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**ACTUAL AND RECOMMENDED
MAINTENANCE PRACTICES
FOR LIGHT-DUTY VEHICLES
FOR 1975 AND LATER
MODEL YEARS
VOLUME I**



**U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air and Waste Management
Office of Mobile Source Air Pollution Control
Certification and Surveillance Division
Ann Arbor, Michigan 48105**

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MAINTENANCE PRACTICES
FOR LIGHT-DUTY VEHICLES
FOR 1975 AND LATER
MODEL YEARS
VOLUME I**

by

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Prepared for

U. S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air and Waste Management
Office of Mobile Source Air Pollution Control
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PREFACE

The purpose of this report is to present findings, conclusions, and substantiating data gathered by the Bendix Corporation, Launch Support Division, during a 1-year contract performance period, 9 May 1974 through 9 May 1975, on the actual and recommended maintenance practices for light-duty vehicles for 1975 and later-model years.

The report consists of two volumes. Volume I contains ten chapters which encompass the Introduction, Summary, Conclusions, the discussion of the performance of six of the seven tasks enumerated in the Introduction, and finally, Survey Findings. It also contains two appendixes, an automotive diagnostic equipment index, and the individual tally sheets on which the results of the consumer, commercial, and dealer surveys have been consolidated.

Volume II contains the seventh task listed in the Introduction, the review and analysis of the 1974 Durability Test scheduled service records.

This study was performed for the U. S. Environmental Protection Agency (EPA), Office of Air and Water Programs, Office of Mobile Source Pollution Control, Certification and Surveillance Division. The Technical Project Officer was Mr. L. D. Verrelli. The report will provide EPA with valid, current information on consumer and commercial automotive activities.

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CHAPTER I

INTRODUCTION

A. BACKGROUND

The Clean Air Act of 1970, Section 207, requires each motor vehicle manufacturer to guarantee to the ultimate purchaser and each subsequent purchaser that the vehicle or engine is designed, built, and equipped to conform with the applicable regulations. The requirement also exists that written instructions for maintenance be supplied to the ultimate purchaser to ensure that vehicles and engines conform to the appropriate regulations throughout the vehicles' and the engines' useful lives.

At present, the major means of obtaining the information concerning vehicle and engine maintenance has been to rely on the manufacturer's input to EPA. Regulatory decisions have been made in the past based on the limited maintenance data available from in-house sources. Continuing changes in the types of maintenance requirements and analytical equipment and the limited expertise available to EPA in-house have necessitated an in-depth type of study. It was felt that this study would allow EPA to gain information from numerous sources and decide for itself what levels and types of maintenance and diagnostic equipment will be available in future years. In addition, an attempt was to be made to determine what prompts customers to have service performed, at present and in the future.

The Clean Air Act of 1970 establishes the need for a program to determine what manufacturer-recommended maintenance practices are necessary and reasonable for the consumer. The results of this study were to be used to guide approval of maintenance and diagnostic techniques to be used for 1976 and later test vehicles. The data was to be used to align maintenance procedures and equipment used in the certification program with actual customer requirements and maintenance habits, to determine if customer practices are related to vehicle make and original costs, and to be able to judge more effectively if recommended maintenance is reasonable and necessary.

Additionally, a more comprehensive analysis of diagnostic equipment availability and its intended use was felt to be needed to ensure proper maintenance practices for future certification programs.

This study was initiated to determine what maintenance will be performed, where it will be performed, the frequency at which it will be performed, the basis on which it will be performed and who will be performing the maintenance for model years 1975 and the future.

The task was to investigate automotive dealers, independent service garages, etc., to determine what the future maintenance practices will be. Additionally, inquiries were to be made into customer habits

to determine the basis on which maintenance is performed. Service facilities were to be investigated to establish what equipment and services will be made available in the market place for 1975 and later years. These projections will be used to establish future regulations and guidelines.

B. SCOPE

The overall scope of this contract was to collect data on maintenance practices, service manpower, consumer habits and practices, and equipment availability for light-duty vehicles in 1975 and the future, and to summarize the information into report form.

A cross section of new-car dealerships, manufacturers, service stations, diagnostic centers, specialty shops, independent service centers, and mass merchandisers such as Sears, Wards, K-Mart, etc., in different geographical locations, was investigated to establish what type of maintenance and diagnostic evaluations are presently being performed, and whether maintenance practices are expected to change for 1975 and later-model year vehicles. A determination as to equipment expected to be ordered for servicing the 1975 and later vehicles is also provided. In addition, the types of analytical equipment and the competence level of the mechanics that will be used at these facilities to perform that maintenance service was evaluated.

Diagnostic equipment manufacturers were contacted to determine availability of such equipment as chassis dynamometers, ignition analyzers, and exhaust gas analyzers, and future availability is projected.

Automotive customer habits and practices regarding vehicle maintenance were investigated. The study determined what the practices are and if these practices are related to vehicle make, age, and original cost; geographic location; state or local vehicle inspection requirements; and other appropriate factors.

A detailed study of maintenance performed on test vehicles, and manufacturers' 1974 service recommendations, both on file at the Environmental Protection Agency, was made and is included in Volume II of the final report.

Information obtained is categorized by subject and is summarized in report form, assessing what maintenance and equipment will be available, what the need will be for the 1975 and later-model year vehicles, and what is likely to be done.

This contract is fundamentally a data-gathering effort as opposed to a laboratory research effort. The work scope was divided into the following seven major tasks:

1. Perform a field survey of actual and recommended maintenance practices for light-duty vehicles for 1975 and later-model years.

2. Determine the type of diagnostic equipment expected to be procured for 1975 vehicles and later-model years.
3. Determine the current availability of automotive diagnostic equipment and project future provisioning.
4. Determine the type of automotive maintenance and diagnostic evaluations presently being performed and whether maintenance is expected to change for the 1975 and later-model vehicles.
5. Determine consumer automotive habits and practices relative to vehicle make, age, original cost, geographic locations' vehicle inspection requirements, and economic conditions of the area and nation.
6. Determine the competence level that will be required of mechanics to maintain the 1975 and later-model automobiles.
7. Develop a method to review and analyze the 1974 Environmental Protection Agency (EPA) durability test maintenance records.

The information for evaluating the requirements included in this contract was derived from the following.

- Review of technical literature.
- Interviews with the manufacturers of automobiles and diagnostic equipment.
- Study of relevant information and statistics obtained from state and Federal agencies.
- Information provided by the American Automobile Association; Automobile Club of Southern California; Automotive Management, Incorporated; Automotive Technical Institute; Automobile Trade Association; Society of Automotive Engineers; and similar professional and trade organizations.

C. CONTRACT ORGANIZATION

The fundamental categories developed for acquiring data related to the performance of the study tasks were the Field Survey Program, Literature Research, and Existing Data Evaluation. After the initial contract familiarization period was complete, data acquisition preparations commenced. The following paragraphs describe the organization, development, and completion of the Field Survey Program, Literature Research, and Data Evaluation.

1. Field Survey Program

a. Purpose

The Field Survey Program was developed to accumulate data by on-site commercial interviews and telephone interviews with automobile owners. It was felt that this approach would be most effective in ensuring that substantiating data would reflect actual commercial and consumer practices and habits.

b. Survey Area Selection

In selecting a cross-section of geographic sites for information gathering in both the consumer and commercial survey areas, the climatological and sociological differences were considered. The various differing state and local regulations covering licensing of maintenance and service facilities were also reviewed before the basic geographical areas were selected.

The following seven areas were selected based on the above criteria:

<u>Area</u>	<u>Division of the United States</u>
Tampa, Florida	Southeast
New York City, N. Y. and Newark, N. J.	Northeast
Seattle, Washington	Northwest
Denver, Colorado	Rocky Mountain Area
Los Angeles, California	West Coast
Phoenix, Arizona	Southwest
Chicago, Illinois and Detroit, Michigan	Midwest

Field survey trips to the seven areas were scheduled to average 3 weeks each. The first survey was limited to the State of Florida to enable supervision to closely monitor the first field trip and to make the necessary schedule and operational changes before field survey personnel departed on the more extended and distant trips.

c. Development of Forms

Development of the commercial and consumer forms and questionnaires was begun in the training and organization period.

The questionnaires were designed to be relatively short to help maintain the subjects' interest and to not interfere unnecessarily with their schedules. This design would also lend itself easily to matrix and table use by yielding short meaningful answers. To ensure valid answers from all survey subjects, the questions were made as straightforward and uncomplicated as possible.

The development of the questionnaires included review and discussion with local automotive maintenance establishment personnel, divisional employees, automobile training center personnel, a Bendix research division, and EPA. The final technical content of the questionnaires was determined by conferring with the Bendix research division's automotive engineering staff, and incorporating EPA's suggestions and comments.

The prepared questionnaires were filled out by local personnel to test their usefulness. Upon completion of the practice survey, minor adjustments were found necessary in the actual method of using the forms. No revisions were made on the actual questionnaires following subsequent Office of Management and Budget (OMB) approval.

The survey forms were designed for field survey use, by phone (consumer) and personal interview (commercial). The consumer questionnaire consisted of three pages of questions expected to provide current, valid information relative to selected automobile owners' maintenance habits and practices, and their opinions regarding certain automobile features and possible new engineering plans.

The commercial questionnaires consisted of six pages each. These were designed to determine:

- The type of maintenance and diagnostic operations presently being performed.
- The expected operational changes needed to maintain the 1975 and later-model vehicles.
- The type diagnostic equipment expected to be procured by commercial establishments.
- The competence level that will be required of the mechanics operating the new equipment.

d. OMB Approval

OMB approval of all forms and questionnaires proposed for use in this survey was a prerequisite to beginning the field surveys. Final approval (OMB Number 158 RO 115) was received 17 September 1974.

e. Selection of Surveyors

It was determined that three field surveyors would be needed to secure the required data for the Field Survey Program. Selection was based on previous work performance, interviewing qualities, and knowledge of automobile and diagnostic equipment.

f. Pre-Survey Training

Once selected, the surveyors attended automobile-makers' training sessions within the State of Florida. These sessions included classes in Miami, Orlando, and Jacksonville. Attendance was not only approved but encouraged by American Motors, General Motors, and the Ford Corporation.

Local surveyor training sessions were conducted with Bendix divisional accounting and contracts personnel to ensure full compliance with regulations, procedures, and laws. The surveyors were schooled in interviewing techniques, and accomplished several consumer phone interviews with Bendix divisional personnel as a training exercise. In addition, several actual field commercial surveys were performed within Brevard and Orange counties in Florida to ascertain the effectiveness of the forms and techniques to be used in the actual designated survey areas.

g. Survey Organization

Telephone interviews were selected as the method to be used to accomplish the consumer interviews. Each interviewee was to be notified of the approximate date of the scheduled surveyor's call by mail at least 2 weeks prior to the survey.

The percentage of information for each type of automobile required to satisfy the survey requirements for a given area was determined by computer sorting, and a representative sample of 800 owners' names made up the list for each of the nine cities listed under "Area Selection." The opinions of approximately 140 of these people were to be obtained in a completed survey in each city, for a total population sample of 1,250.

The commercial surveys were to be accomplished by personal interview. Approximately 20 new-car dealers, 25 mass merchandisers, and franchised diagnostic centers combined, and 15 independent garages and service stations were to be interviewed in each of the nine cities. This would represent a grand total of approximately 540 commercial surveys accomplished.

Information concerning current equipment, maintenance practices, and mechanic skills was to be obtained at the local level of independent maintenance establishments, whose policy is determined at that level.

2. Literature Research

All of the data gathered by field surveys and other interviews was supplemented by reviewing and filing for future reference pertinent technical journals, magazines, books, and reports. A widespread literature research program was organized and carried out to acquire data and existing and published or prepared information relative to the questions generated by this survey. The various areas selected for extensive research were:

- Labor Organizations
- Mass Merchandisers, Corporate Offices
- Franchised Diagnostic Centers, Corporate Offices
- State Pollution Control Offices
- State Air Resources Boards
- State Motor Vehicle Departments
- City Police Departments
- National Automotive Associations
- Diagnostic Equipment Manufacturers Organizations
- Scientific Associations
- Trade Associations
- Automotive Trade Publications
- Automobile Manufacturers, Corporate Offices, Training Units, Regional Offices, and Fleet Maintenance Departments
- Bendix Corporation, Research Laboratories

Information concerning state and commercial regulations, standards, statistics and related information, and equipment design availability and usage was acquired from the above-listed areas by telephone conversations, letter requests, and personal visits.

CHAPTER II

SUMMARY

The technical requirements of this report have been divided into seven major tasks:

- Perform a field survey of actual and recommended automobile maintenance availability.
- Determine diagnostic equipment users' procurement plans.
- Determine the availability of diagnostic equipment and project future development.
- Investigate the types of automotive maintenance and diagnostic evaluations being performed and determine what maintenance practices are expected to change.
- Determine consumer automotive habits and practices.
- Determine the competence level that will be required of future mechanics.
- Review the 1974 Environmental Protection Agency durability test maintenance records.

A national on-site and telephone survey was performed by field survey representatives to determine practices of automotive maintenance establishments and automobile owners.

Equipment manufacturers were contacted and a review of technical journals and trade magazines was made to determine the current and future availability of automotive diagnostic equipment. It was found that there is a sufficient supply of adequate diagnostic equipment, and this condition is expected to remain the same for some time.

The service industry's procurement plans have not stabilized in any of the service areas, especially in other-than-dealership classifications. Commercial facilities are reluctant to commit funds for equipment without knowing what impending local regulations, manufacturers' specifications, and consumer demands they must meet. Of the facilities surveyed, 53 percent indicated they will procure new equipment for expected requirement changes, but would not attempt to identify intended purchases.

Future diagnostic equipment requirements will be determined by the complexity of future automobiles and the influence of consumerism. Equipment manufacturers are working very closely with automobile manufacturers to develop equipment that will allow the mechanics to accurately pinpoint and repair automotive problems on the initial job order.

Survey results indicate that vehicle maintenance centers tend to follow established maintenance policies and practices as referenced in the following text. Automobile dealerships were judged to be the best equipped and most informed of the maintenance service centers surveyed. The in-training and development programs, and personnel classification policies were well organized and appeared adequate to meet the maintenance requirements established by the vehicle manufacturers. Mass merchandisers consider the sale of their products as their primary operation. Independent garages are losing ground as equipment requirements and costs increase but still offer repairs and service as best suited to each garage's location, local consumer demand, and owner's interest.

Commercial facilities surveyed routinely service most American-manufactured automobiles but only half of the garages surveyed would provide maintenance for foreign models brought to them. The larger facilities are generally capable of component, ignition, carburetor services, and basic tuneup. In all cities surveyed, most of the smaller independent garages and service stations lacked the more sophisticated emission and ignition analytical equipment normally found at dealerships and mass merchandisers.

It was found that diagnostic centers, both franchised and independent, are currently changing from a diagnostic-service-only plan to a diagnosis-and-repair concept.

Automobile owners are not consistent in their maintenance methods. Their decisions are affected by frequency and length of operation, availability of service, their economic situations, and their personal habits. The majority of automobile owners are not familiar with the maintenance requirements of their owner's handbook. While 79 percent claimed familiarity, only 25 percent were able to state the handbook recommended oil change. No significant differences of consumer maintenance could be attributed to geographical area, cost (size classification) of vehicle, or year make.

Only a small percentage of the automobile owners felt that the fuel shortages and price increases of late 1973 and early 1974 had any effect upon their maintenance schedules.

Mechanics of the future will be required to use diagnostic equipment extensively in servicing the more sophisticated automobiles predicted for the future. They should have some knowledge of engine diagnostic equipment, be able to take accurate readings, and be able to determine the correct action required.

Review of the 1974 Environmental Protection Agency's Durability Test showed little uniformity in the methods used by automobile manufacturers in accomplishing the maintenance portion of that test. Maintenance frequencies varied broadly and were seldom found equal, in either the test recommendations, the owner's handbook, or the actual records of maintenance performed. The lack of standardization in the identification of the various maintenance operations made review very difficult.

CHAPTER III

CONCLUSIONS

Based on the data obtained during this survey, the following conclusions are offered:

- Automotive service requirements are continually becoming more complex.
- Diagnostic centers are diversifying into diagnostic, service, and repair facilities.
- Of the service centers surveyed, automobile dealerships employ the highest percentage of classified or rated mechanics.
- Of the maintenance shops surveyed, automobile dealerships are more fully equipped than the other classifications.
- Current and future requirements for diagnostic equipment can be met by the diagnostic equipment industry.
- Some manufacturers did not follow the recommended maintenance frequencies for their product line during the 1974 Durability Tests.
- The 1974 Durability Test maintenance records were not compiled in accordance with a standardized reporting system.
- The automobile owner has no common characteristic identifiable by information obtained during this survey.
- The majority of automobile owners are unwilling to voluntarily replace a malfunctioning catalytic converter.

CHAPTER IV

PERFORM A FIELD SURVEY OF ACTUAL AND RECOMMENDED MAINTENANCE PRACTICES FOR LIGHT-DUTY VEHICLES FOR 1975 AND LATER-MODEL YEARS (TASK 1)

A. INTRODUCTION

The gathering of information required by this task entailed contact with automotive manufacturers, maintenance establishments, equipment manufacturers, and automobile owners throughout the United States.

This task was performed using a combination of telephone interviews, written correspondence, and on-site survey interviews in each of the commercial survey categories. As information was obtained it was recorded as concisely as possible without sacrificing pertinent factors.

Selection of the geographical areas was predicated on a cross-section of the United States. The climatological and sociological differences and the varying state and local emission control regulations were considered in this selection. The nine cities chosen (Figure 1) provided differences in location, climate, sociological patterns, and regulations, and encompassed major population centers of the United States.

The areas chosen and the vehicle population of the nine cities involved are listed below. The total automobile registration for the United States as of July 1, 1974 was 92,607,000.

<u>Survey Area</u>	<u>City</u>	<u>Vehicle Population</u>
1	Tampa	279,716
2	New York	2,235,864
2A	Newark	797,203
3	Detroit	1,713,245
3A	Chicago	2,326,000
4	Los Angeles	2,347,425
4A	Phoenix	457,096
5	Seattle	552,331
6	Denver	527,022

To ensure complete understanding of the geographic confinements of each survey area, the counties involved in the nine cities have been listed.

<u>City</u>	<u>Counties Included</u>
Tampa	- Hillsborough, Pasco, Pinellas
New York	- Bronx, Kings, Putnam, Queens, Richmond, Rockland, Westchester
Newark	- Essex, Morris, Somerset, Union
Detroit	- Lapeer, Livingston, Macomb, Oakland, St. Claire, Wayne
Chicago	- Cook, DuPage, Kane, Lake, McHenry, Will

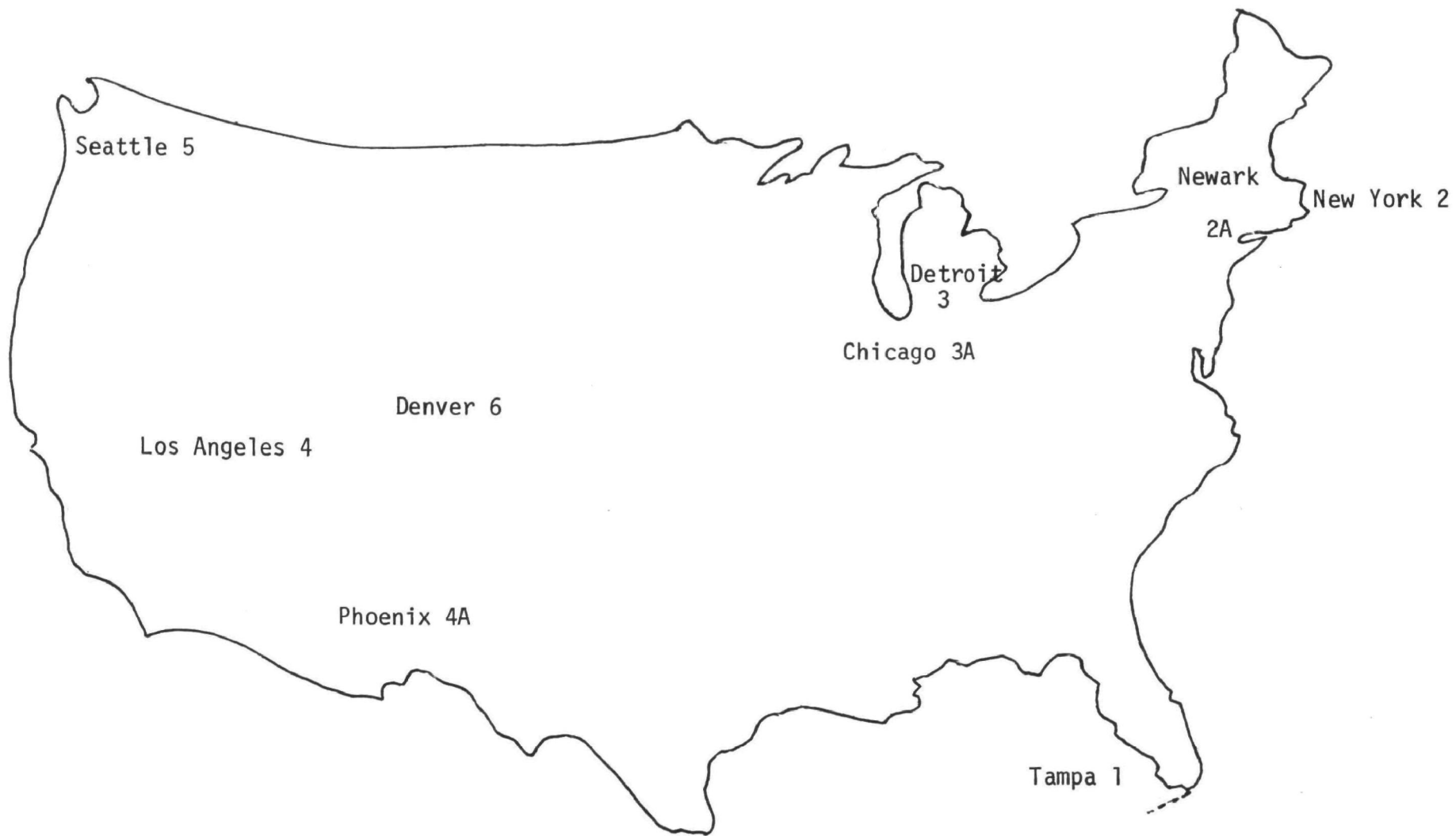


Figure 1. Survey Areas

<u>City</u>	<u>Counties Included</u>
Los Angeles	- Los Angeles County
Phoenix	- Maricopa
Seattle	- King, Snohomish
Denver	- Adams, Arapahoe, Boulder, Denver, Gilpin, Jefferson

Vehicle inspection requirements varied in the areas surveyed, and the consumer responses were influenced by the regulations governing particular areas of the country. The locations and inspection classifications are listed below.

<u>Area</u>	<u>City</u>	<u>Type of Inspection*</u>
1	Tampa, Florida	2AC
2	New York City, New York	2BC
2A	Newark, New Jersey	1AC and 2C
3	Detroit, Michigan	2AC
3A	Chicago, Illinois	1A
4	Los Angeles, California	1BC
4A	Phoenix, Arizona	None
5	Seattle, Washington	None
6	Denver, Colorado	1A and 2BC

*Type of Inspection

1. Emission or smoke test.
 2. Safety inspection.
-
- A. State-operated.
 - B. Government-certified.
 - C. Mandatory.

The survey subjects included organizations such as new-car dealers, diagnostic centers, mass merchandisers, service stations, and independent garages.

Automobile manufacturers were contacted at their corporate offices. The list of manufacturers included American Motors, Chrysler, Ford, General Motors, Nissan, Toyota, and Volkswagen. Manufacturers' representative interviews were scheduled whenever possible while surveyors were in cities where the manufacturing facilities were located.

New-car dealers were interviewed concerning their operations and training, and their shops were surveyed for maintenance capabilities.

Mass merchandisers' outlets were interviewed for their practices and procedures at the retail level. This revealed local policies, capabilities, and operational procedures. Typical of mass merchandisers selected for

interviews were: Sears Roebuck, Montgomery Ward, J. C. Penney, Goodyear, Firestone, and K-Mart. The corporate offices of these mass merchandisers were also contacted by phone and letter, and through personal interviews wherever possible.

A small number of franchised diagnostic centers were surveyed in each city. The franchisors' offices were also contacted for policy development and national/regional practices.

Franchised diagnostic centers reported by the field survey teams were fewer than were anticipated prior to actual survey. A telephone directory from each of seven cities identified below was reviewed to determine the number of potential franchised diagnostic centers in each of the areas. The outcome supported the field survey teams' input that franchised diagnostic centers were decreasing in numbers and would not provide the number of interviews originally anticipated.

Two categories, independent garages and franchised diagnostic centers, were researched through the telephone directories to develop some statistical comparisons. Mass merchandisers were not included in the sample since no direct association could be related to mass merchandisers with automobile centers and tuneup service, and the telephone directory listings. The following is a sample of these two categories.

	<u>No. of Independents</u>	<u>No. of Franchised Diagnostic Centers</u>
1. New York (Manhattan)	500	3
2. New York (Bronx)	500	2
3. Newark, New Jersey	500	3
4. Denver, Colorado	1,000	16
5. Los Angeles, California	2,100	5
6. Tampa, Florida	400	5
7. Detroit, Michigan	700	23

Locally owned or managed maintenance facilities such as service stations, specialty shops, independent garages, and independent diagnostic centers were surveyed. A proportional cross-section of these establishments were surveyed in each of the nine cities.

Consumer surveys were accomplished through telephone interviews in each of the nine areas surveyed.

A list of vehicle owners in the nine selected cities, as well as information relative to their cars, was provided by a data supplier. This sample was based upon the total automobile population in each area.

B. FIELD SURVEY PREPARATION

Preparatory to field surveys, a contract was let for consumer listings of approximately 7,200 consumers who had registered vehicles in the survey areas. The statistical compilation consisted of a representative sample of the total 1970 to 1974 ~~model~~ automobile population of:

Area 1	Tampa, Florida
Area 2 and 2A	New York City and Newark, New Jersey
Area 3 and 3A	Detroit, Michigan and Chicago, Illinois
Area 4	Los Angeles, California
Area 4A	Phoenix, Arizona
Area 5	Seattle, Washington
Area 6	Denver, Colorado

The consumer listings included the names and addresses of 800 automobile owners for each of the above nine cities, plus serial number, model year, manufacturer, series, body style, and number of cylinders for each vehicle.

Approximately 2 weeks before each survey, consumer notification letters were mailed to 800 consumers in the survey area. The objective was to complete 140 consumer questionnaires in each of the nine cities selected.

Pre-survey commercial notification letters were mailed approximately 2 weeks prior to actual surveys. The objectives were to accomplish interviews with 20 new-car dealers, 25 franchised diagnostic centers and mass merchandisers, and 15 independent garages in each of the nine selected cities. The selection of the commercial interviewees was accomplished through informal random selections of telephone directory listings from each of the nine survey cities.

C. CONSUMER FIELD SURVEY

Interviewers were cautioned against leading the consumers in their answers. Some of the interviews had to be terminated by the interviewer, as some consumers became deeply involved in the survey. It is important to note that in some instances consumers were willing to cooperate in the survey and often volunteered information to the surveyors, and some showed a sincere interest in the clean air program.

The information obtained during the interviews was provided by the owner of the vehicle or another member of the family.

An attempt to utilize mail questionnaires to supplement the consumer interview portion of the field surveys was unsuccessful. Less than 5 percent of the inquiries received usable replies.

It was determined by the Bendix Divisional Statistician that the replies received were 95 percent correct within plus or minus 3 percent of the true national percentage.

D. COMMERCIAL FIELD SURVEY

The practices of automotive maintenance establishments were determined by performing an on-site survey of new-car dealers, franchised diagnostic centers, mass merchandisers, and independent garages in each of the nine cities selected.

Each surveyor followed a prescribed interview procedure to ensure consistency and the maximum effectivity. On-site survey was the most effective method available for gathering information of a sensitive nature. The on-site surveys were time-consuming, but resulted in the acquiring of the necessary information to support the contract requirements.

Some of the information requested on the commercial questionnaires was considered proprietary by a small number of the companies interviewed. This situation resulted in some interviews being terminated prior to completion of the questionnaire.

The commercial interviews were accomplished successfully, and with few refusals to complete the questionnaires.

The results of the field surveys are depicted in the Survey Data Sheets shown at the end of this chapter.

E. SUMMARY

A representative field survey listing of 7,200 automobile owners was purchased from a national supplier of technical and statistical data.

The commercial field survey representative sample was extracted from the commercial pages of each city's telephone directory by informal random sampling. This sample met requirements for predetermined categories and quantities of available service facilities.

Field survey requirements were obtained through performing on-site surveys, letter surveys, and telephone interviews. On-site surveys and the telephone interviews were preceded by the forwarding of introductory letters.

A comparison of independent garages and franchised diagnostic centers in seven of the target cities was accomplished for a statistical sample. Less than 1 percent of the vehicle service centers were franchised diagnostic centers.

An attempt to use consumer mail questionnaires in areas found not entirely satisfactory during the phone interviews was not successful. Response to the mail queries was less than acceptable.

The commercial field surveys presented no serious problems. Refusals were rare, with most companies willing to cooperate.

Field survey goals were satisfied, but franchised diagnostic centers surveyed fell short of the total number of firms originally estimated to be in business.

SURVEY DATA SHEETS

Survey Area 1, Tampa, Florida (9/23/74 - 10/4/74)

Consumer Notification Letters Mailed	365
Consumer Notification Letters Returned	65
Number of Consumers with Phones	300
Completed Survey Questionnaires	127
	<u>Interviewed</u>
New-Car Dealers	19
Mass Merchandisers	26
Franchised Diagnostic Centers	5
Independent Garages	<u>13</u>
Total	63

Survey Area 2, New York, New York (10/14/74 - 11/2/74)

Consumer Notification Letters Mailed	800
Consumer Notification Letters Returned	120
Number of Consumers with Phones	391
Completed Survey Questionnaires	120
	<u>Interviewed</u>
New-Car Dealers	21
Mass Merchandisers	4
Franchised Diagnostic Centers	5
Independent Garages	<u>21</u>
Total	51

Survey Area 2A, Newark, New Jersey (11/4/74 - 11/16/74)

Consumer Notification Letters Mailed	800
Consumer Notification Letters Returned	112
Number of Consumers with Phones	392
Completed Survey Questionnaires	130
	<u>Interviewed</u>
New-Car Dealers	30
Mass Merchandisers	13
Franchised Diagnostic Centers	3
Independent Garages	<u>18</u>
Total	64

Survey Area 3, Detroit, Michigan (12/1/74 - 12/21/74)

Consumer Notification Letters Mailed	800
Consumer Notification Letters Returned	75
Number of Consumers with Phones	448
Completed Survey Questionnaires	144
	<u>Interviewed</u>
New-Car Dealers	19
Mass Merchandisers	12
Franchised Diagnostic Centers	6
Independent Garages	<u>10</u>
Total	47

Survey Area 3A, Chicago, Illinois (12/1/74 - 12/21/74)

Consumer Notification Letters Mailed	800
Consumer Notification Letters Returned	95
Number of Consumers with Phones	345
Completed Survey Questionnaires	75
	<u>Interviewed</u>
New-Car Dealers	20
Mass Merchandisers	12
Franchised Diagnostic Centers	0
Independent Garages	<u>18</u>
Total	50

Survey Area 4, Los Angeles, California (2/23/75 - 3/8/75)

Consumer Notification Letters Mailed	800
Consumer Notification Letters Returned	43
Number of Consumers with Phones	306
Completed Survey Questionnaires	103
	<u>Interviewed</u>
New-Car Dealers	29
Mass Merchandisers	11
Franchised Diagnostic Centers	0
Independent Garages	<u>20</u>
Total	60

Survey Area 4A, Phoenix, Arizona (2/27/75 - 3/13/75)

Consumer Notification Letters Mailed	800
Consumer Notification Letters Returned	137
Number of Consumers with Phones	380
Completed Survey Questionnaires	170
	<u>Interviewed</u>
New-Car Dealers	21
Mass Merchandisers	22
Franchised Diagnostic Centers	4
Independent Garages	<u>17</u>
Total	64

Survey Area 5, Seattle, Washington (1/13/75 - 2/1/75)

Consumer Notification Letters Mailed	800
Consumer Notification Letters Returned	158
Number of Consumers with Phones	433
Completed Survey Questionnaires	184
	<u>Interviewed</u>
New-Car Dealers	24
Mass Merchandisers	12
Franchised Diagnostic Centers	0
Independent Garages	<u>24</u>
Total	60

Survey Area 6, Denver, Colorado (1/13/75 - 2/1/75)

Consumer Notification Letters Mailed	800
Consumer Notification Letters Returned	80
Number of Consumers with Phones	435
Completed Survey Questionnaires	172
	<u>Interviewed</u>
New-Car Dealers	23
Mass Merchandisers	14
Franchised Diagnostic Centers	6
Independent Garages	<u>18</u>
Total	61

CHAPTER V

DETERMINE THE TYPE OF DIAGNOSTIC EQUIPMENT EXPECTED TO BE PROCURED FOR 1975 VEHICLES AND LATER-MODEL YEARS (TASK 2)

A. INTRODUCTION

The uncertainty of future requirements of emission control device standards has created a great deal of confusion among the new-car dealers, mass merchandisers, and independent garages throughout the survey areas. With the addition of the catalytic converter in 1975 model vehicles, and the publicity given to the sulphur-compound emissions being experienced and attributed to the catalytic converters, management interviewed in the last two areas, California and Phoenix, hesitated or declined firm forecast of future equipment procurement. The exceptions to this condition are the new-car dealers who are obligated to establish and maintain vehicle service centers in accordance with factory recommendations.

Some garages have invested \$3,000 to \$6,000 for the hydrocarbon/carbon monoxide analyzer and find that analysis and adjustments of some of the 1975 model vehicles are limited because of the converter and exhaust system design.

The fuel shortage has brought about an added burden to the vehicle manufacturers, service organizations, and the consumers. In addition, of course, there is the economic effect which has been felt by all concerns throughout the country. Normal practical advance planning has been abandoned because of the uncertainty of every aspect of business inside and outside the automotive industries.

B. NEW-CAR DEALERS

It is anticipated that new-car dealers will procure the necessary equipment to service their product line as recommended by manufacturers. The diagnostic equipment expected to be procured in excess of the equipment normally found in these garages is:

- Hydrocarbon/carbon monoxide infrared analyzer
- Ignition analyzer with scope

C. FRANCHISED DIAGNOSTIC CENTERS

Franchised diagnostic centers are decreasing in number which creates some doubt that this industry will survive the rapidly changing and expensive transition of the vehicle maintenance standards and requirements. The basic operating philosophy of diagnostic centers has changed from one of strictly diagnosis to diagnosis and repair. Diagnostic equipment expected to be procured is equivalent to the new-car dealer equipment, paragraph B.

D. MASS MERCHANTISERS

The uncertain market has caused mass merchandisers to stall their analytical equipment procurement forecasts until more stable commitments by vehicle manufacturers are established. Until mass merchandisers are satisfied with future markets and potential profit margins, diagnostic equipment acquisition plans will not be divulged.

E. INDEPENDENTS

The independent garages are split on decisions regarding equipment procurement. Many are unwilling to invest large sums of money in equipment because of the instability of the industry. Few are convinced of the necessity of having well-equipped shops if they are to survive the competition for the 1975 and later-model vehicle maintenance market.

F. SUMMARY

Because of the number of influencing factors in existence during the field survey, a great percentage of the management interviewed were undecided or unwilling to make a forecast of future procurement. The influencing factors involved included but were not limited to: economic conditions of the area and/or nation, changing state of the art of maintenance practices, the potential of annual engineering changes, and the availability of skilled labor to utilize the equipment.

CHAPTER VI

DETERMINE THE CURRENT AVAILABILITY OF AUTOMOTIVE DIAGNOSTIC EQUIPMENT AND PROJECT FUTURE AVAILABILITY (TASK 3)

A. INTRODUCTION

The need for new diagnostic equipment is related to the development of new automobile engines and fuels, maintenance requirements, and maintenance procedures. The emission control devices will influence the types and designs of future diagnostic equipment and the operational procedures.

This chapter will discuss the current availability of specific diagnostic equipment, and will report on the automobile and diagnostic equipment industries' diagnostic equipment markets.

The fundamental diagnostic equipment classifications covered in this survey include:

- Automotive engine analyzers
- Engine and chassis dynamometers
- Exhaust emission analyzers
- Individual engine diagnostic and analytical components

This equipment is indexed and described in Appendix A. The basic information for this effort was acquired through field interviews, formal correspondence, and telephone interviews with automobile manufacturers, diagnostic equipment manufacturers, and the service industry.

B. AUTOMOBILE AND DIAGNOSTIC EQUIPMENT MANUFACTURERS

Ninety manufacturers offering diagnostic equipment, dynamometers, or other automotive service equipment for sale in trade journals, the Thomas Register, and McRae's Blue Book were contacted by letters. Three letters were forwarded to diagnostic equipment manufacturers to acquire information for the survey, a product brochure for a source listing, and a letter asking for the manufacturer's development plans. Product brochures were received as requested, but information for survey and development plans was not supplied.

Correspondence and interviews with automobile manufacturers yielded some information concerning industry's coordination in the development of diagnostic equipment to automobile manufacturers' specifications. In some instances, sales and distribution were accomplished under the automobile maker's trade name.

Several of the mass merchandisers and independents expressed their understanding that it would be at least 2 years before they began servicing the new automobiles. With this 2-year lead time, analytical equipment

procurement commitments are premature. Perhaps the best example of the automobile and diagnostic equipment manufacturers' planning and development policies available to the public is a brief report on the annual meeting of the Equipment and Tool Institute (ETI) in October 1974.

Attending automobile manufacturers' representatives challenged the diagnostic equipment manufacturers to develop easy-to-operate equipment, backed by an adequate maintenance and training program that would actually help the mechanic make the correct repair on the first attempt.

ETI members voiced a complaint, one that appears prevalent in this industry, of service information being held back by automobile manufacturers. Automobile manufacturers replied that they were looking to the pros, ETI, for more guidance in this area.

A program recently introduced by an automobile maker publicly releasing service bulletins on how to service various automobile and truck components was discussed in detail. It was felt that this system could be adopted by the industry in a very short time, resolving this problem with very little cost.

Major automobile manufacturers' technical representatives agreed that future diagnostic equipment requirements would be determined by the increasing complexity of automobiles and the influence of consumerism, and both automobile and equipment manufacturers agreed they would have to work together to improve the state of diagnosing, servicing, and repairing the vehicles of the future. They believe this can be accomplished by making available to the automotive industry a greater amount of training and new diagnostic and repair equipment.

The automobile manufacturers' plans include strong efforts toward developing a class of equipment that is capable of solving the specific kinds of problems customers complain about most. A manufacturer's representative for one of the major automobile companies described the automobile maker's role in the development and evaluation of test and repair equipment, and service systems and procedures as being most important in helping dealers provide customer satisfaction. This requirement can be satisfied only by proper diagnostic equipment to ensure that mechanics pinpoint and correct customers' problems on the first attempt.

One method recommended by automobile makers to ensure first-class service to users was maintenance and diagnostic equipment support through implementation of a customer monitoring system. Development of vehicles that would never need maintenance was discussed for a brief time, with the general consensus being that affordable vehicles of this type cannot yet become a reality. The major subjects of several of the representatives' talks were the mutual automobile makers' and ETI members' improvement and distribution of technical information so that it is generally available and more easily understood, and the development of new and better service procedures.

During the field survey portion of this contract, 36 percent of the automobile owners interviewed expressed a cost-conditional acceptance of the automatic service reminder devices.

C. SUMMARY

A review of all of the information gathered during the course of this survey reveals that the diagnostic equipment manufacturers' plans depend almost entirely on the course decided upon by the automobile makers. The automobile manufacturer is continuously attempting to interface the diagnostic equipment manufacturers' development and production schedules with his requirements.

The equipment manufacturing industry appears willing and capable of supplying the instruments and equipment necessary to provide an adequate supply to the service industry. The constantly increasing manufacturing and inventory costs will affect the availability of diagnostic equipment in the future. There is no reason to believe a firm requirement for new equipment could not be met by the manufacturing industry in a reasonable period of time.

CHAPTER VII

DETERMINE THE TYPE OF AUTOMOTIVE MAINTENANCE AND DIAGNOSTIC EVALUATIONS PRESENTLY BEING PERFORMED AND WHETHER MAINTENANCE PRACTICES ARE EXPECTED TO CHANGE FOR THE 1975 AND LATER-MODEL VEHICLES (TASK 4)

A. INTRODUCTION

The emission control devices have contributed to engine design changes; hence, maintenance and diagnostic changes. Prior to emission controls, engine maintenance standards were: vacuum gages, pressure gages, exhaust analyzer (ratio air/fuel), ignition analyzer (distributor dwell/gap), and a few common meters, i.e., volt/ammeter, etc.

Since the addition of emission control devices, engine tuneups have become more complex in comparison to earlier-model vehicles. On the 1974 model vehicles, infrared analyzers are required to ensure factory specification and emission standards are met. The introduction of the catalytic converter in many of the 1975 model vehicles caused some maintenance procedure changes. The announcement by the Government that emission standards will not be changed for 5 years has contributed to the indecision in the planning activities of the service industry.

B. VEHICLE MANUFACTURERS

As with other industries, the automotive industry is rapidly approaching the computer age. This is evidenced by the development of digital analyzers which are being offered by the equipment manufacturers. The automotive manufacturing industry has some evidence of what can be expected; with Volkswagen, a plug-in computer analysis is available for the servicing mechanic, and with Toyota, a small onboard computer is used to control the sensing device used in many of their cars' systems. The automotive manufacturers are looking to the future of plug-in computer analyzers.

C. MAINTENANCE SERVICE CENTERS

The trend is to less maintenance for the life of the car, and, with the development of material, i.e. teflon and others, maintenance frequencies are being reduced. The major changes in the 1975 and later-model vehicles will be the automation of analysis. This type of analysis will remove human error and calculations, and ensure accurate readouts with proper adjustments and settings for maximum performance.

The level of maintenance is not consistent with each of the four categories of service centers that was evaluated during this survey. Since each of these categories of service centers had varying degrees of maintenance capabilities, it would be unrealistic to attempt to define the specific potential by category. Therefore, a more general approach will be taken that will represent the average capability within a particular category. The following is based on information accumulated during the national survey.

- Dealerships have total maintenance potential regarding their product line.
- Franchised diagnostic centers have limited their interest to engine analysis and tuneups, and have specialized in one or two sideline systems, i.e. brakes, front-end alignment, vehicle inspections, electronic troubleshooting, etc. Normally, they do not get involved in heavy maintenance, i.e. engine overhaul, transmission repair, etc.
- Mass merchandisers are heavily involved in tire service, front-end alignment, shocks, front-end repair, brakes, and exhaust systems. They normally are not involved in heavy maintenance items.
- Independent garages have the most uncertain maintenance limits which vary from very restrictive specialization to all-encompassing maintenance potentials. Generally, the independents have restricted their maintenance to work that can be accomplished without making major investments in expensive equipment. Some specialty is normally associated with the shop and the specialty is based on the owner's interest and/or the competition in the owner's immediate area.

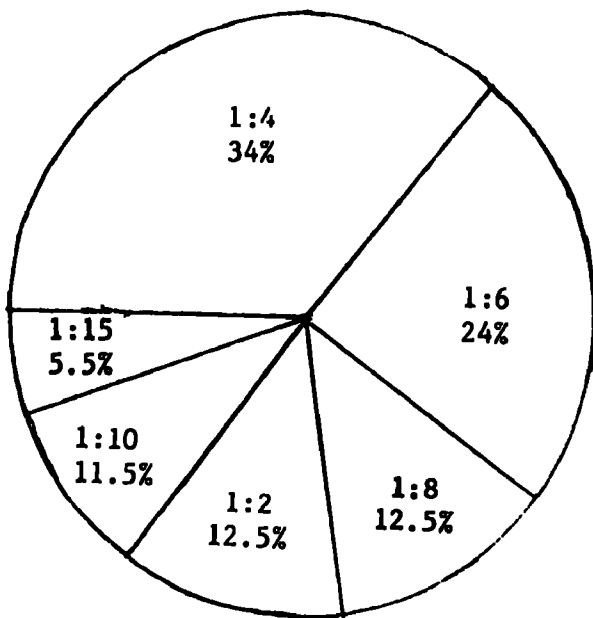
The management-to-mechanic ratio was determined for each service classification by comparing the number of line management personnel to mechanics and shop line personnel employed by each service category.

Line management is defined as those employees, including the service manager or shop superintendent, involved in the actual supervision of service and repair personnel. This classification includes service writers or schedulers whose responsibilities actually involve the supervision of service and repair personnel.

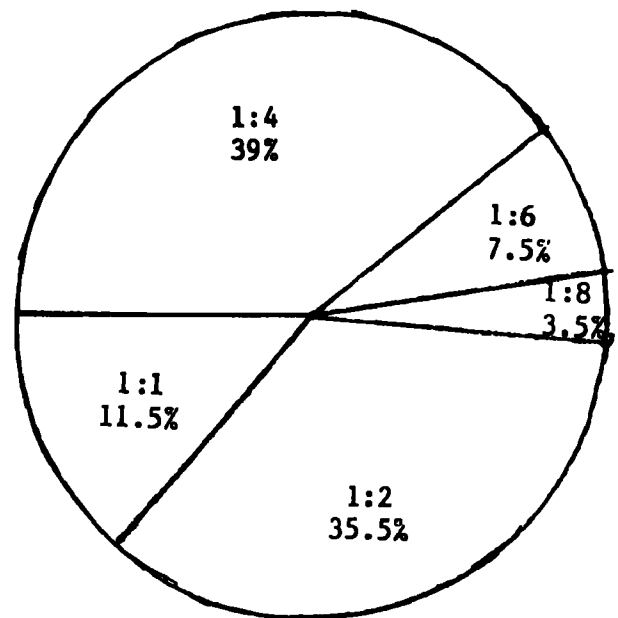
Service personnel are composed of general shop employees actively engaged in the automobile, engine, or accessory service and repair efforts of a maintenance facility. Diagnostic mechanics, tuneup and overhaul specialists, accessory and component technicians, and general automotive mechanics are included in this classification.

A review of the commercial questionnaires covering new-car dealerships, mass merchandisers, franchised diagnostic centers, and independents provided the information necessary to graphically illustrate the management-to-line service personnel supervisory ratios found in the survey areas (Figure 2).

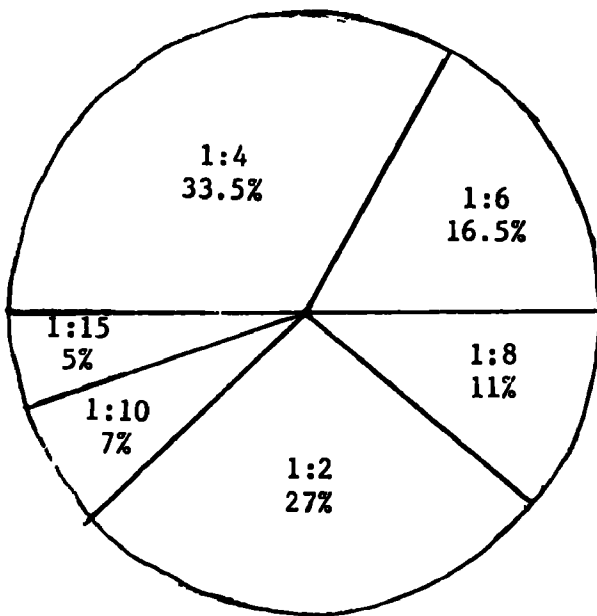
NEW-CAR DEALERS



DIAGNOSTIC CENTERS



MASS MERCHANTISERS



INDEPENDENTS

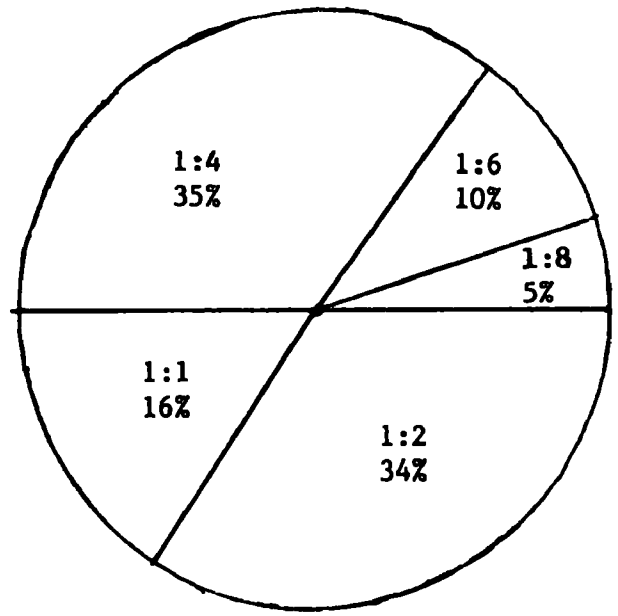


FIGURE 2. MANAGEMENT/MECHANIC RATIO AND PERCENTAGES PREVALENT IN THE SERVICE INDUSTRY

These graphs reveal similarities throughout the service industry. The 1 to 4 ratio of management-to-service personnel was found to be the most common among all classifications, averaging 35 percent of the survey total.

The second ratio found most often in the commercial surveys was 1 of management to 2 of service employees. This ratio was found in use in an average of 26 percent of the facilities surveyed (Figure 2).

Survey results indicate that 86 percent of the new-car dealerships, and 69 percent of the other commercial maintenance shops (mass merchandisers, diagnostic centers, and independents) had acquired some maintenance analyzers, each establishment acquiring the type of analyzer most needed for its particular maintenance requirements. In addition, 73 percent of the dealers and 53 percent of the other commercial maintenance shops claimed they would acquire all additional equipment required to maintain the later-model vehicles.

Maintenance practice changes were predicted by 61 percent of the dealers and 53 percent of the other commercial shops. Some comments by maintenance shop management gave a strong indication that existing conditions forced a more conservative view with regard to future procurement.

D. SUMMARY

Vehicle manufacturers are engineering products that require less maintenance than vehicles of past years. Some manufacturers have indicated that vehicle design will incorporate automated plug-in analysis.

Vehicle maintenance service centers policies will probably continue as in the past, with the only difference being the state of the art. Visual observation and interviews with representatives indicated that the dealerships were equipped and personnel were qualified to perform required service of their product lines within established specifications. The field surveys were not designed to measure the technicians' methods of servicing to determine the dealers' compliance with the manufacturers' recommendations. Mass merchandisers will continue to follow the patterns established in the past, with tire, battery, and shocks servicing being the primary objectives. Independent garages will continue to be directly influenced by the location of the business and the owner's interests. Some will upgrade their shops through new procurement and additional training programs, and some will prefer not to get involved in the growing concept of electronic troubleshooting.

The management-mechanic ratio was found to be fairly standard throughout the industry, with a ratio of 1 management to 4 mechanics being the most numerous. Commercial shops and dealerships anticipate changes in maintenance requirements and practices continuing through the next few years.

CHAPTER VIII

DETERMINE CONSUMERS' AUTOMOTIVE HABITS AND PRACTICES RELATIVE TO VEHICLE MAKE, AGE, AND ORIGINAL COST (TASK 5)

A. INTRODUCTION

State, city, or county vehicle inspection codes influenced the consumer responses to consumer questionnaires. In seven of the nine areas surveyed, inspection codes of some degree were in effect. With the exception of the Los Angeles area, consumer attitude was reasonably consistent. Many Los Angeles consumers stated that they were totally disgusted with the antipollution laws and regulations and would comply only where regulations were enforced by penalty.

The more common problems encountered during the telephone survey were as follows:

- Consumer did not remember receiving the information letter.
- Consumer indicated no interest in the survey and hung up the phone.
- Consumer became irritated at the length of time required to complete survey and hung up the phone before the questionnaire was completed.
- Consumer no longer owned a vehicle.
- Consumer was preparing or eating dinner (call was timed this way to ensure that interviewees would be home).
- Consumer was working and no other member of the family could answer the questionnaire.
- Consumer was convinced the interview was a promotional scheme or a sales pitch.

There were other factors that influenced the consumer attitudes where certain questions were concerned. To better understand these conditions, the following is offered:

- Question 4 (a), the Consumer Questionnaire, "Have the fuel shortages and price increases had any effect on your current maintenance schedule?" was not appropriate for the time period of actual survey. Most consumers had forgotten the effects of the fuel shortage, and as a result could offer little information. Price increases were associated with the national economic conditions, and the consumer was not prepared to blame fuel price increase for maintenance habits. Part (b) of Question 4 "In what way has it affected your current maintenance schedule?" is an extension of the same thought (Question 4a). Part (c) paralleled parts (a) and (b), and those consumers who supplied answers offered little information.

B. CONSUMER SURVEY

On the Consumer Questionnaire, consumers were asked who serviced their cars, a dealer, a mechanic, or themselves. Of the owners interviewed, 38.6 percent have dealers perform scheduled maintenance, 39.2 percent take their cars to other commercial facilities (mechanic), and 22.2 percent perform all or most of the service themselves.

Further review of the replies to this three-part question established that those automobile owners who performed their own scheduled maintenance did so throughout all of the model years.

A comparison was made, for each survey area, of the consumers' choices of method of scheduled maintenance and the local vehicle inspection regulations. No association between the two factors was evident (Table 1).

The age of the automobile did have a measurable effect on the method the owners selected for service (Table 2 and 2A). The owners of 1973, 1974, and 1975 model year vehicles preferred the mileage method by 8.6 percent over the calendar method, and 9.6 percent over the performance method. Dealer service was preferred by 52.3 percent of the owners in this category, and mechanics by 33.3 percent; 14.4 percent of the owners elected to perform their own service.

The 1971 and 1972 model year automobile owners chose the calendar method by 8.7 percent over the mileage system and 8.6 percent over the performance system of servicing their automobiles. A total of 46.7 percent of the owners of 1971 and 1972 automobiles used mechanics to perform their service, and 31.6 percent used dealerships. The owners performed the service in the balance of the cases.

The owners of older automobiles (Other years) were about equally divided between the calendar and performance methods of scheduling their vehicles for service (34.5 and 34.8 percent respectively). Of the owners of pre-1971 cars, 30.7 percent used mileage to determine their automobiles' service schedule. In 41.3 percent of the interviewing, owners of older automobiles (Other years) used mechanics to perform their automotive services; the balance was split almost equally between the owner (29.7 percent) and dealers (29 percent).

No significant relationships were noted between the geographical location, automobile size (cost factor), and the method of scheduling maintenance or selecting maintenance sources. (Tables 3A and 3B).

One important point highlighted by Table 3A is the 31 percent of automobile owners that do not schedule their maintenance at all, relying entirely upon their ability to recognize symptoms of impending malfunctions or breakdowns in time to avoid them.

The data in Table 4 reveals that an average of 54 percent of the foreign car owners use dealerships for maintenance services as compared to only 27 percent of owners of American cars.

An average of 51 percent of foreign car owners use mileage to determine maintenance, while American car owner's use averages 34 percent. These figures appear to support the relationship of the two factors discussed in the preceding paragraph.

An inverse relationship between determining service frequencies by calendar and the actual service accomplished based on the automobile's performance was noted between the eastern, central, and western parts of the United States (Table 5). Overall mileage was the primary method used by consumers in determining service frequency (37 percent). Calendar and performance methods followed very closely with 32 percent in each instance.

Variances were noted in the selection of service methods within the classified geographical locations (Table 6). These factors could be related to economics, climate, local vehicle regulations, or others, but exact analysis was not possible within this report.

Survey findings are presented in Chapter X, B, 1, Tally Sheets.

C. SUMMARY

Local automobile inspection regulations had some influence on the consumer's response to the questions asked during the interview.

Problems encountered during the consumer phone interviews were relatively minor. These were resolved by simply increasing the number of calls until the necessary calls were successfully accomplished.

Outside factors were felt to have considerable influence on the consumer replies to some questions. These included the national economic situation, fuel prices, service cost increases, and reported problems with vehicle safety equipment and emission controls.

Replies to the consumer questions were tallied and reported affirmatively by percentage. These answers are summarized in Chapter II and analyzed in Chapter III.

Comparisons were made and tables developed to examine the possibility of relationships existing between various characteristics of the survey. There were some indications of direct and inverse relationships noted; these were discussed and are presented in graphical form.

TABLE 1. CONSUMER MAINTENANCE HABITS - SELECTION
OF MAINTENANCE METHODS COMPARED WITH
LOCAL VEHICLE INSPECTION REGULATIONS

TYPE OF INSPECTION*	CITY	AREA	DEALER (38.6%) (%)	MECHANIC (39.2%) (%)	VEHICLE OWNER (22.2%) (%)
2AC	Tampa	1	37.5	44	18.5
2BC	New York	2	36.6	41.9	21.5
1AC 2C	Newark	2A	29	52.7	18.3
2AC	Detroit	3	41.5	40.2	18.3
1A	Chicago	3A	35.2	40.9	23.9
1BC	Los Angeles	4	45.3	35.9	18.8
None	Phoenix	4A	49.5	28.3	22.2
None	Seattle	5	37.5	42.9	19.6
1A 2BC	Denver	6	34.8	31.4	33.8

*Type of Inspection

1. Emission or smoke test.
2. Safety inspection.

- A. State-operated.
- B. Government-certified.
- C. Mandatory.

TABLE 2A. CONSUMER MAINTENANCE HABITS BY VEHICLE YEAR MODEL

Subject automobiles were combined into the basic classifications for convenience of presentation. Data value was not compromised in the consolidation.

	Calendar (%)	Mileage (%)	Performance (%)
Area 1 - Tampa, Florida Years 1973, 1974, and 1975 1971 and 1972 Other years	12 17 26	42 24 37	46 59 37
Area 2 - New York, New York Years 1973, 1974, and 1975 1971 and 1972 Other years	36 48 33	38 33 24	26 19 43
Area 2A - Newark, New Jersey Years 1973, 1974, and 1975 1971 and 1972 Other years	31 44 54	47 39 25	22 17 21
Area 3 - Detroit, Michigan Years 1973, 1974, and 1975 1971 and 1972 Other years	59 54 48	21 21 29	20 25 23
Area 3A - Chicago, Illinois Years 1973, 1974, and 1975 1971 and 1972 Other years	69 69 63	22 17 22	9 14 13
Area 4 - Los Angeles, California Years 1973, 1974, and 1975 1971 and 1972 Other years	13 10 5	50 46 26	37 44 69
Area 4A - Phoenix, Arizona Years 1973, 1974, and 1975 1971 and 1972 Other years	4 27 32	58 39 34	38 34 33
Area 5 - Seattle, Washington Years 1973, 1974, and 1975 1971 and 1972 Other years	31 27 29	55 46 39	14 27 32
Area 6 - Denver, Colorado Years 1973, 1974, and 1975 1971 and 1972 Other years	21 41 27	45 38 34	34 21 39

TABLE 2B. CONSUMER MAINTENANCE HABITS BY VEHICLE YEAR MODEL

Subject automobiles were combined into the basic classifications for convenience of presentation. Data value was not compromised in the consolidation.

	Dealer (%)	Mechanic (%)	Owner (%)
Area 1 - Tampa, Florida Years 1973, 1974, and 1975 1971 and 1972 Other years	45 33.3 31	42.5 47.9 50	12.5 18.8 19
Area 2 - New York, New York Years 1973, 1974, and 1975 1971 and 1972 Other years	50 34 25.8	35.3 48.9 38.7	14.7 17.1 35.5
Area 2A - Newark, New Jersey Years 1973, 1974, and 1975 1971 and 1972 Other years	50.9 22.2 13.1	35.4 66.6 56.5	13.7 11.2 30.4
Area 3 - Detroit, Michigan Years 1973, 1974, and 1975 1971 and 1972 Other years	38 36.2 30	42.8 38.3 45	19.2 25.5 25
Area 3A - Chicago, Illinois Years 1973, 1974, and 1975 1971 and 1972 Other years	59 32.3 23	27.8 52.3 38.5	13.2 15.4 38.5
Area 4 - Los Angeles, California Years 1973, 1974, and 1975 1971 and 1972 Other years	53.8 33.4 50	28.2 46.1 32.1	18 20.5 17.9
Area 4A - Phoenix, Arizona Years 1973, 1974, and 1975 1971 and 1972 Other years	51.3 38.8 46.5	36.4 36.4 20.9	12.3 24.8 32.6
Area 5 - Seattle, Washington Years 1973, 1974, and 1975 1971 and 1972 Other years	50.8 34.5 29	33.8 42.6 54.8	15.4 22.9 16.2
Area 6 - Denver, Colorado Years 1973, 1974, and 1975 1971 and 1972 Other years	69.3 22.5 18.5	19.4 40 35.2	11.3 37.5 46.3

TABLE 3A. CONSUMER MAINTENANCE HABITS BY VEHICLE SIZE

Subject automobiles were combined into the basic classifications for convenience of presentation. Data value was not compromised in the consolidation.

	Calendar* (%)	Mileage* (%)	Performance* (%)
Area 1 - Tampa, Florida Luxury, full size, and intermediates Compacts and subcompacts	19 16	37 44	50 52
Area 2 - New York, New York Luxury, full size, and intermediates Compacts and subcompacts	44 34	32 34	27 34
Area 2A - Newark, New Jersey Luxury, full size, and intermediates Compacts and subcompacts	46 39	37 39	18 25
Area 3 - Detroit, Michigan Luxury, full size, and intermediates Compacts and subcompacts	48 53	22 22	24 22
Area 3A - Chicago, Illinois Luxury, full size, and intermediates Compacts and subcompacts	70 62	12 25	11 13
Area 4 - Los Angeles, California Luxury, full size, and intermediates Compacts and subcompacts	7 12	48 36	44 53
Area 4A - Phoenix, Arizona Luxury, full size, and intermediates Compacts and subcompacts	19 17	42 50	42 25
Area 5 - Seattle, Washington Luxury, full size, and intermediates Compacts and subcompacts	32 23	46 54	21 27
Area 6 - Denver, Colorado Luxury, full size, and intermediates Compacts and subcompacts	24 29	39 37	39 33

*Many consumer replies include more than one service selection; as a result the numerical value (percentage) of these three factors (maintenance determined by calendar, mileage, or performance) may not be equal to the sum of 100 percent.

TABLE 3B. CONSUMER MAINTENANCE HABITS BY VEHICLE SIZE

Subject automobiles were combined into the basic classifications for convenience of presentation. Data value was not compromised in the consolidation.

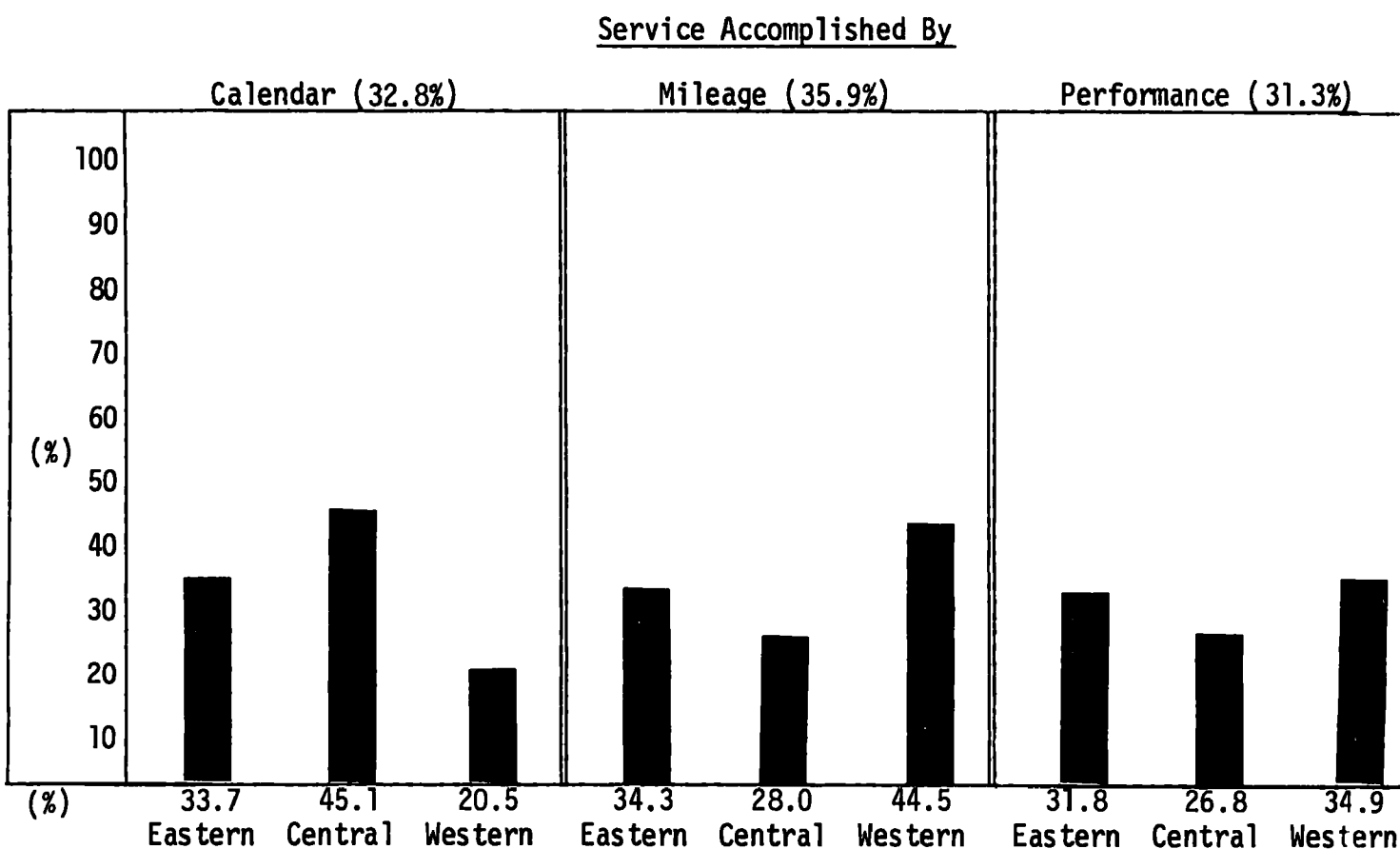
	Dealer (%)	Mechanic (%)	Owner (%)
Area 1 - Tampa, Florida Luxury, full size, and intermediates Compacts and subcompacts	29.5 50	50 35	20.5 15
Area 2 - New York, New York Luxury, full size, and intermediates Compacts and subcompacts	35 40.6	44 37.5	21 21.9
Area 2A - Newark, New Jersey Luxury, full size, and intermediates Compacts and subcompacts	28.3 42.8	53.2 42.8	18.5 14.4
Area 3 - Detroit, Michigan Luxury, full size, and intermediates Compacts and subcompacts	35 51.9	42 28.8	23 19.3
Area 3A - Chicago, Illinois Luxury, full size, and intermediates Compacts and subcompacts	40 31.4	40 45.7	20 22.9
Area 4 - Los Angeles, California Luxury, full size, and intermediates Compacts and subcompacts	56.6 34.6	32 38.4	11.4 27
Area 4A - Phoenix, Arizona Luxury, full size, and intermediates Compacts and subcompacts	48.3 47.3	29.2 21.2	22.5 31.5
Area 5 - Seattle, Washington Luxury, full size, and intermediates Compacts and subcompacts	39 41.2	43 37.2	18 21.6
Area 6 - Denver, Colorado Luxury, full size, and intermediates Compacts and subcompacts	32.3 40.8	34.3 24.6	33.4 34.6

TABLE 4. CONSUMER MAINTENANCE HABITS BY VEHICLE MANUFACTURE/GROUP

	<u>Calendar (%)</u>	<u>Mileage (%)</u>	<u>Performance (%)</u>
American Motors and Chrysler Corp.	38.7	27.8	33.5
Ford	25.2	38.9	35.9
General Motors	36.5	34.8	28.7
Volkswagen	23.8	53.9	22.3
Other Foreign	14.2	49.2	36.6

	<u>Dealer (%)</u>	<u>Mechanic (%)</u>	<u>Owner (%)</u>
American Motors and Chrysler Corp.	22.5	40	37.5
Ford	28.8	45.9	25.3
General Motors	38.5	40.9	20.6
Volkswagen	62	19	19
Other Foreign	46.9	21.2	31.9

TABLE 5. CONSUMER MAINTENANCE HABITS BY GEOGRAPHICAL LOCATION



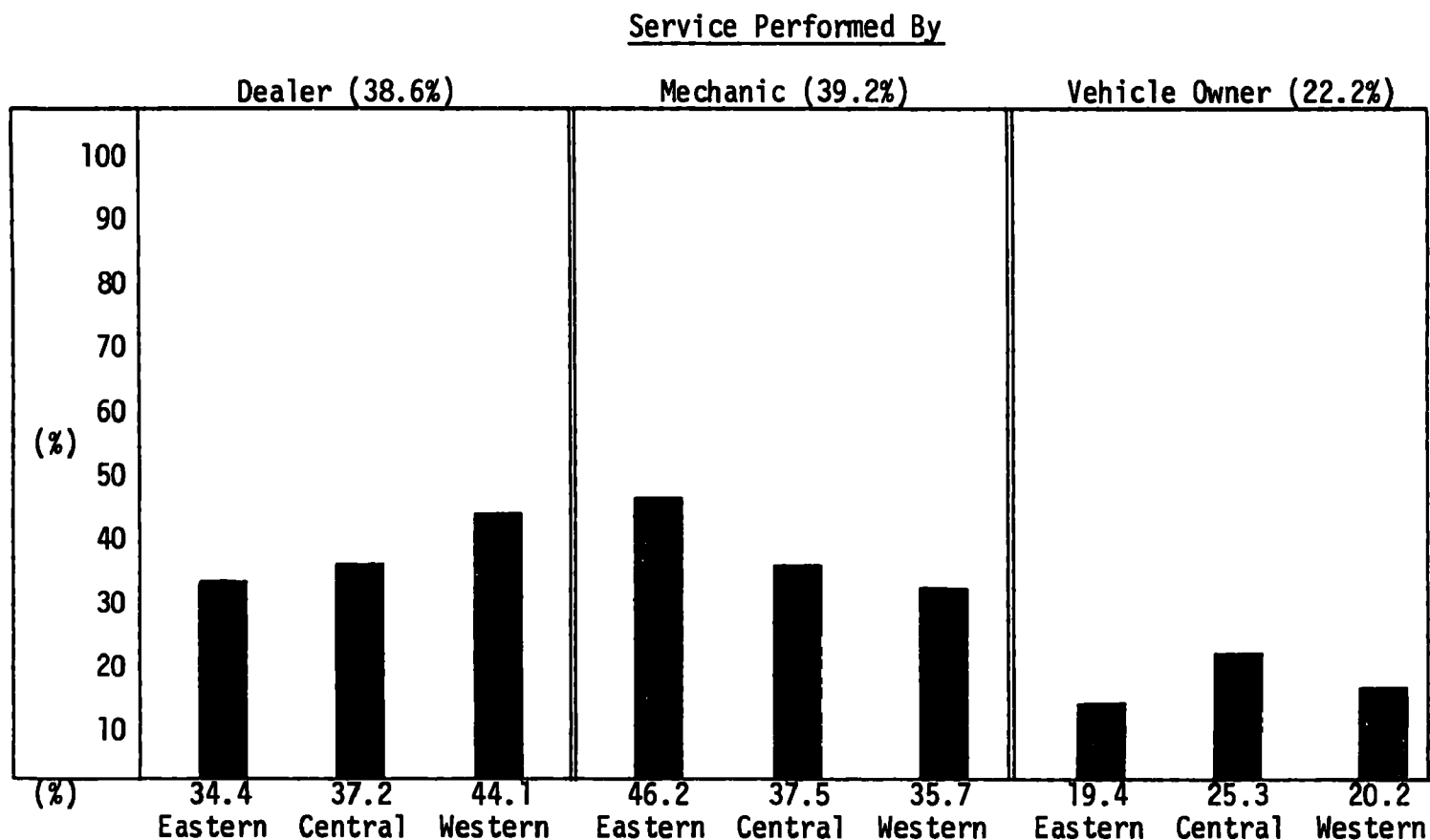
NOTES:

The Eastern classification consists of New York, New York; Newark, New Jersey; and Tampa, Florida.

The Central classification consists of Detroit, Michigan; Chicago, Illinois; and Denver, Colorado.

The Western classification consists of Seattle, Washington; Los Angeles, California; and Phoenix, Arizona.

TABLE 6. CONSUMER MAINTENANCE HABITS BY GEOGRAPHICAL LOCATION



NOTES:

The Eastern classification consists of New York, New York; Newark, New Jersey; and Tampa, Florida.

The Central classification consists of Detroit, Michigan; Chicago, Illinois; and Denver, Colorado.

The Western classification consists of Seattle, Washington; Los Angeles, California; and Phoenix, Arizona.

CHAPTER IX

DETERMINE THE COMPETENCE LEVEL THAT WILL BE REQUIRED OF MECHANICS TO MAINTAIN THE 1975 AND LATER MODEL AUTOMOBILES (TASK 6)

A. INTRODUCTION

This task is fundamentally a market survey and data-gathering effort as opposed to a laboratory research effort.

It is felt necessary to spend some time on the current situation in the different categories of the service industry before proceeding to the determination of future requirements.

To obtain the basic information, automotive manufacturers, mass merchandisers, and franchised diagnostic centers were contacted at the corporate and outlet levels.

In performing this portion of the survey, a combination of three methods was used to ensure consistency in the collection of the information. Telephone contacts were established, letters were forwarded to the interviewees, and the maintenance facilities were visited by the field interviewers.

The subject of this survey was a sensitive one to some of the manufacturers and merchandisers. Some interviews were declined and some responses were vague. Research of technical journals and magazines did provide insight on the subject.

To improve understanding of this material, the remainder of this chapter will be divided into four parts:

- General Background - A general discussion of current manning conditions in the service industry.
- Current Mechanic Competency Review - A review of present-day mechanics' competency in each of the service industry categories.
- Future Mechanic Competency Levels - Prognostications of the competence level expected of mechanics to maintain the 1975 and later-model automobiles.
- Summary - A recap of the subjects discussed in this chapter.

B. GENERAL BACKGROUND

With the volume of today's vehicle maintenance, automobile dealerships have problems in keeping up with mechanic manning requirements. Mass merchandisers, franchised diagnostic centers, and independents have been faced with this same problem, but each has established the skill levels acceptable to their particular conditions.

The level of competency required of mechanics for the next 10 years should not change noticeably from that required today. Attention should be focused

on the fact that some of today's mechanics actually do not present a picture of competency.

An opinion survey reported by the National Academy of Sciences in June 1973 stated that most mechanics are sufficiently skilled at performing repairs and parts replacements, but lack the knowledge of completing a diagnosis of problems related to excessive emissions. The percentage of the mechanics capable of making the correct diagnosis and repair averaged 67 percent across all mechanics present during the study.

A specific test of the ability of mechanics to diagnose and repair purposely introduced malfunctions gave results that basically agreed with the above estimates.¹

This sample indicates a trend that the competency level of 33 percent of mechanics are inadequate in the diagnostic field. This same inadequacy is expected to continue until some standard achievement requirements for licensed mechanics are established and enforced. There is strong evidence of the effort to improve public image and upgrade the public opinion of the mechanic's credibility. Fifty-four percent of the dealers interviewed during the commercial survey employed mechanics who have passed and were certified under the National Institute for Automotive Service Excellence (NIASE) program.

In many states, legislation similar to that under California's Automobile Repair Act, which licenses repair shops rather than mechanics, has already been introduced. As a result, a good number have at least one law on the books or in legislation aimed at governing automobile service.

C. CURRENT MECHANIC COMPETENCY REVIEW

1. New-Car Dealerships

Predictions of two of the automobile manufacturers' service arms for the next 10 years are approximately the same as those recorded during the commercial surveys. The head of General Motors Service foresees most diagnostic work and paperwork being accomplished by automatic computer. Strictly certified (at state level) mechanics will be doing fewer repair jobs, as most of the old parts will be completely removed and replaced.² The Ford Motor Company feels they have just about kept even in maintaining a supply of qualified mechanics, but describes this as possibly the most severe problem in the service area.³

¹Feasibility of Meeting the 1975-76 Exhaust Emission Standards in Actual Use, Panel on Testing, Inspection, and Maintenance for the Committee on Motor Vehicle Emissions of the National Academy of Sciences, June 1973, p. 73.

²Bob Lund, "Preview of Service in the 1980s," Motor, November, 1974, p. 37.

³Jeff Scott, "Ford's Lee Iacocca Talks to MOTOR's Mechanics," Motor, October, 1974, p. 47.

New-car dealers are expected to be able to meet all of the new service requirements through advance training at the automobile manufacturers'/dealership training centers.

No problems are anticipated at this level of service if dealers continue to maintain their training schedules at the current level, and are able to hire mechanics at a wage competitive with other industries. Ninety percent of the automobile dealers surveyed reported that their mechanics had successfully completed training and certification programs.

2. Franchised Diagnostic Centers

Franchised diagnostic centers' mechanics are basically trained in the use of diagnostic equipment, in troubleshooting, and in major tuneups. A review of the survey questionnaires revealed that 50 percent of the mechanics employed were considered general mechanics.

Diagnostic centers comprise only a small number of the service facilities included in this survey. They represent a small percentage of the total maintenance establishments in each area, amounting to only 1 percent of the independents listed in the telephone directory.

Diagnostic centers, as originally defined (diagnosis with no repair), were not found in any of the nine cities surveyed. All observed had changed from a strictly diagnostic function to both diagnosis and repair activities.

These shops were primarily interested in engine tuneup work but advertised other services, such as front-end alignment, exhaust systems replacement, and lubrication. Mechanics were most often diagnostic machine operators who could tune up and adjust the running characteristics of an engine. Few major repairs involving component rebuilding were involved, most of the operations being identified as replacement of parts.

The certification of mechanics to a national standard did not occupy a very important position in most centers' list of priorities. The important training and certifying requirements within this category were limited, in most cases, to the franchise or its parts and equipment suppliers' standards.

The diagnostic centers generally do not have personnel problems identical to those encountered in the other classifications in the service industry. Most still represent a fairly specialized field and provide a limited service to the automobile owner. Training policies were adequate for diagnostic and tuneup activities.

3. Mass Merchandisers

Mass merchandisers' mechanics are rated as either specialists such as diagnostic technicians and tuneup mechanics, air-conditioning specialists, and front-end mechanics, or as lubrication, tire, and accessories men.

Mechanics are often certified as having attended the corporation's service schools, and occasionally have certificates from equipment and parts suppliers. The commercial field survey revealed that only 59 percent of the mechanics had any sort of formal training. Repair facilities in these shops are basic and mechanics' assignments are limited to component removal and replacement service, and general tuneups.

Major component replacements such as transmissions and differentials, are not a part of the normal work program.

The primary goal of the mass merchandisers is the retail sales of their products such as tires, batteries, shock absorbers, and air conditioners.

4. Independents

Independent service facilities, one-man shops, service stations, large garages, and tuneup shops still comprise a large portion of the automotive service available in the United States today.

Local and national certification of mechanics employed in these shops is standard. Approximately 46.7 percent of these mechanics have received training in one or more automobile specialties.

There was little evidence of a strong management-supported training or certification program in the majority of the independents surveyed.

Independents did not maintain manning plans beyond the immediate future. Many owners voiced concern over the anticipated expenses of equipment outlays necessary to keep up with the changing automotive service and tuneup requirements. Their concern was diagnostic equipment, with most of the independents indicating they would simply postpone purchases until conditions were better understood.

Training of mechanics on the operation of diagnostic equipment at this level is accomplished by the equipment manufacturers' representatives, either in the garage or at local training sessions.

Mechanics are not often considered specialists in independent garages, most performing all levels of service and repairs on all makes of automobiles.

D. FUTURE MECHANIC COMPETENCY LEVEL

1. New-Car Dealerships

Automobile service at dealership level for the 1975 and later-model years is difficult to predict; however, some insight was provided by Mr. J. C. Bates, the head of all service for General Motors.⁴ Mr. Bates

⁴Bob Lund, "Preview of Service in the 1980s," Motor, November, 1974, p. 37.

predicts that mechanics employed through 1980 will use a computer to perform most of their diagnostic work. Cars will be equipped with receptacles similar to those now in use on Volkswagen, and the mechanic will be able to take a reading and make necessary adjustments, corrections, or repairs. The mechanic will not have to guess at the job or overprice to be sure the right part is repaired.

Computers will do most of the paperwork, leaving the mechanic more time for servicing and repairing automobiles.

Mechanics will perform fewer repair jobs. Most old parts will be removed and replaced with new parts (often complete assemblies); very little benchwork will be performed by mechanics.

The level of competency that will be required of dealership mechanics will be that necessary to operate the diagnostic equipment and to know when and how to calibrate diagnostic and analytical equipment. It will be mandatory for mechanics of the future to have the ability to read and understand vehicle standards, and to comprehend repair instructions, as they very likely will be salaried and will be expected to work on their own without much supervision. Mechanics will be expected to attend service and specialty courses and to regularly certify in some field of service. Mechanics will eventually have to receive formal training in and certification as to competency in the use of the metric system.

Many of the more developed systems in current use will receive general consumer acceptance. Items such as fuel ignition, sensor controls, and new ignition systems will probably become more common on the automobiles of the general public. Mechanics will be required to spend more time on training, both in the shop and at automobile manufacturers' training centers.

2. Franchised Diagnostic Centers

Mechanics employed by franchised diagnostic centers will be required to use a much larger number of diagnostic devices, and more analytical equipment than they currently use in their work. They will be faced with both standard and special commercial equipment, as well as each automobile manufacturer's specialized equipment for different systems. They will also be required to understand and to operate equipment under the metric system. Mechanics are expected to be certified either by the industry and/or the local Government within the next few years. Original certification of competence requirements may be directed at either the service facility or the mechanic, but certification of mechanics is inevitable.

The competency level of franchised diagnostic center mechanics will depend largely on new developments in both the automobile and diagnostic equipment manufacturing industries. Mechanics in this classification will require regular training at the shop level, as well as in new equipment and diagnostic techniques by equipment and parts manufacturers or suppliers.

3. Mass Merchandisers

The competency requirements of mass merchandisers' mechanics is not expected to change a great deal in the next few years. Most of these mechanics are currently specialized in some particular maintenance or minor repair function. Mass merchandiser mechanics should be able to meet the competency requirements as they are established.

The competence level of mass merchandiser mechanics will be approximately 1 to 2 years behind that of new-car dealers and diagnostic centers, as they do not normally become involved in automobile service until after a car's warranty has expired.

4. Independents

Independent mechanics' competence level requirements necessary to maintain the 1975 and later-model automobiles are expected to be considerably higher than the present skill requirements.

The independent garage operator/mechanic is usually required to do both engine analysis and tuneup, minor service, and general overhaul work. He must be competent in several areas of service.

The competency level of the independent garage mechanic will be affected by developments in the automobile and diagnostic equipment manufacturing industries.

E. SUMMARY

Automobile manufacturers are attempting to remove the human element as far as is currently practicable. The use of automated systems from the point of repair order through pricing, estimating, diagnosing, and final repair is the ultimate goal for their distributorships.

Readjustment of mechanics' salary structure, broader assignment of mechanics' responsibility, and the continuing development of the certification and rating system are in progress throughout the service industry.

Automobile manufacturers' training programs are in effect throughout the United States. Centralized and mobile training facilities presently in use are felt adequate for the training of new-car dealers' mechanics.

The commercial automobile service industry is encouraging certification of mechanics through a national program in the interest of both itself and the consumer.

The mechanics' training programs of other commercial service centers do not approach the quality of those of the dealerships, but have enjoyed a measurable degree of success, and their operation was observed in all service categories surveyed.

CHAPTER X

SURVEY FINDINGS

A. INTRODUCTION

The survey findings accumulated through survey forms have been accumulated, computed, and compiled to ensure positive statistical values are assigned to specific questions on the survey questionnaire forms. Values for all the questions are not provided here but additional data can be obtained from the Appendix B Tally Sheets.

Three different Tally Sheets were developed because of the differences of the questionnaires. Data compiled on the Tally Sheets was extracted from automatic data processing printout reports. The three Tally Sheets included in Appendix B are:

- Consumer Consolidated Tally Sheet
- Commercial Consolidated Tally Sheet
- Dealer Consolidated Tally Sheet

B. TALLY SHEETS

In the tally sheets contained in Appendix B, the last report in each of the series is accumulative of all areas and represents the National sample. Based on the figures provided by this National sample, the following percentages have been computed. The percentages are based on a total sample of 1,225 interviews.

1. Consumer Consolidated Tally Sheet

These percentages are representative of those consumers who answered the questions in the affirmative.

1. Vehicles under warranty - 17 percent.
2. Felt warranty provisions as they had experienced them were reasonable - 74 percent.
3. Claimed to follow the owner's handbook instructions - 79 percent.
4. Knew when oil changes were required per handbook instructions - 25 percent.
- *5. Utilized dealership vehicle service facilities - 41 percent.
- *6. Utilized other commercial vehicle service centers - 42 percent.
- *7. Serviced their own vehicles from a small degree to total maintenance - 24 percent.

- **8. Accomplished engine tuneup by calendar schedule - 32 percent.
- **9. Accomplished engine tuneup by mileage schedule - 37 percent.
- **10. Accomplished engine tuneup by performance schedule - 32 percent.
- 11. Claimed maintenance schedules were affected by the fuel shortages and cost increases - 16 percent.
- 12. Felt fuel shortages and cost increases will affect future maintenance schedules - 8 percent.
- 13. Felt emission controls have affected maintenance schedules - 20 percent.
- 14. Claimed they regularly maintained emission devices on the vehicles - 74 percent.
- 15. Claimed they would change (follow schedules more closely) their maintenance customs if costs were covered by warranty - 38 percent.
- 16. Claimed automatic maintenance reminder devices would be acceptable - 52 percent.
- 17. Claimed they were satisfied with vehicle maintenance services and facilities - 70 percent.
- 18. Claimed they would replace the catalytic converter at their expense to help keep the air clean - 36 percent.

Notes:

*Questions 5, 6, and 7 make up the three-part Question 2 in the Consumer Questionnaire. Many consumer replies included more than one source of maintenance; as a result, the numerical value (percentage) of these three questions will not be equal to the sum of 100 percent.

**Questions 8, 9, and 10 make up the three-part Question 3 in the Consumer Questionnaire. As with Questions 5, 6, and 7, the numerical value (percentage) of these three questions will not be equal to the sum of 100 percent.

2. Commercial Consolidated Tally Sheet

The commercial survey tallies include mass merchandisers, regional chains, diagnostic centers, and independent garages. Each of the survey areas has been recorded independently on the Commercial Consolidated Tally Sheet.

The results of the National sample indicate the following:

1. Maintenance shops surveyed that serviced American Motors, Chrysler Motors, Ford Motors, and General Motors vehicles - 97 percent.
2. Claimed to service Nissan Motors, Toyota Motors, and Volkswagen Motors - 50 to 55 percent; claimed to service Mazda - 27 percent.
3. Claimed to service carburetors, emission controls, exhaust systems, and mechanically calibrated ignition systems - 90 to 96 percent; claimed to service electronic ignition systems - 62 percent.
4. Had some form of analyzers - 69 percent.
5. Claimed to have sources for new maintenance instructions - 94 percent.
6. Claimed to have complete vacuum charts and electric schematics for models serviced - 66 percent.
7. Expected major changes in maintenance practices for 1975 and later-model vehicles - 53 percent.
8. Claimed to have been advised of expected maintenance changes - 51 percent.
9. Claimed they would modify existing equipment to meet new requirements - 40 percent.
10. Claimed they would procure additional equipment - 53 percent.
11. Felt in-house training with additional outside training would be required to meet the state-of-the-art requirement for 1975 and later-model vehicles - 53 percent.
12. Had taken and passed training programs - 51 percent.
13. Classified their mechanics to skill levels - 7 percent.
14. Claimed repeat customer business of 51 to 75 percent - 41 percent.
15. Claimed business had improved because of fuel shortage and price increase - 25 percent.
16. Claimed business had decreased because of fuel shortage and price increase - 34 percent.
17. Claimed they were familiar with emission control regulations - 83 percent.

18. Claimed some emission devices had been modified on vehicles they serviced - 60 percent.
19. Claimed emission control device modifications were limited to 0 to 10 percent of the customers serviced - 42 percent.
20. Claimed emission control device modifications were limited to 11 to 20 percent of the customers serviced - 16 percent.
21. Claimed they reconnected emission devices but with the owners' consent - 24 percent.

Note:

Analysis of any one of the preceding statements should not be based on any other of the statements listed. Each must stand as an independent condition and not be related to the difference between 100 percent and the percentage figures assigned.

3. Dealer Consolidated Tally Sheet

1. Can accomplish maintenance according to manufacturers' specifications - 98 percent.
2. Claimed to have been advised of expected maintenance changes - 84 percent.
3. Expected major changes in maintenance practices for 1975 and later-model vehicles - 61 percent.
4. Claimed they would modify existing equipment to meet new requirements - 61 percent.
5. Claimed they would procure additional equipment - 73 percent.
6. Plan to acquire equipment to service catalytic converter - 65 percent.
7. Claimed to service carburetors, emission controls, exhaust systems, and mechanically calibrated ignition systems - 98 to 100 percent; claimed to service electronic ignition systems - 81 percent.
8. Had electronic analyzer - 85 percent.
9. Claimed to have complete vacuum charts and electric schematics for models serviced - 97 percent.
10. Felt in-house training with additional outside training would be required to meet the state-of-the-art requirements for 1975 and later-model vehicles - 50 percent.

11. Had taken and passed training programs - 91 percent.
12. Classified their mechanics to skill levels - 35 percent.
13. Claimed repeat customer business of 51 to 75 percent - 39 percent.
14. Claimed business had improved because of fuel shortage and price increase - 26 percent.
15. Claimed business had decreased because of fuel shortage and price increase - 35 percent.
16. Claimed they were familiar with emission control regulations - 97 percent.
17. Claimed some emission devices had been modified on vehicles they serviced - 57 percent.
18. Claimed emission control device modifications were limited to 0 to 10 percent of the customers serviced - 44 percent.
19. Claimed emission control device modifications were limited to 11 to 20 percent of the customers serviced - 4 percent.
20. Claimed they reconnected emission devices but with owners' consent - 42 percent.

Note:

Analysis of any one of the preceding statements should not be based on any other of the statements listed. Each must stand as an independent condition and not be related to the difference between 100 percent and the percentage figures assigned.

C. SUMMARY

Geographic location seems to have had little influence in the Dealer Surveys and the Commercial Surveys accomplished.

Some variances were noted in the Consumer Surveys but could not be linked to geographic location. Variances in consumer habits could be related to economics or state or city legislation regarding emission controls, but absolute analysis of precise causes is unrealistic.

APPENDIX A
AUTOMOTIVE DIAGNOSTIC EQUIPMENT INDEX, MARCH 1975

NOTE

The mention of trade names or commercial products does not constitute endorsement by the EPA or recommendation for use.

The following diagnostic and testing equipment manufacturers were contacted by form letter, requesting product information.

A.W. Dynamometer Inc., Colfax, Illinois
ACTRON, Cleveland, Ohio
Alcor Aviation Incorporated, San Antonio, Texas
Alectric Manufacturing Co., Kenosha, Wisconsin
Auto Meter Products Incorporated, Elgin, Illinois
Autoscan Incorporated, Los Angeles, California
B. K. Sweeney Company, Denver, Colorado
B&S Electronics Incorporated, Chicago, Illinois
Bear Manufacturing, Rock Island, Illinois
Burke E. Porter Company, Grand Rapids, Michigan
Cal Custom, Carson, California
CEJ Gage Company, Dearborn, Michigan
Chatillon & Sons, John Div., Kew Gardens, New York
Clayton Manufacturing Company, El Monte, California
Datcon Instruments Company, Lancaster, Pennsylvania
Daytronic Corporation, Dayton, Ohio
Eaton Corporation, Kenosha, Wisconsin
Elder Corporation, Minneapolis, Minnesota
Flo Scan Instrument Company, Seattle, Washington
Foxboro Company, Foxboro, Massachusetts
General Gas & Oil Company, Chicago, Illinois
Go Power Systems, Palo Alto, California
Greening Associates, Detroit, Michigan
Hamilton Standard Div. UAC, Windsor Locks, Connecticut
Industrial Testing Laboratories, St. Louis, Missouri
IRD Mechanalysis Incorporated, Columbus, Ohio
K-Line Industries Incorporated, Holland Michigan
Kal Equipment Company, Ostego, Michigan
King Electronics, Breacksville, Ohio
Kristal Instruments Corp., Grand Island, New York
Labeco-Lab. Equipment, Mooresville, Indiana
Link Engineering Company, Detroit, Michigan
Magtrol Incorporated, Buffalo, New York
Marquette Manufacturing Company, St. Paul, Minnesota
Mausner Equipment Company, Carle Place, New York
Maxwell Dynamometer Company, Downingtown, Pennsylvania
Maxwell Manufacturing Company, Downingtown, Pennsylvania
McFadden Electronics Company, South Gate, California
Merrill Engineering Lab., Englewood, Colorado

APPENDIX A
AUTOMOTIVE DIAGNOSTIC EQUIPMENT INDEX, MARCH 1975

Micro-Strain Incorporated, Spring City, Pennsylvania
Mid-West Dynamometer & Eng., Ruby River Grove, Illinois
Orbit Laboratories, Chicago, Illinois
Peerless Instrument Company, Elmhurst, New York
Physical Data Incorporated, Portland, Oregon
Pohl Associations Incorporated, Hatfield, Pennsylvania
Production Measurements, Hilliard Ohio
Reliance Electric Company, Cleveland, Ohio
Robert Bosch Company, Broadview, Illinois
Roland Marine Corporation, New York, New York
Schaeritz Engineering, Camden, New Jersey
Scherr-Tumico, Incorporated, St. James, Minnesota
Sears Associates, Livonia, Michigan
Sears & Roebuck Company, Chicago, Illinois
Service Diamond Tool Company, Ferndale, Michigan
Simpson Electric Company, Chicago, Illinois
Snap-On Tool Corporation, Kenosha, Wisconsin
Stewart & Warner Corporation, Chicago, Illinois
Stoelting Company, Chicago, Illinois
Sun Electric Corporation, Chicago, Illinois
Taylor Dynamometer & Machine, New Berlin, Wisconsin
Teledyne Analytical Instruments, San Gabriel, California
Toledo Scale Company, Toledo, Ohio
Torque & Tension Equip. Incorporated, Campbell, California
Tyco Instrument, Chicago, Illinois
Uni-Systems, Inc., San Carlos, California
Vulcan Tools Div. TRW, Buffalo, New York
W. C. Dillion & Company, Van Nuys, California
West Coast Research Corporation, Los Angeles, California

The product lines of the companies that replied have been categorized and are listed alphabetically following.

- A. Automotive Engine Analyzers
- B. Engine and Chassis Dynamometers
- C. Exhaust Emission Analyzers
- D. Individual Engine Diagnostic and Analytical Components

AUTOMOTIVE ENGINE ANALYZERS

AC SPARK PLUG DIVISION
General Motors
Flint, Michigan

Model ST-200 AC/GM Diagnostic Tune-Up Center performs 34 different engine tests and requires only five basic engine connections for the tests. It is adaptable to 4-, 6-, and 8-cylinder engines and 12-volt negative ground engines. The tune-up center has the instrumentation and capability to perform the following functions:

Starting and Battery

Battery under light load
Ignition switch
Primary resistor
Cranking current
Cranking volts
Cranking speed

Economy and Smoothness

Engine idle speed
Point dwell
Dynamic primary resistance

Power and Smoothness

Power balance tests for
each cylinder's mechanical
and electrical efficiency
Carburetor balance

Power and Acceleration

Ignition output available
Coil polarity
Ignition output required for each cylinder
Ignition output required under load

Power and Economy

Initial ignition timing
Mechanical spark advance
Total spark advance

Charging System

Generator and regulator
Charging system
Regulator volts
Charging amps

AUTOMOTIVE ENGINE ANALYZERS

ALLEN TEST PRODUCTS DIVISION
2101 North Pitcher Street
Kalamazoo, Michigan 49017

Model 15-290. Engine analyzer; basic unit; cabinet-mounted; 8-inch oscilloscope; ignition advance, 0 to 70, 0 to 60 scales; voltmeter; tachometer; dynamic compression; carburetor adjustment scale; ammeter; distributor dwell; timing light; timing advance control; vacuum tester, 0 to 25 inches; and ohmmeter.

Model 15-300. Same as Model 15-290 with two additional meters; vacuum pressure, 0 to 25 in dual scales; and 0 to 500,000 ohmmeter with continuity test light.

Model 15-730. Suspended, otherwise same as Model 15-290.

Model 15-410. Suspended, otherwise same as Model 15-300.

Model 15-420. Engine analyzer; cabinet-mounted; tests 4-, 6-, and 8-cylinder engines and rotary engines; conventional and electronic ignition systems; 12-inch oscilloscope; automatic ranging in all configurations; crank/kill; ammeter -50 to 0 to 500 amps; points tester; voltmeter, 0 to 20, 0 to 40 volts; timing light; secondary 20KV scopes superimposed, stacked or raster pattern; vacuum/pressure 0 to 25 inches; 0 to 12 PSI; and ohmmeter, 0 to 500 ohms X 1000.

Model 15-010. Solid-state engine analyzer; cabinet-mounted; analyzes 4-, 6-, and 8-cylinder and rotary engines; crank/kill; voltmeter 0 to 20 volts, 0 to 40; ammeter; -50 to 0 to 500 amps; scope, 12-inch parade, superimposed, pattern stacked, or raster; dwell automatic, 0 to 90; timing light; advance meter, 0 to 90, secondary 20KV and 40KV has special pattern shift for point open viewing, .5 millisecond sweep feature, 40KV has special pattern shift for point open viewing on cylinder selector; vacuum/pressure, 0 to 25 VAC, 0 to 12 PSI; ohmmeter, 0 to 500 ohms X 1000.

Model 15-020. Solid-state engine analyzer with HC CO infrared emission capability; suspended cabinet-mounted; same features as Model 15-010; infrared analyzer has exhaust probe (30 feet), 8-inch meters, high and low scales, NDIR analytical method, 90 percent reading-in 10 seconds, built-in, dual-beam optical calibration system.

Model 15-510. Engine analyzer with HC CO infrared emission capability; suspended; same features as Model 15-500 cabinet-mounted unit.

Model 15-530. Engine analyzer with HC CO analyzer; suspended; all features identical to Model 15-520.

Model 15-090. Solid-state engine analyzer with HC CO infrared emission capability; cabinet-mounted; engine analyzer specifications same as Model 15-010; infrared analyzer has exhaust probe (30 foot), 8-inch meter, high and low scales; NDIR analytical method; 90 percent reading

AUTOMOTIVE ENGINE ANALYZERS

ALLEN TEST PRODUCTS DIVISION (Continued)

in 10 seconds; built-in, dual-beam optical calibration system.

Model 15-100. Solid-state engine analyzer with HC CO infrared emission capability; suspended; same features including infrared emission analyzer as in Model 15-090 cabinet-mounted unit.

Model 15-500. Engine analyzer with HC CO infrared emission capability; cabinet-mounted; 8-inch cathode ray tube; 2-percent-accuracy meters; ignition advance 0 to 30 and 0 to 60 scales; tachometer 0 to 10K RPM; dynamic compression -50 to 0 to 250; distributor dwell 0 to 45, 0 to 60, 0 to 90; timing light with 9-foot cable; test cables; single multiconductors scope cable; rest of leads separate.

AMSERV SHOP EQUIPMENT

American Motors Sales Corporation
14250 Plymouth
Detroit, Michigan

Model AM18-017. Solid-state engine analyzer; cabinet-mounted; 16-inch oscilloscope, parade, superimposed, pattern stacked or raster; automatic dwell, 0 to 90; engine select for 4-, 6-, or 8-cylinder and rotary engines; conventional and electronic ignition systems; tachometer, 0 to 1500, 0 to 10,000 RPM, automatic ranging in all test modes; voltmeter 0 to 20, 0 to 40 volts; ammeter 10 to 0 to 90 amps; scope pattern, automatic alternator test; timing light; advance meter, 0 to 90; secondary 20KV scope, parade, superimposed, pattern stacked or raster, cylinder select; secondary 40KV scope, all scope patterns and cylinder select; power balance test; vacuum/pressure 0 to 25 inches, 0 to 12 PSI; ohmmeter 0 to 500 ohms x 1000 with carbon pile battery load test.

Model AM18-027. Solid-state engine analyzer, suspension unit, features same equipment as Model AM18-017 cabinet model.

Model AM18-097. Solid-state engine analyzer; cabinet-mounted; same features as Model AM18-017 and includes a HC CO infrared exhaust emission analyzer with 30-foot exhaust probe; 8-inch meters; high and low scale; NDIR analysis method; 90 percent reading response in 10 seconds; zero and span drift maximum 2 percent full scale; built-in dual-beam optical calibration system.

AUTOMOTIVE ENGINE ANALYZERS

AMSERV SHOP EQUIPMENT (Continued)

Model AM18-107. Solid-state engine analyzer; suspension unit; features same equipment as Model AM18-027, also features a HC CO infrared exhaust emission analyzer with 30-foot exhaust probe; 8-inch meters; high and low scale; NDIR analytical method; 90 percent reading response in 10 seconds; zero and span drift maximum 2 percent full scale; built-in dual-beam optical calibration system.

Model AM15-017. Solid-state engine analyzer; cabinet-mounted; 12-inch oscilloscope; features same equipment as Model AM18-017 with a tool tray.

Model AM15-027. Solid-state engine analyzer; suspension unit; 12-inch oscilloscope; features same equipment as Model AM18-027 with a tool tray.

Model AM15-097. Solid-state engine analyzer; cabinet-mounted; 12-inch oscilloscope; features same equipment as Model AM15-017 cabinet model; includes HC CO infrared exhaust emission analyzer with 30-foot exhaust probe, 8-inch meters; high and low scale; 90 percent response reading in 10 seconds; zero and span drift maximum 2 percent full scale; built-in dual-beam optical calibration system.

Model AM15-107. Solid-state engine analyzer; suspension; featuring same equipment as Model AM15-027; unit includes a HC CO infrared exhaust emission analyzer as described in Model AM15-017 cabinet model.

AUTOSCAN INCORPORATED
3641 Holdrege Avenue
Los Angeles, California 90016

Model 4000. Engine analyzer; stand or track-mounted; includes 14-inch oscilloscope scale 15KV and 40KV scale for parade display; cylinder selector; tachometer synchronizer switch; engine cylinder selector; engine stop switch; conventional/rotary engine analyzer function selector; capacitive discharge switch; point circuit resistance indicator; manual synclight; high-leakage indicator; dwell/advance meter; percent speed change-power meter; tachometer; air/fuel ratio (exhaust test) carbon monoxide meter; AFR balance control (set air/fuel ratio meter).

Model 4000-IR. Engine analyzer; HC CO; stand-mounted; a complete engine diagnostic analyzer; includes HC CO infrared analysis capability.

AUTOMOTIVE ENGINE ANALYZERS

HAMILTON STANDARD

Windsor Locks, Connecticut 06096

Model EPA-75. Engine analyzer; infrared; exhaust performance; 8-inch hydrocarbon meter 0 to 2.5 percent, 0 to 10 percent; 8-inch carbon monoxide meter 0 to 50 PPM, 0 to 2000 PPM; tail pipe probe; check-filter indicator; for use in the Autosense Modular Vehicle Test and Diagnostic System, a complete test system; quick-connects to test unit and computer-directed, hand-held controller; provides a computer evaluation of the test data, and a printout of the high/low limits and test results; has continuous display capabilities.

KAL EQUIPMENT COMPANY

Otsego, Michigan 49078

Model 4005. Console engine system analyzer; includes the latest Ford and Chrysler electronic ignition system, and General Motors High Energy Ignition (HEI) electronic systems. A master analyzer selector controls components while in the console, or individual components can be removed from remote operation.

Individual components housed in the Model 4005 are:

Timing Analyzer Model 4071. Transistorized solid-state components are used in all key circuits. Tachometer scale from 0 to 6000 RPM and distributor cam angle on the back of the meter. A high-tension sensor with a spring-loaded clamp allows timing checks to be performed without removal of the high-tension wires.

Electronic Ignition Adapter Model 4030. This unit checks RPM dwell, power balance, ignition required, ignition loaded, and ignition output on General Motors HEI system.

Primary Analyzer Model 4084. Analyzer makes a complete primary systems analysis with one hookup for all makes of cars; designed for use on all 12-volt negative ground systems; static and dynamic primary resistance; checks condition of contact points while engine is running; dwell test from 0 to 60 degree readings on 4, 6, and 8 cylinders on standard and transistorized ignition systems, and engine RPM on low scale of 0 to 1200 RPM's and high scale of 0 to 6000 RPM's; additional test performed with this unit includes battery voltage checks, cranking voltage test, coil resistance test, ignition switch test, and charging voltage test.

AUTOMOTIVE ENGINE ANALYZERS

KAL EQUIPMENT COMPANY (Continued)

Ignition Analyzer Model 4087. Tests the complete ignition system from the battery to the spark plugs, with capabilities of isolating one cylinder at a time so that problems can be pinpointed. Electronic compression test or cylinder power checks can be performed without removing the spark plugs or plug wires. Other tests performed with this unit are ignition output (measures coil circuit voltage), ignition required (measures spark plug firing voltages), and ignition required under load (checks spark plug firing voltage under simulated road conditions). In addition, carburetor balance can be accurately checked by automatically shorting out one-half of the spark plug.

Components Analyzer Model 4083. Components analyzer was designed to check out all electronic ignition systems components, also the earlier conventional ignition systems. Types of checks performed are amps checks of ignition components, ohms checks of all automotive circuits or components, pickup circuit designed to check output of the electronic ignition pickup coil while cranking a "dead" engine, and voltage drops of electronic control units and other circuits.

KING ELECTRONICS
115 Midwest Road
Scarborough, Ontario

Model 514-TB Scope. Programmed audio engine analyzer; oscilloscope; spark plug load test; distributor advance; and RPM indicator.

Model 514-OH Overhead or 514-HT. Track-mounted; voltmeter; dwell meter; tachometer; distributor advance 0 to 60; air/fuel ratio; combustion efficiency 65 to 95 percent; carbon monoxide 0 to 8 percent; dynamic compression test; and ammeter.

Model 525-B. Cabinet-mounted; voltmeter; ammeter; dwell meter; tachometer; cylinder balancer; distributor advance; ohmmeter; exhaust analyzer; and 11:1 to 16:1 air/fuel ratio scale.

MARQUETTE
3800 North Dunlap Street
St. Paul, Minnesota 55112

Model 41-212. Stand-mounted engine tester; includes dwell tachometer tester; ignition system tester; AVR tester; combustion analyzer; and timing light.

AUTOMOTIVE ENGINE ANALYZERS

PEERLESS INSTRUMENT COMPANY
6101 Gross Point Road
Chicago, Illinois 60648

Model 560 Pulsar 665. Infrared diagnostic and emission tuneup center; gimble-mounted; cabinet or trolley option; checks point resistance, ignition reserve; point dwell 20 to 90; RPM 0 to 6000; voltage 0 to 16, 0 to 40; amps -5 to 0 , 0 to 80, 0 to 400; ignition 0 to 40 scale; 8-inch meters; engine analyzer features on hookup for all tests; diagnostic scope, 9-inch rectangular tube, automatic focus; tests all ignition systems; infrared exhaust gas analyzer performs complete diagnostic analysis of engine condition.

Model 970 Pulsar. Infrared diagnostic and emission tuneup center; a component system made up of five separate diagnostic components.

Diagnostic Engine Analyzer Model 555. Checks and tests dynamic point resistance, static point resistance, point dwell, ignition switch, ballast resistor, coil, condenser, spark plug wires; scale ranges are: point resistance (good or bad), alternator diodes (good or bad), point dwell 20° to 90°, 0 to 1200 RPM and 0 to 6000, voltage 0 to 16, 0 to 40, voltage drop (good or bad) 0 to 1.2, amps 5. to +80, 0 to 400, ohms 0 to 100,000 ignition (good or bad).

Diagnostic Scope Model 500. Checks and tests spark plugs, spark plug wires, coil, battery polarity, point dwell, rotor, distributor cap, coil tower, distributor condition, alternator diodes, and starter distributor tester.

Model 140. Checks initial ignition timing, distributor condition.

Power Balance Tester Model 880. Diagnoses problems, carburetor performance, faulty ignition, worn rings, burned or sticky valves, defective valve lifters, vacuum and manifold leaks; makes carburetor balance check on all V-block engines; checks odd or even cylinders for carburetor balance.

Infrared Exhaust Analyzer Model 660. Scale ranges are carbon monoxide, high range 0 to 10 percent, low range 0 to 2 percent; air/fuel ratio 10.5 percent to 14.5 percent; hydrocarbons, high range 0 to 2000 PPM, low range 0 to 400 PPM; tests and checks on all types carburetor systems, emission control systems, fuel injection systems, air injection systems.

Model 965 Pulsar. Diagnostic and tuneup center; a component system made up of five separate diagnostic components.

AUTOMOTIVE ENGINE ANALYZERS

PEERLESS INSTRUMENT COMPANY (Continued)

Diagnostic Engine Analyzer Model 560. Checks and tests dynamic point resistance, static point resistance, point dwell, ignition, switch, ballast resistor, coil, condenser, spark plug wires; scale ranges are: point resistance, point resistance band, alternator diodes (good or bad band), ignition reserve (good or bad), point dwell 20° to 90°, RPM 0 to 1200 and 0 to 6000, voltage 0 to 16 and 0 to 40, voltage drop 0 to 1.2 scale, amps -5 to 0 and 0 to 80 and 0 to 400, ohms 0 to 100,000, ignition 0 to 40 scale.

Diagnostic Scope Model 515. Checks and tests spark plugs, spark plug wires, coil condenser, spark polarity, point dwell and condition, distributor condition, rotor, coil tower, distributor cap, alternator diodes, and stator.

Exhaust Gas Analyzer Model 625. Tests and adjusts exhaust control systems, idle mixture, accelerator pump, power circuit, main metering jet, float level, needle valve and seat, air cleaner, manifold leaks.

Distributor Tester Model 144. Checks and tests advance mechanisms for all speed and load conditions, initial ignition timing, distributor condition (good or bad); secondary tachometer.

Power Balance Tester Model 888. Performs diagnostic checks on carburetor performance, faulty ignition, worn rings, burned or sticky valves, defective valve lifters, defective cam shaft, vacuum and manifold leaks; checks odd or even cylinders for carburetor balance on all V-block engines.

Model 955 Pulsar. Tuneup center, a component system made up of three separate diagnostic components. With the addition of appropriate components, Model 955 may be transformed into a Model 965 or Model 975. The Model 955 components are:

Diagnostic Engine Analyzer Model 560. Checks and tests dynamic point resistance, static point resistance, point dwell, ignition switch, ballast resistor, coil condenser, spark plug wires; scale ranges are: point resistance, point resistance band, alternator diodes (good or bad band), ignition reserve (good or bad), point dwell 20° to 90°, RPM 0 to 1200 and 0 to 6000, voltage 0 to 16 and 0 to 40, voltage drop 0 to 1.2 scale, amps -5 to 0 and 0 to 80 and 0 to 400, ohms 0 to 100,000, ignition 0 to 40 scale.

Diagnostic Scope Model 515. Checks and tests spark plugs, spark plug wires, coil condenser, spark polarity, point dwell and condition, distributor condition, rotor, coil tower, distributor cap, alternator diodes, and stator.

AUTOMOTIVE ENGINE ANALYZERS

PEERLESS INSTRUMENT COMPANY (Continued)

Exhaust Gas Analyzer Model 625. Tests and adjusts exhaust control systems, idle mixture, accelerator pump, power circuit main metering jet, float level, needle valve and seat, air cleaner, manifold leaks.

Model 460. Portable engine analyzer; a hand-held portable analyzer providing 12 tuneup and ignition troubleshooting tests; performs tests on point resistance; point dwell; idle speed; dwell variation; ignition switch condition; cranking voltage; charging voltage; ignition coil secondary; ignition coil primary; condenser test; cables, switches, and wire condition; spark plug resistance.

ROTUNDA EQUIPMENT

P. O. Box 1000

Plymouth, Michigan 48170

Model ARE18-015. Solid-state engine analyzer; cabinet unit; 16-inch; tests 4-, 6-, and 8-cylinder and rotary engines; tachometer RPM 0 to 1500, 0 to 10,000, automatic ranging in all test modes; crank/kill: voltmeter 0 to 20 and 0 to 40 volts, ammeter -50 to 0 to 500 amps, point resistance dynamic reading when button depressed cranking engine; primary scope, parade, superimposed, pattern stacked or raster; dwell, automatic, 0 to 90; secondary 20KV, scope, parade, superimposed, pattern stacked or raster, 5-millisecond sweep, cylinder select; secondary 40KV, scope, all scope patterns, cylinder select, power balance test, special pattern shift for point open viewing on cylinder selector; vacuum pressure 0 to 25 inches, 0 to 12 PSI; ohmmeter 0 to 500 X 1000 with carbon pile battery load test capability.

Model ARE18-025. Identical to Model ARE18-015 cabinet unit except it is suspended, mounted unit.

Model ARE18-095. Solid-state engine analyzer with HC CO infrared emission analyzer; cabinet unit; 16-inch; features same equipment and performs same functions as Model ARE18-015 except includes HC CO infrared exhaust emission analyzer with 30-foot exhaust probe; 8-inch meters; high and low HC and CO scales; NDIR analysis method; 90 percent response in 10 seconds; maximum 2 percent full scale zero and span drift; built-in dual-beam optical calibration system.

Model ARE18-108. Solid-state engine analyzer with HC CO infrared emission analyzer; suspended unit; 16-inch oscilloscope; features same equipment and performs same functions as Model ARE18-095.

AUTOMOTIVE ENGINE ANALYZERS

ROTUNDA EQUIPMENT (Continued)

Model ARE18-055. Solid-state engine analyzer with HC CO infrared emission analyzer; deluxe; console-mounted; features same equipment and performs same functions as Model ARE15-095; includes additional features for 1975 vehicle emission testing; available by special order only.

Model ARE15-015. Solid-state engine analyzer; 12-inch; cabinet unit; same features as Model ARE18-015 16-inch analyzer except for battery load test capability.

Model ARE15-025. Solid-state engine analyzer; 12 inch; suspended-mount unit; includes same features as Model ARE15-015.

Model ARE15-095. Solid-state engine analyzer; 12-inch; cabinet unit; same features as the Model ARE15-015 and includes HC CO infrared exhaust emission analyzer with 30-foot exhaust probe; high-low scale HC CO 8-inch meters; NDIR analysis method; 90 percent response in 10 seconds; built-in, dual-beam optical system.

Model ARE15-105. Solid-state engine analyzer; 12-inch; suspended-mount unit; same features as Model ARE15-095 cabinet unit.

Model LLRE 4030R. Engine analyzer; stand-mounted; 14-inch oscilloscope; solid-state circuitry; clamp-on connections; automatic self-calibration of all scope functions; displays parade, stacked, and superimposed; digital cylinder selection and cross-inductance display; all displays and measurements for rotary engines and capacitive discharge systems; cylinder balance tests; timing light-advance test; automatic locked advance meter reading; automatic point circuit resistance test; condenser tests; voltmeter 0 to 4, 0 to 2, and 0 to 40 volts; ohmmeter 0 to 100 ohms X1, X10, X100, X1000; vacuum pressure gauge 0 to 30 inches, 0 to 15 PSI; combustion analyzer; tachometer 0 to 1200, 0 to 6000 RPM; dwell advance meter 0 to 70.

Model LLRE 2907 TS. Engine analyzer; track-mounted; unit includes same features as Model LLRE 4030 R.

Model ARE23-065. HC CO infrared emission analyzer; 2-caster cabinet unit; 8-inch meters; high scale, low scale; NDIR analysis method; 90 percent response in 10 seconds; zero and span drift maximum 2 percent full scale; built-in, dual-beam optical calibration system; 20-foot exhaust probe.

Model ARE23-075. HC CO infrared emission analyzer; unit contains same features as Model ARE23-065 except exhaust probe is 30 feet and cabinet has 4 casters.

AUTOMOTIVE ENGINE ANALYZERS

ROTUNDA EQUIPMENT (Continued)

Model LLRE 710-IR. Infrared testing engine/electrical systems analyzer with HC CO emission diagnostic capability; self-contained; double caster; stand-mounted; dual-range HC and CO 8-inch meters; 90 percent response in 7 seconds; built-in automatic gas calibration; +2 percent accuracy; exhaust filtering; built-in self-diagnosis and self-service capability.

Model LLRE 705-IR. Infrared testing engine/electrical systems analyzer with HC CO emission diagnostic capability; same features as the Model LLRE 710-IR except calibration is electronic instead of gas.

Model BRE 42-732. Infrared exhaust emissions analyzer; dual-scale; tachometer; two 8-inch meters; dual HC CO scale; accuracy +3 percent full scale; 95 percent response in 10 seconds; 20-foot pickup hose; self-checking tachometer with induction pickup.

SEARS-PENSKE (Catalog)

Model No. 28A21036N4. Tuneup center; combines dual-meter air/fuel ratio tuneup analyzer with a diagnostic oscilloscope roll-around stand; includes an alternator test adapter; for 4-, 6-, and 8-cylinder engines; tests conventional, electronic, magneto ignition systems; two 5-1/2-inch D'Arsonval meters; checks alternator-generator, voltage regulator, dwell, RPM, diodes, battery, condenser, air/fuel ratio, CO; scales: 0 to 1200, 0 to 6000 RPM; 0° to 60° dwell; 0 to 50 spark output; 0 to 2000, 0 to 40,000 ohms; 0 to 3.2, 0 to 16, 0 to 32 volts; 10 to 0 to 80 amps; 0 to 300 starter amps; 0 to 8.5 percent carbon monoxide; 1:11 to 1:14.6 air/fuel ratio; Penske diagnostic oscilloscope tests high-voltage secondary ignition circuit; 7-inch-diameter graduated screen; spark polarity; voltage insulation; available voltage; voltage under load; dwell; coil; condenser; point action; secondary resistance; scales: 8-cylinder -0 to 15KV, 0° to 45° dwell; 6-cylinder -0 to 30KV, 0° to 60° dwell.

Model No 28A2123C. Portable engine analyzer with 7-inch D'Arsonval 12-scale meter; remote starter switch; compression tester, 2-1/2-inch-diameter dial, tests up to 300 PSI and 0 to 21 KG; combination vacuum gauge/fuel pump/PCV valve tester with 3-1/2-inch dial, 0 to 30 inches vacuum and 0 to 10 PSI fuel pressure; solid-state circuitry D.C.-powered timing light works on 6- and 12-volt conventional magneto and electronic ignition systems.

AUTOMOTIVE ENGINE ANALYZERS

SEARS-PENSKE (Continued) (Catalog)

Model No. 28A2142. Solid-state analyzer; checks alternator, generator, regulator, dwell, point resistance, RPM, battery, spark output, ignition wires; direct readings for 4-, 6-, and 8-cylinder engines on 5-inch D'Arsonval meter; scales: 0 to 1200, 0 to 6000 RPM; 20° to 90° dwell; 0 to 16 volts; 0 to 250 amps; 0 to 50 ignition output; 0 to 500,000 ohms; point resistance on good/bad band.

Model No. 28A2121. Dual-meter sequential analyzer; two meters permit simultaneous related test readings; checks alternator, generator, voltage regulator, points and resistance, RPM, diodes and battery; two zero-adjusting D'Arsonval 5-inch meters; tests electronic and conventional ignition systems; scales include 0 to 1200, 0 to 6000 RPM; 0 to 70 ignition; 0 to 100, 0 to 400 amps; 0 to 50,000 ohms; 0 to 10 ignition output; 0 to 1, 0 to 16, 0 to 32 volts; point resistance diodes on good/bad bands.

Model No. 28A21033. Solid-state analyzer; used on 4-, 6-, and 8-cylinder and rotary engines; checks conventional electronic and magneto ignition system; checks alternator, generator, voltage regulators, dwell angle, points resistance, RPM, diodes, battery, and condenser; 7-inch D'Arsonval meter; scales include 0 to 1200, 0 to 6000 RPM; 0 to 60 dwell; 0 to 200, 0 to 40,000 ohms; 5 to 0 to 90 amps; 0 to 3.2, 0 to 12, 0 to 32 volts; 0 to 50 spark output; point resistance diodes on good/bad bands.

SIMPSONS ELECTRIC COMPANY
853 Dundee Avenue
Elgin, Illinois 60120

Model TUC-300. Automatic ranger; cabinet-mounted; includes CA-2 cylinder analyzer; TD 1-2 tachometer; dwell ignition tester; TAT tachometer-advance tester; BST battery-starter tester; ADT alternator tester; 508 vacuum pressure tester.

Model TUC-200-2. Automatic ranger; stand-mounted; includes TD-12; TAT, BST; 507 compression gage; 508 vacuum-pressure tester and ADT.

Model TUC-100-2. Automatic ranger; stand-mounted; includes TD 1-2; BST; 507 compression gage; 508 vacuum pressure tester; PTL-2 power timing light.

AUTOMOTIVE ENGINE ANALYZERS

SNAP-ON TOOL CORPORATION
2801 80th Street
Kenosha, Wisconsin 53140

Model MT-4063. Tuneup center; cabinet-mounted modular; oscilloscope; accessory circuit tester; combustion analyzer; tachometer-dwell meter and vacuum gauge.

Model MT-4063 G. Master tuneup center; cabinet-mounted; includes picture tube type screen scope; alternator tester; tachometer-dwell meter and vacuum gauge; performs tests on ignition reserve capacity; ignition timing; coil polarity; spark plugs; secondary circuit; condenser; battery to coil resistance; point faults and bounce; dwell; circuit leakage; distributor wear; valve timing; valve leakage; valve sticking; spring condition; engine RPM; cylinder balance; intake system air leak; exhaust back pressure; idle mixture; cruising mixture; accelerator pump; fuel pump vacuum system.

Model MT-4064 D. Utility tuneup center; includes all features of the Model MT-4063 G master tuneup center except the exhaust gas analyzer and vacuum gauge; unit has the same test capabilities of Model MT-4063 G except those requiring exhaust analysis and vacuum capabilities.

Model MT-4065 C. Utility tuneup center; cabinet-mounted; includes all features of the Model MT-4063 master tuneup center except the picture-type scope; unit has all test capabilities of Model MT-4063 G except those requiring an oscilloscope.

STEWART-WARNER ALEMITE AND INSTRUMENT DIVISION
1826 Diversey Parkway
Chicago, Illinois 60614

Model 3000-A. Modular tester engine analyzer; pedestal-mounted with boom; timing light; electrical system tester; cylinder balance tester; timing advance tester; combination carburetor and fuel injection combustion tester and ignition scope, 0 to 20/40KV.

Model 3000-D. Modular tester engine analyzer; overhead-mounted; contains all units in Model 3000-A.

AUTOMOTIVE ENGINE ANALYZERS

SUN ELECTRIC CORPORATION
Harlem and Avondale
Chicago, Illinois 60631

Model EET-940. Engine performance tester; multipattern oscilloscope; automatic-ranging tachometer; volt-ohm condenser tester; dwell meter; cylinder leak tester; coil tester; fuel pump tester; cylinder shorter; timing light and advance unit.

Models EET-945 and 947. Engine performance testers; infrared HC and CO analyzer; volt-ohm-condenser meter; cylinder leakage tester; oscilloscope; coil tester; vacuum gauge; fuel pump tester; timing light; timing advance tester; automatic-ranging tachometer; cylinder shorter; clamp-on pattern and trigger pickup leads and dwell meter.

Model TUT-915-R. Solid-state tuneup tester; oscilloscope, 8-inch meter, 0 to 600 and 400 to 1200 RPM tachometer; dwell meter; dual-range voltmeter; cylinder shorter; timing light/advance unit.

ENGINE AND CHASSIS DYNAMOMETERS

ALLEN TEST PRODUCTS DIVISION
2101 North Pitcher Street
Kalamazoo, Michigan 49107

Model L 24-200. Eco-Trac; road test simulator; 8-inch meters; dual scale; 10 to 1 engine rating plus 0 to 100 MPH; 8-inch fuel economy meter; 0 to 40 MPG; 2-inch air pressure gauge, 0 to 160 PSI; includes roller; brake; ramp; drive-over plates; chocks; fuel transducer; two-meter mobile cart; Hand-held load; and MPG controls; Allen diagnostic and analytical equipment available as required to meet operational criteria; includes wheel chocks; wheel base indicators; and 60 feet of maximum power cable.

AMSERV SHOP EQUIPMENT
American Motors Sales Corporation
14250 Plymouth
Detroit, Michigan

Model AM24-207. Road test simulator; includes roller assembly with ramps; 8-inch meters 0 to 100 MPH; 10 to 1 engine rating; 0 to 40 MPG.

Model AM24-607. Road test simulator; includes roller assembly with ramps and the Model AM15-017 12-inch, solid-state, cabinet-mounted engine analyzer; road test meter system identical to Model AM24-207.

Model AM24-617. Road test simulator; includes roller assembly with ramps and the Model AM15-027 12-inch, solid-state suspension engine analyzer; road test meter system identical to Model AM24-207.

Model AM24-627. Road test simulator; includes roller assembly with ramps and the Model AM15-097 12-inch solid-state, cabinet-mounted engine analyzer and HC CO two-meter infrared exhaust emission analyzer; road test meter system identical to Model AM24-207.

Model AM24-637. Road test simulator; includes roller assembly with ramps and the Model AM15-107 12-inch, solid-state suspension-type engine analyzer and HC CO two-meter infrared exhaust emission analyzer; road test meter system identical to Model AM24-207.

Model AM24-707. Road test simulator; includes roller assembly with ramps and the Model AM18-017 16-inch, solid-state cabinet-mounted engine analyzer; road test meter system identical to Model AM24-207.

ENGINE AND CHASSIS DYNAMOMETERS

AMSERV SHOP EQUIPMENT (Continued)

Model AM24-717. Road test simulator; includes roller assembly with ramps and the Model AM18-027 16-inch solid-state suspension-type engine analyzer; road test meter system identical to Model AM24-207.

Model AM24-727. Road test simulator; includes roller assembly with ramps and the Model AM18-097 16-inch solid-state, cabinet-mounted engine analyzer and HC CO two-meter infrared exhaust emission analyzer.

Model AM27-737. Road test simulator; includes roller assembly with ramps and the Model AM18-107 suspension-type engine analyzer and HC CO two-meter infrared exhaust emission analyzer.

GO-POWER SYSTEMS

1890 Embarcadero Road
Palo Alto, California 94303

Portable Self-Contained Dynamometers:
Models DA-312 and DA-512

Dynamometer Absorption Units, Instrumentation and Accessories:

Absorption Units, Models:
D-312, D-512, D-352, D-552, and D-752

Instrumentation, Models:
C-10 Portable Instrument Console
C-11 Remote Instrument Console
C-12 Digital Instrument Console
C-13 Digital Instrument Console with Printer

High-Torque Dynamometer Absorption
Unit, Instrumentation and Accessories:
Absorption Unit: DT-1000

Instrumentation:
DT-P Portable Instrument Console
DT-R Remote Instrument Console
DT-D Digital Instrument Console
DT-DP Digital Instrument Console with Printer

Small Engine Dynamometers, Models:
DY-7D and DY-9D

Vocational Training Modules, Models:
DY-7DD, DY-7DE, DY-7DT, DY-7DW, and MD-80

ENGINE AND CHASSIS DYNAMOMETERS

GREENING ASSOCIATES, INCORPORATED
19465 Mt. Elliott Avenue
Detroit, Michigan 48234

Chassis Dynamometer, 1750 to 5500
GVW Simulation at 250-pound increments

INDUCTOR, INCORPORATED
Union Grove, Wisconsin 53182

Chassis Dynamometer. Light Vehicle,
Road Test Simulator, Model RTS-500
Air-Operated, 160 PSI

LABORATORY EQUIPMENT CORPORATION
P. O. Box 158
Mooresville, Indiana 46158

Chassis Dynamometers, Large Roll
Road Simulators - Programmed (Eddy-Current)
Environmental Testing (DC)
Sound testing (DC SCR)
Small Roll (DC SCR) - Hydraulic Restraints
Engine Dynamometers (Manual and Programmed)
Consoles and Controls, Engine and Chassis
Dynamometers (Manual and Programmed)

POHL ASSOCIATE
430 Fair Hill Road
Hatfield, Pennsylvania 19440

Engine Dynamometers, Water Brake:
Carl Schenck Model U1-10, 30 H.P.
Engine Dynamometers, Eddy Current Inductor
Dynamatic Model 758 DG, 50 H.P.
With Toledo number 9600 Dynamometer
Scale, Electronic Load Control
Dynamatic Model 810DG, 100 H.P.
With Toledo number 9704 Scale, Electronic
Load Controller with operator panel. Standard
Electric Time Model SG-6 Speed 3500/5000 RPM
Dynamatic Model 1214, 250 H.P. 2000/5000 RPM

ENGINE AND CHASSIS DYNAMOMETERS

BURKE E. PORTER MACHINERY COMPANY
730 Plymouth N.E.
Grand Rapids, Michigan 49505

Chassis Dynamometer, DC Driver/Absorber
Manual or Computer-Controlled

Chassis Dynamometer, DC Driver/Absorber
Computer, Electronic-Controlled with Blower Unit

Chassis Dynamometers, Large Roll
Road Simulators - Programmed (Eddy-Current)
Environmental Testing (DC)
Sound Testing (DC SCR)
Small Roll (DC SCR) - Hydraulic Restraints
Engine Dynamometers (Manual and Programmed)
Consoles and Controls, Engine and Chassis
Dynamometers (Manual and Programmed)

ROTUNDA EQUIPMENT
P. O. Box 1000
Plymouth, Michigan 48170

Models RRE 200 and RRE-C-200. Chassis dynamometers; RRE is flush model; RRE-C-200 is top-floor model to 200 horsepower; infinite speeds to 200 MPH; up to 4000-pound axle weight; remote-controlled loading/unloading; inertia flywheels optional; requires normal shop air, water, and electrical supply; road speed and horsepower meters available.

Model RRE-DCP-200. Chassis dynamometer/brake analyzer; passenger car chassis; performance characteristics identical to the Model RRE-C-200 dynamometer; has split roll design permitting conversion to a combination chassis dynamometer/dynamic brake analyzer; flush floor installation only; 200 horsepower absorption assemblies available for up to 400 road horsepower.

Model RRE-DB-8-CP-200. Chassis dynamometer/brake analyzer; combination of the Model RRE-DCP-200 chassis dynamometer and the Model RRE-DB-8-CP dynamic brake analyzer as a single unit; standard equipment includes an inertia flywheel, a brake effort gauge, and two remote-control pendants for operating the brake analyzer, dynamometer, and air lift.

Models RRE-CT-200 and RRE-CT-400. Heavy-duty universal chassis dynamometers; single-axle 200 and 400 road horsepower; flush-mounted on floor top; 22,500-pound axle weight with speed meters; dynamometers include roll assembly with air-actuated brakes, power absorption, and power-measuring systems, thermocooling control, and load controls; bogie rolls are available for tandem drive axles.

ENGINE AND CHASSIS DYNAMOMETERS

ROTUNDA EQUIPMENT (Continued)

Models RRE-CT-200 X 200, RRE-CT-400 X 200, and RRE-CT-400 X 400.
Heavy-duty universal chassis dynamometers; same features as Models RRE-CT-200 and RRE-CT-400 except twin axle design; include two dynamometer assemblies (one movable, one fixed), traverse rails, and locating mechanism; inertia flywheels optional.

SUN ELECTRIC CORPORATION
Harlem and Avondale
Chicago, Illinois 60631

Model RAM-937. Chassis dynamometer with electronic analog computer; 8-inch meters for brake power, average brake power, brake balance, pedal pounds force, drive power, gradient, speed (MPH), time (seconds); hand controls provided; electromagnetic power absorber; passive eddy-current absorbs 350 road horsepower; tractionized 21-inch rollers; total pit mass inertia 1440 pounds; unit tests engine performance, brakes, vibration, and time.

UNI-SYSTEMS INCORPORATED
1007 Washington Street
San Carlos, California 94070

Chassis Dynamometers,
Eddy-Current Motor/Absorber, DC
Motor/Absorber Frequency Modulated tapes system
Engine Dynamometers, 600 H.P. DC Motor

WEST COAST RESEARCH CORPORATION
P. O. Box 25061
Los Angeles, California 90025

Engine Dynamometer Test Stand
Model I 144 ARW

ENGINE AND CHASSIS DYNAMOMETERS

ZOLLNER AND COMPANY, KIEL
c/o Roland Marine Inc.
50 Broadway
New York, NY 10004

Engine Dynamometer (water brakes),
Models: 2 and 7
Engine Dynamometer (electirc brakes)
Models: B-220, C-630, and A-100
Test Stand, Combined, Model 4N22

EXHAUST EMISSION ANALYZERS

AC SPARK PLUG DIVISION
General Motors
Flint, Michigan

Model ST-500. AC/GM emissions analyzer; measures automotive exhaust gas concentrations by nondispersive infrared analysis; measures hydrocarbon (HC) in parts per million and carbon monoxide (CO) on a percentage basis by volume; both can be measured simultaneously by the device.

ALLEN TEST PRODUCTS DIVISION
2101 North Pitcher Street
Kalamazoo, Michigan 49017

Model 23-060. HC CO emission analyzer; portable cabinet; 20-foot exhaust probe; 8-inch meters; high, low scale 0 to 10, 0 to 2.5 percent CO, 0 to 2000 RPM, 0 to 500 PPM HC; NDIR analysis method; accuracy, CO 0.3 percent, 0.075 percent, HC 60 PPM, 15 PPM; response reading 90 percent in 10 seconds; zero and span drift, 2 percent full scale; built-in, dual-beam optical calibration system.

Model AM23-070. Emission analyzer; base deluxe cabinet; features same equipment as the Model 23-060 HC CO portable emission analyzer; 30-foot exhaust probe.

AMERSERVE SHOP EQUIPMENT
American Motors Sales Corporation
14250 Plymouth
Detroit, Michigan

Model AM23-067. HC CO emission analyzer; cabinet-mounted; 8-inch meters; dual scale; NDIR analytical method; accuracy, CO 0.3 percent, 0.075 percent, HC 60 PPM maximum; 15 PPM maximum; 90 percent reading response in 10 seconds; zero span and drift 2 percent full scale; dual optical system, built-in calibration; 20-foot exhaust probe.

Model AM23-077. Emission analyzer; cabinet-mounted; "scope up-date"; 30-foot exhaust probe; 8-inch meters; 0 to 10 percent CO, 0 to 2.5 percent CO, 0 to 2000 PPM HC, 0 to 500 PPM; NDIR analysis method; accuracy CO 0.3 percent, CO 0.075 percent, HC 60 PPM, HC 15 PPM; 90 percent reading response in 10 seconds; zero and span drift 2 percent full scale; built-in, dual-beam optical calibration system.

EXHAUST EMISSION ANALYZERS

KAL EQUIPMENT

Otsego, Michigan 49078

Model 4089. Exhaust analyzer; measures the air/fuel ratio of gasoline and liquid-gas-burning engines; for use on vehicles either positive or negative ground, 6- or 12-volt; mini-sensor-remote "at the tailpipe" sensor for accurate and fast response; built-in mounting magnet, no clip, springs, or straps; multiple meter scales: air/fuel ratio gasoline, 8/1 to 16/1; air/fuel ratio (liquid gas), 12/1 to 16/1; percentage carbon monoxide, 0 to 10 percent (based on average engine displacement); solid-state circuitry; 2-1/2-inch jeweled meter.

Model 4094-D. Exhaust analyzer; HC testing ranges of 0 to 2000 PPM and 0 to 500 PPM, and CO testing ranges of 0 to 10 percent and 0 to 2-1/2 percent; accuracy \pm 3 percent full scale; response time 90 percent of final indication within 10 seconds; AGC circuit maintains constant reference signal, guaranteeing drift of less than 1 percent of full scale over 60-minute period after warmup; operating voltage range from 12.7 to 15.7 volts, 6 amps nominal; ambient temperature range 35° to 110° F; storage temperature range 0° to 132° F; ambient humidity range of up to 95 percent.

PEERLESS INSTRUMENT COMPANY

6101 Grosse Point Road
Chicago, Illinois 60648

Model 662 Pulsar. HC CO infrared emission analyzer; portable cabinet; consists of Model 660 analyzer components with wheeled cabinet; tests and adjusts all types of carburetion systems, emission control systems, fuel injection systems; 6-inch dual-scale meters for HC CO readings; measures CO minimum level within .05 percent; measures HC minimum within 10 PPM; indicates air/fuel ratio.

ROTUNDA

P. O. Box 1000
Plymouth, Michigan 48170

Model BRE-42-732. Exhaust emissions analyzer; dual-scale; infrared; with self-checking tachometer with induction pickup; 8-inch meters; 0 to 10 at 0.2 percent and 0 to 57 percent at 0.1 percent increments; hydrocarbon dual scale plus tachometer scale 0 to 2000 PPM at 20 PPM, and 0 to 1000 PPM at 10 PPM; engine RPM 0 to 3000; \pm 3 percent accuracy, fuel scale HC CO; 95 percent response in 10 seconds; 20-foot pickup hose; electronic span adjust.

EXHAUST EMISSION ANALYZERS

SEARS-PENSKE (Catalog)

Model No. 28A21011C. Exhaust gas analyzer; dual-range instrument featuring two scales on 6-inch illuminated meter; low CO scale 0 to 2.5 percent divided into tenths of a percent; high CO scale of 0 to 10 percent with corresponding air/fuel ratio scale; used for tuning pre-emission-control cars; supplied with 18-foot sampling hose and tailpipe probe.

Model No. 28A21012. Air/fuel ratio meter; 3-inch D'Arsonval meter; air/fuel ratio tester; scales: 11:1 to 14.6:1/standard and emission control system idle zone air/fuel ratio; 0 to 8.5 percent CO; propane, butane air/fuel ratio scales.

STEWART WARNER CORPORATION 5246 Snapfinger Woods Drive Decatur, Georgia 30032

Model 3160-AC-1. Exhaust emission analyzer; infrared; modular; dual-beam nondispersive; 0 to 10 percent and 6.2 percent CO, 0 to 2000 PPM and 0 to 400 PPM HC; ± 1 percent of full scale; 90 percent reading in 10 seconds; includes sampling system, hose, and probe; built-in gas calibration system; pushbutton optical check for both HC and CO; accessories available; 20-foot meter extension cable and dynamometer kit.

SUN ELECTRIC CORPORATION Harlem and Avondale Chicago, Illinois 60631

Model EPA-75. Exhaust performance analyzer; nondispersive gas analyzer; infrared; operates on principle of an absorption of specific wavelengths of infrared energy by HC and CO (as N-Hexane) present in the sample exhaust stream; levels of HC can be read between 0 to 2000 PPM and 0 to 500 PPM on separate color-coded scales; same arrangement permits reading CO levels between 0 to 10 percent and 0 to 2.5 percent.

Model EET-910-I. Exhaust emission tester; infrared; nondispersive; solid-state; designed to measure levels of HC and CO in the exhaust of internal combustion engines; each unit is supplied with a roll-around cabinet, test probe, hose, and instructional literature; testing capability includes measurement of HC between 0 to 500 PPM and 0 to 2000 PPM, CO between 0 to 2.5 percent and 0 to 10 percent, and engine speed from 0 to 3000 RPM.

EXHAUST EMISSION ANALYZERS

SUN ELECTRIC CORPORATION (Continued)

Model EET-910NJ. Exhaust emission tester; infrared; modification of basic Model EET-910-I for the state of New Jersey's vehicle emission testing program; includes two red "fail" lights mounted on top of the tester, one corresponding to CO emissions, the other to HC percentages; graduated color-coded meter scales; color-coded controls for selection of different model years; small heating unit for operation at extremely low temperatures.

Model VETS-75. Exhaust performance analyzer, modification of the Model EPA-75 to meet the requirements of Chicago's vehicle emissions testing ordinance of June 1, 1973; contains measuring instrumentation for HC, CO, and CO₂ detection, a remote sensing capability, and a clamp-on tachometer for measuring engine revolutions; tests include one emissions test at idle and another at 2250 RPM; designed to interface with a computerized test system.

Model EPA-75P. Exhaust performance analyzer; modification of the Model EPA-75 to meet portability and measuring requirements of the California State Highway Patrol; solid-state; compact; capable of operating from a battery source or 115' VAC utility power source; includes an analyzer module with built-in calibrating gases, a remote-control instrument panel, and a power pack with batteries, inverter, and charger.

Model SPEA 1000. Programmed emission analyzer; totally automatic; designed for use in city and state emission programs; specific capabilities can be programmed to any requirement; computer-controlled emission measurement; manual operations include entering vehicle data on computer keyboard and inserting a probe in vehicle's tailpipe; all else is automatic.

INDIVIDUAL ENGINE DIAGNOSTIC AND ANALYTICAL COMPONENTS

ALLEN TEST PRODUCTS DIVISION
2101 North Pitcher Street
Kalamazoo, Michigan 49107

Model 21-090. Ohmmeter 0 to 500 ohms X 1000; four scales plus continuity light.

AMERICAN MOTORS SALES CORPORATION
14250 Plymouth
Detroit, Michigan

Model AM21-097. Ohmmeter; wide-range; measures 0.2 to 500,000 ohms in four ranges; center scale reading of 10, 100, 1000, and 10,000 ohms; pilot lamp for continuity testing; compensator for battery voltage variations.

HEATH COMPANY
Benton Harbor, Michigan 49022

Model W0-5104. Ignition analyzer; 5-inch scope; 12-volt inverter optional (Model W0A-5104-1).

KING ELECTRONICS COMPANY
6892 Snowvilk Road
Brecksville, Ohio 44141

Model 250. Ohmmeter; five test ranges 0 to 50/500/5000/50,000/500,000 ohms.

MARQUETTE
3800 North Dunlap Street
St. Paul, Minnesota 55112

Model 41-206. Circuit tester; ohmmeter capable of determining continuity and actual resistance of ignition ballast resistors, spark plug cables, coil windings.

INDIVIDUAL ENGINE DIAGNOSTIC AND ANALYTICAL COMPONENTS

PEERLESS INSTRUMENT COMPANY
6101 Grosse Point Road
Chicago, Illinois 60648

Model 410-D10A. Dwell-ohmmeter for 4-, 6-, and 8-cylinder engine testing; works on most transistorized ignition systems; scales: dwell, 8-cylinder, 0 to 45; 6-cylinder, 0 to 60; 4-cylinder, 0 to 90; point resistance scale, 0 to 20, 0 to 20,000 ohms.

Model 515. Diagnostic scope; 9-inch automatic 20KV and 40KV readings; two pattern controls; test unit provides power; checks spark plugs and cables, coil, condenser, spark polarity, point condition and dwell, distributor condition, rotor, coil tower, distributor cap, and alternator.

ROTUNDA EQUIPMENT
P. O. Box 1000
Plymouth, Michigan 48170

Model ARE 21-095. Ohmmeter; measures 0.2 to 500,000 ohms in four ranges; center scale reading of 10, 100, 1000, and 10,000 ohms; pilot lamp continuity tester; voltage compensator.

SNAP-ON TOOLS CORPORATION
2801 80th Street
Kenosha, Wisconsin 53140

Model MT-404 C. Ohmmeter; scales divisions range from 0 to 500 to infinity ohms in as low as 100-ohm increments; diode test Linear reference scale ranges from 0 to 100 in divisions of 1.

Model MT-704. Ohmmeter; measures electrical component resistance; can be used for continuity checks and to locate open circuits; three ranges, R X 1 providing direct reading by ohms, R X 10 and R X 100 which multiply dial readings by 10 and 100 respectively.

Model MT-615 D. Oscilloscope; 6-inch; uses test vehicles 6-, 12-, or 24-volt power or 115 AC; presents trace pattern on picture-tube type screen; provides two basic patterns, direct readout, primary and secondary circuits; each of 44 patterns can be amplified vertically or horizontally.

INDIVIDUAL ENGINE DIAGNOSTIC AND ANALYTICAL COMPONENTS

STEWART-WARNER CORPORATION
5246 Snapfinger Woods Drive
Decatur, Georgia 30032

Component of Model 3000A (Pedestal-Mounted Engine Analyzer).
Ignition scope; 9-inch screen; two patterns; scale ranges 0 to 20/40KV, 0 to 45/60/90 degrees dwell.

SUN ELECTRIC CORPORATION
Harlem and Avondale
Chicago, Illinois 61631

Model RD0. Rectifier diode ohms tester; consists of an ohmmeter and rectifier diode tester; 4-inch D'Arsonval-type meter for general-purpose testing of resistance values; scale range 0 to 100, 0 to 1,000, 0 to 10,000, and 0 to 100,000 ohms.

Model SS-400. Oscilloscope; 23-inch; diagonal; for displaying ignition system patterns; equipped with transparent graticule for measuring secondary voltage to 40,000 volts; waveforms are superimposed, raster, or display configurations.

Model SS 50-3. Oscilloscope; 3-inch; dynamically checks solid-state rectifiers and voltage regulators; range from 1 to 100 volts peak to peak; frequency range from 10 Hz to 100kHz.

Model CCT-10. Coil condenser tester; 3-inch oscilloscope displays performance of ignition coils.

Model SS-50. Oscilloscope; AC; 3-inch; used to locate malfunctions in solid-state components; 1- to 100-volt work range; 10 Hz to 100 kHz

APPENDIX B
TALLY SHEETS

.

CONSUMER CONSOLIDATED TALLY SHEET

DATES 9/23/74 - 10/4/74AREA Tampa

<u>QUESTIONS</u>	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
01. Auto under warranty	<u>35</u>	<u>91</u>	<u>0</u>
02. Feels warranty provisions reasonable	<u>82</u>	<u>36</u>	<u>8</u>
03. Follows owner's handbook instructions	<u>98</u>	<u>27</u>	<u>1</u>
04. Is familiar with handbook instructions	<u>26</u>	<u>75</u>	<u>25</u>
05. Dealer services auto	<u>47</u>	<u>79</u>	<u>0</u>
06. Mechanic services auto	<u>56</u>	<u>70</u>	<u>0</u>
07. Vehicle owner services auto	<u>24</u>	<u>102</u>	<u>0</u>
08. Tuneup by calendar	<u>23</u>	<u>103</u>	<u>0</u>
09. Tuneup by mileage	<u>42</u>	<u>84</u>	<u>0</u>
10. Tuneup by performance	<u>62</u>	<u>63</u>	<u>1</u>
11. Fuel shortages and cost increase has affected maintenance schedules	<u>44</u>	<u>81</u>	<u>1</u>
12. Fuel shortage and cost increase will affect maintenance schedule	<u>30</u>	<u>72</u>	<u>24</u>

CONSUMER CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 9/23/74 - 10/4/74AREA TampaQUESTIONSYES NO UNKNOWN

13. Emission controls have affected maintenance schedule

35 80 11

14. Regularly maintains emission devices

82 36 8

15. Would change maintenance customs if cost was covered by warranty

65 57 4

16. Automatic tuneup/maintenance devices acceptable

85 37 4

17. Satisfied with services and facilities

71 50 5

18. Will replace catalytic converter to keep air clean.

36 66 24

CONSUMER CONSOLIDATED TALLY SHEET

DATES 10/14/74 - 11/4/74AREA New YorkQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
01. Auto under warranty	<u>21</u>	<u>76</u>	<u>2</u>
02. Feels warranty provisions reasonable	<u>72</u>	<u>18</u>	<u>9</u>
03. Follows owner's handbook instructions	<u>87</u>	<u>12</u>	<u>0</u>
04. Is familiar with handbook instructions	<u>28</u>	<u>66</u>	<u>5</u>
05. Dealer services auto	<u>41</u>	<u>58</u>	<u>0</u>
06. Mechanic services auto	<u>47</u>	<u>52</u>	<u>0</u>
07. Vehicle owner services auto	<u>24</u>	<u>75</u>	<u>0</u>
08. Tuneup by calendar	<u>41</u>	<u>58</u>	<u>0</u>
09. Tuneup by mileage	<u>32</u>	<u>67</u>	<u>0</u>
10. Tuneup by performance	<u>29</u>	<u>69</u>	<u>1</u>
11. Fuel shortages and cost increase has affected maintenance schedules	<u>27</u>	<u>71</u>	<u>1</u>
12. Fuel shortage and cost increase will affect maintenance schedule	<u>12</u>	<u>66</u>	<u>21</u>

CONSUMER CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 10/14/74 - 11/4/74AREA New YorkQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
13. Emission controls have affected maintenance schedule	<u>18</u>	<u>73</u>	<u>8</u>
14. Regularly maintains emission devices	<u>70</u>	<u>25</u>	<u>4</u>
15. Would change maintenance customs if cost was covered by warranty	<u>42</u>	<u>56</u>	<u>1</u>
16. Automatic tuneup/maintenance devices acceptable	<u>74</u>	<u>24</u>	<u>1</u>
17. Satisfied with services and facilities	<u>64</u>	<u>34</u>	<u>1</u>
18. Will replace catalytic converter to keep air clean.	<u>44</u>	<u>43</u>	<u>12</u>

CONSUMER CONSOLIDATED TALLY SHEET

DATES 11/4/74 - 11/16/74AREA Newark

<u>QUESTIONS</u>	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
01. Auto under warranty	<u>24</u>	<u>112</u>	<u>0</u>
02. Feels warranty provisions reasonable	<u>102</u>	<u>21</u>	<u>13</u>
03. Follows owner's handbook instructions	<u>109</u>	<u>24</u>	<u>3</u>
04. Is familiar with handbook instructions	<u>27</u>	<u>108</u>	<u>1</u>
05. Dealer services auto	<u>43</u>	<u>93</u>	<u>0</u>
06. Mechanic services auto	<u>78</u>	<u>58</u>	<u>0</u>
07. Vehicle owner services auto	<u>27</u>	<u>109</u>	<u>0</u>
08. Tuneup by calendar	<u>60</u>	<u>74</u>	<u>2</u>
09. Tuneup by mileage	<u>52</u>	<u>82</u>	<u>2</u>
10. Tuneup by performance	<u>29</u>	<u>105</u>	<u>2</u>
11. Fuel shortages and cost increase has affected maintenance schedules	<u>46</u>	<u>90</u>	<u>0</u>
12. Fuel shortage and cost increase will affect maintenance schedule	<u>9</u>	<u>88</u>	<u>39</u>

CONSUMER CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 11/4/74 - 11/16/74AREA NewarkQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
13. Emission controls have affected maintenance schedule	<u>30</u>	<u>73</u>	<u>33</u>
14. Regularly maintains emission devices	<u>93</u>	<u>16</u>	<u>27</u>
15. Would change maintenance customs if cost was covered by warranty	<u>54</u>	<u>78</u>	<u>4</u>
16. Automatic tuneup/maintenance devices acceptable	<u>91</u>	<u>44</u>	<u>1</u>
17. Satisfied with services and facilities	<u>88</u>	<u>47</u>	<u>1</u>
18. Will replace catalytic converter to keep air clean.	<u>46</u>	<u>76</u>	<u>14</u>

CONSUMER CONSOLIDATED TALLY SHEET

DATES 12/1/74 - 12/21/74AREA DetroitQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
01. Auto under warranty	<u>28</u>	<u>109</u>	<u>3</u>
02. Feels warranty provisions reasonable	<u>106</u>	<u>24</u>	<u>10</u>
03. Follows owner's handbook instructions	<u>111</u>	<u>27</u>	<u>2</u>
04. Is familiar with handbook instructions	<u>35</u>	<u>88</u>	<u>17</u>
05. Dealer services auto	<u>64</u>	<u>75</u>	<u>1</u>
06. Mechanic services auto	<u>62</u>	<u>77</u>	<u>1</u>
07. Vehicle owner services auto	<u>28</u>	<u>111</u>	<u>1</u>
08. Tuneup by calendar	<u>70</u>	<u>62</u>	<u>8</u>
09. Tuneup by mileage	<u>31</u>	<u>101</u>	<u>8</u>
10. Tuneup by performance	<u>32</u>	<u>100</u>	<u>8</u>
11. Fuel shortages and cost increase has affected maintenance schedules	<u>20</u>	<u>116</u>	<u>4</u>
12. Fuel shortage and cost increase will affect maintenance schedule	<u>2</u>	<u>19</u>	<u>119</u>

CONSUMER CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 12/1/74 - 12/21/74AREA DetroitQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
13. Emission controls have affected maintenance schedule	<u>28</u>	<u>110</u>	<u>2</u>
14. Regularly maintains emission devices	<u>93</u>	<u>41</u>	<u>6</u>
15. Would change maintenance customs if cost was covered by warranty	<u>59</u>	<u>78</u>	<u>3</u>
16. Automatic tuneup/maintenance devices acceptable	<u>69</u>	<u>69</u>	<u>2</u>
17. Satisfied with services and facilities	<u>113</u>	<u>26</u>	<u>1</u>
18. Will replace catalytic converter to keep air clean.	<u>53</u>	<u>69</u>	<u>18</u>

CONSUMER CONSOLIDATED TALLY SHEET

DATES 12/1/74 - 12/21/74AREA ChicagoQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
01. Auto under warranty	<u>11</u>	<u>75</u>	<u>3</u>
02. Feels warranty provisions reasonable	<u>63</u>	<u>18</u>	<u>8</u>
03. Follows owner's handbook instructions	<u>63</u>	<u>26</u>	<u>0</u>
04. Is familiar with handbook instructions	<u>28</u>	<u>59</u>	<u>2</u>
05. Dealer services auto	<u>31</u>	<u>57</u>	<u>1</u>
06. Mechanic services auto	<u>36</u>	<u>53</u>	<u>0</u>
07. Vehicle owner services auto	<u>21</u>	<u>66</u>	<u>2</u>
08. Tuneup by calendar	<u>61</u>	<u>28</u>	<u>0</u>
09. Tuneup by mileage	<u>16</u>	<u>73</u>	<u>0</u>
10. Tuneup by performance	<u>11</u>	<u>78</u>	<u>0</u>
11. Fuel shortages and cost increase has affected maintenance schedules	<u>12</u>	<u>76</u>	<u>1</u>
12. Fuel shortage and cost increase will affect maintenance schedule	<u>8</u>	<u>27</u>	<u>54</u>

CONSUMER CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 12/1/74 - 12/21/74AREA ChicagoQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
13. Emission controls have affected maintenance schedule	<u>20</u>	<u>62</u>	<u>7</u>
14. Regularly maintains emission devices	<u>66</u>	<u>14</u>	<u>9</u>
15. Would change maintenance customs if cost was covered by warranty	<u>32</u>	<u>55</u>	<u>2</u>
16. Automatic tuneup/maintenance devices acceptable	<u>46</u>	<u>41</u>	<u>2</u>
17. Satisfied with services and facilities	<u>54</u>	<u>34</u>	<u>1</u>
18. Will replace catalytic converter to keep air clean.	<u>28</u>	<u>56</u>	<u>5</u>

CONSUMER CONSOLIDATED TALLY SHEET

DATES 2/23/75 - 3/8/75AREA Los AngelesQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
01. Auto under warranty	<u>12</u>	<u>89</u>	<u>1</u>
02. Feels warranty provisions reasonable	<u>77</u>	<u>22</u>	<u>3</u>
03. Follows owner's handbook instructions	<u>82</u>	<u>20</u>	<u>0</u>
04. Is familiar with handbook instructions	<u>32</u>	<u>66</u>	<u>4</u>
05. Dealer services auto	<u>48</u>	<u>54</u>	<u>0</u>
06. Mechanic services auto	<u>38</u>	<u>64</u>	<u>0</u>
07. Vehicle owner services auto	<u>20</u>	<u>82</u>	<u>0</u>
08. Tuneup by calendar	<u>10</u>	<u>92</u>	<u>0</u>
09. Tuneup by mileage	<u>44</u>	<u>58</u>	<u>0</u>
10. Tuneup by performance	<u>49</u>	<u>53</u>	<u>0</u>
11. Fuel shortages and cost increase has affected maintenance schedules	<u>7</u>	<u>87</u>	<u>8</u>
12. Fuel shortage and cost increase will affect maintenance schedule	<u>3</u>	<u>75</u>	<u>24</u>

CONSUMER CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 2/23/75 - 3/8/75AREA Los AngelesQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
13. Emission controls have affected maintenance schedule	<u>20</u>	<u>75</u>	<u>7</u>
14. Regularly maintains emission devices	<u>82</u>	<u>14</u>	<u>6</u>
15. Would change maintenance customs if cost was covered by warranty	<u>32</u>	<u>64</u>	<u>6</u>
16. Automatic tuneup/maintenance devices acceptable	<u>65</u>	<u>34</u>	<u>3</u>
17. Satisfied with services and facilities	<u>77</u>	<u>24</u>	<u>1</u>
18. Will replace catalytic converter to keep air clean.	<u>37</u>	<u>62</u>	<u>3</u>

CONSUMER CONSOLIDATED TALLY SHEET

DATES 2/27/75 - 3/13/75AREA PhoenixQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
01. Auto under warranty	<u>25</u>	<u>143</u>	<u>3</u>
02. Feels warranty provisions reasonable	<u>119</u>	<u>38</u>	<u>14</u>
03. Follows owner's handbook instructions	<u>136</u>	<u>33</u>	<u>2</u>
04. Is familiar with handbook instructions	<u>38</u>	<u>104</u>	<u>29</u>
05. Dealer services auto	<u>91</u>	<u>80</u>	<u>0</u>
06. Mechanic services auto	<u>52</u>	<u>119</u>	<u>0</u>
07. Vehicle owner services auto	<u>44</u>	<u>127</u>	<u>0</u>
08. Tuneup by calendar	<u>31</u>	<u>139</u>	<u>1</u>
09. Tuneup by mileage	<u>79</u>	<u>91</u>	<u>1</u>
10. Tuneup by performance	<u>69</u>	<u>101</u>	<u>1</u>
11. Fuel shortages and cost increase has affected maintenance schedules	<u>17</u>	<u>154</u>	<u>0</u>
12. Fuel shortage and cost increase will affect maintenance schedule	<u>24</u>	<u>83</u>	<u>64</u>

CONSUMER CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 2/27/75 - 3/13/75AREA PhoenixQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
13. Emission controls have affected maintenance schedule	<u>33</u>	<u>136</u>	<u>2</u>
14. Regularly maintains emission devices	<u>132</u>	<u>30</u>	<u>9</u>
15. Would change maintenance customs if cost was covered by warranty	<u>56</u>	<u>110</u>	<u>5</u>
16. Automatic tuneup/maintenance devices acceptable	<u>57</u>	<u>110</u>	<u>4</u>
17. Satisfied with services and facilities	<u>127</u>	<u>42</u>	<u>2</u>
18. Will replace catalytic converter to keep air clean.	<u>73</u>	<u>89</u>	<u>9</u>

CONSUMER CONSOLIDATED TALLY SHEET

DATES 1/13/75 - 2/1/75AREA SeattleQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
01. Auto under warranty	<u>24</u>	<u>158</u>	<u>0</u>
02. Feels warranty provisions reasonable	<u>148</u>	<u>27</u>	<u>7</u>
03. Follows owner's handbook instructions	<u>148</u>	<u>33</u>	<u>1</u>
04. Is familiar with handbook instructions	<u>44</u>	<u>136</u>	<u>2</u>
05. Dealer services auto	<u>69</u>	<u>113</u>	<u>0</u>
06. Mechanic services auto	<u>79</u>	<u>103</u>	<u>0</u>
07. Vehicle owner services auto	<u>36</u>	<u>146</u>	<u>0</u>
08. Tuneup by calendar	<u>52</u>	<u>130</u>	<u>0</u>
09. Tuneup by mileage	<u>91</u>	<u>91</u>	<u>0</u>
10. Tuneup by performance	<u>42</u>	<u>140</u>	<u>0</u>
11. Fuel shortages and cost increase has affected maintenance schedules	<u>11</u>	<u>169</u>	<u>2</u>
12. Fuel shortage and cost increase will affect maintenance schedule	<u>11</u>	<u>150</u>	<u>21</u>

CONSUMER CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 1/13/75 - 2/1/75AREA SeattleQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
13. Emission controls have affected maintenance schedule	<u>40</u>	<u>132</u>	<u>10</u>
14. Regularly maintains emission devices	<u>147</u>	<u>20</u>	<u>15</u>
15. Would change maintenance customs if cost was covered by warranty	<u>45</u>	<u>130</u>	<u>7</u>
16. Automatic tuneup/maintenance devices acceptable	<u>56</u>	<u>124</u>	<u>2</u>
17. Satisfied with services and facilities	<u>141</u>	<u>38</u>	<u>3</u>
18. Will replace catalytic converter to keep air clean.	<u>48</u>	<u>126</u>	<u>8</u>

CONSUMER CONSOLIDATED TALLY SHEET

DATES 1/13/75 - 2/8/75AREA DenverQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
01. Auto under warranty	<u>28</u>	<u>152</u>	<u>3</u>
02. Feels warranty provisions reasonable	<u>135</u>	<u>29</u>	<u>19</u>
03. Follows owner's handbook instructions	<u>133</u>	<u>46</u>	<u>4</u>
04. Is familiar with handbook instructions	<u>53</u>	<u>100</u>	<u>30</u>
05. Dealer services auto	<u>70</u>	<u>112</u>	<u>1</u>
06. Mechanic services auto	<u>63</u>	<u>119</u>	<u>1</u>
07. Vehicle owner services auto	<u>68</u>	<u>114</u>	<u>1</u>
08. Tuneup by calendar	<u>49</u>	<u>131</u>	<u>3</u>
09. Tuneup by mileage	<u>67</u>	<u>113</u>	<u>3</u>
10. Tuneup by performance	<u>67</u>	<u>112</u>	<u>4</u>
11. Fuel shortages and cost increase has affected maintenance schedules	<u>13</u>	<u>147</u>	<u>23</u>
12. Fuel shortage and cost increase will affect maintenance schedule	<u>2</u>	<u>25</u>	<u>156</u>

CONSUMER CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 1/13/75 - 2/8/75AREA Denver

<u>QUESTIONS</u>	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
13. Emission controls have affected maintenance schedule	<u>25</u>	<u>145</u>	<u>13</u>
14. Regularly maintains emission devices	<u>142</u>	<u>24</u>	<u>17</u>
15. Would change maintenance customs if cost was covered by warranty	<u>80</u>	<u>96</u>	<u>7</u>
16. Automatic tuneup/maintenance devices acceptable	<u>97</u>	<u>81</u>	<u>5</u>
17. Satisfied with services and facilities	<u>124</u>	<u>50</u>	<u>9</u>
18. Will replace catalytic converter to keep air clean.	<u>81</u>	<u>86</u>	<u>16</u>

CONSUMER CONSOLIDATED TALLY SHEET

DATES 9/23/74 - 3/18/75AREA NationalQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
01. Auto under warranty	<u>208</u>	<u>1005</u>	<u>15</u>
02. Feels warranty provisions reasonable	<u>904</u>	<u>233</u>	<u>91</u>
03. Follows owner's handbook instructions	<u>967</u>	<u>248</u>	<u>13</u>
04. Is familiar with handbook instructions	<u>311</u>	<u>802</u>	<u>115</u>
05. Dealer services auto	<u>504</u>	<u>721</u>	<u>3</u>
06. Mechanic services auto	<u>511</u>	<u>715</u>	<u>2</u>
07. Vehicle owner services auto	<u>292</u>	<u>932</u>	<u>4</u>
08. Tuneup by calendar	<u>397</u>	<u>817</u>	<u>14</u>
09. Tuneup by mileage	<u>454</u>	<u>760</u>	<u>14</u>
10. Tuneup by performance	<u>390</u>	<u>821</u>	<u>17</u>
11. Fuel shortages and cost increase has affected maintenance schedules	<u>197</u>	<u>991</u>	<u>40</u>
12. Fuel shortage and cost increase will affect maintenance schedule	<u>101</u>	<u>605</u>	<u>522</u>

CONSUMER CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 9/23/74 - 3/18/75AREA NationalQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
13. Emission controls have affected maintenance schedule	<u>249</u>	<u>886</u>	<u>93</u>
14. Regularly maintains emission devices	<u>907</u>	<u>220</u>	<u>101</u>
15. Would change maintenance customs if cost was covered by warranty	<u>465</u>	<u>724</u>	<u>39</u>
16. Automatic tuneup/maintenance devices acceptable	<u>640</u>	<u>564</u>	<u>24</u>
17. Satisfied with services and facilities	<u>859</u>	<u>345</u>	<u>24</u>
18. Will replace catalytic converter to keep air clean.	<u>446</u>	<u>673</u>	<u>109</u>

COMMERCIAL CONSOLIDATED TALLY SHEET

DATES 9/23/74 - 10/4/74AREA TampaQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
01. Can service American Motors Corporation	<u>38</u>	<u>0</u>	<u>0</u>
02. Can service Chrysler Corporation	<u>38</u>	<u>0</u>	<u>0</u>
03. Can service Ford Motor Corporation	<u>38</u>	<u>0</u>	<u>0</u>
04. Can service General Motors Corporation	<u>36</u>	<u>2</u>	<u>0</u>
05. Can service Nissan Motors Corporation	<u>18</u>	<u>20</u>	<u>0</u>
06. Can service Toyota Motors Corporation	<u>22</u>	<u>16</u>	<u>0</u>
07. Can service Volkswagen Motors Corporation	<u>20</u>	<u>18</u>	<u>0</u>
08. Can service Mazda Motors Corporation	<u>16</u>	<u>22</u>	<u>0</u>
09. Check, adjust, or replace carburetor	<u>36</u>	<u>1</u>	<u>1</u>
10. Check, adjust, or replace emission controls	<u>37</u>	<u>0</u>	<u>1</u>
11. Check, adjust, or replace exhaust system	<u>36</u>	<u>1</u>	<u>1</u>
12. Check, adjust, or replace ignition system	<u>35</u>	<u>2</u>	<u>1</u>
13. Check, adjust, or replace electronic ignition	<u>23</u>	<u>14</u>	<u>1</u>

COMMERCIAL CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 9/23/74 - 10/4/74AREA TampaQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
14. Check, adjust, or replace valve lash	<u>24</u>	<u>13</u>	<u>1</u>
15. Have timing light	<u>37</u>	<u>0</u>	<u>1</u>
16. Have dwell meter	<u>37</u>	<u>0</u>	<u>1</u>
17. Have ignition analyzer	<u>32</u>	<u>5</u>	<u>1</u>
18. Have exhaust analyzer	<u>26</u>	<u>11</u>	<u>1</u>
19. Have choke analyzer	<u>18</u>	<u>19</u>	<u>1</u>
20. Have air pump analyzer	<u>11</u>	<u>26</u>	<u>1</u>
21. Have fuel injection analyzer	<u>7</u>	<u>30</u>	<u>1</u>
22. Have PCV analyzer	<u>24</u>	<u>13</u>	<u>1</u>
23. Have vacuum analyzer	<u>31</u>	<u>6</u>	<u>1</u>
24. Have air cleaner heat stove analyzer	<u>10</u>	<u>27</u>	<u>1</u>
25. Have belt tension gage	<u>13</u>	<u>24</u>	<u>1</u>
26. Have combination	<u>23</u>	<u>14</u>	<u>1</u>

COMMERCIAL CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 9/23/74 - 10/4/74AREA TampaQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
27. Have source of new maintenance instructions	<u>36</u>	<u>1</u>	<u>1</u>
28. Have complete vacuum charts and electric schematics	<u>20</u>	<u>17</u>	<u>1</u>
29. Anticipates major changes in 1975 and later models	<u>22</u>	<u>8</u>	<u>8</u>
30. Advised of changes expected in maintenance requirements	<u>11</u>	<u>26</u>	<u>1</u>
31. Will modify existing equipment	<u>11</u>	<u>17</u>	<u>10</u>
32. Will purchase additional equipment	<u>16</u>	<u>9</u>	<u>13</u>
33. Planning procurement of equipment to service the catalytic converter	<u>13</u>	<u>16</u>	<u>9</u>
34. Need current level, no additional training	<u>10</u>	<u>28</u>	<u>0</u>
35. Need present mechanic's, in-house training	<u>24</u>	<u>14</u>	<u>0</u>
36. Need present mechanic's outside training	<u>14</u>	<u>24</u>	<u>0</u>
37. Need additional <u>Specially</u> trained mechanics	<u>1</u>	<u>37</u>	<u>0</u>
38. Have taken and passed training program	<u>18</u>	<u>20</u>	<u>0</u>
39. Have mechanic classification for skill level	<u>1</u>	<u>37</u>	<u>0</u>

COMMERCIAL CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 9/23/74 - 10/4/74AREA TampaQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
40. Repeat customers 0 to 50 percent	<u>10</u>	<u>28</u>	<u>0</u>
41. Repeat customers 51 to 75 percent	<u>9</u>	<u>29</u>	<u>0</u>
42. Repeat customers 76 to 95 percent	<u>18</u>	<u>20</u>	<u>0</u>
43. Fuel shortage and price increase has improved business	<u>10</u>	<u>28</u>	<u>0</u>
44. Fuel shortage and price increase has decreased business	<u>12</u>	<u>26</u>	<u>0</u>
45. Familiar with state inspection system	<u>38</u>	<u>0</u>	<u>0</u>
46. Familiar with emission control regulations	<u>33</u>	<u>5</u>	<u>0</u>
47. Compliance with emission control regulations	<u>37</u>	<u>1</u>	<u>0</u>
48. Emission control devices disconnected	<u>23</u>	<u>15</u>	<u>0</u>
49. 0 to 10 percent disconnected	<u>16</u>	<u>22</u>	<u>0</u>
50. 11 to 20 percent disconnected	<u>3</u>	<u>35</u>	<u>0</u>
51. 21 to 50 percent disconnected	<u>4</u>	<u>34</u>	<u>0</u>
52. 51 and up disconnected	<u>0</u>	<u>38</u>	<u>0</u>
53. Reconnects emission devices	<u>12</u>	<u>16</u>	<u>10</u>

COMMERCIAL CONSOLIDATED TALLY SHEET

DATES 10/14/74 - 11/4/74AREA New YorkQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
01. Can service American Motors Corporation	<u>23</u>	<u>1</u>	<u>0</u>
02. Can service Chrysler Corporation	<u>23</u>	<u>1</u>	<u>0</u>
03. Can service Ford Motor Corporation	<u>23</u>	<u>1</u>	<u>0</u>
04. Can service General Motors Corporation	<u>23</u>	<u>1</u>	<u>0</u>
05. Can service Nissan Motors Corporation	<u>14</u>	<u>10</u>	<u>0</u>
06. Can service Toyota Motors Corporation	<u>15</u>	<u>9</u>	<u>0</u>
07. Can service Volkswagen Motors Corporation	<u>15</u>	<u>9</u>	<u>0</u>
08. Can service Mazda Motors Corporation	<u>12</u>	<u>12</u>	<u>0</u>
09. Check, adjust, or replace carburetor	<u>22</u>	<u>2</u>	<u>0</u>
10. Check, adjust, or replace emission controls	<u>20</u>	<u>4</u>	<u>0</u>
11. Check, adjust, or replace exhaust system	<u>23</u>	<u>1</u>	<u>0</u>
12. Check, adjust, or replace ignition system	<u>22</u>	<u>2</u>	<u>0</u>
13. Check, adjust, or replace electronic ignition	<u>19</u>	<u>5</u>	<u>0</u>

COMMERCIAL CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 10/14/74 - 11/4/74AREA New YorkQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
14. Check, adjust, or replace valve lash	<u>20</u>	<u>4</u>	<u>0</u>
15. Have timing light	<u>24</u>	<u>0</u>	<u>0</u>
16. Have dwell meter	<u>23</u>	<u>1</u>	<u>0</u>
17. Have ignition analyzer	<u>20</u>	<u>4</u>	<u>0</u>
18. Have exhaust analyzer	<u>15</u>	<u>9</u>	<u>0</u>
19. Have choke analyzer	<u>10</u>	<u>14</u>	<u>0</u>
20. Have air pump analyzer	<u>8</u>	<u>16</u>	<u>0</u>
21. Have fuel injection analyzer	<u>4</u>	<u>20</u>	<u>0</u>
22. Have PCV analyzer	<u>20</u>	<u>4</u>	<u>0</u>
23. Have vacuum analyzer	<u>23</u>	<u>1</u>	<u>0</u>
24. Have air cleaner heat stove analyzer	<u>7</u>	<u>17</u>	<u>0</u>
25. Have belt tension gage	<u>14</u>	<u>10</u>	<u>0</u>
26. Have combination	<u>10</u>	<u>14</u>	<u>0</u>

COMMERCIAL CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 10/14/74 - 11/4/74AREA New YorkQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
27. Have source of new maintenance instructions	<u>23</u>	<u>1</u>	<u>0</u>
28. Have complete vacuum charts and electric schematics	<u>19</u>	<u>4</u>	<u>1</u>
29. Anticipates major changes in 1975 and later models	<u>14</u>	<u>3</u>	<u>7</u>
30. Advised of changes expected in maintenance requirements	<u>7</u>	<u>16</u>	<u>1</u>
31. Will modify existing equipment	<u>12</u>	<u>6</u>	<u>6</u>
32. Will purchase additional equipment	<u>14</u>	<u>2</u>	<u>8</u>
33. Planning procurement of equipment to service the catalytic converter	<u>14</u>	<u>7</u>	<u>3</u>
34. Need current level, no additional training	<u>1</u>	<u>23</u>	<u>0</u>
35. Need present mechanic's, in-house training	<u>17</u>	<u>7</u>	<u>0</u>
36. Need present mechanic's outside training	<u>10</u>	<u>14</u>	<u>0</u>
37. Need additional <u>Specially</u> trained mechanics	<u>2</u>	<u>22</u>	<u>0</u>
38. Have taken and passed training program	<u>11</u>	<u>12</u>	<u>1</u>
39. Have mechanic classification for skill level	<u>2</u>	<u>21</u>	<u>1</u>

COMMERCIAL CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 10/14/74 - 11/4/74AREA New YorkQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
40. Repeat customers 0 to 50 percent	<u>3</u>	<u>21</u>	<u>0</u>
41. Repeat customers 51 to 75 percent	<u>8</u>	<u>16</u>	<u>0</u>
42. Repeat customers 76 to 95 percent	<u>13</u>	<u>11</u>	<u>0</u>
43. Fuel shortage and price increase has improved business	<u>4</u>	<u>20</u>	<u>0</u>
44. Fuel shortage and price increase has decreased business	<u>8</u>	<u>16</u>	<u>0</u>
45. Familiar with state inspection system	<u>24</u>	<u>0</u>	<u>0</u>
46. Familiar with emission control regulations	<u>18</u>	<u>6</u>	<u>0</u>
47. Compliance with emission control regulations	<u>23</u>	<u>0</u>	<u>1</u>
48. Emission control devices disconnected	<u>10</u>	<u>14</u>	<u>0</u>
49. 0 to 10 percent disconnected	<u>7</u>	<u>17</u>	<u>0</u>
50. 11 to 20 percent disconnected	<u>1</u>	<u>23</u>	<u>0</u>
51. 21 to 50 percent disconnected	<u>0</u>	<u>24</u>	<u>0</u>
52. 51 and up disconnected	<u>1</u>	<u>23</u>	<u>0</u>
53. Reconnects emission devices	<u>9</u>	<u>7</u>	<u>8</u>

COMMERCIAL CONSOLIDATED TALLY SHEET

DATES 11/4/74 - 11/16/74AREA NewarkQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
01. Can service American Motors Corporation	<u>29</u>	<u>2</u>	<u>0</u>
02. Can service Chrysler Corporation	<u>30</u>	<u>1</u>	<u>0</u>
03. Can service Ford Motor Corporation	<u>30</u>	<u>1</u>	<u>0</u>
04. Can service General Motors Corporation	<u>30</u>	<u>1</u>	<u>0</u>
05. Can service Nissan Motors Corporation	<u>11</u>	<u>20</u>	<u>0</u>
06. Can service Toyota Motors Corporation	<u>15</u>	<u>16</u>	<u>0</u>
07. Can service Volkswagen Motors Corporation	<u>16</u>	<u>15</u>	<u>0</u>
08. Can service Mazda Motors Corporation	<u>8</u>	<u>23</u>	<u>0</u>
09. Check, adjust, or replace carburetor	<u>28</u>	<u>3</u>	<u>0</u>
10. Check, adjust, or replace emission controls	<u>30</u>	<u>1</u>	<u>0</u>
11. Check, adjust, or replace exhaust system	<u>29</u>	<u>2</u>	<u>0</u>
12. Check, adjust, or replace ignition system	<u>31</u>	<u>0</u>	<u>0</u>
13. Check, adjust, or replace electronic ignition	<u>23</u>	<u>8</u>	<u>0</u>

COMMERCIAL CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 11/4/74 - 11/16AREA NewarkQUESTIONS

14. Check, adjust, or replace valve lash
15. Have timing light
16. Have dwell meter
17. Have ignition analyzer
18. Have exhaust analyzer
19. Have choke analyzer
20. Have air pump analyzer
21. Have fuel injection analyzer
22. Have PCV analyzer
23. Have vacuum analyzer
24. Have air cleaner heat stove analyzer
25. Have belt tension gage
26. Have combination

<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
<u>22</u>	<u>9</u>	<u>0</u>
<u>31</u>	<u>0</u>	<u>0</u>
<u>31</u>	<u>0</u>	<u>0</u>
<u>27</u>	<u>4</u>	<u>0</u>
<u>24</u>	<u>7</u>	<u>0</u>
<u>14</u>	<u>17</u>	<u>0</u>
<u>10</u>	<u>21</u>	<u>0</u>
<u>9</u>	<u>22</u>	<u>0</u>
<u>24</u>	<u>7</u>	<u>0</u>
<u>27</u>	<u>4</u>	<u>0</u>
<u>12</u>	<u>19</u>	<u>0</u>
<u>20</u>	<u>11</u>	<u>0</u>
<u>20</u>	<u>11</u>	<u>0</u>

COMMERCIAL CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 11/4/74 - 11/16/74AREA NewarkQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
27. Have source of new maintenance instructions	<u>31</u>	<u>0</u>	<u>0</u>
28. Have complete vacuum charts and electric schematics	<u>27</u>	<u>3</u>	<u>1</u>
29. Anticipates major changes in 1975 and later models	<u>10</u>	<u>7</u>	<u>14</u>
30. Advised of changes expected in maintenance requirements	<u>13</u>	<u>17</u>	<u>1</u>
31. Will modify existing equipment	<u>10</u>	<u>5</u>	<u>16</u>
32. Will purchase additional equipment	<u>8</u>	<u>11</u>	<u>12</u>
33. Planning procurement of equipment to service the catalytic converter	<u>16</u>	<u>8</u>	<u>7</u>
34. Need current level, no additional training	<u>3</u>	<u>28</u>	<u>0</u>
35. Need present mechanic's, in-house training	<u>23</u>	<u>8</u>	<u>0</u>
36. Need present mechanic's outside training	<u>20</u>	<u>11</u>	<u>0</u>
37. Need additional <u>Specially</u> trained mechanics	<u>1</u>	<u>30</u>	<u>0</u>
38. Have taken and passed training program	<u>21</u>	<u>9</u>	<u>1</u>
39. Have mechanic classification for skill level	<u>3</u>	<u>27</u>	<u>1</u>

COMMERCIAL CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 11/4/74 - 11/16/74AREA NewarkQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
40. Repeat customers 0 to 50 percent	<u>11</u>	<u>20</u>	<u>0</u>
41. Repeat customers 51 to 75 percent	<u>12</u>	<u>19</u>	<u>0</u>
42. Repeat customers 76 to 95 percent	<u>9</u>	<u>22</u>	<u>0</u>
43. Fuel shortage and price increase has improved business	<u>5</u>	<u>26</u>	<u>0</u>
44. Fuel shortage and price increase has decreased business	<u>11</u>	<u>20</u>	<u>0</u>
45. Familiar with state inspection system	<u>27</u>	<u>1</u>	<u>3</u>
46. Familiar with emission control regulations	<u>27</u>	<u>4</u>	<u>0</u>
47. Compliance with emission control regulations	<u>27</u>	<u>4</u>	<u>0</u>
48. Emission control devices disconnected	<u>11</u>	<u>20</u>	<u>0</u>
49. 0 to 10 percent disconnected	<u>7</u>	<u>24</u>	<u>0</u>
50. 11 to 20 percent disconnected	<u>3</u>	<u>28</u>	<u>0</u>
51. 21 to 50 percent disconnected	<u>0</u>	<u>31</u>	<u>0</u>
52. 51 and up disconnected	<u>0</u>	<u>31</u>	<u>0</u>
53. Reconnects emission devices	<u>10</u>	<u>6</u>	<u>15</u>

COMMERCIAL CONSOLIDATED TALLY SHEET

DATES 12/1/74 - 12/21/74AREA DetroitQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
01. Can service American Motors Corporation	<u>27</u>	<u>1</u>	<u>0</u>
02. Can service Chrysler Corporation	<u>27</u>	<u>1</u>	<u>0</u>
03. Can service Ford Motor Corporation	<u>27</u>	<u>1</u>	<u>0</u>
04. Can service General Motors Corporation	<u>26</u>	<u>2</u>	<u>0</u>
05. Can service Nissan Motors Corporation	<u>5</u>	<u>23</u>	<u>0</u>
06. Can service Toyota Motors Corporation	<u>6</u>	<u>22</u>	<u>0</u>
07. Can service Volkswagen Motors Corporation	<u>6</u>	<u>22</u>	<u>0</u>
08. Can service Mazda Motors Corporation	<u>4</u>	<u>24</u>	<u>0</u>
09. Check, adjust, or replace carburetor	<u>27</u>	<u>1</u>	<u>0</u>
10. Check, adjust, or replace emission controls	<u>26</u>	<u>2</u>	<u>0</u>
11. Check, adjust, or replace exhaust system	<u>27</u>	<u>1</u>	<u>0</u>
12. Check, adjust, or replace ignition system	<u>26</u>	<u>2</u>	<u>0</u>
13. Check, adjust, or replace electronic ignition	<u>9</u>	<u>19</u>	<u>0</u>

COMMERCIAL CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 12/1/74 - 12/21/74AREA DetroitQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
14. Check, adjust, or replace valve lash	<u>15</u>	<u>13</u>	<u>0</u>
15. Have timing light	<u>26</u>	<u>2</u>	<u>0</u>
16. Have dwell meter	<u>26</u>	<u>2</u>	<u>0</u>
17. Have ignition analyzer	<u>23</u>	<u>5</u>	<u>0</u>
18. Have exhaust analyzer	<u>16</u>	<u>12</u>	<u>0</u>
19. Have choke analyzer	<u>9</u>	<u>19</u>	<u>0</u>
20. Have air pump analyzer	<u>4</u>	<u>24</u>	<u>0</u>
21. Have fuel injection analyzer	<u>4</u>	<u>24</u>	<u>0</u>
22. Have PCV analyzer	<u>15</u>	<u>13</u>	<u>0</u>
23. Have vacuum analyzer	<u>24</u>	<u>4</u>	<u>0</u>
24. Have air cleaner heat stove analyzer	<u>2</u>	<u>26</u>	<u>0</u>
25. Have belt tension gage	<u>6</u>	<u>22</u>	<u>0</u>
26. Have combination	<u>23</u>	<u>5</u>	<u>0</u>

COMMERCIAL CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 12/1/74 - 12/21/74AREA DetroitQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
27. Have source of new maintenance instructions	<u>25</u>	<u>3</u>	<u>0</u>
28. Have complete vacuum charts and electric schematics	<u>17</u>	<u>11</u>	<u>0</u>
29. Anticipates major changes in 1975 and later models	<u>16</u>	<u>9</u>	<u>3</u>
30. Advised of changes expected in maintenance requirements	<u>10</u>	<u>16</u>	<u>2</u>
31. Will modify existing equipment	<u>12</u>	<u>12</u>	<u>4</u>
32. Will purchase additional equipment	<u>18</u>	<u>3</u>	<u>7</u>
33. Planning procurement of equipment to service the catalytic converter	<u>12</u>	<u>8</u>	<u>8</u>
34. Need current level, no additional training	<u>4</u>	<u>24</u>	<u>0</u>
35. Need present mechanic's, in-house training	<u>17</u>	<u>11</u>	<u>0</u>
36. Need present mechanic's outside training	<u>13</u>	<u>15</u>	<u>0</u>
37. Need additional <u>Specially</u> trained mechanics	<u>1</u>	<u>27</u>	<u>0</u>
38. Have taken and passed training program	<u>11</u>	<u>15</u>	<u>2</u>
39. Have mechanic classification for skill level	<u>1</u>	<u>26</u>	<u>1</u>

COMMERCIAL CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 12/1/74 - 12/21/74AREA DetroitQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
40. Repeat customers 0 to 50 percent	<u>2</u>	<u>24</u>	<u>2</u>
41. Repeat customers 51 to 75 percent	<u>13</u>	<u>13</u>	<u>2</u>
42. Repeat customers 76 to 95 percent	<u>10</u>	<u>16</u>	<u>2</u>
43. Fuel shortage and price increase has improved business	<u>9</u>	<u>17</u>	<u>2</u>
44. Fuel shortage and price increase has decreased business	<u>10</u>	<u>16</u>	<u>2</u>
45. Familiar with state inspection system	<u>5</u>	<u>23</u>	<u>0</u>
46. Familiar with emission control regulations	<u>24</u>	<u>4</u>	<u>0</u>
47. Compliance with emission control regulations	<u>26</u>	<u>1</u>	<u>1</u>
48. Emission control devices disconnected	<u>17</u>	<u>11</u>	<u>0</u>
49. 0 to 10 percent disconnected	<u>12</u>	<u>16</u>	<u>0</u>
50. 11 to 20 percent disconnected	<u>2</u>	<u>26</u>	<u>0</u>
51. 21 to 50 percent disconnected	<u>2</u>	<u>26</u>	<u>0</u>
52. 51 and up disconnected	<u>1</u>	<u>27</u>	<u>0</u>
53. Reconnects emission devices	<u>2</u>	<u>14</u>	<u>12</u>

COMMERCIAL CONSOLIDATED TALLY SHEET

DATES 12/1/74 ÷ 12/21/74AREA ChicagoQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
01. Can service American Motors Corporation	<u>29</u>	<u>0</u>	<u>0</u>
02. Can service Chrysler Corporation	<u>29</u>	<u>0</u>	<u>0</u>
03. Can service Ford Motor Corporation	<u>29</u>	<u>0</u>	<u>0</u>
04. Can service General Motors Corporation	<u>29</u>	<u>0</u>	<u>0</u>
05. Can service Nissan Motors Corporation	<u>2</u>	<u>27</u>	<u>0</u>
06. Can service Toyota Motors Corporation	<u>3</u>	<u>26</u>	<u>0</u>
07. Can service Volkswagen Motors Corporation	<u>5</u>	<u>24</u>	<u>0</u>
08. Can service Mazda Motors Corporation	<u>3</u>	<u>26</u>	<u>0</u>
09. Check, adjust, or replace carburetor	<u>28</u>	<u>1</u>	<u>0</u>
10. Check, adjust, or replace emission controls	<u>28</u>	<u>1</u>	<u>0</u>
11. Check, adjust, or replace exhaust system	<u>28</u>	<u>1</u>	<u>0</u>
12. Check, adjust, or replace ignition system	<u>28</u>	<u>1</u>	<u>0</u>
13. Check, adjust, or replace electronic ignition	<u>15</u>	<u>14</u>	<u>0</u>

COMMERCIAL CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 12/1/74 - 12/21/74AREA ChicagoQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
14. Check, adjust, or replace valve lash	<u>14</u>	<u>15</u>	<u>0</u>
15. Have timing light	<u>28</u>	<u>1</u>	<u>0</u>
16. Have dwell meter	<u>28</u>	<u>1</u>	<u>0</u>
17. Have ignition analyzer	<u>23</u>	<u>6</u>	<u>0</u>
18. Have exhaust analyzer	<u>16</u>	<u>13</u>	<u>0</u>
19. Have choke analyzer	<u>10</u>	<u>19</u>	<u>0</u>
20. Have air pump analyzer	<u>10</u>	<u>19</u>	<u>0</u>
21. Have fuel injection analyzer	<u>5</u>	<u>24</u>	<u>0</u>
22. Have PCV analyzer	<u>14</u>	<u>15</u>	<u>0</u>
23. Have vacuum analyzer	<u>18</u>	<u>11</u>	<u>0</u>
24. Have air cleaner heat stove analyzer	<u>7</u>	<u>22</u>	<u>0</u>
25. Have belt tension gage	<u>13</u>	<u>16</u>	<u>0</u>
26. Have combination	<u>21</u>	<u>8</u>	<u>0</u>

COMMERCIAL CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 12/1/74 - 12/21/74AREA ChicagoQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
27. Have source of new maintenance instructions	<u>26</u>	<u>2</u>	<u>1</u>
28. Have complete vacuum charts and electric schematics	<u>20</u>	<u>8</u>	<u>1</u>
29. Anticipates major changes in 1975 and later models	<u>12</u>	<u>10</u>	<u>7</u>
30. Advised of changes expected in maintenance requirements	<u>14</u>	<u>14</u>	<u>1</u>
31. Will modify existing equipment	<u>12</u>	<u>8</u>	<u>9</u>
32. Will purchase additional equipment	<u>11</u>	<u>1</u>	<u>17</u>
33. Planning procurement of equipment to service the catalytic converter	<u>9</u>	<u>7</u>	<u>13</u>
34. Need current level, no additional training	<u>3</u>	<u>25</u>	<u>1</u>
35. Need present mechanic's, in-house training	<u>20</u>	<u>9</u>	<u>0</u>
36. Need present mechanic's outside training	<u>17</u>	<u>12</u>	<u>0</u>
37. Need additional <u>Specially</u> trained mechanics	<u>4</u>	<u>25</u>	<u>0</u>
38. Have taken and passed training program	<u>12</u>	<u>17</u>	<u>0</u>
39. Have mechanic classification for skill level	<u>2</u>	<u>27</u>	<u>0</u>

COMMERCIAL CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 12/1/74 - 12/21/74AREA ChicagoQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
40. Repeat customers 0 to 50 percent	<u>4</u>	<u>25</u>	<u>0</u>
41. Repeat customers 51 to 75 percent	<u>11</u>	<u>18</u>	<u>0</u>
42. Repeat customers 76 to 95 percent	<u>13</u>	<u>16</u>	<u>0</u>
43. Fuel shortage and price increase has improved business	<u>6</u>	<u>23</u>	<u>0</u>
44. Fuel shortage and price increase has decreased business	<u>11</u>	<u>18</u>	<u>0</u>
45. Familiar with state inspection system	<u>0</u>	<u>29</u>	<u>0</u>
46. Familiar with emission control regulations	<u>21</u>	<u>8</u>	<u>0</u>
47. Compliance with emission control regulations	<u>27</u>	<u>2</u>	<u>0</u>
48. Emission control devices disconnected	<u>12</u>	<u>17</u>	<u>0</u>
49. 0 to 10 percent disconnected	<u>9</u>	<u>20</u>	<u>0</u>
50. 11 to 20 percent disconnected	<u>1</u>	<u>28</u>	<u>0</u>
51. 21 to 50 percent disconnected	<u>1</u>	<u>28</u>	<u>0</u>
52. 51 and up disconnected	<u>0</u>	<u>29</u>	<u>0</u>
53. Reconnects emission devices	<u>4</u>	<u>6</u>	<u>19</u>

COMMERCIAL CONSOLIDATED TALLY SHEET

DATES 2/23/75 - 3/8/75AREA Los AngelesQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
01. Can service American Motors Corporation	<u>29</u>	<u>0</u>	<u>0</u>
02. Can service Chrysler Corporation	<u>29</u>	<u>0</u>	<u>0</u>
03. Can service Ford Motor Corporation	<u>28</u>	<u>1</u>	<u>0</u>
04. Can service General Motors Corporation	<u>29</u>	<u>0</u>	<u>0</u>
05. Can service Nissan Motors Corporation	<u>20</u>	<u>9</u>	<u>0</u>
06. Can service Toyota Motors Corporation	<u>20</u>	<u>9</u>	<u>0</u>
07. Can service Volkswagen Motors Corporation	<u>20</u>	<u>9</u>	<u>0</u>
08. Can service Mazda Motors Corporation	<u>10</u>	<u>19</u>	<u>0</u>
09. Check, adjust, or replace carburetor	<u>29</u>	<u>0</u>	<u>0</u>
10. Check, adjust, or replace emission controls	<u>28</u>	<u>1</u>	<u>0</u>
11. Check, adjust, or replace exhaust system	<u>20</u>	<u>9</u>	<u>0</u>
12. Check, adjust, or replace ignition system	<u>28</u>	<u>1</u>	<u>0</u>
13. Check, adjust, or replace electronic ignition	<u>17</u>	<u>12</u>	<u>0</u>

COMMERCIAL CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 2/23/75 - 3/8/75AREA Los AngelesQUESTIONS

14. Check, adjust, or replace valve lash
15. Have timing light
16. Have dwell meter
17. Have ignition analyzer
18. Have exhaust analyzer
19. Have choke analyzer
20. Have air pump analyzer
21. Have fuel injection analyzer
22. Have PCV analyzer
23. Have vacuum analyzer
24. Have air cleaner heat stove analyzer
25. Have belt tension gage
26. Have combination

<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
<u>19</u>	<u>10</u>	<u>0</u>
<u>28</u>	<u>1</u>	<u>0</u>
<u>29</u>	<u>0</u>	<u>0</u>
<u>29</u>	<u>0</u>	<u>0</u>
<u>19</u>	<u>10</u>	<u>0</u>
<u>16</u>	<u>13</u>	<u>0</u>
<u>11</u>	<u>18</u>	<u>0</u>
<u>5</u>	<u>24</u>	<u>0</u>
<u>15</u>	<u>14</u>	<u>0</u>
<u>26</u>	<u>3</u>	<u>0</u>
<u>6</u>	<u>23</u>	<u>0</u>
<u>15</u>	<u>14</u>	<u>0</u>
<u>22</u>	<u>7</u>	<u>0</u>

COMMERCIAL CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 2/23/75 - 3/8/75AREA Los AngelesQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
27. Have source of new maintenance instructions	<u>28</u>	<u>1</u>	<u>0</u>
28. Have complete vacuum charts and electric schematics	<u>15</u>	<u>13</u>	<u>1</u>
29. Anticipates major changes in 1975 and later models	<u>15</u>	<u>9</u>	<u>5</u>
30. Advised of changes expected in maintenance requirements	<u>18</u>	<u>10</u>	<u>1</u>
31. Will modify existing equipment	<u>16</u>	<u>4</u>	<u>9</u>
32. Will purchase additional equipment	<u>18</u>	<u>5</u>	<u>6</u>
33. Planning procurement of equipment to service the catalytic converter	<u>4</u>	<u>13</u>	<u>12</u>
34. Need current level, no additional training	<u>0</u>	<u>28</u>	<u>1</u>
35. Need present mechanic's, in-house training	<u>13</u>	<u>15</u>	<u>1</u>
36. Need present mechanic's outside training	<u>21</u>	<u>7</u>	<u>1</u>
37. Need additional <u>Specially</u> trained mechanics	<u>0</u>	<u>28</u>	<u>1</u>
38. Have taken and passed training program	<u>22</u>	<u>5</u>	<u>2</u>
39. Have mechanic classification for skill level	<u>1</u>	<u>26</u>	<u>2</u>

COMMERCIAL CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 2/23/75 - 3/8/75AREA Los AngelesQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
40. Repeat customers 0 to 50 percent	<u>7</u>	<u>20</u>	<u>2</u>
41. Repeat customers 51 to 75 percent	<u>13</u>	<u>14</u>	<u>2</u>
42. Repeat customers 76 to 95 percent	<u>7</u>	<u>20</u>	<u>2</u>
43. Fuel shortage and price increase has improved business	<u>6</u>	<u>21</u>	<u>2</u>
44. Fuel shortage and price increase has decreased business	<u>4</u>	<u>23</u>	<u>2</u>
45. Familiar with state inspection system	<u>7</u>	<u>20</u>	<u>2</u>
46. Familiar with emission control regulations	<u>25</u>	<u>2</u>	<u>2</u>
47. Compliance with emission control regulations	<u>26</u>	<u>1</u>	<u>2</u>
48. Emission control devices disconnected	<u>10</u>	<u>17</u>	<u>2</u>
49. 0 to 10 percent disconnected	<u>9</u>	<u>18</u>	<u>2</u>
50. 11 to 20 percent disconnected	<u>0</u>	<u>27</u>	<u>2</u>
51. 21 to 50 percent disconnected	<u>0</u>	<u>27</u>	<u>2</u>
52. 51 and up disconnected	<u>0</u>	<u>27</u>	<u>2</u>
53. Reconnects emission devices	<u>10</u>	<u>14</u>	<u>5</u>

COMMERCIAL CONSOLIDATED TALLY SHEET

DATES 2/27/75 - 3/8/75AREA PhoenixQUESTIONS

01. Can service American Motors Corporation
02. Can service Chrysler Corporation
03. Can service Ford Motor Corporation
04. Can service General Motors Corporation
05. Can service Nissan Motors Corporation
06. Can service Toyota Motors Corporation
07. Can service Volkswagen Motors Corporation
08. Can service Mazda Motors Corporation
09. Check, adjust, or replace carburetor
10. Check, adjust, or replace emission controls
11. Check, adjust, or replace exhaust system
12. Check, adjust, or replace ignition system
13. Check, adjust, or replace electronic ignition

<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
<u>41</u>	<u>2</u>	<u>0</u>
<u>41</u>	<u>2</u>	<u>0</u>
<u>41</u>	<u>2</u>	<u>0</u>
<u>41</u>	<u>2</u>	<u>0</u>
<u>27</u>	<u>16</u>	<u>0</u>
<u>27</u>	<u>16</u>	<u>0</u>
<u>22</u>	<u>21</u>	<u>0</u>
<u>8</u>	<u>35</u>	<u>0</u>
<u>40</u>	<u>3</u>	<u>0</u>
<u>42</u>	<u>1</u>	<u>0</u>
<u>33</u>	<u>10</u>	<u>0</u>
<u>39</u>	<u>4</u>	<u>0</u>
<u>30</u>	<u>13</u>	<u>0</u>

COMMERCIAL CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 2/27/75 - 3/8/75AREA PhoenixQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
14. Check, adjust, or replace valve lash	<u>25</u>	<u>18</u>	<u>0</u>
15. Have timing light	<u>43</u>	<u>0</u>	<u>0</u>
16. Have dwell meter	<u>43</u>	<u>0</u>	<u>0</u>
17. Have ignition analyzer	<u>38</u>	<u>5</u>	<u>0</u>
18. Have exhaust analyzer	<u>11</u>	<u>32</u>	<u>0</u>
19. Have choke analyzer	<u>15</u>	<u>28</u>	<u>0</u>
20. Have air pump analyzer	<u>10</u>	<u>33</u>	<u>0</u>
21. Have fuel injection analyzer	<u>11</u>	<u>32</u>	<u>0</u>
22. Have PCV analyzer	<u>36</u>	<u>7</u>	<u>0</u>
23. Have vacuum analyzer	<u>37</u>	<u>6</u>	<u>0</u>
24. Have air cleaner heat stove analyzer	<u>12</u>	<u>31</u>	<u>0</u>
25. Have belt tension gage	<u>27</u>	<u>16</u>	<u>0</u>
26. Have combination	<u>27</u>	<u>16</u>	<u>0</u>

COMMERCIAL CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 2/27/75 - 3/8/75AREA PhoenixQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
27. Have source of new maintenance instructions	<u>40</u>	<u>3</u>	<u>0</u>
28. Have complete vacuum charts and electric schematics	<u>33</u>	<u>9</u>	<u>1</u>
29. Anticipates major changes in 1975 and later models	<u>32</u>	<u>9</u>	<u>2</u>
30. Advised of changes expected in maintenance requirements	<u>31</u>	<u>10</u>	<u>2</u>
31. Will modify existing equipment	<u>26</u>	<u>14</u>	<u>3</u>
32. Will purchase additional equipment	<u>33</u>	<u>5</u>	<u>5</u>
33. Planning procurement of equipment to service the catalytic converter	<u>10</u>	<u>26</u>	<u>7</u>
34. Need current level, no additional training	<u>1</u>	<u>41</u>	<u>1</u>
35. Need present mechanic's, in-house training	<u>35</u>	<u>7</u>	<u>1</u>
36. Need present mechanic's outside training	<u>29</u>	<u>13</u>	<u>1</u>
37. Need additional <u>Specially</u> trained mechanics	<u>3</u>	<u>39</u>	<u>1</u>
38. Have taken and passed training program	<u>26</u>	<u>15</u>	<u>2</u>
39. Have mechanic classification for skill level	<u>9</u>	<u>33</u>	<u>1</u>

COMMERCIAL CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 2/27/75 - 3/8/75AREA PhoenixQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
40. Repeat customers 0 to 50 percent	<u>12</u>	<u>30</u>	<u>1</u>
41. Repeat customers 51 to 75 percent	<u>14</u>	<u>28</u>	<u>1</u>
42. Repeat customers 76 to 95 percent	<u>16</u>	<u>26</u>	<u>1</u>
43. Fuel shortage and price increase has improved business	<u>16</u>	<u>25</u>	<u>2</u>
44. Fuel shortage and price increase has decreased business	<u>17</u>	<u>25</u>	<u>1</u>
45. Familiar with state inspection system	<u>5</u>	<u>37</u>	<u>1</u>
46. Familiar with emission control regulations	<u>37</u>	<u>5</u>	<u>1</u>
47. Compliance with emission control regulations	<u>38</u>	<u>2</u>	<u>3</u>
48. Emission control devices disconnected	<u>32</u>	<u>10</u>	<u>1</u>
49. 0 to 10 percent disconnected	<u>27</u>	<u>15</u>	<u>1</u>
50. 11 to 20 percent disconnected	<u>1</u>	<u>41</u>	<u>1</u>
51. 21 to 50 percent disconnected	<u>1</u>	<u>41</u>	<u>1</u>
52. 51 and up disconnected	<u>0</u>	<u>42</u>	<u>1</u>
53. Reconnects emission devices	<u>11</u>	<u>25</u>	<u>7</u>

COMMERCIAL CONSOLIDATED TALLY SHEET

DATES 1/13/75 - 2/1/75AREA SeattleQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
01. Can service American Motors Corporation	<u>37</u>	<u>0</u>	<u>0</u>
02. Can service Chrysler Corporation	<u>37</u>	<u>0</u>	<u>0</u>
03. Can service Ford Motor Corporation	<u>37</u>	<u>0</u>	<u>0</u>
04. Can service General Motors Corporation	<u>37</u>	<u>0</u>	<u>0</u>
05. Can service Nissan Motors Corporation	<u>25</u>	<u>12</u>	<u>0</u>
06. Can service Toyota Motors Corporation	<u>27</u>	<u>10</u>	<u>0</u>
07. Can service Volkswagen Motors Corporation	<u>23</u>	<u>14</u>	<u>0</u>
08. Can service Mazda Motors Corporation	<u>5</u>	<u>32</u>	<u>0</u>
09. Check, adjust, or replace carburetor	<u>37</u>	<u>0</u>	<u>0</u>
10. Check, adjust, or replace emission controls	<u>37</u>	<u>0</u>	<u>0</u>
11. Check, adjust, or replace exhaust system	<u>35</u>	<u>2</u>	<u>0</u>
12. Check, adjust, or replace ignition system	<u>34</u>	<u>3</u>	<u>0</u>
13. Check, adjust, or replace electronic ignition	<u>20</u>	<u>17</u>	<u>0</u>

COMMERCIAL CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 1/13/75 - 2/1/75AREA SeattleQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
14. Check, adjust, or replace valve lash	<u>22</u>	<u>15</u>	<u>0</u>
15. Have timing light	<u>37</u>	<u>0</u>	<u>0</u>
16. Have dwell meter	<u>37</u>	<u>0</u>	<u>0</u>
17. Have ignition analyzer	<u>37</u>	<u>0</u>	<u>0</u>
18. Have exhaust analyzer	<u>26</u>	<u>11</u>	<u>0</u>
19. Have choke analyzer	<u>7</u>	<u>30</u>	<u>0</u>
20. Have air pump analyzer	<u>4</u>	<u>33</u>	<u>0</u>
21. Have fuel injection analyzer	<u>3</u>	<u>34</u>	<u>0</u>
22. Have PCV analyzer	<u>12</u>	<u>25</u>	<u>0</u>
23. Have vacuum analyzer	<u>31</u>	<u>6</u>	<u>0</u>
24. Have air cleaner heat stove analyzer	<u>5</u>	<u>32</u>	<u>0</u>
25. Have belt tension gage	<u>5</u>	<u>32</u>	<u>0</u>
26. Have combination	<u>28</u>	<u>9</u>	<u>0</u>

COMMERCIAL CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 1/13/75 - 2/1/75AREA SeattleQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
27. Have source of new maintenance instructions	<u>34</u>	<u>3</u>	<u>0</u>
28. Have complete vacuum charts and electric schematics	<u>23</u>	<u>12</u>	<u>2</u>
29. Anticipates major changes in 1975 and later models	<u>14</u>	<u>11</u>	<u>12</u>
30. Advised of changes expected in maintenance requirements	<u>20</u>	<u>13</u>	<u>4</u>
31. Will modify existing equipment	<u>6</u>	<u>16</u>	<u>15</u>
32. Will purchase additional equipment	<u>13</u>	<u>7</u>	<u>17</u>
33. Planning procurement of equipment to service the catalytic converter	<u>10</u>	<u>12</u>	<u>15</u>
34. Need current level, no additional training	<u>18</u>	<u>19</u>	<u>0</u>
35. Need present mechanic's, in-house training	<u>17</u>	<u>20</u>	<u>0</u>
36. Need present mechanic's outside training	<u>10</u>	<u>27</u>	<u>0</u>
37. Need additional <u>Specially</u> trained mechanics	<u>1</u>	<u>36</u>	<u>0</u>
38. Have taken and passed training program	<u>11</u>	<u>26</u>	<u>0</u>
39. Have mechanic classification for skill level	<u>3</u>	<u>34</u>	<u>0</u>

COMMERCIAL CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 1/13/75 - 2/1/75AREA SeattleQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
40. Repeat customers 0 to 50 percent	<u>6</u>	<u>31</u>	<u>0</u>
41. Repeat customers 51 to 75 percent	<u>27</u>	<u>10</u>	<u>0</u>
42. Repeat customers 76 to 95 percent	<u>4</u>	<u>33</u>	<u>0</u>
43. Fuel shortage and price increase has improved business	<u>9</u>	<u>26</u>	<u>2</u>
44. Fuel shortage and price increase has decreased business	<u>10</u>	<u>25</u>	<u>2</u>
45. Familiar with state inspection system	<u>2</u>	<u>35</u>	<u>0</u>
46. Familiar with emission control regulations	<u>32</u>	<u>5</u>	<u>0</u>
47. Compliance with emission control regulations	<u>32</u>	<u>5</u>	<u>0</u>
48. Emission control devices disconnected	<u>20</u>	<u>17</u>	<u>0</u>
49. 0 to 10 percent disconnected	<u>13</u>	<u>24</u>	<u>0</u>
50. 11 to 20 percent disconnected	<u>37</u>	<u>0</u>	<u>0</u>
51. 21 to 50 percent disconnected	<u>3</u>	<u>34</u>	<u>0</u>
52. 51 and up disconnected	<u>1</u>	<u>36</u>	<u>0</u>
53. Reconnects emission devices	<u>5</u>	<u>7</u>	<u>25</u>

COMMERCIAL CONSOLIDATED TALLY SHEET

DATES 1/13/75 - 2/8/75AREA Denver

<u>QUESTIONS</u>	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
01. Can service American Motors Corporation	<u>34</u>	<u>4</u>	<u>0</u>
02. Can service Chrysler Corporation	<u>35</u>	<u>3</u>	<u>0</u>
03. Can service Ford Motor Corporation	<u>36</u>	<u>2</u>	<u>0</u>
04. Can service General Motors Corporation	<u>35</u>	<u>3</u>	<u>0</u>
05. Can service Nissan Motors Corporation	<u>28</u>	<u>10</u>	<u>0</u>
06. Can service Toyota Motors Corporation	<u>28</u>	<u>10</u>	<u>0</u>
07. Can service Volkswagen Motors Corporation	<u>27</u>	<u>11</u>	<u>0</u>
08. Can service Mazda Motors Corporation	<u>14</u>	<u>24</u>	<u>0</u>
09. Check, adjust, or replace carburetor	<u>37</u>	<u>1</u>	<u>0</u>
10. Check, adjust, or replace emission controls	<u>38</u>	<u>0</u>	<u>0</u>
11. Check, adjust, or replace exhaust system	<u>36</u>	<u>2</u>	<u>0</u>
12. Check, adjust, or replace ignition system	<u>36</u>	<u>2</u>	<u>0</u>
13. Check, adjust, or replace electronic ignition	<u>29</u>	<u>9</u>	<u>0</u>

COMMERCIAL CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 1/13/75 - 2/8/75AREA DenverQUESTIONS

14. Check, adjust, or replace valve lash
15. Have timing light
16. Have dwell meter
17. Have ignition analyzer
18. Have exhaust analyzer
19. Have choke analyzer
20. Have air pump analyzer
21. Have fuel injection analyzer
22. Have PCV analyzer
23. Have vacuum analyzer
24. Have air cleaner heat stove analyzer
25. Have belt tension gage
26. Have combination

<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
<u>25</u>	<u>13</u>	<u>0</u>
<u>38</u>	<u>0</u>	<u>0</u>
<u>38</u>	<u>0</u>	<u>0</u>
<u>36</u>	<u>2</u>	<u>0</u>
<u>22</u>	<u>16</u>	<u>0</u>
<u>17</u>	<u>21</u>	<u>0</u>
<u>15</u>	<u>23</u>	<u>0</u>
<u>6</u>	<u>32</u>	<u>0</u>
<u>21</u>	<u>17</u>	<u>0</u>
<u>36</u>	<u>2</u>	<u>0</u>
<u>7</u>	<u>31</u>	<u>0</u>
<u>19</u>	<u>19</u>	<u>0</u>
<u>32</u>	<u>6</u>	<u>0</u>

COMMERCIAL CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 1/13/75 - 2/8/75AREA DenverQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
27. Have source of new maintenance instructions	<u>37</u>	<u>1</u>	<u>0</u>
28. Have complete vacuum charts and electric schematics	<u>22</u>	<u>15</u>	<u>1</u>
29. Anticipates major changes in 1975 and later models	<u>24</u>	<u>8</u>	<u>6</u>
30. Advised of changes expected in maintenance requirements	<u>27</u>	<u>10</u>	<u>1</u>
31. Will modify existing equipment	<u>15</u>	<u>10</u>	<u>13</u>
32. Will purchase additional equipment	<u>27</u>	<u>7</u>	<u>4</u>
33. Planning procurement of equipment to service the catalytic converter	<u>14</u>	<u>16</u>	<u>8</u>
34. Need current level, no additional training	<u>6</u>	<u>30</u>	<u>2</u>
35. Need present mechanic's, in-house training	<u>26</u>	<u>11</u>	<u>1</u>
36. Need present mechanic's outside training	<u>23</u>	<u>14</u>	<u>1</u>
37. Need additional <u>Specially</u> trained mechanics	<u>2</u>	<u>35</u>	<u>1</u>
38. Have taken and passed training program	<u>20</u>	<u>17</u>	<u>1</u>
39. Have mechanic classification for skill level	<u>1</u>	<u>36</u>	<u>1</u>

COMMERCIAL CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 1/13/75 - 2/8/75AREA DenyerQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
40. Repeat customers 0 to 50 percent	<u>14</u>	<u>22</u>	<u>2</u>
41. Repeat customers 51 to 75 percent	<u>15</u>	<u>21</u>	<u>2</u>
42. Repeat customers 76 to 95 percent	<u>10</u>	<u>26</u>	<u>2</u>
43. Fuel shortage and price increase has improved business	<u>10</u>	<u>27</u>	<u>1</u>
44. Fuel shortage and price increase has decreased business	<u>18</u>	<u>19</u>	<u>1</u>
45. Familiar with state inspection system	<u>36</u>	<u>1</u>	<u>1</u>
46. Familiar with emission control regulations	<u>29</u>	<u>7</u>	<u>2</u>
47. Compliance with emission control regulations	<u>35</u>	<u>1</u>	<u>2</u>
48. Emission control devices disconnected	<u>29</u>	<u>8</u>	<u>1</u>
49. 0 to 10 percent disconnected	<u>25</u>	<u>12</u>	<u>1</u>
50. 11 to 20 percent disconnected	<u>0</u>	<u>37</u>	<u>1</u>
51. 21 to 50 percent disconnected	<u>2</u>	<u>35</u>	<u>1</u>
52. 51 and up disconnected	<u>0</u>	<u>37</u>	<u>1</u>
53. Reconnects emission devices	<u>7</u>	<u>22</u>	<u>9</u>

COMMERCIAL CONSOLIDATED TALLY SHEET

DATES 9/23/74 - 3/18/75AREA NationalQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
01. Can service American Motors Corporation	<u>287</u>	<u>10</u>	<u>0</u>
02. Can service Chrysler Corporation	<u>289</u>	<u>8</u>	<u>0</u>
03. Can service Ford Motor Corporation	<u>289</u>	<u>8</u>	<u>0</u>
04. Can service General Motors Corporation	<u>286</u>	<u>11</u>	<u>0</u>
05. Can service Nissan Motors Corporation	<u>150</u>	<u>147</u>	<u>0</u>
06. Can service Toyota Motors Corporation	<u>163</u>	<u>134</u>	<u>0</u>
07. Can service Volkswagen Motors Corporation	<u>154</u>	<u>143</u>	<u>0</u>
08. Can service Mazda Motors Corporation	<u>80</u>	<u>217</u>	<u>0</u>
09. Check, adjust, or replace carburetor	<u>284</u>	<u>12</u>	<u>1</u>
10. Check, adjust, or replace emission controls	<u>286</u>	<u>10</u>	<u>1</u>
11. Check, adjust, or replace exhaust system	<u>267</u>	<u>29</u>	<u>1</u>
12. Check, adjust, or replace ignition system	<u>279</u>	<u>17</u>	<u>1</u>
13. Check, adjust, or replace electronic ignition	<u>185</u>	<u>111</u>	<u>1</u>

COMMERCIAL CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 9/23/74 - 3/18/75AREA NationalQUESTIONS

14. Check, adjust, or replace valve lash
15. Have timing light
16. Have dwell meter
17. Have ignition analyzer
18. Have exhaust analyzer
19. Have choke analyzer
20. Have air pump analyzer
21. Have fuel injection analyzer
22. Have PCV analyzer
23. Have vacuum analyzer
24. Have air cleaner heat stove analyzer
25. Have belt tension gage
26. Have combination

<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
<u>186</u>	<u>110</u>	<u>1</u>
<u>292</u>	<u>4</u>	<u>1</u>
<u>292</u>	<u>4</u>	<u>1</u>
<u>265</u>	<u>31</u>	<u>1</u>
<u>175</u>	<u>121</u>	<u>1</u>
<u>116</u>	<u>180</u>	<u>1</u>
<u>83</u>	<u>213</u>	<u>1</u>
<u>54</u>	<u>242</u>	<u>1</u>
<u>181</u>	<u>115</u>	<u>1</u>
<u>253</u>	<u>43</u>	<u>1</u>
<u>68</u>	<u>228</u>	<u>1</u>
<u>132</u>	<u>164</u>	<u>1</u>
<u>206</u>	<u>90</u>	<u>1</u>

COMMERCIAL CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 9/23/74 - 3/18/75AREA NationalQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
27. Have source of new maintenance instructions	<u>280</u>	<u>15</u>	<u>2</u>
28. Have complete vacuum charts and electric schematics	<u>196</u>	<u>92</u>	<u>9</u>
29. Anticipates major changes in 1975 and later models	<u>159</u>	<u>74</u>	<u>64</u>
30. Advised of changes expected in maintenance requirements	<u>151</u>	<u>132</u>	<u>14</u>
31. Will modify existing equipment	<u>120</u>	<u>92</u>	<u>85</u>
32. Will purchase additional equipment	<u>158</u>	<u>50</u>	<u>89</u>
33. Planning procurement of equipment to service the catalytic converter	<u>102</u>	<u>113</u>	<u>82</u>
34. Need current level, no additional training	<u>46</u>	<u>246</u>	<u>5</u>
35. Need present mechanic's, in-house training	<u>192</u>	<u>102</u>	<u>3</u>
36. Need present mechanic's outside training	<u>157</u>	<u>137</u>	<u>3</u>
37. Need additional <u>Specially</u> trained mechanics	<u>15</u>	<u>279</u>	<u>3</u>
38. Have taken and passed training program	<u>152</u>	<u>136</u>	<u>9</u>
39. Have mechanic classification for skill level	<u>23</u>	<u>267</u>	<u>7</u>

COMMERCIAL CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 9/23/74 - 3/18/75AREA NationalQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
40. Repeat customers 0 to 50 percent	<u>69</u>	<u>221</u>	<u>7</u>
41. Repeat customers 51 to 75 percent	<u>122</u>	<u>168</u>	<u>7</u>
42. Repeat customers 76 to 95 percent	<u>100</u>	<u>190</u>	<u>7</u>
43. Fuel shortage and price increase has improved business	<u>75</u>	<u>213</u>	<u>9</u>
44. Fuel shortage and price increase has decreased business	<u>101</u>	<u>188</u>	<u>8</u>
45. Familiar with state inspection system	<u>144</u>	<u>146</u>	<u>7</u>
46. Familiar with emission control regulations	<u>246</u>	<u>46</u>	<u>5</u>
47. Compliance with emission control regulations	<u>271</u>	<u>17</u>	<u>9</u>
48. Emission control devices disconnected	<u>164</u>	<u>129</u>	<u>4</u>
49. 0 to 10 percent disconnected	<u>125</u>	<u>168</u>	<u>4</u>
50. 11 to 20 percent disconnected	<u>48</u>	<u>245</u>	<u>4</u>
51. 21 to 50 percent disconnected	<u>13</u>	<u>280</u>	<u>4</u>
52. 51 and up disconnected	<u>3</u>	<u>290</u>	<u>4</u>
53. Reconnects emission devices	<u>70</u>	<u>117</u>	<u>110</u>

DEALER CONSOLIDATED TALLY SHEET

DATES 9/23/74 - 10/4/74AREA TampaQUESTIONS

01. Can all manufacturers' specifications be accomplished
02. Anticipates major changes in 1975 and later models
03. Advised of changes expected in maintenance requirements
04. Will modify existing equipment
05. Will purchase additional equipment
06. Planning procurement of equipment to service the catalytic converter
07. Check, adjust, or replace carburetor
08. Check, adjust, or replace emission controls
09. Check, adjust, or replace exhaust system
10. Check, adjust, or replace ignition system
11. Check, adjust, or replace electronic ignition
12. Check, adjust valve lash

<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
<u>18</u>	<u>1</u>	<u>0</u>
<u>13</u>	<u>6</u>	<u>0</u>
<u>13</u>	<u>6</u>	<u>0</u>
<u>7</u>	<u>11</u>	<u>1</u>
<u>18</u>	<u>0</u>	<u>1</u>
<u>15</u>	<u>2</u>	<u>2</u>
<u>19</u>	<u>0</u>	<u>0</u>
<u>19</u>	<u>0</u>	<u>0</u>
<u>19</u>	<u>0</u>	<u>0</u>
<u>19</u>	<u>0</u>	<u>0</u>
<u>15</u>	<u>4</u>	<u>0</u>
<u>13</u>	<u>6</u>	<u>0</u>

DEALER CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 9/23/74 - 10/4/74AREA TampaQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
13. Have Timing Light	<u>19</u>	<u>0</u>	<u>0</u>
14. Have Dwell Meter	<u>18</u>	<u>1</u>	<u>0</u>
15. Have Ignition Analyzer	<u>18</u>	<u>1</u>	<u>0</u>
16. Have Exhaust Analyzer	<u>16</u>	<u>3</u>	<u>0</u>
17. Have Choke Analyzer	<u>13</u>	<u>6</u>	<u>0</u>
18. Have Air Pump Analyzer	<u>11</u>	<u>8</u>	<u>0</u>
19. Have Fuel Injection Analyzer	<u>6</u>	<u>13</u>	<u>0</u>
20. Have PCV Analyzer	<u>13</u>	<u>6</u>	<u>0</u>
21. Have Vacuum Analyzer	<u>18</u>	<u>1</u>	<u>0</u>
22. Have Air Cleaner Heat Stove Analyzer	<u>6</u>	<u>13</u>	<u>0</u>
23. Have Belt Tension Gage	<u>16</u>	<u>3</u>	<u>0</u>
24. Have Combination Unit	<u>18</u>	<u>1</u>	<u>0</u>
25. Have source of new maintenance instructions	<u>19</u>	<u>0</u>	<u>0</u>

DEALER CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 9/23/74 - 10/4/74AREA TampaQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
26. Have complete vacuum charts and electric schematics	<u>18</u>	<u>1</u>	<u>0</u>
27. Need current level, no additional training	<u>0</u>	<u>18</u>	<u>1</u>
28. Need present mechanic's, in-house training	<u>16</u>	<u>2</u>	<u>1</u>
29. Need present mechanic's outside training	<u>14</u>	<u>4</u>	<u>1</u>
30. Need additional <u>Specially</u> trained mechanics	<u>2</u>	<u>16</u>	<u>1</u>
31. Have taken and passed training program	<u>19</u>	<u>0</u>	<u>0</u>
32. Have mechanic classification for skill level	<u>4</u>	<u>15</u>	<u>0</u>
33. Repeat customers 0 to 50 percent	<u>4</u>	<u>15</u>	<u>0</u>
34. Repeat customers 51 to 75 percent	<u>5</u>	<u>14</u>	<u>0</u>
35. Repeat customers 76 to 95 percent	<u>11</u>	<u>8</u>	<u>0</u>
36. Fuel shortage and price increase has improved business	<u>5</u>	<u>14</u>	<u>0</u>
37. Fuel shortage and price increase has decreased business	<u>7</u>	<u>12</u>	<u>0</u>
38. Is familiar with state inspection system	<u>19</u>	<u>0</u>	<u>0</u>

DEALER CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 9/23/74 - 10/4/74AREA TampaQUESTIONS

39. Is familiar with emission control regulations
40. Is in compliance with emission control regulations
41. Found emission control devices disconnected
42. 0 to 10 percent disconnected
43. 11 to 20 percent disconnected
44. 21 to 50 percent disconnected
45. 51 percent and up disconnected
46. Reconnects emission devices

<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
<u>19</u>	<u>0</u>	<u>0</u>
<u>19</u>	<u>0</u>	<u>0</u>
<u>14</u>	<u>5</u>	<u>0</u>
<u>11</u>	<u>4</u>	<u>4</u>
<u>1</u>	<u>14</u>	<u>4</u>
<u>2</u>	<u>13</u>	<u>4</u>
<u>0</u>	<u>15</u>	<u>4</u>
<u>8</u>	<u>6</u>	<u>5</u>

DEALER CONSOLIDATED TALLY SHEET

DATES 10/14/75 - 11/4/75AREA New YorkQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
01. Can all manufacturers' specifications be accomplished	<u>18</u>	<u>2</u>	<u>0</u>
02. Anticipates major changes in 1975 and later models	<u>15</u>	<u>5</u>	<u>0</u>
03. Advised of changes expected in maintenance requirements	<u>14</u>	<u>6</u>	<u>0</u>
04. Will modify existing equipment	<u>10</u>	<u>8</u>	<u>2</u>
05. Will purchase additional equipment	<u>16</u>	<u>3</u>	<u>1</u>
06. Planning procurement of equipment to service the catalytic converter	<u>17</u>	<u>1</u>	<u>2</u>
07. Check, adjust, or replace carburetor	<u>20</u>	<u>0</u>	<u>0</u>
08. Check, adjust, or replace emission controls	<u>20</u>	<u>0</u>	<u>0</u>
09. Check, adjust, or replace exhaust system	<u>20</u>	<u>0</u>	<u>0</u>
10. Check, adjust, or replace ignition system	<u>19</u>	<u>1</u>	<u>0</u>
11. Check, adjust, or replace electronic ignition	<u>19</u>	<u>1</u>	<u>0</u>
12. Check, adjust valve lash	<u>12</u>	<u>8</u>	<u>0</u>

DEALER CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 10/14/75 - 11/4/75AREA New YorkQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
13. Have Timing Light	<u>19</u>	<u>1</u>	<u>0</u>
14. Have Dwell Meter	<u>20</u>	<u>0</u>	<u>0</u>
15. Have Ignition Analyzer	<u>19</u>	<u>1</u>	<u>0</u>
16. Have Exhaust Analyzer	<u>15</u>	<u>5</u>	<u>0</u>
17. Have Choke Analyzer	<u>13</u>	<u>7</u>	<u>0</u>
18. Have Air Pump Analyzer	<u>12</u>	<u>8</u>	<u>0</u>
19. Have Fuel Injection Analyzer	<u>7</u>	<u>13</u>	<u>0</u>
20. Have PCV Analyzer	<u>15</u>	<u>5</u>	<u>0</u>
21. Have Vacuum Analyzer	<u>18</u>	<u>2</u>	<u>0</u>
22. Have Air Cleaner Heat Stove Analyzer	<u>11</u>	<u>9</u>	<u>0</u>
23. Have Belt Tension Gage	<u>14</u>	<u>6</u>	<u>0</u>
24. Have Combination Unit	<u>14</u>	<u>5</u>	<u>1</u>
25. Have source of new maintenance instructions	<u>19</u>	<u>1</u>	<u>0</u>

DEALER CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 10/14/75 - 11/4/75AREA New YorkQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
26. Have complete vacuum charts and electric schematics	<u>20</u>	<u>0</u>	<u>0</u>
27. Need current level, no additional training	<u>2</u>	<u>18</u>	<u>0</u>
28. Need present mechanic's, in-house training	<u>16</u>	<u>4</u>	<u>0</u>
29. Need present mechanic's outside training	<u>12</u>	<u>8</u>	<u>0</u>
30. Need additional <u>Specially</u> trained mechanics	<u>3</u>	<u>17</u>	<u>0</u>
31. Have taken and passed training program	<u>18</u>	<u>2</u>	<u>0</u>
32. Have mechanic classification for skill level	<u>8</u>	<u>12</u>	<u>0</u>
33. Repeat customers 0 to 50 percent	<u>5</u>	<u>15</u>	<u>0</u>
34. Repeat customers 51 to 75 percent	<u>7</u>	<u>13</u>	<u>0</u>
35. Repeat customers 76 to 95 percent	<u>8</u>	<u>12</u>	<u>0</u>
36. Fuel shortage and price increase has improved business	<u>5</u>	<u>15</u>	<u>0</u>
37. Fuel shortage and price increase has decreased business	<u>7</u>	<u>13</u>	<u>0</u>
38. Is familiar with state inspection system	<u>18</u>	<u>0</u>	<u>2</u>

DEALER CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 10/14/75 - 11/4/75AREA New YorkQUESTIONS

39. Is familiar with emission control regulations
40. Is in compliance with emission control regulations
41. Found emission control devices disconnected
42. 0 to 10 percent disconnected
43. 11 to 20 percent disconnected
44. 21 to 50 percent disconnected
45. 51 percent and up disconnected
46. Reconnects emission devices

<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
<u>19</u>	<u>1</u>	<u>0</u>
<u>19</u>	<u>1</u>	<u>0</u>
<u>7</u>	<u>13</u>	<u>0</u>
<u>5</u>	<u>15</u>	<u>0</u>
<u>1</u>	<u>19</u>	<u>0</u>
<u>0</u>	<u>20</u>	<u>0</u>
<u>0</u>	<u>20</u>	<u>0</u>
<u>8</u>	<u>4</u>	<u>8</u>

DEALER CONSOLIDATED TALLY SHEET

DATES 11/4/74 - 11/16/74AREA NewarkQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
01. Can all manufacturers' specifications be accomplished	<u>22</u>	<u>0</u>	<u>0</u>
02. Anticipates major changes in 1975 and later models	<u>9</u>	<u>12</u>	<u>1</u>
03. Advised of changes expected in maintenance requirements	<u>18</u>	<u>3</u>	<u>1</u>
04. Will modify existing equipment	<u>15</u>	<u>7</u>	<u>0</u>
05. Will purchase additional equipment	<u>15</u>	<u>7</u>	<u>0</u>
06. Planning procurement of equipment to service the catalytic converter	<u>17</u>	<u>5</u>	<u>0</u>
07. Check, adjust, or replace carburetor	<u>22</u>	<u>0</u>	<u>0</u>
08. Check, adjust, or replace emission controls	<u>22</u>	<u>0</u>	<u>0</u>
09. Check, adjust, or replace exhaust system	<u>21</u>	<u>1</u>	<u>0</u>
10. Check, adjust, or replace ignition system	<u>22</u>	<u>0</u>	<u>0</u>
11. Check, adjust, or replace electronic ignition	<u>18</u>	<u>4</u>	<u>0</u>
12. Check, adjust valve lash	<u>18</u>	<u>4</u>	<u>0</u>

DEALER CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 11/4/74 - 11/16/74AREA NewarkQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
13. Have Timing Light	<u>22</u>	<u>0</u>	<u>0</u>
14. Have Dwell Meter	<u>22</u>	<u>0</u>	<u>0</u>
15. Have Ignition Analyzer	<u>20</u>	<u>2</u>	<u>0</u>
16. Have Exhaust Analyzer	<u>21</u>	<u>1</u>	<u>0</u>
17. Have Choke Analyzer	<u>15</u>	<u>7</u>	<u>0</u>
18. Have Air Pump Analyzer	<u>13</u>	<u>9</u>	<u>0</u>
19. Have Fuel Injection Analyzer	<u>8</u>	<u>14</u>	<u>0</u>
20. Have PCV Analyzer	<u>18</u>	<u>4</u>	<u>0</u>
21. Have Vacuum Analyzer	<u>22</u>	<u>0</u>	<u>0</u>
22. Have Air Cleaner Heat Stove Analyzer	<u>11</u>	<u>11</u>	<u>0</u>
23. Have Belt Tension Gage	<u>20</u>	<u>2</u>	<u>0</u>
24. Have Combination Unit	<u>15</u>	<u>7</u>	<u>0</u>
25. Have source of new maintenance instructions	<u>22</u>	<u>0</u>	<u>0</u>

DEALER CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 11/4/74 - 11/16/74AREA NewarkQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
26. Have complete vacuum charts and electric schematics	<u>20</u>	<u>2</u>	<u>0</u>
27. Need current level, no additional training	<u>1</u>	<u>21</u>	<u>0</u>
28. Need present mechanic's, in-house training	<u>18</u>	<u>4</u>	<u>0</u>
29. Need present mechanic's outside training	<u>21</u>	<u>1</u>	<u>0</u>
30. Need additional <u>Specially</u> trained mechanics	<u>1</u>	<u>21</u>	<u>0</u>
31. Have taken and passed training program	<u>22</u>	<u>0</u>	<u>0</u>
32. Have mechanic classification for skill level	<u>7</u>	<u>15</u>	<u>0</u>
33. Repeat customers 0 to 50 percent	<u>4</u>	<u>18</u>	<u>0</u>
34. Repeat customers 51 to 75 percent	<u>2</u>	<u>20</u>	<u>0</u>
35. Repeat customers 76 to 95 percent	<u>16</u>	<u>6</u>	<u>0</u>
36. Fuel shortage and price increase has improved business	<u>6</u>	<u>16</u>	<u>0</u>
37. Fuel shortage and price increase has decreased business	<u>10</u>	<u>12</u>	<u>0</u>
38. Is familiar with state inspection system	<u>22</u>	<u>0</u>	<u>0</u>

DEALER CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 11/4/74 - 11/16/74AREA Newark

<u>QUESTIONS</u>	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
39. Is familiar with emission control regulations	<u>22</u>	<u>0</u>	<u>0</u>
40. Is in compliance with emission control regulations	<u>22</u>	<u>0</u>	<u>0</u>
41. Found emission control devices disconnected	<u>7</u>	<u>15</u>	<u>0</u>
42. 0 to 10 percent disconnected	<u>4</u>	<u>18</u>	<u>0</u>
43. 11 to 20 percent disconnected	<u>0</u>	<u>22</u>	<u>0</u>
44. 21 to 50 percent disconnected	<u>0</u>	<u>22</u>	<u>0</u>
45. 51 percent and up disconnected	<u>0</u>	<u>22</u>	<u>0</u>
46. Reconnects emission devices	<u>7</u>	<u>0</u>	<u>15</u>

DEALER CONSOLIDATED TALLY SHEET

DATES 1/13/75 - 2/8/75AREA DetroitQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
01. Can all manufacturers' specifications be accomplished	<u>19</u>	<u>0</u>	<u>0</u>
02. Anticipates major changes in 1975 and later models	<u>15</u>	<u>4</u>	<u>0</u>
03. Advised of changes expected in maintenance requirements	<u>16</u>	<u>2</u>	<u>1</u>
04. Will modify existing equipment	<u>9</u>	<u>7</u>	<u>3</u>
05. Will purchase additional equipment	<u>12</u>	<u>4</u>	<u>3</u>
06. Planning procurement of equipment to service the catalytic converter	<u>12</u>	<u>6</u>	<u>1</u>
07. Check, adjust, or replace carburetor	<u>19</u>	<u>0</u>	<u>0</u>
08. Check, adjust, or replace emission controls	<u>19</u>	<u>0</u>	<u>0</u>
09. Check, adjust, or replace exhaust system	<u>19</u>	<u>0</u>	<u>0</u>
10. Check, adjust, or replace ignition system	<u>18</u>	<u>1</u>	<u>0</u>
11. Check, adjust, or replace electronic ignition	<u>11</u>	<u>8</u>	<u>0</u>
12. Check, adjust valve lash	<u>8</u>	<u>11</u>	<u>0</u>

DEALER CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 1/13/75 - 2/8/75AREA DetroitQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
13. Have Timing Light	<u>19</u>	<u>0</u>	<u>0</u>
14. Have Dwell Meter	<u>19</u>	<u>0</u>	<u>0</u>
15. Have Ignition Analyzer	<u>17</u>	<u>2</u>	<u>0</u>
16. Have Exhaust Analyzer	<u>13</u>	<u>6</u>	<u>0</u>
17. Have Choke Analyzer	<u>12</u>	<u>7</u>	<u>0</u>
18. Have Air Pump Analyzer	<u>9</u>	<u>10</u>	<u>0</u>
19. Have Fuel Injection Analyzer	<u>8</u>	<u>11</u>	<u>0</u>
20. Have PCV Analyzer	<u>17</u>	<u>2</u>	<u>0</u>
21. Have Vacuum Analyzer	<u>18</u>	<u>1</u>	<u>0</u>
22. Have Air Cleaner Heat Stove Analyzer	<u>0</u>	<u>19</u>	<u>0</u>
23. Have Belt Tension Gage	<u>12</u>	<u>7</u>	<u>0</u>
24. Have Combination Unit	<u>16</u>	<u>3</u>	<u>0</u>
25. Have source of new maintenance instructions	<u>19</u>	<u>0</u>	<u>0</u>

DEALER CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 1/13/75 - 2/8/75AREA DetroitQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
26. Have complete vacuum charts and electric schematics	<u>18</u>	<u>1</u>	<u>0</u>
27. Need current level, no additional training	<u>0</u>	<u>19</u>	<u>0</u>
28. Need present mechanic's, in-house training	<u>16</u>	<u>3</u>	<u>0</u>
29. Need present mechanic's outside training	<u>9</u>	<u>10</u>	<u>0</u>
30. Need additional <u>Specially</u> trained mechanics	<u>1</u>	<u>18</u>	<u>0</u>
31. Have taken and passed training program	<u>12</u>	<u>7</u>	<u>0</u>
32. Have mechanic classification for skill level	<u>2</u>	<u>17</u>	<u>0</u>
33. Repeat customers 0 to 50 percent	<u>0</u>	<u>19</u>	<u>0</u>
34. Repeat customers 51 to 75 percent	<u>7</u>	<u>12</u>	<u>0</u>
35. Repeat customers 76 to 95 percent	<u>13</u>	<u>6</u>	<u>0</u>
36. Fuel shortage and price increase has improved business	<u>10</u>	<u>9</u>	<u>0</u>
37. Fuel shortage and price increase has decreased business	<u>4</u>	<u>15</u>	<u>0</u>
38. Is familiar with state inspection system	<u>1</u>	<u>18</u>	<u>0</u>

DEALER CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 1/13/75 - 2/8/75AREA DetroitQUESTIONS

39. Is familiar with emission control regulations
40. Is in compliance with emission control regulations
41. Found emission control devices disconnected
42. 0 to 10 percent disconnected
43. 11 to 20 percent disconnected
44. 21 to 50 percent disconnected
45. 51 percent and up disconnected
46. Reconnects emission devices

<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
<u>18</u>	<u>1</u>	<u>0</u>
<u>19</u>	<u>0</u>	<u>0</u>
<u>11</u>	<u>8</u>	<u>0</u>
<u>9</u>	<u>10</u>	<u>0</u>
<u>2</u>	<u>17</u>	<u>0</u>
<u>0</u>	<u>19</u>	<u>0</u>
<u>0</u>	<u>19</u>	<u>0</u>
<u>4</u>	<u>8</u>	<u>7</u>

DEALER CONSOLIDATED TALLY SHEET

DATES 12/1/74 - 12/21/74AREA ChicagoQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
01. Can all manufacturers' specifications be accomplished	<u>20</u>	<u>0</u>	<u>0</u>
02. Anticipates major changes in 1975 and later models	<u>13</u>	<u>7</u>	<u>0</u>
03. Advised of changes expected in maintenance requirements	<u>17</u>	<u>1</u>	<u>2</u>
04. Will modify existing equipment	<u>10</u>	<u>9</u>	<u>1</u>
05. Will purchase additional equipment	<u>15</u>	<u>3</u>	<u>2</u>
06. Planning procurement of equipment to service the catalytic converter	<u>15</u>	<u>4</u>	<u>1</u>
07. Check, adjust, or replace carburetor	<u>20</u>	<u>0</u>	<u>0</u>
08. Check, adjust, or replace emission controls	<u>20</u>	<u>0</u>	<u>0</u>
09. Check, adjust, or replace exhaust system	<u>20</u>	<u>0</u>	<u>0</u>
10. Check, adjust, or replace ignition system	<u>20</u>	<u>0</u>	<u>0</u>
11. Check, adjust, or replace electronic ignition	<u>12</u>	<u>8</u>	<u>0</u>
12. Check, adjust valve lash	<u>13</u>	<u>7</u>	<u>0</u>

DEALER CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 12/1/74 - 12/21/74AREA ChicagoQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
13. Have Timing Light	<u>20</u>	<u>0</u>	<u>0</u>
14. Have Dwell Meter	<u>20</u>	<u>0</u>	<u>0</u>
15. Have Ignition Analyzer	<u>20</u>	<u>0</u>	<u>0</u>
16. Have Exhaust Analyzer	<u>19</u>	<u>1</u>	<u>0</u>
17. Have Choke Analyzer	<u>16</u>	<u>4</u>	<u>0</u>
18. Have Air Pump Analyzer	<u>10</u>	<u>10</u>	<u>0</u>
19. Have Fuel Injection Analyzer	<u>16</u>	<u>4</u>	<u>0</u>
20. Have PCV Analyzer	<u>16</u>	<u>4</u>	<u>0</u>
21. Have Vacuum Analyzer	<u>18</u>	<u>2</u>	<u>0</u>
22. Have Air Cleaner Heat Stove Analyzer	<u>9</u>	<u>11</u>	<u>0</u>
23. Have Belt Tension Gage	<u>16</u>	<u>4</u>	<u>0</u>
24. Have Combination Unit	<u>19</u>	<u>1</u>	<u>0</u>
25. Have source of new maintenance instructions	<u>20</u>	<u>0</u>	<u>0</u>

DEALER CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 12/1/74 - 12/21/74AREA ChicagoQUESTIONSYES NO UNKNOWN

26. Have complete vacuum charts and electric schematics

20 0 0

27. Need current level, no additional training

0 20 0

28. Need present mechanic's, in-house training

19 1 0

29. Need present mechanic's outside training

18 2 030. Need additional Specially trained mechanics2 18 0

31. Have taken and passed training program

20 0 0

32. Have mechanic classification for skill level

7 13 0

33. Repeat customers 0 to 50 percent

2 18 0

34. Repeat customers 51 to 75 percent

8 12 0

35. Repeat customers 76 to 95 percent

10 10 0

36. Fuel shortage and price increase has improved business

6 14 0

37. Fuel shortage and price increase has decreased business

6 14 0

38. Is familiar with state inspection system

5 15 0

DEALER CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 12/1/74 - 12/21/74AREA ChicagoQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
39. Is familiar with emission control regulations	<u>20</u>	<u>0</u>	<u>0</u>
40. Is in compliance with emission control regulations	<u>20</u>	<u>0</u>	<u>0</u>
41. Found emission control devices disconnected	<u>7</u>	<u>13</u>	<u>0</u>
42. 0 to 10 percent disconnected	<u>5</u>	<u>15</u>	<u>0</u>
43. 11 to 20 percent disconnected	<u>0</u>	<u>20</u>	<u>0</u>
44. 21 to 50 percent disconnected	<u>0</u>	<u>20</u>	<u>0</u>
45. 51 percent and up disconnected	<u>0</u>	<u>20</u>	<u>0</u>
46. Reconnects emission devices	<u>6</u>	<u>5</u>	<u>9</u>

DEALER CONSOLIDATED TALLY SHEET

DATES 2/23/75 - 3/8/75AREA Los AngelesQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
01. Can all manufacturers' specifications be accomplished	<u>29</u>	<u>0</u>	<u>0</u>
02. Anticipates major changes in 1975 and later models	<u>14</u>	<u>15</u>	<u>0</u>
03. Advised of changes expected in maintenance requirements	<u>28</u>	<u>1</u>	<u>0</u>
04. Will modify existing equipment	<u>22</u>	<u>3</u>	<u>4</u>
05. Will purchase additional equipment	<u>20</u>	<u>8</u>	<u>1</u>
06. Planning procurement of equipment to service the catalytic converter	<u>14</u>	<u>13</u>	<u>2</u>
07. Check, adjust, or replace carburetor	<u>29</u>	<u>0</u>	<u>0</u>
08. Check, adjust, or replace emission controls	<u>29</u>	<u>0</u>	<u>0</u>
09. Check, adjust, or replace exhaust system	<u>29</u>	<u>0</u>	<u>0</u>
10. Check, adjust, or replace ignition system	<u>29</u>	<u>0</u>	<u>0</u>
11. Check, adjust, or replace electronic ignition	<u>26</u>	<u>3</u>	<u>0</u>
12. Check, adjust valve lash	<u>23</u>	<u>6</u>	<u>0</u>

DEALER CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 2/23/75 - 3/8/75AREA Los AngelesQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
13. Have Timing Light	<u>29</u>	<u>0</u>	<u>0</u>
14. Have Dwell Meter	<u>29</u>	<u>0</u>	<u>0</u>
15. Have Ignition Analyzer	<u>29</u>	<u>0</u>	<u>0</u>
16. Have Exhaust Analyzer	<u>28</u>	<u>1</u>	<u>0</u>
17. Have Choke Analyzer	<u>27</u>	<u>2</u>	<u>0</u>
18. Have Air Pump Analyzer	<u>23</u>	<u>6</u>	<u>0</u>
19. Have Fuel Injection Analyzer	<u>15</u>	<u>14</u>	<u>0</u>
20. Have PCV Analyzer	<u>27</u>	<u>2</u>	<u>0</u>
21. Have Vacuum Analyzer	<u>29</u>	<u>0</u>	<u>0</u>
22. Have Air Cleaner Heat Stove Analyzer	<u>23</u>	<u>6</u>	<u>0</u>
23. Have Belt Tension Gage	<u>27</u>	<u>2</u>	<u>0</u>
24. Have Combination Unit	<u>28</u>	<u>1</u>	<u>0</u>
25. Have source of new maintenance instructions	<u>29</u>	<u>0</u>	<u>0</u>

DEALER CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 2/23/75 - 3/8/75AREA Los AngelesQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
26. Have complete vacuum charts and electric schematics	<u>29</u>	<u>0</u>	<u>0</u>
27. Need current level, no additional training	<u>0</u>	<u>29</u>	<u>0</u>
28. Need present mechanic's, in-house training	<u>28</u>	<u>1</u>	<u>0</u>
29. Need present mechanic's outside training	<u>27</u>	<u>2</u>	<u>0</u>
30. Need additional <u>Specially</u> trained mechanics	<u>4</u>	<u>25</u>	<u>0</u>
31. Have taken and passed training program	<u>26</u>	<u>3</u>	<u>0</u>
32. Have mechanic classification for skill level	<u>6</u>	<u>23</u>	<u>0</u>
33. Repeat customers 0 to 50 percent	<u>2</u>	<u>27</u>	<u>0</u>
34. Repeat customers 51 to 75 percent	<u>10</u>	<u>19</u>	<u>0</u>
35. Repeat customers 76 to 95 percent	<u>18</u>	<u>11</u>	<u>0</u>
36. Fuel shortage and price increase has improved business	<u>4</u>	<u>25</u>	<u>0</u>
37. Fuel shortage and price increase has decreased business	<u>10</u>	<u>19</u>	<u>0</u>
38. Is familiar with state inspection system	<u>15</u>	<u>14</u>	<u>0</u>

DEALER CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 2/23/75 - 3/8/75AREA Los AngelesQUESTIONS

39. Is familiar with emission control regulations
40. Is in compliance with emission control regulations
41. Found emission control devices disconnected
42. 0 to 10 percent disconnected
43. 11 to 20 percent disconnected
44. 21 to 50 percent disconnected
45. 51 percent and up disconnected
46. Reconnects emission devices

<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
<u>28</u>	<u>1</u>	<u>0</u>
<u>28</u>	<u>1</u>	<u>0</u>
<u>16</u>	<u>13</u>	<u>0</u>
<u>13</u>	<u>16</u>	<u>0</u>
<u>1</u>	<u>28</u>	<u>0</u>
<u>0</u>	<u>29</u>	<u>0</u>
<u>0</u>	<u>29</u>	<u>0</u>
<u>20</u>	<u>1</u>	<u>8</u>

DEALER CONSOLIDATED TALLY SHEET

DATES 2/27/75 - 3/13/75AREA PhoenixQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
01. Can all manufacturers' specifications be accomplished	<u>21</u>	<u>0</u>	<u>0</u>
02. Anticipates major changes in 1975 and later models	<u>13</u>	<u>8</u>	<u>0</u>
03. Advised of changes expected in maintenance requirements	<u>21</u>	<u>0</u>	<u>0</u>
04. Will modify existing equipment	<u>15</u>	<u>5</u>	<u>1</u>
05. Will purchase additional equipment	<u>15</u>	<u>6</u>	<u>0</u>
06. Planning procurement of equipment to service the catalytic converter	<u>13</u>	<u>8</u>	<u>0</u>
07. Check, adjust, or replace carburetor	<u>21</u>	<u>0</u>	<u>0</u>
08. Check, adjust, or replace emission controls	<u>21</u>	<u>0</u>	<u>0</u>
09. Check, adjust, or replace exhaust system	<u>21</u>	<u>0</u>	<u>0</u>
10. Check, adjust, or replace ignition system	<u>20</u>	<u>1</u>	<u>0</u>
11. Check, adjust, or replace electronic ignition	<u>17</u>	<u>4</u>	<u>0</u>
12. Check, adjust valve lash	<u>17</u>	<u>4</u>	<u>0</u>

DEALER CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 2/27/75 - 3/13/75AREA PhoenixQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
13. Have Timing Light	<u>21</u>	<u>0</u>	<u>0</u>
14. Have Dwell Meter	<u>21</u>	<u>0</u>	<u>0</u>
15. Have Ignition Analyzer	<u>21</u>	<u>0</u>	<u>0</u>
16. Have Exhaust Analyzer	<u>13</u>	<u>8</u>	<u>0</u>
17. Have Choke Analyzer	<u>19</u>	<u>2</u>	<u>0</u>
18. Have Air Pump Analyzer	<u>17</u>	<u>4</u>	<u>0</u>
19. Have Fuel Injection Analyzer	<u>11</u>	<u>10</u>	<u>0</u>
20. Have PCV Analyzer	<u>21</u>	<u>0</u>	<u>0</u>
21. Have Vacuum Analyzer	<u>21</u>	<u>0</u>	<u>0</u>
22. Have Air Cleaner Heat Stove Analyzer	<u>12</u>	<u>9</u>	<u>0</u>
23. Have Belt Tension Gage	<u>18</u>	<u>3</u>	<u>0</u>
24. Have Combination Unit	<u>10</u>	<u>11</u>	<u>0</u>
25. Have source of new maintenance instructions	<u>21</u>	<u>0</u>	<u>0</u>

DEALER CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 2/27/75 - 3/13/75AREA PhoenixQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
26. Have complete vacuum charts and electric schematics	<u>21</u>	<u>1</u>	<u>0</u>
27. Need current level, no additional training	<u>1</u>	<u>20</u>	<u>0</u>
28. Need present mechanic's, in-house training	<u>21</u>	<u>0</u>	<u>0</u>
29. Need present mechanic's outside training	<u>20</u>	<u>1</u>	<u>0</u>
30. Need additional <u>Specially</u> trained mechanics	<u>2</u>	<u>19</u>	<u>0</u>
31. Have taken and passed training program	<u>20</u>	<u>1</u>	<u>0</u>
32. Have mechanic classification for skill level	<u>11</u>	<u>10</u>	<u>0</u>
33. Repeat customers 0 to 50 percent	<u>3</u>	<u>18</u>	<u>0</u>
34. Repeat customers 51 to 75 percent	<u>13</u>	<u>8</u>	<u>0</u>
35. Repeat customers 76 to 95 percent	<u>5</u>	<u>16</u>	<u>0</u>
36. Fuel shortage and price increase has improved business	<u>4</u>	<u>17</u>	<u>0</u>
37. Fuel shortage and price increase has decreased business	<u>11</u>	<u>10</u>	<u>0</u>
38. Is familiar with state inspection system	<u>2</u>	<u>19</u>	<u>0</u>

DEALER CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 2/27/75 - 3/13/75AREA PhoenixQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
39. Is familiar with emission control regulations	<u>21</u>	<u>0</u>	<u>0</u>
40. Is in compliance with emission control regulations	<u>21</u>	<u>0</u>	<u>0</u>
41. Found emission control devices disconnected	<u>16</u>	<u>5</u>	<u>0</u>
42. 0 to 10 percent disconnected	<u>16</u>	<u>5</u>	<u>0</u>
43. 11 to 20 percent disconnected	<u>1</u>	<u>20</u>	<u>0</u>
44. 21 to 50 percent disconnected	<u>0</u>	<u>21</u>	<u>0</u>
45. 51 percent and up disconnected	<u>0</u>	<u>21</u>	<u>0</u>
46. Reconnects emission devices	<u>4</u>	<u>12</u>	<u>5</u>

DEALER CONSOLIDATED TALLY SHEET

DATES 1/13/75 - 2/1/75AREA SeattleQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
01. Can all manufacturers' specifications be accomplished	<u>24</u>	<u>0</u>	<u>0</u>
02. Anticipates major changes in 1975 and later models	<u>14</u>	<u>10</u>	<u>0</u>
03. Advised of changes expected in maintenance requirements	<u>21</u>	<u>2</u>	<u>1</u>
04. Will modify existing equipment	<u>17</u>	<u>4</u>	<u>3</u>
05. Will purchase additional equipment	<u>17</u>	<u>7</u>	<u>0</u>
06. Planning procurement of equipment to service the catalytic converter	<u>12</u>	<u>10</u>	<u>2</u>
07. Check, adjust, or replace carburetor	<u>23</u>	<u>0</u>	<u>1</u>
08. Check, adjust, or replace emission controls	<u>24</u>	<u>0</u>	<u>0</u>
09. Check, adjust, or replace exhaust system	<u>24</u>	<u>0</u>	<u>0</u>
10. Check, adjust, or replace ignition system	<u>24</u>	<u>0</u>	<u>0</u>
11. Check, adjust, or replace electronic ignition	<u>23</u>	<u>1</u>	<u>0</u>
12. Check, adjust valve lash	<u>23</u>	<u>1</u>	<u>0</u>

DEALER CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 1/13/75 - 2/1/75AREA SeattleQUESTIONSYES NO UNKNOWN

13. Have Timing Light	<u>24</u>	<u>0</u>	<u>0</u>
14. Have Dwell Meter	<u>24</u>	<u>0</u>	<u>0</u>
15. Have Ignition Analyzer	<u>24</u>	<u>0</u>	<u>0</u>
16. Have Exhaust Analyzer	<u>24</u>	<u>0</u>	<u>0</u>
17. Have Choke Analyzer	<u>16</u>	<u>8</u>	<u>0</u>
18. Have Air Pump Analyzer	<u>16</u>	<u>8</u>	<u>0</u>
19. Have Fuel Injection Analyzer	<u>12</u>	<u>12</u>	<u>0</u>
20. Have PCV Analyzer	<u>20</u>	<u>4</u>	<u>0</u>
21. Have Vacuum Analyzer	<u>23</u>	<u>1</u>	<u>0</u>
22. Have Air Cleaner Heat Stove Analyzer	<u>12</u>	<u>12</u>	<u>0</u>
23. Have Belt Tension Gage	<u>14</u>	<u>10</u>	<u>0</u>
24. Have Combination Unit	<u>23</u>	<u>1</u>	<u>0</u>
25. Have source of new maintenance instructions	<u>24</u>	<u>0</u>	<u>0</u>

DEALER CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 1/13/75 - 2/1/75AREA Seattle

<u>QUESTIONS</u>	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
26. Have complete vacuum charts and electric schematics	<u>24</u>	<u>0</u>	<u>0</u>
27. Need current level, no additional training	<u>0</u>	<u>24</u>	<u>0</u>
28. Need present mechanic's, in-house training	<u>22</u>	<u>2</u>	<u>0</u>
29. Need present mechanic's outside training	<u>17</u>	<u>7</u>	<u>0</u>
30. Need additional <u>Specially</u> trained mechanics	<u>6</u>	<u>18</u>	<u>0</u>
31. Have taken and passed training program	<u>23</u>	<u>1</u>	<u>0</u>
32. Have mechanic classification for skill level	<u>14</u>	<u>10</u>	<u>0</u>
33. Repeat customers 0 to 50 percent	<u>3</u>	<u>21</u>	<u>0</u>
34. Repeat customers 51 to 75 percent	<u>15</u>	<u>9</u>	<u>0</u>
35. Repeat customers 76 to 95 percent	<u>7</u>	<u>17</u>	<u>0</u>
36. Fuel shortage and price increase has improved business	<u>8</u>	<u>15</u>	<u>1</u>
37. Fuel shortage and price increase has decreased business	<u>7</u>	<u>16</u>	<u>1</u>
38. Is familiar with state inspection system	<u>1</u>	<u>21</u>	<u>2</u>

DEALER CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 1/13/75 - 2/1/75AREA SeattleQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
39. Is familiar with emission control regulations	<u>24</u>	<u>0</u>	<u>0</u>
40. Is in compliance with emission control regulations	<u>24</u>	<u>0</u>	<u>0</u>
41. Found emission control devices disconnected	<u>15</u>	<u>9</u>	<u>0</u>
42. 0 to 10 percent disconnected	<u>12</u>	<u>12</u>	<u>0</u>
43. 11 to 20 percent disconnected	<u>2</u>	<u>22</u>	<u>0</u>
44. 21 to 50 percent disconnected	<u>1</u>	<u>23</u>	<u>0</u>
45. 51 percent and up disconnected	<u>0</u>	<u>24</u>	<u>0</u>
46. Reconnects emission devices	<u>13</u>	<u>7</u>	<u>4</u>

DEALER CONSOLIDATED TALLY SHEET

DATES 1/13/75 - 2/8/75AREA DenverQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
01. Can all manufacturers' specifications be accomplished	<u>23</u>	<u>0</u>	<u>0</u>
02. Anticipates major changes in 1975 and later models	<u>14</u>	<u>8</u>	<u>1</u>
03. Advised of changes expected in maintenance requirements	<u>18</u>	<u>4</u>	<u>1</u>
04. Will modify existing equipment	<u>15</u>	<u>6</u>	<u>2</u>
05. Will purchase additional equipment	<u>16</u>	<u>4</u>	<u>3</u>
06. Planning procurement of equipment to service the catalytic converter	<u>13</u>	<u>7</u>	<u>3</u>
07. Check, adjust, or replace carburetor	<u>23</u>	<u>0</u>	<u>0</u>
08. Check, adjust, or replace emission controls	<u>23</u>	<u>0</u>	<u>0</u>
09. Check, adjust, or replace exhaust system	<u>23</u>	<u>0</u>	<u>0</u>
10. Check, adjust, or replace ignition system	<u>23</u>	<u>0</u>	<u>0</u>
11. Check, adjust, or replace electronic ignition	<u>18</u>	<u>5</u>	<u>0</u>
12. Check, adjust valve lash	<u>17</u>	<u>6</u>	<u>0</u>

DEALER CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 1/13/75 - 2/8/75AREA DenverQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
13. Have Timing Light	<u>23</u>	<u>0</u>	<u>0</u>
14. Have Dwell Meter	<u>23</u>	<u>0</u>	<u>0</u>
15. Have Ignition Analyzer	<u>22</u>	<u>1</u>	<u>0</u>
16. Have Exhaust Analyzer	<u>22</u>	<u>1</u>	<u>0</u>
17. Have Choke Analyzer	<u>21</u>	<u>2</u>	<u>0</u>
18. Have Air Pump Analyzer	<u>14</u>	<u>9</u>	<u>0</u>
19. Have Fuel Injection Analyzer	<u>13</u>	<u>10</u>	<u>0</u>
20. Have PCV Analyzer	<u>19</u>	<u>4</u>	<u>0</u>
21. Have Vacuum Analyzer	<u>22</u>	<u>1</u>	<u>0</u>
22. Have Air Cleaner Heat Stove Analyzer	<u>13</u>	<u>10</u>	<u>0</u>
23. Have Belt Tension Gage	<u>19</u>	<u>4</u>	<u>0</u>
24. Have Combination Unit	<u>24</u>	<u>4</u>	<u>0</u>
25. Have source of new maintenance instructions	<u>22</u>	<u>1</u>	<u>0</u>

DEALER CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 1/13/75 - 2/8/75AREA DenverQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
26. Have complete vacuum charts and electric schematics	<u>22</u>	<u>1</u>	<u>0</u>
27. Need current level, no additional training	<u>0</u>	<u>23</u>	<u>0</u>
28. Need present mechanic's, in-house training	<u>20</u>	<u>3</u>	<u>0</u>
29. Need present mechanic's outside training	<u>18</u>	<u>5</u>	<u>0</u>
30. Need additional <u>Specially</u> trained mechanics	<u>6</u>	<u>17</u>	<u>0</u>
31. Have taken and passed training program	<u>19</u>	<u>4</u>	<u>0</u>
32. Have mechanic classification for skill level	<u>10</u>	<u>13</u>	<u>0</u>
33. Repeat customers 0 to 50 percent	<u>5</u>	<u>18</u>	<u>0</u>
34. Repeat customers 51 to 75 percent	<u>9</u>	<u>14</u>	<u>0</u>
35. Repeat customers 76 to 95 percent	<u>10</u>	<u>13</u>	<u>0</u>
36. Fuel shortage and price increase has improved business	<u>3</u>	<u>20</u>	<u>0</u>
37. Fuel shortage and price increase has decreased business	<u>7</u>	<u>16</u>	<u>0</u>
38. Is familiar with state inspection system	<u>22</u>	<u>1</u>	<u>0</u>

DEALER CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 1/13/75 - 2/8/75AREA DenverQUESTIONS

39. Is familiar with emission control regulations
40. Is in compliance with emission control regulations
41. Found emission control devices disconnected
42. 0 to 10 percent disconnected
43. 11 to 20 percent disconnected
44. 21 to 50 percent disconnected
45. 51 percent and up disconnected
46. Reconnects emission devices

<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
<u>21</u>	<u>2</u>	<u>0</u>
<u>23</u>	<u>0</u>	<u>0</u>
<u>19</u>	<u>4</u>	<u>0</u>
<u>12</u>	<u>11</u>	<u>0</u>
<u>0</u>	<u>23</u>	<u>0</u>
<u>0</u>	<u>23</u>	<u>0</u>
<u>0</u>	<u>23</u>	<u>0</u>
<u>12</u>	<u>7</u>	<u>4</u>

DEALER CONSOLIDATED TALLY SHEET

DATES 9/23/74 - 3/18/75AREA NationalQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
01. Can all manufacturers' specifications be accomplished	<u>194</u>	<u>3</u>	<u>0</u>
02. Anticipates major changes in 1975 and later models	<u>120</u>	<u>75</u>	<u>2</u>
03. Advised of changes expected in maintenance requirements	<u>166</u>	<u>27</u>	<u>4</u>
04. Will modify existing equipment	<u>120</u>	<u>60</u>	<u>17</u>
05. Will purchase additional equipment	<u>144</u>	<u>42</u>	<u>11</u>
06. Planning procurement of equipment to service the catalytic converter	<u>128</u>	<u>56</u>	<u>13</u>
07. Check, adjust, or replace carburetor	<u>196</u>	<u>0</u>	<u>1</u>
08. Check, adjust, or replace emission controls	<u>197</u>	<u>0</u>	<u>0</u>
09. Check, adjust, or replace exhaust system	<u>196</u>	<u>1</u>	<u>0</u>
10. Check, adjust, or replace ignition system	<u>194</u>	<u>3</u>	<u>0</u>
11. Check, adjust, or replace electronic ignition	<u>159</u>	<u>38</u>	<u>0</u>
12. Check, adjust valve lash	<u>144</u>	<u>53</u>	<u>0</u>

DEALER CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 9/23/74 - 3/18/75AREA NationalQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
13. Have Timing Light	<u>196</u>	<u>1</u>	<u>0</u>
14. Have Dwell Meter	<u>196</u>	<u>1</u>	<u>0</u>
15. Have Ignition Analyzer	<u>190</u>	<u>7</u>	<u>0</u>
16. Have Exhaust Analyzer	<u>171</u>	<u>26</u>	<u>0</u>
17. Have Choke Analyzer	<u>152</u>	<u>45</u>	<u>0</u>
18. Have Air Pump Analyzer	<u>125</u>	<u>72</u>	<u>0</u>
19. Have Fuel Injection Analyzer	<u>96</u>	<u>101</u>	<u>0</u>
20. Have PCV Analyzer	<u>166</u>	<u>31</u>	<u>0</u>
21. Have Vacuum Analyzer	<u>189</u>	<u>8</u>	<u>0</u>
22. Have Air Cleaner Heat Stove Analyzer	<u>97</u>	<u>100</u>	<u>0</u>
23. Have Belt Tension Gage	<u>156</u>	<u>41</u>	<u>0</u>
24. Have Combination Unit	<u>167</u>	<u>29</u>	<u>1</u>
25. Have source of new maintenance instructions	<u>195</u>	<u>2</u>	<u>0</u>

DEALER CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 9/23/74 - 3/18/75AREA NationalQUESTIONS

	<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
26. Have complete vacuum charts and electric schematics	<u>191</u>	<u>6</u>	<u>0</u>
27. Need current level, no additional training	<u>4</u>	<u>192</u>	<u>1</u>
28. Need present mechanic's, in-house training	<u>176</u>	<u>20</u>	<u>1</u>
29. Need present mechanic's outside training	<u>156</u>	<u>40</u>	<u>1</u>
30. Need additional <u>Specially</u> trained mechanics	<u>27</u>	<u>170</u>	<u>1</u>
31. Have taken and passed training program	<u>179</u>	<u>18</u>	<u>0</u>
32. Have mechanic classification for skill level	<u>69</u>	<u>128</u>	<u>0</u>
33. Repeat customers 0 to 50 percent	<u>28</u>	<u>169</u>	<u>0</u>
34. Repeat customers 51 to 75 percent	<u>76</u>	<u>121</u>	<u>0</u>
35. Repeat customers 76 to 95 percent	<u>98</u>	<u>99</u>	<u>0</u>
36. Fuel shortage and price increase has improved business	<u>51</u>	<u>146</u>	<u>1</u>
37. Fuel shortage and price increase has decreased business	<u>69</u>	<u>127</u>	<u>1</u>
38. Is familiar with state inspection system	<u>105</u>	<u>88</u>	<u>4</u>

DEALER CONSOLIDATED TALLY SHEET (CONTINUED)

DATES 9/23/74 - 3/18/75AREA NationalQUESTIONS

39. Is familiar with emission control regulations
40. Is in compliance with emission control regulations
41. Found emission control devices disconnected
42. 0 to 10 percent disconnected
43. 11 to 20 percent disconnected
44. 21 to 50 percent disconnected
45. 51 percent and up disconnected
46. Reconnects emission devices

<u>YES</u>	<u>NO</u>	<u>UNKNOWN</u>
<u>192</u>	<u>5</u>	<u>0</u>
<u>195</u>	<u>2</u>	<u>0</u>
<u>112</u>	<u>85</u>	<u>0</u>
<u>87</u>	<u>106</u>	<u>4</u>
<u>8</u>	<u>185</u>	<u>4</u>
<u>3</u>	<u>190</u>	<u>4</u>
<u>0</u>	<u>193</u>	<u>4</u>
<u>82</u>	<u>50</u>	<u>65</u>

BIBLIOGRAPHIC DATA SHEET	1. Report No. EPA-460/3-75-009A	2.	3. Recipient's Accession No.
4. Title and Subtitle Actual and Recommended Maintenance Practices for Light-Duty Vehicles for 1975 and Later-Model Years		5. Report Date	
7. Author(s) Charles W. Sims		8. Performing Organization Rept. No.	
9. Performing Organization Name and Address The Bendix Corporation, Launch Support Division		10. Project/Task/Work Unit No.	
		11. Contract/Grant No.	
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15. Supplementary Notes		14.	
16. Abstracts A survey was made to determine the actual and recommended maintenance practices for light-duty vehicles for 1975 and later-model years. Data was gained through consumers, new-car dealerships, manufacturers, service stations, diagnostic centers, specialty shops, independent service stations, and mass merchandisers, literature research, and data evaluation. The following conclusions were reached. Automotive service requirements are becoming more complex. Diagnostic centers are diversifying into diagnostic, service, and repair facilities. Automobile dealerships employ the highest percentage of classified or rated mechanics and are more fully equipped than other classifications. Current and future requirements can be met by the diagnostic equipment industry. The majority of automobile owners are unwilling to voluntarily replace a malfunctioning catalytic converter.			
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