportion to their effect on the air, then the effect of cold starts is lower than 40% of the total emissions. Furthermore, the gross polluters which emit large amounts of CO at all times are not constrained in the real world to run an FTP cycle. The few gross polluters which are also high daily mileage vehicles, and which emit CO all day, probably dominate the basinwide emissions. In locations where a large number of vehicles are in a cold start mode (i.e. at the end of the day in a cold parking lot) then they will dominate the local CO emissions.

Since the ozone problem is dominated by basinwide effects, rather than local effects, the remote sensing data could be regarded as diverging from the MOBILE model in terms of temperature dependence.

3. Oxygenated Fuels

The remote sensor has been used to study the apparent effects of oxygenated fuels on emissions. The results agree with the models to within a factor of two (2, 9).

4. Inspection and Maintenance

The remote sensor has also been used to study the effects of the Colorado I/M program (a decentralized idle and 25OOrpm idle program) (15). In this one study, the results showed that when the age of the tested and untested fleets was taken into account, the I/M program reduced fleet average emissions by 3 ± 3% (10). This contrasts sharply with the model assumption of greater than 30%. The local authorities have suggested that this discrepancy may arise because the driving mode studied was under heavy load up a mountain grade, and that in City driving a greater difference might be observed. They have not suggested a location where such a study might be unequivocally carried out. We note that uphill under load is the condition under which most fuel is burned, and therefore most pollutants emitted. So, the results are probably entirely correct from an air quality point of view.

5. Fleet Age

The data in Figures 6 and 11 show that vehicle CO emissions on average, increase approximately linearly for about ten years, and then level off. As discussed earlier, the increasing average is not because most vehicles are deteriorating, rather because the minor fraction of gross polluters is increasing (up to 25% in the oldest fleets).

This observation has profound implications to the MOBILE model predictions of future fleet emissions. The data and the model agree that new vehicles are essentially irrelevant to on-road emissions (for this reason the Clean Air Act tighter new car standards are likely to be ineffective). The model, however, requires a linear deterioration rate for all vehicle model years, thus all 1973 cars are modelled as dirtier than all 1974 vehicles, etc. The model actually includes larger deterioration rates for the older vehicles. The result is that the modelled emissions by model year show a curve quite similar to the data for new vehicles, and quite discrepant for older vehicles. Figure 17 shows the results of a typical model run (MOBILE3 for Denver Colorado with 75% Light Duty Gasoline Vehicles). When this model curve is run out into the future, the old (dirty) cars get off the road, and the new (clean) cars take over, and we meet the standards. If the remote sensing data are used instead of the model, then a year later some of the old cars have gotten off the road, but all the vehicles have become a year older, the fraction of gross polluters has increased in every model year, and the fleet emissions are unchanged.

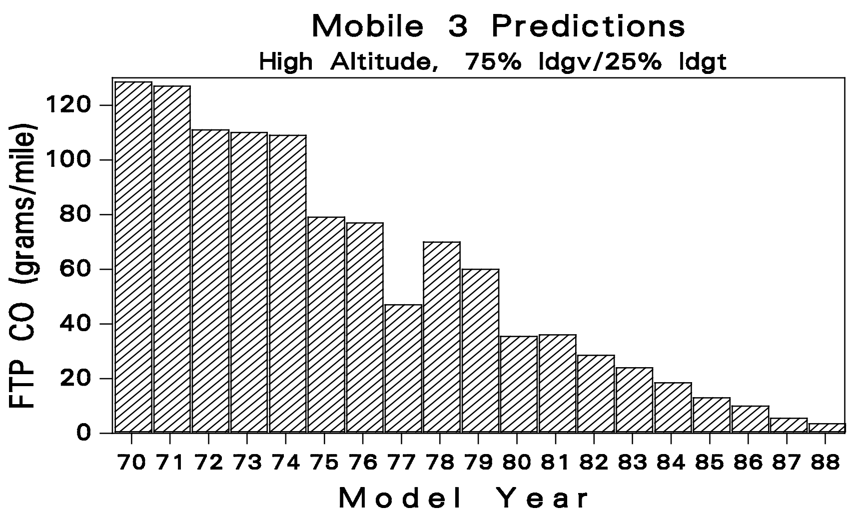

Figure 17: Mobile 3 predictions similar to Figures 6 and 10, but in grams/mile units.

In the last decade there has certainly been a reduction in mobile source CO. We attribute the reduction to the tighter new car standards. The fact that new cars are irrelevant to CO is a tribute to both the regulators and the regulated industry. Unfortunately, <u>unless the observed deterioration is altered, further reduction in new car emissions will be quite ineffective.</u>

Our conclusions concerning the correctness of the MOBILE model assumptions are confirmed by several other literature sources. Hlavlinka and Bullin (17), Zweidinger (4) and Ingalls (18) have all reported measurements for which the MOBILE model underpredicts the emissions. For CO, Hlavlinka and Bullin report disagreement by a factor of 2.2, Zweidinger a factor of 3.6 and Ingalls a factor of 2.7. For hydrocarbons Zweidinger reports that the model underpredicted by a factor of 1.7 and Ingalls reports an underprediction factor of 3.8.

In an independent audit of the Arizona I/M (VEIP) program the State Auditor General concluded that (19):

> "MOBILE3's limited data base appears to result in underestimates of fleet emissions and overestimates of VEIP benefits ..."

E. Comparison of findings to Illinois I/M failure rates

1. Enforcement implications

One can imagine many different techniques whereby the remote sensing information could be used as an air pollution control measure. A New York State mobile source expert suggested that in real time, tolls could be assessed more heavily the more emissions the vehicle evidenced; in effect a proportional pollution tax.

Another scheme whereby remote sensing could be used is to place a single remote sensor at each centralized testing location, with all vehicles entering the remote sensing lane as they arrive. A fraction of the cleanest vehicles (for instance 70%) would be issued with a passing certificate, and would be allowed to go on their way. This procedure would take approximately 15 seconds, would pass on to the current test all the dirty vehicles, and would save the public a great deal of time and frustration.

It is important to consider how a remote sensing program might compare with Illinois current I/M testing program. One way to judge programs is to compare the failure rates by model year of the current idle program with two potential remote sensing programs. Figure 18 details the failure rates for vehicles by model year under the current program (20).

Figure 19 is using the Chicago FEAT database but applying current idle standards as if the measurements made had been true idle measurements. They, of course, were not and it can be seen that many more 1980 and newer vehicles fail the test using this criterion. It may be fortuitous, but it is interesting to note that the shapes of the two graphs are similar. Both have maximums in 1981 then decrease and are flat after that year.

Figure 20 is a graph of the failure rates if a new type of criterion were applied to the Chicago data. The criterion uses the 50% cut-point for gross polluters measured at the location. This value is 4.48% CO applied to every model year, regardless of type of vehicle.

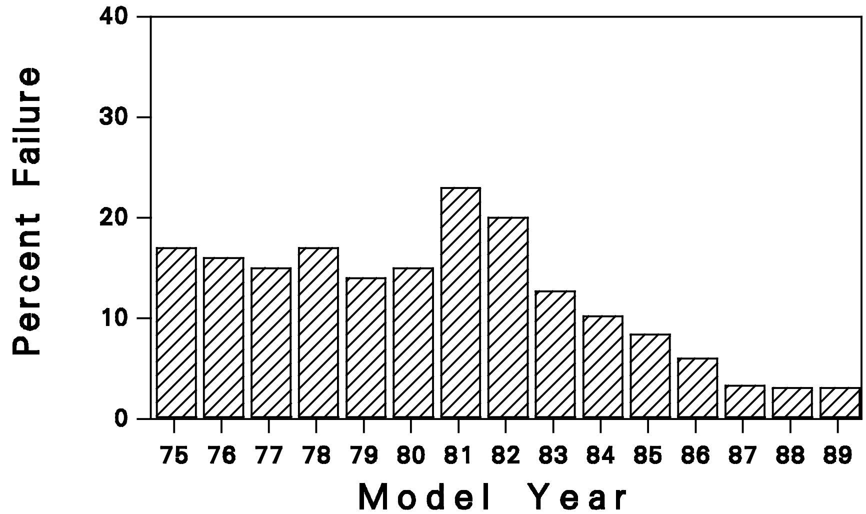

Figure 18: Failure rate by model year for the current Illinois Environmental Protection Agency I/M program. 1988 and 89 data are estimated equal to 1987.

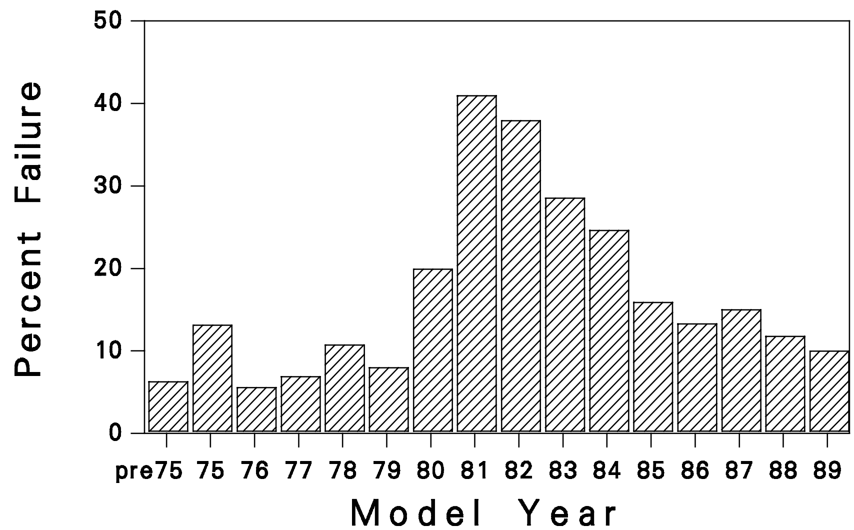

Figure 19: Failure rate by model year using remote sensing data compared to current idle standards as pass/fail criterion.

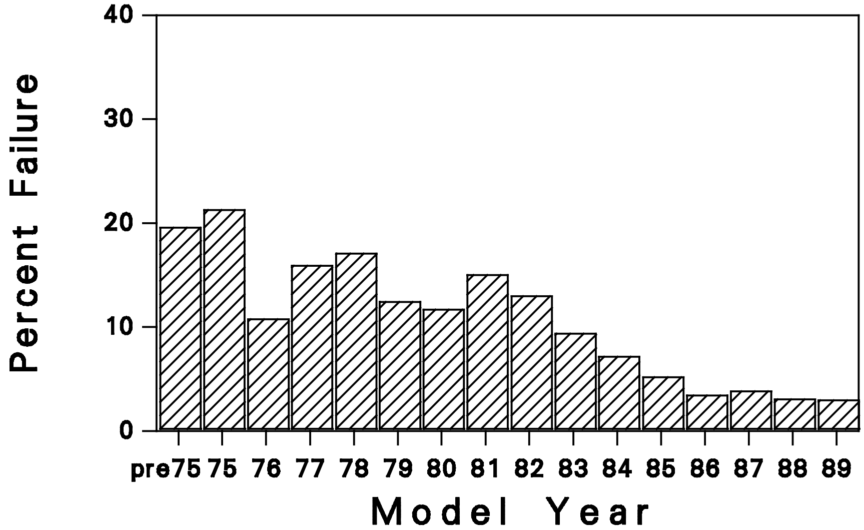

Figure 20: Failure rate by model year using remote sensing data compared to the 50% cut point for gross polluters (4.48% CO) as the pass/fail criterion.

As can be seen from this figure, the failure rates are almost identical to the current Illinois program. It is therefore reasonable to assume that programs based on remote sensing would achieve failure rates similar to the current program.

2. Costs

A remote sensing program could also save the Illinois taxpayers money. Approximate costs are derived for two scenarios. In the first scenario, a single remote sensor is located at each centralized testing station. The present I/M testing costs are $23 million. If the remote sensing system is set to pass the cleanest 70 percent of the fleet, then the centralized program will be reduced to 30 percent of its current cost. Allowing for upgrading the centralized services the costs would be approximately $7 million for a savings of $16 million. The cost of remote sensing is estimated to be $0.50 per test plus $1.00 for a certificate for each passing vehicle (1.50 * 2.8 * 0.70) equals $3 million, for a net savings of $13 million.

An alternate method to calculate the savings can be derived using data from Wards Engine Update (November, 1989). According to Wards, a single centralized I/M lane costs $460,000 for land, buildings and equipment and can test 20 vehicles per hour. A remote sensor is priced at $50,000, it can easily operate from a small van (say $20,000) and be used beside the right of way wherever there is room to park. A unit such as described is capable of testing over

1,000 vehicles per hour. At one busy freeway ramp in California we once observed 1,200 vehicles per hour. The extent of the potential cost savings is great. More refined cost savings arising from full scale implementation in the Chicago area can also be estimated.

A higher level of utility and cost savings would be realized in a second scenario. Remote sensing is used as an on-road screening tool to send only the dirtiest vehicles in the fleet to take the centralized test. Assuming that the test is set to screen out the dirtiest ten percent of the fleet and assuming that remote sensing is required to test each vehicle five times per year, the cost savings would be over $12 million. The cost savings are estimated as follows. Present I/M testing costs $23 million. If reduced to ten percent of the fleet, and upgraded, the I/M cost would be reduced to approximately $3 million for a savings of $20 million. Assuming the cost of remote sensing at $0.50 per test, testing 2.8 million vehicles, 5 tests/yr, will cost $7 million plus $1.00 notification for 10% of the fleet ($280,000). The net savings are over twelve million dollars.

This program will also achieve significant hydrocarbon emission reductions. According to the Federal Implementation Plan (FIP) for the Chicago area, the total daily amount of hydrocarbon ozone precursors (VOC) emitted into the Chicago air is 2187 tons/day. Of this total, 44 percent or 966 tons are estimated to be emitted by mobile sources. Assuming that a remote sensing based I/M program will be 80% effective at controlling 50% of the mobile source problem, then a reduction of 386 tons/day will be realized. It is predicted that proposed gasoline volatility (RVP) reductions will result in a 200 ton/day reduction in on-road VOC emissions by 1992. RVP reductions and elimination of gross polluters are not targeting the same sources, nevertheless the calculation is very conservative if the full effect of RVP is discounted from the estimated effect of a remote sensing based I/M program. This leaves the program with a 186 ton/day potential VOC reduction. A total program cost of $10 to $12 million for 260 weekdays per year means a daily cost of $38,000 to $46,000. Dividing by reductions of 186 or 386 tons/day leads to a cost effectiveness of $100 to $248 per reduced ton of VOC in the Chicago area.

As the public becomes used to the convenience of never having to go to the centralized test, one can envisage a system in which the remote sensing results themselves would be used to issue notifications, and centralized testing would only be needed for those vehicle owners who wished to dispute their readings, or to demonstrate compliance. With centralized testing now being a small component of I/M, it is possible to envisage more stringent (including loaded mode) testing of the few vehicles which are sent to take the centralized test. Not only are the cost savings substantial, but also the emissions reduction potential is great.

F. Additional air quality and economic side benefits

The overall cost savings, reduced pollution and substantial cost efficiency advantages of remote sensing, as discussed above, are significant. As a final word we list three other important benefits.

1. Not only are the proposed remote sensing I/M programs less expensive, we predict that they will be more effective than current programs. The major problems with current I/M programs are that the vehicle is tested under no-load conditions, and those few owners who treat the test as a contest to be won, rather than a commitment to clean air, know exactly when to tune their vehicles to "pass the test". Some "de-tune" them afterwards.

2. If the vehicle owners of the gross polluting vehicles have their vehicles tuned up, then their gas mileage will improve. Both carbon monoxide and hydrocarbons are combustible. A vehicle which burns all its fuel to carbon dioxide is getting the most possible energy out of the fuel. Combustion efficiency increases by about twice the observed %CO if a good tune-up is obtained. Thus a vehicle which fails a remote sensing test at 5%CO might be tuned up to emit 1%CO. The gas savings would be about 8%. For a 25 mile per gallon (mpg) car this amounts to an extra two mpg. This increased efficiency benefits the owner, as well as benefiting the atmosphere both because of the CO reduction, and because of the greenhouse CO_2 reduction. Overall less gasoline is handled, and thus less spilled and less evaporated.

3. A program based on remote sensing collects the data by which it can be judged for effectiveness. When the remote sensors return to the same sampling sites after some time period, the results can be used directly to determine a measure of the program effectiveness.

For all of the reasons given above, we believe that remote sensing represents the most economical, effective and socially acceptable inspection component of a control strategy for mobile source emissions yet devised. In the present system, it is important to remain vigilant that the vehicle maintenance is performed in a timely and effective manner. At a minimum, the advantages of remote sensing certainly justify a commitment to proceed with development of this technology, and to move toward implementation of remote sensing based mobile source emissions enforcement programs.

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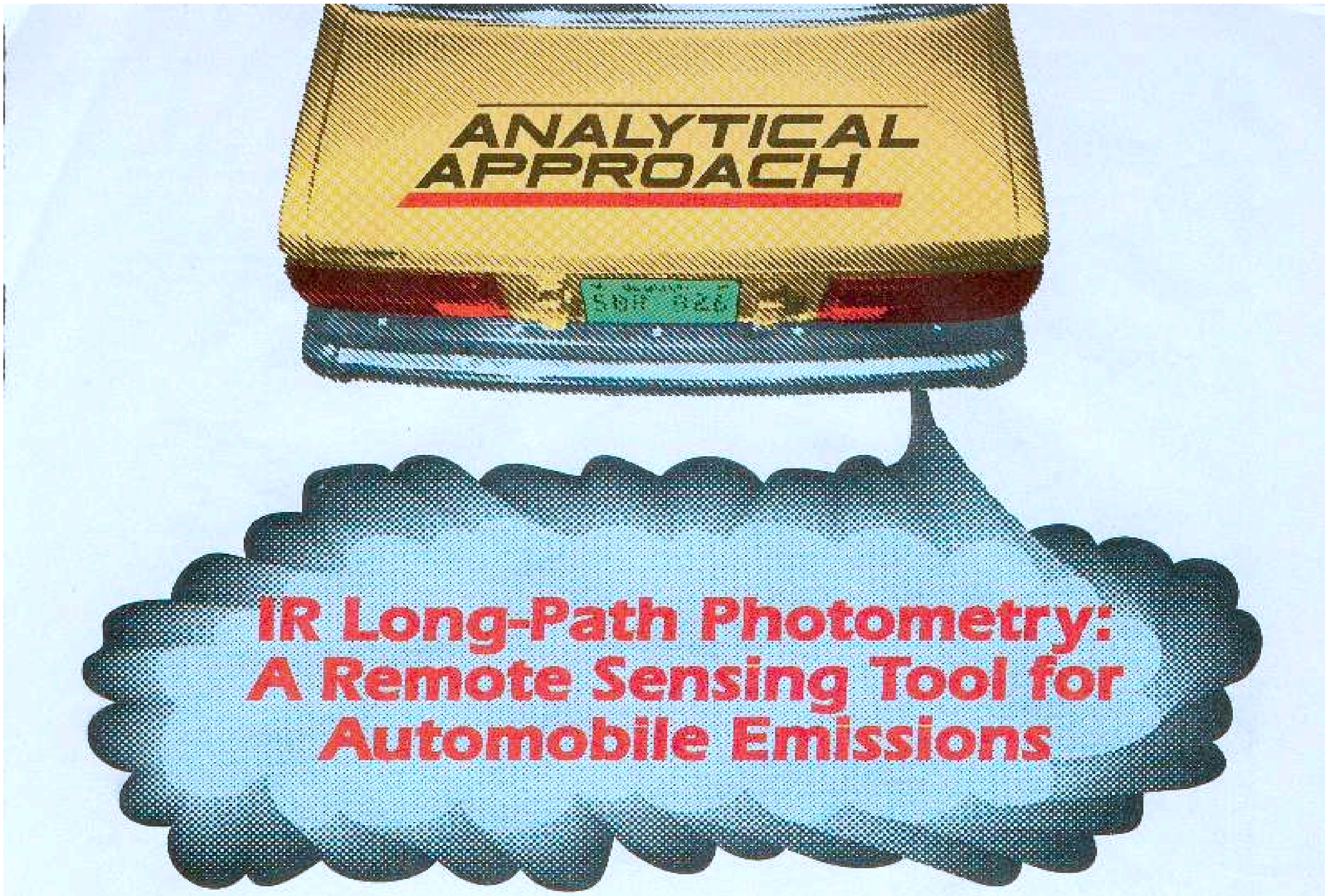
V. Appendices



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Picture Los Angeles or New York City on a hot summer day. Few commuters can ignore the ever-present haze surrounding these cities caused by motor vehicles that emit carbon monoxide (CO), hydrocarbons, nitrogen oxides, fine particles, and lead. With the Clean Air Act of 1970 and subsequent amendments (*1,2*), a mandate exists "to protect and enhance the quality of the Nation's air resources." As a result, a major industry concerned with the measurement of automobile exhaust emissions was born.

After reviewing the Federal Motor Vehicle Control Program, M. J. Walsh (*3*) outlined the following criteria for an as-yet nonexistent ideal emissions test. It should evaluate the vehicle under real-life conditions; be reproducible, accurate, quick, and inexpensive; measure all pollutants of concern; and be comprehensive enough to discourage testing bias.

From a scientific standpoint, it is essential that the first criterion be met. With this in mind, we undertook a new approach using an old technology to develop a long-path IR photometer that can remotely measure CO emissions from operating vehicles.

Current testing

Federal and state governments, along with the automobile manufacturers, test and certify new vehicle emissions and carry out some in-use testing of older vehicles. These tests use the Federal Test Procedure (FTP) (*4–7*), a carefully designed, specific test that is divided into cold transient, cold stabilized, and hot transient phases. A vehicle is operated under a series of accelerations, decelerations, stops, and starts on a chassis dynamometer whose inertia and friction are set for each vehicle. The emissions from each phase are collected at a constant volume into three sample bags, and the concentrations of each species are determined. The final result, given in grams of pollutant per mile, is a weighted average from the three phases. The driving course is modeled after a typical summertime (20 °C to 30 °C) commute to work in Los Angeles. Each test takes at least 12 h to complete and costs more than $700. Precision of the results for a given vehicle is claimed to be ±20% (*8*) and is controlled mainly by the reproducibility of the automobile's emission system, not by the test system or gas analysis protocols.

Current computer models (EPA MOBILE3 and soon-to-be-released MOBILE4) are based on the concept that the FTP emissions measured from a fleet of vehicles are well correlated (though not necessarily 1:1) with the emissions that the same fleet would exhibit under normal driving conditions. Because little is known about actual on-the-road fleet emissions, it is impossible to gauge the accuracy of this assumption.

The public is more familiar with state inspection and maintenance (I/M) programs, which are designed to test every vehicle in any area with air

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pollution problems. These I/M tests are always less rigorous than the FTP, and thus the results are less indicative of actual on-the-road emissions. The most sophisticated centralized I/M testing programs use a chassis dynamometer with one or two fixed loads and speeds and measure the steady-state emissions as a percent of the exhaust. Many centralized (and all decentralized) programs only measure idle emissions at one, or possibly two, engine speeds. These tests typically take 10–15 min to perform and cost $6 to $12 each.

Remote sensing instrumentation

The idea of remotely measuring vehicle emissions is not new. Lockheed Missiles and Space Corporation first attempted to construct an across-the-road monitor for the California Air Resources Board (*9*), but successful operation of the device was never reported. Later, Chaney (*10*) proved that CO plumes from passing cars could be observed using a gas filter correlation radiometer. Unfortunately, Chaney's system did not include any of the parameters necessary to estimate emissions data from the plume observation.

The University of Denver's instrument consists of three basic units: the source, a detector, and a computer. IR absorption is used to determine the amounts of CO and CO_2 emitted by a passing automobile. The IR light source, located on one side of a roadway, sends a collimated beam into a gas filter radiometer equipped with two liquid-nitrogen-cooled indium antimonide photovoltaic detectors (Judson Infrared Inc., Montgomeryville, PA). A 4.3-μm bandpass filter isolates the CO_2 spectral region, and a 4.6-μm filter isolates the CO region. The 4.6-μm beam passes through a rotating gas filter wheel (Thermo Environmental Corp., Franklin, MA), one-half of which contains a CO and H_2 mixture and the other half N_2 (*11*). The rotating wheel modulates the signal and provides both a reference channel and a CO data channel. Figure 1 is a schematic of the optics and the detector layout.

A typical operational scenario follows. The system is installed across a single-lane highway with the IR beam located 10 in. (25.4 cm) above the roadway. When a car enters the optical path, a drop in the reference voltage signals the vehicle's presence. Span voltages from each of the three signal channels (CO_2, CO, and reference) are acquired before the car enters the beam, and zero correction voltages for each channel are acquired while the car is completely blocking the beam. As the vehicle exits the beam, a 1-s voltage versus time trace from each of the three channels is obtained. The 1 s is a user-selected time chosen for convenience; recent tests of one-half second of exhaust plume have also been successful. The signal is averaged over 8 ms (the time for one-half of a rotation of the gas filter wheel), zero-corrected, and related to the span values.

Figure 2a shows a typical 1-s voltage trace for the CO, CO_2, and reference channels. If a second vehicle enters the beam and interrupts the measurement

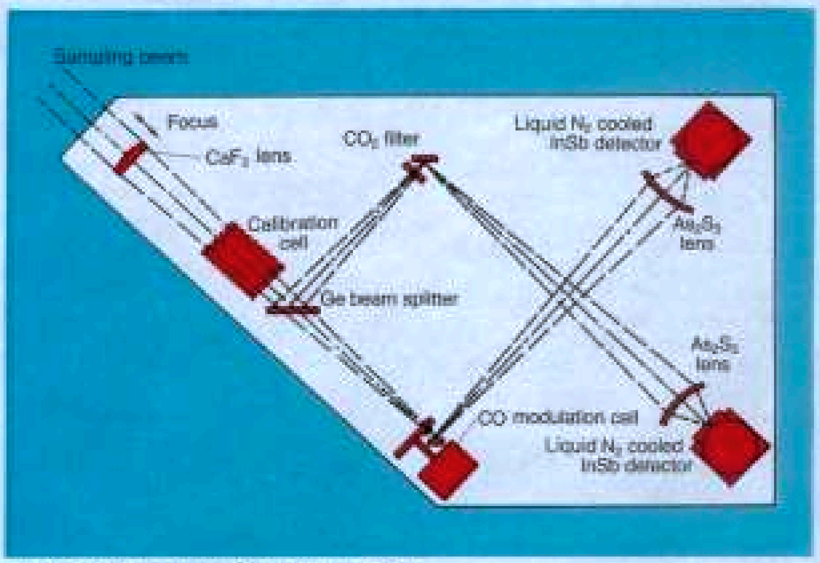


Figure 1. Optics and detector configuration.
The motor rotates the gas filter correlation cell at 3600 rpm, and its position is sensed photoelectrically.

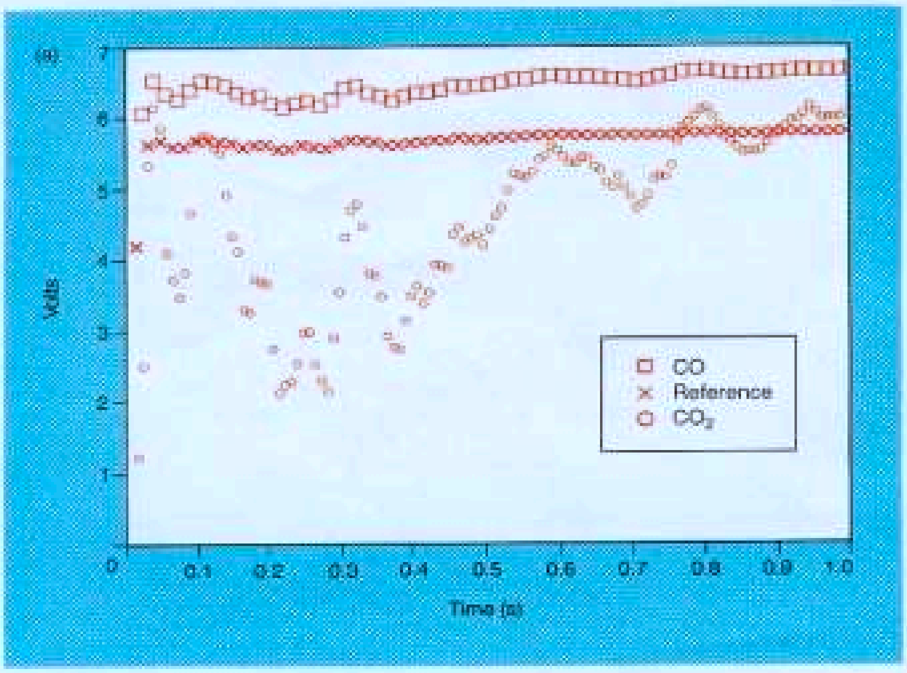
of a previous vehicle, the software recycles and performs the measurement on the new vehicle using the span values obtained from in front of the first car.

Emission results are obtained by computing the ratios of the CO and CO_2 voltages (I) to the reference voltages (I_0) and re-scaling these arbitrary units into calibrated CO and CO_2 values through the use of calibration curves determined in the laboratory (see Figure 2b). These data are then analyzed by a least-squares procedure that determines a single path-independent CO/CO_2 ratio from the slope of the CO versus CO_2 graph in Figure 2c.

It has been well documented that the application of a linear least-squares analysis to data whose dependent and independent variables are both subject to error can produce erroneous results (*12, 13*). As a safeguard, some on-road experimental data were fitted using the linear least-squares method and a standard iterative nonlinear procedure (*14*). All of these tests produced identical measurements of the slope within experimental error.

The CO/CO_2 ratio is the only valid measurement that can be made because the instrument cannot distinguish the magnitude or position of the exhaust plume. Pollution contribution can be determined directly from the ratio. A high ratio corresponds to a high polluter, a low ratio to a clean-burning vehicle. The highest polluters observed produce almost vertical slopes.

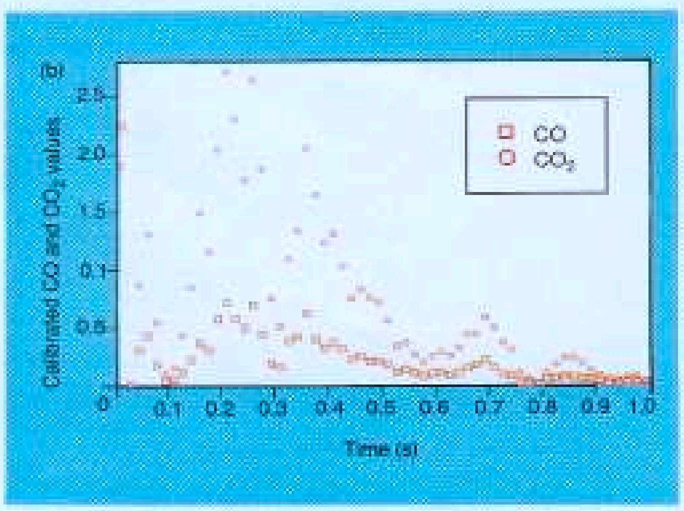
Computer algorithms are written conservatively; confidence limits require the presence of minimum amounts of CO_2, and slope standard deviations must not exceed ±20%. The minimum amount of CO_2 requirement is used to distinguish cars from pedestrians, bicycles, or heavy-duty trucks with elevated exhaust systems. When tests are made in favorable weather, data fall outside these confidence limits for less than 10% of the measurements.



Conversion of CO/CO_2 ratio to exhaust percent CO

Most workers in the automobile emissions field do not report CO/CO_2 ratios. Idle emission standards are usually written in terms of percent CO. Thus we have derived equations that translate the observed CO/CO_2 to the percent CO that an exhaust gas monitor would observe if inserted into the tailpipe at the time of the remote sensing measurement. We also have derived the equation for converting the CO/CO_2 ratio into grams of CO per gallon of fuel, an important conversion for fleet studies.

These calculations are made under the assumption that any excess air present in the exhaust is neglected and that the contribution of water vapor to the actual exhaust volume is subtracted. This is analogous to standard moni-



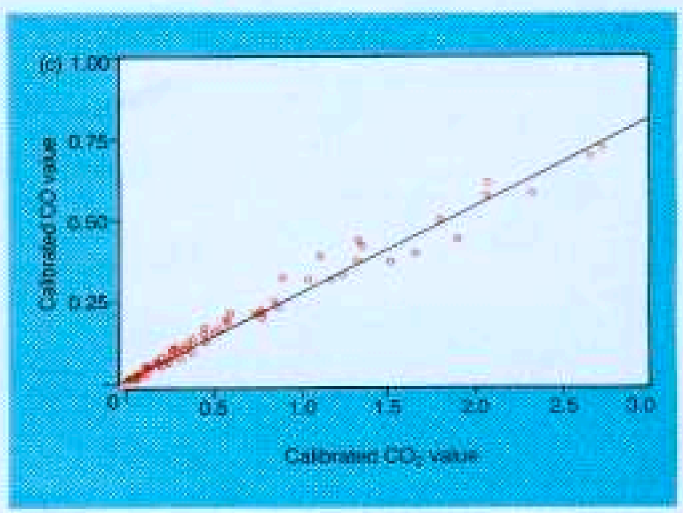


Figure 2. (a) Data from the remote sensor for a 1983 Oldsmobile at 20 mph, (b) raw data converted to calibrated CO and CO_2 values vs. time using a 4-in. (10.16 cm) calibration cell, and (c) the final CO/CO_2 correlation graph used to obtain unitless slope.
Clean cars produce a horizontal correlation graph.

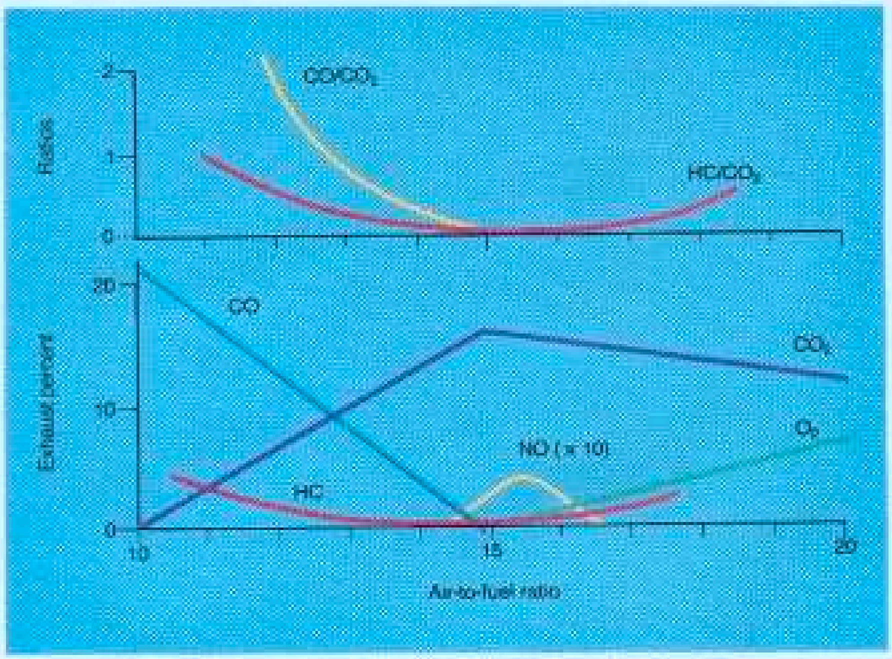


Figure 3. Idealized engine map of percent pollutants vs. air-to-fuel ratio.
Plotted above are the ratios of the pollutants to CO_2. Hydrocarbon emissions are schematic and exaggerated so they can be shown on the same scale as CO and O_2.

tors that measure a reading after the water vapor has been condensed out of their intake systems. Figure 3 shows an ideal engine map of percent emissions as a function of air-to-fuel ratio (*15*). Above the standard diagram is the same information plotted in terms of the ratio of emitted species to CO_2. The equations are derived from an accurate version of this diagram and the standard chemical equation for combustion in air of a 6:1 by weight carbon:hydrogen mixture typical of Denver gasoline.

Accuracy and precision

The sensor is calibrated initially using a special flow cell with calcium fluoride windows and a 4-in. (10.16-cm) optical path. Controlled mixtures of pure CO and CO_2 mixed with nitrogen are passed through the cell using mass flow controllers (MKS Instruments Inc., Andover, MA). The calibration is checked in a mode that simulates auto exhaust by momentarily blocking the beam and then puffing certified mixtures of CO and CO_2 for half a second into the beam without the cell.

At a local freeway ramp, three certified gas mixtures with CO/CO_2 ratios of 1:12.1, 1:1, and 4.96:1 (Scientific Gas Products, Longmont, CO; and Linde, Denver, CO) were used for field calibration. The 1:12.1 cylinder was measured 61 times over a temperature range of 5 °C to 26 °C with a mean and standard error of 0.103 ± 0.01; the 1:1 cylinder was measured 53 times over a temperature range of −2 °C to 24 °C with a mean and standard error of 1.017 ± 0.091; and the 4.96:1 was measured 27 times over a temperature range of 6 °C to 21 °C with a mean and standard error of 4.91 ± 0.88. These ratios, translated into exhaust percent CO values, would be 1.44 ± 0.13 (1:12.1), 8.84 ± 0.46 (1:1), and 16.27 ± 0.68 (4.96:1). The system is calibrated daily using the gas mixtures and an automated computer program.

In the summer of 1987 three vehicles were tested under similar conditions (i.e., warmed up and in first gear under constant acceleration in a large circular parking lot). Each vehicle was driven a constant 20 mph up a 3% grade and was measured 31 times by the sensor. Measurement variability was found to increase with increasing CO concentration. A computer-controlled, low-mileage 1985 Chevy Celebrity gave results of 0.22 ± 0.4% CO. A 1981 Honda Civic with California-specified controls and high mileage gave results of 1.84 ± 0.4% CO. This vehicle emitted less than 1% CO when idling and experienced transient emissions of up to 6% CO when shifting into second gear. A 1967 Ford Galaxie showed the highest emissions and variability at 6.47 ± 0.9% CO.

Further testing was conducted on the Honda Civic at a local speedway. Measurements were made at speeds of up to 40 mph with the gear ratio, speed, and manifold vacuum recorded. An attempt was made to simulate these conditions on a chassis dynamometer at the Environmental Testing Corporation in Aurora, CO. Unfortunately, on the dynamometer it was impossible to sufficiently reduce the inevitable dynamometer roller load on the vehicle to obtain identical manifold vacuums. With this caveat in mind, the dynamometer laboratory results summarized in Table I can be compared with the field data.

A 1977 Volkswagen Bus was equipped with an on-board Peerless Corporation exhaust gas monitor and printer to measure percent CO and percent CO_2. Tests were conducted at vari-

Table I. Test result comparisons between the remote sensor and conventional methods of automobile emission testing for a 1981 Honda Civic

Location/method	rpm's	mph	Percent CO	No. of readings
State of Colorado idle test	2500	—	0.8	1
Remote sensor at Bandimere Speedway	NA[a]	10	2.0 ± 0.8	4
		20	2.5 ± 0.5	5
		30	2.0 ± 0.7	5
		40	2.2 ± 1.5	3
Environmental Testing Corp. loaded steady-state testing on rollers	2500	10	0.5	NA
		20	2.5	NA
		30	2.5	NA
		40	2.4	NA
		50	2.1	NA

[a] Not applicable.

ous air-to-fuel ratios on a local freeway ramp. Figure 4 compares the results between the two monitors. One experimental difficulty encountered was that the intake system for the Peerless monitor created a 13-s delay between the tailpipe and the actual measurement. Because the printer was operated manually, the timing of this delay could account for the values at the higher air-to-fuel ratios exceeding the expected ±1% error bounds. More "high-end" calibration data and a vehicle whose emissions can be adjusted to higher percent CO's are needed to extend the range. Typical in-use percent CO emissions range from 0% to 16%. Based on the test data described above, we believe that our system has an accuracy and precision of ±1% CO for an individual test.

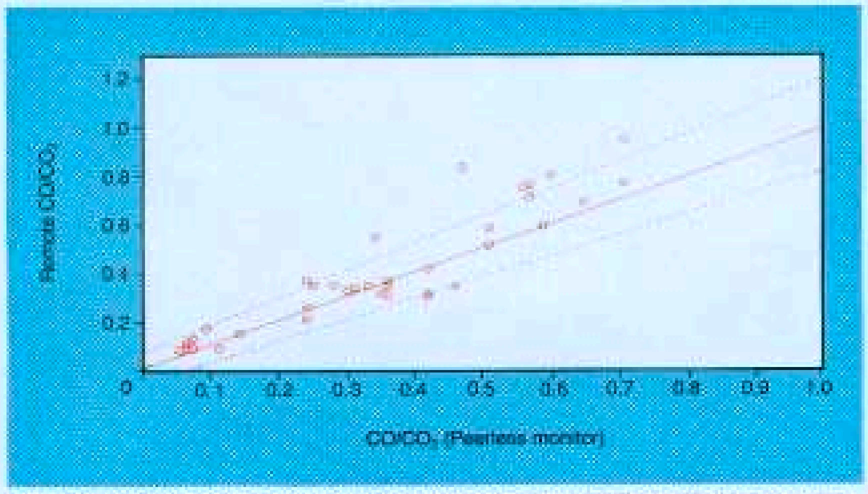


Figure 4. Remote sensing CO/CO_2 measurements correlated against data from an on-board percent CO and percent CO_2 exhaust monitor.

The solid line represents a 1:1 agreement. The dashed lines indicate the corresponding ±1% CO deviation from the 1:1 line.

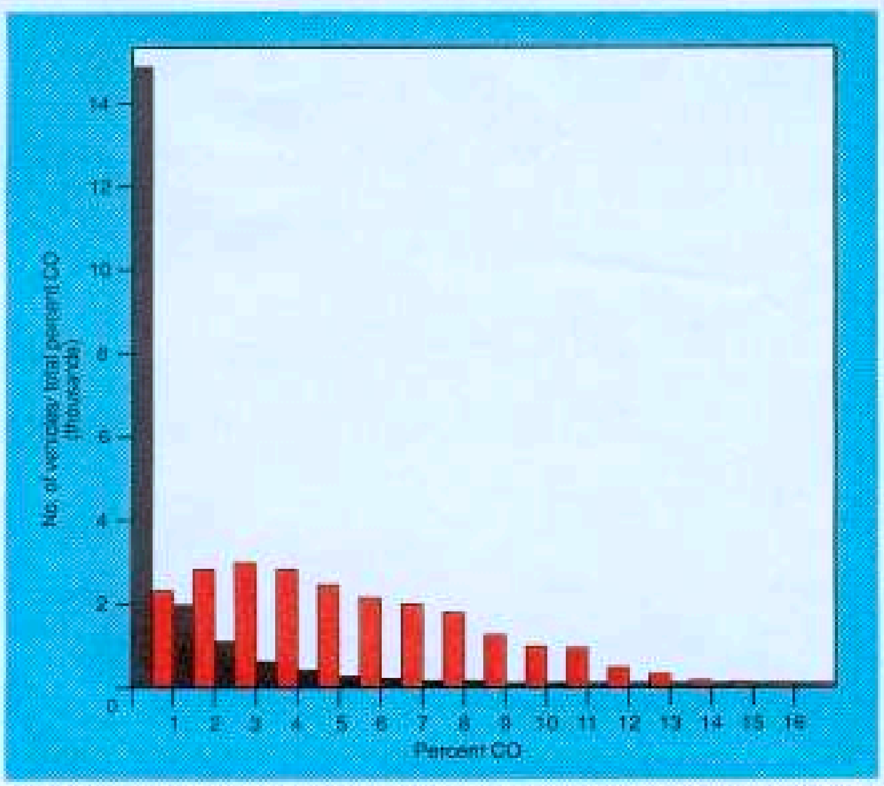


Figure 5. CO emission measurements of operating vehicles made in April 1988 at a local freeway ramp.

The black bars represent the number of vehicles measured between adjacent percent CO's (i.e., 0%–1%, 1%–2%, etc.). The colored bars represent the total contribution in percent CO for each category.

Comparison to Federal Test Procedure

In collaboration with the Colorado Department of Health, a comparison between the FTP and our remote sensing method was attempted. After the lengthy FTP was completed, each vehicle was driven up a parking lot with a grade of ~2.5% through the remote sensor beam. An average of three to five readings was recorded. Fifty-three measurements were recorded for 30 vehicles that consumed either regular unleaded or oxygenated fuels. A correlation coefficient to the FTP of 0.71 was obtained. Using only the first remote sensing measurement from each vehicle, the correlation coefficient to FTP is 0.58. First and second measurements from three vehicles—a 1986 and a 1987 Dodge Aries and a 1987 Isuzu Pickup—were excluded from the correlations because of unexplained behavior in which high (~2–5%) initial percent CO measurements were followed by very low measurements (~0–0.5%). The variability observed in the remote sensing test results was comparable to the variability of the standard two-speed idle tests performed by the Colorado Department of Health concurrent with the FTP tests. Direct variability comparisons with FTP were not possible because the FTP measurements were not repeated.

Using miles-per-gallon data available from the FTP tests, it is possible to convert our percent CO (grams of CO per gallon of fuel) readings directly into grams of CO per mile, improving the average correlation to 0.81. This data set indicates that further improvement in the correlation is possible through the use of a multimode test (i.e., using different speeds and acceleration rates) (*16*). Because remote sensing fulfills the need for a direct on-road test, correlation with FTP is not as important as it is for short-cycle dynamometer tests.

Applications and future developments

The University of Denver's remote sensor allows the rapid and low-cost measurement of numerous vehicles operating under real conditions. Figure 5 is a histogram detailing the CO measurements of 20,725 vehicles made during a two-week period in April 1988 at a local freeway ramp. A small percentage of the vehicles are very high CO emitters. In this data set 8.6% of the vehicles account for half of the CO emissions, and 71% of the vehicles are totally irrelevant contributors from an air quality standpoint (all measured at less than 1% CO). This demonstrates the ease with which very large data sets can be accumulated at a fraction of the cost of current testing.

Currently under development is a video system that will enable us to ask more pertinent questions of our fleet distributions: What is the day-to-day variability of the high-pollution vehicles, and can they be repeatedly identified? What do percent CO distributions look like for various vehicle ages and models (e.g., are the high-polluting vehicles all older vehicles)? Do some models have a higher probability of showing up in this category?

The EPA computer model has been shown to be ineffective at predicting operating vehicle emissions. In two recent studies (*17*, *18*), the EPA model of vehicle CO emissions (MOBILE3) was in error by more than a factor of two. The MOBILE# models are handicapped by a lack of operating vehicle data, especially on "super emitters" (vehicles with CO emissions greater than 150 grams per mile). We anticipate that remote sensing measurements can form the basis for a more realistic model through the collection of large in-use databases (*19*, *20*).

The current device will work only on a single lane of traffic and on only one exhaust species, CO. It probably will not be possible to distinguish separate contributions from vehicles operating in adjacent lanes. However, we believe that the basic concept is sound and that it is feasible to expand the sensor to monitor additional species such as hydrocarbons, formaldehyde, and nitrogen oxides.

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APPENDIX B: Detailed Calculations

Detailed arithmetic derivations of A/F ratio, gms CO/gallon, and dry, air corrected, exhaust %CO from the remotely-measured value of Q. For this purpose, dry air is assumed to have the formula $0.21O_2$ and $0.79N_2$. It is interesting to note that (0.21 x 2) = 0.42 and 0.79 appear throughout the final equations, sometimes with added integers (such as 2.79). Reappearance of these numbers is one advantage of carrying out all arithmetic in molar rather than mass units.

Determination of effective A/F ratio

$$CH_n + m(0.21O_2 + 0.79N_2) \rightarrow \frac{n}{2}(H_2O) + aCO + bCO_2 + 0.79mN_2 \quad \text{(a)}$$

a + b = 1	by carbon balance
0.42m = n/2 + a + 2b	by oxygen balance
Q = a/b	by remote sensing

a = Q/(1 + Q), b = 1/(1 + Q)

Molar A/F = m =

= (n/2 + a + 2b)/0.42

= (n/2 + 1/(1 + Q) + 1)/0.42

= (2 + n/2 + Q(1 + n/2))/0.42(1 + Q)

For fuel of chemical formula CH_2, n = 2 and

A/F = (3 + 2*Q)/0.42(1 + Q).

If the fuel has a different C:H ratio, then this calculation will be in error. However, for small values of Q (most vehicles) an 8% error in the assumed C:H ratio results in only a 4% error in calculated A/F ratio.

The A/F ratio used by mechanical engineers is by weight. To obtain the engineering units, the molar ratio should be multiplied by 29/(molecular weight of the fuel). In the case of n=2, multiply by 29/14.

Note that unburned HC or evaporative emissions will increase the actual fuel use, and an air pump or excess combustion air would increase the actual air throughput. This calculation only refers to air participating in combustion either in the engine, catalyst, or exhaust system.

Determination of gm/gallon CO emissions

The ratio of CO to CO + CO_2 is a measure of CO emissions in moles of CO per mole of carbon in the fuel, thus:

$$CO/(CO + CO_2) = a/(a + b) = a$$

from earlier equations a = Q/(1 + Q)

To convert moles of CO to grams of CO multiply by 28gm/mole

To convert moles of carbon in the fuel to gallons of fuel use approximate fuel formula CH_2 (14 gm/mole) and density 700gm/liter, 4 liters per gallon.

$$CO\ gm/gallon = 4*28*700*Q/(1 + Q)*14$$

$$= 5600*Q/(1 + Q)$$

Note that this equation is approximate and neglects any contribution from exhaust HC.

The FEAT gm/gallon equation can also be derived from the Federal EPA miles/gallon equation (a). The EPA MPG calculation is based on the same exact combustion equations used in the FEAT system. The numbers look more complex since mass units are used instead of molar units. The EPA MPG equation reads:

$$MPG = 2421/(0.866HC + 0.429CO + 0.273CO_2) \qquad (b)$$

where HC, CO and CO_2 are expressed in gm/mile and HC is assumed to be $CH_{1.85}$. Since gm/gallon equals gm/mile multiplied by miles/gallon.

$$.429CO(gm/gal)=2421-.273CO_2(gm/gal)-.866HC(gm/gal) \qquad (c)$$

The FEAT System measures Q = CO/CO_2 in molar units.

$$CO/CO_2 \text{ in mass units - } Q*28/44.$$

A development planned for the FEAT System will measure Q'=CO/HC in the next generation system.

$$CO/HC \text{ in mass units } = Q'*28/13.85.$$

Substituting in equation (c), we obtain:

$$0.429CO=2421-0.273(44CO/28Q)-0.866(13.85CO/28Q')$$

$$12*Q*CO = 67,800Q-12CO-12QCO/Q'$$

$$12CO(1+Q+Q/Q') = 67,800*Q$$

$$CO\ gm/gallon = 5650Q/(1 + Q + Q/Q')$$

As shown above, a simplified equation was derived neglecting HC and dropping one significant figure. This equation was

$$CO\ gm/gallon = 5600*Q/(1 + Q)$$

For typical fleet average, Q = 0.1 and the results of this simplified equation and the hydrocarbon-corrected equation are essentially identical. Since we do not currently have the capability to measure HC, we make use of literature data (from FTP) which shows that CO and HC are quite well correlated with a ratio of about 12.5 (in molar units) (2). This allows for a simple correction for HC, i.e.,

$$CO\ gm/gallon = 5650*Q/(1 + 1.08*Q)$$

If the CO/HC ratio were actually 10, the equation reads:

$$CO\ gm/gallon = 5650*Q/(1+1.1*Q)$$

For most vehicles Q = O and all equations are identical. For a gross-polluting car (Q = 1), the HC addition increases the gm/gallon by only 6% from the simple formula in which HC is not included at all. This demonstrates that lack of measurement of HC has little effect on the CO equations. Neglecting HC entirely leads to errors less than 6% for 95% of vehicles. Incorrect assignment of the CO/HC ratio introduces negligible further correction.

When the next generation of FEAT Systems is available which measures Q', then not only will slightly more accurate gmCO/gallon estimates be available, but also accurate tailpipe gmHC/gallon estimates will become available.

It is important to note that all these per-gallon calculations refer only to fuel which exits via the tailpipe, vehicles with large evaporative or other fuel losses will use more gallons than these tailpipe-based equations assume.

Derivation of the exhaust mole %CO and %CO_2 in terms of the measured CO/CO_2 molar ratio Q:

Assuming n = 2

$$\text{from (a) } m = (1 + a + 2b)/0.42$$

$$\text{dry } CO_2 \text{ fraction} = b/(1 + 0.79m)$$

Note that, as discussed earlier, any percentage errors in m caused by the assumption of n = 2 will be halved for most vehicles:

$$\text{fraction of } CO_2 = (1/(1+Q))/(1+0.79(3+2Q)/0.42(1+Q))$$

multiply throughout by 0.42(1+Q)

$$= 0.42/(0.42+0.42Q+2.37+1.58Q)$$
$$= 0.42/(2.79+2Q)$$

$$\text{dry } \%CO_2 = 42/(2.79 + 2Q)$$

$$\text{dry } \%CO = 42*Q/(2.79 + 2Q)$$

from which one obtains directly

$$\text{dry } \%CO_2 = 100/(6.64 + 4.76*Q)$$

$$\text{dry } \%CO = 100*Q/(6.64 + 4.76*Q)$$

Effect of the Water Gas Shift Reaction

There is a reaction known as the water gas shift reaction in which the exhaust CO reacts (sometimes on the catalyst) with exhaust H_2O to form CO_2 and hydrogen (H_2).

$$CO + H_2O \rightarrow CO_2 + H_2.$$

To determine the effect of this reaction, consider a vehicle burning CH_2 fuel in which the exhaust would have been measured at Q = 1 (8.8% CO). The exhaust would have been:

$$H_2O + 0.5CO + 0.5CO_2 + 5.95*0.79N_2.$$

If the water gas shift proceeded so as to remove half the CO, then the exhaust would be:

$$0.75H_2O + 0.25CO + 0.25H_2 + 0.75\ CO_2 + 4.7N_2$$

The remote sensor would find Q = 0.25/0.75 = 0.333, and calculate exhaust %CO as

$$42Q/(2.79 + 2Q) = 14/3.456 = 4.45\%.$$

$$\text{In fact, dry exhaust } \%CO = \frac{0.25 \times 100}{0.25+0.25+0.75+4.7} = 4.2\%$$

Thus, for a very dirty vehicle, the water gas shift reaction can be shown to cause only a small error in reported %CO. For the majority of clean vehicles, CO is small and the effect is even smaller.

For the interested reader, Table I brings together in summary form the relevant equations for emissions as a function of Q for three extreme vehicle fuels (carbon, CH_2 and CH_4). The equations and derivations are independent of the nature of the vehicle or of its emissions system. The equations are slightly dependent on the chemical nature of the fuel, but the dependency is small because the largest fraction of the exhaust, namely nitrogen, is constant.

TABLE 1

Solutions to the combustion equation in terms of CO/CO_2 ratio (Q) for three extreme C/H ratio fuels. It is interesting that for these three simple cases, most of the coefficients are integers or integers plus 0.42 (twice the 0.21 fraction of oxygen, O_2 in air). These parameters are derived from the remotely measured values of Q, the determination of Q would be carried out correctly independent of the fuel chemistry.

FUEL	FORMULA	A/F in moles	EXHAUST CO FRACTION	
Carbon	C	$\frac{(2+Q)}{.42(1+Q)}$	$\frac{2=0.42A/F}{1+0.79A/F}$	$\frac{.42Q}{2+1.21Q}$
Gasoline	CH_2	$\frac{(3+2Q)}{.42(1+Q)}$	$\frac{3-0.42A/F}{1+0.79A/F}$	$\frac{.42Q}{2.79+2Q}$
Natural Gas	CH_4	$\frac{(4+3Q)}{.42(1+Q)}$	$\frac{4-0.42A/F}{1+0.79A/F}$	$\frac{.42Q}{3.58+2.79Q}$

The EPA fuel economy equations are based on the same combustion equations as are used in all the derivations above. As discussed in the Federal Register, there are no corrections required for differences in the vehicle or for the presence, absence, or type of emission system. There are small corrections required for the density and the carbon to hydrogen ratio of the fuel. For normal gasolines, the density differences are not large. Figure 1 illustrates that the corrections arising from a lack of knowledge of fuel carbon to hydrogen ratio are also not large. For a vehicle which has enough air to burn all the fuel carbon to CO_2, then no CO is observed, and independent of C/H ratio, the exhaust %CO is correctly assigned to zero. For a vehicle in which a CO/CO_2 ratio of one is observed (a fairly dirty car under any circumstances), for a fuel with a C/H ratio of 1:2, the %CO will be reported as 8.8. If the vehicle were actually running on pure carbon, (a coal-fired car! C/H of 1:0), the remote sensor would report 8.8 again, whereas the actual value would be 12. Going to the other extreme, if the vehicle were powered by CNG (methane, CH_4) with the maximum possible C/H ratio of 1:4 for a hydrocarbon fuel, then the remote sensor report would be wrong at 8.8, but the correct reading would be 6.6. The reason the errors introduced by drastic changes in fuel oxygenation are not large has mostly to do with the fact that the major exhaust percentage is always nitrogen.

We have also solved the combustion equation for 2% and 4% fuel oxygenation. The resultant equations show that the remote sensor would underreport by a percentage equal to half the oxygenation percentage. These small corrections are taken into account when we report studies of oxygenated fuel programs where the degree of oxygenation is known.

APPENDIX C: Repeat Gross Polluting Vehicles

Vehicles which showed up four or more times in the gross polluter (>4.48% CO) category in license plate order. The first on the list, license 428027 AM motors, Four-door 1980 showed up a fifth time at 3.3% CO. For all others, all data were >4.5%. These 12 vehicles emitted an average of 2270 grams CO per gallon of gasoline. The total CO emissions is calculated from these 12 vehicles by summing all the observed %CO values. This number is 118,059 emissions units The total CO emissions from the 671 vehicles measured 4 times or more is 907,499 in the same units. Thus, the 1.8% of the vehicles which drive by that site in the gross polluting category every day, cause 13% of the CO measured at that site.

Date	Time	License	Make	Model	Year	%CO
08/09/1989	07:32:16	428027	AM MOTORS	4 DOOR	80	5.9
08/07/1989	07:45:14	428027				4.7
08/08/1989	07:46:52	428027				5.2
08/10/1989	08:11:02	428027				4.9
08/10/1989	06:05:43	DCZ500	BUICK	COUPE	75	9.8
08/11/1989	05:56:15	DCZ500				11.1
08/08/1989	06:07:15	DCZ500				8.5
08/09/1989	06:07:47	DCZ500				8.6
08/10/1989	08:24:01	GFT313	FORD	STA WAGON	79	6.0
08/09/1989	08:30:29	GFT313				10.9
08/11/1989	08:26:22	GFT313				10.9
08/07/1989	08:37:37	GFT313				11.6
08/08/1989	08:31:22	GFT313				12.6
08/09/1989	06:42:27	MBT120	PONTIAC	4 DOOR	77	5.5
08/08/1989	06:25:44	MBT120				5.3
08/11/1989	06:24:34	MBT120				6.4
08/10/1989	06:32:28	MBT120				7.2
08/11/1989	06:13:18	MBX893	PONTIAC	2 DOOR	76	9.3
08/08/1989	09:35:17	MBX893				6.5
08/11/1989	06:53:04	MBX893				10.7
08/10/1989	08:55:31	MBX893				5.5
08/07/1989	07:43:58	MY2834	NISSAN	2 DOOR	88	9.2
08/10/1989	07:43:57	MY2834				10.8
08/11/1989	07:12:18	MY2834				11.6
08/08/1989	07:44:43	MY2834				12.5
08/11/1989	06:40:31	NLV805	BUICK	4 DOOR	77	9.5
08/07/1989	06:45:10	NLV805				6.7
08/08/1989	06:35:41	NLV805				7.3
08/10/1989	06:30:12	NLV805				9.3
08/09/1989	06:32:20	NLV805				7.9
08/10/1989	07:20:46	OM4672	ACURA	HATCHBACK	89	4.8
08/07/1989	07:17:39	OM4672				4.7
08/11/1989	07:31:15	OM4672				5.8
08/09/1989	07:23:18	OM4672				4.8
08/07/1989	06:50:39	PER173	FORD	4 DOOR	77	10.2
08/08/1989	06:50:42	PER173				9.2
08/09/1989	06:49:42	PER173				7.4
08/10/1989	06:52:53	PER173				7.6
08/11/1989	06:49:40	PER173				11.2

08/08/1989	08:00:43	QX8250	DODGE	STA WAGON	73	5.5
08/11/1989	07:51:07	QX8250				5.6
08/10/1989	07:55:32	QX8250				5.0
08/07/1989	08:04:21	QX8250				6.5
08/09/1989	08:04:26	QX8250				9.1
08/07/1989	08:04:32	RU6163	CHEVROLET	4 DOOR	82	7.5
08/11/1989	07:53:05	RU6163				7.0
08/09/1989	07:52:27	RU6163				5.1
08/10/1989	08:00:24	RU6163				5.8
08/11/1989	07:14:15	SNU312	AM MOTORS	PASSENGER	81	11.8
08/08/1989	11:15:43	SNU312				7.6
08/09/1989	11:12:15	SNU312				7.3
08/10/1989	11:08:46	SNU312				6.7

APPENDIX D: All Repeat Vehicles

671 vehicles which were measured more than four times at the Central Ave. to Eastbound I-290 on ramp 8/7/89 to 8/11/89 in license plate order. Most vehicles show very consistent readings (mostly clean, and a few dirty given in Appendix C). The most inconsistent is KS4624, a 1979 Pontiac 4-door measured at (14.2, 0.2, 0.3, 1.1, and 0.1). Apparently this vehicle was operating with a very rich mixture on one pass. This is attributable to either "off cycle" emissions (discussed earlier), or the vehicle had its choke (or equivalent) stuck on the one day, or extra gasoline had collected at some location in the intake system and purged into the combustion chamber as we made the measurement.

Date	Time	License	Make	Model	Year	%CO
08/07/1989	07:45:08	1077AF-B	MAZDA	PICKUP	86	0.0
08/09/1989	07:45:52	1077AF-B				0.0
08/10/1989	07:36:51	1077AF-B				5.8
08/11/1989	07:37:34	1077AF-B				0.1
08/07/1989	09:51:41	118948RV	CHEVROLET	CAMPER	78	2.0
08/08/1989	08:22:54	118948RV				0.2
08/09/1989	12:02:03	118948RV				0.5
08/10/1989	07:32:12	118948RV				0.2
08/07/1989	09:18:31	133336RV	CHEVROLET	PICKUP	88	0.0
08/08/1989	09:14:51	133336RV				0.0
08/09/1989	09:31:15	133336RV				0.1
08/11/1989	09:09:36	133336RV				0.0
08/07/1989	06:44:50	13618SB	FORD	BUS	85	0.2
08/07/1989	13:35:06	13618SB				0.1
08/08/1989	08:57:05	13618SB				0.4
08/09/1989	13:27:42	13618SB				0.1
08/08/1989	10:15:22	1376DP-B		PICKUP	86	2.3
08/08/1989	11:39:40	1376DP-B				0.8
08/09/1989	08:48:48	1376DP-B				2.4
08/11/1989	11:16:05	1376DP-B				2.1
08/07/1989	08:31:30	17263SB	CHEVROLET	BUS	86	1.8
08/08/1989	08:36:53	17263SB				0.2
08/10/1989	08:28:46	17263SB				2.0
08/11/1989	08:36:10	17263SB				0.0
08/08/1989	06:10:57	195432	OLDSMOBILE	4 DR HT	73	0.2
08/09/1989	06:04:33	195432				6.3
08/10/1989	06:09:31	195432				1.3
08/11/1989	06:08:40	195432				0.2
08/07/1989	08:19:54	199696	TOYOTA	COUPE	87	0.0
08/09/1989	08:21:02	199696				-0.1
08/10/1989	08:17:19	199696				-0.1
08/11/1989	08:28:39	199696				0.5
08/07/1989	08:24:59	2000AC-B		PICKUP	87	0.0
08/08/1989	08:09:58	2000AC-B				3.7
08/09/1989	08:05:08	2000AC-B				2.9
08/10/1989	08:09:11	2000AC-B				2.1
08/11/1989	08:00:33	2000AC-B				4.9
08/07/1989	08:24:54	204980	FORD	CONVTBLE	89	0.0
08/08/1989	08:38:23	204980				0.4
08/09/1989	08:34:55	204980				0.1
08/11/1989	08:36:30	204980				0.0

08/08/1989	06:58:19	258602B	GENERAL MOTOR	VAN	78	1.0
08/09/1989	07:11:25	258602B				0.5
08/10/1989	08:49:45	258602B				1.4
08/11/1989	06:58:21	258602B				2.0
08/08/1989	06:35:00	266189	BUICK	4 DOOR	87	0.1
08/09/1989	06:36:49	266189				0.4
08/10/1989	06:41:14	266189				0.2
08/11/1989	06:38:35	266189				5.3
08/08/1989	06:37:05	268800	OLDSMOBILE	4 DOOR	86	0.3
08/08/1989	11:08:47	268800				0.0
08/09/1989	06:31:04	268800				-0.1
08/10/1989	06:32:33	268800				0.4
08/11/1989	06:29:00	268800				0.1
08/07/1989	08:25:41	2821DF-B	FORD	VAN	73	1.7
08/08/1989	08:41:44	2821DF-B				11.3
08/09/1989	08:25:04	2821DF-B				9.6
08/10/1989	08:28:08	2821DF-B				10.3
08/11/1989	07:45:42	2821DF-B				2.2
08/08/1989	08:48:25	29024D	GENERAL MOTOR	PANEL	76	0.2
08/09/1989	08:35:24	29024D				0.1
08/10/1989	09:23:20	29024D				0.2
08/11/1989	08:34:57	29024D				0.4
08/07/1989	06:54:20	294054B	FORD	PICKUP	85	0.0
08/08/1989	06:56:01	294054B				0.0
08/09/1989	06:51:26	294054B				-0.1
08/10/1989	06:46:11	294054B				0.0
08/11/1989	06:48:26	294054B				0.0
08/07/1989	07:33:02	2940DF-B	CHEVROLET	PICKUP	76	0.6
08/08/1989	07:33:37	2940DF-B				0.5
08/09/1989	07:39:35	2940DF-B				0.6
08/10/1989	07:35:57	2940DF-B				2.1
08/11/1989	07:39:43	2940DF-B				4.3
08/08/1989	07:58:18	3583AN-B	FORD	VAN	87	3.2
08/09/1989	11:22:53	3583AN-B				0.0
08/10/1989	07:49:56	3583AN-B				7.4
08/10/1989	11:20:10	3583AN-B				0.1
08/08/1989	06:33:23	383566	CHEVROLET	4 DOOR	86	4.3
08/09/1989	06:32:38	383566				0.1
08/10/1989	06:34:19	383566				0.2
08/11/1989	06:32:56	383566				0.1

08/08/1989	10:30:46	3DAWN-B	CHEVROLET	VAN	84	0.0
08/09/1989	10:20:04	3DAWN-B				0.0
08/10/1989	10:16:06	3DAWN-B				0.0
08/11/1989	10:19:49	3DAWN-B				0.0
08/08/1989	08:32:01	40087RV	FORD	PICKUP	69	1.6
08/09/1989	06:54:14	40087RV				0.9
08/10/1989	07:40:49	40087RV				1.8
08/11/1989	07:53:48	40087RV				3.4
08/08/1989	06:28:13	401531	MERCURY	HATCHBACK	88	1.0
08/09/1989	06:29:51	401531				0.1
08/10/1989	06:21:58	401531				-0.1
08/11/1989	06:31:17	401531				0.0
08/08/1989	07:40:19	406295	CHEVROLET	STA WAGON	83	3.2
08/10/1989	07:36:06	406295				0.9
08/11/1989	07:38:29	406295				0.2
08/11/1989	12:01:43	406295				0.8
08/07/1989	08:25:13	412056	CHEVROLET	4 DOOR	87	0.1
08/08/1989	08:17:53	412056				0.1
08/09/1989	08:44:08	412056				0.1
08/09/1989	09:54:39	412056				0.2
08/09/1989	13:14:13	412056				0.1
08/10/1989	08:57:06	412056				0.2
08/11/1989	08:15:50	412056				0.2
08/07/1989	07:45:14	428027	AM MOTORS	4 DOOR	80	4.7
08/08/1989	07:46:52	428027				5.2
08/09/1989	07:32:16	428027				5.9
08/10/1989	08:11:02	428027				4.9
08/11/1989	07:53:45	428027				3.3
08/07/1989	07:59:21	433100	FORD MAVERICK	2DR SEDAN	77	0.6
08/08/1989	07:50:45	433100				0.5
08/09/1989	07:59:14	433100				0.7
08/11/1989	07:49:49	433100				0.3
08/07/1989	09:30:13	433457	BUICK	COUPE	84	1.4
08/08/1989	09:03:35	433457				0.9
08/10/1989	10:16:26	433457				0.8
08/11/1989	11:10:26	433457				0.7
08/08/1989	06:27:42	435765	DODGE	4 DOOR	78	3.9
08/09/1989	06:28:57	435765				0.3
08/10/1989	06:28:51	435765				3.6
08/11/1989	06:18:31	435765				0.3

08/07/1989	08:16:37	475795	OLDSMOBILE	COUPE	81	0.0
08/08/1989	08:24:16	475795				0.1
08/09/1989	08:08:38	475795				0.0
08/11/1989	08:18:09	475795				0.0
08/07/1989	07:38:28	516612B	CHEVROLET	PICKUP	77	1.0
08/08/1989	07:34:56	516612B				1.1
08/09/1989	06:48:45	516612B				1.3
08/10/1989	06:54:34	516612B				1.1
08/11/1989	06:53:37	516612B				1.2
08/07/1989	06:38:59	540305	BUICK	COUPE	86	0.5
08/08/1989	06:50:33	540305				0.0
08/09/1989	06:51:54	540305				0.1
08/10/1989	06:48:15	540305				0.2
08/11/1989	06:45:44	540305				-0.1
08/07/1989	06:49:33	573791	DODGE	HATCHBACK	89	0.1
08/08/1989	07:33:25	573791				1.1
08/10/1989	07:26:02	573791				0.1
08/11/1989	07:32:46	573791				0.0
08/07/1989	07:03:16	583154	HONDA	4 DOOR	86	0.1
08/08/1989	06:51:15	583154				0.0
08/09/1989	06:28:09	583154				0.0
08/10/1989	07:10:24	583154				0.1
08/11/1989	07:12:47	583154				0.1
08/07/1989	06:45:48	5930BD-B	CHEVROLET	VAN	86	0.0
08/08/1989	06:48:39	5930BD-B				0.0
08/09/1989	06:47:01	5930BD-B				0.2
08/10/1989	06:42:22	5930BD-B				0.2
08/07/1989	06:43:03	5977AU-B	FORD	PICKUP	87	0.0
08/08/1989	06:14:57	5977AU-B				0.0
08/09/1989	06:27:11	5977AU-B				0.1
08/11/1989	06:40:07	5977AU-B				2.1
08/07/1989	08:36:11	602134	OLDSMOBILE	4 DOOR	86	0.2
08/08/1989	08:36:24	602134				5.3
08/09/1989	08:22:39	602134				0.0
08/10/1989	08:22:39	602134				0.8
08/11/1989	08:43:35	602134				3.8
08/07/1989	07:17:57	604839	CHEVROLET	PASSENGER	79	0.1
08/08/1989	07:24:58	604839				0.1
08/09/1989	07:25:43	604839				0.1
08/10/1989	07:17:06	604839				0.1
08/11/1989	07:25:01	604839				0.1

08/08/1989	07:09:13	609170	DODGE	HATCHBACK	86	0.1
08/09/1989	06:55:31	609170				0.3
08/10/1989	06:57:31	609170				-0.3
08/11/1989	06:54:52	609170				0.2
08/08/1989	08:46:54	612413	PONTIAC	COUPE	85	0.0
08/09/1989	08:45:22	612413				0.2
08/10/1989	08:45:38	612413				0.3
08/11/1989	08:49:23	612413				0.1
08/07/1989	08:35:17	617894	FORD	4 DOOR	85	2.4
08/08/1989	08:37:42	617894				5.6
08/09/1989	08:41:22	617894				0.0
08/10/1989	08:25:47	617894				0.0
08/11/1989	08:35:55	617894				0.4
08/08/1989	07:44:25	620190	DODGE	2 DOOR	82	0.1
08/09/1989	07:38:06	620190				-0.1
08/10/1989	07:39:01	620190				0.1
08/11/1989	07:35:36	620190				-0.1
08/07/1989	07:04:02	621311	VOLKSWAGEN	HATCHBACK	85	0.1
08/08/1989	06:59:20	621311				0.1
08/09/1989	06:59:42	621311				0.1
08/10/1989	07:01:00	621311				0.1
08/11/1989	07:02:09	621311				0.0
08/07/1989	08:58:35	624660	DATSUN	COUPE	77	1.8
08/08/1989	08:44:02	624660				2.8
08/09/1989	13:00:19	624660				0.1
08/10/1989	08:46:58	624660				0.1
08/07/1989	07:12:36	649931B	FORD	PICKUP	89	0.0
08/08/1989	06:27:13	649931B				0.3
08/09/1989	06:31:44	649931B				0.1
08/10/1989	06:28:41	649931B				0.1
08/11/1989	07:09:24	649931B				-0.1
08/07/1989	08:31:57	675994	TOYOTA	HATCHBACK	85	0.5
08/08/1989	08:23:10	675994				0.3
08/09/1989	08:27:11	675994				0.1
08/10/1989	08:17:57	675994				0.2
08/11/1989	09:09:14	675994				0.0
08/07/1989	11:30:17	685042	OLDSMOBILE	2 DOOR	81	6.9
08/08/1989	11:14:05	685042				7.7
08/10/1989	11:17:24	685042				4.9
08/11/1989	11:14:33	685042				1.5

08/07/1989	08:32:02	726263	RENAULT	4 DOOR	84	0.8
08/08/1989	08:36:43	726263				0.6
08/09/1989	08:30:24	726263				0.2
08/10/1989	08:44:39	726263				0.9
08/11/1989	08:33:25	726263				0.4
08/07/1989	10:36:26	727107	B.M.W.	4 DOOR	79	-0.2
08/08/1989	10:57:09	727107				0.3
08/09/1989	11:45:12	727107				0.2
08/10/1989	10:45:25	727107				0.1
08/11/1989	07:15:09	727107				0.1
08/07/1989	10:25:54	7400DP-B	CHEVROLET	PICKUP	89	0.5
08/08/1989	12:36:38	7400DP-B				0.4
08/09/1989	12:41:35	7400DP-B				0.5
08/10/1989	09:09:38	7400DP-B				0.8
08/08/1989	07:58:42	749004	SAAB	HATCHBACK	88	0.0
08/09/1989	07:59:09	749004				0.0
08/10/1989	07:59:59	749004				0.0
08/11/1989	08:02:52	749004				0.0
08/08/1989	08:01:44	754758	TOYOTA	4 DOOR	82	0.8
08/09/1989	08:00:34	754758				0.3
08/10/1989	08:06:04	754758				1.6
08/11/1989	07:58:30	754758				0.3
08/07/1989	11:09:14	76725	FORD	STA WAGON	78	0.0
08/08/1989	09:46:00	76725				0.0
08/09/1989	11:22:32	76725				0.0
08/10/1989	09:48:48	76725				0.1
08/07/1989	06:40:19	7792DT-B	GENERAL MOTOR	PICKUP	77	0.0
08/08/1989	06:48:44	7792DT-B				0.0
08/09/1989	06:46:53	7792DT-B				-0.1
08/10/1989	06:41:58	7792DT-B				0.0
08/11/1989	06:47:59	7792DT-B				0.1
08/08/1989	06:43:54	779587B	FORD	PICKUP	88	0.1
08/09/1989	06:26:03	779587B				0.0
08/10/1989	06:25:10	779587B				0.1
08/11/1989	06:25:51	779587B				0.0
08/07/1989	07:48:52	7810DH-B	FORD	PICKUP	85	0.0
08/09/1989	08:01:05	7810DH-B				-0.1
08/10/1989	08:02:18	7810DH-B				0.0
08/11/1989	07:12:58	7810DH-B				0.2
08/07/1989	06:46:00	78817RV	DODGE	PICKUP	80	3.2
08/08/1989	06:42:22	78817RV				2.6
08/09/1989	06:38:49	78817RV				2.1
08/10/1989	06:41:07	78817RV				3.5

08/08/1989	06:24:14	79013RV	CHEVROLET	PICKUP	85	0.2
08/09/1989	06:16:11	79013RV				0.1
08/10/1989	06:22:06	79013RV				4.2
08/11/1989	06:18:33	79013RV				0.1
08/07/1989	07:52:19	7917	OLDSMOBILE	COUPE	86	0.1
08/08/1989	07:55:30	7917				0.1
08/09/1989	07:46:02	7917				0.1
08/11/1989	07:28:55	7917				0.1
08/07/1989	07:05:55	793477	BUICK	PASSENGER	82	0.6
08/09/1989	07:02:16	793477				0.1
08/10/1989	07:00:15	793477				1.3
08/11/1989	07:09:10	793477				1.7
08/08/1989	06:17:20	807493	PLYMOUTH	HATCHBACK	84	0.7
08/09/1989	06:17:43	807493				0.6
08/10/1989	06:18:18	807493				0.8
08/11/1989	06:20:31	807493				0.3
08/07/1989	08:01:50	826741	HONDA	4 DOOR	88	0.1
08/08/1989	08:23:20	826741				0.1
08/10/1989	06:40:21	826741				0.2
08/11/1989	06:30:01	826741				0.3
08/07/1989	06:40:30	828657	OLDSMOBILE	COUPE	86	0.0
08/08/1989	06:43:00	828657				-0.3
08/09/1989	06:40:33	828657				0.3
08/10/1989	06:43:26	828657				0.2
08/11/1989	06:47:16	828657				0.0
08/08/1989	06:04:21	831254	BUICK	COUPE	89	0.1
08/09/1989	06:10:48	831254				0.0
08/10/1989	06:11:41	831254				0.0
08/11/1989	06:10:15	831254				0.1
08/07/1989	08:14:19	844172	PLYMOUTH	VAN	86	0.8
08/09/1989	08:23:44	844172				0.4
08/10/1989	08:52:55	844172				1.4
08/11/1989	08:27:11	844172				1.1
08/08/1989	06:33:19	8453DW-B	CHEVROLET	PICKUP	84	0.1
08/09/1989	06:30:24	8453DW-B				0.1
08/10/1989	07:55:51	8453DW-B				0.1
08/11/1989	06:26:00	8453DW-B				0.0
08/07/1989	07:04:54	857387	PLYMOUTH	VAN	86	0.5
08/08/1989	09:59:21	857387				0.0
08/09/1989	06:53:12	857387				0.8
08/10/1989	07:34:34	857387				0.0
08/11/1989	07:00:31	857387				0.2

08/07/1989	08:13:12	858439	PONTIAC	COUPE	86	0.2
08/08/1989	08:20:54	858439				0.3
08/09/1989	08:09:10	858439				0.3
08/10/1989	08:13:34	858439				0.2
08/08/1989	06:30:46	871432	FORD	HATCHBACK	89	0.1
08/09/1989	06:31:31	871432				0.1
08/10/1989	06:26:19	871432				0.0
08/11/1989	06:30:52	871432				0.1
08/07/1989	06:42:39	874EC-B	CHEVROLET	VAN	89	0.0
08/08/1989	06:53:29	874EC-B				0.0
08/09/1989	09:44:49	874EC-B				0.1
08/11/1989	06:51:18	874EC-B				0.2
08/07/1989	11:07:11	897343	CHEVROLET	4 DOOR	87	0.0
08/08/1989	10:44:08	897343				0.0
08/09/1989	10:53:08	897343				0.0
08/11/1989	10:30:35	897343				0.2
08/07/1989	10:08:42	90527RV	CHEVROLET	VAN	86	1.2
08/09/1989	07:06:29	90527RV				0.7
08/10/1989	07:08:07	90527RV				1.5
08/11/1989	06:44:30	90527RV				0.2
08/08/1989	06:35:03	9062DW-B	FORD	PICKUP	89	2.8
08/08/1989	13:00:23	9062DW-B				0.2
08/09/1989	06:34:06	9062DW-B				0.5
08/10/1989	06:37:36	9062DW-B				2.1
08/08/1989	06:49:52	9108DT-B	CHEVROLET	PICKUP	87	0.7
08/09/1989	09:14:07	9108DT-B				0.8
08/10/1989	06:45:55	9108DT-B				0.8
08/11/1989	06:12:46	9108DT-B				0.5
08/07/1989	07:50:02	93725RV	TOYOTA	TRUCK	85	0.2
08/08/1989	07:47:41	93725RV				0.2
08/08/1989	11:15:30	93725RV				0.1
08/09/1989	07:37:49	93725RV				0.0
08/09/1989	12:24:03	93725RV				0.2
08/10/1989	08:00:33	93725RV				0.4
08/11/1989	07:50:48	93725RV				0.1
08/07/1989	07:52:09	94607RV	CHEVROLET	TRUCK	74	1.7
08/08/1989	06:38:13	94607RV				1.7
08/10/1989	07:50:29	94607RV				3.6
08/11/1989	08:09:45	94607RV				3.9
08/08/1989	06:48:35	9507BA-B		PICKUP	85	0.2
08/09/1989	06:55:09	9507BA-B				1.1
08/10/1989	06:36:15	9507BA-B				4.6
08/11/1989	06:31:32	9507BA-B				0.0

08/07/1989	08:18:17	970755B	CHEVROLET	VAN	85	0.7
08/08/1989	08:26:58	970755B				0.4
08/10/1989	08:11:09	970755B				0.1
08/11/1989	08:07:21	970755B				1.0
08/07/1989	07:30:15	9758DZ-B	CHEVROLET	TRUCK	79	0.1
08/08/1989	07:36:09	9758DZ-B				0.4
08/09/1989	07:33:56	9758DZ-B				0.2
08/10/1989	07:26:57	9758DZ-B				0.1
08/11/1989	07:22:14	9758DZ-B				0.2
08/08/1989	06:42:52	987317B	FORD	PICKUP	86	-0.1
08/09/1989	06:52:14	987317B				0.2
08/10/1989	06:20:54	987317B				0.1
08/11/1989	06:04:20	987317B				0.2
08/07/1989	06:54:02	999564	CHEVROLET	4 DOOR	79	1.0
08/08/1989	06:40:41	999564				0.7
08/09/1989	07:08:11	999564				0.1
08/10/1989	06:53:38	999564				0.2
08/11/1989	06:50:08	999564				0.2
08/07/1989	07:16:36	AEG82	PONTIAC	COUPE	88	0.1
08/08/1989	08:06:13	AEG82				0.0
08/09/1989	07:10:05	AEG82				-0.3
08/10/1989	07:25:51	AEG82				0.3
08/11/1989	07:18:32	AEG82				0.0
08/07/1989	08:26:49	AFORD2	LINCOLN	4 DOOR	88	0.0
08/08/1989	08:27:23	AFORD2				0.1
08/10/1989	08:24:26	AFORD2				0.1
08/11/1989	07:57:03	AFORD2				0.0
08/08/1989	06:12:24	AIRWAZ3	CHEVROLET	VAN	87	0.1
08/09/1989	06:18:19	AIRWAZ3				0.4
08/10/1989	06:20:41	AIRWAZ3				0.3
08/11/1989	06:18:43	AIRWAZ3				0.2
08/08/1989	07:31:28	AK3456	BUICK	COUPE	89	0.1
08/09/1989	07:27:07	AK3456				0.1
08/10/1989	07:25:03	AK3456				0.0
08/11/1989	07:28:28	AK3456				0.0
08/07/1989	07:06:23	AL7973	TOYOTA	SEDAN	87	0.2
08/08/1989	06:57:57	AL7973				1.4
08/09/1989	07:04:39	AL7973				0.0
08/10/1989	07:09:31	AL7973				0.1

08/07/1989	10:44:07	ALD600	CHEVROLET	4 DOOR	82	2.8
08/07/1989	12:57:23	ALD600				1.3
08/08/1989	10:39:10	ALD600				4.5
08/08/1989	12:51:14	ALD600				3.5
08/09/1989	11:56:21	ALD600				3.7
08/09/1989	13:48:03	ALD600				3.2
08/10/1989	09:30:53	ALD600				2.5
08/11/1989	12:20:09	ALD600				3.5
08/07/1989	08:03:56	ALV579	DODGE	2 DOOR	86	0.1
08/09/1989	07:54:52	ALV579				0.1
08/10/1989	07:52:39	ALV579				0.2
08/11/1989	07:43:00	ALV579				0.2
08/09/1989	08:27:15	AM1724	PLYMOUTH	VAN	88	0.1
08/09/1989	11:41:32	AM1724				0.0
08/09/1989	13:39:33	AM1724				0.0
08/11/1989	08:47:27	AM1724				0.1
08/11/1989	11:21:47	AM1724				0.4
08/07/1989	07:01:22	AN9805	FORD	HATCHBACK	85	0.7
08/08/1989	06:58:59	AN9805				-0.1
08/09/1989	06:59:48	AN9805				0.6
08/10/1989	06:57:17	AN9805				1.1
08/11/1989	06:56:38	AN9805				0.6
08/07/1989	07:37:30	ANG531	CHEVROLET	4 DOOR	87	0.1
08/08/1989	07:34:30	ANG531				0.1
08/09/1989	07:30:16	ANG531				0.0
08/10/1989	07:26:42	ANG531				0.1
08/11/1989	07:35:13	ANG531				0.2
08/07/1989	07:03:08	APS320	VOLKSWAGEN	4 DOOR	86	0.2
08/08/1989	07:04:03	APS320				0.0
08/09/1989	07:07:43	APS320				0.1
08/10/1989	07:03:33	APS320				0.0
08/11/1989	07:06:58	APS320				0.4
08/08/1989	09:46:05	ARPRINT-B	DODGE	VAN	89	0.8
08/09/1989	12:55:36	ARPRINT-B				0.0
08/10/1989	10:39:00	ARPRINT-B				0.0
08/11/1989	09:14:17	ARPRINT-B				0.2
08/07/1989	06:40:06	AU9711	CHRYSLER	4 DOOR	84	0.1
08/09/1989	06:38:40	AU9711				0.1
08/10/1989	06:46:58	AU9711				0.2
08/11/1989	06:39:54	AU9711				0.0
08/07/1989	07:26:25	AVK134	CHEVROLET	4 DOOR	87	0.3
08/08/1989	07:20:51	AVK134				0.0
08/09/1989	07:45:39	AVK134				0.0
08/11/1989	07:27:17	AVK134				0.2

08/08/1989	08:09:28	AW2221	CHEVROLET	2 DOOR	78	2.9
08/09/1989	08:09:33	AW2221				2.4
08/10/1989	08:36:04	AW2221				3.0
08/11/1989	08:02:42	AW2221				6.5
08/08/1989	06:57:06	AZ2893	PONTIAC	4DR SEDAN	80	0.9
08/09/1989	06:34:52	AZ2893				1.1
08/10/1989	06:52:42	AZ2893				0.3
08/11/1989	07:04:27	AZ2893				0.6
08/07/1989	08:32:53	BA7675	DODGE	VAN	79	0.4
08/08/1989	10:09:19	BA7675				0.2
08/10/1989	08:10:52	BA7675				0.4
08/11/1989	07:38:46	BA7675				0.3
08/07/1989	08:10:08	BAR151	OLDSMOBILE	COUPE	79	0.2
08/08/1989	08:09:21	BAR151				0.3
08/09/1989	08:06:44	BAR151				0.2
08/11/1989	08:10:19	BAR151				0.2
08/08/1989	06:44:53	BD5326	BUICK	4 DOOR	87	0.3
08/09/1989	06:26:25	BD5326				0.7
08/10/1989	06:35:40	BD5326				0.1
08/11/1989	06:30:24	BD5326				0.0
08/07/1989	08:29:35	BE102	LINCOLN	4 DOOR	81	0.2
08/09/1989	08:40:42	BE102				0.3
08/10/1989	08:31:04	BE102				1.6
08/11/1989	08:19:34	BE102				2.8
08/07/1989	07:10:22	BE8726	FORD	4 DOOR	89	0.0
08/08/1989	07:01:21	BE8726				0.0
08/09/1989	07:18:11	BE8726				0.0
08/10/1989	07:10:22	BE8726				0.0
08/11/1989	07:12:34	BE8726				0.0
08/07/1989	06:59:07	BEW195	OLDSMOBILE	COUPE	87	0.0
08/08/1989	07:00:49	BEW195				0.0
08/10/1989	07:02:28	BEW195				0.1
08/11/1989	07:00:51	BEW195				0.1
08/07/1989	07:56:34	BF1993	FORD	HATCHBACK	87	0.0
08/09/1989	07:46:08	BF1993				-0.1
08/10/1989	08:12:11	BF1993				0.8
08/11/1989	07:54:27	BF1993				0.0
08/08/1989	08:07:32	BILLEE1	PONTIAC	4 DOOR	82	0.1
08/09/1989	09:00:18	BILLEE1				0.1
08/10/1989	08:54:01	BILLEE1				0.1
08/11/1989	08:59:53	BILLEE1				0.4

08/07/1989	12:18:46	BKC27	DODGE	VAN	86	11.3
08/08/1989	12:39:16	BKC27				1.4
08/10/1989	06:11:03	BKC27				2.7
08/11/1989	06:14:22	BKC27				1.8
08/08/1989	07:21:36	BM7077	PONTIAC	4 DOOR	86	0.3
08/09/1989	07:03:08	BM7077				-0.1
08/10/1989	07:40:06	BM7077				0.1
08/11/1989	07:11:21	BM7077				0.3
08/07/1989	07:45:32	BN8574	CHEVROLET	COUPE	88	0.0
08/08/1989	07:42:22	BN8574				7.5
08/09/1989	07:23:07	BN8574				0.1
08/10/1989	07:25:40	BN8574				-0.1
08/08/1989	06:40:02	BN9945	DODGE	4 DOOR	81	1.0
08/09/1989	06:39:03	BN9945				6.2
08/10/1989	06:42:42	BN9945				9.4
08/11/1989	06:48:41	BN9945				10.5
08/07/1989	07:28:32	BNX676	MERCURY	4 DOOR	82	0.0
08/09/1989	07:41:40	BNX676				0.9
08/10/1989	07:28:29	BNX676				0.8
08/11/1989	07:22:51	BNX676				0.8
08/07/1989	06:36:45	BONE13	PONTIAC	SEDAN	86	0.1
08/07/1989	11:48:18	BONE13				0.9
08/08/1989	07:22:22	BONE13				0.1
08/09/1989	07:10:54	BONE13				0.3
08/10/1989	06:58:54	BONE13				0.1
08/11/1989	07:03:27	BONE13				0.2
08/07/1989	08:59:07	BP4249	CHEVROLET	COUPE	78	0.7
08/08/1989	08:35:57	BP4249				0.1
08/09/1989	08:31:03	BP4249				0.1
08/10/1989	08:37:57	BP4249				1.5
08/11/1989	08:51:29	BP4249				0.2
08/08/1989	10:53:13	BP901	OLDSMOBILE	PASSENGER	78	10.9
08/09/1989	10:08:31	BP901				7.3
08/10/1989	09:36:28	BP901				4.7
08/11/1989	09:41:18	BP901				1.9
08/08/1989	12:12:44	BR6149	HONDA	4 DOOR	83	0.1
08/09/1989	08:02:56	BR6149				0.1
08/10/1989	08:37:37	BR6149				0.0
08/11/1989	08:39:21	BR6149				0.1

08/07/1989	07:16:05	BR6987	OLDSMOBILE	4 DOOR	86	0.1
08/08/1989	07:21:22	BR6987				0.2
08/09/1989	07:15:34	BR6987				-0.2
08/10/1989	07:13:27	BR6987				0.2
08/11/1989	07:19:35	BR6987				0.2
08/08/1989	06:45:27	BT2667	CHEVROLET	4 DOOR	88	0.1
08/09/1989	06:42:23	BT2667				0.1
08/10/1989	07:05:07	BT2667				0.1
08/11/1989	06:50:58	BT2667				0.1
08/07/1989	07:08:08	BV396	OLDSMOBILE	COUPE	83	0.0
08/08/1989	09:12:15	BV396				0.0
08/09/1989	06:24:06	BV396				0.0
08/10/1989	06:27:06	BV396				0.0
08/08/1989	06:26:07	BW2980	BUICK	2 DR HT	73	0.2
08/09/1989	12:49:50	BW2980				0.1
08/10/1989	06:27:13	BW2980				0.1
08/11/1989	06:32:32	BW2980				0.2
08/07/1989	07:43:00	BW4112	BUICK	COUPE	86	0.3
08/08/1989	07:52:25	BW4112				0.2
08/09/1989	07:49:54	BW4112				0.1
08/10/1989	07:52:04	BW4112				0.3
08/07/1989	06:51:29	BX3087	OLDSMOBILE	2 DOOR	80	1.3
08/08/1989	06:54:35	BX3087				1.8
08/09/1989	06:51:02	BX3087				6.8
08/10/1989	06:50:02	BX3087				2.2
08/11/1989	06:50:01	BX3087				0.7
08/07/1989	07:48:11	BXT738	BUICK	4 DOOR	88	0.2
08/08/1989	07:37:44	BXT738				0.1
08/09/1989	07:28:19	BXT738				0.2
08/10/1989	07:28:10	BXT738				0.1
08/11/1989	07:24:01	BXT738				0.0
08/08/1989	06:28:36	BZ331	CHRYSLER	4 DOOR	74	0.7
08/09/1989	07:01:21	BZ331				1.3
08/10/1989	06:42:12	BZ331				0.4
08/11/1989	06:52:20	BZ331				1.4
08/07/1989	08:06:01	BZ6519	CADILLAC	4 DOOR	76	0.0
08/08/1989	08:07:48	BZ6519				0.0
08/09/1989	08:09:40	BZ6519				0.0
08/10/1989	08:04:18	BZ6519				0.3
08/08/1989	08:52:51	CA2864	DODGE	4 DOOR	87	0.2
08/09/1989	08:50:36	CA2864				0.5
08/09/1989	10:52:34	CA2864				4.2
08/11/1989	09:11:45	CA2864				0.2

08/07/1989	09:06:26	CAP946	CADILLAC	4 DOOR	77	0.3
08/08/1989	09:03:23	CAP946				0.3
08/09/1989	09:21:44	CAP946				4.4
08/10/1989	09:33:50	CAP946				0.7
08/08/1989	07:31:48	CAX564	OLDSMOBILE	COUPE	83	0.0
08/09/1989	07:25:19	CAX564				-0.1
08/10/1989	07:24:09	CAX564				0.0
08/11/1989	07:21:41	CAX564				-0.1
08/07/1989	08:53:30	CC8893	CHEVROLET	HATCHBACK	86	0.0
08/08/1989	09:34:46	CC8893				0.0
08/09/1989	10:05:11	CC8893				0.0
08/11/1989	08:53:50	CC8893				0.2
08/08/1989	06:26:50	CFV793	CHEVROLET	VAN	86	0.0
08/09/1989	06:29:58	CFV793				0.1
08/10/1989	06:29:00	CFV793				0.1
08/11/1989	06:27:09	CFV793				0.1
08/07/1989	07:12:18	CGH559	BUICK	4 DOOR	86	0.1
08/08/1989	07:14:47	CGH559				0.0
08/09/1989	06:46:34	CGH559				0.2
08/10/1989	07:16:50	CGH559				-0.1
08/07/1989	07:52:21	CGX721	BUICK	HATCHBACK	86	0.1
08/09/1989	07:28:11	CGX721				0.1
08/10/1989	07:31:22	CGX721				0.2
08/11/1989	07:38:27	CGX721				1.2
08/07/1989	06:53:22	CH9527	CHEVROLET	STA WAGON	86	0.3
08/08/1989	07:01:38	CH9527				0.1
08/09/1989	06:58:59	CH9527				0.3
08/10/1989	06:59:31	CH9527				0.2
08/11/1989	07:03:06	CH9527				0.2
08/07/1989	07:01:18	CJ7366	MITSUBISHI	2 DOOR	88	0.1
08/07/1989	12:04:13	CJ7366				0.1
08/09/1989	07:09:46	CJ7366				0.6
08/10/1989	07:13:21	CJ7366				0.4
08/11/1989	07:16:40	CJ7366				0.4
08/07/1989	07:47:01	CL7858	CHEVROLET	COUPE	86	0.1
08/08/1989	07:43:06	CL7858				-0.1
08/09/1989	07:31:16	CL7858				0.1
08/10/1989	07:33:19	CL7858				0.0
08/07/1989	08:23:57	CM951	FORD	HATCHBACK	88	0.1
08/08/1989	08:37:04	CM951				0.1
08/09/1989	08:31:07	CM951				0.2
08/10/1989	08:30:00	CM951				0.1
08/11/1989	08:31:54	CM951				0.2

08/08/1989	06:09:37	CN485	PLYMOUTH	HATCHBACK	89	0.2
08/09/1989	06:04:31	CN485				0.0
08/10/1989	06:41:00	CN485				1.0
08/11/1989	06:41:17	CN485				0.0
08/08/1989	06:36:28	CNL847	CHEVROLET	VAN	89	0.4
08/09/1989	06:33:50	CNL847				0.1
08/10/1989	06:36:27	CNL847				0.1
08/11/1989	06:35:37	CNL847				0.4
08/07/1989	09:07:42	CR9364	OLDSMOBILE	4 DOOR	84	4.1
08/09/1989	07:10:12	CR9364				2.3
08/10/1989	07:10:55	CR9364				0.9
08/11/1989	07:08:41	CR9364				3.8
08/07/1989	07:09:26	CT2784	FORD	HATCHBACK	88	0.1
08/08/1989	07:16:38	CT2784				0.6
08/09/1989	07:07:52	CT2784				0.2
08/11/1989	07:07:14	CT2784				0.3
08/08/1989	09:05:36	CU5040	AUDI	4 DOOR	86	0.0
08/09/1989	08:30:48	CU5040				1.1
08/09/1989	10:58:09	CU5040				0.2
08/10/1989	09:14:11	CU5040				0.3
08/11/1989	08:30:34	CU5040				0.2
08/07/1989	08:29:45	CU8856	OLDSMOBILE	COUPE	83	0.1
08/08/1989	08:27:42	CU8856				0.0
08/09/1989	08:37:18	CU8856				0.1
08/10/1989	08:31:43	CU8856				0.1
08/11/1989	08:19:08	CU8856				0.1
08/07/1989	06:57:28	CV6078	FORD	COUPE	85	-0.2
08/08/1989	07:09:28	CV6078				-0.1
08/09/1989	06:58:00	CV6078				0.1
08/10/1989	06:56:27	CV6078				0.1
08/11/1989	06:57:04	CV6078				-0.1
08/07/1989	07:19:32	CW3758	DODGE	HATCHBACK	87	0.0
08/08/1989	06:33:48	CW3758				0.0
08/09/1989	08:03:42	CW3758				0.1
08/10/1989	07:57:24	CW3758				0.2
08/11/1989	08:17:46	CW3758				0.0
08/08/1989	06:41:58	CW8774	BUICK	COUPE	80	0.0
08/09/1989	06:44:18	CW8774				0.0
08/10/1989	06:44:58	CW8774				0.1
08/11/1989	06:43:51	CW8774				0.1

08/07/1989	06:59:03	CX5964	OLDS CUTLASS	2 DOOR	86	0.1
08/08/1989	06:57:13	CX5964				0.2
08/09/1989	07:00:05	CX5964				4.8
08/10/1989	06:58:06	CX5964				3.4
08/07/1989	07:44:18	CX8309	AM MOTORS	2 DOOR	81	-0.1
08/08/1989	07:44:21	CX8309				0.4
08/09/1989	07:31:39	CX8309				0.1
08/10/1989	07:22:00	CX8309				1.1
08/11/1989	07:36:11	CX8309				1.8
08/07/1989	10:47:04	CX8465	PONTIAC	4 DOOR	73	2.0
08/08/1989	10:49:12	CX8465				0.1
08/10/1989	10:54:44	CX8465				0.1
08/11/1989	11:19:08	CX8465				0.1
08/07/1989	06:47:52	CX9723	GMC	PASSENGER	79	0.2
08/08/1989	06:53:04	CX9723				0.1
08/09/1989	06:53:06	CX9723				0.1
08/10/1989	06:51:21	CX9723				0.0
08/11/1989	06:57:20	CX9723				0.1
08/07/1989	07:10:06	CXB324	OLDSMOBILE	COUPE	84	0.0
08/08/1989	07:05:30	CXB324				0.8
08/09/1989	07:19:52	CXB324				0.2
08/10/1989	07:21:21	CXB324				0.1
08/07/1989	09:26:05	CY664	TOYOTA	4 DOOR	82	0.0
08/08/1989	09:43:48	CY664				1.0
08/10/1989	09:37:55	CY664				0.1
08/11/1989	09:41:20	CY664				1.4
08/07/1989	07:15:50	CY7246	OLDSMOBILE	4 DOOR	84	8.4
08/08/1989	07:21:13	CY7246				3.3
08/09/1989	07:14:11	CY7246				0.4
08/10/1989	07:16:13	CY7246				0.1
08/07/1989	08:07:53	CYG993	OLDSMOBILE	COUPE	84	0.0
08/09/1989	08:08:02	CYG993				0.4
08/10/1989	08:13:14	CYG993				0.2
08/11/1989	08:02:19	CYG993				0.0
08/07/1989	07:36:46	CZ8864	FORD MUSTANG	2 DOOR	80	0.1
08/08/1989	07:35:40	CZ8864				0.4
08/09/1989	07:41:57	CZ8864				-0.1
08/10/1989	07:31:03	CZ8864				0.1
08/11/1989	07:19:57	CZ8864				0.4
08/08/1989	06:24:17	DA4710	DODGE	2 DOOR	88	0.2
08/09/1989	06:26:18	DA4710				0.2
08/10/1989	06:25:32	DA4710				0.2
08/11/1989	06:28:55	DA4710				0.3

08/08/1989	10:23:28	DA781		4 DOOR	87	0.2
08/09/1989	09:11:45	DA781				0.8
08/10/1989	09:26:52	DA781				0.1
08/11/1989	10:45:09	DA781				0.0
08/07/1989	08:09:12	DB9084	BUICK	2 DOOR	84	0.1
08/08/1989	07:23:11	DB9084				0.8
08/10/1989	08:39:53	DB9084				0.1
08/11/1989	07:19:44	DB9084				0.1
08/08/1989	06:07:15	DCZ500	BUICK	COUPE	75	8.5
08/09/1989	06:07:47	DCZ500				8.6
08/10/1989	06:05:43	DCZ500				9.8
08/11/1989	05:56:15	DCZ500				11.1
08/08/1989	06:22:23	DDL486	THUNDERBIRD	2 DOOR	77	0.0
08/09/1989	06:24:20	DDL486				0.2
08/10/1989	06:24:58	DDL486				0.1
08/11/1989	06:23:04	DDL486				0.1
08/08/1989	08:15:57	DDX501	BUICK	2 DR HT	75	1.2
08/09/1989	08:10:27	DDX501				2.0
08/10/1989	08:18:13	DDX501				1.9
08/11/1989	08:22:22	DDX501				1.3
08/07/1989	09:54:21	DDY842	OLDSMOBILE	COUPE	79	0.3
08/09/1989	09:57:06	DDY842				0.3
08/10/1989	10:17:35	DDY842				0.1
08/11/1989	09:24:22	DDY842				-0.1
08/08/1989	06:02:41	DER127	CHEVROLET	STA WAGON	87	0.1
08/09/1989	06:31:47	DER127				0.4
08/10/1989	06:37:40	DER127				1.1
08/11/1989	06:40:03	DER127				-0.1
08/08/1989	06:18:30	DEY798	BUICK	COUPE	78	0.0
08/09/1989	06:29:42	DEY798				0.1
08/10/1989	06:25:23	DEY798				0.1
08/10/1989	10:04:50	DEY798				0.2
08/11/1989	06:24:42	DEY798				0.2
08/07/1989	07:45:52	DF6119	PLYMOUTH	HATCHBACK	80	0.1
08/08/1989	07:22:03	DF6119				0.3
08/09/1989	07:27:44	DF6119				0.1
08/11/1989	08:20:47	DF6119				0.5
08/07/1989	07:55:58	DF8619	CHRYSLER	2 DOOR	78	1.0
08/08/1989	06:43:38	DF8619				0.2
08/10/1989	06:40:36	DF8619				1.1
08/11/1989	07:40:44	DF8619				0.6

08/07/1989	08:08:20	DFG650	CHEV CAMARO	2 DOOR	85	0.0
08/08/1989	08:41:18	DFG650				0.4
08/09/1989	08:46:34	DFG650				0.1
08/10/1989	08:48:27	DFG650				0.0
08/11/1989	08:33:51	DFG650				0.2
08/07/1989	11:51:59	DIMITRI	CADILLAC	COUPE	78	4.1
08/08/1989	08:40:29	DIMITRI				5.5
08/09/1989	11:51:07	DIMITRI				3.4
08/11/1989	11:51:20	DIMITRI				0.4
08/07/1989	07:58:13	DLN97	VOLVO	4 DOOR	86	0.1
08/08/1989	08:06:50	DLN97				0.1
08/09/1989	08:03:49	DLN97				0.0
08/11/1989	08:00:51	DLN97				0.0
08/07/1989	07:58:19	DM2358	HONDA	HATCHBACK	80	1.7
08/08/1989	07:45:19	DM2358				1.1
08/09/1989	07:45:25	DM2358				5.1
08/11/1989	07:46:03	DM2358				4.0
08/07/1989	07:10:54	DN3481	OLDSMOBILE	COUPE	86	0.1
08/08/1989	07:10:41	DN3481				0.0
08/09/1989	07:23:02	DN3481				0.0
08/10/1989	09:31:43	DN3481				0.0
08/11/1989	07:16:47	DN3481				0.0
08/08/1989	07:39:03	DT8908	BUICK	COUPE	85	0.0
08/09/1989	07:24:20	DT8908				-0.1
08/10/1989	07:34:43	DT8908				0.0
08/11/1989	07:36:24	DT8908				0.0
08/07/1989	07:23:58	DW4065	OLDSMOBILE	COUPE	79	1.4
08/09/1989	07:16:26	DW4065				0.3
08/10/1989	07:18:56	DW4065				0.2
08/11/1989	07:21:05	DW4065				0.5
08/08/1989	06:43:57	DW5089	OLDSMOBILE	4 DOOR	76	0.1
08/09/1989	06:39:41	DW5089				0.1
08/10/1989	06:43:47	DW5089				0.0
08/11/1989	06:42:30	DW5089				0.1
08/07/1989	08:12:08	DY1267	MERCURY	4 DOOR	86	0.1
08/08/1989	07:54:39	DY1267				0.5
08/10/1989	07:57:56	DY1267				0.2
08/11/1989	08:05:45	DY1267				0.1
08/07/1989	07:43:12	DZM461	DODGE	VAN	87	0.1
08/08/1989	07:45:24	DZM461				0.2
08/09/1989	07:32:11	DZM461				0.0
08/11/1989	07:48:20	DZM461				0.0

08/08/1989	08:11:40	DZZ132	PONTIAC	HATCHBACK	84	1.7
08/09/1989	08:07:27	DZZ132				0.5
08/10/1989	08:09:33	DZZ132				0.1
08/11/1989	08:02:56	DZZ132				0.0
08/07/1989	09:25:48	EB2361	FORD	4 DOOR	89	0.5
08/08/1989	09:36:18	EB2361				0.0
08/10/1989	10:21:31	EB2361				0.1
08/11/1989	09:29:34	EB2361				0.1
08/07/1989	08:59:33	EB340	VOLVO	4 DOOR	86	0.1
08/08/1989	08:58:48	EB340				0.5
08/09/1989	12:41:34	EB340				-0.1
08/10/1989	09:05:50	EB340				0.1
08/11/1989	09:27:17	EB340				0.1
08/07/1989	07:56:24	EB7967	BUICK	COUPE	86	0.0
08/08/1989	08:01:09	EB7967				2.5
08/09/1989	07:50:39	EB7967				1.3
08/10/1989	08:03:05	EB7967				0.2
08/11/1989	07:47:06	EB7967				3.8
08/07/1989	07:38:06	EB9015	PONTIAC	HATCHBACK	86	2.4
08/08/1989	07:54:18	EB9015				3.6
08/09/1989	07:54:36	EB9015				0.5
08/10/1989	07:59:40	EB9015				1.8
08/11/1989	07:50:10	EB9015				1.0
08/07/1989	08:21:45	EC1585	FORD	HATCHBACK	86	0.1
08/08/1989	08:32:51	EC1585				0.1
08/09/1989	08:18:33	EC1585				-0.1
08/10/1989	08:25:06	EC1585				0.1
08/11/1989	08:22:11	EC1585				0.0
08/07/1989	10:38:22	EC7739	FORD	HATCHBACK	86	0.1
08/09/1989	08:15:56	EC7739				1.5
08/09/1989	10:24:02	EC7739				4.8
08/10/1989	08:50:02	EC7739				0.7
08/07/1989	06:37:29	EC8108	OLDSMOBILE	COUPE	79	3.4
08/08/1989	06:36:18	EC8108				0.3
08/09/1989	06:38:36	EC8108				4.3
08/09/1989	12:09:10	EC8108				0.8
08/10/1989	06:40:52	EC8108				1.5
08/11/1989	06:34:02	EC8108				10.6
08/08/1989	09:22:27	ECX539	CHEVROLET	4 DOOR	84	0.2
08/09/1989	09:26:12	ECX539				-0.1
08/10/1989	09:08:41	ECX539				0.0
08/11/1989	10:12:48	ECX539				0.0

08/07/1989	07:29:12	ED2132	CHEVROLET	4 DOOR	88	0.1
08/08/1989	07:24:27	ED2132				0.1
08/10/1989	07:24:04	ED2132				0.1
08/11/1989	07:17:56	ED2132				0.1
08/07/1989	06:58:01	ED9639	FORD	HATCHBACK	83	5.2
08/08/1989	06:58:07	ED9639				5.6
08/09/1989	06:58:30	ED9639				0.4
08/10/1989	06:57:54	ED9639				3.7
08/11/1989	06:58:18	ED9639				1.9
08/07/1989	11:14:56	EDK897	CHEVROLET	COUPE	86	0.5
08/08/1989	07:12:54	EDK897				0.7
08/09/1989	07:12:29	EDK897				0.5
08/10/1989	07:15:50	EDK897				0.6
08/07/1989	12:24:34	EDW470	PONTIAC	COUPE	87	0.4
08/08/1989	09:04:38	EDW470				0.2
08/09/1989	08:30:04	EDW470				0.3
08/10/1989	08:43:04	EDW470				-0.2
08/10/1989	09:56:13	EDW470				0.5
08/08/1989	06:12:18	EE2911	VOLKSWAGEN	2 DOOR	88	0.1
08/09/1989	06:11:35	EE2911				0.6
08/10/1989	06:17:53	EE2911				3.9
08/11/1989	06:17:22	EE2911				0.3
08/07/1989	07:48:17	EE4080	MERCURY	4 DOOR	78	4.7
08/09/1989	07:32:50	EE4080				6.5
08/10/1989	07:35:50	EE4080				1.0
08/11/1989	07:45:48	EE4080				4.1
08/07/1989	08:27:46	EE4680	TOYOTA	4 DOOR	86	0.1
08/08/1989	08:30:53	EE4680				1.1
08/09/1989	08:30:08	EE4680				0.0
08/10/1989	08:36:42	EE4680				0.0
08/11/1989	08:33:42	EE4680				1.4
08/07/1989	07:27:49	EE4907	PLYMOUTH	HATCHBACK	87	0.0
08/08/1989	07:25:17	EE4907				0.2
08/09/1989	07:18:55	EE4907				0.1
08/10/1989	07:19:28	EE4907				0.4
08/11/1989	07:21:36	EE4907				0.0
08/07/1989	09:17:54	EF1442	CHEVROLET	4 DOOR	74	0.8
08/08/1989	09:20:59	EF1442				4.0
08/09/1989	09:10:24	EF1442				0.6
08/11/1989	10:07:09	EF1442				0.8

08/07/1989	09:05:47	EF9056	OLDSMOBILE	4 DOOR	86	0.0
08/09/1989	09:17:03	EF9056				0.0
08/10/1989	09:00:19	EF9056				6.5
08/11/1989	09:06:41	EF9056				0.3
08/07/1989	13:09:56	EG2683	PONTIAC	HATCHBACK	85	0.0
08/09/1989	06:43:45	EG2683				0.0
08/10/1989	06:52:31	EG2683				0.2
08/11/1989	06:45:53	EG2683				0.0
08/07/1989	06:52:37	EGYWIZE-B	FORD	PICKUP	86	0.0
08/08/1989	06:58:03	EGYWIZE-B				-0.1
08/09/1989	06:58:40	EGYWIZE-B				0.0
08/10/1989	07:06:03	EGYWIZE-B				0.1
08/11/1989	06:58:05	EGYWIZE-B				0.1
08/07/1989	09:32:45	EH2232	CHEVROLET	HATCHBACK	81	0.1
08/08/1989	10:10:33	EH2232				0.5
08/09/1989	12:10:41	EH2232				0.8
08/11/1989	12:02:04	EH2232				0.6
08/07/1989	07:36:36	EH2741	FORD	VAN	86	0.0
08/08/1989	07:41:04	EH2741				0.4
08/09/1989	07:28:52	EH2741				0.0
08/10/1989	07:36:30	EH2741				0.1
08/11/1989	07:32:30	EH2741				0.2
08/08/1989	06:54:11	EH4959	TOYOTA	2 DOOR	85	6.8
08/09/1989	06:47:29	EH4959				0.7
08/10/1989	06:55:02	EH4959				5.0
08/11/1989	07:08:27	EH4959				6.5
08/07/1989	08:08:00	EH5362	DODGE	2 DR HT	73	1.4
08/08/1989	08:17:37	EH5362				1.3
08/09/1989	08:12:34	EH5362				0.6
08/10/1989	08:12:23	EH5362				0.4
08/11/1989	08:07:28	EH5362				0.5
08/08/1989	06:48:05	EH9194	OLDSMOBILE	PASSENGER	78	0.0
08/09/1989	06:52:09	EH9194				0.2
08/10/1989	06:50:52	EH9194				0.0
08/11/1989	06:49:20	EH9194				0.2
08/07/1989	07:22:36	EH9826	OLDSMOBILE	COUPE	86	0.0
08/08/1989	07:23:04	EH9826				-0.2
08/09/1989	07:12:49	EH9826				-0.2
08/10/1989	07:21:46	EH9826				0.1
08/11/1989	07:22:30	EH9826				0.0

08/08/1989	07:05:09	EHE129	MERCURY	4 DOOR	88	0.0
08/09/1989	06:52:00	EHE129				0.1
08/10/1989	07:03:36	EHE129				-0.1
08/11/1989	07:13:23	EHE129				0.2
08/08/1989	06:58:26	EJ4876	PONTIAC	PASSENGER	78	3.4
08/09/1989	06:55:02	EJ4876				0.2
08/10/1989	06:54:04	EJ4876				0.1
08/11/1989	06:58:30	EJ4876				0.2
08/07/1989	07:08:26	EJZ48	CHEVROLET	4 DOOR	77	1.2
08/09/1989	07:02:54	EJZ48				0.5
08/10/1989	07:04:44	EJZ48				5.3
08/11/1989	07:09:03	EJZ48				1.0
08/07/1989	08:22:48	EKC834	VOLVO	4 DOOR	84	0.1
08/08/1989	09:27:00	EKC834				1.4
08/09/1989	08:59:39	EKC834				0.3
08/10/1989	08:12:52	EKC834				0.1
08/08/1989	07:52:51	EKN849	PLYMOUTH	HATCHBACK	87	0.0
08/09/1989	07:37:57	EKN849				-0.3
08/10/1989	07:43:47	EKN849				0.4
08/11/1989	07:45:17	EKN849				0.1
08/07/1989	07:51:29	EKS150	BUICK	STA WAGON	77	0.1
08/08/1989	08:01:05	EKS150				0.2
08/09/1989	07:56:21	EKS150				0.1
08/10/1989	07:49:16	EKS150				0.1
08/11/1989	07:48:29	EKS150				0.1
08/07/1989	09:03:39	EL9101	PLYMOUTH	HATCHBACK	89	0.5
08/09/1989	08:49:21	EL9101				0.4
08/10/1989	09:23:47	EL9101				0.1
08/11/1989	09:12:59	EL9101				0.1
08/07/1989	11:19:23	ELF141	MERCURY	4 DOOR	87	0.1
08/09/1989	06:57:19	ELF141				0.0
08/10/1989	06:48:46	ELF141				0.1
08/11/1989	06:28:36	ELF141				7.3
08/07/1989	07:23:13	ELH190	MERCURY	2 DOOR	87	0.1
08/08/1989	07:28:15	ELH190				0.0
08/10/1989	07:24:39	ELH190				0.0
08/11/1989	07:28:10	ELH190				0.1
08/07/1989	10:10:00	ELR495	OLDSMOBILE	4 DOOR	84	2.1
08/08/1989	10:03:49	ELR495				0.7
08/09/1989	10:42:33	ELR495				2.7
08/11/1989	11:42:09	ELR495				1.5

08/07/1989	10:41:16	EM3679	BUICK	4 DOOR	87	0.1
08/08/1989	10:36:22	EM3679				1.0
08/09/1989	10:42:35	EM3679				0.1
08/11/1989	10:41:10	EM3679				0.0
08/07/1989	08:12:42	ENE331	FORD	HATCHBACK	84	6.2
08/08/1989	07:36:40	ENE331				1.4
08/09/1989	08:09:21	ENE331				3.7
08/11/1989	08:34:01	ENE331				2.5
08/07/1989	07:42:03	EP9145	MERCURY	2 DOOR	84	-0.6
08/08/1989	07:40:33	EP9145				-0.1
08/09/1989	07:35:13	EP9145				0.0
08/10/1989	07:34:23	EP9145				0.6
08/11/1989	07:43:16	EP9145				0.0
08/08/1989	06:59:43	EP9785	CHEVROLET	4 DOOR	77	1.4
08/09/1989	07:14:41	EP9785				0.7
08/10/1989	07:06:20	EP9785				0.4
08/11/1989	07:03:09	EP9785				0.5
08/08/1989	07:57:08	EPL262	TOYOTA	2 DOOR	81	0.0
08/09/1989	07:54:08	EPL262				7.5
08/10/1989	07:51:26	EPL262				0.9
08/11/1989	07:50:55	EPL262				0.1
08/08/1989	06:31:07	ER2737	BUICK	4 DOOR	82	0.0
08/09/1989	06:29:02	ER2737				0.0
08/10/1989	06:36:19	ER2737				4.5
08/11/1989	06:32:50	ER2737				0.1
08/07/1989	11:50:11	ERH293	CHEVROLET	HATCHBACK	79	3.8
08/08/1989	11:58:54	ERH293				5.3
08/09/1989	12:17:47	ERH293				4.2
08/11/1989	11:10:18	ERH293				4.5
08/07/1989	08:24:17	EU3156	OLDSMOBILE	COUPE	86	3.8
08/08/1989	08:23:45	EU3156				-0.1
08/09/1989	08:08:42	EU3156				0.0
08/10/1989	08:24:49	EU3156				0.0
08/11/1989	08:20:16	EU3156				0.1
08/08/1989	06:02:35	EUZ500	CHEVROLET	2 DOOR	87	0.1
08/09/1989	06:01:03	EUZ500				0.1
08/10/1989	06:07:39	EUZ500				0.0
08/11/1989	06:05:38	EUZ500				0.2
08/07/1989	07:06:55	EV1657	DODGE	4 DOOR	89	0.0
08/08/1989	07:07:31	EV1657				0.6
08/10/1989	07:08:48	EV1657				0.3
08/11/1989	07:07:22	EV1657				0.1

08/07/1989	09:51:42	EVL195	BUICK	SEDAN	86	0.1
08/08/1989	07:06:30	EVL195				-0.2
08/09/1989	07:18:36	EVL195				0.4
08/10/1989	07:00:59	EVL195				0.4
08/07/1989	07:49:37	EVN270	CHRYSLER	4 DR HT	79	0.5
08/08/1989	07:48:44	EVN270				0.1
08/09/1989	07:53:40	EVN270				0.3
08/10/1989	07:55:12	EVN270				0.1
08/11/1989	07:38:10	EVN270				0.6
08/07/1989	06:57:01	EVR392	BUICK	COUPE	86	0.5
08/08/1989	06:54:26	EVR392				0.0
08/09/1989	06:52:20	EVR392				0.1
08/10/1989	06:53:23	EVR392				0.0
08/11/1989	06:53:51	EVR392				0.1
08/07/1989	07:35:32	EVR947	CHEVROLET	4 DOOR	72	7.5
08/08/1989	07:27:32	EVR947				5.1
08/09/1989	07:45:41	EVR947				1.9
08/10/1989	07:21:05	EVR947				1.2
08/11/1989	07:25:06	EVR947				2.7
08/07/1989	07:06:39	EWC134	HONDA	4 DOOR	87	0.4
08/08/1989	07:22:57	EWC134				0.0
08/09/1989	07:19:49	EWC134				0.0
08/10/1989	07:10:27	EWC134				-0.1
08/11/1989	06:28:28	EWC134				2.2
08/07/1989	07:40:45	EXR493	DODGE	2 DOOR	85	0.0
08/08/1989	07:44:03	EXR493				0.2
08/10/1989	07:52:14	EXR493				0.0
08/11/1989	07:47:32	EXR493				1.4
08/07/1989	08:48:11	EXX416	HONDA	4 DOOR	88	0.1
08/08/1989	08:35:35	EXX416				0.0
08/09/1989	08:14:38	EXX416				0.0
08/10/1989	08:20:49	EXX416				0.0
08/11/1989	08:24:37	EXX416				-0.1
08/07/1989	09:16:10	EYA968	CHEVROLET	4 DOOR	88	0.1
08/08/1989	09:18:34	EYA968				1.0
08/09/1989	10:07:08	EYA968				0.1
08/10/1989	09:02:44	EYA968				0.1
08/11/1989	09:21:35	EYA968				0.0
08/07/1989	07:07:43	EZ4252	BUICK	COUPE	84	5.0
08/08/1989	06:52:16	EZ4252				0.5
08/09/1989	06:43:22	EZ4252				0.3
08/10/1989	06:43:17	EZ4252				0.4
08/11/1989	07:03:17	EZ4252				0.7

08/08/1989	06:41:09	EZ6527	BUICK	COUPE	87	0.2
08/08/1989	11:18:51	EZ6527				0.1
08/09/1989	06:40:31	EZ6527				0.0
08/09/1989	11:08:15	EZ6527				0.7
08/10/1989	06:44:25	EZ6527				0.0
08/11/1989	06:40:27	EZ6527				0.0
08/07/1989	07:52:49	FAP126	CHRYSLER	4 DOOR	84	0.0
08/08/1989	08:00:36	FAP126				0.5
08/09/1989	08:09:44	FAP126				0.1
08/11/1989	08:12:13	FAP126				0.3
08/07/1989	07:27:53	FD9653	CHEVROLET	4 DOOR	78	0.6
08/09/1989	07:28:41	FD9653				0.2
08/10/1989	07:23:56	FD9653				0.3
08/11/1989	07:15:49	FD9653				0.3
08/07/1989	10:23:56	FJ2004	RENAULT	2 DOOR	85	0.2
08/08/1989	11:43:47	FJ2004				0.1
08/09/1989	10:31:49	FJ2004				0.1
08/10/1989	10:21:39	FJ2004				0.2
08/08/1989	07:03:47	FJ8064	TOYOTA	4 DOOR	88	0.0
08/09/1989	07:03:00	FJ8064				0.1
08/10/1989	07:08:10	FJ8064				0.3
08/11/1989	07:01:54	FJ8064				0.1
08/07/1989	08:00:38	FK570	TOYOTA	4 DOOR	88	0.0
08/08/1989	08:00:41	FK570				0.2
08/09/1989	08:02:52	FK570				0.3
08/10/1989	08:09:42	FK570				0.0
08/11/1989	08:04:03	FK570				0.0
08/07/1989	07:06:52	FL8682	CADILLAC	COUPE	80	0.2
08/09/1989	07:02:41	FL8682				0.1
08/10/1989	07:12:21	FL8682				0.5
08/11/1989	07:04:10	FL8682				0.4
08/07/1989	08:09:35	FNB265	OLDSMOBILE	STA WAGON	85	0.1
08/08/1989	08:04:50	FNB265				0.1
08/09/1989	07:41:38	FNB265				0.0
08/10/1989	07:58:31	FNB265				0.5
08/07/1989	10:12:51	FOX860		4DR SEDAN	86	1.6
08/09/1989	10:08:33	FOX860				1.7
08/10/1989	09:57:43	FOX860				0.3
08/11/1989	09:59:46	FOX860				-0.1
08/07/1989	08:02:38	FP5704	CHEVROLET	4 DOOR	87	0.0
08/08/1989	07:49:18	FP5704				-0.1
08/10/1989	07:33:47	FP5704				0.0
08/11/1989	07:49:23	FP5704				0.1

08/08/1989	06:51:20	FS124	CHEVROLET	4 DOOR	78	3.1
08/09/1989	06:49:52	FS124				2.4
08/10/1989	06:50:20	FS124				3.1
08/11/1989	06:45:20	FS124				5.7
08/08/1989	06:14:27	FXZ221	BUICK	COUPE	83	0.0
08/09/1989	06:15:08	FXZ221				0.0
08/10/1989	06:14:16	FXZ221				0.1
08/11/1989	06:13:37	FXZ221				0.0
08/07/1989	06:43:48	FY9049	BUICK	COUPE	82	0.1
08/08/1989	06:41:20	FY9049				0.1
08/09/1989	06:43:41	FY9049				0.2
08/10/1989	06:49:49	FY9049				1.8
08/08/1989	06:46:25	FZ2267	AM MOTORS	STA WAGON	89	0.3
08/09/1989	06:50:03	FZ2267				0.1
08/10/1989	06:46:00	FZ2267				0.0
08/11/1989	06:54:03	FZ2267				0.1
08/08/1989	07:27:30	FZE180	FORD	PASSENGER	84	3.3
08/09/1989	07:20:44	FZE180				0.0
08/10/1989	07:22:56	FZE180				0.0
08/11/1989	07:18:28	FZE180				0.3
08/08/1989	06:56:33	GA3726	PLYMOUTH	HATCHBACK	87	0.2
08/09/1989	07:02:29	GA3726				0.0
08/09/1989	13:26:19	GA3726				0.0
08/10/1989	07:15:58	GA3726				0.0
08/07/1989	08:13:15	GB6569	FORD	4 DOOR	78	0.3
08/08/1989	07:35:45	GB6569				0.1
08/09/1989	08:20:05	GB6569				-0.1
08/11/1989	09:40:54	GB6569				0.4
08/08/1989	06:08:18	GB8231	BUICK	PASSENGER	76	5.5
08/09/1989	06:11:54	GB8231				4.6
08/10/1989	06:07:15	GB8231				4.1
08/11/1989	06:09:38	GB8231				4.1
08/07/1989	13:31:25	GC9328	FORD	HATCHBACK	86	1.2
08/08/1989	06:23:46	GC9328				0.2
08/09/1989	11:09:44	GC9328				0.3
08/10/1989	06:13:37	GC9328				0.2
08/11/1989	10:49:16	GC9328				4.5
08/07/1989	06:54:24	GD1528	PONTIAC	4 DOOR	80	0.0
08/08/1989	06:54:52	GD1528				0.0
08/09/1989	06:56:55	GD1528				0.1
08/10/1989	06:54:36	GD1528				-0.1
08/11/1989	06:51:28	GD1528				0.1

08/07/1989	08:27:36	GD5427	TOYOTA	2 DOOR	83	0.0
08/08/1989	08:21:03	GD5427				0.0
08/10/1989	08:13:53	GD5427				-0.1
08/11/1989	08:26:59	GD5427				0.2
08/08/1989	07:21:28	GE3054	OLDSMOBILE	COUPE	85	0.1
08/09/1989	07:16:47	GE3054				0.0
08/10/1989	07:16:09	GE3054				-0.1
08/11/1989	07:18:08	GE3054				0.2
08/07/1989	07:13:26	GE3697	CHEVROLET	STA WAGON	79	0.1
08/08/1989	07:11:49	GE3697				-0.1
08/09/1989	07:06:55	GE3697				-0.1
08/10/1989	07:14:25	GE3697				0.2
08/11/1989	07:09:18	GE3697				0.2
08/07/1989	06:50:35	GF2659	FIAT	4 DOOR	79	2.2
08/08/1989	06:48:29	GF2659				4.4
08/09/1989	06:46:39	GF2659				2.3
08/10/1989	06:48:02	GF2659				1.5
08/11/1989	06:54:44	GF2659				2.2
08/07/1989	08:37:37	GFT313	FORD	STA WAGON	79	11.6
08/08/1989	08:31:22	GFT313				12.6
08/09/1989	08:30:29	GFT313				10.9
08/10/1989	08:24:01	GFT313				6.0
08/11/1989	08:26:22	GFT313				10.9
08/07/1989	07:02:12	GG5698	FORD	HATCHBACK	85	0.1
08/08/1989	06:57:09	GG5698				0.7
08/09/1989	06:57:42	GG5698				1.0
08/10/1989	06:59:25	GG5698				1.0
08/07/1989	10:32:09	GGG278	BUICK	4 DOOR	83	0.7
08/08/1989	09:50:21	GGG278				0.8
08/09/1989	09:57:34	GGG278				0.4
08/10/1989	10:25:59	GGG278				0.7
08/11/1989	09:30:25	GGG278				0.5
08/07/1989	06:41:17	GGYONG	CADILLAC	COUPE	77	0.1
08/08/1989	06:38:10	GGYONG				0.1
08/10/1989	06:36:33	GGYONG				0.0
08/11/1989	06:38:19	GGYONG				5.9
08/07/1989	07:04:08	GJ5211	BUICK	4 DOOR	80	1.0
08/08/1989	06:46:18	GJ5211				1.6
08/09/1989	07:04:47	GJ5211				1.8
08/10/1989	06:39:08	GJ5211				1.3

08/07/1989	07:26:52	GLX300	BUICK	COUPE	84	0.0
08/08/1989	07:25:39	GLX300				0.2
08/09/1989	07:30:07	GLX300				0.3
08/11/1989	07:01:37	GLX300				0.1
08/07/1989	06:51:45	GN5196	OLDS CUTLASS	2 DOOR	77	0.8
08/08/1989	06:57:01	GN5196				1.8
08/09/1989	07:00:16	GN5196				0.9
08/10/1989	06:52:19	GN5196				0.3
08/11/1989	06:51:31	GN5196				0.3
08/07/1989	07:16:19	GN5951	CHEVROLET	2 DOOR	79	0.1
08/08/1989	07:18:26	GN5951				3.3
08/09/1989	07:14:24	GN5951				3.6
08/10/1989	07:15:04	GN5951				0.4
08/07/1989	06:40:12	GNB462	BUICK	COUPE	80	0.6
08/08/1989	06:37:54	GNB462				0.3
08/09/1989	06:33:16	GNB462				0.9
08/09/1989	12:15:52	GNB462				0.3
08/10/1989	06:36:06	GNB462				0.3
08/11/1989	06:35:20	GNB462				1.7
08/07/1989	07:16:54	GOP28	CHRYSLER	4 DOOR	86	0.0
08/08/1989	07:20:15	GOP28				0.1
08/09/1989	07:15:19	GOP28				0.0
08/10/1989	07:18:15	GOP28				0.1
08/07/1989	07:42:02	GP6149	BUICK	4 DOOR	82	2.4
08/08/1989	06:46:37	GP6149				0.6
08/09/1989	06:43:04	GP6149				0.1
08/11/1989	06:45:33	GP6149				0.3
08/07/1989	08:22:43	GR3885	TOYOTA	4 DOOR	89	0.0
08/08/1989	08:45:02	GR3885				-0.1
08/09/1989	08:06:59	GR3885				0.0
08/10/1989	08:22:07	GR3885				0.2
08/11/1989	08:21:41	GR3885				0.0
08/07/1989	06:48:36	GS1851	FORD	STA WAGON	76	0.2
08/09/1989	06:44:15	GS1851				0.1
08/10/1989	06:44:01	GS1851				0.2
08/11/1989	06:41:30	GS1851				0.2
08/07/1989	07:55:23	GS2773	BUICK	4 DOOR	84	0.3
08/08/1989	07:57:58	GS2773				0.9
08/09/1989	07:50:29	GS2773				0.0
08/10/1989	08:03:51	GS2773				0.8
08/11/1989	07:53:58	GS2773				0.1

08/07/1989	08:07:44	GU9003	OLDSMOBILE	COUPE	81	0.0
08/08/1989	08:12:13	GU9003				0.1
08/09/1989	09:00:28	GU9003				0.0
08/10/1989	08:23:09	GU9003				0.2
08/08/1989	06:35:30	GVU224	BUICK	COUPE	85	3.7
08/09/1989	06:34:40	GVU224				-0.1
08/10/1989	06:32:37	GVU224				0.1
08/11/1989	06:34:40	GVU224				0.3
08/07/1989	08:00:46	GWA256	CHEVROLET	COUPE	84	0.1
08/08/1989	07:56:50	GWA256				0.1
08/10/1989	07:46:20	GWA256				0.2
08/11/1989	08:01:58	GWA256				0.0
08/07/1989	08:16:01	GWX491	CHEVROLET	PASSENGER	88	0.0
08/09/1989	08:14:11	GWX491				-0.1
08/10/1989	08:19:22	GWX491				0.1
08/11/1989	08:34:05	GWX491				0.1
08/07/1989	07:32:00	GWY238	CADILLAC	COUPE	76	0.0
08/08/1989	07:34:25	GWY238				0.1
08/09/1989	07:39:49	GWY238				3.1
08/10/1989	07:27:13	GWY238				0.5
08/11/1989	07:39:41	GWY238				0.3
08/11/1989	10:29:38	GWY238				0.8
08/07/1989	06:45:36	GX8476		4 DOOR	88	0.9
08/08/1989	06:55:55	GX8476				0.1
08/09/1989	06:44:41	GX8476				0.8
08/10/1989	06:43:07	GX8476				3.0
08/11/1989	06:52:51	GX8476				0.1
08/07/1989	08:29:50	GZM462		2 DOOR	87	0.8
08/08/1989	08:37:51	GZM462				0.1
08/09/1989	08:33:46	GZM462				0.0
08/10/1989	08:24:33	GZM462				0.0
08/07/1989	08:07:35	HB9176	BUICK	COUPE	88	0.1
08/08/1989	08:23:13	HB9176				0.0
08/09/1989	08:18:24	HB9176				0.0
08/10/1989	08:10:40	HB9176				-0.1
08/08/1989	07:41:47	HBG717		4 DOOR	89	-0.1
08/09/1989	08:01:25	HBG717				0.1
08/10/1989	07:56:02	HBG717				0.0
08/11/1989	09:08:45	HBG717				0.0
08/07/1989	07:21:49	HC3180	OLDSMOBILE	COUPE	80	0.3
08/08/1989	07:18:48	HC3180				0.0
08/09/1989	07:14:45	HC3180				0.1
08/10/1989	07:19:34	HC3180				0.3

08/07/1989	07:30:08	HD4431	DODGE	HATCHBACK	87	0.4
08/08/1989	07:22:07	HD4431				0.0
08/09/1989	07:23:47	HD4431				0.1
08/10/1989	07:26:43	HD4431				0.0
08/07/1989	08:30:10	HDB174	OLDSMOBILE	4 DOOR	79	0.0
08/08/1989	08:46:49	HDB174				1.0
08/09/1989	08:40:20	HDB174				1.8
08/10/1989	07:50:41	HDB174				0.2
08/07/1989	07:17:25	HEATH99	FORD	4DR WAGON	82	0.2
08/08/1989	07:12:04	HEATH99				0.0
08/09/1989	07:13:24	HEATH99				0.2
08/10/1989	07:16:32	HEATH99				0.2
08/08/1989	07:50:54	HH6732		HATCHBACK	88	0.5
08/09/1989	07:27:36	HH6732				0.3
08/10/1989	07:54:06	HH6732				2.7
08/11/1989	08:01:10	HH6732				3.0
08/07/1989	07:50:52	HK5106	FORD	HATCHBACK	85	0.0
08/08/1989	07:54:08	HK5106				0.1
08/09/1989	07:47:36	HK5106				0.0
08/10/1989	07:56:13	HK5106				0.0
08/11/1989	07:53:47	HK5106				0.4
08/07/1989	11:41:37	HOHO7	DATSUN	COUPE	74	1.1
08/08/1989	11:55:25	HOHO7				3.6
08/09/1989	11:53:11	HOHO7				0.0
08/11/1989	12:06:04	HOHO7				0.3
08/07/1989	09:34:50	HR8482		COUPE	89	0.0
08/08/1989	09:05:42	HR8482				0.0
08/10/1989	09:08:34	HR8482				0.0
08/11/1989	09:18:58	HR8482				0.0
08/07/1989	12:03:34	HRC622	CADILLAC	4 DOOR	83	0.0
08/08/1989	07:59:42	HRC622				0.2
08/09/1989	07:59:20	HRC622				0.1
08/10/1989	08:07:12	HRC622				0.0
08/08/1989	06:08:25	HU4008	PONTIAC	4 DOOR	84	0.5
08/09/1989	06:03:33	HU4008				0.3
08/10/1989	06:05:32	HU4008				0.4
08/11/1989	06:13:10	HU4008				0.5
08/08/1989	09:03:20	HU5246	BUICK	COUPE	79	1.4
08/09/1989	10:19:48	HU5246				1.0
08/10/1989	08:34:33	HU5246				6.5
08/11/1989	10:00:06	HU5246				6.7

08/08/1989	07:48:01	HU857	OLDSMOBILE	COUPE	81	0.5
08/09/1989	07:39:52	HU857				0.3
08/10/1989	07:51:06	HU857				0.2
08/10/1989	09:28:28	HU857				0.3
08/11/1989	07:37:02	HU857				0.7
08/07/1989	07:23:00	HV3894	OLDSMOBILE	4 DOOR	81	7.1
08/08/1989	07:15:08	HV3894				2.8
08/09/1989	07:27:48	HV3894				3.1
08/10/1989	07:13:31	HV3894				1.2
08/11/1989	07:13:32	HV3894				0.6
08/07/1989	06:51:16	HVV355	CHEVROLET	HATCHBACK	85	0.1
08/08/1989	07:13:04	HVV355				0.3
08/10/1989	07:18:33	HVV355				0.5
08/11/1989	07:03:37	HVV355				0.1
08/07/1989	08:15:52	HW6586	DODGE	HATCHBACK	81	2.3
08/08/1989	08:19:39	HW6586				1.6
08/09/1989	08:36:59	HW6586				0.0
08/10/1989	08:18:56	HW6586				0.1
08/11/1989	08:24:29	HW6586				0.4
08/07/1989	08:16:11	HXY658	MERCURY	4 DOOR	88	0.1
08/08/1989	08:15:03	HXY658				0.1
08/09/1989	08:17:16	HXY658				0.0
08/10/1989	08:16:14	HXY658				0.1
08/11/1989	08:16:43	HXY658				0.1
08/07/1989	08:53:17	HY7409	CADILLAC	4 DOOR	81	0.1
08/08/1989	08:24:49	HY7409				0.0
08/09/1989	09:12:43	HY7409				0.0
08/10/1989	08:35:27	HY7409				0.2
08/07/1989	08:16:32	HZ8091	HONDA	4 DOOR	88	3.2
08/08/1989	07:54:25	HZ8091				0.7
08/09/1989	07:34:10	HZ8091				0.0
08/11/1989	08:23:18	HZ8091				0.9
08/07/1989	07:26:45	IB3710	PLYMOUTH	HATCHBACK	88	0.1
08/08/1989	07:18:21	IB3710				0.1
08/09/1989	07:18:33	IB3710				0.1
08/10/1989	07:24:15	IB3710				0.4
08/08/1989	07:55:42	ICE57	PONTIAC	2 DOOR	82	0.1
08/09/1989	07:47:15	ICE57				0.0
08/10/1989	07:39:11	ICE57				0.1
08/11/1989	07:42:36	ICE57				0.7

08/07/1989	06:53:37	ID6184	OLDSMOBILE	4 DOOR	87	0.0
08/08/1989	06:55:14	ID6184				0.0
08/10/1989	06:58:16	ID6184				0.4
08/11/1989	07:05:54	ID6184				0.0
08/07/1989	07:58:52	IE7320	DODGE	STA WAGON	85	0.1
08/08/1989	07:50:04	IE7320				-0.3
08/09/1989	07:12:32	IE7320				0.3
08/10/1989	07:53:28	IE7320				-0.2
08/07/1989	07:26:04	IG3243		2 DOOR	87	0.2
08/08/1989	07:32:33	IG3243				0.0
08/09/1989	07:30:02	IG3243				0.1
08/10/1989	07:27:35	IG3243				0.1
08/11/1989	07:31:11	IG3243				0.5
08/07/1989	07:47:24	IK3544	TOYOTA	HATCHBACK	84	0.2
08/08/1989	10:20:36	IK3544				0.1
08/09/1989	10:25:44	IK3544				0.0
08/11/1989	08:17:12	IK3544				0.2
08/07/1989	06:48:23	IK688	RENAULT	4 DOOR	87	-0.1
08/08/1989	06:43:10	IK688				-0.2
08/09/1989	06:44:29	IK688				0.0
08/10/1989	06:46:55	IK688				0.1
08/11/1989	06:47:10	IK688				-0.1
08/07/1989	07:32:12	IM6636	OLDSMOBILE	COUPE	87	0.1
08/09/1989	07:21:32	IM6636				0.1
08/10/1989	07:18:11	IM6636				0.3
08/11/1989	09:42:51	IM6636				0.1
08/07/1989	07:42:46	IMFREE	CHRYSLER	2 DOOR	80	0.0
08/08/1989	07:58:50	IMFREE				0.1
08/10/1989	07:45:19	IMFREE				0.0
08/11/1989	07:46:43	IMFREE				-0.1
08/07/1989	07:15:12	IR4548	CHEVROLET	4 DOOR	82	4.2
08/08/1989	06:35:59	IR4548				2.8
08/09/1989	07:43:32	IR4548				3.2
08/11/1989	08:05:35	IR4548				4.4
08/07/1989	07:31:05	IRMIE	FORD	2 DOOR	88	6.3
08/08/1989	07:31:35	IRMIE				1.5
08/09/1989	07:28:06	IRMIE				0.1
08/10/1989	07:30:26	IRMIE				4.0
08/11/1989	07:32:10	IRMIE				1.4
08/07/1989	10:19:55	IS8824	OLDSMOBILE	COUPE	85	-0.2
08/09/1989	12:34:31	IS8824				0.8
08/10/1989	10:26:10	IS8824				0.2
08/11/1989	10:29:46	IS8824				0.1

08/07/1989	06:39:04	IT5439	HONDA	4 DOOR	87	0.3
08/08/1989	06:38:20	IT5439				0.1
08/09/1989	06:39:18	IT5439				0.5
08/10/1989	06:41:28	IT5439				0.2
08/11/1989	11:44:53	IT5439				0.4
08/08/1989	06:12:59	IW8865	BUICK	COUPE	78	0.0
08/09/1989	06:11:02	IW8865				0.2
08/10/1989	06:11:26	IW8865				0.2
08/11/1989	06:13:34	IW8865				0.1
08/07/1989	08:51:55	IX2239	BUICK	COUPE	87	0.1
08/07/1989	10:05:45	IX2239				0.1
08/08/1989	13:09:13	IX2239				0.9
08/09/1989	09:40:05	IX2239				0.5
08/11/1989	12:25:57	IX2239				0.2
08/07/1989	08:02:07	IY9376	CADILLAC	4 DOOR	81	0.1
08/08/1989	07:53:38	IY9376				0.1
08/09/1989	07:23:53	IY9376				0.2
08/10/1989	07:43:05	IY9376				3.3
08/11/1989	07:47:55	IY9376				-0.1
08/07/1989	08:16:08	IZ957	CHEVROLET	COUPE	89	0.0
08/08/1989	08:31:11	IZ957				0.1
08/09/1989	08:13:23	IZ957				0.0
08/11/1989	08:03:35	IZ957				0.1
08/07/1989	07:38:37	JBZ873	TOYOTA	2 DOOR	82	0.0
08/08/1989	07:42:57	JBZ873				-0.1
08/09/1989	07:42:22	JBZ873				4.3
08/10/1989	07:47:59	JBZ873				5.0
08/08/1989	06:22:50	JD1516	OLDSMOBILE	STA WAGON	78	0.2
08/09/1989	06:26:29	JD1516				0.0
08/10/1989	06:30:04	JD1516				0.1
08/11/1989	06:26:17	JD1516				0.2
08/09/1989	07:34:43	JD9580	VOLVO	4 DOOR	80	0.1
08/10/1989	08:02:34	JD9580				0.1
08/10/1989	10:16:10	JD9580				0.1
08/11/1989	10:32:26	JD9580				0.2
08/07/1989	10:32:52	JDL4	DODGE	2 DOOR	85	0.2
08/08/1989	09:59:18	JDL4				-0.1
08/09/1989	12:37:15	JDL4				-0.1
08/11/1989	10:23:53	JDL4				0.5
08/07/1989	08:10:34	JDW188	TOYOTA	2 DOOR	78	6.4
08/08/1989	08:35:25	JDW188				3.1
08/10/1989	08:15:07	JDW188				7.2
08/11/1989	08:28:19	JDW188				3.2

08/07/1989	07:51:52	JDY570	FORD	4 DOOR	85	0.7
08/08/1989	07:54:14	JDY570				0.2
08/09/1989	07:56:34	JDY570				0.2
08/10/1989	07:48:46	JDY570				5.2
08/11/1989	07:59:54	JDY570				0.3
08/07/1989	09:16:18	JFB166	FORD	4 DR HT	79	0.0
08/08/1989	08:26:28	JFB166				2.2
08/09/1989	06:41:27	JFB166				2.3
08/10/1989	09:41:21	JFB166				2.5
08/11/1989	08:36:35	JFB166				2.7
08/07/1989	06:54:36	JG4374	DODGE	HATCHBACK	87	0.1
08/08/1989	07:04:17	JG4374				0.2
08/09/1989	07:00:10	JG4374				0.4
08/10/1989	06:55:04	JG4374				-0.4
08/08/1989	06:06:55	JGV947	FORD BRONCO	VAN	79	2.7
08/09/1989	06:10:28	JGV947				3.5
08/10/1989	06:09:29	JGV947				4.1
08/11/1989	06:07:55	JGV947				3.0
08/08/1989	07:12:45	JH2761	PONTIAC	4 DOOR	82	0.3
08/09/1989	06:39:37	JH2761				2.6
08/10/1989	06:35:31	JH2761				0.5
08/11/1989	06:28:46	JH2761				0.7
08/08/1989	06:19:30	JJ4608	FORD	HATCHBACK	87	0.3
08/09/1989	06:16:07	JJ4608				0.2
08/10/1989	06:15:14	JJ4608				0.3
08/11/1989	06:11:16	JJ4608				0.2
08/07/1989	06:51:36	JJG122	BUICK	4 DOOR	85	-0.1
08/08/1989	06:51:12	JJG122				0.0
08/09/1989	06:47:15	JJG122				0.3
08/10/1989	06:44:44	JJG122				0.1
08/08/1989	06:08:47	JJH114	CHEVROLET	COUPE	85	0.1
08/09/1989	06:07:59	JJH114				0.7
08/10/1989	06:07:12	JJH114				0.1
08/11/1989	06:07:48	JJH114				0.6
08/08/1989	08:39:40	JK2628	CHEVROLET	2 DOOR	88	0.1
08/09/1989	08:28:33	JK2628				0.0
08/10/1989	08:38:58	JK2628				0.1
08/11/1989	08:30:10	JK2628				0.0
08/07/1989	07:53:08	JK4663	MERCURY	4 DOOR	87	0.0
08/08/1989	07:07:44	JK4663				0.1
08/09/1989	07:12:42	JK4663				0.0
08/10/1989	06:59:07	JK4663				0.0

08/07/1989	10:40:43	JL3361	PLYMOUTH	VAN	86	0.0
08/09/1989	12:50:55	JL3361				0.1
08/10/1989	10:48:13	JL3361				0.0
08/11/1989	12:04:02	JL3361				-0.1
08/08/1989	08:51:31	JLJ141	TOYOTA	4 DOOR	87	0.3
08/09/1989	08:51:24	JLJ141				0.2
08/10/1989	10:03:25	JLJ141				0.1
08/11/1989	08:56:26	JLJ141				-0.1
08/07/1989	06:57:35	JN1579	PONTIAC	4 DOOR	84	0.1
08/08/1989	07:00:55	JN1579				0.5
08/10/1989	07:08:04	JN1579				0.4
08/11/1989	06:55:41	JN1579				0.1
08/07/1989	09:47:21	JN7061	THUNDERBIRD	2 DOOR	88	0.1
08/09/1989	06:20:25	JN7061				0.0
08/10/1989	06:19:46	JN7061				0.1
08/11/1989	06:20:27	JN7061				0.0
08/07/1989	11:50:52	JNK129	OLDSMOBILE	COUPE	89	0.3
08/08/1989	11:44:04	JNK129				0.0
08/10/1989	08:32:52	JNK129				0.0
08/11/1989	12:07:04	JNK129				0.1
08/07/1989	07:06:19	JNL105	FORD	VAN	88	2.2
08/07/1989	12:39:55	JNL105				0.2
08/08/1989	07:19:04	JNL105				0.8
08/10/1989	07:01:57	JNL105				0.0
08/11/1989	07:07:33	JNL105				0.0
08/08/1989	07:57:47	JONIH	OLDSMOBILE	4 DOOR	89	0.1
08/09/1989	08:01:49	JONIH				0.1
08/10/1989	08:09:20	JONIH				0.1
08/11/1989	08:00:28	JONIH				0.0
08/07/1989	07:07:56	JSP190	BUICK	4 DOOR	77	0.1
08/08/1989	07:20:48	JSP190				0.0
08/09/1989	07:27:31	JSP190				0.0
08/10/1989	07:22:06	JSP190				0.2
08/11/1989	07:29:14	JSP190				0.1
08/07/1989	08:36:14	JT1519	MERCURY	PASSENGER	79	3.2
08/08/1989	09:40:14	JT1519				2.3
08/09/1989	08:36:10	JT1519				3.0
08/11/1989	08:36:20	JT1519				2.6
08/07/1989	07:46:02	JV6319	MERCURY	2 DOOR	84	2.4
08/08/1989	07:54:23	JV6319				0.0
08/09/1989	07:54:46	JV6319				0.1
08/10/1989	08:00:43	JV6319				0.0
08/11/1989	07:42:42	JV6319				8.6

08/07/1989	06:46:19	JW4591	CHEVROLET	4 DOOR	86	0.0
08/08/1989	06:41:11	JW4591				0.3
08/09/1989	06:51:44	JW4591				0.0
08/10/1989	06:48:25	JW4591				0.0
08/11/1989	06:47:12	JW4591				0.1
08/07/1989	07:58:10	JW9828	VOLKSWAGEN	2 DOOR	87	0.0
08/09/1989	06:29:12	JW9828				-0.2
08/10/1989	06:55:22	JW9828				0.1
08/11/1989	07:21:55	JW9828				-0.2
08/07/1989	08:05:31	JWH142	DODGE	VAN	87	0.0
08/08/1989	08:09:38	JWH142				0.1
08/09/1989	08:04:34	JWH142				-0.1
08/10/1989	08:08:39	JWH142				2.3
08/07/1989	09:32:43	JXC389	CHEVROLET	VAN	77	0.7
08/09/1989	08:44:19	JXC389				0.2
08/10/1989	08:46:12	JXC389				0.2
08/11/1989	09:02:44	JXC389				1.1
08/07/1989	07:48:00	JXY665	PLYMOUTH	HATCHBACK	85	2.5
08/08/1989	07:47:16	JXY665				5.5
08/09/1989	07:43:17	JXY665				4.4
08/10/1989	07:48:54	JXY665				4.3
08/11/1989	07:46:05	JXY665				4.7
08/08/1989	06:30:31	JY7457	FORD	2 DOOR	87	0.0
08/09/1989	06:37:25	JY7457				0.0
08/10/1989	06:28:57	JY7457				0.0
08/11/1989	06:32:54	JY7457				0.1
08/08/1989	08:08:59	JYW811	BUICK	4 DOOR	79	0.0
08/09/1989	08:14:44	JYW811				-0.1
08/10/1989	08:09:44	JYW811				3.5
08/11/1989	08:08:07	JYW811				0.0
08/07/1989	07:11:34	JZL708		COUPE	83	0.3
08/08/1989	07:13:53	JZL708				2.3
08/10/1989	07:13:48	JZL708				0.2
08/11/1989	07:13:28	JZL708				0.1
08/07/1989	07:20:19	JZR713	THUNDERBIRD	PASSENGER	78	0.6
08/08/1989	07:26:43	JZR713				4.5
08/10/1989	07:23:30	JZR713				0.8
08/11/1989	07:30:14	JZR713				3.2
08/07/1989	07:24:53	KAV371	FORD	4 DOOR	87	0.1
08/08/1989	07:39:59	KAV371				0.0
08/09/1989	07:33:05	KAV371				-0.1
08/10/1989	07:40:14	KAV371				0.0
08/11/1989	07:33:41	KAV371				0.0

08/07/1989	06:59:00	KAY843	PONTIAC	COUPE	88	0.1
08/08/1989	06:56:54	KAY843				0.3
08/09/1989	07:03:10	KAY843				0.9
08/10/1989	07:08:00	KAY843				0.5
08/11/1989	07:04:19	KAY843				0.2
08/07/1989	08:27:55	KB567	FORD	2 DOOR	86	0.0
08/08/1989	07:52:48	KB567				0.0
08/09/1989	09:10:03	KB567				11.5
08/10/1989	08:25:29	KB567				0.0
08/11/1989	07:54:48	KB567				0.0
08/07/1989	08:10:05	KBD442	BUICK	4 DOOR	88	0.1
08/08/1989	08:00:52	KBD442				0.1
08/09/1989	08:04:53	KBD442				0.0
08/10/1989	08:04:05	KBD442				0.2
08/11/1989	08:05:13	KBD442				0.0
08/07/1989	07:59:13	KBJ932	TOYOTA	4 DOOR	88	0.0
08/08/1989	08:06:40	KBJ932				0.2
08/09/1989	08:00:58	KBJ932				0.1
08/10/1989	08:01:47	KBJ932				0.0
08/11/1989	07:48:45	KBJ932				0.0
08/07/1989	06:50:25	KBN183	CHEVROLET	COUPE	86	0.0
08/08/1989	06:50:44	KBN183				0.2
08/09/1989	06:51:41	KBN183				0.0
08/10/1989	06:51:05	KBN183				0.1
08/11/1989	06:51:34	KBN183				0.0
08/07/1989	07:32:52	KBU519	PONTIAC	COUPE	79	0.7
08/08/1989	07:32:49	KBU519				3.7
08/09/1989	07:32:55	KBU519				2.8
08/10/1989	07:30:30	KBU519				0.1
08/11/1989	07:35:06	KBU519				0.5
08/07/1989	07:19:42	KD7556	OLDSMOBILE	4 DOOR	80	0.1
08/08/1989	07:24:53	KD7556				0.0
08/10/1989	07:21:32	KD7556				0.2
08/11/1989	07:24:30	KD7556				0.0
08/07/1989	07:29:21	KD7644	MERCURY	HATCHBACK	83	0.8
08/08/1989	07:33:47	KD7644				6.7
08/09/1989	07:27:21	KD7644				2.4
08/10/1989	07:30:12	KD7644				4.2
08/07/1989	06:48:04	KD960	TOYOTA	4 DOOR	85	0.0
08/09/1989	06:58:49	KD960				1.6
08/10/1989	06:45:20	KD960				1.3
08/11/1989	11:33:25	KD960				0.2

08/07/1989	07:58:00	KE7789	FORD	STA WAGON	87	0.1
08/07/1989	09:52:52	KE7789				0.5
08/08/1989	07:19:24	KE7789				0.5
08/09/1989	07:32:29	KE7789				0.2
08/10/1989	07:02:50	KE7789				0.1
08/11/1989	07:12:44	KE7789				-0.2
08/07/1989	12:21:36	KF4780	DODGE	VAN	87	0.0
08/09/1989	07:37:11	KF4780				2.4
08/09/1989	09:14:37	KF4780				1.3
08/09/1989	11:54:20	KF4780				1.6
08/11/1989	07:37:18	KF4780				2.0
08/11/1989	09:22:51	KF4780				3.8
08/11/1989	10:26:26	KF4780				0.2
08/11/1989	12:08:12	KF4780				0.4
08/08/1989	06:27:50	KF6415		4 DOOR	87	-0.1
08/09/1989	06:27:50	KF6415				0.0
08/10/1989	06:28:28	KF6415				0.0
08/11/1989	06:30:09	KF6415				0.0
08/07/1989	13:44:06	KL790	HONDA	HATCHBACK	88	2.4
08/09/1989	12:37:04	KL790				0.9
08/10/1989	09:14:23	KL790				-0.1
08/10/1989	09:22:52	KL790				1.5
08/07/1989	07:43:34	KMH265	TOYOTA	COUPE	83	5.7
08/09/1989	07:40:10	KMH265				2.8
08/10/1989	07:45:38	KMH265				6.3
08/11/1989	07:46:36	KMH265				2.4
08/08/1989	06:40:33	KNR659	BUICK	4 DOOR	82	6.0
08/09/1989	06:16:28	KNR659				4.9
08/10/1989	06:42:39	KNR659				4.5
08/11/1989	06:44:47	KNR659				6.1
08/07/1989	08:11:58	KP9647	PONTIAC	4 DOOR	89	-0.1
08/08/1989	08:22:47	KP9647				0.2
08/09/1989	08:19:31	KP9647				-0.1
08/10/1989	08:00:16	KP9647				-0.2
08/11/1989	08:16:16	KP9647				-0.1
08/07/1989	07:25:01	KPF243	CHEVROLET	4 DOOR	88	2.3
08/08/1989	07:19:56	KPF243				0.9
08/09/1989	07:23:43	KPF243				-0.1
08/10/1989	07:22:02	KPF243				0.5
08/11/1989	07:24:18	KPF243				0.0
08/08/1989	07:16:42	KPL924	PLYMOUTH	HATCHBACK	87	0.2
08/09/1989	07:04:42	KPL924				0.2
08/10/1989	06:54:52	KPL924				0.0
08/11/1989	06:50:16	KPL924				-0.1

08/08/1989	07:49:09	KPZ935	MERCURY	4 DOOR	89	0.1
08/09/1989	08:46:03	KPZ935				0.1
08/10/1989	08:31:00	KPZ935				0.2
08/11/1989	08:35:21	KPZ935				0.4
08/08/1989	06:21:00	KPZ940	AUDI	4 DOOR	83	0.0
08/09/1989	06:24:43	KPZ940				0.2
08/10/1989	06:26:21	KPZ940				-0.2
08/11/1989	06:23:06	KPZ940				0.1
08/07/1989	06:50:30	KS4624	PONTIAC	4 DOOR	79	14.2
08/08/1989	06:51:58	KS4624				0.2
08/09/1989	06:50:32	KS4624				0.3
08/10/1989	06:54:20	KS4624				1.1
08/11/1989	06:54:20	KS4624				0.1
08/07/1989	06:47:55	KTG249	MAZDA	COUPE	86	0.1
08/08/1989	06:48:27	KTG249				0.0
08/10/1989	06:49:46	KTG249				0.1
08/11/1989	06:51:42	KTG249				4.4
08/07/1989	08:36:41	KU7851	CHEVROLET	4 DOOR	88	0.0
08/08/1989	08:41:21	KU7851				0.1
08/10/1989	08:40:10	KU7851				0.1
08/11/1989	08:29:41	KU7851				4.3
08/07/1989	06:42:10	KULMOM1	DODGE	HATCHBACK	89	0.0
08/08/1989	06:39:32	KULMOM1				0.1
08/09/1989	06:41:38	KULMOM1				0.0
08/10/1989	06:39:03	KULMOM1				-0.1
08/11/1989	06:41:14	KULMOM1				0.1
08/07/1989	06:40:23	KVV216	FORD	4 DOOR	87	0.1
08/08/1989	07:04:54	KVV216				0.9
08/09/1989	07:07:56	KVV216				2.1
08/10/1989	07:15:41	KVV216				1.8
08/11/1989	07:00:02	KVV216				0.1
08/07/1989	07:12:39	KZ9146	TOYOTA	COUPE	88	0.4
08/09/1989	09:54:30	KZ9146				0.1
08/09/1989	11:45:08	KZ9146				0.0
08/10/1989	07:00:23	KZ9146				0.4
08/11/1989	11:15:01	KZ9146				0.0
08/07/1989	10:07:08	LAW969	FORD	STA WAGON	87	0.1
08/08/1989	09:56:38	LAW969				0.5
08/09/1989	09:04:52	LAW969				0.6
08/10/1989	09:31:00	LAW969				3.4
08/11/1989	09:52:42	LAW969				3.7

08/07/1989	08:37:24	LBX293	CHEVROLET	COUPE	86	0.2
08/08/1989	08:43:08	LBX293				0.1
08/09/1989	08:40:34	LBX293				0.0
08/10/1989	08:34:02	LBX293				0.5
08/11/1989	08:41:30	LBX293				0.2
08/08/1989	07:35:12	LBZ958	BUICK	4 DOOR	85	1.9
08/09/1989	07:18:50	LBZ958				0.1
08/10/1989	07:23:40	LBZ958				0.5
08/11/1989	07:26:52	LBZ958				0.1
08/07/1989	09:30:23	LF9883	HONDA	4 DOOR	88	0.1
08/08/1989	07:42:06	LF9883				0.0
08/09/1989	07:44:35	LF9883				0.0
08/10/1989	07:53:53	LF9883				0.0
08/07/1989	06:43:59	LFH257	BUICK	4 DOOR	89	0.0
08/08/1989	06:51:56	LFH257				0.0
08/09/1989	06:53:23	LFH257				0.0
08/10/1989	06:48:31	LFH257				0.0
08/11/1989	06:41:59	LFH257				0.1
08/07/1989	07:25:05	LIL530	TOYOTA	4 DOOR	84	0.1
08/09/1989	07:22:15	LIL530				0.0
08/10/1989	06:49:53	LIL530				0.5
08/11/1989	07:23:39	LIL530				0.0
08/07/1989	07:34:33	LK4225	BUICK	4 DOOR	83	0.2
08/08/1989	08:23:00	LK4225				3.0
08/09/1989	08:03:36	LK4225				1.4
08/10/1989	08:22:17	LK4225				1.9
08/11/1989	07:54:19	LK4225				0.5
08/08/1989	08:02:31	LLS169	TOYOTA	4 DOOR	88	0.4
08/09/1989	08:01:30	LLS169				0.0
08/10/1989	08:04:23	LLS169				-0.1
08/11/1989	08:05:59	LLS169				3.2
08/07/1989	08:09:53	LMB308	PONTIAC	COUPE	88	0.8
08/08/1989	08:22:19	LMB308				0.1
08/09/1989	08:20:02	LMB308				0.1
08/10/1989	08:13:47	LMB308				0.1
08/11/1989	08:23:12	LMB308				0.1
08/07/1989	07:10:48	LMM273	MITSUBISHI	HATCHBACK	87	0.5
08/07/1989	09:14:43	LMM273				3.2
08/08/1989	07:15:33	LMM273				0.1
08/09/1989	09:48:52	LMM273				0.0
08/10/1989	07:14:53	LMM273				4.3
08/10/1989	09:08:38	LMM273				2.3
08/11/1989	07:59:05	LMM273				0.0

08/07/1989	08:54:23	LNN536	OLDSMOBILE	COUPE	78	0.1
08/08/1989	08:36:38	LNN536				0.0
08/09/1989	08:37:34	LNN536				-0.1
08/10/1989	09:21:57	LNN536				0.0
08/11/1989	09:51:02	LNN536				0.0
08/07/1989	07:08:30	LPT656	CHEVROLET	4 DOOR	86	0.6
08/08/1989	07:05:40	LPT656				0.1
08/09/1989	07:25:53	LPT656				0.2
08/10/1989	07:38:39	LPT656				0.1
08/11/1989	07:18:14	LPT656				0.1
08/07/1989	06:53:09	LR9713	BUICK	COUPE	78	0.1
08/09/1989	06:39:08	LR9713				2.1
08/10/1989	06:29:50	LR9713				0.0
08/11/1989	06:37:25	LR9713				0.0
08/07/1989	07:16:08	LRW154	TOYOTA	4 DOOR	88	0.1
08/08/1989	07:19:54	LRW154				0.0
08/09/1989	07:10:14	LRW154				0.1
08/10/1989	07:11:03	LRW154				0.2
08/11/1989	07:12:13	LRW154				0.1
08/07/1989	09:40:20	LTN642	BUICK	STA WAGON	69	1.2
08/08/1989	08:45:08	LTN642				0.2
08/09/1989	09:41:33	LTN642				0.1
08/10/1989	09:36:35	LTN642				1.5
08/11/1989	10:05:25	LTN642				1.2
08/07/1989	12:09:05	LTZ970	BUICK	STA WAGON	78	1.1
08/08/1989	12:40:58	LTZ970				2.3
08/09/1989	12:04:46	LTZ970				2.3
08/11/1989	11:47:29	LTZ970				7.9
08/07/1989	08:34:12	LUCI2	CADILLAC	4 DOOR	84	0.6
08/08/1989	08:45:53	LUCI2				3.2
08/09/1989	09:10:31	LUCI2				0.1
08/11/1989	09:38:51	LUCI2				0.3
08/08/1989	06:27:07	LVE413	BUICK	4 DR HT	73	0.2
08/09/1989	06:25:43	LVE413				0.3
08/10/1989	06:28:48	LVE413				0.3
08/11/1989	06:28:25	LVE413				0.3
08/08/1989	06:22:46	LVF468	CHEVROLET	HATCHBACK	85	0.9
08/09/1989	06:18:05	LVF468				0.3
08/10/1989	06:17:26	LVF468				0.7
08/11/1989	06:16:09	LVF468				0.0

08/07/1989	10:32:50	LVR949	OLDSMOBILE	4 DOOR	84	1.5
08/08/1989	09:46:36	LVR949				1.0
08/09/1989	12:13:14	LVR949				0.6
08/11/1989	08:14:36	LVR949				0.9
08/07/1989	06:41:25	LW5280	FORD	2 DOOR	88	0.1
08/08/1989	06:40:59	LW5280				0.1
08/09/1989	06:41:52	LW5280				-0.1
08/10/1989	06:38:01	LW5280				0.1
08/11/1989	06:42:23	LW5280				0.1
08/07/1989	07:40:32	LW6211	FORD	2 DOOR	77	0.5
08/09/1989	07:12:53	LW6211				0.1
08/10/1989	07:38:27	LW6211				0.1
08/11/1989	07:46:18	LW6211				0.2
08/07/1989	07:20:27	LWG949	MERCURY	4 DOOR	85	0.0
08/09/1989	07:06:03	LWG949				0.0
08/10/1989	07:08:38	LWG949				0.0
08/11/1989	07:18:38	LWG949				0.1
08/07/1989	07:43:05	LWX665	PONTIAC	2 DOOR	88	0.1
08/08/1989	07:58:58	LWX665				0.1
08/10/1989	08:02:24	LWX665				0.1
08/11/1989	08:03:02	LWX665				0.1
08/08/1989	06:21:24	LWY281	CADILLAC	4 DOOR	85	0.6
08/08/1989	12:01:10	LWY281				0.5
08/09/1989	06:23:25	LWY281				0.1
08/09/1989	12:00:25	LWY281				0.3
08/10/1989	06:17:07	LWY281				0.0
08/11/1989	06:16:06	LWY281				0.2
08/11/1989	12:09:02	LWY281				0.0
08/07/1989	06:46:22	LXT456	OLDSMOBILE	COUPE	84	0.1
08/08/1989	06:49:50	LXT456				0.2
08/09/1989	06:50:06	LXT456				0.1
08/11/1989	06:52:16	LXT456				0.0
08/08/1989	06:21:44	LY322	CHRYSLER	CONVTBLE	87	-0.1
08/09/1989	06:20:28	LY322				0.1
08/10/1989	06:24:08	LY322				0.4
08/11/1989	06:27:24	LY322				0.7
08/08/1989	09:04:29	LYH397		COUPE	86	0.6
08/09/1989	08:04:29	LYH397				0.5
08/10/1989	08:01:12	LYH397				0.3
08/11/1989	08:05:40	LYH397				0.6

08/07/1989	08:02:57	LZC714	CHEVROLET	COUPE	85	0.4
08/07/1989	13:30:52	LZC714				0.2
08/09/1989	10:00:47	LZC714				0.0
08/10/1989	10:31:17	LZC714				0.1
08/07/1989	06:45:23	M31673	FORD	4 DOOR	82	8.2
08/08/1989	07:10:22	M31673				11.8
08/09/1989	06:52:03	M31673				3.5
08/10/1989	07:09:40	M31673				8.8
08/07/1989	07:11:12	MA3447	FORD	4 DOOR	88	0.3
08/08/1989	07:19:16	MA3447				0.1
08/09/1989	07:13:01	MA3447				0.1
08/10/1989	07:16:19	MA3447				0.1
08/11/1989	07:14:02	MA3447				0.1
08/07/1989	06:55:56	MACRIS1	PONTIAC	COUPE	86	0.1
08/08/1989	06:56:40	MACRIS1				0.4
08/09/1989	06:55:18	MACRIS1				0.2
08/10/1989	06:52:02	MACRIS1				0.1
08/11/1989	06:52:29	MACRIS1				0.1
08/07/1989	07:06:44	MAL2640	CHEVROLET	4 DOOR	86	0.7
08/08/1989	07:07:16	MAL2640				0.3
08/09/1989	07:06:48	MAL2640				-0.1
08/10/1989	07:04:30	MAL2640				0.1
08/07/1989	13:18:50	MB1219	BUICK	4 DOOR	76	1.0
08/08/1989	09:05:53	MB1219				0.9
08/10/1989	09:25:16	MB1219				0.3
08/11/1989	09:03:15	MB1219				0.5
08/07/1989	07:34:13	MB1668	DODGE	4 DOOR	88	4.9
08/08/1989	07:40:11	MB1668				0.5
08/09/1989	07:43:15	MB1668				0.1
08/10/1989	07:29:58	MB1668				0.2
08/08/1989	06:52:40	MB5467	LINCOLN	4 DOOR	86	0.5
08/09/1989	06:40:42	MB5467				0.0
08/10/1989	06:45:30	MB5467				0.2
08/11/1989	06:50:37	MB5467				0.2
08/08/1989	10:14:55	MB7381	CHEVROLET	COUPE	87	0.5
08/09/1989	06:49:13	MB7381				0.1
08/10/1989	06:46:41	MB7381				0.4
08/11/1989	06:53:11	MB7381				-0.1
08/08/1989	06:25:44	MBT120	PONTIAC	4 DOOR	77	5.3
08/09/1989	06:42:27	MBT120				5.5
08/10/1989	06:32:28	MBT120				7.2
08/11/1989	06:24:34	MBT120				6.4

08/08/1989	09:35:17	MBX893	PONTIAC	2 DOOR	76	6.5
08/10/1989	08:55:31	MBX893				5.5
08/11/1989	06:13:18	MBX893				9.3
08/11/1989	06:53:04	MBX893				10.7
08/07/1989	06:49:03	MC2557	FORD	2 DOOR	88	0.3
08/08/1989	07:02:17	MC2557				0.1
08/09/1989	06:41:13	MC2557				0.7
08/10/1989	06:49:51	MC2557				0.3
08/11/1989	06:51:03	MC2557				0.3
08/08/1989	06:43:25	MC3826	OLDSMOBILE	4 DOOR	88	0.0
08/09/1989	06:30:01	MC3826				0.0
08/10/1989	06:16:26	MC3826				0.1
08/11/1989	06:26:54	MC3826				0.1
08/07/1989	08:29:10	MD6197	FORD	4 DOOR	85	0.8
08/08/1989	08:30:15	MD6197				6.3
08/10/1989	08:18:02	MD6197				0.1
08/11/1989	08:29:57	MD6197				7.6
08/07/1989	07:07:12	ME9685	MERCURY	4 DOOR	88	0.0
08/08/1989	07:06:57	ME9685				0.0
08/10/1989	07:08:57	ME9685				0.0
08/11/1989	07:09:27	ME9685				0.0
08/07/1989	07:12:14	MF1782	BUICK	COUPE	82	0.2
08/08/1989	07:25:37	MF1782				0.0
08/09/1989	07:15:08	MF1782				0.2
08/10/1989	07:11:41	MF1782				0.0
08/11/1989	07:13:41	MF1782				0.1
08/08/1989	08:20:51	MF4194	BUICK	4 DOOR	80	0.5
08/09/1989	09:05:18	MF4194				-0.1
08/10/1989	08:50:20	MF4194				6.2
08/10/1989	10:51:24	MF4194				6.4
08/11/1989	08:52:34	MF4194				0.1
08/07/1989	07:37:57	MG1356	CADILLAC	4 DOOR	85	0.0
08/08/1989	07:49:58	MG1356				0.0
08/09/1989	07:59:45	MG1356				0.1
08/11/1989	07:50:29	MG1356				0.1
08/07/1989	09:44:20	MJR75	PONTIAC	4 DOOR	86	1.5
08/08/1989	08:10:13	MJR75				0.0
08/09/1989	08:10:30	MJR75				0.1
08/10/1989	08:05:19	MJR75				1.8

08/07/1989	08:35:26	MK1773	AUDI	4 DOOR	78	0.4
08/08/1989	08:37:27	MK1773				0.4
08/09/1989	09:48:50	MK1773				0.3
08/10/1989	08:34:22	MK1773				0.5
08/11/1989	08:50:02	MK1773				0.3
08/07/1989	08:59:31	MK4484	DODGE	4 DOOR	75	0.1
08/08/1989	08:30:29	MK4484				2.2
08/09/1989	08:38:54	MK4484				0.7
08/10/1989	08:39:56	MK4484				1.5
08/11/1989	08:39:50	MK4484				6.0
08/07/1989	07:12:25	MK5164	MERCURY	HATCHBACK	86	0.0
08/08/1989	06:49:02	MK5164				0.1
08/09/1989	07:02:02	MK5164				0.3
08/10/1989	06:19:24	MK5164				0.0
08/07/1989	07:06:04	MK6205	DODGE	VAN	86	-0.1
08/09/1989	07:14:50	MK6205				0.1
08/10/1989	07:05:17	MK6205				0.0
08/11/1989	06:59:35	MK6205				0.1
08/07/1989	09:41:38	ML2872	MERCURY	2 DOOR	84	0.1
08/08/1989	08:26:03	ML2872				0.0
08/09/1989	08:20:48	ML2872				0.0
08/10/1989	07:36:39	ML2872				1.1
08/11/1989	07:31:58	ML2872				0.1
08/07/1989	11:09:36	MLG204	OLDSMOBILE	COUPE	84	0.3
08/09/1989	11:16:36	MLG204				2.6
08/10/1989	08:24:44	MLG204				0.2
08/11/1989	09:11:48	MLG204				0.1
08/07/1989	08:20:35	MLK205	CHEVROLET	4 DOOR	86	1.0
08/08/1989	08:02:51	MLK205				2.0
08/09/1989	08:09:27	MLK205				0.1
08/10/1989	08:08:02	MLK205				0.1
08/11/1989	07:55:50	MLK205				0.1
08/07/1989	07:52:11	MM8159	CHEVROLET	COUPE	83	0.2
08/08/1989	07:50:19	MM8159				0.3
08/09/1989	07:53:06	MM8159				0.3
08/10/1989	07:50:43	MM8159				0.0
08/11/1989	07:47:25	MM8159				0.1
08/08/1989	06:03:02	MMR187	FORD	4 DOOR	87	0.1
08/09/1989	05:59:23	MMR187				1.8
08/10/1989	08:09:18	MMR187				0.2
08/11/1989	05:57:55	MMR187				0.2

08/07/1989	11:13:45	MN1352	CHRYSLER	4 DR HT	80	1.4
08/08/1989	08:45:23	MN1352				0.9
08/09/1989	09:46:40	MN1352				1.0
08/10/1989	08:47:11	MN1352				1.2
08/11/1989	07:18:18	MN1352				1.1
08/08/1989	07:19:34	MP1050	PONTIAC	STA WAGON	87	0.0
08/09/1989	07:14:22	MP1050				-0.1
08/10/1989	07:16:42	MP1050				-0.1
08/11/1989	07:13:03	MP1050				0.4
08/07/1989	08:02:16	MRJ127	VOLVO	2 DOOR	81	1.6
08/08/1989	07:40:02	MRJ127				1.9
08/09/1989	08:11:47	MRJ127				-0.1
08/10/1989	08:17:51	MRJ127				-0.2
08/11/1989	08:24:58	MRJ127				2.6
08/07/1989	07:00:16	MSU272	BUICK	PASSENGER	78	0.1
08/08/1989	07:02:11	MSU272				0.2
08/09/1989	07:06:07	MSU272				0.1
08/10/1989	07:05:22	MSU272				0.2
08/11/1989	07:02:02	MSU272				0.1
08/07/1989	07:31:54	MTD291	FORD	4 DOOR	85	0.1
08/08/1989	07:23:54	MTD291				0.1
08/09/1989	07:30:32	MTD291				0.1
08/10/1989	07:32:35	MTD291				0.1
08/08/1989	06:05:42	MU9140	FORD	2 DOOR	88	0.3
08/09/1989	06:07:25	MU9140				-0.1
08/10/1989	06:04:47	MU9140				0.0
08/11/1989	06:11:13	MU9140				0.1
08/07/1989	07:10:36	MVN663	LINCOLN	4 DOOR	78	1.6
08/08/1989	07:03:40	MVN663				3.1
08/09/1989	07:16:04	MVN663				2.0
08/10/1989	07:10:53	MVN663				2.2
08/11/1989	07:09:00	MVN663				3.4
08/07/1989	06:45:00	MW4890		HATCHBACK	89	1.2
08/08/1989	07:29:16	MW4890				0.0
08/08/1989	11:54:08	MW4890				0.0
08/09/1989	06:49:28	MW4890				0.0
08/10/1989	06:45:44	MW4890				0.3
08/07/1989	06:51:11	MW7575	CHEVROLET	4 DOOR	86	0.7
08/08/1989	07:16:54	MW7575				0.8
08/09/1989	07:00:27	MW7575				0.3
08/11/1989	07:06:05	MW7575				0.1

08/07/1989	07:51:34	MWY745	FORD	4 DOOR	85	0.1
08/08/1989	07:51:01	MWY745				0.1
08/09/1989	07:45:47	MWY745				0.0
08/10/1989	07:54:25	MWY745				0.1
08/11/1989	07:51:53	MWY745				0.0
08/07/1989	08:20:44	MX7132	TOYOTA	2 DOOR	88	0.0
08/08/1989	08:23:18	MX7132				0.0
08/09/1989	07:28:57	MX7132				0.0
08/10/1989	08:28:18	MX7132				0.1
08/11/1989	07:20:43	MX7132				-0.1
08/08/1989	11:30:02	MXD415	FORD	HATCHBACK	82	0.7
08/09/1989	07:29:57	MXD415				-0.1
08/10/1989	07:29:07	MXD415				0.2
08/11/1989	07:44:44	MXD415				0.3
08/07/1989	09:17:56	MXD433		HATCHBACK	85	0.7
08/08/1989	09:12:31	MXD433				1.2
08/09/1989	09:18:48	MXD433				1.2
08/10/1989	09:00:01	MXD433				1.3
08/07/1989	07:43:58	MY2834		2 DOOR	88	9.2
08/08/1989	07:44:43	MY2834				12.5
08/10/1989	07:43:57	MY2834				10.8
08/11/1989	07:12:18	MY2834				11.6
08/07/1989	08:01:54	MY3094	CHEVROLET	2 DOOR	88	0.0
08/08/1989	08:16:30	MY3094				0.1
08/09/1989	08:04:41	MY3094				0.3
08/11/1989	07:55:34	MY3094				0.2
08/08/1989	06:58:23	MY5995	FORD	VAN	86	0.0
08/09/1989	06:54:18	MY5995				-0.1
08/10/1989	06:54:27	MY5995				0.1
08/11/1989	06:24:12	MY5995				0.1
08/07/1989	10:14:13	MZ8858	CHEVROLET	4 DOOR	88	0.0
08/08/1989	07:32:32	MZ8858				0.1
08/10/1989	09:18:16	MZ8858				0.1
08/11/1989	07:29:19	MZ8858				0.1
08/07/1989	08:11:19	MZ9472	MERCURY	HATCHBACK	88	0.0
08/08/1989	08:16:08	MZ9472				-0.1
08/09/1989	08:08:12	MZ9472				0.0
08/10/1989	08:07:52	MZ9472				0.0
08/11/1989	08:00:56	MZ9472				0.1

08/07/1989	08:31:53	MZ9767	CHEVROLET	4 DOOR	80	0.1
08/08/1989	08:35:46	MZ9767				0.8
08/09/1989	08:39:52	MZ9767				0.2
08/10/1989	08:39:27	MZ9767				0.2
08/11/1989	08:38:56	MZ9767				0.6
08/07/1989	07:21:57	NB4152	MERCURY	4 DOOR	88	0.0
08/08/1989	07:16:59	NB4152				-0.1
08/10/1989	07:16:27	NB4152				0.0
08/11/1989	07:23:50	NB4152				0.0
08/07/1989	09:45:52	NCR4353	OLDSMOBILE	4 DOOR	88	0.2
08/08/1989	07:53:17	NCR4353				0.1
08/10/1989	09:50:41	NCR4353				0.1
08/11/1989	09:51:12	NCR4353				0.2
08/07/1989	08:54:32	NEL270	CADILLAC	4 DOOR	79	0.6
08/08/1989	08:57:19	NEL270				7.3
08/09/1989	09:35:55	NEL270				0.8
08/10/1989	08:48:20	NEL270				5.7
08/11/1989	09:32:55	NEL270				9.1
08/08/1989	13:13:27	NHT661		2 DOOR	86	0.7
08/09/1989	11:46:15	NHT661				0.7
08/10/1989	09:59:14	NHT661				0.0
08/11/1989	10:16:52	NHT661				0.4
08/07/1989	07:47:22	NJH134	CHEVROLET	2 DOOR	88	0.0
08/08/1989	07:40:53	NJH134				0.3
08/09/1989	07:42:59	NJH134				0.1
08/10/1989	07:46:00	NJH134				0.0
08/11/1989	07:39:46	NJH134				0.2
08/08/1989	07:17:29	NKS771	CHEVROLET	COUPE	89	0.1
08/09/1989	07:23:13	NKS771				0.0
08/10/1989	07:57:46	NKS771				-0.1
08/11/1989	08:13:59	NKS771				0.0
08/07/1989	12:20:02	NLC716	CHEVROLET	STA WAGON	85	0.5
08/08/1989	12:20:44	NLC716				1.1
08/09/1989	11:35:52	NLC716				0.0
08/10/1989	09:00:09	NLC716				0.3
08/07/1989	06:45:10	NLV805	BUICK	4 DOOR	77	6.7
08/08/1989	06:35:41	NLV805				7.3
08/09/1989	06:32:20	NLV805				7.9
08/10/1989	06:30:12	NLV805				9.3
08/11/1989	06:40:31	NLV805				9.5

08/07/1989	07:07:48	NP1192	CHEVROLET	HATCHBACK	79	0.2
08/08/1989	07:18:44	NP1192				0.1
08/10/1989	07:05:03	NP1192				0.2
08/11/1989	06:53:15	NP1192				0.3
08/08/1989	13:03:44	NP6944	OLDSMOBILE	4 DOOR	82	0.2
08/09/1989	10:51:00	NP6944				4.0
08/10/1989	08:34:28	NP6944				0.1
08/11/1989	12:15:59	NP6944				0.1
08/07/1989	06:49:06	NPL554	CHEVROLET	COUPE	79	2.6
08/08/1989	06:16:56	NPL554				-0.1
08/09/1989	07:36:40	NPL554				3.2
08/10/1989	06:34:07	NPL554				5.5
08/11/1989	06:23:25	NPL554				2.0
08/08/1989	07:43:23	NR4835	CHEVROLET	COUPE	88	-0.1
08/09/1989	07:49:20	NR4835				0.1
08/10/1989	08:09:22	NR4835				0.7
08/11/1989	07:37:05	NR4835				0.2
08/07/1989	11:18:17	NS2207	CHEVROLET	STA WAGON	89	0.1
08/08/1989	10:02:10	NS2207				0.0
08/09/1989	10:19:56	NS2207				2.2
08/10/1989	10:02:03	NS2207				0.1
08/07/1989	08:32:12	NS3844	BUICK	4 DOOR	78	0.2
08/08/1989	08:33:36	NS3844				8.7
08/09/1989	08:28:05	NS3844				10.4
08/11/1989	08:30:05	NS3844				0.6
08/07/1989	08:15:56	NT474	BUICK	4 DOOR	78	0.9
08/08/1989	07:21:41	NT474				6.1
08/10/1989	08:18:31	NT474				0.2
08/11/1989	07:53:27	NT474				3.0
08/07/1989	07:31:10	NU1056	OLDSMOBILE	4 DOOR	81	0.7
08/08/1989	06:49:07	NU1056				0.8
08/09/1989	06:41:47	NU1056				1.0
08/11/1989	06:34:27	NU1056				0.7
08/07/1989	07:55:37	NU4401	CHEVROLET	VAN	88	0.1
08/08/1989	07:36:32	NU4401				0.0
08/09/1989	07:50:50	NU4401				0.0
08/11/1989	07:54:40	NU4401				0.2
08/07/1989	09:52:34	NU5763	MAZDA	HATCHBACK	78	0.2
08/09/1989	09:21:16	NU5763				0.5
08/10/1989	09:21:23	NU5763				0.3
08/11/1989	09:47:15	NU5763				0.4

08/08/1989	06:28:10	NV3235	CHEVROLET	VAN	88	0.2
08/09/1989	06:27:43	NV3235				0.0
08/10/1989	06:28:03	NV3235				0.5
08/11/1989	06:28:40	NV3235				0.6
08/07/1989	07:22:54	NV8206	BUICK	4 DOOR	81	0.1
08/08/1989	10:09:27	NV8206				0.1
08/10/1989	07:35:24	NV8206				0.2
08/11/1989	07:34:11	NV8206				0.2
08/07/1989	06:59:10	NV8266	LINCOLN	4 DOOR	77	1.3
08/10/1989	07:02:34	NV8266				2.8
08/11/1989	06:52:47	NV8266				5.7
08/11/1989	09:08:54	NV8266				3.3
08/07/1989	06:40:38	NVN189	DODGE	4 DOOR	89	2.9
08/07/1989	07:47:45	NVN189				0.1
08/08/1989	06:37:12	NVN189				0.1
08/11/1989	06:52:09	NVN189				0.0
08/07/1989	08:06:25	NVR997	CADILLAC	COUPE	82	0.3
08/08/1989	07:50:28	NVR997				0.2
08/09/1989	08:03:32	NVR997				0.1
08/10/1989	08:07:43	NVR997				0.2
08/07/1989	07:06:11	NW5374	PLYMOUTH	HATCHBACK	89	0.0
08/08/1989	08:43:25	NW5374				-0.1
08/09/1989	07:35:05	NW5374				0.2
08/10/1989	08:14:16	NW5374				0.2
08/11/1989	07:43:38	NW5374				0.1
08/07/1989	09:50:20	NX2077	HONDA	4 DOOR	80	0.1
08/08/1989	09:04:34	NX2077				3.4
08/09/1989	09:00:34	NX2077				0.3
08/10/1989	09:35:31	NX2077				0.4
08/07/1989	08:19:49	NYU955	OLDSMOBILE	4 DOOR	85	-0.1
08/08/1989	08:33:14	NYU955				0.3
08/09/1989	07:58:14	NYU955				0.1
08/10/1989	08:44:36	NYU955				-0.1
08/07/1989	08:50:51	NZ919	OLDSMOBILE	4 DOOR	79	0.1
08/08/1989	08:44:59	NZ919				0.1
08/09/1989	08:45:12	NZ919				0.1
08/10/1989	08:51:17	NZ919				0.0
08/08/1989	07:10:09	NZY278	FORD	HATCHBACK	83	0.1
08/09/1989	07:05:02	NZY278				0.0
08/10/1989	07:04:59	NZY278				0.2
08/11/1989	07:03:14	NZY278				0.0

08/08/1989	07:20:05	OE6936	OLDSMOBILE	COUPE	85	0.2
08/09/1989	07:18:46	OE6936				0.2
08/09/1989	13:32:40	OE6936				0.7
08/10/1989	08:51:44	OE6936				0.4
08/11/1989	07:23:56	OE6936				0.5
08/07/1989	07:41:50	OE8754	BUICK	2 DR HT	74	0.4
08/08/1989	07:41:58	OE8754				0.2
08/09/1989	07:36:15	OE8754				0.3
08/10/1989	07:40:34	OE8754				0.3
08/11/1989	07:43:48	OE8754				4.9
08/07/1989	08:01:29	OG3710	CHEVROLET	4 DOOR	86	0.1
08/08/1989	08:23:24	OG3710				0.3
08/09/1989	08:12:00	OG3710				0.2
08/10/1989	07:59:18	OG3710				0.5
08/11/1989	08:02:02	OG3710				0.2
08/07/1989	09:19:21	OH3699	LINCOLN	4 DOOR	77	5.2
08/08/1989	09:25:25	OH3699				4.3
08/09/1989	08:57:38	OH3699				8.9
08/10/1989	09:29:20	OH3699				4.1
08/11/1989	08:58:00	OH3699				2.1
08/07/1989	07:39:45	OH7732	SUBARU	HATCHBACK	82	2.8
08/08/1989	07:35:21	OH7732				0.1
08/09/1989	07:38:46	OH7732				2.1
08/11/1989	07:32:39	OH7732				2.0
08/08/1989	06:20:00	OH991	LINCOLN	COUPE	88	0.1
08/09/1989	06:32:00	OH991				0.1
08/10/1989	06:25:30	OH991				0.1
08/11/1989	06:32:07	OH991				0.1
08/08/1989	06:14:15	OJ3078	MERCURY	4 DOOR	89	0.1
08/09/1989	06:07:51	OJ3078				0.4
08/09/1989	13:14:08	OJ3078				0.0
08/10/1989	06:14:20	OJ3078				0.1
08/11/1989	06:06:45	OJ3078				0.1
08/11/1989	10:15:22	OJ3078				0.1
08/07/1989	13:51:54	OK4838	OLDSMOBILE	4 DOOR	89	0.0
08/08/1989	06:18:32	OK4838				0.0
08/10/1989	06:21:03	OK4838				0.2
08/11/1989	06:17:27	OK4838				0.1
08/08/1989	06:52:19	OK8183		4 DOOR	85	0.0
08/09/1989	06:51:06	OK8183				0.1
08/10/1989	06:54:54	OK8183				-0.1
08/11/1989	06:50:18	OK8183				1.4

08/08/1989	06:18:18	OL4263	FORD	4 DOOR	85	0.2
08/09/1989	06:18:43	OL4263				0.7
08/10/1989	06:20:36	OL4263				0.3
08/11/1989	06:19:49	OL4263				0.1
08/07/1989	07:17:39	OM4672		HATCHBACK	89	4.7
08/09/1989	07:23:18	OM4672				4.8
08/10/1989	07:20:46	OM4672				4.8
08/11/1989	07:31:15	OM4672				5.8
08/07/1989	11:24:12	OM6815	MERCURY	4 DOOR	83	0.0
08/09/1989	09:40:08	OM6815				0.1
08/10/1989	09:56:19	OM6815				0.3
08/11/1989	07:26:07	OM6815				0.1
08/08/1989	11:51:17	ON5072	TOYOTA	2 DOOR	81	1.6
08/09/1989	09:00:39	ON5072				0.5
08/10/1989	10:18:59	ON5072				0.4
08/11/1989	10:40:55	ON5072				1.2
08/08/1989	06:30:13	OP2840	MERCURY	4 DOOR	88	0.1
08/09/1989	06:31:01	OP2840				0.1
08/10/1989	06:34:04	OP2840				0.0
08/11/1989	06:34:28	OP2840				-0.1
08/07/1989	07:50:32	OP436	LINCOLN	COUPE	86	0.1
08/08/1989	07:58:32	OP436				0.0
08/09/1989	08:04:09	OP436				0.1
08/10/1989	08:01:37	OP436				0.8
08/11/1989	08:03:58	OP436				0.1
08/08/1989	06:39:46	OP4968	BUICK	COUPE	83	2.1
08/09/1989	06:33:37	OP4968				1.5
08/10/1989	06:36:54	OP4968				0.5
08/11/1989	06:37:36	OP4968				1.3
08/08/1989	10:59:12	OP7477	HONDA	HATCHBACK	89	0.2
08/09/1989	10:57:49	OP7477				0.0
08/10/1989	11:04:18	OP7477				1.6
08/11/1989	11:06:12	OP7477				0.4
08/08/1989	07:25:08	OP8243	CHEVROLET	4 DOOR	82	0.1
08/09/1989	07:29:07	OP8243				1.1
08/10/1989	07:29:23	OP8243				0.1
08/11/1989	07:13:37	OP8243				0.0
08/07/1989	11:44:31	OP8303	OLDSMOBILE	COUPE	85	0.3
08/08/1989	09:17:45	OP8303				0.0
08/09/1989	10:52:47	OP8303				0.1
08/10/1989	09:24:58	OP8303				0.0

08/08/1989	06:02:49	OR7144	CHRYSLER	4 DOOR	86	0.1
08/09/1989	06:19:12	OR7144				0.1
08/10/1989	06:19:48	OR7144				0.1
08/11/1989	06:21:33	OR7144				0.1
08/07/1989	08:48:56	OR9864	OLDSMOBILE	COUPE	81	0.3
08/08/1989	08:40:20	OR9864				1.8
08/09/1989	08:31:21	OR9864				1.8
08/10/1989	08:36:49	OR9864				1.3
08/11/1989	08:49:16	OR9864				2.5
08/07/1989	07:47:10	OS4811	FORD	HATCHBACK	86	0.0
08/08/1989	07:46:40	OS4811				0.1
08/09/1989	07:44:10	OS4811				0.2
08/10/1989	08:06:29	OS4811				0.1
08/07/1989	09:19:41	OT5268	FORD	4 DOOR	88	1.1
08/08/1989	09:17:52	OT5268				0.6
08/09/1989	08:36:06	OT5268				0.2
08/10/1989	08:32:43	OT5268				3.3
08/11/1989	09:47:51	OT5268				0.6
08/07/1989	09:38:27	OT5949	TOYOTA	STA WAGON	88	0.0
08/08/1989	09:45:51	OT5949				0.0
08/09/1989	09:25:48	OT5949				0.0
08/10/1989	09:55:47	OT5949				-0.1
08/07/1989	11:36:26	OT7252	OLDSMOBILE	COUPE	85	0.7
08/08/1989	08:43:21	OT7252				0.5
08/08/1989	11:57:07	OT7252				0.5
08/09/1989	08:41:07	OT7252				0.4
08/09/1989	11:40:42	OT7252				0.4
08/10/1989	08:45:09	OT7252				0.4
08/11/1989	10:01:09	OT7252				0.3
08/08/1989	06:32:45	OW2394	CADILLAC	4 DOOR	76	0.5
08/10/1989	06:45:12	OW2394				0.1
08/10/1989	07:26:29	OW2394				0.6
08/11/1989	06:49:33	OW2394				0.1
08/08/1989	07:20:36	OW2786		HATCHBACK	89	0.0
08/09/1989	07:08:53	OW2786				0.3
08/10/1989	07:08:30	OW2786				0.1
08/11/1989	07:06:54	OW2786				4.9
08/08/1989	08:30:45	OW4556	CHEVROLET	COUPE	87	0.1
08/09/1989	08:24:37	OW4556				0.1
08/10/1989	08:34:46	OW4556				0.1
08/11/1989	09:27:14	OW4556				0.2

08/08/1989	06:16:52	OWL139	OLDSMOBILE	4 DOOR	88	0.0
08/09/1989	06:20:04	OWL139				0.1
08/10/1989	06:16:44	OWL139				0.1
08/11/1989	06:14:05	OWL139				-0.1
08/07/1989	07:18:10	OX1188	HONDA	4 DOOR	89	0.0
08/08/1989	07:22:41	OX1188				0.0
08/09/1989	07:11:14	OX1188				0.0
08/11/1989	07:05:30	OX1188				0.0
08/08/1989	06:19:54	OX4721	FORD	4 DOOR	88	0.1
08/09/1989	06:26:20	OX4721				0.0
08/10/1989	06:23:54	OX4721				-0.1
08/11/1989	06:27:26	OX4721				0.1
08/07/1989	08:10:50	PAM804	CHEVROLET	COUPE	80	5.9
08/08/1989	08:04:16	PAM804				0.3
08/09/1989	08:18:29	PAM804				0.7
08/10/1989	08:16:08	PAM804				1.5
08/08/1989	06:17:04	PATSYP	CHEVROLET	4 DOOR	87	0.1
08/09/1989	06:22:10	PATSYP				0.0
08/10/1989	06:22:28	PATSYP				0.1
08/11/1989	06:12:23	PATSYP				0.1
08/07/1989	07:24:14	PC4244	BUICK	COUPE	80	0.0
08/08/1989	07:42:30	PC4244				0.0
08/10/1989	07:37:19	PC4244				0.1
08/11/1989	07:34:30	PC4244				0.0
08/07/1989	07:42:32	PD2192	CADILLAC	2 DOOR	79	0.2
08/08/1989	10:07:54	PD2192				0.1
08/09/1989	10:05:39	PD2192				0.2
08/10/1989	09:52:30	PD2192				0.5
08/11/1989	09:23:00	PD2192				0.5
08/07/1989	06:50:39	PER173	FORD	4 DOOR	77	10.2
08/08/1989	06:50:42	PER173				9.2
08/09/1989	06:49:42	PER173				7.4
08/10/1989	06:52:53	PER173				7.6
08/11/1989	06:49:40	PER173				11.2
08/07/1989	08:11:46	PG3464	PLYMOUTH	VAN	89	0.2
08/08/1989	08:18:40	PG3464				0.1
08/10/1989	08:17:33	PG3464				5.2
08/11/1989	08:24:23	PG3464				0.4
08/08/1989	06:35:34	PG6653	OLDSMOBILE	4 DOOR	78	0.1
08/09/1989	06:47:42	PG6653				0.1
08/10/1989	06:40:06	PG6653				0.1
08/11/1989	06:52:55	PG6653				0.1

08/07/1989	07:14:48	PH1467		4 DOOR	89	3.8
08/08/1989	07:12:29	PH1467				0.1
08/09/1989	07:09:04	PH1467				0.2
08/10/1989	07:10:44	PH1467				0.0
08/11/1989	07:05:44	PH1467				0.1
08/08/1989	07:19:12	PJ2507	BUICK	4 DOOR	85	0.8
08/09/1989	07:11:03	PJ2507				0.1
08/10/1989	07:11:38	PJ2507				0.0
08/11/1989	07:15:06	PJ2507				0.0
08/07/1989	06:40:50	PK8468	BUICK	4 DOOR	80	0.1
08/08/1989	06:40:13	PK8468				0.1
08/09/1989	06:36:34	PK8468				0.1
08/11/1989	06:41:54	PK8468				-0.1
08/07/1989	08:13:54	PL167		4 DOOR	89	0.3
08/08/1989	08:48:46	PL167				2.5
08/09/1989	07:39:24	PL167				0.0
08/10/1989	08:36:11	PL167				0.1
08/11/1989	08:36:47	PL167				0.1
08/07/1989	08:51:06	PL3344	OLDSMOBILE	4 DOOR	89	0.1
08/08/1989	08:51:26	PL3344				0.1
08/09/1989	08:47:06	PL3344				0.1
08/10/1989	08:47:08	PL3344				-0.1
08/08/1989	06:08:35	PLC737	PONTIAC	COUPE	79	0.2
08/09/1989	06:11:14	PLC737				0.0
08/10/1989	06:05:47	PLC737				0.3
08/11/1989	06:01:58	PLC737				2.1
08/07/1989	06:43:33	PM4391		4 DOOR	89	0.0
08/08/1989	07:02:38	PM4391				-0.1
08/10/1989	07:30:43	PM4391				0.0
08/11/1989	07:46:02	PM4391				6.2
08/07/1989	07:01:40	PM608	OLDSMOBILE	PASSENGER	80	0.4
08/08/1989	07:07:35	PM608				0.5
08/09/1989	07:07:05	PM608				0.6
08/11/1989	07:05:20	PM608				0.4
08/07/1989	10:12:21	PM8973	RENAULT	2 DOOR	84	2.3
08/08/1989	10:16:35	PM8973				1.3
08/10/1989	10:08:24	PM8973				0.0
08/11/1989	10:15:03	PM8973				0.5
08/07/1989	06:40:53	PM9571	FORD	2 DOOR	79	-0.1
08/08/1989	06:33:17	PM9571				0.0
08/09/1989	06:37:44	PM9571				0.4
08/10/1989	06:35:45	PM9571				1.7
08/11/1989	06:38:04	PM9571				4.1

08/08/1989	06:41:26	PN3169	OLDSMOBILE	4 DOOR	89	0.1
08/09/1989	06:29:32	PN3169				0.0
08/10/1989	06:28:36	PN3169				0.0
08/11/1989	06:30:14	PN3169				0.0
08/07/1989	07:53:35	PN4923	FORD	2 DR HT	76	1.5
08/09/1989	07:56:41	PN4923				10.1
08/10/1989	08:02:38	PN4923				8.1
08/11/1989	08:07:06	PN4923				2.9
08/07/1989	11:46:23	PN9144	FORD	HATCHBACK	88	0.0
08/08/1989	08:16:27	PN9144				0.3
08/09/1989	07:59:57	PN9144				0.0
08/11/1989	07:39:50	PN9144				0.1
08/07/1989	08:21:43	PP2607	FORD	VAN	84	4.4
08/08/1989	08:23:56	PP2607				6.2
08/09/1989	08:20:00	PP2607				1.5
08/10/1989	08:18:22	PP2607				2.8
08/07/1989	06:53:06	PP3293	PLYMOUTH	HATCHBACK	88	0.0
08/08/1989	07:17:37	PP3293				0.0
08/09/1989	06:47:49	PP3293				0.1
08/10/1989	06:44:09	PP3293				0.2
08/07/1989	07:05:16	PP373	OLDSMOBILE	4 DR HT	72	4.8
08/08/1989	07:05:21	PP373				0.2
08/09/1989	07:12:36	PP373				1.9
08/10/1989	07:03:14	PP373				4.9
08/11/1989	07:31:44	PP373				6.2
08/07/1989	08:00:29	PP3828	TOYOTA	4 DOOR	89	-0.1
08/08/1989	07:32:45	PP3828				-0.1
08/09/1989	07:44:54	PP3828				0.0
08/11/1989	07:41:33	PP3828				0.0
08/07/1989	12:11:46	PP3879	BUICK	4 DR HT	73	0.5
08/08/1989	11:35:44	PP3879				0.6
08/11/1989	09:44:21	PP3879				4.0
08/11/1989	11:16:25	PP3879				1.3
08/07/1989	10:47:02	PPP109	OLDSMOBILE	2 DOOR	89	0.0
08/09/1989	10:36:54	PPP109				0.0
08/10/1989	10:43:14	PPP109				0.2
08/11/1989	10:36:49	PPP109				0.1
08/07/1989	11:13:19	PR7304	RENAULT	COUPE	82	0.1
08/09/1989	08:46:12	PR7304				0.0
08/10/1989	08:28:24	PR7304				0.0
08/11/1989	07:24:25	PR7304				0.1

08/07/1989	10:41:22	PS194	PLYMOUTH	HATCHBACK	90	0.1
08/08/1989	10:46:02	PS194				0.0
08/10/1989	10:44:43	PS194				0.9
08/11/1989	10:57:54	PS194				0.3
08/08/1989	08:38:20	PS2679	BUICK	4 DOOR	80	9.6
08/09/1989	08:34:51	PS2679				1.0
08/10/1989	08:26:55	PS2679				1.2
08/11/1989	08:45:14	PS2679				2.9
08/08/1989	07:47:27	PS3692	CHEVROLET	4 DOOR	88	0.3
08/09/1989	08:00:40	PS3692				-0.4
08/10/1989	08:57:47	PS3692				1.1
08/11/1989	07:27:42	PS3692				0.1
08/07/1989	09:30:49	PS4968	BUICK	4 DOOR	76	1.1
08/08/1989	08:52:28	PS4968				3.7
08/09/1989	08:47:30	PS4968				0.4
08/10/1989	09:05:16	PS4968				8.1
08/11/1989	09:25:52	PS4968				7.7
08/08/1989	06:22:56	PS7540	CHEVROLET	HATCHBACK	89	5.0
08/09/1989	06:22:17	PS7540				0.7
08/10/1989	06:26:02	PS7540				0.5
08/11/1989	06:23:46	PS7540				0.1
08/07/1989	09:14:20	PS8406	MERCEDES-BENZ	4 DOOR	76	4.8
08/08/1989	07:54:31	PS8406				3.4
08/09/1989	10:10:50	PS8406				0.6
08/10/1989	08:57:53	PS8406				0.5
08/10/1989	09:50:44	PS8406				0.4
08/07/1989	08:36:18	PS9157	MERCURY	4 DOOR	89	0.1
08/08/1989	08:53:53	PS9157				0.0
08/10/1989	07:48:16	PS9157				0.1
08/11/1989	08:35:09	PS9157				0.0
08/08/1989	07:39:55	PV61	CHRYSLER	COUPE	87	0.0
08/09/1989	07:36:35	PV61				0.1
08/10/1989	07:35:42	PV61				0.2
08/11/1989	07:33:31	PV61				0.1
08/08/1989	06:21:19	PV7583	FORD	4 DOOR	84	0.6
08/09/1989	06:23:15	PV7583				0.0
08/10/1989	06:21:00	PV7583				0.6
08/11/1989	06:26:45	PV7583				-0.1
08/08/1989	06:21:58	PVM260		4 DOOR	85	0.0
08/09/1989	06:03:37	PVM260				0.8
08/10/1989	06:19:53	PVM260				0.0
08/11/1989	06:07:42	PVM260				0.3

08/07/1989	10:09:39	PVN360	FORD	HATCHBACK	89	0.0
08/08/1989	10:05:35	PVN360				0.0
08/09/1989	09:34:03	PVN360				0.4
08/10/1989	09:55:59	PVN360				0.2
08/11/1989	09:48:09	PVN360				-0.1
08/08/1989	06:03:13	PW5668	CADILLAC	4 DOOR	82	4.2
08/09/1989	06:36:07	PW5668				0.2
08/10/1989	06:15:54	PW5668				0.3
08/11/1989	06:30:30	PW5668				0.4
08/07/1989	07:41:22	PX1234	CHEVROLET	HATCHBACK	81	3.4
08/08/1989	07:41:01	PX1234				2.5
08/09/1989	07:27:28	PX1234				0.3
08/10/1989	07:39:33	PX1234				1.7
08/11/1989	07:41:54	PX1234				3.2
08/08/1989	06:08:09	PX2787	CHEVROLET	COUPE	74	0.2
08/09/1989	06:10:10	PX2787				0.3
08/10/1989	06:08:11	PX2787				0.2
08/11/1989	06:07:11	PX2787				0.1
08/07/1989	08:07:08	PXS449	CHEVROLET	4 DOOR	89	0.0
08/08/1989	07:53:26	PXS449				0.0
08/09/1989	07:34:55	PXS449				0.0
08/10/1989	08:14:04	PXS449				0.1
08/11/1989	08:12:16	PXS449				-0.1
08/08/1989	08:45:34	QA1329	TOYOTA	HATCHBACK	84	0.1
08/09/1989	08:43:06	QA1329				0.0
08/10/1989	08:41:29	QA1329				0.0
08/11/1989	08:48:39	QA1329				0.0
08/07/1989	07:12:55	QA1335	PONTIAC	COUPE	89	0.0
08/08/1989	07:18:15	QA1335				0.0
08/09/1989	07:15:01	QA1335				0.0
08/10/1989	07:13:24	QA1335				0.0
08/11/1989	07:15:15	QA1335				0.1
08/08/1989	07:35:14	QA7015	FORD	4 DOOR	83	0.2
08/09/1989	06:20:00	QA7015				0.5
08/10/1989	06:34:29	QA7015				0.1
08/11/1989	06:54:12	QA7015				0.1
08/07/1989	06:43:26	QB1773	TOYOTA	4 DOOR	81	3.3
08/08/1989	06:41:06	QB1773				7.4
08/09/1989	06:43:30	QB1773				3.9
08/11/1989	06:44:13	QB1773				-0.1

08/08/1989	07:41:45	QB4521	CHEVROLET	4 DOOR	82	1.5
08/09/1989	07:40:23	QB4521				0.7
08/10/1989	07:34:39	QB4521				10.0
08/11/1989	07:34:36	QB4521				1.8
08/07/1989	07:44:21	QB9170	PONTIAC	2 DR HT	75	0.2
08/08/1989	07:10:00	QB9170				0.2
08/09/1989	07:24:16	QB9170				0.1
08/10/1989	07:20:56	QB9170				0.2
08/07/1989	07:59:47	QE6496	CHEVROLET	4 DOOR	84	0.1
08/08/1989	08:21:33	QE6496				0.1
08/08/1989	12:18:14	QE6496				0.0
08/09/1989	06:40:24	QE6496				0.1
08/10/1989	07:26:36	QE6496				0.1
08/11/1989	08:40:29	QE6496				0.3
08/07/1989	09:05:14	QE869	CHEVROLET	COUPE	79	0.8
08/09/1989	07:16:12	QE869				0.3
08/10/1989	09:16:46	QE869				2.3
08/11/1989	09:20:07	QE869				1.2
08/11/1989	10:56:45	QE869				1.1
08/08/1989	06:21:06	QF1737	DODGE	4 DOOR	89	0.0
08/09/1989	06:23:09	QF1737				0.0
08/10/1989	06:11:06	QF1737				0.0
08/11/1989	06:23:09	QF1737				0.1
08/07/1989	08:29:40	QF3149	CHEVROLET	2 DOOR	88	0.8
08/08/1989	08:44:33	QF3149				0.1
08/09/1989	07:51:30	QF3149				0.0
08/10/1989	10:04:48	QF3149				0.0
08/11/1989	08:36:00	QF3149				0.1
08/08/1989	06:01:22	QF727	PLYMOUTH	4 DOOR	85	0.2
08/09/1989	06:01:39	QF727				0.0
08/10/1989	06:04:49	QF727				-0.1
08/11/1989	06:03:01	QF727				0.3
08/07/1989	12:48:46	QF7696	CHEVROLET	2 DR HT	75	0.1
08/08/1989	12:43:49	QF7696				0.5
08/09/1989	05:53:37	QF7696				0.1
08/10/1989	06:24:26	QF7696				0.1
08/07/1989	07:55:46	QL2424	CHEVROLET	4 DOOR	76	0.2
08/08/1989	07:47:53	QL2424				3.0
08/09/1989	07:46:57	QL2424				10.7
08/09/1989	13:01:34	QL2424				0.1
08/10/1989	08:01:10	QL2424				2.5
08/11/1989	08:09:07	QL2424				9.5

08/07/1989	06:52:48	QN7502	DODGE	HATCHBACK	89	0.2
08/08/1989	06:36:38	QN7502				0.5
08/09/1989	06:49:57	QN7502				-0.1
08/11/1989	06:31:20	QN7502				2.5
08/07/1989	06:46:13	QS5090	CHEVROLET	4 DOOR	89	0.1
08/08/1989	06:52:03	QS5090				0.1
08/09/1989	06:50:16	QS5090				0.1
08/10/1989	06:46:51	QS5090				-0.1
08/07/1989	06:52:51	QT4097	HONDA	COUPE	84	0.3
08/08/1989	06:58:12	QT4097				0.4
08/09/1989	06:58:17	QT4097				0.5
08/10/1989	06:56:03	QT4097				0.3
08/11/1989	06:59:30	QT4097				1.0
08/07/1989	07:29:36	QT7287	FORD	2 DOOR	87	0.0
08/08/1989	07:38:32	QT7287				1.7
08/09/1989	07:46:13	QT7287				0.1
08/10/1989	08:33:57	QT7287				0.1
08/11/1989	06:43:37	QT7287				0.5
08/08/1989	06:09:29	QT8430	FORD	2 DR HT	77	0.7
08/09/1989	06:24:24	QT8430				1.2
08/10/1989	06:24:48	QT8430				10.0
08/11/1989	06:25:00	QT8430				8.3
08/08/1989	08:44:37	QV1130	CHEVROLET	VAN	88	0.0
08/09/1989	08:42:10	QV1130				0.1
08/10/1989	08:27:26	QV1130				0.7
08/11/1989	08:48:48	QV1130				0.1
08/07/1989	07:27:30	QV1977	HONDA	4 DOOR	89	0.1
08/09/1989	07:42:15	QV1977				-0.1
08/10/1989	07:48:13	QV1977				0.1
08/11/1989	07:55:57	QV1977				0.1
08/07/1989	07:11:36	QV4164	CHRYSLER	PASSENGER	82	0.4
08/08/1989	07:19:39	QV4164				0.6
08/09/1989	07:18:41	QV4164				2.2
08/10/1989	07:05:12	QV4164				0.1
08/11/1989	07:08:19	QV4164				0.3
08/07/1989	07:09:21	QV6563	MERCURY	4 DOOR	79	5.7
08/09/1989	07:08:42	QV6563				4.3
08/10/1989	06:59:37	QV6563				6.3
08/11/1989	07:00:06	QV6563				4.4

08/07/1989	08:04:21	QX8250	DODGE	STA WAGON	73	6.5
08/08/1989	08:00:43	QX8250				5.5
08/09/1989	08:04:26	QX8250				9.1
08/10/1989	07:55:32	QX8250				5.0
08/11/1989	07:51:07	QX8250				5.6
08/08/1989	06:56:10	QX9074	CHEVROLET	4 DOOR	90	0.1
08/09/1989	07:20:58	QX9074				0.0
08/10/1989	06:50:00	QX9074				0.0
08/11/1989	06:31:12	QX9074				-0.2
08/08/1989	06:31:32	QY1134	CADILLAC	4 DOOR	81	0.5
08/09/1989	06:15:00	QY1134				1.9
08/10/1989	06:26:53	QY1134				0.9
08/11/1989	06:34:44	QY1134				0.6
08/07/1989	08:35:50	QY5891	PONTIAC	4 DOOR	84	0.1
08/09/1989	08:13:39	QY5891				1.1
08/10/1989	08:08:34	QY5891				0.5
08/11/1989	08:04:30	QY5891				0.5
08/07/1989	13:26:58	QZ2797	CHEVROLET	VAN	89	0.0
08/08/1989	06:55:29	QZ2797				0.5
08/08/1989	08:45:59	QZ2797				0.1
08/09/1989	07:31:48	QZ2797				0.1
08/07/1989	06:56:59	QZ2925	FORD	4 DOOR	88	0.0
08/09/1989	07:20:55	QZ2925				0.1
08/10/1989	06:55:29	QZ2925				0.1
08/11/1989	06:53:57	QZ2925				0.0
08/07/1989	08:09:42	QZ4607	BUICK	4 DOOR	84	0.2
08/08/1989	07:42:09	QZ4607				0.5
08/09/1989	07:08:57	QZ4607				0.3
08/10/1989	06:53:03	QZ4607				0.3
08/11/1989	06:53:21	QZ4607				0.4
08/07/1989	08:58:05	RAF168	OLDSMOBILE	COUPE	84	0.1
08/08/1989	08:45:11	RAF168				0.1
08/09/1989	08:46:26	RAF168				0.1
08/10/1989	08:35:54	RAF168				0.1
08/07/1989	06:57:11	RAG60	CHEVROLET	4 DOOR	86	0.2
08/08/1989	07:25:48	RAG60				0.1
08/10/1989	07:42:42	RAG60				0.4
08/11/1989	06:16:15	RAG60				0.1
08/07/1989	08:18:01	RD4285	BUICK	4 DOOR	80	12.2
08/08/1989	08:24:32	RD4285				7.0
08/10/1989	08:15:37	RD4285				1.7
08/11/1989	08:14:48	RD4285				2.4

08/07/1989	06:37:22	RD8077	FORD	2 DR HT	76	0.2
08/08/1989	06:29:22	RD8077				0.0
08/09/1989	07:42:32	RD8077				1.3
08/10/1989	06:30:49	RD8077				0.3
08/11/1989	06:11:23	RD8077				4.2
08/07/1989	12:03:28	REGBRN	BUICK	PASSENGER	86	2.0
08/08/1989	11:45:37	REGBRN				4.6
08/09/1989	09:04:50	REGBRN				3.1
08/11/1989	12:15:54	REGBRN				0.0
08/08/1989	06:30:33	RETSEL	PLYMOUTH	2 DOOR	82	9.4
08/09/1989	06:31:16	RETSEL				2.6
08/10/1989	09:27:31	RETSEL				6.7
08/11/1989	06:31:04	RETSEL				3.0
08/08/1989	07:45:12	RF3172	PLYMOUTH	HATCHBACK	86	0.5
08/09/1989	07:40:40	RF3172				0.1
08/10/1989	07:38:16	RF3172				-0.1
08/11/1989	07:35:44	RF3172				0.0
08/07/1989	07:09:52	RF7443	PLYMOUTH	STA WAGON	84	0.6
08/08/1989	07:04:44	RF7443				0.1
08/09/1989	07:08:15	RF7443				0.2
08/11/1989	07:07:56	RF7443				0.1
08/08/1989	06:11:40	RF8118	BUICK	COUPE	79	1.4
08/09/1989	06:10:50	RF8118				0.3
08/10/1989	06:09:45	RF8118				2.7
08/11/1989	06:11:47	RF8118				3.0
08/07/1989	12:36:55	RF9785	FORD	VAN	89	0.0
08/08/1989	12:39:18	RF9785				-0.1
08/09/1989	10:22:23	RF9785				0.0
08/11/1989	09:00:34	RF9785				0.1
08/07/1989	06:54:26	RFN229	PLYMOUTH	4 DOOR	88	0.0
08/08/1989	06:29:19	RFN229				0.0
08/09/1989	06:24:28	RFN229				7.8
08/11/1989	06:19:03	RFN229				0.0
08/08/1989	08:43:57	RHG4	HONDA	2 DOOR	86	0.0
08/09/1989	08:44:41	RHG4				0.1
08/10/1989	08:41:17	RHG4				0.0
08/11/1989	08:43:25	RHG4				0.1
08/07/1989	10:23:58	RJYAO1	OLDSMOBILE	COUPE	87	5.4
08/08/1989	10:31:56	RJYAO1				9.5
08/09/1989	10:55:22	RJYAO1				3.8
08/10/1989	10:52:59	RJYAO1				0.5

08/07/1989	07:27:00	RN7798	GMC	VAN	89	0.0
08/08/1989	07:20:25	RN7798				0.0
08/09/1989	07:20:17	RN7798				0.0
08/10/1989	07:39:50	RN7798				0.0
08/11/1989	07:22:33	RN7798				0.0
08/07/1989	07:44:30	RP2919	PONTIAC	2 DR HT	77	2.9
08/08/1989	07:25:12	RP2919				3.3
08/09/1989	08:02:41	RP2919				0.5
08/10/1989	07:42:00	RP2919				0.1
08/07/1989	06:44:31	RP7013	HONDA	HATCHBACK	89	0.2
08/08/1989	07:41:35	RP7013				0.0
08/09/1989	07:53:25	RP7013				0.7
08/11/1989	07:39:21	RP7013				4.0
08/07/1989	08:06:30	RP9173	DODGE	HATCHBACK	83	0.1
08/08/1989	08:01:58	RP9173				0.2
08/09/1989	08:13:35	RP9173				0.1
08/10/1989	08:13:08	RP9173				1.0
08/11/1989	08:19:45	RP9173				0.7
08/07/1989	08:04:32	RU6163	CHEVROLET	4 DOOR	82	7.5
08/09/1989	07:52:27	RU6163				5.1
08/10/1989	08:00:24	RU6163				5.8
08/11/1989	07:53:05	RU6163				7.0
08/07/1989	08:19:45	RUBYQ	CHEVROLET	CONVTBLE	84	0.7
08/08/1989	08:19:13	RUBYQ				0.0
08/09/1989	08:07:47	RUBYQ				0.5
08/11/1989	08:09:20	RUBYQ				0.2
08/07/1989	07:31:22	RW2017	FORD	2 DOOR	88	0.0
08/08/1989	07:25:59	RW2017				0.6
08/08/1989	10:41:50	RW2017				2.6
08/09/1989	07:22:20	RW2017				2.5
08/09/1989	10:55:13	RW2017				6.9
08/10/1989	08:46:19	RW2017				0.4
08/10/1989	10:23:10	RW2017				0.1
08/07/1989	08:05:47	RW5128	DODGE	VAN	87	0.0
08/08/1989	08:08:41	RW5128				0.8
08/09/1989	08:08:32	RW5128				1.8
08/10/1989	08:12:47	RW5128				0.0
08/11/1989	08:08:38	RW5128				2.6
08/07/1989	06:45:03	RYL452	PONTIAC	COUPE	84	0.4
08/09/1989	06:49:04	RYL452				0.8
08/10/1989	06:42:30	RYL452				0.6
08/11/1989	06:46:13	RYL452				0.2

08/07/1989	07:44:38	RYP293	SUBARU	4 DOOR	87	0.1
08/08/1989	07:41:27	RYP293				1.4
08/09/1989	07:40:25	RYP293				-0.4
08/10/1989	07:41:57	RYP293				-0.1
08/11/1989	07:38:25	RYP293				0.0
08/07/1989	07:05:52	RYT299	CHEVROLET	4 DOOR	85	0.1
08/08/1989	07:21:07	RYT299				0.3
08/09/1989	08:35:14	RYT299				0.6
08/10/1989	06:35:57	RYT299				0.2
08/07/1989	09:28:09	RZK120	CHEVROLET	STA WAGON	79	0.1
08/09/1989	10:18:19	RZK120				0.1
08/10/1989	09:45:54	RZK120				0.1
08/11/1989	10:15:11	RZK120				0.3
08/07/1989	07:26:39	RZK183	CHEVROLET	COUPE	82	2.6
08/09/1989	07:24:27	RZK183				0.7
08/10/1989	07:25:48	RZK183				0.0
08/11/1989	07:29:40	RZK183				0.1
08/07/1989	08:53:55	RZT517	CHEVROLET	COUPE	78	0.7
08/08/1989	07:35:53	RZT517				0.5
08/09/1989	07:31:32	RZT517				0.4
08/10/1989	07:42:58	RZT517				1.0
08/11/1989	07:38:52	RZT517				1.5
08/07/1989	06:41:55	RZV191	DODGE	STA WAGON	85	2.6
08/08/1989	06:39:17	RZV191				-0.3
08/09/1989	06:41:23	RZV191				0.2
08/11/1989	06:40:57	RZV191				0.3
08/07/1989	06:53:00	SAVIO1	MERCEDES-BENZ	4 DOOR	88	0.1
08/08/1989	07:03:11	SAVIO1				0.1
08/09/1989	06:31:21	SAVIO1				0.0
08/10/1989	07:09:08	SAVIO1				0.0
08/11/1989	07:19:54	SAVIO1				0.0
08/07/1989	10:21:19	SB10	CHEVROLET	PASSENGER	83	4.8
08/08/1989	10:37:48	SB10				3.0
08/09/1989	10:38:20	SB10				3.2
08/10/1989	10:44:51	SB10				2.8
08/07/1989	09:44:16	SFY676	CHEVROLET	COUPE	81	0.5
08/08/1989	09:24:51	SFY676				4.9
08/10/1989	09:29:04	SFY676				0.4
08/11/1989	09:18:02	SFY676				0.3
08/07/1989	08:07:12	SG2060		STA WAGON	86	0.3
08/08/1989	08:10:23	SG2060				0.1
08/10/1989	08:08:37	SG2060				0.0
08/11/1989	08:07:58	SG2060				0.2

08/07/1989	08:34:03	SJA11	B.M.W.	4 DOOR	88	0.0
08/09/1989	08:51:34	SJA11				-0.1
08/10/1989	07:42:08	SJA11				0.3
08/11/1989	08:01:13	SJA11				0.0
08/07/1989	06:41:31	SMN813	HONDA	4 DOOR	85	1.3
08/08/1989	06:44:05	SMN813				0.0
08/09/1989	06:47:12	SMN813				0.1
08/11/1989	06:41:07	SMN813				1.1
08/08/1989	11:15:43	SNU312	AM MOTORS	PASSENGER	81	7.6
08/09/1989	11:12:15	SNU312				7.3
08/10/1989	11:08:46	SNU312				6.7
08/11/1989	07:14:15	SNU312				11.8
08/07/1989	07:01:54	SPK906	PLYMOUTH	HATCHBACK	78	0.2
08/08/1989	07:20:19	SPK906				1.0
08/09/1989	07:13:03	SPK906				-0.2
08/11/1989	07:05:48	SPK906				0.0
08/08/1989	06:52:54	SPUNKY3	OLDSMOBILE	4 DOOR	85	0.0
08/09/1989	06:49:01	SPUNKY3				0.0
08/10/1989	06:35:53	SPUNKY3				0.0
08/11/1989	11:46:06	SPUNKY3				0.1
08/08/1989	06:47:05	SPX234	TOYOTA	4 DOOR	86	0.0
08/09/1989	06:51:48	SPX234				0.0
08/10/1989	06:46:35	SPX234				0.1
08/11/1989	06:53:18	SPX234				0.2
08/07/1989	12:18:38	SPX379	FORD	HATCHBACK	85	0.0
08/08/1989	12:14:42	SPX379				2.0
08/09/1989	12:21:04	SPX379				0.3
08/11/1989	12:14:02	SPX379				0.5
08/07/1989	07:25:42	SPX966	CHEVROLET	4 DOOR	84	0.0
08/08/1989	07:35:25	SPX966				0.2
08/09/1989	07:07:11	SPX966				0.1
08/11/1989	07:05:24	SPX966				0.0
08/07/1989	08:12:30	ST4461	FORD	2 DOOR	85	4.3
08/08/1989	08:12:03	ST4461				4.4
08/09/1989	08:12:09	ST4461				7.3
08/11/1989	08:19:56	ST4461				1.8
08/07/1989	08:03:15	STR115	FORD	HATCHBACK	85	0.4
08/08/1989	07:59:07	STR115				-0.2
08/09/1989	07:59:34	STR115				0.1
08/10/1989	07:57:12	STR115				0.3

08/07/1989	07:34:03	STS333	TOYOTA	COUPE	86	0.1
08/08/1989	07:41:33	STS333				0.0
08/09/1989	07:29:41	STS333				0.1
08/10/1989	07:41:55	STS333				0.1
08/07/1989	07:09:38	STT458	PONTIAC	COUPE	88	0.1
08/08/1989	07:00:19	STT458				0.1
08/09/1989	07:05:28	STT458				0.1
08/10/1989	07:08:45	STT458				0.0
08/11/1989	07:10:08	STT458				0.0
08/07/1989	08:27:33	SUA868	MERCURY	4 DOOR	84	0.0
08/08/1989	07:02:54	SUA868				0.1
08/10/1989	09:31:45	SUA868				0.0
08/11/1989	06:56:34	SUA868				0.1
08/11/1989	08:31:04	SUA868				4.0
08/08/1989	07:46:12	SUR776	VOLVO	2 DOOR	81	0.5
08/09/1989	07:40:20	SUR776				0.7
08/10/1989	07:47:30	SUR776				1.4
08/11/1989	07:55:31	SUR776				0.3
08/11/1989	11:16:28	SUR776				0.3
08/07/1989	07:42:39	SUS121	MAZDA	COUPE	86	0.0
08/08/1989	07:53:15	SUS121				0.0
08/09/1989	07:49:13	SUS121				-0.1
08/10/1989	07:50:19	SUS121				0.1
08/11/1989	07:46:56	SUS121				0.1
08/07/1989	06:40:02	SVF	BUICK	4DR SEDAN	79	2.9
08/08/1989	06:37:43	SVF				0.1
08/09/1989	06:39:46	SVF				0.1
08/10/1989	06:40:56	SVF				0.7
08/07/1989	06:39:54	SYE492	PONTIAC	4 DOOR	85	0.1
08/08/1989	06:42:25	SYE492				-0.1
08/10/1989	06:40:39	SYE492				0.0
08/11/1989	06:41:23	SYE492				0.0
08/08/1989	06:27:57	SZT698	DODGE	4 DOOR	88	0.2
08/09/1989	06:31:39	SZT698				0.4
08/10/1989	06:33:38	SZT698				0.2
08/11/1989	06:25:05	SZT698				0.2
08/08/1989	06:05:32	TA7324	FORD BRONCO	STA WAGON	79	2.9
08/09/1989	06:10:16	TA7324				3.5
08/10/1989	06:07:32	TA7324				1.7
08/11/1989	06:22:51	TA7324				2.8

08/07/1989	07:04:27	TA8889	CHEVROLET	HATCHBACK	84	6.7
08/08/1989	07:24:15	TA8889				5.6
08/09/1989	07:19:08	TA8889				0.2
08/10/1989	07:24:22	TA8889				0.1
08/08/1989	06:20:19	TCN797	BUICK	4 DOOR	81	3.7
08/09/1989	06:23:12	TCN797				0.8
08/10/1989	06:19:18	TCN797				0.3
08/11/1989	06:01:21	TCN797				0.4
08/07/1989	08:12:19	TDP919	FORD	4DR WAGON	85	0.2
08/08/1989	08:15:46	TDP919				0.0
08/09/1989	08:13:16	TDP919				0.1
08/10/1989	08:16:03	TDP919				0.5
08/11/1989	08:17:36	TDP919				0.2
08/07/1989	07:18:45	TDP957	CHEVROLET	2 DOOR	79	3.9
08/08/1989	07:32:21	TDP957				0.0
08/09/1989	07:59:01	TDP957				0.0
08/11/1989	07:55:32	TDP957				3.4
08/08/1989	08:06:21	TLC112		COUPE	89	-0.2
08/09/1989	08:18:41	TLC112				0.2
08/10/1989	08:20:29	TLC112				0.1
08/11/1989	07:44:32	TLC112				-0.2
08/07/1989	06:54:42	TLM1020	MERCURY	SEDAN	88	0.0
08/08/1989	06:51:45	TLM1020				0.1
08/10/1989	06:53:53	TLM1020				0.1
08/11/1989	06:49:25	TLM1020				0.0
08/07/1989	08:12:40	TMY409	CHEVROLET	COUPE	86	0.1
08/08/1989	08:14:57	TMY409				3.8
08/09/1989	08:06:40	TMY409				0.1
08/11/1989	08:09:58	TMY409				0.1
08/07/1989	07:29:31	TN1257	PLYMOUTH	STA WAGON	85	0.2
08/08/1989	07:38:43	TN1257				-0.1
08/10/1989	07:30:25	TN1257				0.4
08/11/1989	07:40:24	TN1257				0.5
08/07/1989	13:11:25	TOP13	BUICK	4 DOOR	85	0.8
08/08/1989	12:42:15	TOP13				0.8
08/10/1989	11:02:55	TOP13				0.4
08/11/1989	10:00:09	TOP13				0.5
08/08/1989	06:44:37	TOSCANO	PONTIAC	4 DOOR	85	0.6
08/09/1989	06:48:34	TOSCANO				0.2
08/10/1989	06:43:58	TOSCANO				0.0
08/11/1989	06:43:32	TOSCANO				0.0

08/08/1989	09:19:49	TRN123		HATCHBACK	89	0.0
08/09/1989	09:43:38	TRN123				0.1
08/10/1989	10:44:08	TRN123				0.0
08/11/1989	06:37:10	TRN123				0.0
08/07/1989	08:02:29	TSJ424	PLYMOUTH	HATCHBACK	85	3.0
08/09/1989	07:57:32	TSJ424				-0.1
08/10/1989	07:44:55	TSJ424				0.7
08/11/1989	07:56:53	TSJ424				1.1
08/07/1989	07:17:22	UA4453	CHRYSLER	PASSENGER	79	1.5
08/08/1989	07:24:05	UA4453				2.0
08/09/1989	07:19:04	UA4453				1.5
08/10/1989	07:20:39	UA4453				1.1
08/11/1989	07:11:48	UA4453				1.3
08/07/1989	07:15:54	UAR700	CHEVROLET	HATCHBACK	80	4.9
08/09/1989	07:09:18	UAR700				1.2
08/10/1989	07:36:31	UAR700				0.9
08/11/1989	07:32:56	UAR700				1.0
08/07/1989	07:42:27	UAZ414	BUICK	4 DOOR	87	0.0
08/08/1989	07:42:02	UAZ414				0.0
08/09/1989	07:38:36	UAZ414				0.1
08/10/1989	07:45:28	UAZ414				0.1
08/07/1989	08:56:00	UK7670		HATCHBACK	84	0.0
08/09/1989	09:01:53	UK7670				-0.1
08/10/1989	08:29:35	UK7670				0.1
08/11/1989	08:58:56	UK7670				-0.3
08/07/1989	06:48:55	UZ3099	OLDSMOBILE	SEDAN	85	0.1
08/08/1989	06:43:44	UZ3099				0.0
08/09/1989	06:46:03	UZ3099				0.3
08/10/1989	06:46:05	UZ3099				0.0
08/07/1989	09:09:12	VC2050	SAAB	4 DOOR	85	0.2
08/09/1989	08:54:56	VC2050				5.4
08/10/1989	09:02:41	VC2050				5.1
08/11/1989	09:08:52	VC2050				0.5
08/07/1989	10:16:51	W-25852	FORD	4 DOOR	83	0.0
08/08/1989	10:14:03	W-25852				0.0
08/09/1989	09:49:08	W-25852				0.1
08/10/1989	09:38:56	W-25852				0.0
08/11/1989	09:57:28	W-25852				0.0
08/07/1989	10:26:37	W-34856	CHEVROLET	VAN	87	-0.1
08/08/1989	12:45:27	W-34856				0.0
08/09/1989	13:39:13	W-34856				0.5
08/11/1989	11:11:56	W-34856				0.0

08/07/1989	09:06:03	W-7281	TOYOTA	VAN	85	0.0
08/08/1989	09:06:00	W-7281				0.1
08/09/1989	09:04:23	W-7281				0.0
08/10/1989	09:05:11	W-7281				0.0
08/11/1989	08:53:32	W-7281				0.0
08/07/1989	07:57:47	W-9959	CADILLAC	2 DOOR	79	0.7
08/08/1989	07:43:54	W-9959				0.1
08/10/1989	07:50:54	W-9959				0.5
08/11/1989	07:58:35	W-9959				0.1
08/07/1989	06:54:51	WENCH	DODGE	2 DOOR	87	0.7
08/08/1989	06:33:31	WENCH				0.3
08/09/1989	06:48:28	WENCH				0.4
08/11/1989	06:43:48	WENCH				0.5
08/07/1989	08:28:05	XDP39	HONDA	STA WAGON	85	0.0
08/08/1989	08:12:42	XDP39				0.1
08/09/1989	08:17:19	XDP39				0.1
08/10/1989	07:34:11	XDP39				0.0
08/11/1989	08:08:17	XDP39				0.0
08/07/1989	11:59:02	XE4607	CHEVROLET	STA WAGON	84	0.1
08/08/1989	09:57:35	XE4607				0.9
08/09/1989	10:42:23	XE4607				0.2
08/11/1989	11:45:33	XE4607				0.0
08/07/1989	08:13:04	XIN797	DATSUN	4 DOOR	84	0.1
08/08/1989	08:03:05	XIN797				3.2
08/09/1989	08:31:54	XIN797				4.6
08/10/1989	08:03:01	XIN797				2.0
08/07/1989	07:41:39	XIV184	TOYOTA	4 DOOR	88	0.1
08/08/1989	07:40:40	XIV184				2.8
08/09/1989	07:34:34	XIV184				0.0
08/10/1989	07:34:27	XIV184				0.0
08/07/1989	06:37:13	XZP646	VOLVO	STA WAGON	83	0.0
08/08/1989	06:14:53	XZP646				0.1
08/09/1989	06:27:17	XZP646				0.1
08/10/1989	06:24:55	XZP646				0.1
08/11/1989	06:26:42	XZP646				0.3
08/07/1989	09:33:40	YBK567	PONTIAC	COUPE	87	0.6
08/08/1989	09:41:56	YBK567				0.3
08/09/1989	09:41:47	YBK567				0.3
08/10/1989	09:31:09	YBK567				0.2
08/11/1989	09:37:31	YBK567				0.0

08/07/1989	07:02:14	YDL103	CHRYSLER	HATCHBACK	85	4.8
08/08/1989	06:32:23	YDL103				3.2
08/09/1989	07:05:43	YDL103				2.7
08/11/1989	07:24:40	YDL103				8.7
08/07/1989	06:49:21	YH3558	PLYMOUTH	VAN	84	0.1
08/08/1989	06:46:59	YH3558				0.3
08/09/1989	06:46:18	YH3558				-0.1
08/10/1989	06:41:37	YH3558				-0.1
08/11/1989	06:45:51	YH3558				0.1
08/08/1989	07:46:05	YJP39	PLYMOUTH	2 DOOR	84	6.6
08/09/1989	07:45:06	YJP39				5.5
08/10/1989	07:41:31	YJP39				1.2
08/11/1989	07:45:53	YJP39				2.6
08/07/1989	07:06:49	YKC366	CHEVROLET	HATCHBACK	80	0.2
08/08/1989	07:07:25	YKC366				0.5
08/09/1989	07:05:26	YKC366				0.4
08/10/1989	07:03:07	YKC366				1.8
08/07/1989	07:24:58	YQV840	OLDSMOBILE	4 DOOR	86	0.1
08/08/1989	07:41:16	YQV840				0.0
08/09/1989	07:39:04	YQV840				0.0
08/10/1989	08:17:05	YQV840				0.1
08/11/1989	08:21:21	YQV840				0.1
08/07/1989	07:37:41	YXJ532	DODGE	HATCHBACK	86	0.1
08/08/1989	10:10:31	YXJ532				-0.2
08/09/1989	08:56:08	YXJ532				0.2
08/10/1989	07:39:21	YXJ532				0.1
08/11/1989	07:44:15	YXJ532				0.1
08/07/1989	08:06:46	YZE202	TOYOTA	STA WAGON	84	5.2
08/09/1989	08:03:54	YZE202				0.0
08/10/1989	08:12:17	YZE202				5.0
08/11/1989	08:05:08	YZE202				5.4
08/07/1989	06:53:42	ZD4105	MERCEDES-BENZ	4 DOOR	77	0.1
08/08/1989	07:00:42	ZD4105				0.1
08/09/1989	06:55:55	ZD4105				0.3
08/10/1989	07:19:08	ZD4105				0.1
08/11/1989	07:07:08	ZD4105				0.1
08/07/1989	08:20:55	ZE308	BUICK	PASSENGER	81	0.3
08/08/1989	08:26:51	ZE308				0.1
08/09/1989	08:12:17	ZE308				0.8
08/10/1989	08:15:56	ZE308				0.1
08/11/1989	08:12:04	ZE308				0.1

08/07/1989	08:32:19	ZH7502	OLDSMOBILE	4 DOOR	88	0.1
08/08/1989	08:40:33	ZH7502				0.0
08/09/1989	08:56:15	ZH7502				0.0
08/10/1989	08:53:11	ZH7502				0.1
08/11/1989	08:52:27	ZH7502				0.1
08/07/1989	06:40:45	ZJ2870	CHEVROLET	COUPE	75	0.1
08/08/1989	06:28:24	ZJ2870				0.3
08/09/1989	06:34:54	ZJ2870				0.1
08/10/1989	06:35:23	ZJ2870				0.1
08/07/1989	08:35:41	ZK1205	PONTIAC	PASSENGER	77	0.1
08/08/1989	08:42:26	ZK1205				0.7
08/10/1989	08:16:59	ZK1205				0.6
08/11/1989	08:32:44	ZK1205				0.1
08/08/1989	06:29:57	ZK6640	CADILLAC	COUPE	87	0.0
08/09/1989	06:29:27	ZK6640				-0.1
08/10/1989	06:26:42	ZK6640				0.0
08/11/1989	06:27:30	ZK6640				0.0
08/07/1989	08:05:26	ZKT965	MITSUBISHI	HATCHBACK	87	0.0
08/08/1989	08:06:16	ZKT965				0.0
08/10/1989	08:03:41	ZKT965				4.4
08/11/1989	08:11:07	ZKT965				0.0
08/07/1989	07:35:28	ZMW121	CHEVROLET	STA WAGON	88	0.0
08/08/1989	07:40:05	ZMW121				5.3
08/09/1989	07:39:15	ZMW121				0.4
08/11/1989	07:38:17	ZMW121				0.6

APPENDIX E: Daily Summary of Gross Polluter Statistics

"Gross polluters" are here defined as the few vehicles which emit half the CO. Average age should be read as Arithmetic average model year. Emissions are in %CO. Closed Loop, Catalyst, Oxidation Cat and Non-Cat should not be taken as guarantees of a particular technology. They designate only model years 83 and newer, 81 and 82, 75-80, and 74 and older respectively. Original Vehicle Emissions Technology depends on vehicle type (truck/car). Actual technology also depends on maintenance history. The first % of total column shows that half the CO came from 8.23% of the measurements (973 of 11,818). The rest of the column shows percentages of the 973 by age category. The ± are derived from the daily means as described earlier.

Total Summary

The average GROSS POLLUTING vehicle age was: 80.71
The average CO emissions were: 7.09

The total vehicle count was:	11,818	Percent
Number of GROSS POLLUTING vehicles:	973	8.23% ± 0.4

Technology Distribution

The number of Closed looped vehicles were:	336	34.53% ± 2.4
The number of Catalyst equipped vehicles were:	146	8.72% ± 1.7
The number of Oxidation Cat vehicles were :	419	43.06% ± 3.0
The number of Non-Cat vehicles were :	72	7.40% ± 1.7

Daily Summary
(08/07/1989)

The average GROSS POLLUTING vehicle age was: 80.46
The average CO emissions were: 7.45

The total vehicle count was:	2294	Percent
Number of GROSS POLLUTING vehicles:	179	7.80%

Technology Distribution

The number of Closed looped vehicles were:	64	35.75%
The number of Catalyst equipped vehicles were:	21	11.73%
The number of Oxidation Cat vehicles were :	76	42.46%
The number of Non-Cat vehicles were :	18	10.06%

Daily Summary
(08/08/1989)

The average GROSS POLLUTING vehicle age was: 80.92
The average CO emissions were: 6.95

The total vehicle count was:	2385	Percent
Number of GROSS POLLUTING vehicles:	210	8.81%

Technology Distribution

The number of Closed looped vehicles were:	80	38.10%
The number of Catalyst equipped vehicles were:	29	13.81%
The number of Oxidation Cat vehicles were :	88	41.90%
The number of Non-Cat vehicles were :	13	6.19%

Daily Summary
(08/09/1989)

The average GROSS POLLUTING vehicle age was: 80.86
The average CO emissions were: 6.90

The total vehicle count was:	2676	Percent
Number of GROSS POLLUTING vehicles:	220	8.22%

Technology Distribution

The number of Closed looped vehicles were:	78	35.45%
The number of Catalyst equipped vehicles were:	36	16.36%
The number of Oxidation Cat vehicles were :	90	40.91%
The number of Non-Cat vehicles were :	16	7.27%

Daily Summary
(08/10/1989)

The average GROSS POLLUTING vehicle age was: 80.60
The average CO emissions were: 7.09

The total vehicle count was:	2071	Percent
Number of GROSS POLLUTING vehicles:	162	7.82%

Technology Distribution

The number of Closed looped vehicles were:	53	32.72%
The number of Catalyst equipped vehicles were:	28	17.28%
The number of Oxidation Cat vehicles were :	66	40.74%
The number of Non-Cat vehicles were :	15	9.26%

Daily Summary
(08/11/1989)

The average GROSS POLLUTING vehicle age was: 80.60
The average CO emissions were: 7.09

The total vehicle count was:	2392	Percent
Number of GROSS POLLUTING vehicles:	205	8.57%

Technology Distribution

The number of Closed looped vehicles were:	64	31.22%
The number of Catalyst equipped vehicles were:	29	14.15%
The number of Oxidation Cat vehicles were :	101	49.27%
The number of Non-Cat vehicles were :	11	5.37%

APPENDIX F: Average Emissions by Age Group

Note that all ± values printed are the standard deviation of the data (σ). If the distributions were a perfect exponential, σ would equal the mean ($\bar{X}$). This is not the case for either the overall average or for the numerous newer vehicles. The new vehicle emissions distribution is even more skewed than exponential because of a preponderance of clean vehicles. As the age increases, the distributions approach closer to exponential within each model year, as seen by the means coming closer to the printed σ values. As before, the standard error of the mean is much less than the standard deviation of the data because of the large number of samples.

Total Summary

The average vehicle age was: 83.47 ± 4.57
The average CO emissions were: 1.17 ± 2.12

The total vehicle count was:	11818	Percent
The number of Closed looped vehicles were:	7481	63.30%
The number of Catalyst equipped vehicles were:	1030	8.72%
The number of Oxidation Cat vehicles were :	2939	24.87%
The number of Non-Cat vehicles were :	368	3.11%

Yearly CO Averages

1989	1043	;	0.47	±	1.217		1978	644	;	2.09	±	2.600
1988	1576	;	0.56	±	1.416		1977	509	;	1.96	±	2.629
1987	1236	;	0.65	±	1.449		1976	288	;	1.72	±	2.388
1986	1200	;	0.64	±	1.554		1975	160	;	2.53	±	3.302
1985	1003	;	0.80	±	1.665		1974	124	;	2.36	±	2.822
1984	813	;	1.11	±	1.931		1973	93	;	2.14	±	2.736
1983	596	;	1.31	±	2.130		1972	54	;	2.58	±	3.074
1982	517	;	1.68	±	2.413		1971	26	;	2.41	±	2.615
1981	513	;	1.91	±	2.568		1970	13	;	1.69	±	1.973
1980	548	;	1.71	±	2.547		pre70	58	;	2.55	±	3.405
1979	790	;	1.86	±	2.642							

Daily Summary
(08/07/1989)

The average vehicle age was: 83.56 ± 4.47
The average CO emissions were: 1.16 ± 2.18

The total vehicle count was:	2294	Percent
The number of Closed looped vehicles were:	1472	64.17%
The number of Catalyst equipped vehicles were:	196	8.54%
The number of Oxidation Cat vehicles were :	557	24.28%
The number of Non-Cat vehicles were :	69	3.01%

Yearly CO Averages

1989	211	;	0.46	±	1.148		1978	115	;	2.09	±	2.405
1988	323	;	0.63	±	1.578		1977	97	;	2.23	±	2.846
1987	243	;	0.57	±	1.191		1976	65	;	1.40	±	2.151
1986	230	;	0.64	±	1.762		1975	38	;	2.35	±	3.091
1985	193	;	0.90	±	1.878		1974	24	;	2.65	±	3.310
1984	156	;	0.99	±	1.851		1973	17	;	2.11	±	2.512
1983	114	;	1.42	±	2.391		1972	16	;	3.23	±	4.022
1982	104	;	1.48	±	2.341		1971	1	;	1.58	±	0.000
1981	92	;	1.85	±	2.380		1970	3	;	2.87	±	3.430
1980	95	;	1.65	±	2.701		pre70	8	;	4.08	±	5.335
1979	147	;	1.86	±	2.957							

Daily Summary
(08/08/1989)

The average vehicle age was: 83.41 ± 4.48
The average CO emissions were: 1.22 ± 2.14

The total vehicle count was:	2385	Percent
The number of Closed looped vehicles were:	1493	62.60%
The number of Catalyst equipped vehicles were:	206	8.64%
The number of Oxidation Cat vehicles were :	616	25.83%
The number of Non-Cat vehicles were :	70	2.94%

Yearly CO Averages

1989	199 ;	0.59	±	1.408	1978	140 ;	2.22	±	2.552
1988	317 ;	0.61	±	1.519	1977	106 ;	1.65	±	2.369
1987	250 ;	0.71	±	1.514	1976	61 ;	1.57	±	1.892
1986	245 ;	0.60	±	1.496	1975	35 ;	2.77	±	3.207
1985	200 ;	0.92	±	1.787	1974	19 ;	2.04	±	2.032
1984	157 ;	1.41	±	2.050	1973	22 ;	1.81	±	2.639
1983	122 ;	1.37	±	2.110	1972	8 ;	2.48	±	2.610
1982	103 ;	1.52	±	2.600	1971	6 ;	1.69	±	2.549
1981	103 ;	2.05	±	2.736	1970	3 ;	0.75	±	0.565
1980	117 ;	1.81	±	2.560	pre70	12 ;	3.87	±	4.244
1979	157 ;	1.87	±	2.729					

Daily Summary
(08/09/1989)

The average vehicle age was: 83.43 ± 4.52
The average CO emissions were: 1.13 ± 2.05

The total vehicle count was:	2676	Percent
The number of Closed looped vehicles were:	1680	62.78%
The number of Catalyst equipped vehicles were:	241	9.01%
The number of Oxidation Cat vehicles were :	681	25.45%
The number of Non-Cat vehicles were :	74	2.77%

Yearly CO Averages

1989	232	;	0.42 ± 1.204		1978	158	;	1.95 ± 2.570
1988	340	;	0.56 ± 1.476		1977	121	;	1.89 ± 2.414
1987	267	;	0.58 ± 1.493		1976	54	;	1.79 ± 2.510
1986	275	;	0.69 ± 1.697		1975	36	;	2.06 ± 2.957
1985	235	;	0.71 ± 1.648		1974	32	;	2.24 ± 2.723
1984	184	;	1.15 ± 1.938		1973	14	;	2.87 ± 3.396
1983	145	;	1.18 ± 1.944		1972	12	;	1.28 ± 1.699
1982	131	;	2.09 ± 2.418		1971	2	;	2.61 ± 3.613
1981	110	;	1.63 ± 2.003		1970	2	;	0.17 ± 0.085
1980	125	;	1.61 ± 2.435		pre70	12	;	2.76 ± 3.798
1979	187	;	1.72 ± 2.424					

Daily Summary
(08/10/1989)

The average vehicle age was: 83.48 ± 4.88
The average CO emissions were: 1.11 ± 2.07

The total vehicle count was:	2071	Percent
The number of Closed looped vehicles were:	1320	63.74%
The number of Catalyst equipped vehicles were:	179	8.64%
The number of Oxidation Cat vehicles were :	496	23.95%
The number of Non-Cat vehicles were :	76	3.67%

Yearly CO Averages

1989	178	;	0.43 ± 1.081		1978	105	;	1.71 ± 2.534
1988	293	;	0.52 ± 1.173		1977	83	;	2.07 ± 3.106
1987	217	;	0.68 ± 1.461		1976	46	;	1.65 ± 2.471
1986	217	;	0.65 ± 1.436		1975	22	;	2.91 ± 3.872
1985	175	;	0.73 ± 1.485		1974	25	;	2.60 ± 3.218
1984	136	;	0.99 ± 1.906		1973	18	;	2.60 ± 3.184
1983	101	;	1.19 ± 1.857		1972	8	;	3.67 ± 3.785
1982	89	;	1.30 ± 2.090		1971	8	;	2.22 ± 3.209
1981	90	;	2.14 ± 2.773		1970	2	;	1.93 ± 2.517
1980	95	;	1.75 ± 2.716		pre70	15	;	1.00 ± 1.033
1979	145	;	1.70 ± 2.415					

Daily Summary
(08/11/1989)

The average vehicle age was: 83.47 ± 4.53
The average CO emissions were: 1.21 ± 2.15

The total vehicle count was:	2392	Percent
The number of Closed looped vehicles were:	1516	63.38%
The number of Catalyst equipped vehicles were:	208	8.70%
The number of Oxidation Cat vehicles were :	589	24.62%
The number of Non-Cat vehicles were :	79	3.30%

Yearly CO Averages

1989	223	;	0.46	±	1.215		1978	126	;	2.42	±	2.888
1988	303	;	0.47	±	1.261		1977	102	;	2.02	±	2.505
1987	259	;	0.72	±	1.549		1976	62	;	2.21	±	2.846
1986	233	;	0.63	±	1.320		1975	29	;	2.79	±	3.747
1985	200	;	0.73	±	1.480		1974	24	;	2.23	±	2.708
1984	180	;	1.02	±	1.893		1973	22	;	1.64	±	2.184
1983	114	;	1.41	±	2.341		1972	10	;	2.32	±	2.137
1982	90	;	1.87	±	2.513		1971	9	;	3.10	±	2.370
1981	118	;	1.92	±	2.866		1970	3	;	2.30	±	1.324
1980	116	;	1.74	±	2.418		pre70	11	;	1.87	±	1.778
1979	154	;	2.20	±	2.692							

APPENDIX G: Emissions by Fleet Ownership

Most of the vehicles at the ramp chosen were individually owned. The total, and the three subcategory fleets are shown, corporate (taxi and livery as well as company cars), government vehicles. The corporate and government fleets are much newer than the individually-owned vehicles. When corrected for age, the corporate and individual fleets are indistinguishable. The government fleet (of only 70 vehicles) is clearly dirtier than either fleet. However, it should be emphasized that the poor-looking government fleet emissions look as bad as they do because of only a few vehicles, namely, a 1982 Ford at 8.2% on 8/7, 11.8% on 8/8 and at 8.8% on 8/10, a 1979 Cadillac at 11.3% and a 1988 Chevrolet at 8.1%. The whole government fleet emissions are included in this appendix.

Private Fleet

The average vehicle age was: 83.18 ± 4.58
The average PERCENT_CO emissions were: 1.20 ± 2.15

The total vehicle count was:	10604	Percent
The number of Closed looped vehicles were:	6414	60.49%
The number of Catalyst equipped vehicles were:	996	9.39%
The number of Oxidation Cat vehicles were :	2837	26.75%
The number of Non-Cat vehicles were :	357	3.37%

Yearly CO Averages

1989	827 ;	0.48	±	1.236	1978	623 ;	2.08	±	2.600
1988	1292 ;	0.60	±	1.491	1977	497 ;	1.97	±	2.620
1987	1040 ;	0.59	±	1.320	1976	278 ;	1.75	±	2.405
1986	1029 ;	0.61	±	1.547	1975	155 ;	2.51	±	3.299
1985	909 ;	0.79	±	1.675	1974	123 ;	2.37	±	2.829
1984	756 ;	1.09	±	1.924	1973	93 ;	2.14	±	2.736
1983	548 ;	1.17	±	2.020	1972	54 ;	2.58	±	3.074
1982	499 ;	1.65	±	2.363	1971	22 ;	2.14	±	2.538
1981	497 ;	1.91	±	2.552	1970	13 ;	1.69	±	1.973
1980	526 ;	1.73	±	2.572	pre70	53 ;	2.76	±	3.489
1979	758 ;	1.90	±	2.656					

Corporate Fleet

The average vehicle age was: 85.95 ± 3.68
The average CO emissions were: 0.86 ± 1.73

The total vehicle count was:	1144	Percent
The number of Closed looped vehicles were:	1008	88.11%
The number of Catalyst equipped vehicles were:	25	2.19%
The number of Oxidation Cat vehicles were :	100	8.74%
The number of Non-Cat vehicles were :	11	0.96%

Yearly CO Averages

1989	209	;	0.46	±	1.158		1978	20	;	2.38	±	2.707
1988	269	;	0.36	±	0.880		1977	12	;	1.54	±	3.071
1987	183	;	1.02	±	2.011		1976	10	;	1.05	±	1.820
1986	164	;	0.85	±	1.620		1975	5	;	3.36	±	3.659
1985	88	;	0.85	±	1.603		1974	1	;	0.59	±	0.000
1984	50	;	1.19	±	1.936		1973	0	;	*****	±	0.000
1983	43	;	2.90	±	2.579		1972	0	;	*****	±	0.000
1982	11	;	1.09	±	1.360		1971	4	;	3.89	±	2.899
1981	14	;	2.08	±	3.304		1970	0	;	*****	±	0.000
1980	22	;	1.35	±	1.851		pre70	6	;	0.29	±	0.408
1979	31	;	0.74	±	1.133							

Government Fleet

The average vehicle age was: 85.64 ±- 2.64
The average CO emissions were: 1.58 ±- 2.82

The total vehicle count was:	70	Percent
The number of Closed looped vehicles were:	59	84.29%
The number of Catalyst equipped vehicles were:	9	12.86%
The number of Oxidation Cat vehicles were :	2	2.86%
The number of Non-Cat vehicles were :	0	0.00%

Yearly CO Averages

1989	7	;	0.07	±	0.063		1978	1	;	0.61	±	0.000
1988	15	;	0.90	±	2.181		1977	0	;	*****	±	0.000
1987	12	;	0.80	±	1.246		1976	0	;	*****	±	0.000
1986	7	;	0.20	±	0.326		1975	0	;	*****	±	0.000
1985	6	;	0.68	±	1.023		1974	0	;	*****	±	0.000
1984	7	;	2.65	±	2.268		1973	0	;	*****	±	0.000
1983	5	;	2.86	±	3.771		1972	0	;	*****	±	0.000
1982	7	;	5.01	±	4.565		1971	0	;	*****	±	0.000
1981	2	;	0.83	±	1.379		1970	0	;	*****	±	0.000
1980	0	;	*****	±	0.000		pre70	0	;	*****	±	0.000
1979	1	;	11.27	±	0.000							

Government Vehicle Listing

License	Make	Body style	Year	% CO
** 08/07/1989				
M67109	CHEVROLET	STA WAGON	88	0.1
M31673	FORD	4 DOOR	82	8.2
M9743	CHEVROLET	4 DOOR	87	3.8
M55323	FORD	4 DOOR	84	2.3
U8345	DODGE	UTILITY	88	0.4
M62230	CHEVROLET	4 DOOR	87	0.1
M62631	FORD	4 DOOR	87	0.0
M43629	CHEVROLET	VAN	87	2.6
BYY760	FORD	4 DOOR	83	5.4
BYZ392	CADILLAC	4 DOOR	79	11.3
M66210	CHEVROLET	PICKUP	88	0.4
M66210	CHEVROLET	PICKUP	88	-0.1
M170	CHEVROLET	4 DOOR	87	1.1
M60744	CHEVROLET	4 DOOR	87	0.0
M55548	FORD	PICKUP	85	0.0
** 08/08/1989				
M170	CHEVROLET	4 DOOR	87	0.0
M43629	CHEVROLET	VAN	87	1.6
M59162	CHEVROLET	4 DOOR	86	0.0
M68049	CHEVROLET	4 DOOR	88	-0.1
M59162	CHEVROLET	4 DOOR	86	0.0
U6283	DODGE	HATCHBACK	88	0.1
M59186	CHEVROLET	4 DOOR	86	0.3
M12834	DODGE	VAN	81	1.8
M30541	CHRYSLER		81	-0.1
M65865	GMC	VAN	88	0.0
M31673	FORD	4 DOOR	82	11.8
GPF658	FORD	4 DOOR	84	6.1
M65106	CHEVROLET	4 DOOR	88	3.5
** 08/09/1989				
U7558	CHEVROLET	VAN	89	0.1
M50173	FORD	PICKUP	82	0.7
M57004	DODGE	VAN	86	0.0
M50079	CHEVROLET	HATCHBACK	82	0.2
M68045	CHEVROLET	4 DOOR	88	0.0
U7558	CHEVROLET	VAN	89	0.1
M54510	FORD	4 DOOR	84	0.3
U16054	DODGE	STA WAGON	86	0.0
M60147	CHEVROLET	4 DOOR	86	0.1
M55548	FORD	PICKUP	85	0.0
U9887	PONTIAC	HATCHBACK	85	0.4
U16270	CHEVROLET	4DR SEDAN	87	0.4
U9896	DODGE	VAN	88	0.1
U9910	DODGE	VAN	87	-0.1
M31673	FORD	4 DOOR	82	3.5

U14292	DODGE	4 DOOR	86	0.9
XEW868	FORD	4 DOOR	83	0.3
BXF915	FORD	4 DOOR	83	0.1
NN1887	CHEVROLET	4 DOOR	88	0.0

** 08/10/1989

M31673	FORD	4 DOOR	82	8.8
M70428	CHEVROLET	VAN	89	0.0
M54510	FORD	4 DOOR	84	0.2
M67131	CHEVROLET	TRUCK	88	0.9
M65105	CHEVROLET	4 DOOR	88	0.0
HTL258	OLDSMOBILE	4 DOOR	85	2.7
BYY760	FORD	4 DOOR	83	8.3
U4203	DODGE	VAN	89	0.0
PZH276	FORD	4 DOOR	83	0.3

** 08/11/1989

M54510	FORD	4 DOOR	84	1.2
M37957	CHEVROLET	PICKUP	89	0.1
M31281	FORD	4 DOOR	82	1.9
M10437	CHEVROLET	STA WAGON	87	0.0
M170	CHEVROLET	4 DOOR	87	0.2
M55548	FORD	PICKUP	85	0.7
M5363	CHEVROLET	4 DOOR	88	8.1
U15338	CHEVROLET	STA WAGON	89	0.0
U14955	CHEVROLET	VAN	89	0.2
HTL258	OLDSMOBILE	4 DOOR	85	0.3
FN8122	CHEVROLET	4 DOOR	88	0.1
FTN294	FORD	4 DOOR	84	4.6
HNX598	FORD	4 DOOR	84	3.9
MG1660	CHEVROLET	STA WAGON	78	0.6

APPENDIX H: Cleanest, Oldest, and Dirtiest By Day

For each day of measurement, the fifty cleanest, fifty oldest, and fifty dirtiest vehicles are listed. It is important to note that the cleanest vehicles (typically listed as -0.6 to -0.1% CO) are all zero %CO emitters, and are not claimed to be either a) cleaning the air or b) any different from the large number of vehicles measured at 0 ± 0.5% CO. They serve to illustrate the make, model year, and age distribution of the rest of the many clean vehicles. The fifty oldest vehicles are listed to emphasize that old vehicles are not necessarily dirty vehicles. This list can be compared to the fifty dirtiest, which are by no means all old. It is interesting to note that on the two days (08/10 and 08/11) when the 1975 Toyota two-door hard-top SSN913 turned up, it was high on the list both days (12.7 and 14.8%CO). A tuneup of this vehicle would probably save its owner 20 to 25% on his gasoline bills.

Cleanest
(08/07/1989)

License	Make	Body style	Year	% CO
EP9145	MERCURY	2 DOOR	84	-0.6
BAK190	SUBARU	COUPE	89	-0.5
JU7195	FORD	VAN	86	-0.4
HF1703	CHEVROLET	VAN	88	-0.3
ET2805	OLDSMOBILE	4 DOOR	86	-0.3
GVG401	MAZDA	VAN	89	-0.3
185405	OLDSMOBILE	4 DOOR	86	-0.3
IS6122	VOLKSWAGEN	4 DOOR	86	-0.2
1458BB-B	FORD	PICKUP	86	-0.2
MEM253	PONTIAC	COUPE	88	-0.2
CV6078	FORD	COUPE	85	-0.2
IS8824	OLDSMOBILE	COUPE	85	-0.2
GD398	CHEVROLET	4 DOOR	87	-0.2
83251RV	FORD	VAN	84	-0.2
BRX514	LINCOLN	COUPE	83	-0.2
MPEARL	MERCURY	4 DOOR	86	-0.2
727107	B.M.W.	4 DOOR	79	-0.2
JJT148	CHEVROLET	VAN	88	-0.1
7136BY-B	DODGE	PICKUP	89	-0.1
RLC3169	CHEVROLET	4 DOOR	88	-0.1
PM9571	FORD	2 DOOR	79	-0.1
OT6988	FORD	2 DOOR	88	-0.1
NT8257	PONTIAC	HATCHBACK	82	-0.1
M66210	CHEVROLET	PICKUP	88	-0.1
IW5140	PLYMOUTH	4 DOOR	88	-0.1
DW5869	BUICK	4 DOOR	85	-0.1
LRS125	PONTIAC	COUPE	81	-0.1
PV3458		4 DOOR	89	-0.1
JZT265	BUICK	STA WAGON	88	-0.1
LY4261	CHEVROLET	4 DOOR	80	-0.1
PX1768	B.M.W.	2 DOOR	83	-0.1
ETT496	FORD	4 DOOR	88	-0.1
OJ9120	CHEVROLET	4 DOOR	77	-0.1
CWU741	CADILLAC	4 DOOR	88	-0.1
DYD353	BUICK	COUPE	80	-0.1
JY5374	VOLVO	4 DOOR	82	-0.1
IK688	RENAULT	4 DOOR	87	-0.1
DB7814	TOYOTA	HATCHBACK	88	-0.1
SRR691	PLYMOUTH	PASSENGER	81	-0.1
NYU955	OLDSMOBILE	4 DOOR	85	-0.1
CW2378	FORD	HATCHBACK	86	-0.1
140495B	CHEVROLET	VAN	81	-0.1
DW2845	BUICK	COUPE	86	-0.1
FA2603	CHEVROLET	HATCHBACK	79	-0.1
DX1270	BUICK	4 DOOR	86	-0.1
SCHINC	OLDSMOBILE	4 DOOR	88	-0.1
OD2977	CHEVROLET	STA WAGON	88	-0.1
OU8696	CHEVROLET	STA WAGON	89	-0.1
RC8881	BUICK	COUPE	79	-0.1
RUPAL	CHEVROLET	4 DOOR	83	-0.1

Oldest
(08/07/1989)

License	Make	Body style	Year	% CO
PLX634	CHEVROLET	4 DOOR	64	10.8
RA9127	BUICK	CONVTBLE	65	8.2
PY1586	CADILLAC	SEDAN	66	1.2
97028RV	FORD	PICKUP	68	0.5
HSP865	PONTIAC	2 DOOR	68	0.1
NU1652	CHEVROLET	4 DOOR	68	10.6
LTN642	BUICK	STA WAGON	69	1.2
EA7526	CHEVROLET	4 DOOR	69	0.0
PZ427	CADILLAC	4 DR HT	70	6.8
PXP902	OLDSMOBILE	2 DR HT	70	1.6
MVE474	BUICK	COUPE	70	0.3
CA6855	CHEVROLET	COUPE	71	1.6
GPF771	OLDSMOBILE	2 DR HT	72	0.1
LVR899	OLDSMOBILE	2 DR HT	72	0.6
FW953	OLDSMOBILE	4 DOOR	72	6.6
GPF771	OLDSMOBILE	2 DR HT	72	0.7
NW102	MERCURY	2 DR HT	72	2.0
KC2883	BUICK	4 DOOR	72	0.2
OL3651	CHEVROLET	4 DOOR	72	2.3
BWH130	BUICK	4 DR HT	72	0.2
RD8536	OLDSMOBILE	4 DR HT	72	14.6
PP373	OLDSMOBILE	4 DR HT	72	4.8
JHY182	FORD	2 DOOR	72	0.2
PP5677	PLYMOUTH	4 DOOR	72	7.1
EVR947	CHEVROLET	4 DOOR	72	7.5
QY4550	CHRYSLER	4 DR HT	72	3.4
KX5626	OLDSMOBILE	2 DR HT	72	0.0
UND210	CADILLAC	COUPE	72	1.2
2821DF-B	FORD	VAN	73	1.7
QA6422	CADILLAC	4 DOOR	73	4.4
PW7079	FORD	2 DR HT	73	0.4
FUN530	CHEVROLET	PASSENGER	73	0.1
CD6381	VOLKSWAGEN	2 DOOR	73	0.8
JHU612	FORD	STA WAGON	73	0.9
FR8085	BUICK	4 DR HT	73	1.0
KA4862	FORD	4 DR HT	73	1.5
OM4040	MERCURY	2 DOOR	73	0.2
STT478	FORD	2 DOOR	73	1.2
CX8465	PONTIAC	4 DOOR	73	2.0
EH5362	DODGE	2 DR HT	73	1.4
QX8250	DODGE	STA WAGON	73	6.5
PZ4654	CHEVROLET	4 DOOR	73	1.3
RT6150	AM MOTORS	4 DOOR	73	9.6
PP3879	BUICK	4 DR HT	73	0.5
XNJ314	BUICK	2 DR HT	73	2.5
OJ2523	CHEVROLET	COUPE	74	0.7
BK2964	DODGE	VAN	74	1.3
OH2497	FORD	2 DR HT	74	6.5
218DH-B	FORD	PICKUP	74	0.3
PDS163	DATSUN	STA WAGON	74	0.4

Dirtiest
(08/07/1989)

License	Make	Body style	Year	% CO
A2824	JEEP	VAN	86	14.9
RD8536	OLDSMOBILE	4 DR HT	72	14.6
KS4624	PONTIAC	4 DOOR	79	14.2
OG2795	DODGE	HATCHBACK	88	14.1
FZN607	OLDSMOBILE	4 DOOR	76	13.6
PXP871	OLDSMOBILE	2 DOOR	77	13.6
AMA401	PONTIAC	4 DOOR	80	13.3
LZZ685	CHEVROLET	COUPE	82	13.2
OM6221	CADILLAC	4 DOOR	85	13.0
LRX882	RENAULT	HATCHBACK	85	12.6
RD4285	BUICK	4 DOOR	80	12.2
OV8760	PLYMOUTH	STA WAGON	80	11.9
CX7408	OLDSMOBILE	4 DOOR	83	11.9
JZR909	CHEVROLET	4 DOOR	74	11.8
PX4729	CHEVROLET	4 DOOR	81	11.7
GFT313	FORD	STA WAGON	79	11.6
IP152	CHEVROLET	4 DOOR	75	11.5
OV8622	OLDSMOBILE	COUPE	79	11.5
BKC27	DODGE	VAN	86	11.3
BYZ392	CADILLAC	4 DOOR	79	11.3
CC1532	FORD	4 DOOR	86	11.2
KANDAY2	BUICK	4 DOOR	83	10.9
DH9450	CADILLAC	PASSENGER	77	10.9
235984B	CHEVROLET	VAN	81	10.8
PLX634	CHEVROLET	4 DOOR	64	10.8
DW8301	FORD	STA WAGON	84	10.8
HH1780	MERCURY	2 DR HT	79	10.6
NU1652	CHEVROLET	4 DOOR	68	10.6
KPZ625	CHEVROLET	4 DOOR	78	10.2
PER173	FORD	4 DOOR	77	10.2
83065RV	CHEVROLET	PICKUP	75	10.2
86066RV	CHEVROLET	VAN	79	9.9
OR3217	OLDSMOBILE	4 DOOR	82	9.9
QY8028	MERCURY	2 DR HT	77	9.9
BAG101	CHEVROLET	HATCHBACK	79	9.8
LXT451	OLDSMOBILE	4 DOOR	84	9.7
NES136	FORD	4 DOOR	78	9.6
RT6150	AM MOTORS	4 DOOR	73	9.6
EH8870	BUICK	2 DR HT	75	9.5
LY7298	CHEVROLET	PASSENGER	79	9.5
HZ7488	CHEVROLET	COUPE	79	9.3
LL4733	OLDSMOBILE	4 DOOR	79	9.3
MY2834		2 DOOR	88	9.2
HMJ559	FORD	HATCHBACK	78	9.0
JED866	MERCURY	STA WAGON	88	8.9
CDK717	FORD	4 DOOR	77	8.7
MX8673	OLDSMOBILE	4 DOOR	77	8.7
PNA309	PLYMOUTH	4 DOOR	79	8.5
864315	MERCURY	COUPE	86	8.5
RZR367	OLDSMOBILE	4 DOOR	80	8.4

Cleanest
(08/08/1989)

License	Make	Body style	Year	% CO
QUESHA1	FORD	2 DOOR	81	-0.5
MIGG	SAAB	SEDAN	84	-0.4
JJUDE	DODGE	SEDAN	86	-0.4
BVH631	DATSUN	4 DOOR	84	-0.4
FW9038	PONTIAC	COUPE	88	-0.4
IE7320	DODGE	STA WAGON	85	-0.3
NV4308	BUICK	COUPE	83	-0.3
JML127	MERCURY	2 DOOR	88	-0.3
MARVAJO	PONTIAC	COUPE	86	-0.3
135176RV	FORD	PICKUP	89	-0.3
FX1748	FORD	STA WAGON	88	-0.3
2173DX-B		TRUCK	89	-0.3
RZV191	DODGE	STA WAGON	85	-0.3
KBS472	CHEVROLET	VAN	85	-0.3
828657	OLDSMOBILE	COUPE	86	-0.3
FLY982	FORD	2 DOOR	87	-0.2
JRP257	CHEVROLET	4 DOOR	87	-0.2
DK3091	CHEVROLET	COUPE	88	-0.2
RNX856	PLYMOUTH	VAN	85	-0.2
JTL2325	BUICK	4 DOOR	88	-0.2
EC7049	OLDSMOBILE	4 DOOR	85	-0.2
YXJ532	DODGE	HATCHBACK	86	-0.2
STR115	FORD	HATCHBACK	85	-0.2
JK3270	BUICK	4 DOOR	83	-0.2
TLC112		COUPE	89	-0.2
NW7047	CHEVROLET	4 DOOR	88	-0.2
GS6532	PONTIAC	4 DOOR	88	-0.2
EH9826	OLDSMOBILE	COUPE	86	-0.2
FTP246	PONTIAC	4 DOOR	89	-0.2
4778BD-B	FORD	VAN	86	-0.2
MW7390	PONTIAC	STA WAGON	87	-0.2
IK688	RENAULT	4 DOOR	87	-0.2
QY8964	BUICK	COUPE	80	-0.2
EVL195	BUICK	SEDAN	86	-0.2
MKB280	PLYMOUTH	HATCHBACK	79	-0.2
M30541	CHRYSLER		81	-0.1
QR6256		4 DOOR	85	-0.1
218DM-B	CHEVROLET	PICKUP	76	-0.1
EGYWIZE-B	FORD	PICKUP	86	-0.1
PY7056	CHEVROLET	STA WAGON	80	-0.1
KK1653	SAAB	HATCHBACK	85	-0.1
NW5374	PLYMOUTH	HATCHBACK	89	-0.1
NVM337		4 DOOR	89	-0.1
FE5657	DODGE	HATCHBACK	88	-0.1
LW3532	BUICK	4 DOOR	88	-0.1
ZFJ553	TOYOTA	SEDAN	86	-0.1
DUA816	FORD	HATCHBACK	86	-0.1
97041RV	DODGE	VAN	84	-0.1
PW9140	CHRYSLER	4 DOOR	87	-0.1
RC5689	FORD	HATCHBACK	89	-0.1

Oldest
(08/08/1989)

License	Make	Body style	Year	% CO
482AB-B	CHEVROLET	VAN	59	4.3
PX4825	CHEVROLET	2 DOOR	65	8.1
LE3448	CHEVROLET	PASSENGER	65	1.7
EKN501	CHECKER	4DR SEDAN	65	6.1
OV6932	VOLKSWAGEN	2DR SEDAN	67	0.0
40087RV	FORD	PICKUP	69	1.6
191766	BUICK	2 DOOR	69	7.4
19098H	INTERNATIONAL	STAKE	69	0.1
19102H	CHEVROLET	VAN	69	0.0
256749B	GENERAL MOTOR	PICKUP	69	10.8
LTN642	BUICK	STA WAGON	69	0.2
918163B	CHEVROLET	TRUCK	69	6.0
1805CE-B	CHEVROLET	PICKUP	70	0.9
KG5989	PLYMOUTH FURY	4DR SEDAN	70	1.2
3275CW-B	CHEVROLET	PICKUP	70	0.1
SJT446	FORD	2 DR HT	71	1.4
EP9305	OLDSMOBILE	2 DR HT	71	0.2
CA6855	CHEVROLET	COUPE	71	1.1
WLMJR1	OLDS CUTLASS	COUPE	71	-0.1
GVK687	PONTIAC	PASSENGER	71	0.8
7865AK-B	GENERAL MOTOR	VAN	71	6.8
324586	BUICK	2 DOOR	72	5.3
OJ1203	OLDSMOBILE	2 DR HT	72	1.3
NN9404	CHEVROLET	COUPE	72	0.3
PP373	OLDSMOBILE	4 DR HT	72	0.2
JBX701	OLDSMOBILE	2 DR HT	72	0.9
6156AR-B	CHEVROLET	PICKUP	72	6.3
EVR947	CHEVROLET	4 DOOR	72	5.1
BN6109	CHEVROLET	COUPE	72	0.4
195432	OLDSMOBILE	4 DR HT	73	0.2
EE8695	CHEVROLET	PASSENGER	73	0.2
FR8085	BUICK	4 DR HT	73	0.8
2821DF-B	FORD	VAN	73	11.3
EEE486	BUICK	2 DOOR	73	3.7
HCG179	CADILLAC	COUPE	73	1.7
EC5854	FORD	4 DR HT	73	1.2
BW2980	BUICK	2 DR HT	73	0.2
843663	CHEVROLET	HATCHBACK	73	1.9
JOR96	PONTIAC	4 DOOR	73	0.2
EZ2567	VOLKSWAGEN	CONVTBLE	73	0.7
GPF770	PLYMOUTH	COUPE	73	0.1
CX8465	PONTIAC	4 DOOR	73	0.1
PP3879	BUICK	4 DR HT	73	0.6
QX8250	DODGE	STA WAGON	73	5.5
XNJ314	BUICK	2 DR HT	73	0.7
FM8580	OLDSMOBILE	4 DR HT	73	0.1
EC5854	FORD	4 DR HT	73	0.7
EH5362	DODGE	2 DR HT	73	1.3
LW6589	DODGE	2 DR HT	73	3.9
EJ4211	PONTIAC	4 DOOR	73	4.5

Dirtiest
(08/08/1989)

License	Make	Body style	Year	% CO
OG3911	OLDSMOBILE	4 DOOR	80	16.0
JF9547	OLDSMOBILE	4 DOOR	81	13.4
NH6895	BUICK	COUPE	88	13.1
GFT313	FORD	STA WAGON	79	12.6
987370B	FORD	VAN	86	12.6
ID6693	LINCOLN	2 DR HT	79	12.5
MY2834		2 DOOR	88	12.5
PTT812	MERCURY	4 DOOR	82	12.4
PCA120	PONTIAC	COUPE	79	12.1
PN5381	CADILLAC	4 DOOR	77	12.0
NC502	OLDSMOBILE	4 DOOR	83	11.9
M31673	FORD	4 DOOR	82	11.8
2821DF-B	FORD	VAN	73	11.3
BYX822	DATSUN	HATCHBACK	84	11.2
BP901	OLDSMOBILE	PASSENGER	78	10.9
XCC634	OLDSMOBILE	4 DOOR	82	10.9
256749B	GENERAL MOTOR	PICKUP	69	10.8
SMJ116	FORD	2 DOOR	85	10.7
QD313	FORD	STA WAGON	79	10.6
PXT102	FORD	STA WAGON	79	10.5
PS5645	CHEVROLET	COUPE	79	10.4
MRLEE60	CHEVROLET	COUPE	78	10.4
ED4096	TOYOTA	STA WAGON	81	10.3
23527D	GENERAL MOTOR	VAN	84	10.2
PNA168	BUICK	4 DOOR	81	10.1
CH2810	AM MOTORS	HATCHBACK	79	10.1
4519CV	DODGE	VAN	75	9.8
EG3776	BUICK	2 DOOR	81	9.7
OF3343	PONTIAC	2 DR HT	77	9.7
431594	LINCOLN	2 DR HT	75	9.6
PS2679	BUICK	4 DOOR	80	9.6
RJYA01	OLDSMOBILE	COUPE	87	9.5
RETSEL	PLYMOUTH	2 DOOR	82	9.4
PX8791		4 DOOR	89	9.4
PER173	FORD	4 DOOR	77	9.2
FX2044	CHRYSLER	STA WAGON	78	9.2
MX2073	CADILLAC	COUPE	84	9.1
EM2923	PONTIAC	4 DOOR	78	9.0
DT2931	PONTIAC	COUPE	78	8.9
EC9888	FORD	4 DOOR	86	8.8
PVX619	CADILLAC	COUPE	80	8.7
NS3844	BUICK	4 DOOR	78	8.7
284427B	CHEVROLET	TRUCK	85	8.7
FYR388	MERCURY	HATCHBACK	85	8.6
PS8881	CHEVROLET	2 DR HT	75	8.6
BX9182	FORD	2 DR HT	79	8.6
PV1635	CHEVROLET	HATCHBACK	79	8.5
DCZ500	BUICK	COUPE	75	8.5
PP4146	PONTIAC	HATCHBACK	81	8.3
ZAM27	PONTIAC	COUPE	82	8.3

Cleanest
(08/09/1989)

License	Make	Body style	Year	% CO
TLM102	CHEVROLET	COUPE	78	-0.8
GPT393	CADILLAC	4 DOOR	84	-0.7
NM8085	PONTIAC	HATCHBACK	88	-0.6
KA2862	CHEVROLET	STA WAGON	85	-0.6
TRV911		4 DOOR	87	-0.5
DB1136	BUICK	4 DOOR	79	-0.5
CC1319	PLYMOUTH	HATCHBACK	88	-0.4
PS3692	CHEVROLET	4 DOOR	88	-0.4
RYP293	SUBARU	4 DOOR	87	-0.4
769EA-B	CHEVROLET	PICKUP	84	-0.3
AEG82	PONTIAC	COUPE	88	-0.3
ADF417	FORD	4 DOOR	87	-0.3
JJ3248		2 DOOR	83	-0.3
NC3274	PLYMOUTH	4 DOOR	81	-0.3
SYV511		SEDAN	89	-0.3
OW5869	MERCURY	2 DOOR	88	-0.3
EKN849	PLYMOUTH	HATCHBACK	87	-0.3
RG9197	PONTIAC	2 DR HT	75	-0.2
PS4924	SUBARU	2 DOOR	87	-0.2
FW9038	PONTIAC	COUPE	88	-0.2
6010DA-B	CHEVROLET	PICKUP	88	-0.2
EH9826	OLDSMOBILE	COUPE	86	-0.2
BJR53	OLDSMOBILE	4 DOOR	87	-0.2
BR6987	OLDSMOBILE	4 DOOR	86	-0.2
CX623	PONTIAC	4 DOOR	78	-0.2
GF9775	FORD	VAN	85	-0.2
JER844	CHEVROLET	COUPE	88	-0.2
PJS102	FORD	4 DOOR	88	-0.2
DNS215	CADILLAC	4 DOOR	87	-0.2
JW9828	VOLKSWAGEN	2 DOOR	87	-0.2
JV7391	CHEVROLET	TRUCK	87	-0.2
JU2853	PLYMOUTH	HATCHBACK	87	-0.2
SPK906	PLYMOUTH	HATCHBACK	78	-0.2
GV7200	CHEVROLET	COUPE	89	-0.2
GWX491	CHEVROLET	PASSENGER	88	-0.1
LNN536	OLDSMOBILE	COUPE	78	-0.1
HM6773	CHEVROLET	COUPE	88	-0.1
MAL2640	CHEVROLET	4 DOOR	86	-0.1
QE8968	TOYOTA	4 DOOR	85	-0.1
QR7497	PONTIAC	HATCHBACK	89	-0.1
CFX613	CHEVROLET	STA WAGON	84	-0.1
NT6605	PONTIAC	4 DOOR	82	-0.1
MU9140	FORD	2 DOOR	88	-0.1
6317BP-B	GENERAL MOTOR	TRUCK	86	-0.1
AKZ952	BUICK	4 DOOR	78	-0.1
DA5653	MERCURY	2 DOOR	83	-0.1
420742	MERCURY	COUPE	85	-0.1
GE3697	CHEVROLET	STA WAGON	79	-0.1
GLA90	FORD	4DR SEDAN	89	-0.1
EB340	VOLVO	4 DOOR	86	-0.1

Oldest
(08/09/1989)

License	Make	Body style	Year	% CO
BT6331	CHEVROLET	PASSENGER	34	0.8
33851D	CHEVROLET	STAKE	49	1.0
PLX634	CHEVROLET	4 DOOR	64	9.6
218DN-B	CHEVROLET	PICKUP	65	0.2
LE3448	CHEVROLET	PASSENGER	65	1.1
996DW-B	CHEVROLET	PICKUP	66	3.5
IY2908	AM MOTORS	4 DOOR	67	6.1
BG7247	FORD	2 DR HT	67	9.5
HV4084	CHEVROLET	2 DOOR	68	0.1
FZ4008	CADILLAC	2 DR HT	69	0.3
40087RV	FORD	PICKUP	69	0.9
LTN642	BUICK	STA WAGON	69	0.1
OP9354	CHEVROLET	COUPE	70	0.2
RA4557	OLDSMOBILE	2 DOOR	70	0.1
SPX495	DODGE	2 DR HT	71	0.1
7865AK-B	GENERAL MOTOR	VAN	71	5.2
EX9659	OLDSMOBILE	4 DOOR	72	0.5
GVY443	CHEVROLET	2 DR HT	72	5.9
324586	BUICK	2 DOOR	72	0.4
OH9222	CHEVROLET	COUPE	72	0.1
8574DB-B	FORD	PICKUP	72	0.2
1378EC-B	CHEVROLET	PICKUP	72	0.8
SMKE99	BUICK	4 DOOR	72	0.3
PP373	OLDSMOBILE	4 DR HT	72	1.9
EVR947	CHEVROLET	4 DOOR	72	1.9
PP5677	PLYMOUTH	4 DOOR	72	2.7
KC2883	BUICK	4 DOOR	72	0.3
637990	CHEVROLET	SEDAN	72	0.2
2821DF-B	FORD	VAN	73	9.6
QX8250	DODGE	STA WAGON	73	9.1
195432	OLDSMOBILE	4 DR HT	73	6.3
BW2980	BUICK	2 DR HT	73	0.1
HCG179	CADILLAC	COUPE	73	2.1
QE5489	BUICK	4 DR HT	73	0.3
UP7761	BUICK	4 DOOR	73	0.5
9859F	FORD	DUMP	73	3.8
FR8085	BUICK	4 DR HT	73	5.4
JHU612	FORD	STA WAGON	73	0.8
EH5362	DODGE	2 DR HT	73	0.6
LZ6952	DODGE	2 DR HT	73	0.8
EC5854	FORD	4 DR HT	73	0.5
LVE413	BUICK	4 DR HT	73	0.3
IW6408	B.M.W.	2 DOOR	74	0.6
IN5045	CHEVROLET	2 DR HT	74	4.3
OW6145	FORD	2 DOOR	74	1.0
BS1266	TOYOTA	STA WAGON	74	0.4
NELL53	MERCEDES-BENZ	4 DOOR	74	2.0
BZ331	CHRYSLER	4 DOOR	74	1.3
MXA113	CHEVROLET	2 DOOR	74	0.4
OP9014	CHEVROLET	2 DR HT	74	4.8

Dirtiest
(08/09/1989)

License	Make	Body style	Year	% CO
FXC641	MERCURY	4 DOOR	80	15.3
TU9364	BUICK	4 DOOR	79	12.6
RDZ764	FORD	2 DOOR	79	12.5
5053AC-B	TOYOTA	PICKUP	87	12.4
ADM136	OLDSMOBILE	COUPE	78	12.3
JK6957	AUDI	4 DOOR	82	12.0
KB567	FORD	2 DOOR	86	11.5
231714B	CHEVROLET	VAN	77	11.2
JLV144		2 DOOR	88	11.0
GFT313	FORD	STA WAGON	79	10.9
MF3944	BUICK	STA WAGON	78	10.8
QL2424	CHEVROLET	4 DOOR	76	10.7
4681DH-B	CHEVROLET	PICKUP	83	10.5
LX5618	PONTIAC	COUPE	79	10.4
NS3844	BUICK	4 DOOR	78	10.4
GWY973	CADILLAC	COUPE	78	10.4
LHOOQ2	MITSUBISHI	HATCHBACK	86	10.3
PN4923	FORD	2 DR HT	76	10.1
MY6077	BUICK	2 DOOR	75	10.1
OG7337	LINCOLN	COUPE	84	10.1
TBF389	DODGE	4 DR HT	87	10.0
SSN913	TOYOTA	2 DR HT	75	9.9
NV5084	CHEVROLET	VAN	86	9.8
ACM60	OLDSMOBILE	4 DOOR	86	9.7
2821DF-B	FORD	VAN	73	9.6
MX4211	OLDSMOBILE	STA WAGON	78	9.6
753960	CADILLAC	2 DOOR	79	9.6
SMJ116	FORD	2 DOOR	85	9.6
PLX634	CHEVROLET	4 DOOR	64	9.6
BG7247	FORD	2 DR HT	67	9.5
AMA401	PONTIAC	4 DOOR	80	9.5
FX2038	CHEVROLET	COUPE	74	9.3
QE2032	BUICK	COUPE	79	9.1
QX8250	DODGE	STA WAGON	73	9.1
BYZ822	FORD	4 DOOR	87	9.1
IZ3832	PONTIAC	4 DOOR	87	9.0
6178DP-B	MAZDA	PICKUP	86	9.0
DCC508	DODGE	HATCHBACK	89	9.0
OH3699	LINCOLN	4 DOOR	77	8.9
NN8280	CHEVROLET	4 DR HT	74	8.9
DR1781	MERCURY	COUPE	85	8.9
OT9147	FORD	HATCHBACK	80	8.8
4681DH-B	CHEVROLET	PICKUP	83	8.7
DCZ500	BUICK	COUPE	75	8.6
W-II	FORD	4 DOOR	85	8.5
OD8456	CHEVROLET	HATCHBACK	82	8.5
RP4236	FORD	HATCHBACK	82	8.5
PN2628		VAN	88	8.4
NS1826	DATSUN	HATCHBACK	80	8.4
431594	LINCOLN	2 DR HT	75	8.3

Cleanest
(08/10/1989)

License	Make	Body style	Year	% CO
JG4374	DODGE	HATCHBACK	87	-0.4
MWX178	CHEVROLET	SEDAN	85	-0.3
2218DF-B	CHEVROLET	VAN	88	-0.3
JJ825	BUICK	2 DOOR	84	-0.3
609170	DODGE	HATCHBACK	86	-0.3
NM430	SUZUKI	VAN	88	-0.2
MRJ127	VOLVO	2 DOOR	81	-0.2
KPZ940	AUDI	4 DOOR	83	-0.2
GF9267	FORD	VAN	87	-0.2
PP312	CHEVROLET	4 DOOR	81	-0.2
CN9837	TOYOTA	4 DOOR	86	-0.2
GWT869	FORD MUSTANG	2 DOOR	85	-0.2
SUEG1	HONDA	4 DOOR	89	-0.2
OT8030	FORD	STA WAGON	87	-0.2
AESMX6	MAZDA	COUPE	89	-0.2
RF1270	FORD	CONVTBLE	89	-0.2
IE7320	DODGE	STA WAGON	85	-0.2
GFE736	HONDA	HATCHBACK	83	-0.2
CR6610	BUICK	4 DOOR	86	-0.2
KP9647	PONTIAC	4 DOOR	89	-0.2
EDW470	PONTIAC	COUPE	87	-0.2
MSY600	FORD	HATCHBACK	86	-0.2
195471	CHEVROLET	4 DOOR	86	-0.1
KULMOM1	DODGE	HATCHBACK	89	-0.1
JRB651	OLDSMOBILE	4 DOOR	77	-0.1
OK8183		4 DOOR	85	-0.1
NZG279	FORD	4 DOOR	84	-0.1
720666	TOYOTA	COUPE	88	-0.1
NZ5097		4 DOOR	89	-0.1
994962B	TOYOTA	TRUCK	85	-0.1
ET399	OLDSMOBILE	4 DOOR	84	-0.1
RN9571	FORD	HATCHBACK	89	-0.1
SRR674	CHEVROLET	COUPE	86	-0.1
NKS771	CHEVROLET	COUPE	89	-0.1
MRCOZZI	CHEVROLET	4 DOOR	87	-0.1
EWC134	HONDA	4 DOOR	87	-0.1
403566	DODGE	HATCHBACK	87	-0.1
FZ8477	FORD	HATCHBACK	88	-0.1
4720CE-B	CHEVROLET	VAN	88	-0.1
QX486	MERCURY	2 DR HT	78	-0.1
PW9554	DODGE	4 DOOR	87	-0.1
EL7264	DODGE	4 DOOR	78	-0.1
SC8621	CHEVROLET	COUPE	87	-0.1
CW4524	CHEVROLET	4 DOOR	86	-0.1
CB5589	CADILLAC	4 DOOR	88	-0.1
JY5108	PLYMOUTH	4 DOOR	87	-0.1
QS5090	CHEVROLET	4 DOOR	89	-0.1
OX4721	FORD	4 DOOR	88	-0.1
199696	TOYOTA	COUPE	87	-0.1
GE3054	OLDSMOBILE	COUPE	85	-0.1

Oldest
(08/10/1989)

License	Make	Body style	Year	% CO
303759B	INTERNATIONAL	TRUCK	63	0.3
LV2639	DODGE	4 DOOR	64	0.1
MM144	CHEVROLET	SEDAN	66	2.5
OV6932	VOLKSWAGEN	2DR SEDAN	67	3.2
868639	CHEVROLET	PASSENGER	67	0.5
3774CA-B	CHEVROLET	PICKUP	67	0.9
FVV935	CADILLAC	CONVTBLE	67	0.3
SPH453	BUICK	4 DOOR	69	0.4
19098H	INTERNATIONAL	STAKE	69	0.1
40087RV	FORD	PICKUP	69	1.8
SZY692	BUICK	SEDAN	69	0.5
448425	CHRYSLER	2DR SEDAN	69	0.3
PS4927	CADILLAC	4 DOOR	69	2.0
LTN642	BUICK	STA WAGON	69	1.5
CY2919	CHEVROLET	2 DOOR	70	3.7
PXP902	OLDSMOBILE	2 DR HT	70	0.1
OJ3003	DODGE	2 DR HT	71	8.4
EP9305	OLDSMOBILE	2 DR HT	71	0.2
624524	OLDSMOBILE	2 DOOR	71	0.6
19456H	FORD	DUMP	71	0.0
OM1456	CHEVROLET	COUPE	71	0.7
GD1089	OLDSMOBILE	CONVTBLE	71	6.2
PT2975	CHEVROLET	4 DR HT	71	1.5
8268DF-B	GENERAL MOTOR	PICKUP	71	0.2
GF7816	CHEVROLET	STA WAGON	72	0.1
JX9292	BUICK	4 DR HT	72	0.1
JPG101	CHEVROLET	2 DR HT	72	8.1
QA6471	CHEVROLET	4 DOOR	72	1.4
PP373	OLDSMOBILE	4 DR HT	72	4.9
RD8536	OLDSMOBILE	4 DR HT	72	10.2
EVR947	CHEVROLET	4 DOOR	72	1.2
JBX701	OLDSMOBILE	2 DR HT	72	3.5
PP3854	DODGE	2 DR HT	73	1.5
W-37702	CHEVROLET	4 DOOR	73	2.0
PY5923	FORD	2 DR HT	73	0.5
2821DF-B	FORD	VAN	73	10.3
HCG179	CADILLAC	COUPE	73	1.0
DDN248	BUICK	4 DR HT	73	0.5
KP7785	CHEVROLET	PASSENGER	73	1.7
195432	OLDSMOBILE	4 DR HT	73	1.3
BW2980	BUICK	2 DR HT	73	0.1
QX8250	DODGE	STA WAGON	73	5.0
CX8465	PONTIAC	4 DOOR	73	0.1
EH5362	DODGE	2 DR HT	73	0.4
QX6788	LINCOLN	2 DR HT	73	0.5
LW6589	DODGE	2 DR HT	73	3.8
LVE413	BUICK	4 DR HT	73	0.3
LZ6952	DODGE	2 DR HT	73	1.7
GE26	CHEVROLET	2 DOOR	73	9.1
EK3950	CHEVROLET	VAN	73	6.9

Dirtiest
(08/10/1989)

License	Make	Body style	Year	% CO
AMA401	PONTIAC	4 DOOR	80	13.7
SSN913	TOYOTA	2 DR HT	75	12.7
DA4662	OLDSMOBILE	4 DOOR	80	12.6
RR219	OLDSMOBILE	4 DOOR	77	12.5
GVN784	LINCOLN	4DR SEDAN	77	12.4
QC4680	BUICK	COUPE	79	12.2
FT2082	OLDSMOBILE	COUPE	81	11.4
MY1804	BUICK	4 DOOR	78	11.3
257038B	CHEVROLET	PICKUP	75	11.3
PV1635	CHEVROLET	HATCHBACK	79	11.0
MY2834		2 DOOR	88	10.8
PG5134	OLDSMOBILE	2 DR HT	76	10.5
PJ2181	DODGE	HATCHBACK	78	10.4
NENAM	PONTIAC	COUPE	83	10.4
BZ2941	CHEVROLET	4 DOOR	81	10.4
DU4936	FORD	2 DR HT	80	10.4
2821DF-B	FORD	VAN	73	10.3
EFA212	MERCURY	4 DOOR	84	10.3
ML3777	DODGE	VAN	77	10.3
TSF491	LINCOLN	2 DR HT	79	10.3
PNA212	BUICK	2 DR HT	74	10.2
RD8536	OLDSMOBILE	4 DR HT	72	10.2
QT8430	FORD	2 DR HT	77	10.0
QB4521	CHEVROLET	4 DOOR	82	10.0
PCA120	PONTIAC	COUPE	79	9.8
269162B	CHEVROLET	TRUCK	77	9.8
DCZ500	BUICK	COUPE	75	9.8
DW8301	FORD	STA WAGON	84	9.8
BN9945	DODGE	4 DOOR	81	9.4
OJ7677	CHEVROLET	VAN	78	9.3
NLV805	BUICK	4 DOOR	77	9.3
FD1320	FORD	4 DR HT	79	9.3
KIMMIS1		HATCHBACK	87	9.2
GE26	CHEVROLET	2 DOOR	73	9.1
JMX957	CHRYSLER	4 DOOR	85	9.1
23527D	GENERAL MOTOR	VAN	84	9.0
NJD126	BUICK	4 DOOR	81	8.9
M31673	FORD	4 DOOR	82	8.8
MXA913	FORD	VAN	85	8.5
OJ3003	DODGE	2 DR HT	71	8.4
PNA168	BUICK	4 DOOR	81	8.3
BYY760	FORD	4 DOOR	83	8.3
CG9202	CADILLAC	COUPE	81	8.2
OP7355	DODGE	4 DOOR	74	8.2
IX6331	OLDSMOBILE	COUPE	78	8.1
JPG101	CHEVROLET	2 DR HT	72	8.1
PS4968	BUICK	4 DOOR	76	8.1
PN4923	FORD	2 DR HT	76	8.1
EC7341	MAZDA	2 DOOR	86	8.0
6178DP-B	MAZDA	PICKUP	86	7.9

Cleanest
(08/11/1989)

License	Make	Body style	Year	% CO
MY3806	FORD	HATCHBACK	88	-0.6
588041	CHEVROLET	2 DOOR	79	-0.4
698118	FORD	2 DOOR	89	-0.3
DESIRES	CADILLAC	4 DOOR	85	-0.3
UK7670		HATCHBACK	84	-0.3
13607SB	FORD	BUS	85	-0.2
EUW649	LINCOLN	COUPE	89	-0.2
MN1629	CHEVROLET	HATCHBACK	80	-0.2
OL3945	FORD	VAN	87	-0.2
QD2947	MAZDA	COUPE	85	-0.2
KE7789	FORD	STA WAGON	87	-0.2
NXC564	TOYOTA	SEDAN	87	-0.2
IJ6326	MITSUBISHI	2 DOOR	87	-0.2
QX3902	CHEVROLET	VAN	89	-0.2
QX9074	CHEVROLET	4 DOOR	90	-0.2
KXC926	BUICK	STA WAGON	82	-0.2
FT7337	SUZUKI	2 DOOR	88	-0.2
CHAPAUL	CHEVROLET	COUPE	81	-0.2
288339	PLYMOUTH	4 DOOR	87	-0.2
PZ9945	MERCURY	HATCHBACK	85	-0.2
DK3723	FORD	STA WAGON	88	-0.2
JW9828	VOLKSWAGEN	2 DOOR	87	-0.2
4886AE-B	CHEVROLET	PICKUP	84	-0.2
QE509	RENAULT	2 DOOR	85	-0.2
MVE357	PONTIAC	HATCHBACK	80	-0.2
DY3816	BUICK	COUPE	88	-0.2
TLC112		COUPE	89	-0.2
961952	CHEVROLET	4 DOOR	81	-0.2
DER127	CHEVROLET	STA WAGON	87	-0.1
JL3361	PLYMOUTH	VAN	86	-0.1
NT7035	BUICK	4 DR HT	76	-0.1
ADAMS11	CHRYSLER	4 DOOR	86	-0.1
JLJ141	TOYOTA	4 DOOR	87	-0.1
CV6078	FORD	COUPE	85	-0.1
OU7909	OLDSMOBILE	COUPE	88	-0.1
AW6402	CHEVROLET	HATCHBACK	85	-0.1
KNU561	FORD	HATCHBACK	89	-0.1
GNU543	BUICK	4 DOOR	87	-0.1
MWY692	BUICK	COUPE	85	-0.1
RYR642	RENAULT	4 DOOR	86	-0.1
FOX860		4DR SEDAN	86	-0.1
620018	DODGE	HATCHBACK	84	-0.1
PLF22	MAZDA	SEDAN	89	-0.1
PK8468	BUICK	4 DOOR	80	-0.1
AKA288	CHEVROLET	4 DOOR	84	-0.1
FTZ31	CHEVROLET	4 DOOR	88	-0.1
OW8513	BUICK	COUPE	83	-0.1
QD8777	PONTIAC	COUPE	89	-0.1
SNZ526	TOYOTA	COUPE	83	-0.1
QB1773	TOYOTA	4 DOOR	81	-0.1

Oldest
(08/11/1989)

License	Make	Body style	Year	% CO
33851D	CHEVROLET	STAKE	49	0.4
MN4728	CHEVROLET	4 DOOR	63	1.5
LE3448	CHEVROLET	PASSENGER	65	1.7
OV6932	VOLKSWAGEN	2DR SEDAN	67	4.2
FVV935	CADILLAC	CONVTBLE	67	1.7
CAM361	CADILLAC	COUPE	69	2.8
SZY692	BUICK	SEDAN	69	0.5
19098H	INTERNATIONAL	STAKE	69	0.1
40087RV	FORD	PICKUP	69	3.4
8469EB-B	CHEVROLET	PICKUP	69	3.2
LTN642	BUICK	STA WAGON	69	1.2
CY2919	CHEVROLET	2 DOOR	70	3.8
9405CX-B	INTERNATIONAL	PICKUP	70	1.9
KG5989	PLYMOUTH FURY	4DR SEDAN	70	1.3
HV3033	CHEVROLET	4 DOOR	71	3.2
EGT149	MERCURY	2 DR HT	71	2.0
MX868	VOLVO	2 DOOR	71	0.9
EJA198	DODGE	TRUCK	71	0.3
128707RV	CHEVROLET	PANEL	71	8.2
DP4091	OLDSMOBILE	PASSENGER	71	4.7
128707RV	CHEVROLET	PANEL	71	1.5
PS3059	BUICK	SEDAN	71	3.4
7865AK-B	GENERAL MOTOR	VAN	71	3.6
GRT264	VOLKSWAGEN	SEDAN	72	2.9
PP373	OLDSMOBILE	4 DR HT	72	6.2
BTU459	PONTIAC	2 DR HT	72	4.5
EX7968	CHEVROLET	2 DR HT	72	0.3
GZB430	BUICK	4 DR HT	72	1.6
EH9484	CHEVROLET	2 DOOR	72	0.5
637990	CHEVROLET	SEDAN	72	0.1
SMKE99	BUICK	4 DOOR	72	4.2
EVR947	CHEVROLET	4 DOOR	72	2.7
LP9235	OLDSMOBILE	2 DR HT	72	0.1
QC8854	FORD	4 DR HT	73	5.5
SL2507	CADILLAC	COUPE	73	0.3
2821DF-B	FORD	VAN	73	2.2
BW2980	BUICK	2 DR HT	73	0.2
195432	OLDSMOBILE	4 DR HT	73	0.2
PP3879	BUICK	4 DR HT	73	1.3
CX8465	PONTIAC	4 DOOR	73	0.1
OM4040	MERCURY	2 DOOR	73	0.0
KP7785	CHEVROLET	PASSENGER	73	1.1
PP3879	BUICK	4 DR HT	73	4.0
STT478	FORD	2 DOOR	73	0.2
86248RV	FORD	PICKUP	73	0.2
LVE413	BUICK	4 DR HT	73	0.3
EH5362	DODGE	2 DR HT	73	0.5
KF8886	CADILLAC	COUPE	73	0.1
QX8250	DODGE	STA WAGON	73	5.6
JHU612	FORD	STA WAGON	73	0.9

Dirtiest
(08/11/1989)

License	Make	Body style	Year	% CO
SSN913	TOYOTA	2 DR HT	75	14.8
828553	OLDSMOBILE	COUPE	81	14.6
MD6293	CHEVROLET	HATCHBACK	78	13.9
MY4529	FORD	STA WAGON	82	12.4
DW8301	FORD	STA WAGON	84	12.2
SNU312	AM MOTORS	PASSENGER	81	11.8
MY2834		2 DOOR	88	11.6
FXP558	CADILLAC	COUPE	79	11.6
PER173	FORD	4 DOOR	77	11.2
OM3833	AM MOTORS	4 DOOR	79	11.2
DCZ500	BUICK	COUPE	75	11.1
MW7509	CHEVROLET	4 DOOR	88	11.1
PV3249	OLDSMOBILE	STA WAGON	78	11.0
GFT313	FORD	STA WAGON	79	10.9
PV1635	CHEVROLET	HATCHBACK	79	10.8
JSR64	OLDSMOBILE	COUPE	83	10.8
MBX893	PONTIAC	2 DOOR	76	10.7
MTJ697	MERCURY	PASSENGER	81	10.6
KANDAY2	BUICK	4 DOOR	83	10.6
EC8108	OLDSMOBILE	COUPE	79	10.6
BN9945	DODGE	4 DOOR	81	10.5
PWN314	FORD	HATCHBACK	82	10.4
NS2524	JEEP	VAN	80	10.3
6225CZ-B	FORD	PICKUP	80	10.3
FR1289	DODGE	4 DOOR	81	10.2
BT5552	BUICK	4 DOOR	78	10.1
81575RV	TOYOTA	CAMPER	84	10.0
JJ639	PONTIAC	COUPE	74	9.7
MZ9853	PONTIAC	COUPE	79	9.6
NLV805	BUICK	4 DOOR	77	9.5
QL2424	CHEVROLET	4 DOOR	76	9.5
ROY553	FORD	STA WAGON	82	9.4
BU2199	FORD	2 DR HT	80	9.4
86066RV	CHEVROLET	VAN	79	9.4
KPK325	FORD	STA WAGON	75	9.3
JPP114	CHEVROLET	VAN	84	9.3
MBX893	PONTIAC	2 DOOR	76	9.3
PS7366	PONTIAC	2 DR HT	77	9.2
CX7408	OLDSMOBILE	4 DOOR	83	9.2
PE8318	FORD	4 DR HT	78	9.2
NEL270	CADILLAC	4 DOOR	79	9.1
JSS123	MITSUBISHI	HATCHBACK	86	9.0
463236	OLDSMOBILE	COUPE	86	8.9
YDL103	CHRYSLER	HATCHBACK	85	8.7
OH8541	VOLKSWAGEN	SEDAN	80	8.7
OP7355	DODGE	4 DOOR	74	8.6
JV6319	MERCURY	2 DOOR	84	8.6
IRONMEN	BUICK	4 DOOR	83	8.6
KA8740	FORD	4 DOOR	87	8.5
DZ7414	OLDSMOBILE	4 DOOR	81	8.5