REFERENCE COPY

REPORT NO. DOT-TSC-OST-76-27

1975 AUTOMOTIVE CHARACTERISTICS DATA BASE

Moses Rouse
William Basham

U.S. Department of Transportation
Transportation Systems Center
Kendall Square
Cambridge MA 02142

OCTOBER 1976
FINAL REPORT

Prepared for

U.S. DEPARTMENT OF TRANSPORTATION
OFFICE OF THE SECRETARY
Office of the Assistant Secretary for
Systems Development and Technology
Office of Systems Engineering
Washington DC 20590

NOTICE

NOTICE

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
DOT-TSC-OST-76-27		

4. Title and Subtitle
1975 AUTOMOTIVE CHARACTERISTICS DATA BASE

5. Report Date
October 1976

6. Performing Organization Code

7. Author(s)
Moses Rouse and William Basham

8. Performing Organization Report No.
DOT-TSC-OST-76-27

9. Performing Organization Name and Address
U.S. Department of Transportation
Transportation Systems Center
Kendall Square
Cambridge MA 02142

10. Work Unit No. (TRAIS)
OS614/R6517T

11. Contract or Grant No.

12. Sponsoring Agency Name and Address
U.S. Department of Transportation
Office of the Secretary
Office of the Assistant Secretary for Systems Development and Technology
Office of Systems Engineering
Washington DC 20590

13. Type of Report and Period Covered
Final Report
June 1975 to June 1976

14. Sponsoring Agency Code

15. Supplementary Notes

16. Abstract

A study of automobile characteristics as a supportive tool for auto energy consumption, fuel economy monitoring, and fleet analysis studies is presented. This report emphasizes the utility of efficient data retrieval methods in fuel economy analysis, statistical data reporting, and fleet mix analysis. The methods of vehicle sample selection, computation methods for statistical reports, illustrative output examples, and instructions for operating the data base are presented in order to fully represent the 1975 automobile fleet characteristics. A statistics section in this report contains information that is useful in econometric modeling and the determination of automobile design characteristics.

17. Key Words
Performance, Vehicle Characteristics, Vehicle Attributes, Fuel Economy, Emission Levels

18. Distribution Statement
DOCUMENT IS AVAILABLE TO THE U.S. PUBLIC THROUGH THE NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VIRGINIA 22161

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	140	

Form DOT F 1700.7 (8-72) Reproduction of completed page authorized

PREFACE

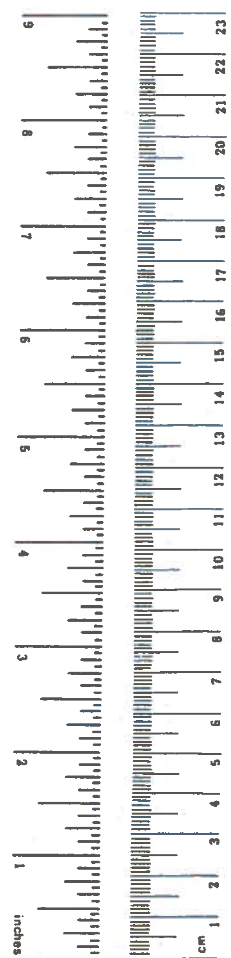
This data base of automotive characteristics was prepared in order to provide readily available information that is needed for quick reaction studies and for other studies. This work was undertaken by the Transportation Systems Center as part of the Automotive Energy Efficiency Project, sponsored by the Energy and Environmental Systems Division of the Office of Systems Engineering, Office of the Secretary.

The authors would like to acknowledge the valuable contribution of Dr. Karl Hergenrother of TSC, who made the original plan for developing the data base and some of the data base specifications. Continuing encouragement and assistance was given throughout the effort by Harold Miller, Project Manager of the AEEP. Finally, special thanks are due to Mr. Arthur Weber, Kentron, Ltd., who did an excellent job in developing all data base and analyses software.

METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
in	inches	2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
		AREA		
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
		MASS (weight)		
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
		VOLUME		
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C



Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
		AREA		
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
		MASS (weight)		
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
		VOLUME		
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
		TEMPERATURE (exact)		
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F

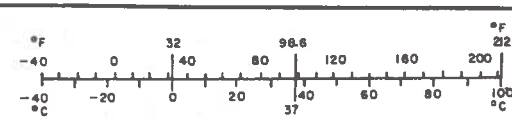


TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS

LIST OF TABLES

SUMMARY

The Automotive Characteristics Data Base (ACDB) was developed because of the need for an efficient and unified location of automotive characteristics. The supportive concept of the ACDB for quick reaction studies and major automotive Energy Efficiency program studies emphasizes the utility of the data base in data retrieval and data analysis.

Criteria for the data base was developed after carefully reviewing the requirements of the potential user. Requirements for the data base included cost-effective data management system and simplicity (easily used by non-computer type personnel). A vehicle selection procedure was used to select the automotive characteristics that would support the proposed fuel economy studies and the research activities of the Automotive Energy Efficiency Project. Finally, the size of the data base was limited to the selection of those vehicle configurations which would be representative of the U.S. 1975 Automotive fleet.

A total of 216 different vehicle configurations was selected to represent the 1975 new car fleet. Each vehicle was described by approximately 50 attributes. These attributes include: fuel economy; emission control system and levels; acceleration performance; vehicle interior and exterior dimensions; engine characteristics; price; and production quantities.

To date, the data base has been used with positive results to support many quick-reaction studies and also major studies in the Automotive Energy Efficiency Project.

A statistical section is provided which presents the important characteristics of the 1975 new car fleet. These data are presented in various tables, histograms, plots, and by regression analyses.

Finally, a users' information guide is included which provides the specific details of the data base and presents operating instructions for users unfamiliar with the data base. This users'

guide is written as a separate entity which may be removed from the data base report without affecting the report contents.

1. INTRODUCTION

The Automotive Characteristics Data Base (ACDB) was developed to meet the need for an efficient and unified location of automotive characteristics that are most frequently used in research analysis and discussions concerning automotive energy consumption.

Specifically, the original concept of an automotive data base grew out of a need to support: 1) quick-reaction studies; 2) the on-going Automotive Energy Efficiency Program (AEEP) studies; and 3) the Voluntary Fuel Economy Monitoring Program (VFEMP).

In early 1975, the frequent occurrence of short-notice quick-response studies concerned with 1975 model year automobile production, fuel economy, performance, and other vehicle characteristics, emphasized the need for a data base containing vehicle characteristics data. These "quick-reaction" studies constantly required reallocation of manpower resources within the AEEP to complete the large data gathering effort and manual calculations frequently required in these studies. Clearly, the development of an automotive data base would not only reduce the manpower expenditures but also reduce the time required to respond to "quick-reaction" requests from days to hours, or, hopefully, to minutes.

The "Potential for Motor Vehicle Fuel Economy Improvement" and "Motor Vehicle Goals Beyond 1980" studies, and the Fuel Economy Report to Congress due to be completed in 1976, require the establishment of a current baseline fleet from which fuel economy of future fleets can be projected and compared. The requirements of these studies differ from the quick-reaction studies. The quick-reaction studies require data of a limited nature, i.e., fuel economy for 1975 vehicles, while the long-range studies require data of a broad nature; fuel economy, price, sales mix, etc. The data base must be encompassing because all researchers, whose disciplines range from economics to engineering, should be using a common data source.

In late 1974, DOT was given the task of developing the Voluntary Fuel Economy Monitoring Program by the President's Energy Resource Council. Under this program, DOT is to monitor the automobile industry goal of increasing fuel economy by 40% by 1980. One measure of the industries' success or failure to meet their assigned goals is to review the industries' past and present fuel economy performance. Therefore, this program required that a data base be developed which would describe the fuel-economy-related attributes of post 1974 automobiles.

Based on the requirements discussed above, a decision was made in February 1975 to create, initially, a 1975 model year automobile data base. Specifications for the data base were to include:

1. The selection of a data management system which is cost effective, and relatively easy for the average user to execute.

2. The selection of those vehicle attributes which would be meaningful to all subprojects within the AEEP. These attributes include: 1) vehicle fuel economy; 2) emissions; 3) engine and vehicle characteristics; 4) performance; 5) price; and 6) production quantities.

3. The easy accessibilities of data in the literature or from other government sources.

4. The selection of a reasonably limited number of vehicles. The vehicles will be selected on the basis of production and fuel economy attributes, i.e., engine size, transmission type, weight.

This report discusses the development of the ACDB in Section 2, presents 1975 automobile fleet statistics in Section 3, and provides an ACDB user manual in Section 4.

2. AUTOMOTIVE CHARACTERISTICS DATA BASE DEVELOPMENT

2.1 DATA MANAGEMENT SYSTEM SELECTION

Prior to actual collection and collating of vehicle data, a review of the various data management systems (DMS) was conducted in order to determine the appropriate DMS relative to the data base requirements. The selected DMS should be cost effective, offer easy access to DOT personnel, be simple to use by non-computer oriented personnel, and should be able to perform the required analytical functions.

Using the above criteria, the System 1022 data management system was selected. This DMS is a sophisticated, general purpose, data management software system designed for use on the DEC system 10, the in-house TSC computer system. With the System 1022, the user can create, update, and maintain a large data base. It simplifies handling large or complex data structures by insulating the user from the physical structure of the data and removing the burden of programming the data management functions. Other features include: English-like commands for all operations; conversational time sharing or batch mode of operation; fast retrieval capability; an efficient sort command; arithmetic functions; and a comprehensive report generator.

2.2 VEHICLE SELECTION

The inclusion of every domestic and import vehicle configuration produced for sale in the United States into an automobile data base was beyond the scope of this project. The required accuracy of the data base allows a selected vehicle sampling to represent the 1975 automotive fleet. The three requirements used in selecting vehicle configurations were:

1. The total number of vehicles selected should be representative of the total fleet produced by the manufacturers in the 1975 model year.

2. Vehicle configuration would be defined according to fuel economy attributes.

3. Light duty trucks, vans, and variant models would not be included in the data base.

From 1) above, vehicle configurations produced in large quantities, i.e., 50,000 units, should be represented in the data base while low volume, i.e., 900 units, configurations need not be included. From 2) above, vehicle weight, engine size, and transmission type, would be primarily used to select particular vehicle configurations. Therefore, the number of vehicle configurations initially available for selection in the data base is a function of the number of engine sizes, transmission types, and weight classes offered by the manufacturer for any particular model i.e.: (Chevelle, Pinto, Dart, Pacer). For a given model, the number of configurations may vary from one to twenty. Table 2-1a presents the configuration initially selected for one model, the Oldsmobile Cutlass. For this case, eight vehicles were initially selected. After the model configurations were established, the 50 state production quantities of each configuration were found or estimated from the literature (Wards, Automotive News). If the annual production of a particular configuration was small, it was climinated. This process was continued until all configurations were reviewed. For the Oldsmobile Cutlass, Table 2-1b shows that three vehicle configurations were finally selected for inclusion in the data base.

NOTE: The estimated production for the identical configurations contained in Table 2-1a and b differ. The production quantities of those vehicle configurations eliminated from Table 2-1a are apportioned to the selected Table 2-1b vehicle configurations, according to similar fuel economy attribute characteristics.

The above process is continued for each model produced by the four domestic and the 21 largest import manufacturers. For the 1975 model year, 216 vehicle configurations were selected to represent the total fleet (153 domestic and 63 import).

TABLE 2-1. VEHICLE SELECTION METHODOLOGY

2-1a. Initial configurations of Oldsmobile Cutlass models.

Body Type[1]	50 State Estimated Production %	Engine Size[2]	Transmission[3] type & # of gears	Inertia Weight Class
Standard	~0	250	M3	4000
Standard	1	250	A3	4000
Standard	~0	260	M3	4500
Standard	19	260	A3	4500
Standard	71	350	A3	4500
Standard	2	455	A3	4500
Station Wagon	7	350	A3	5000
Station Wagon	~0	455	A3	5000
	100			

2.1b. Final configuration selection.

Standard	20	260	A3	4500
Standard	73	350	A3	4500
Station Wagon	7	350	A3	5000

[1]Body Type or (weight class) - two classes were established, a station wagon and standard (hatchback, notchback, sedan, hardtop, etc). In general, the assumption was made that station wagons weigh more than the standard configurations

[2]Engine Size - cubic inch displacement.

[3]Transmission - Automatic and Manual (3 speed, 4 speed, 5 speed).

2.3 VEHICLE ATTRIBUTE SELECTION

Based on the comments and suggestions from potential DOT/TSC users of the proposed data base, the following types of data were considered useful for inclusion in the data base: 1) fuel economy;

2) overall vehicle dimensions, both interior and exterior; 3) engine and drivetrain characteristics; 4) emission control equipment and emission levels; 5) production; 6) performances; and 7) price. Approximately 50 explicit attributes were selected to describe each of the 216 vehicles. Table 2-2 presents a list of the selected attributes.

2.3.1 Fuel Economy Attributes

Fuel economy is one of the most important characteristics for a vehicle. Since the fuel economy values calculated by the Environmental Protection Agency (EPA) are generally accepted as the fuel economy standard by both the automobile industry and the Government, the three EPA fuel economies, urban, highway and composite, were used in the ACDB to define vehicle fuel economy performance. Each of the 216 vehicle configurations was assigned a 49-state fuel economy value from data provided by the EPA. The methodology used in selecting the proper EPA fuel economy for a particular ACDB vehicle configuration was to attempt to match the ACDB vehicle and EPA test vehicle weight class CID, and transmission type. If the ACDB vehicle configuration and the EPA test vehicle were identical, the selection of the EPA test vehicle's fuel economy value was used. In those cases where the two sets of vehicles did not match, the fuel economy of the EPA test vehicle which most closely matched ACDB vehicle was used.

2.3.2 Production

Vehicle sales, production, or registration data can be used as a measure of how many new vehicles exist in the 1975 model year fleet. However, since vehicle registration data is not available for 1975 and sales data is incomplete, production data was used to describe vehicle quantities. For domestic automobile production, Wards Weekly Reports and Wards Annual Reports (1973, 1974 and 1975) were used, as the primary source, for determining model production and for estimating individual vehicle configuration production. Because

TABLE 2-2. VEHICLE ATTRIBUTES

Group	Attribute Name	Comment
Fuel economy performance	Urban fuel economy (mpg)	EPA CVC-2 drive cycle
	Highway fuel economy (mpg)	EPA highway drive cycle
	Composite fuel economy (mpg)	(Note 1)
	40 MPH fuel economy (mpg)	Steady speed
	50 MPH fuel economy (mpg)	Steady speed
Acceleration performance	Zero to sixty mph (sec)	Wide open throttle
	Forty to sixty mph (sec)	Passing
	Forty-five to sixty-five mph (sec)	Passing
Emissions:		
Controls	Aftertreatment device	For example, catalyst
	NO_x control device	For example, EGR
	Hydrocarbon control device	For example, air pumps
	Other device type	- - - -
Levels	Hydrocarbon (gm/mile)	EPA CVC-2 drive cycle, projected to 50,000 miles
	Carbon monoxide (gm/mile)	
	Nitrogen oxide (gm/mile)	
	Other (gm/mile)	

TABLE 2-2. VEHICLE ATTRIBUTES (CONTINUED)

Group	Attribute Name	Comment
Engine and drivetrain characteristics	Transmission type and # of gears	For example, 5-speed manual
	Rear axle ratio	- - - -
	Fuel injection type	For example, 2 barrel carburetor
	Cubic inch dispacement $(in)^3$	- - - -
	# of cylinders	For example, 8
	Compression ratio	- - - -
	Horsepower	- - - -
	Revolutions per minute	- - - -
	Engine type	For example, Diesel engine
Vehicle dimensions	Wheelbase (in.)	- - - -
	Length (in.)	- - - -
	Height (in.)	- - - -
	Width (in.)	- - - -
	Trunk space $(ft.^3)$	Or, for station wagons, cargo volume
	Roominess factor (in.)	Sum of the following seven interior dimensions: legroom(F, R), shoulder room (F, R), headroom (F, R), and seat height.
	Tire size	Type (radial) and dimensions
	Curb weight (lb.)	- - - -
	Inertia weight class (lb.)	As defined by EPA
	Number of passengers	- - - -

TABLE 2-2. VEHICLE ATTRIBUTES (CONTINUED)

Group	Attribute Name	Comment
Price	Manufacturers suggested retail price	- - - -
Production:		
For model	Total as of December 31 Total as of March 31 Total as of June 30 Total for model year	For all models, i.e. Nova
For vehicle configurations	Total as of December 31 Total as of March 31 Total as of June 30 Total for model year	For each vehicle configuration, i.e. 350 CID Nova with automatic transmission
Other	Vehicle identification	Unique identification code with given vehicle: model year; manufacturer; division of manufacturer; domestic or import; body type; cubic inch displacement

NOTES:

(1) Composite Fuel Economy equals $\dfrac{1}{\left(\dfrac{.55}{\text{Urban Fuel Economy}}\right) + \left(\dfrac{.45}{\text{Highway Fuel Economy}}\right)}$

of the complete absence of import production data in the literature, requests were made to the sixteen major import manufacturers to supply production data to DOT/TSC.[1] All sixteen manufacturers responded favorably, and this data was used to determine both import model and vehicle configuration production.

NOTE: All vehicles produced for sale in the United States (including California) are included in the production related attributes.

Two sets of production figures are included for each vehicle contained in the data base. Both model production and individual configuration production are given in terms of cumulative production from the date of production start-up to December 31, March 31, June 30, respectively and also for the whole model year. Table 2-3 presents the volume data for the three configurations which represent the Nova model. The CID, transmission (TR), and curb weight (CWT) define the three different configurations, while the column, MS4 presents the total production of all Novas for the whole model year.

TABLE 2-3. NOVA PRODUCTION DATA

MOD	CID	TR	CWT	MS4	TP1	TP2	TP3	TP4
Nova	250	A3	3225.0	275.0	41.0	71.8	105.4	141.2
Nova	262	A3	3534.0	275.0	26.2	31.7	46.2	46.5
Nova	350	A3	3895.0	275.0	46.7	63.5	83.1	87.4

[1] Under Federal law, all manufacturers must submit quarterly production reports to the EPA. TSC personnel from the Voluntary Fuel Economy Monitoring Program requested that copies of this data also be sent to DOT.

The TP1, TP2, TP3 and TP4 columns give the cumulative vehicle configuration through the first, second, third and final model year quarter respectively. The sum of the three TP4 production figures equals total Nova production (MS4).

2.3.3 Vehicle Characteristics

The vehicle characteristics data serves as an aid in classifying groups of vehicles. For example, a compact vehicle can be defined in terms of: 1) wheelbase; 2) length; 3) weight; 4) inertia weight class; 5) passenger capacity; 6) roominess index; and 7) trunk capacity. The vehicle characteristics data was primarily derived from the following two sources: Automotive News and Motor Vehicle Manufacturers Association publications.

2.3.4 Engine Drivetrain Characteristics

The fuel economy and performance of a vehicle are greatly influenced by the powertrain characteristics. Attributes are chosen to represent powertrain characteristics such as:

- engine cubic inch displacement
- horsepower
- engine revolutions per minute (RPM)
- engine compression ratio
- number of cylinders
- fuel injection system (carburetor or electronic)
- transmission type and number of gears
- rear-end-ratio

Data for these attributes were derived from the same sources as mentioned in Section 2.3.3.

2.3.5 Emission Control Hardware and Emission Levels

In model year 1975, catalytic converters were installed for the first time to reduce automobile hydrocarbon and carbon monoxide emissions. Also, other systems were used to control these emissions and also nitrogen oxide emissions. The emissions control hardware attributes were selected in order to indicate the presence or absence of the hardware in a specific vehicle configuration. Emissions equipment presented in the data base includes aftertreatment devices (catalytic converter or thermal reactor), EGR, air injection pumps, etc. Data obtained by the EPA under their vehicle certification program were used as the source of emission data in the ACDB. The emission level for the three pollutants are based on actual vehicle tests at the 4000 mile mark, projected to 50,000 miles.

2.3.6 Performance

Several attributes were selected to describe vehicle acceleration performance. The selected performance attributes are: the time to accelerate from 0 to 60 mph; the time to accelerate from 40 to 60 mph; and the time to accelerate from 45 to 65 mph. The main sources for these performance attributes were Consumer Report and various monthly automobile magazines. Since these types of magazines tend to test certain types of automobiles ("good" performers or brand new models), performance data is missing for some of the 216 vehicles. Also, the definition of the time to accelerate from 0 to 60 mph is not consistent from one source to another. For example, two different magazines which tested identical vehicles reported acceleration times that differed by as much as 20%.

2.3.7 Price

The manufacturer suggested retail price (MSRP), actual purchase price, dealer wholesale price, and manufacturer cost are all descriptions of vehicle costs. Because the data were not available for the last three descriptions, MSRP was selected to describe vehicle cost. Automotive News Weekly and Wards Weekly Report were the main data sources used in calculating vehicle cost.

In determining the MSRP for a vehicle, the first step was to estimate the percent of optional equipment sold on new automobiles. In general, the literature indicated that most intermediate, standard, and luxury type models were purchased with the following accessories: air-conditioner; power steering; power brakes; automatic transmission; and radio. The majority of the subcompacts and compacts were bought with only automatic transmission and radio. Next, the base price, i.e., no optional equipment, was determined, and then additional costs of the optional equipment were added on in order to calculate the final MSRP. This methodology was used to estimate the MSRP for the majority of the 216 vehicles contained in the data base. However, if individual models were purchased with different optional equipment, i.e., the majority of the compact Monarchs sold had air-conditioning units, the pricing methodology was modified to incorporate these changes.

2.3.8 Other

Several attributes were selected to further define the individual vehicle configuration in the data base. These attributes include: the model year in which the vehicle was built; where the vehicle was produced, the United States or imported; the vehicle manufacturer, and the division of the manufacturer, if applicable; body style (standard or station wagon); transmission type; and engine size (cubic inch displacement).

A comment section was also included for each vehicle in the ACDB. The comment section was used to help clarify or further define certain attributes. For instance, if the selection of the EPA fuel economy for an ACDB vehicle configuration was not exact, i.e., the EPA test vehicle and ACDB vehicle were not identical, the specifications of the EPA test vehicle were included under the "comment" attribute.

2.4 DATA BASE DEVELOPMENT

After the 216 vehicles and the attributes to describe these vehicles were selected, the actual collection, collation, and storage of the data on the DEC System 10 computer was initiated. This process involved:

a) Collecting reference material

b) Recording of the data on coding sheets. This involved the entry of approximately 10,000 elements (216 vehicles by 50 attributes) onto the coding sheets.

c) Manually checking all coding sheets for accuracy.

d) Transferring, input data from the coding sheets to a card deck. After the data was transferred to cards, the card deck was verified by a card reader.

e) Reading the card deck into computer disk.

f) Manually rechecking the data for accuracy.

g) Using data base routines to reformat the newly-generated disc file into a System 1022 data input file.

h) Reviewing again the data contained in the System 1022 data input file for accuracy and corrections.

2.5 RESULTS TO DATE

Since the ACDB became operational in March 1975, various users have made useful applications of the data base functions. Table 2-4 summarizes the various users of the data base, and indicates the information which has been provided to them.

2.6 FUTURE DATA BASE DEVELOPMENT

In early 1976, a 1976 Automotive Characteristics Data Base will be developed to describe the 1976 model year fleet. This data base will be very similar to the 1975 ACDB, except that the number of vehicle attributes and the number of vehicle configurations will be reduced.

A contract will be awarded to collect and collate vehicle characteristic data for pre-1975 model years. Specifically, vehicle data will be collected for model years 1974, 1973, 1972, 1971, 1970, 1965 and 1955. This data base will also be similar to the 1975 ACDB.

TABLE 2-4. AUTOMOTIVE CHARACTERISTICS DATA BASE USERS

Type Study	Provided For	Data Provided
Quick-Reaction Studies	Senate Committee on Commerce	Analysis of domestic vs. import vehicle fuel economies
	House Joint Committee on Internal Revenue Taxation	Histograms of domestic and import fuel economy
	Federal Energy Administration	Manufacturer and fleet fuel economy by production quarter
	Department of Transportation (DOT)	Various analyses completed
	Energy Research and Development Administration	Vehicle performance data
Major Studies		
1. Motor Vehicle Goals Beyond 1980	Automotive Design Panel	Vehicle characteristics of the 1975 fleet
	Marketing and Mobility Panel	Production data
	Automotive Manufacturing and Maintenance Panel	Production data
	Safety Panel	Production data
2. Fuel Economy-Emissions Trade-off Study	DOT/TSC	Fuel economy and vehicle price data
Voluntary Fuel Economy Monitoring Program	DOT	Fuel economy and production data

3. AUTOMOBILE FLEET STATISTICS, 1975

3.1 INTRODUCTION

The statistical data presented in this section are useful in the analysis of the characteristics of automotive energy efficient vehicles. Data presentation is divided into three basic categories: Manufacturers; Domestic/Import; Fleet. Manufacturer subcategories include the four major domestic producers and the foreign producers of the three major U.S. import models. The Domestic/Import categories include the total domestic fleet and the total import fleet. Fleet subcategory groupings include all models contained in the data base. Tables, Histograms, and Plots comprise the formats of the statistical data presented in this section. Each data format is described in greater detail in the paragraphs that follows.

3.2 VEHICLE PERFORMANCE AND CHARACTERISTICS TABLES

Tables 3-1 and 3-2 present fuel economy performance and statistics of vehicle characteristics for: (1) the four domestic manufacturers and the three largest import manufacturers; (2) the total for the domestic and import manufacturers; and (3) the total fleet. Table 3-1 presents the market penetration and fuel economy for the largest domestic and import manufacturers. Fuel economy data is presented in terms of harmonic production weighted averages for the EPA composite cycle. Table 3-2 presents vehicle characteristics data for the following parameters:

a) Inertia Weight

b) The estimated 50,000 mile emission levels over the EPA CVS-2 drive cycle for hydrocarbons, carbon monoxide, and nitrogen oxide

c) Wheelbase

d) Vehicle length

e) Vehicle height

f) Vehicle roominess

g) Engine cubic inch displacement (CID)

h) Engine horsepower

i) Number of cylinders

j) Suggested manufacturer list price

k) Horsepower to inertia weight ratio

l) Roominess to inertia weight ratio

Production weighted averages are presented for all parameters considered in Tables 3-1 and 3-2.

3.3 HISTOGRAMS

Histograms are presented for vehicle production versus the selected vehicle parameters for each of the three basic categories (i.e., domestic, import, and total fleet).

The histograms presented are:

a) Figures 3-1 through 3-9 are fuel economy histograms for the EPA urban, highway and composite drive cycles.

b) Figures 3-10 through 3-12 are by inertia weight class.

c) Figures 3-13 through 3-15 are by wheelbase class.

d) Figures 3-16 through 3-18 are by vehicle roominess class.

e) Figures 3-19 through 3-21 are by horsepower class.

f) Figures 3-22 through 3-24 are by engine cubic inch displacement (CID) class.

g) Figures 3-25 through 3-27 are by # cylinders.

h) Figures 3-28 through 3-30 are by passenger capacity.

i) Figures 3-31 through 3-33 are by HC emissions class.

j) Figures 3-34 through 3-36 are by CO emissions class.

k) Figures 3-37 through 3-39 are by NO_x emissions class.

l) Figures 3-40 through 3-42 are by manufacturer's suggested retail price class.

m) Figures 3-43 through 3-45 are by horsepower to inertia weight ratio class.

n) Figures 3-46 through 3-48 are by cubic inch displacement to inertia weight ratio class.

o) Figures 3-49 through 3-51 are by roominess factor to inertia weight ratio class.

3.4 FUEL ECONOMY TABLES

These tables present the harmonic production-weighted fuel economy in mpg. The three basic manufacturer categories are included in each table. The fuel economy tables presented are:

a) IWT Weight (IWT) - Table 3-3.

b) Wheel Base (WB) - Table 3-4.

c) Vehicle Roominess (RF) - Table 3-5.

d) Horsepower (HP) - Table 3-6.

e) Cubic Inch Displacement (CID) - Table 3-7.

f) # of Cylinders (CY) - Table 3-8.

g) # of Passengers (PASS) - Table 3-9.

h) Price - Table 3-10.

3.5 OTHER TABLES

Table 3-11 presents emission control system utilization statistics by engine CID class. The emission control systems include catalysts and thermal reactors, exhaust gas recirculation, and air pump. The data are presented as the percentages of the particular emission control system usage to the total vehicle production for the given CID class.

Table 3-12 presents manufacturers suggested retail price data versus inertia weight class for the major automobile manufacturers.

3.6 PLOTS

Plots are presented for the various data base attributes. The numbers which constitute the plots represent the number of occurrences found in the data base. The number "0" indicates ten or more occurrences.

These plots are presented to show the relationship, if any, between any two given vehicle attributes. In order to show the actual relationship between two variables, a regression, using a polynomial fit, was made using the plot data. The regression equations and the correlation coeffient are present on each plot. The plots and regressions presented are:

a) Inertia Weight versus Fuel Economy - Figure 3-52.

b) Wheel Base versus Fuel Economy - Figure 3-53.

c) Roominess Factor versus Fuel Economy - Figure 3-54.

d) HP/IWT Ratio versus Fuel Economy - Figure 3-55.

e) HP/IWT Ratio versus 0 - 60 Acceleration - Figure 3-56.

f) CID/IWT Ratio versus 0 - 60 Acceleration - Figure 3-57.

g) Inertia Weight versus Wheel Base - Figure 3-58.

h) Inertia Weight versus Roominess Factor - Figure 3-59.

i) Inertia weight versus Horsepower - Figure 3-60.

j) Inertia Weight versus Price - Figure 3-61.

k) Vehicle Roominess (RF) versus Price - Figure 3-62.

l) Length versus Wheel Base - Figure 3-63.

m) Horsepower versus CID - Figure 3-64.

TABLE 3-1. 1975 AUTOMOBILE PRODUCTION AND FUEL ECONOMY

Manufacturer	Market Share Percent of Total Production 1/	49-State Composite Fuel Economy (mpg)
GMC	46	15.4
FORD	25	13.9
CHRYSLER	11	15.4
AMC	4	18.8
TOTAL DOMESTIC	86	15.1
VW	2	28.1
TOYOTA	3	23.5
NISSAN	2	26.8
OTHER	7	22.5
TOTAL IMPORT	14	24.3
TOTAL FLEET	100	15.9

1/ Market share for 50 states

TABLE 3-2. COMPUTED AVERAGE VEHICLE CHARACTERISTICS FOR THE 1975 AUTOMOBILE FLEET

Manufacturer	Inertia Weight (lbs)	Emissions Level (gm/mile)			Wheel-Base (in)	Length (in)	Height (in)	Roominess Factor (in^3)	Engine Characteristics			SUGGESTED PRICE (MLP) ($)	OTHER	
		HC	CO	NO_x					CID (in^3)	HP (hp)	#CYL		HP/IWT (hp/lb)	RF/IWT (in^3/lb)
GMC	4450	.76	7.27	2.33	115	210	53	278	342	150	7.4	5150	.033	.064
FORD	4250	.80	9.10	2.41	110	203	53	275	304	126	7.0	4950	.029	.066
CHRYSLER	4250	.99	8.49	2.27	115	210	54	279	311	143	7.3	4750	.033	.067
AMC	3600	.89	7.43	2.64	104	184	53	269	262	99	6.4	3800	.028	.076
TOTAL DOMESTIC	4350	.80	7.49	2.37	113	207	53	277	325	140	7.2	5000	.032	.065
VW	2300	1.19	8.49	1.71	95	160	56	259	92	64	4.0	3500	.028	.114
TOYTA	2650	.98	8.60	2.21	95	169	54	255	112	84	4.0	3800	.032	.097
NISSAN	2550	1.15	8.42	2.28	93	167	54	256	107	89	4.3	3800	.035	.102
OTHER	2700	.75	6.21	1.40	96	170	53	256	117	82	4.3	5400	.030	.098
TOTAL IMPORT	2600	.99	7.88	1.87	95	168	54	256	110	81	4.2	4450	.031	.101
TOTAL FLEET	4100	.83	7.93	2.30	111	202	53	274	296	132	6.8	4900	.032	.070

TABLE 3-3. HARMONIC PRODUCTION WEIGHTED COMPOSITE FUEL ECONOMY (MPG) VERSUS INERTIA WEIGHT CLASS.

Manufacturer	INERTIA WEIGHT CLASS (LBS)									
	2000	2250	2500	2750	3000	3500	4000	4500	5000	$\geq$5500
GMC	--	--	--	24.5	23.0	19.4	16.3	15.4	14.2	12.8
FORD	--	--	--	--	21.8	16.1	14.3	12.8	12.0	11.3
CHRYSLER	--	--	--	--	--	20.0	15.7	13.7	13.8	12.2
AMC	--	--	--	--	21.9	19.5	17.2	15.0	--	--
TOTAL DOMESTIC	--	--	--	24.5	22.3	18.5	15.5	14.7	13.3	12.3
VW	--	28.1	27.9	--	--	--	--	--	--	--
TOYOTA	--	--	25.1	21.5	22.0	--	--	--	--	--
NISSAN	--	31.9	27.7	25.9	20.0	--	--	--	--	--
OTHER	28.4	25.9	23.2	20.6	20.4	21.3	14.4	--	--	10.1
TOTAL IMPORT	28.4	29.0	24.6	22.6	20.6	21.3	14.4	--	--	10.1
TOTAL FLEET	28.4	29.0	24.6	23.7	21.9	18.6	15.5	14.7	13.3	12.3

TABLE 3-4. HARMONIC PRODUCTION WEIGHTED 49 STATE COMPOSITE FUEL ECONOMY (MPG) VERSUS WHEEL BASE

Manufacturer	WHEEL BASE CLASS (INCHES)						
	≤90	90.1-97.0	97.1-104.0	104.1-111.0	111.1-118.0	118.1-125.0	≥125.1
GMC	--	22.3	15.4	16.3	15.4	13.9	12.8
FORD	--	19.5	16.3	14.3	12.5	11.6	11.8
CHRYSLER	--	--	--	19.1	13.8	13.5	--
AMC	--	21.6	19.9	19.2	15.3	--	--
TOTAL DOMESTIC	--	20.9	17.3	16.4	14.5	13.0	12.7
VW	--	28.1	27.9	--	--	--	--
TOYOTA	--	23.8	22.0	--	--	--	--
NISSAN	--	27.0	22.9	--	--	--	--
OTHER	26.2	21.2	20.1	20.9	--	10.1	--
TOTAL IMPORT	26.2	25.0	22.0	20.9	--	10.1	--
TOTAL FLEET	26.2	22.4	18.7	16.5	14.5	13.0	12.7

TABLE 3-5. HARMONIC PRODUCTION WEIGHTED 49 STATE COMPOSITE FUEL ECONOMY (MPG VERSUS VEHICLE ROOMINESS

Manufacturer	ROOMINESS FACTOR CLASS (INCHES)							
	≤255	256-260	261-265	266-270	271-275	276-280	281-285	≥285
GMC	20.1	24.5	15.4	--	16.4	14.8	15.3	13.5
FORD	18.4	20.4	--	15.8	14.6	11.8	12.5	11.5
CHRYSLER	--	--	--	--	19.1	15.3	12.5	13.5
AMC	--	--	20.5	19.2	--	--	--	15.3
TOTAL DOMESTIC	19.3	22.0	17.2	17.8	16.3	14.6	14.1	13.1
VW	26.5	--	29.2	--	--	--	--	--
TOYOTA	23.6	20.0	--	--	--	--	--	--
NISSAN	27.3	25.2	--	--	--	--	--	--
OTHER	25.3	21.5	23.6	20.3	18.7	--	--	10.1
TOTAL IMPORT	25.2	23.4	27.8	20.3	18.7	--	--	10.1
TOTAL FLEET	22.4	22.2	19.1	18.7	16.4	14.6	14.1	13.1

TABLE 3-6. HARMONIC PRODUCTION WEIGHTED 49 STATE COMPOSITE FUEL ECONOMY (MPG) VERSUS HORSEPOWER

Manufacturer	HORSEPOWER CLASS							
	≤50	51-75	76-100	101-125	126-150	151-175	176-200	≥201
GMC	--	--	23.6	17.8	14.9	14.7	13.6	12.5
FORD	--	16.0	20.2	13.2	12.6	10.9	11.8	11.37
CHRYSLER	--	--	20.0	--	13.3	13.1	15.4	12.8
AMC	--	--	20.1	15.2	14.5	--	--	--
TOTAL DOMESTIC	--	16.0	20.9	16.5	13.8	14.1	13.7	12.1
VW	25.9	29.0	--	--	--	--	--	--
TOYOTA	--	25.1	21.7	19.2	--	--	--	--
NISSAN	--	30.7	25.2	--	19.3	--	--	--
OTHER	27.4	26.6	21.8	18.3	17.5	20.4	13.6	--
TOTAL IMPORT	26.5	27.5	22.2	18.4	18.6	20.4	13.6	--
TOTAL FLEET	26.5	21.6	21.2	16.6	13.9	14.1	13.7	12.1

TABLE 3-7. HARMONIC PRODUCTION WEIGHTED 49 STATE COMPOSITE FUEL ECONOMY (MPG) VERSUS ENGINE SIZE

Manufacturer	ENGINE CLASS (CID)							
	≤100	101-150	151-200	201-250	251-300	301-350	351-400	≥401
GMC	--	23.6	--	18.3	16.9	15.3	13.7	12.8
FORD	--	21.8	16.7	15.8	--	13.5	12.2	11.6
CHRYSLER	--	--	--	20.0	--	13.3	14.5	12.8
AMC	--	--	--	20.1	20.1	15.2	14.5	--
TOTAL DOMESTIC	--	22.8	16.7	18.1	18.6	14.8	13.1	12.5
VW	28.1	--	--	--	--	--	--	--
TOYOTA	25.1	21.7	19.2	--	--	--	--	--
NISSAN	30.7	25.2	19.3	--	--	--	--	--
OTHER	25.5	21.7	19.4	--	13.1	--	--	10.1
TOTAL IMPORT	26.9	22.2	19.3	--	13.1	--	--	10.1
TOTAL FLEET	26.9	22.6	17.8	18.1	18.3	14.8	13.1	12.5

TABLE 3-8. HARMONIC PRODUCTION WEIGHTED 49 STATE COMPOSITE FUEL ECONOMY (MPG) VERSUS THE NUMBER OF CYLINDERS

Manufacturer	Number of Cylinders		
	4	6	8
GMC	23.6	18.3	14.5
FORD	21.8	16.2	12.3
CHRYSLER	--	20.0	13.9
AMC	--	20.1	15.1
TOTAL DOMESTIC	22.8	18.2	13.8
VW	28.1	--	--
TOYOTA	23.6	19.2	--
NISSAN	29.0	19.3	--
OTHER	24.0	18.1	13.0
TOTAL IMPORT	25.4	18.6	13.0
TOTAL FLEET	24.3	18.2	13.8

TABLE 3-9. HARMONIC PRODUCTION WEIGHTED 49 STATE COMPOSITE FUEL ECONOMY (MPG) VERSUS PASSENGER CAPACITY

Manufacturer	PASSENGER CAPACITY		
	≤4	5	≥6
GMC	21.6	16.3	14.3
FORD	19.5	15.8	12.6
CHRYSLER	--	19.1	13.7
AMC	21.6	19.6	15.3
TOTAL DOMESTIC	20.6	17.3	13.7
VW	28.1	--	--
TOYOTA	23.6	--	--
NISSAN	26.8	--	--
OTHER	24.3	19.6	10.1
TOTAL IMPORT	25.3	19.6	10.1
TOTAL FLEET	22.6	17.5	13.7

TABLE 3-10. HARMONIC PRODUCTION WEIGHTED 49 STATE COMPOSITE FUEL ECONOMY (MPG) VERSUS MANUFACTURER'S LIST PRICE

Manufacturer	MANUFACTURER'S LIST PRICE (MLP) (DOLLARS)					
	≤3000	3001-4000	4001-5000	5001-6000	6001-7000	≥7001
GMC	24.8	19.5	16.3	14.1	13.3	13.1
FORD	21.6	18.5	14.3	12.0	11.0	11.8
CHRYSLER	--	19.5	13.3	14.1	12.0	12.8
AMC	21.0	20.1	15.4	14.5	--	--
TOTAL DOMESTIC	23.0	19.1	15.4	13.5	12.4	12.7
VW	--	27.9	29.0	27.0	--	--
TOYOTA	--	25.1	21.7	19.2	--	--
NISSAN	31.9	27.1	25.0	--	19.3	--
OTHER	29.8	23.1	21.9	20.9	21.1	18.9
TOTAL IMPORT	30.8	25.6	23.0	21.3	20.3	18.9
TOTAL FLEET	26.6	20.2	16.0	13.6	14.0	13.3

TABLE 3-11. EMISSIONS CONTROL HARDWARE STATISTICS (PERCENT) 49 STATES

Manfacturer	CID ≤ 200				201 ≤ CID ≤ 299				300 ≤ CID ≤ 399				CID ≥ 400			
	% TOTAL PRODUCTION	% AFTER-TREATMENT[1]	% EGR	% AIR[2]	% TOTAL PRODUCTION	% AFTER-TREATMENT	% EGR	% AIR	% TOTAL PRODUCTION	% AFTER-TREATMENT	% EGR	% AIR	% TOTAL PRODUCTION	% AFTER-TREATMENT	% EGR	% AIR
GMC	9.5	8.7	9.2	--	11.0	11.0	14.0	5.1	46.4	46.4	46.4	0.7	30.3	30.3	30.3	7.8
FORD	22.5	13.5	22.5	22.5	15.1	8.5	14.1	15.1	38.0	32.9	38.0	38.0	24.6	24.6	24.6	24.6
CHRYSLER	--	--	--	--	33.5	33.5	33.5	--	50.6	50.6	50.6	--	15.9	15.9	15.9	--
AMC	--	--	--	--	80.1	2.9	80.1	16.1	19.9	19.9	19.9	19.9	--	--	--	--
TOTAL DOMESTIC	10.8	8.2	10.8	6.1	20.1	14.6	20.1	6.8	43.5	42.2	43.5	12.2	25.5	25.5	25.5	11.2
VW	100.0	71.8	100.0	71.8	--	--	--	--	--	--	--	--	--	--	--	--
TOYOTA	100.0	1.1	10.6	100.0	--	--	--	--	--	--	--	--	--	--	--	--
NISSAN	100.0	--	83.8	83.8	--	--	--	--	--	--	--	--	--	--	--	--
OTHER	97.1	11.3	58.5	81.1	2.8	2.8	2.8	2.8	--	--	--	--	0.1	0.1	0.1	0.1
TOTAL IMPORT	97.1	17.7	66.6	83.9	2.8	2.8	2.8	2.8	--	--	--	--	0.1	0.1	0.1	0.1
TOTAL FLEET	22.7	9.5	18.3	16.6	17.5	12.8	17.6	6.0	37.7	36.4	37.7	10.6	22.1	22.1	22.1	9.7

[1] Catalyst and Thermal Reactor

[2] Air Pump or Engine Modification

TABLE 3-12. MANUFACTURER'S SUGGESTED RETAIL PRICE ($) VERSUS INERTIA WEIGHT CLASS (LBS)

Manufacturer	WEIGHT CLASSES (LBS)			
	≤3000	3000-4000	4000-5000	>5000
GMC	$3450	$4400	$5100	$7400
FORD	3500	4300	5150	8000
CHRYSLER	--	3700	5350	7050
AMC	3100	3750	4700	--
TOTAL DOMESTIC	3450	4200	5250	7500
VW	3400	--	--	--
TOYOTA	3750	--	--	--
NISSAN	3550	--	--	--
OTHER	4150	10,000	--	36,600
TOTAL IMPORT	3900	10,000	--	36,600
TOTAL FLEET	3700	4450	5200	7550

N= 6877.00 (THOUSANDS)
MEAN= 13.1 (MPG)
S= 3.10 (MPG)

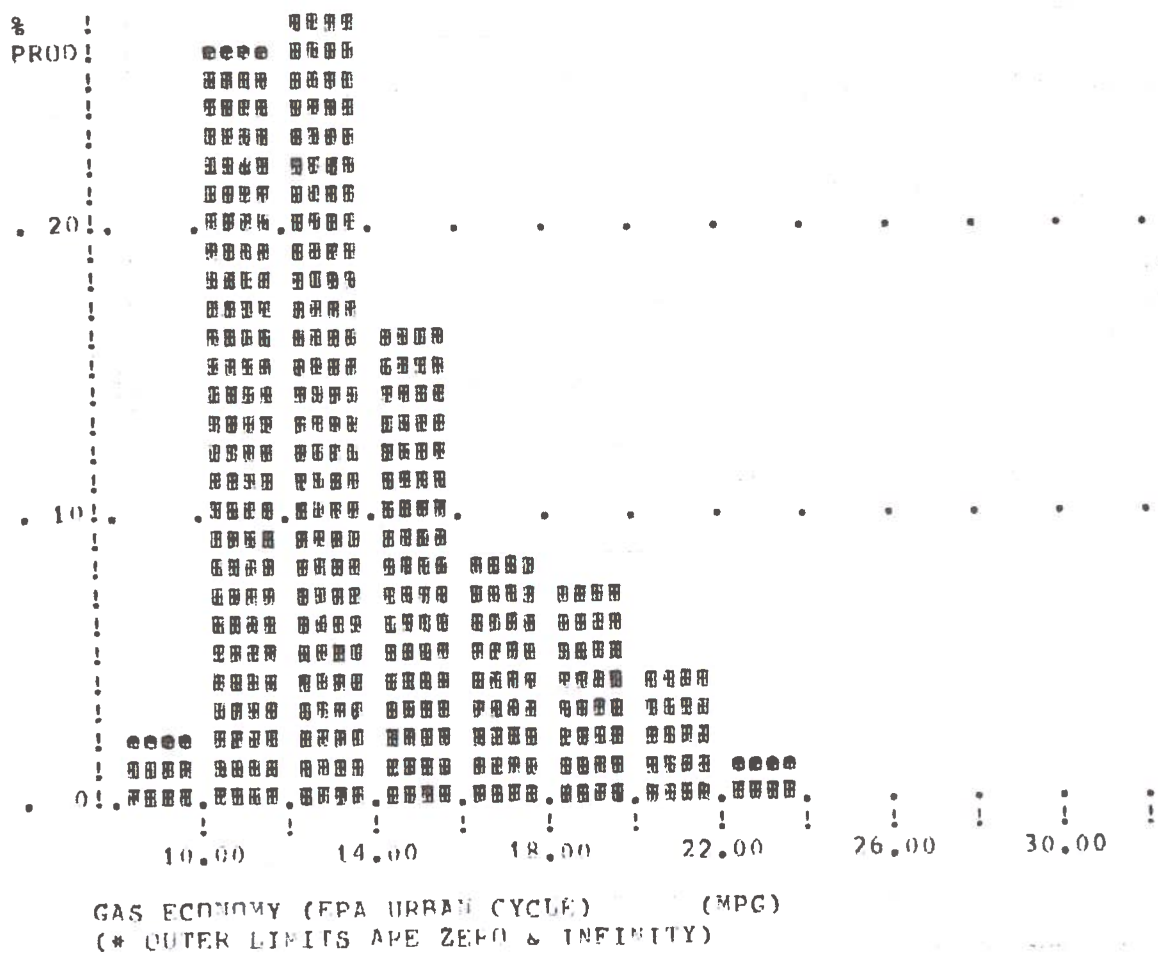


FIGURE 3-1. HISTOGRAM OF GAS ECONOMY (EPA URBAN CYCLE) (49 STATE) VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR DOMESTIC PRODUCTION (50 STATE)

N= 1073.50 (THOUSANDS)
MEAN= 21.4 (MPG)
S= 5.38 (MPG)

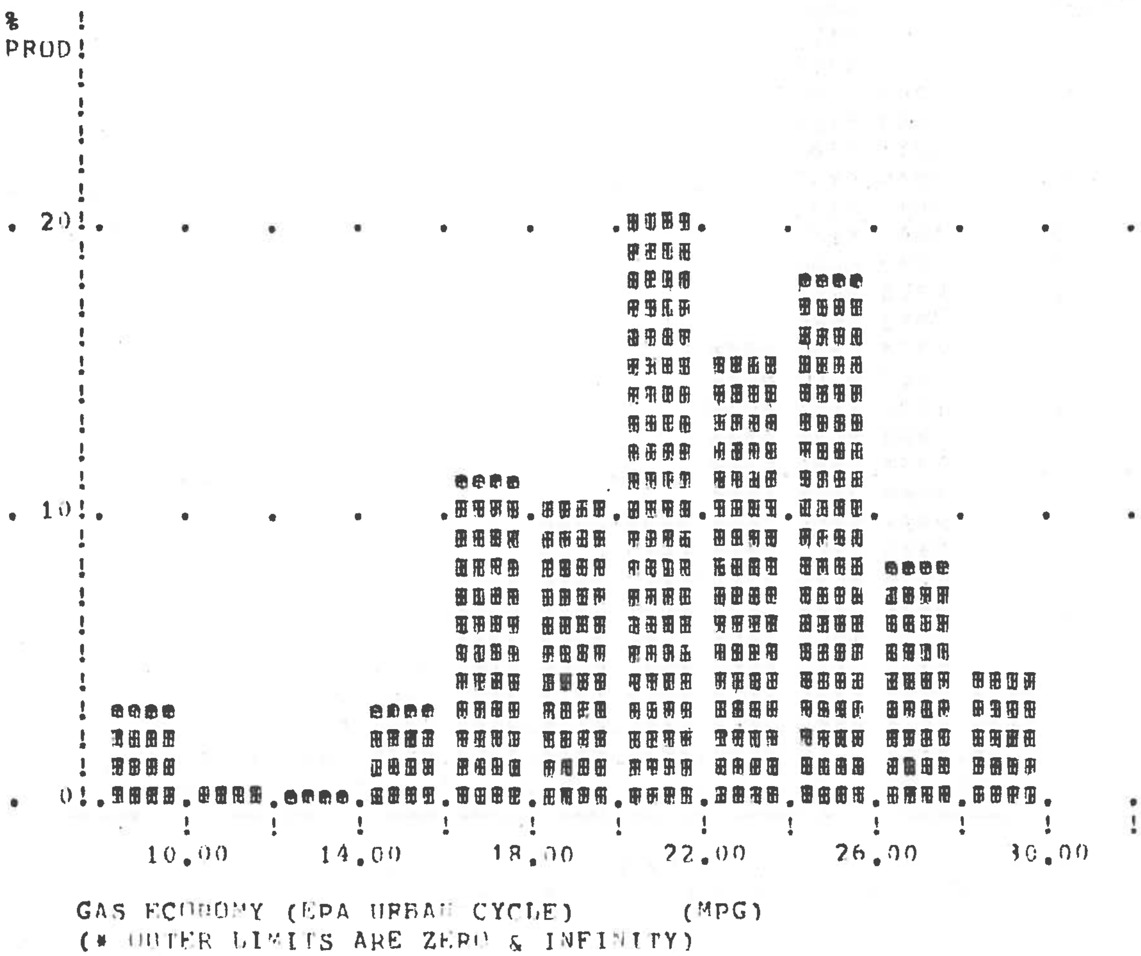


FIGURE 3-2. HISTOGRAM OF GAS ECONOMY (EPA URBAN CYCLE) (49 STATE) VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR IMPORT PRODUCTION (50 STATE)

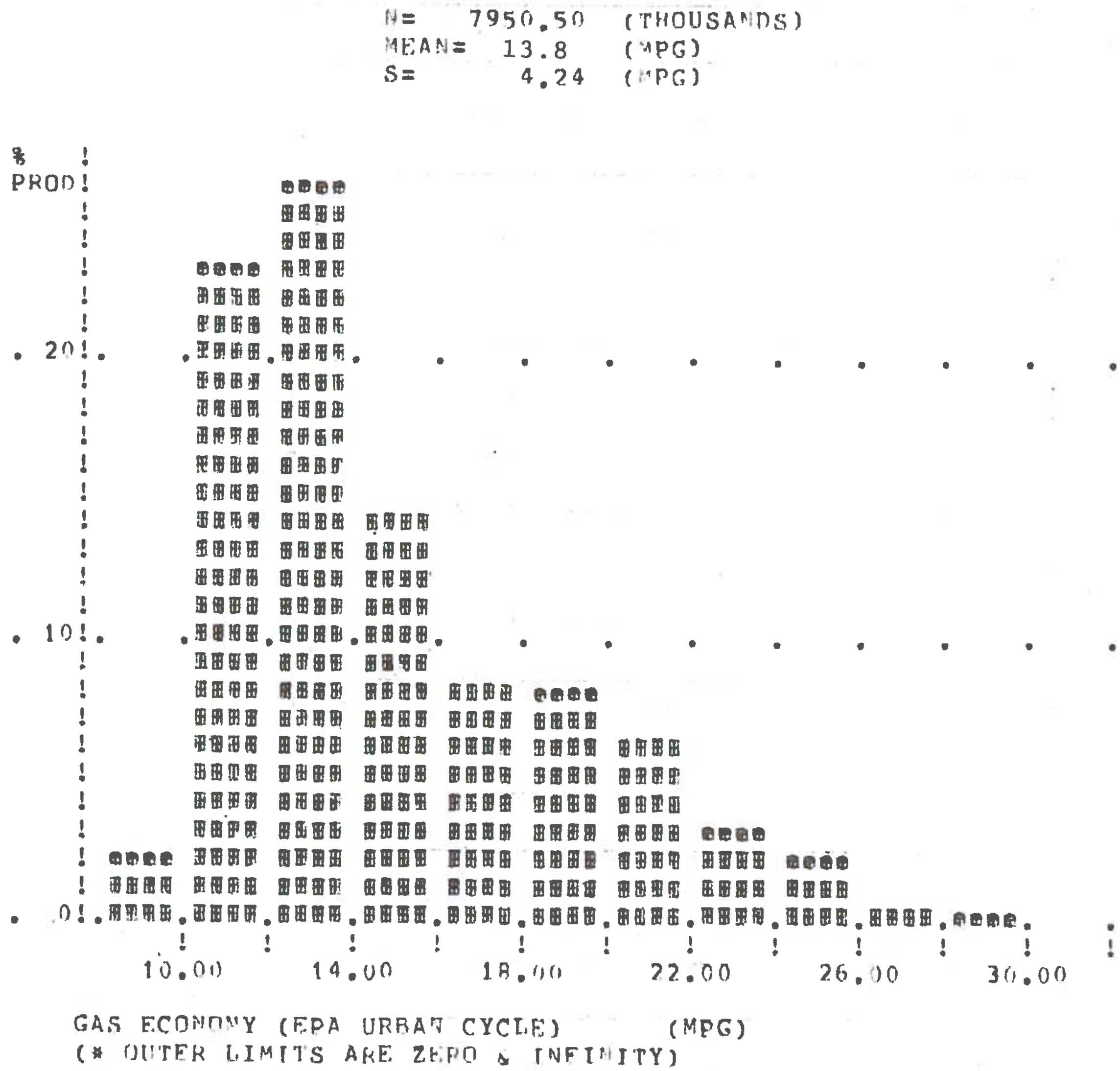


FIGURE 3-3. HISTOGRAM OF GAS ECONOMY (EPA URBAN CYCLE) (49 STATE) VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR FLEET PRODUCTION (50 STATE)

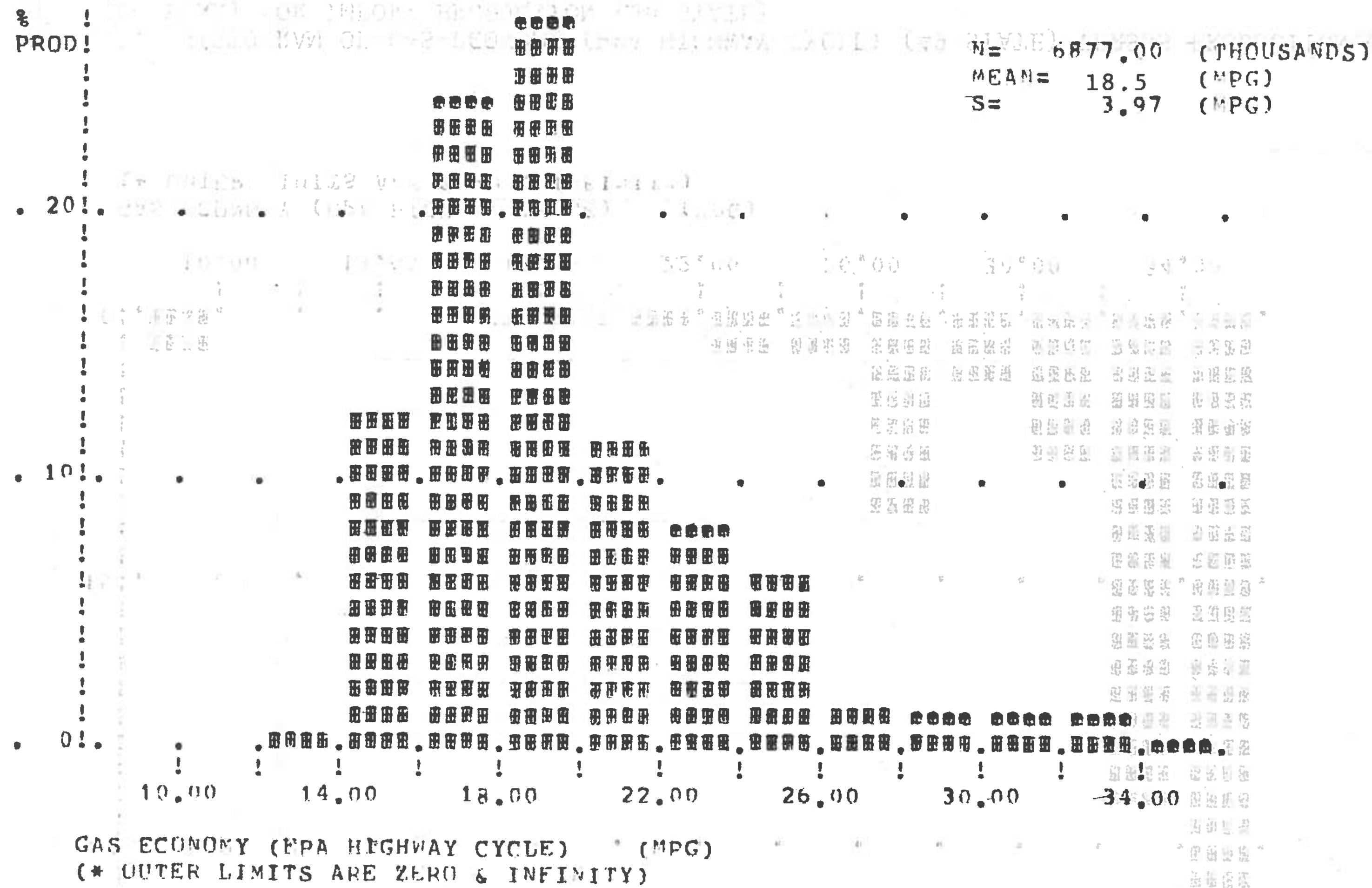


FIGURE 3-4. HISTOGRAM OF GAS ECONOMY (EPA HIGHWAY CYCLE) (49 STATE) VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR DOMESTIC PRODUCTION (50 STATE)

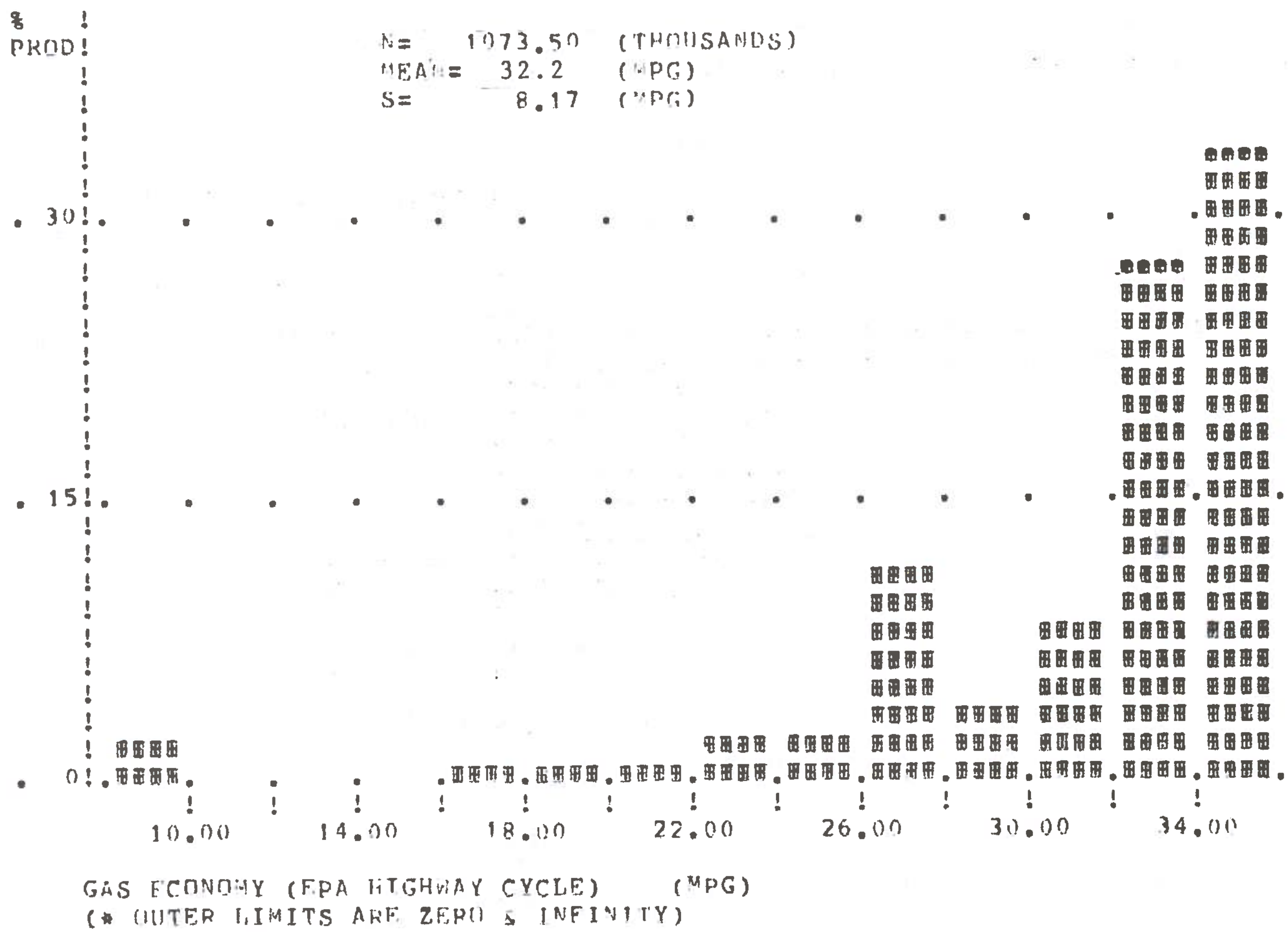


FIGURE 3-5. HISTOGRAM OF GAS ECONOMY (EPA HIGHWAY CYCLE) (49 STATE) VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR IMPORT PRODUCTION (50 STATE)

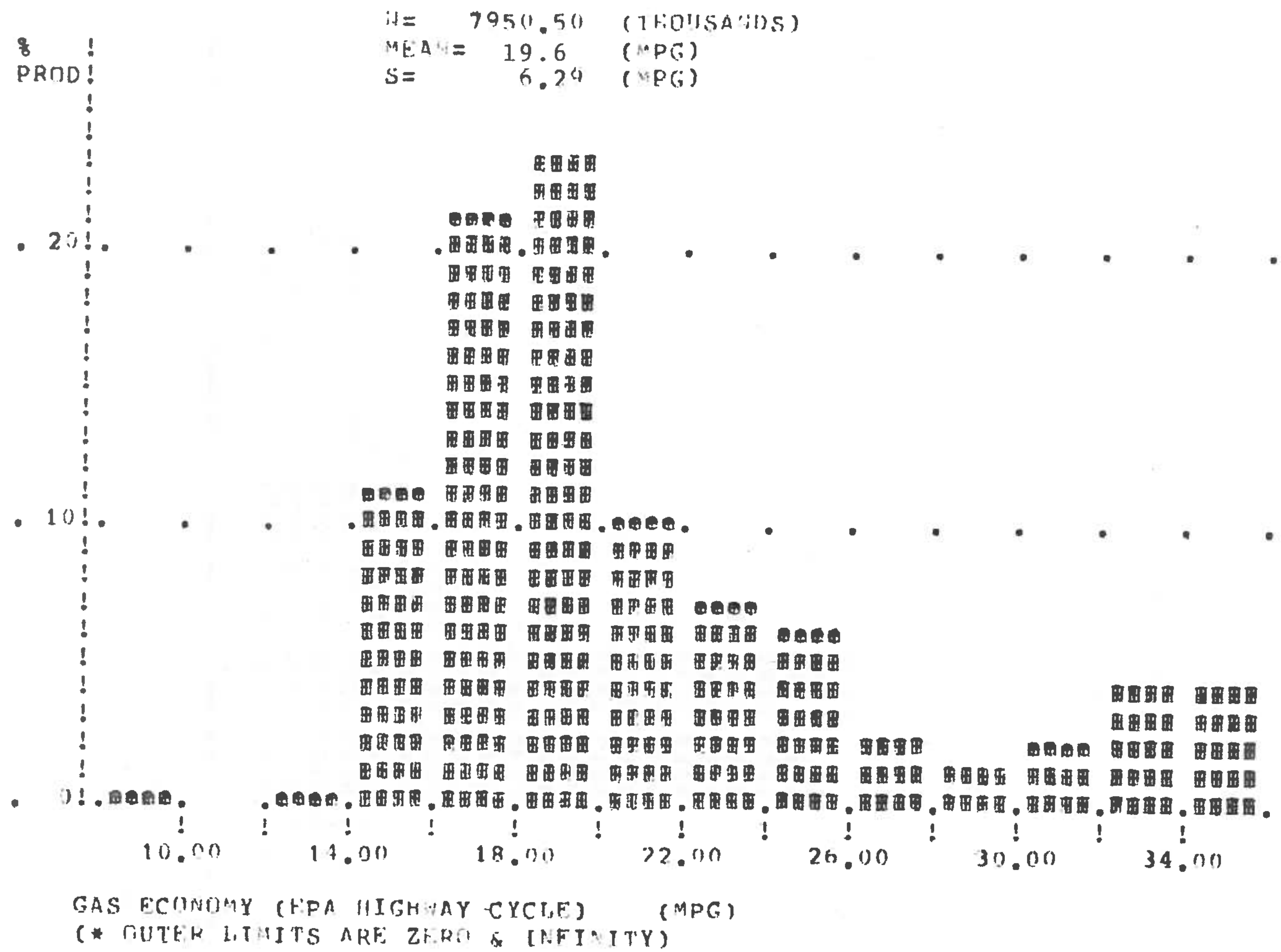


FIGURE 3-6. HISTOGRAM OF GAS ECONOMY (EPA HIGHWAY CYCLE) (49 STATE) VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR FLEET PRODUCTION (50 STATE)

N= 6877.00 (THOUSANDS)
MEAN= 15.1 (MPG)
S= 3.37 (MPG)

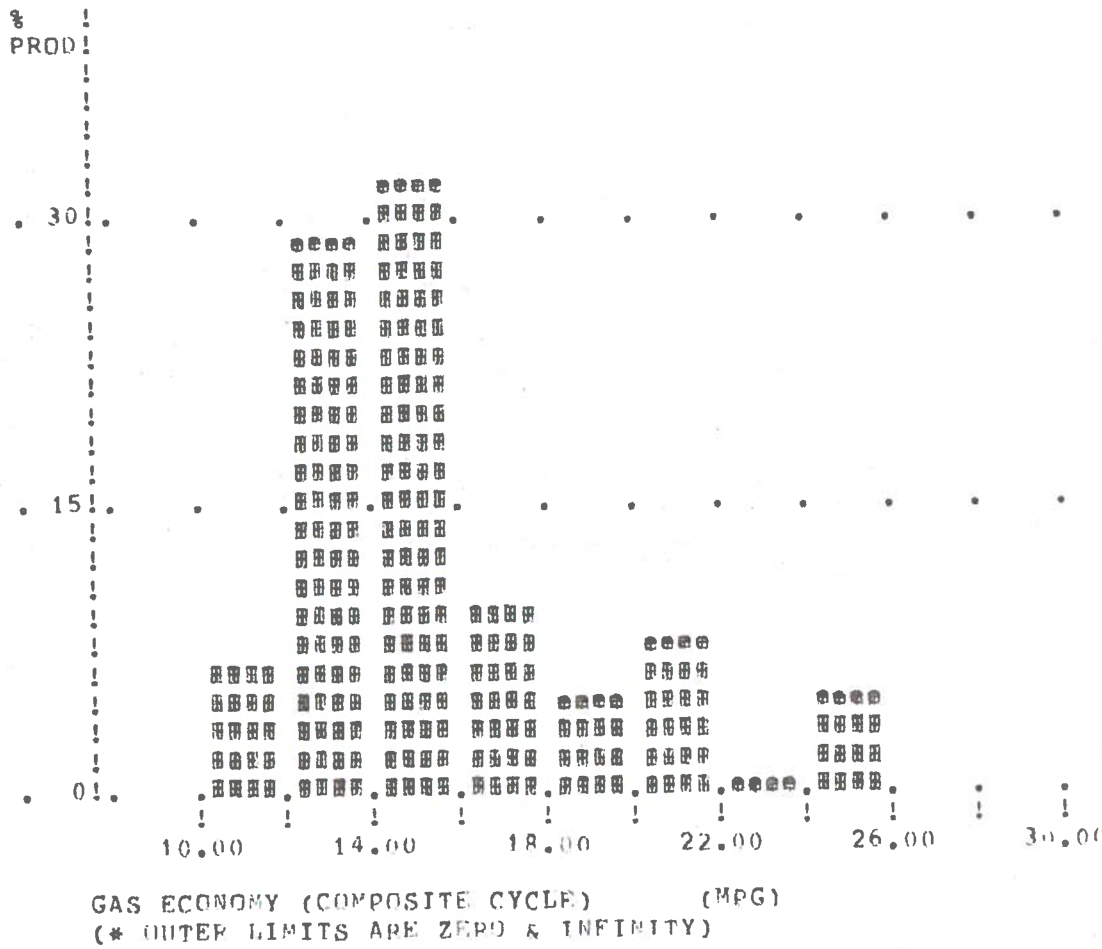
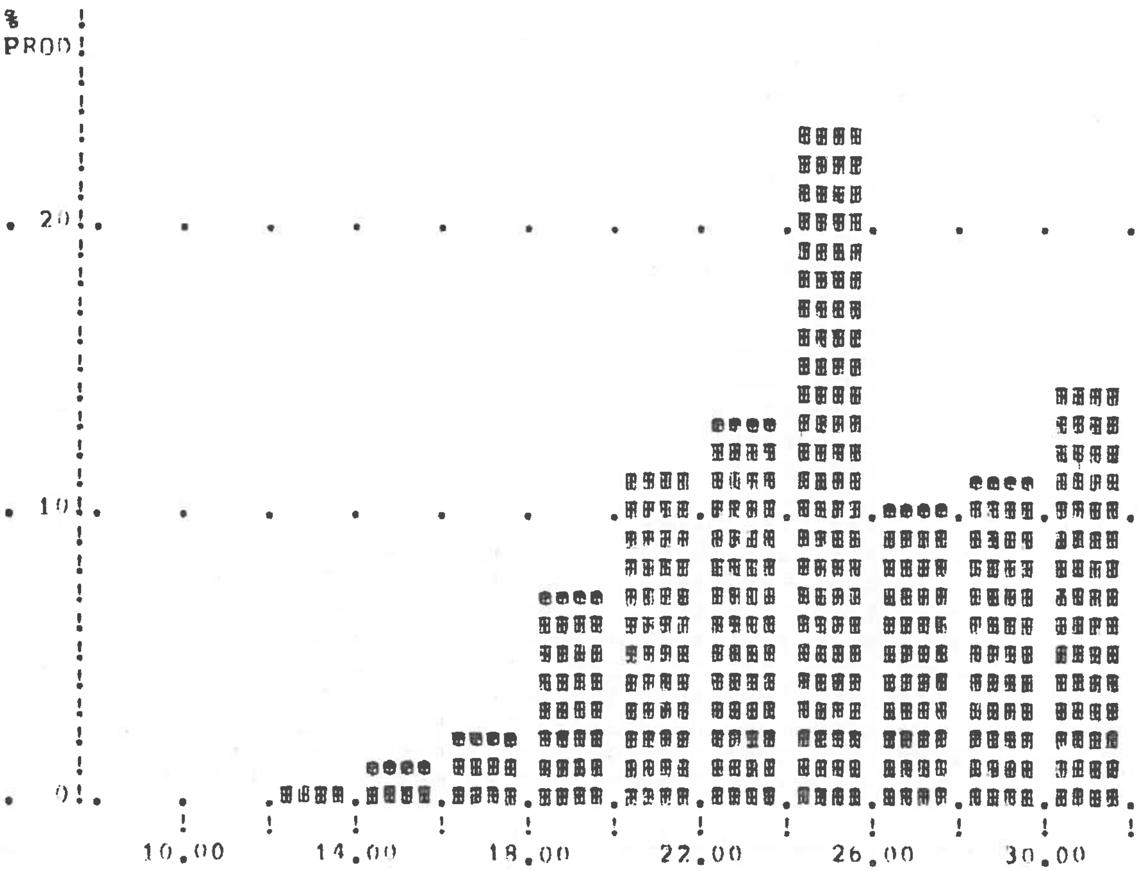


FIGURE 3-7. HISTOGRAM OF GAS ECONOMY (COMPOSITE CYCLE) (49 STATE) VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR DOMESTIC PRODUCTION (50 STATE)

FOR IMPORT PRODUCTION (50 STATE)

N= 1073.50 (THOUSANDS)
MEAN= 24.3 (MPG)
S= 4.34 (MPG)



GAS ECONOMY (COMPOSITE CYCLE) (MPG)
(* OUTER LIMITS ARE ZERO & INFINITY)

FIGURE 3-8. HISTOGRAM OF GAS ECONOMY (COMPOSITE CYCLE) (49 STATE) VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR IMPORT PRODUCTION (50 STATE)

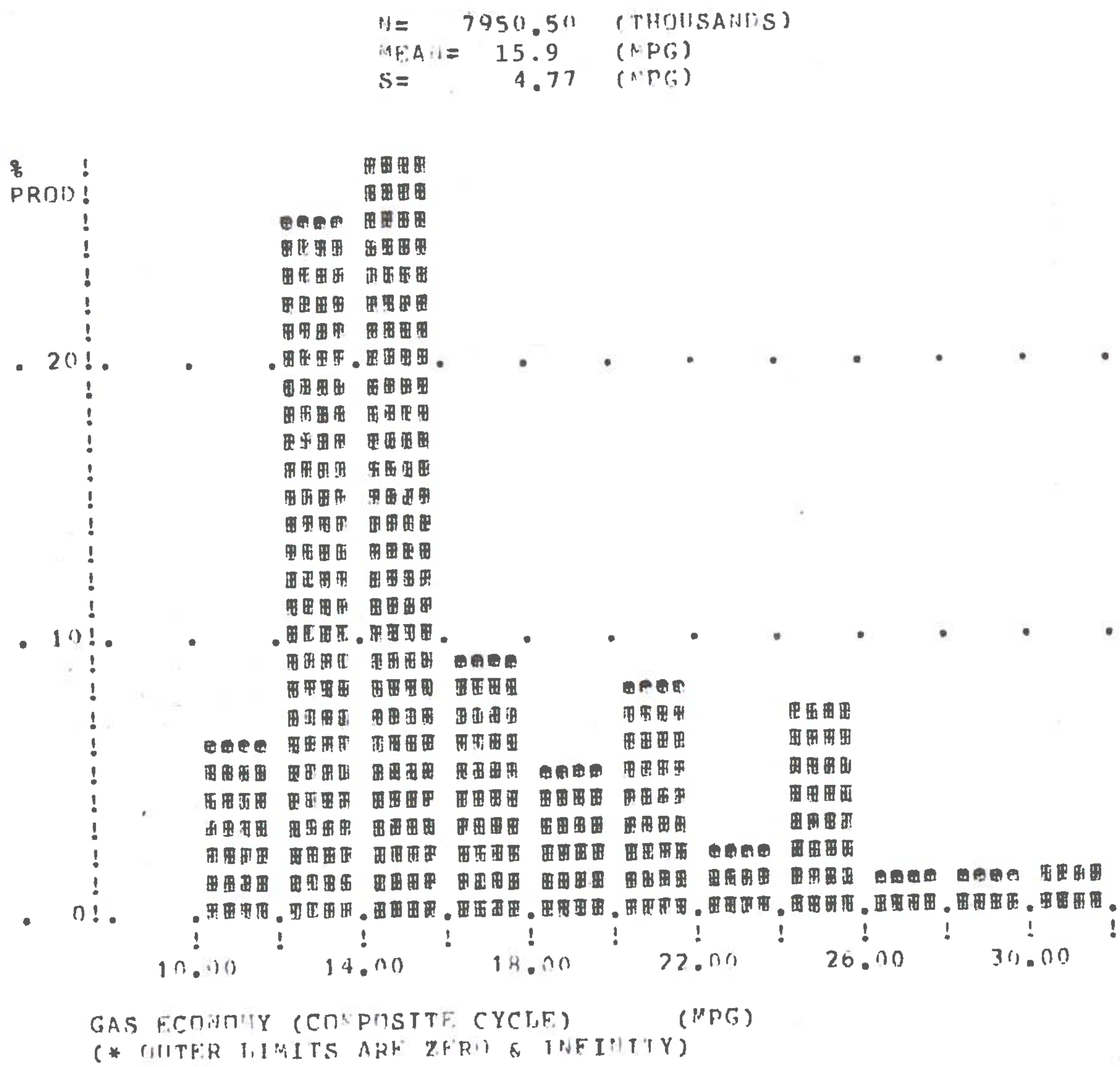


FIGURE 3-9. HISTOGRAM OF GAS ECONOMY (COMPOSITE CYCLE) (49 STATE) VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR FLEET PRODUCTION (50 STATE)

N=   6877.00   (THOUSANDS)
MEAN=4352.35   (LBS)
S=   754.56   (LBS)

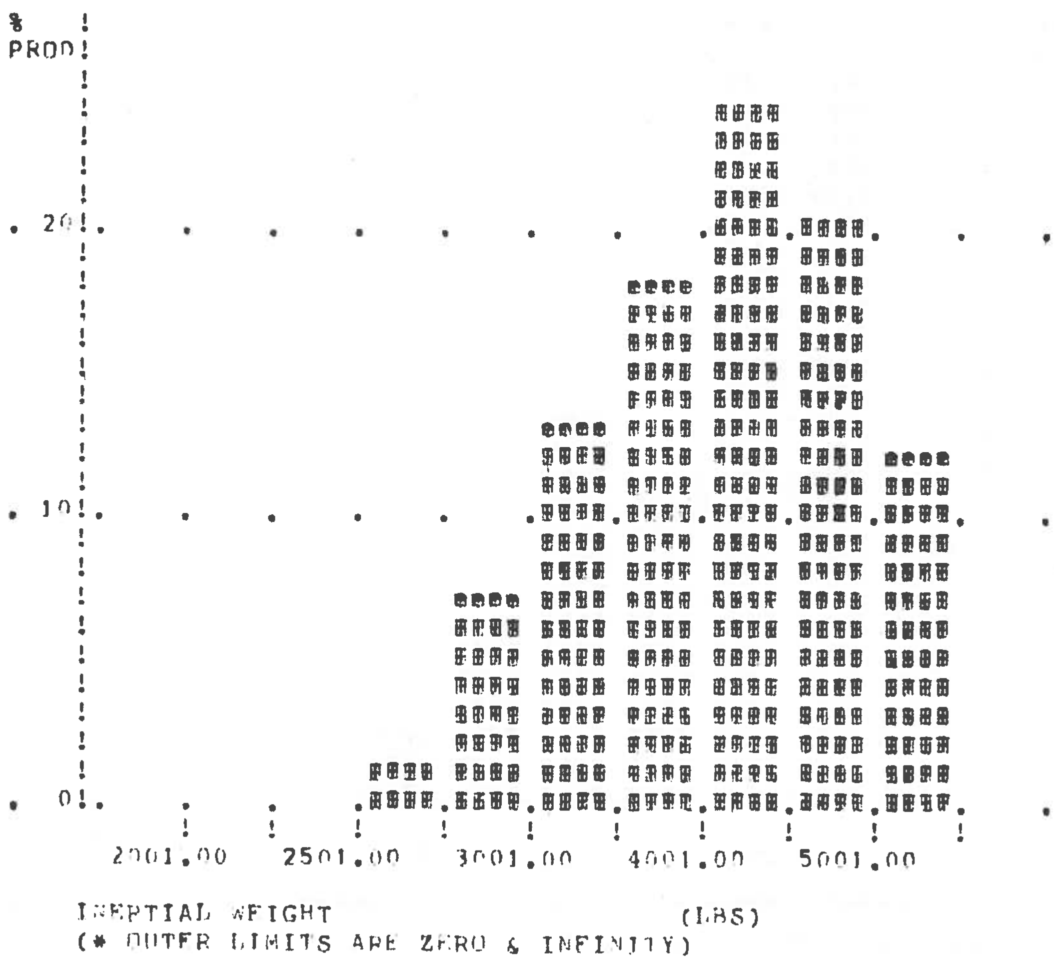


FIGURE 3-10. HISTOGRAM OF INERTIAL WEIGHT VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR DOMESTIC PRODUCTION

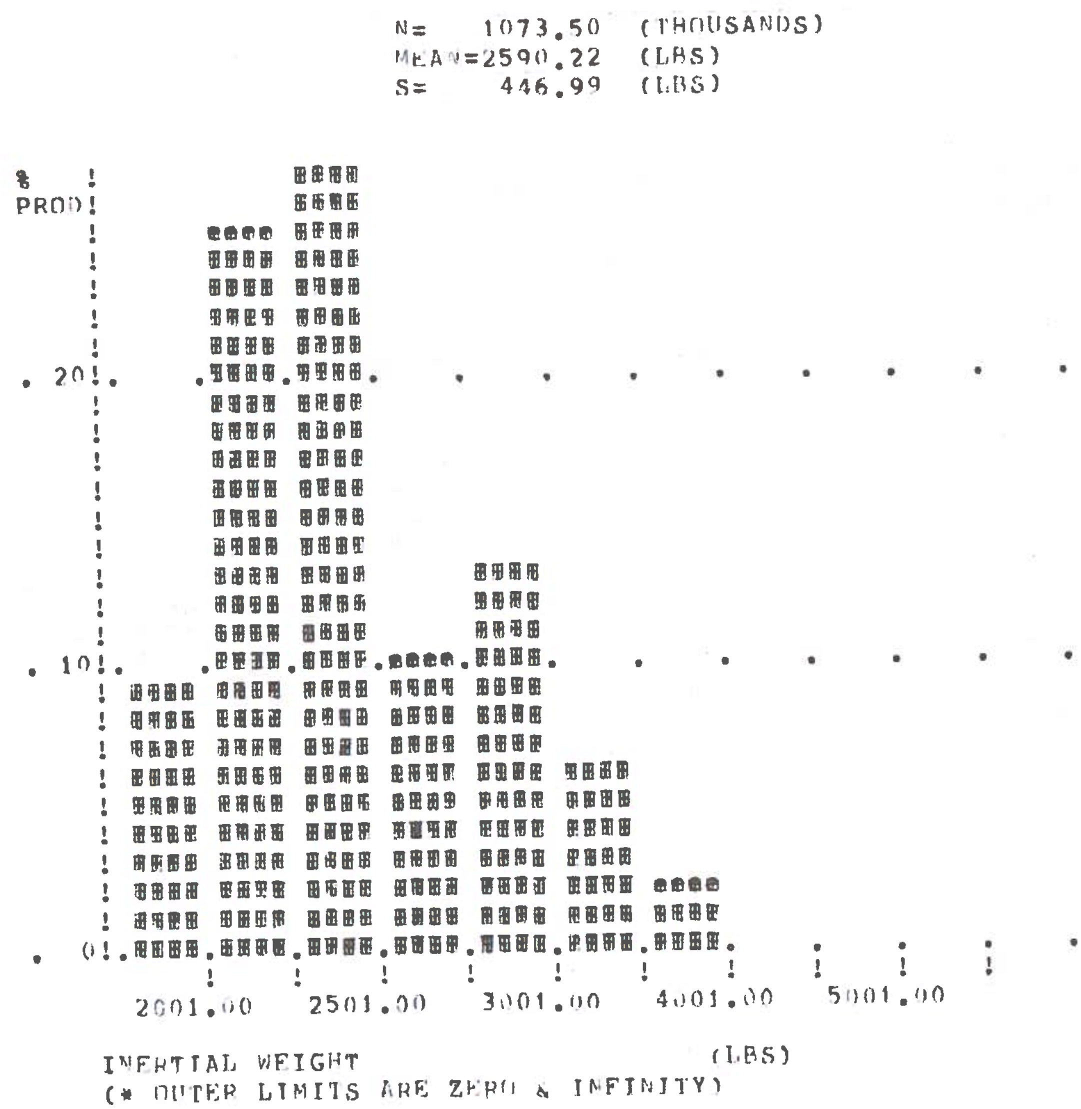


FIGURE 3-11. HISTOGRAM OF INERTIAL WEIGHT VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR IMPORT PRODUCTION

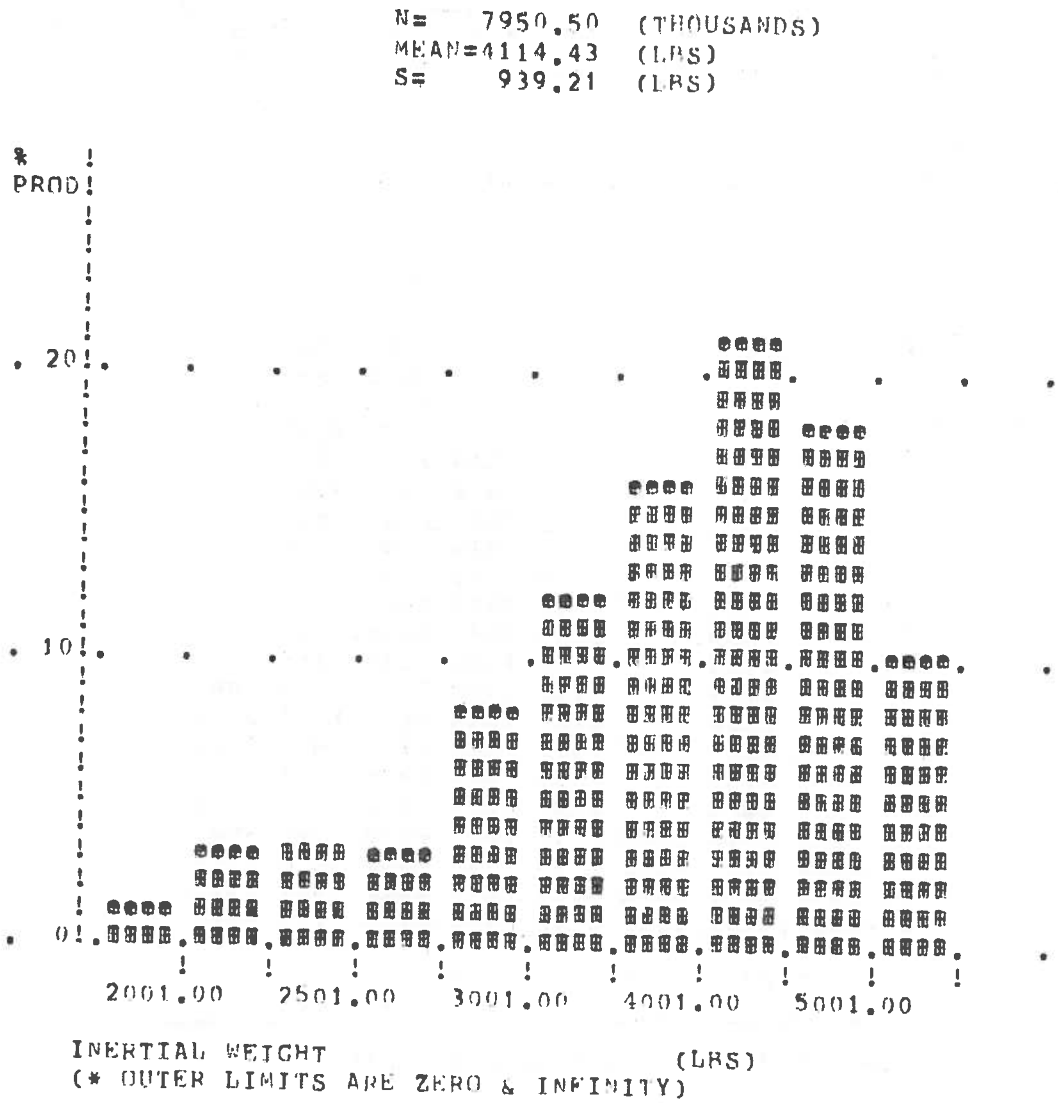


FIGURE 3-12. HISTOGRAM OF INERTIAL WEIGHT VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR FLEET PRODUCTION

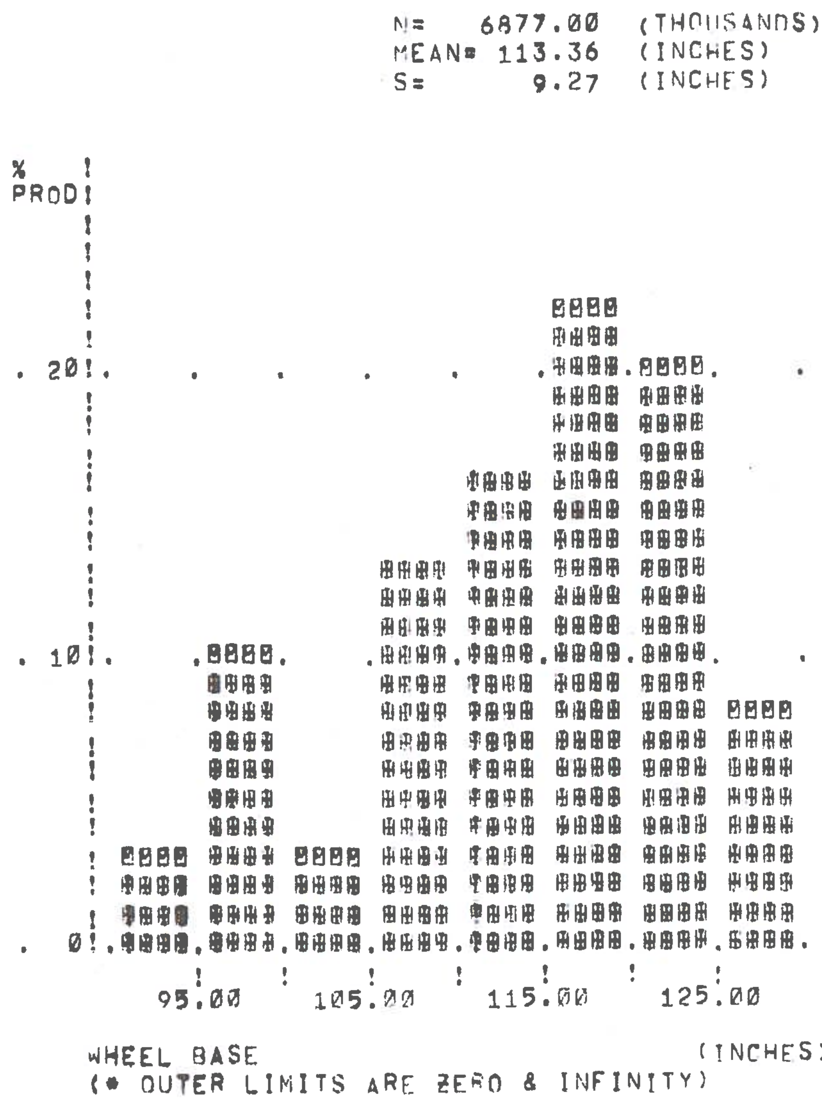


FIGURE 3-13. HISTOGRAM OF WHEEL BASE VERSUS PRODUCTION OF MODEL FOR DOMESTIC PRODUCTION

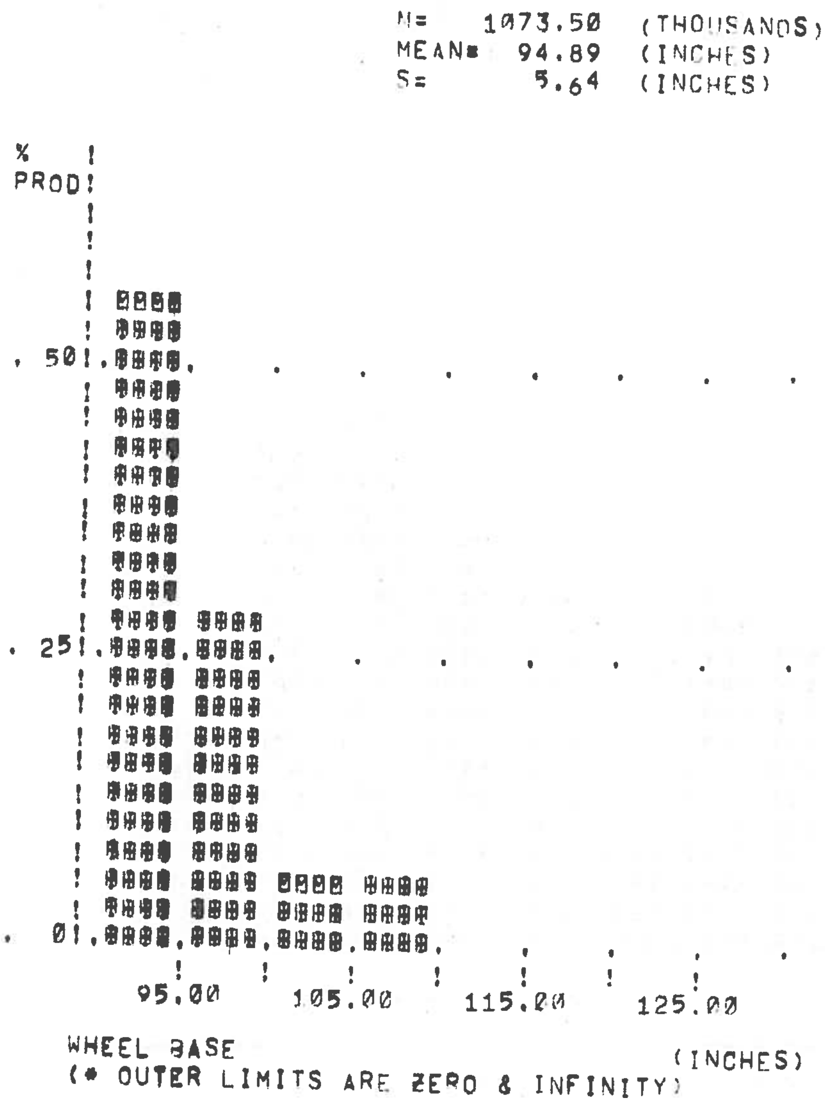


FIGURE 3-14. HISTOGRAM OF WHEEL BASE VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR IMPORT PRODUCTION

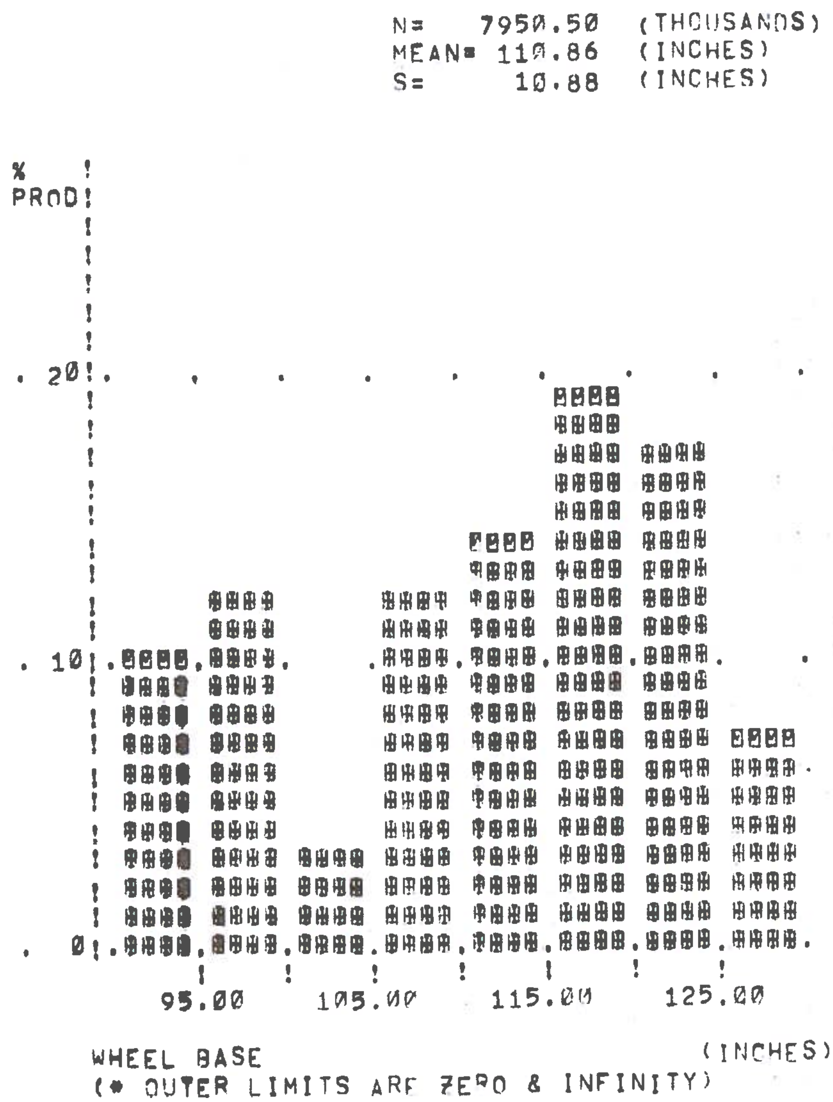


FIGURE 3-15. HISTOGRAM OF WHEEL BASE VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR FLEET PRODUCTION

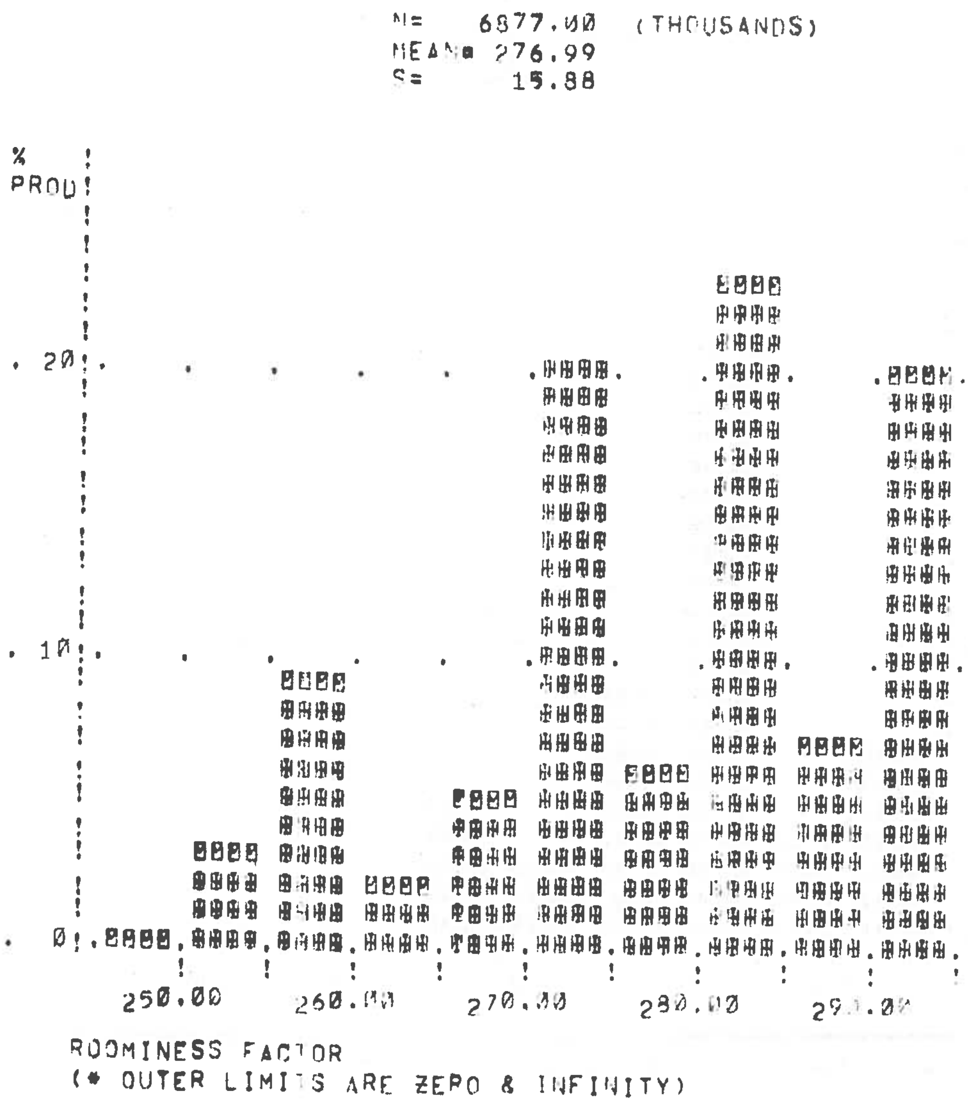


FIGURE 3-16. HISTOGRAM OF ROOMINESS FACTOR VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR DOMESTIC PRODUCTION

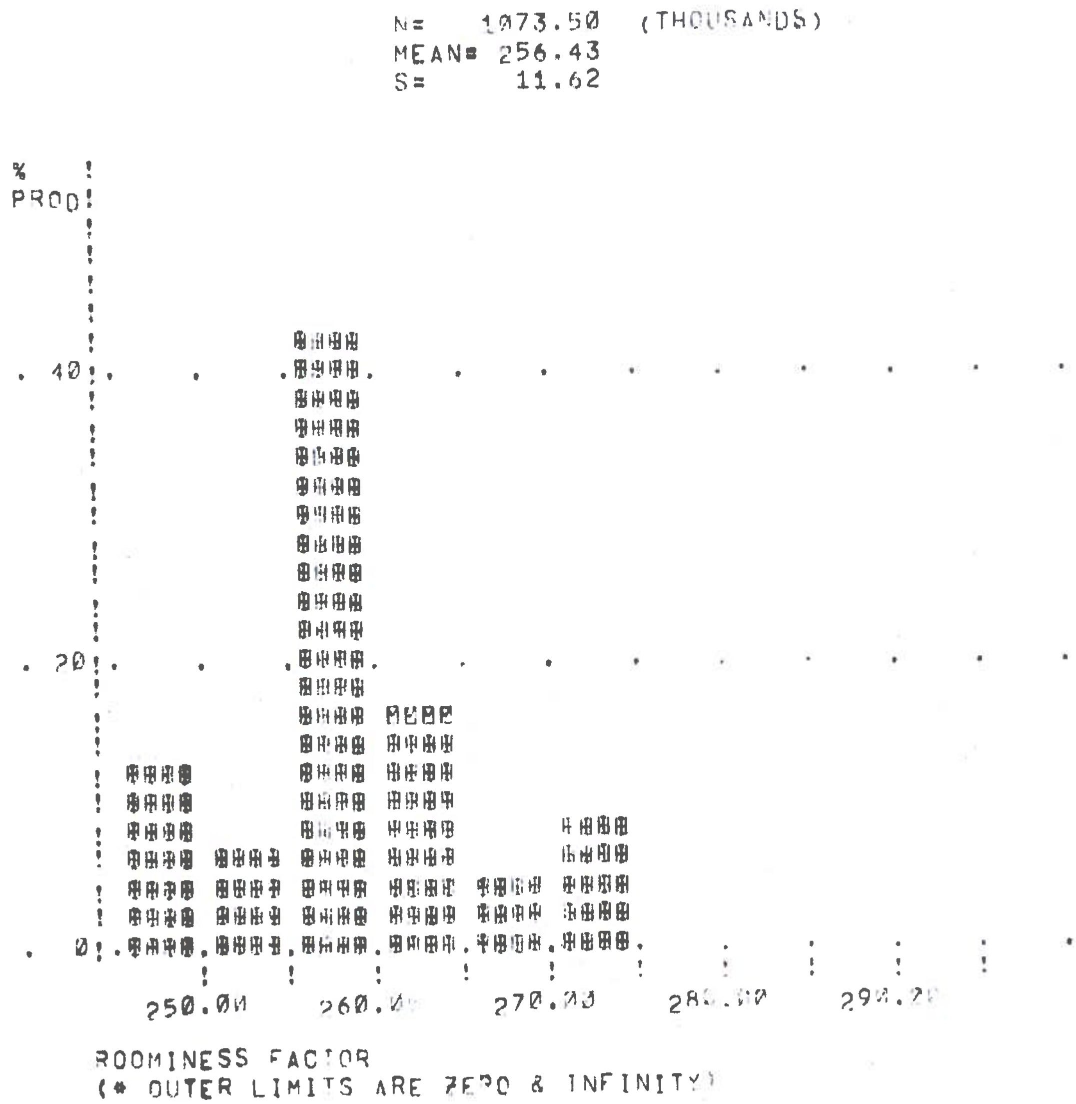


FIGURE 3-17. HISTOGRAM OF ROOMINESS FACTOR VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR IMPORT PRODUCTION

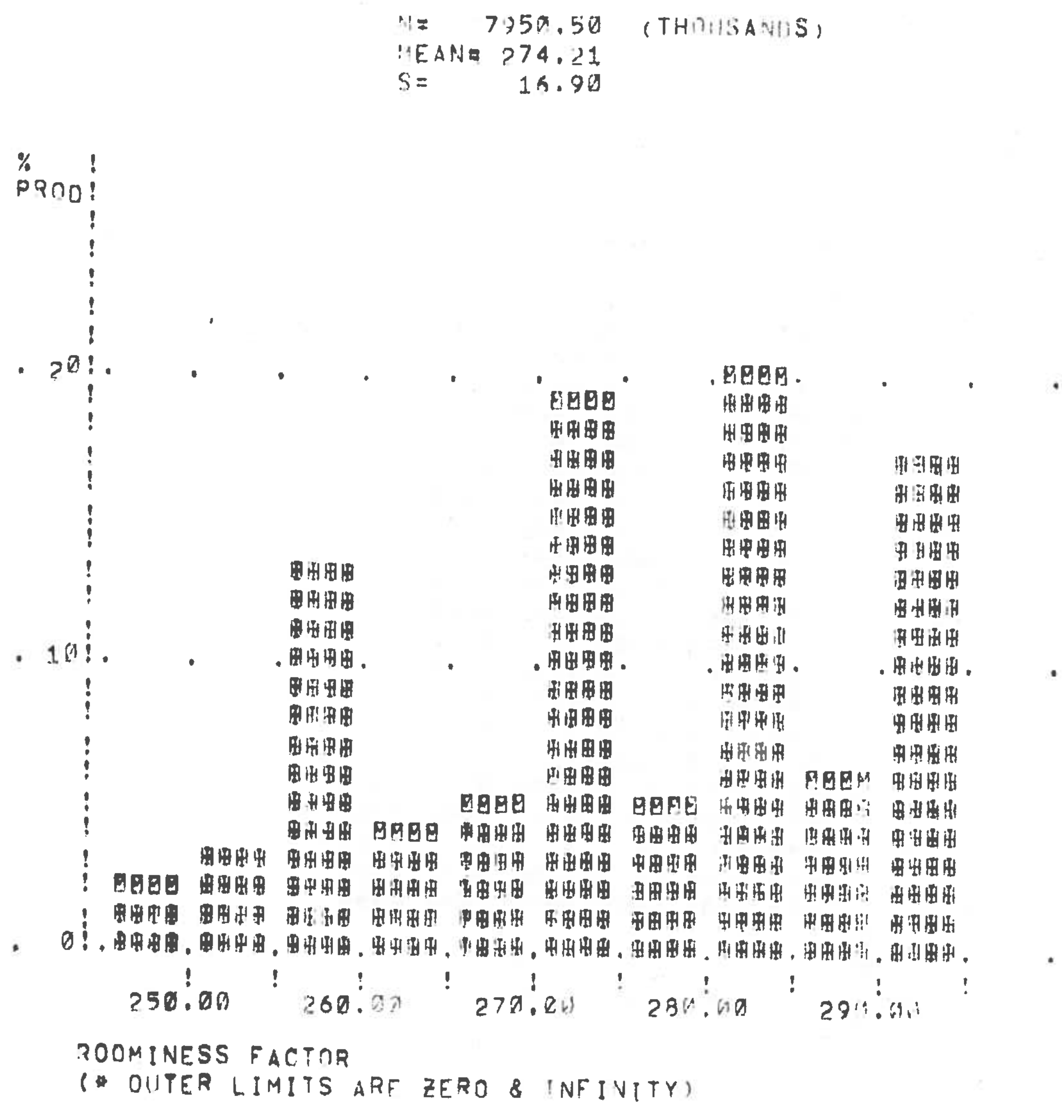


FIGURE 3-18. HISTOGRAM OF ROOMINESS FACTOR VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR FLEET PRODUCTION

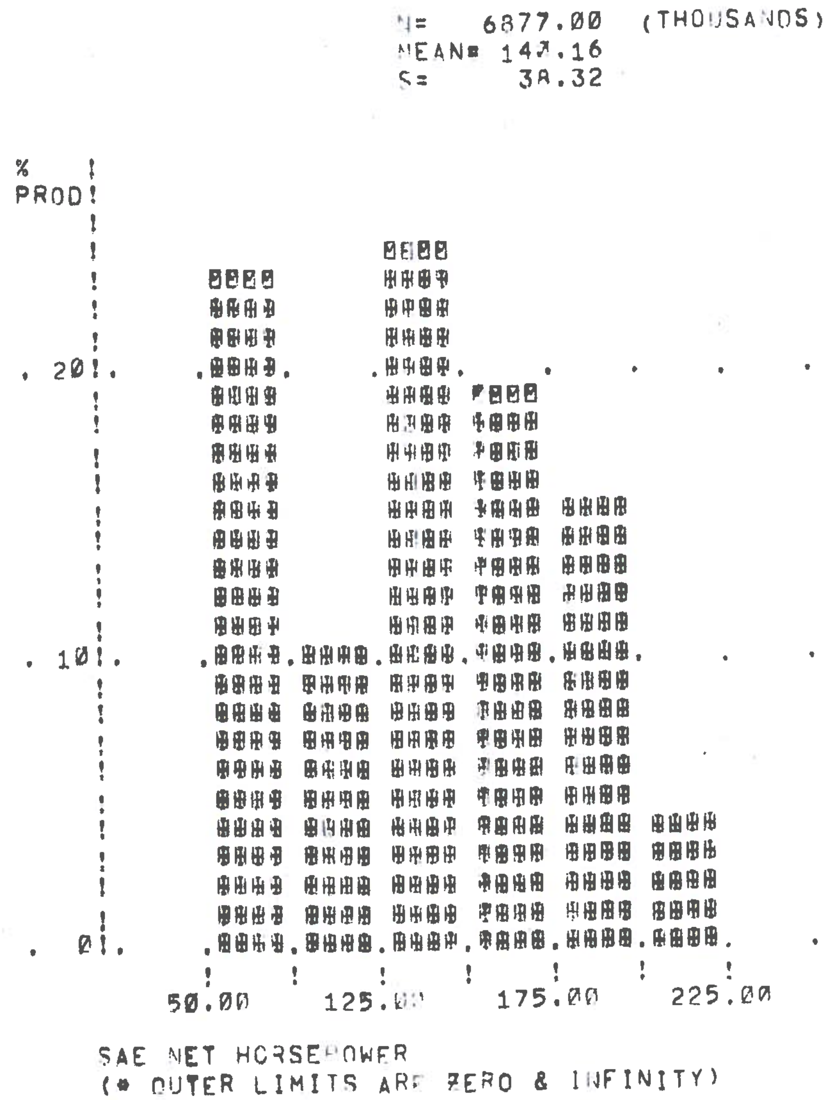


FIGURE 3-19. HISTOGRAM OF SAE NET HORSEPOWER VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR DOMESTIC PRODUCTION

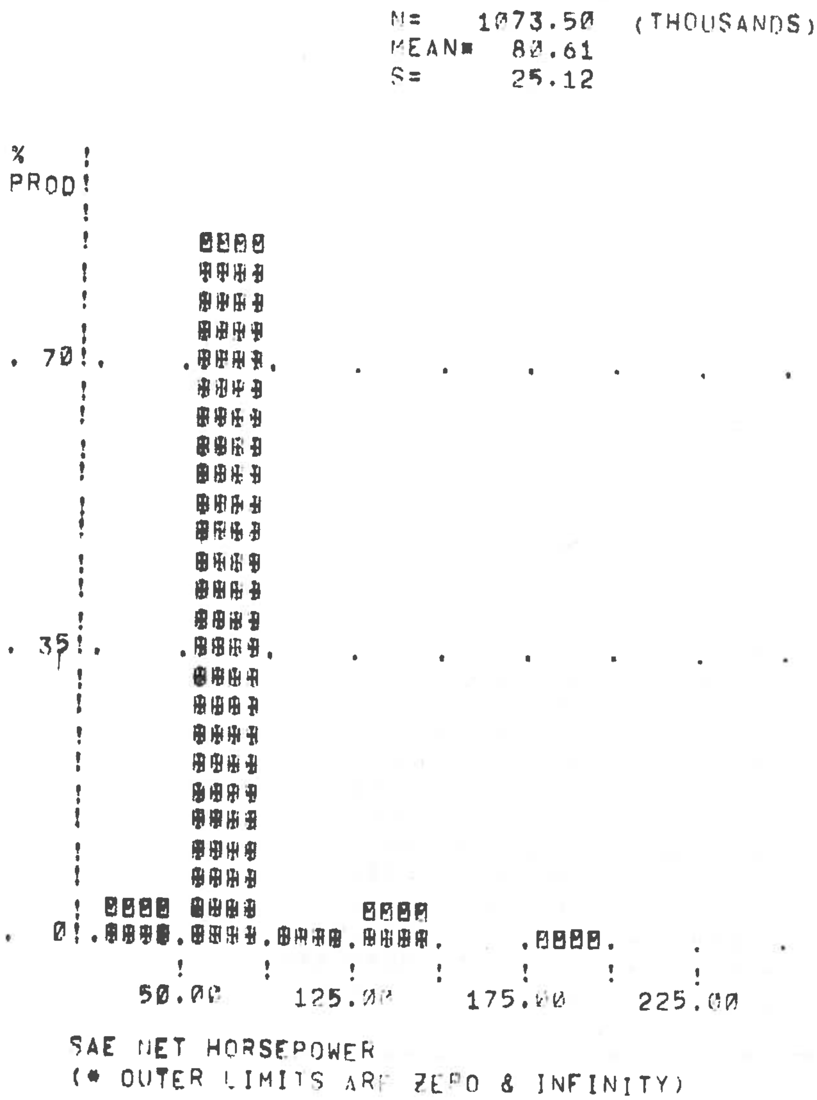


FIGURE 3-20. HISTOGRAM OF SAE NET HORSEPOWER VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR IMPORT PRODUCTION

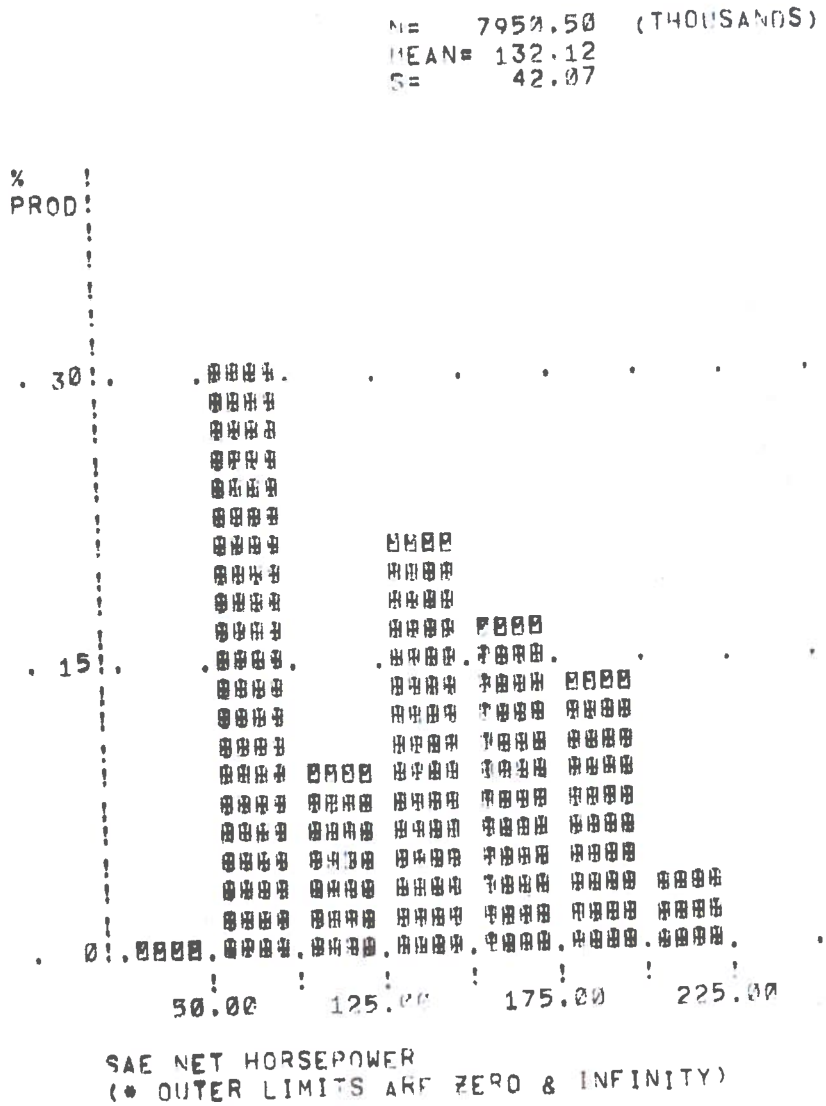


FIGURE 3-21. HISTOGRAM OF SAE NET HORSEPOWER VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR FLEET PRODUCTION

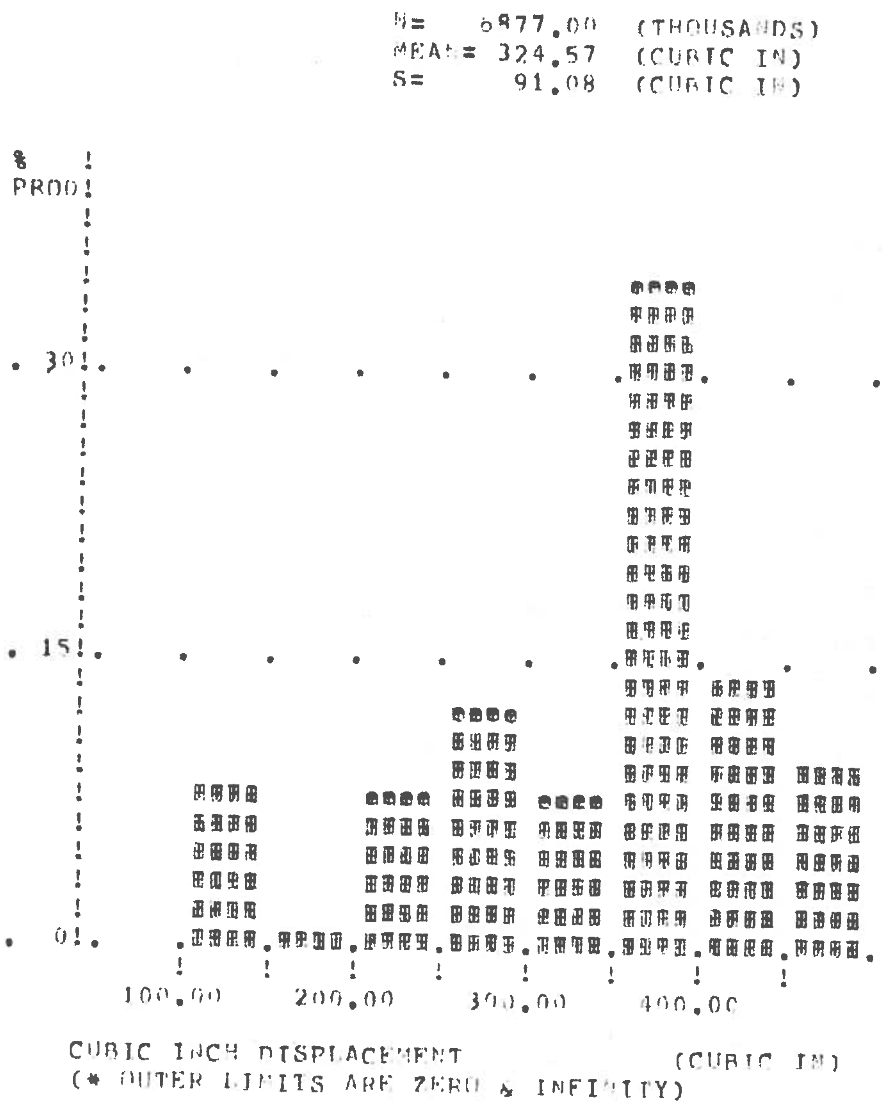


FIGURE 3-22. HISTOGRAM OF CUBIC INCH DISPLACEMENT VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR DOMESTIC PRODUCTION

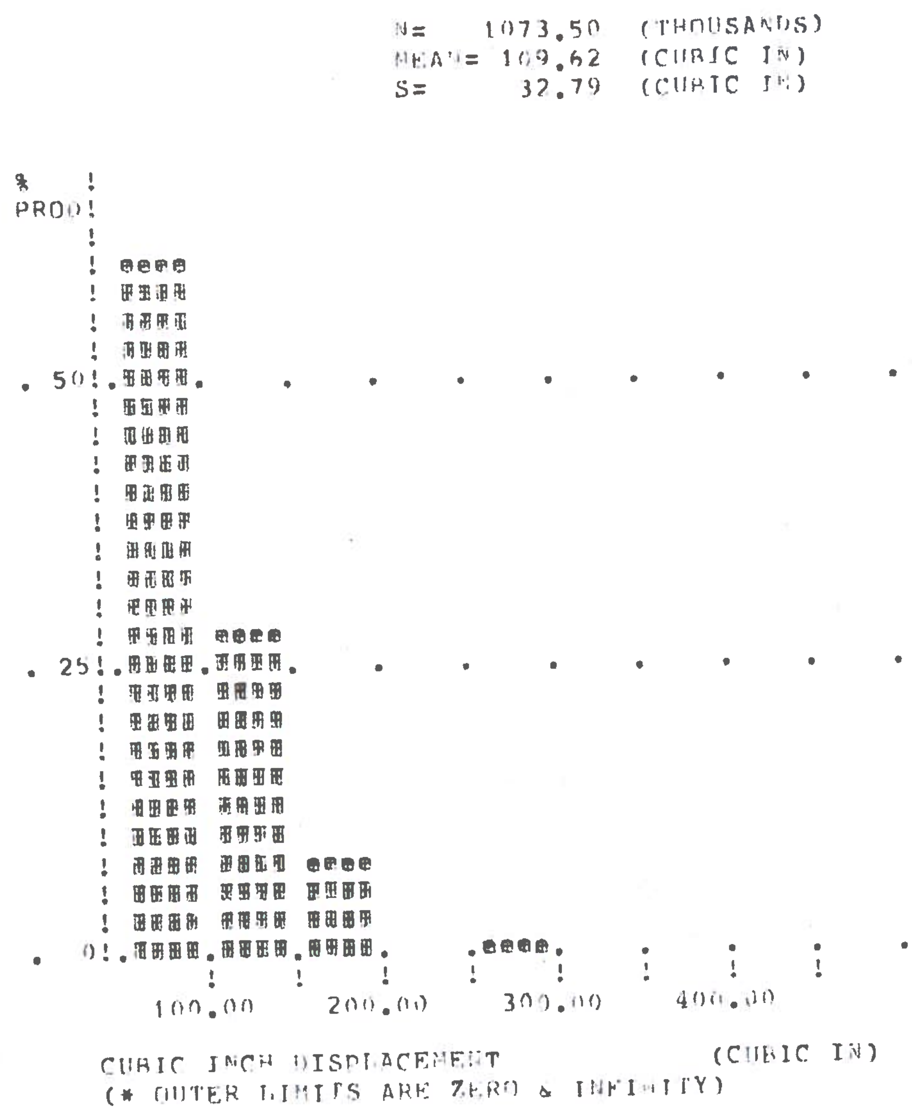


FIGURE 3-23. HISTOGRAM OF CUBIC INCH DISPLACEMENT VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR IMPORT PRODUCTION

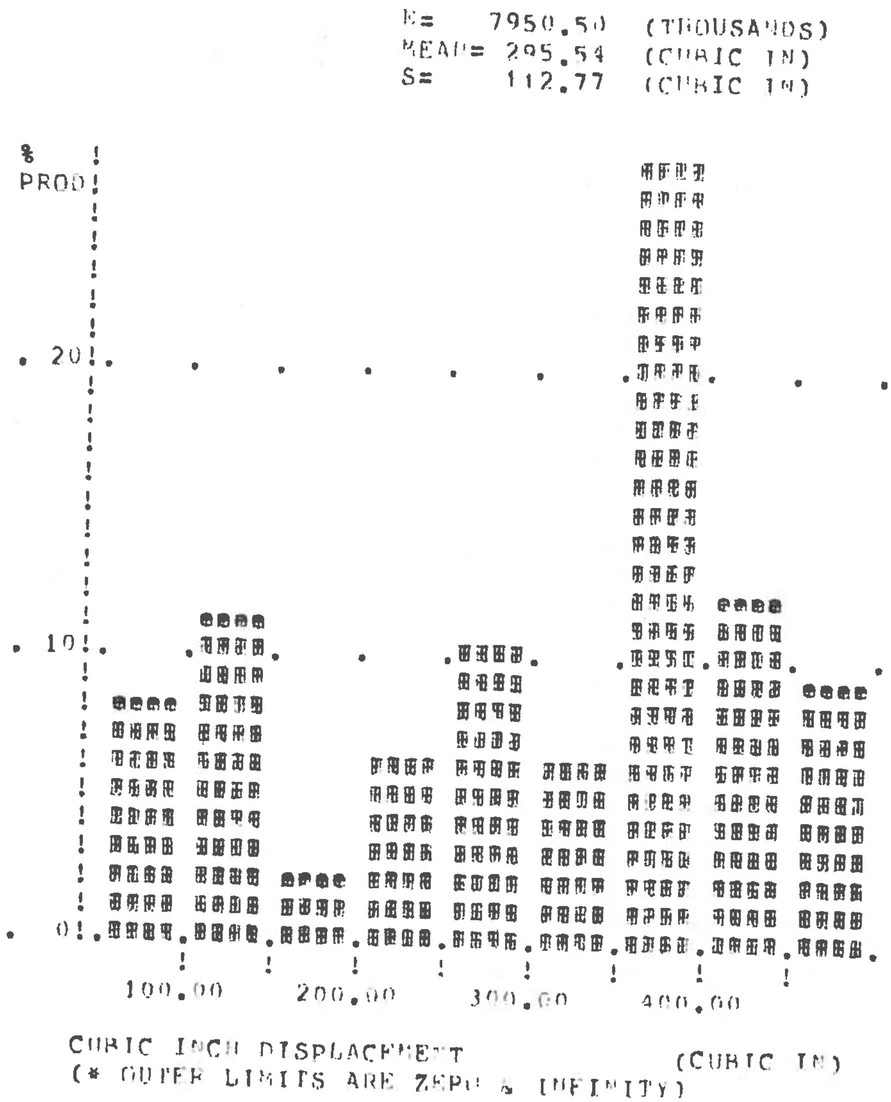
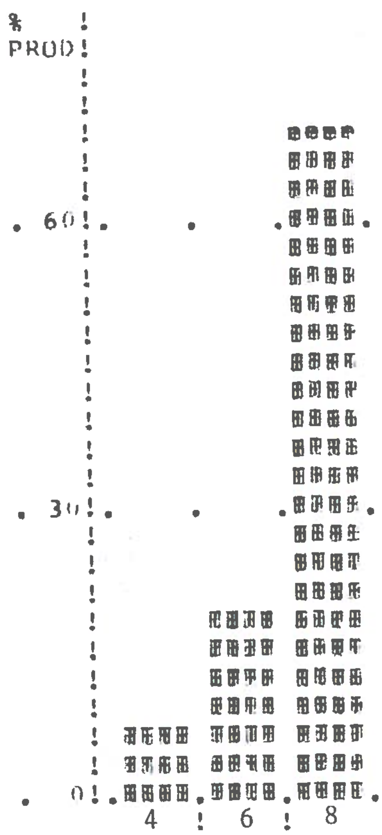


FIGURE 3-24. HISTOGRAM OF CUBIC INCH DISPLACEMENT VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR FLEET PRODUCTION

N= 6877.00 (THOUSANDS)
MEAN= 7.24
S= 1.28



NUMBER OF CYLINDERS
(* OUTER LIMITS ARE ZERO & INFINITY)

FIGURE 3-25. HISTOGRAM OF NUMBER OF CYLINDERS VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR DOMESTIC PRODUCTION

N= 1073.50 (THOUSANDS)
MEAN= 4.20
S= 0.72

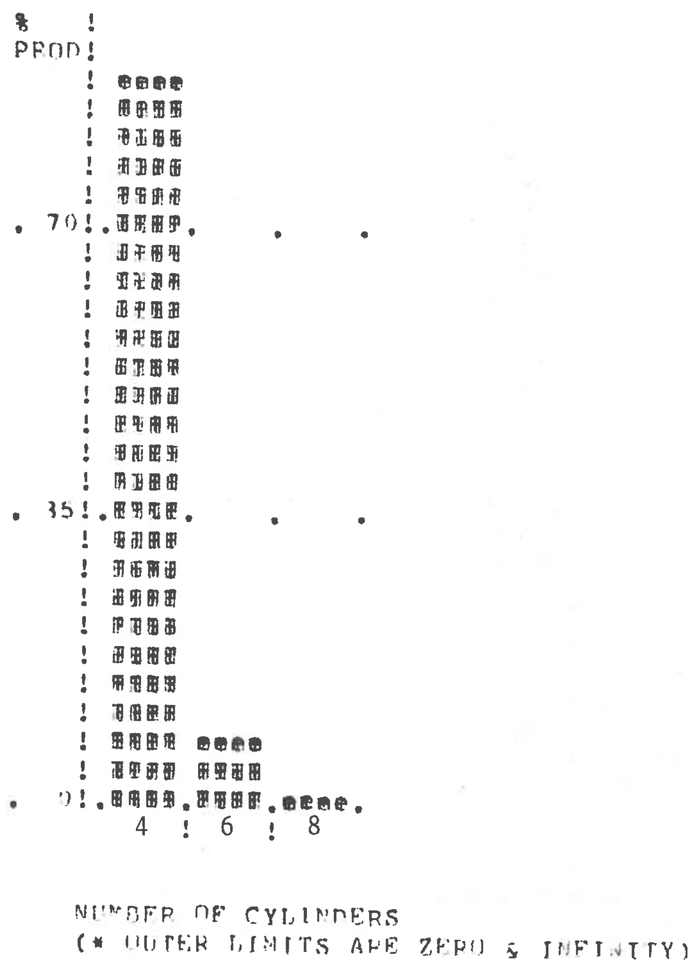


FIGURE 3-26. HISTOGRAM OF NUMBER OF CYLINDERS VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR IMPORT PRODUCTION

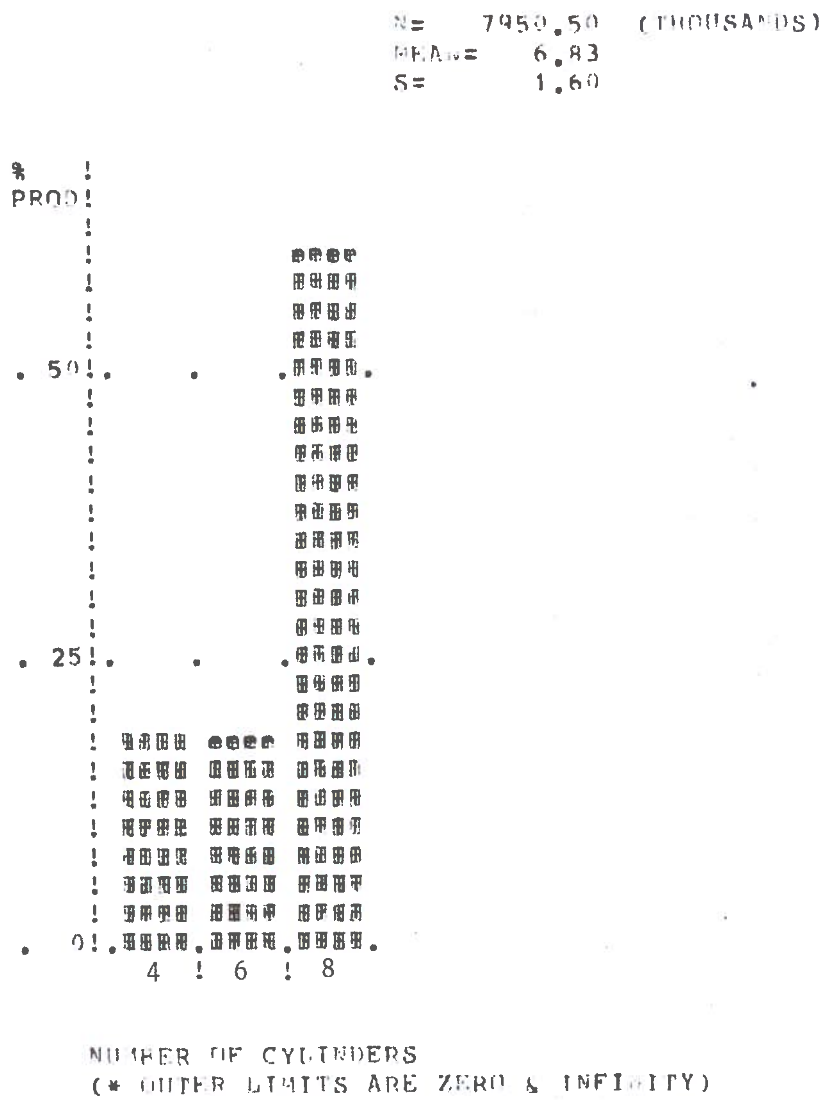


FIGURE 3-27. HISTOGRAM OF NUMBER OF CYLINDERS VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR FLEET PRODUCTION

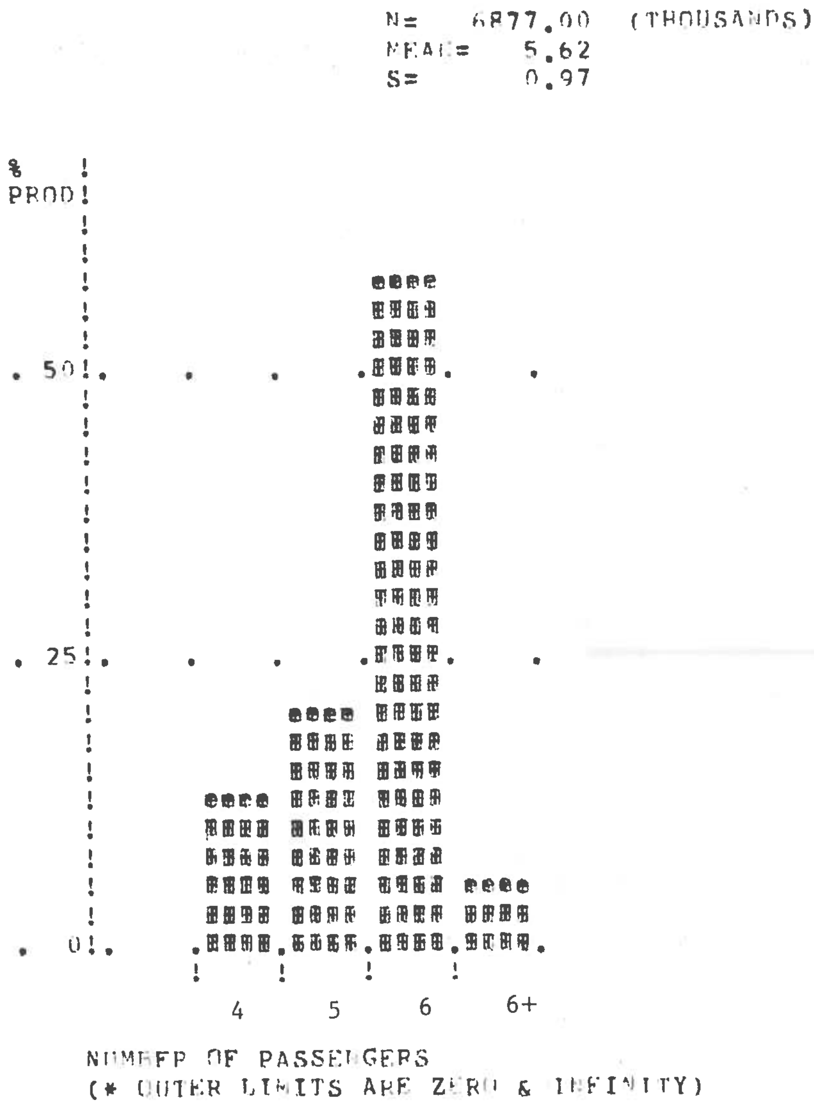


FIGURE 3-28. HISTOGRAM OF NUMBER OF PASSENGERS VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR DOMESTIC PRODUCTION

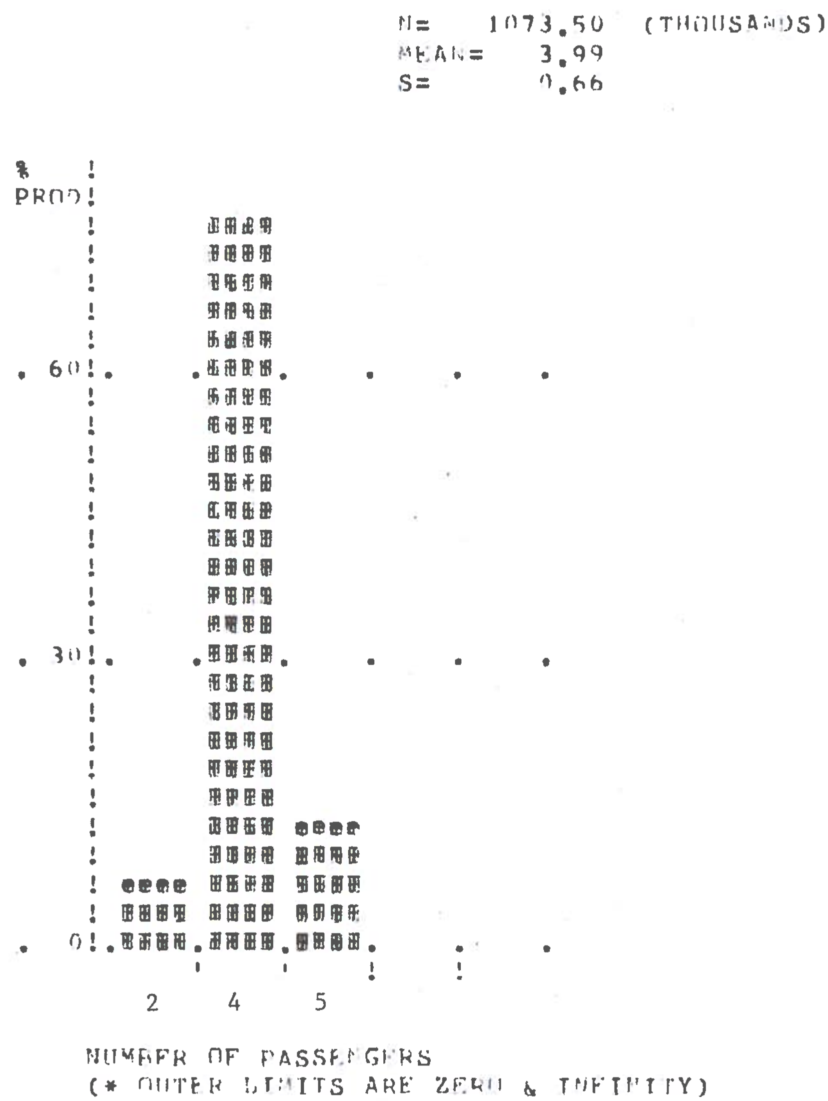


FIGURE 3-29. HISTOGRAM OF NUMBER OF PASSENGERS VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR IMPORT PRODUCTION

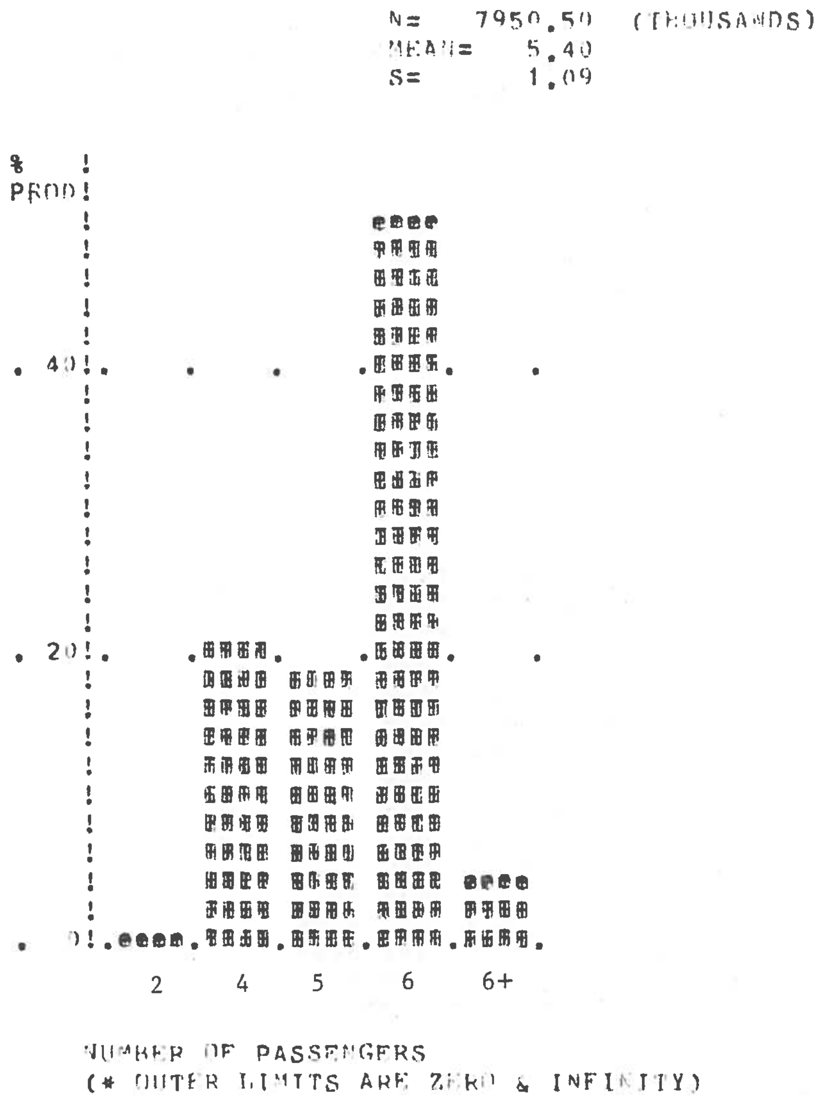


FIGURE 3-30. HISTOGRAM OF NUMBER OF PASSENGERS VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR FLEET PRODUCTION

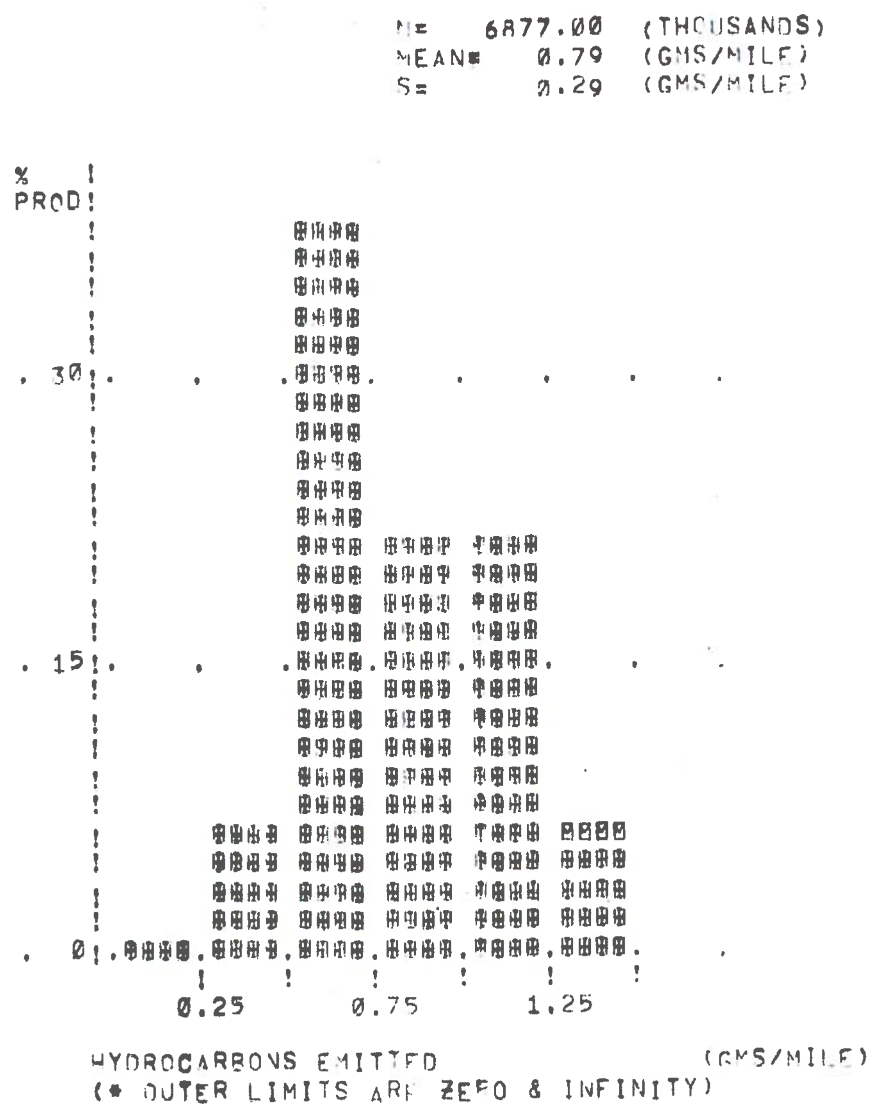


FIGURE 3-31. HISTOGRAM OF HYDROCARBONS EMITTED (49 STATE) VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR DOMESTIC PRODUCTION

N=   1073.50   (THOUSANDS)
MEAN=   0.95   (GMS/MILE)
S=   0.38   (GMS/MILE)

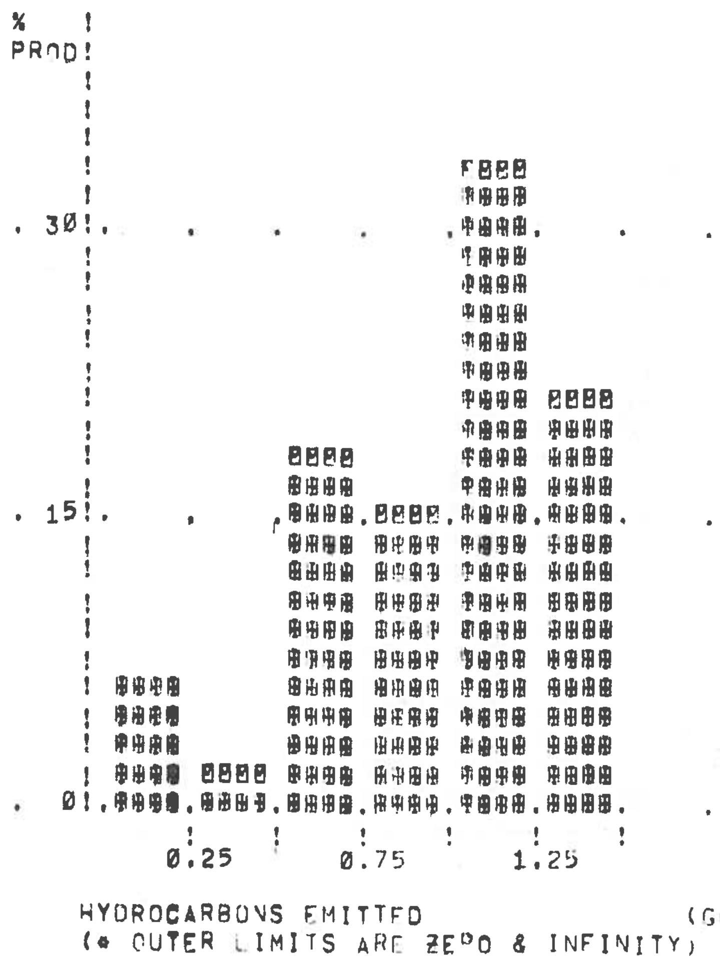


FIGURE 3-32. HISTOGRAM OF HYDROCARBONS EMITTED (49 STATE) VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR IMPORT PRODUCTION

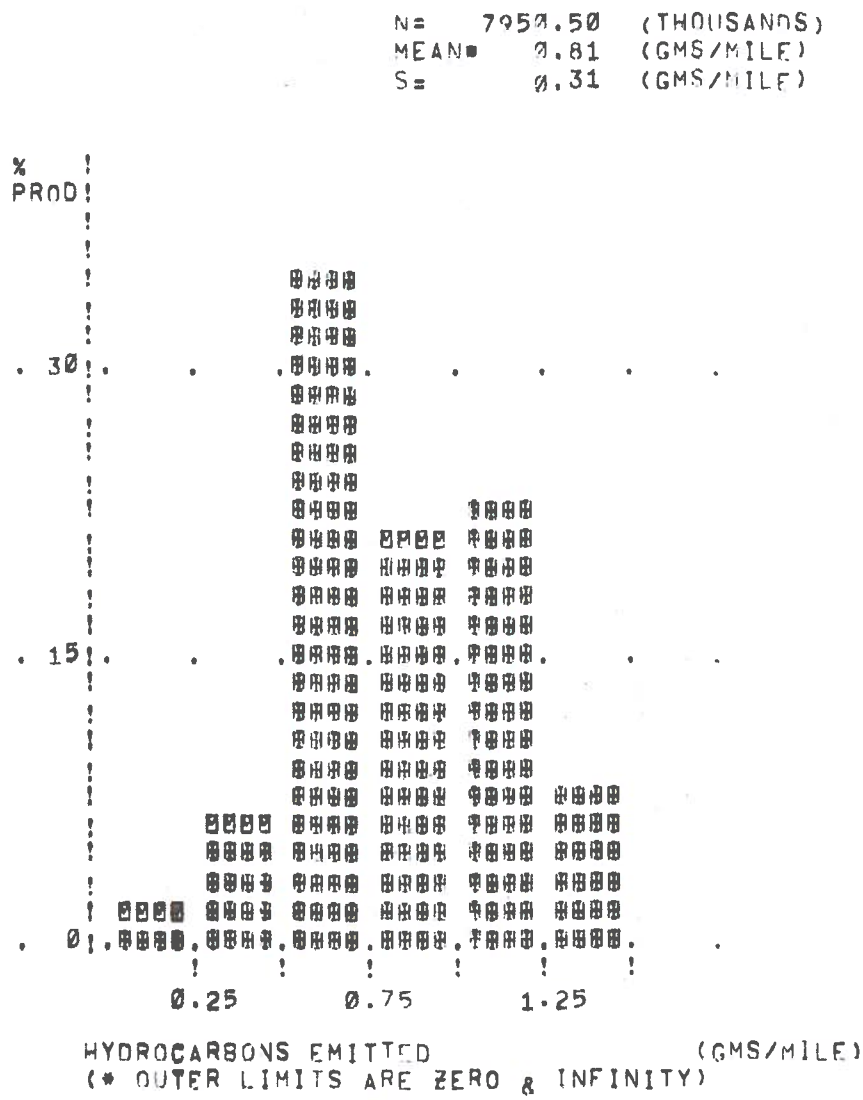


FIGURE 3-33. HISTOGRAM OF HYDROCARBONS EMITTED (49 STATE) VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR FLEET PRODUCTION

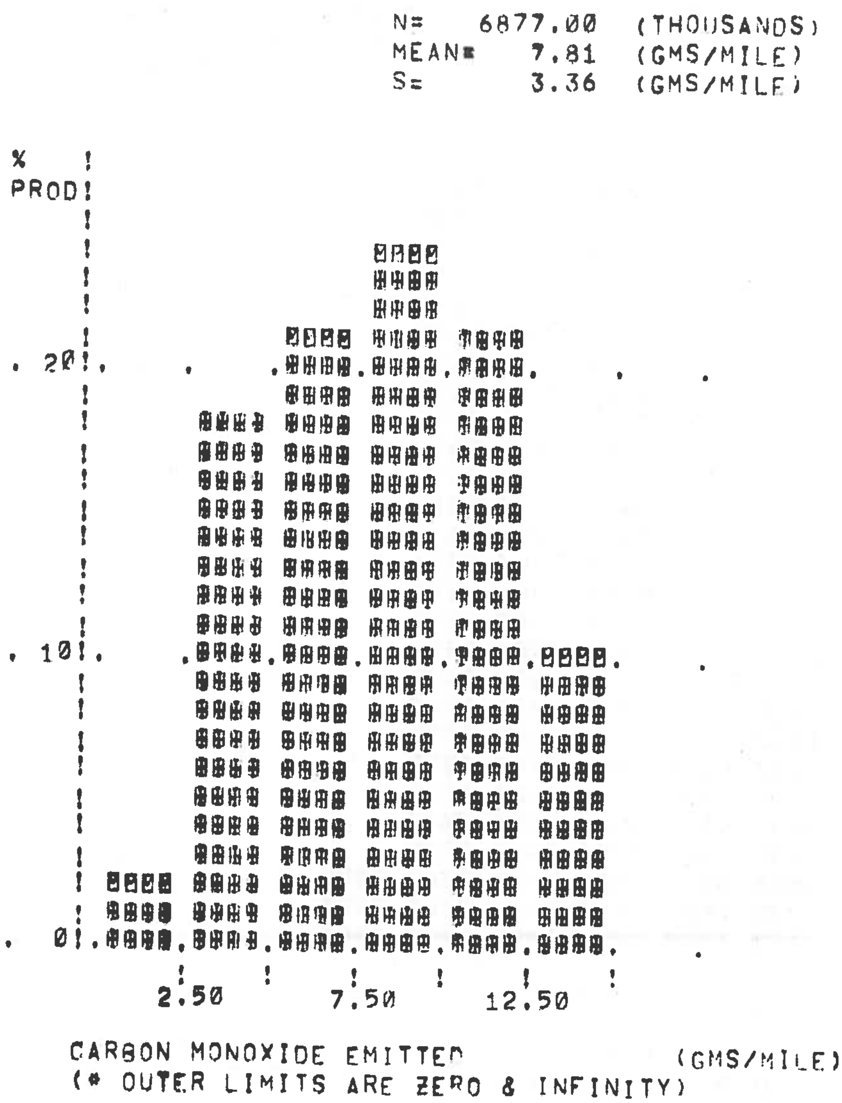


FIGURE 3-34. HISTOGRAM OF CARBON MONOXIDE EMITTED (49 STATE) VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR DOMESTIC PRODUCTION

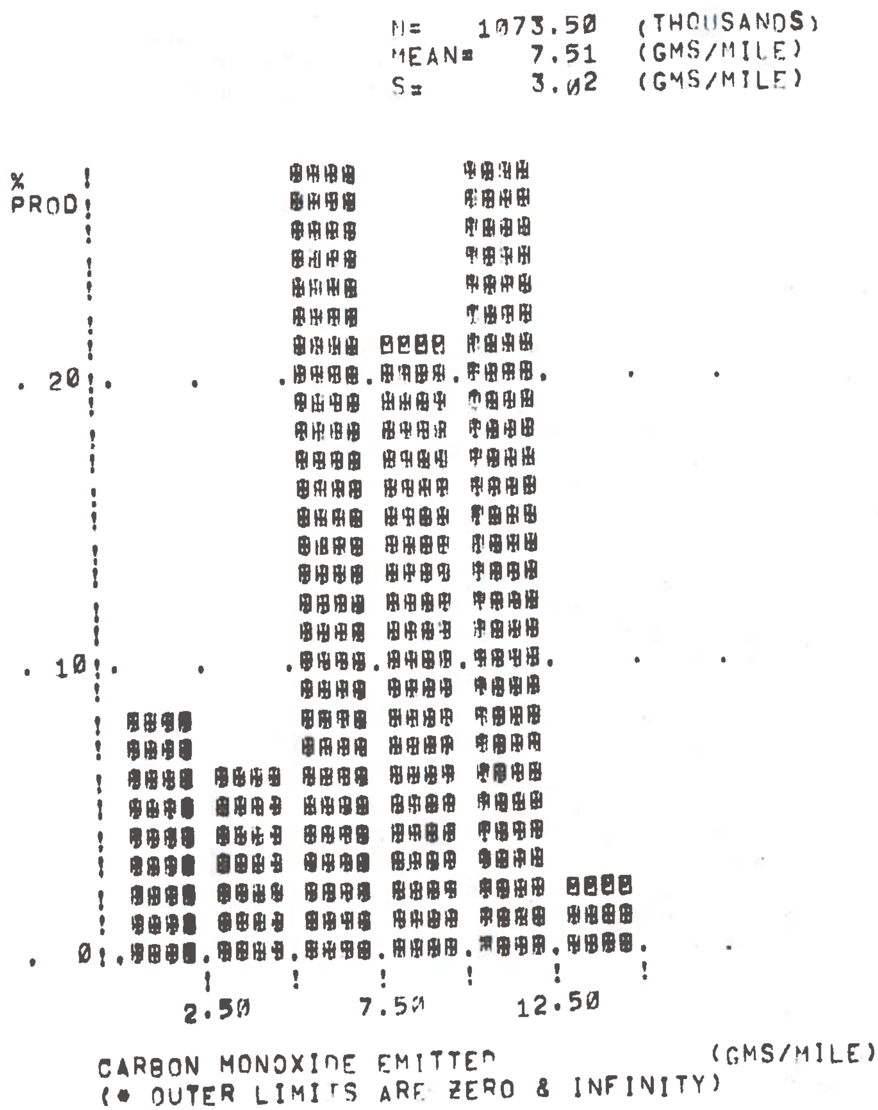


FIGURE 3-35. HISTOGRAM OF CARBON MONOXIDE EMITTED (49 STATE) VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR IMPORT PRODUCTION

N=   7950.50 (THOUSANDS)
MEAN=   7.77 (GMS/MILE)
S=   3.31 (GMS/MILE)

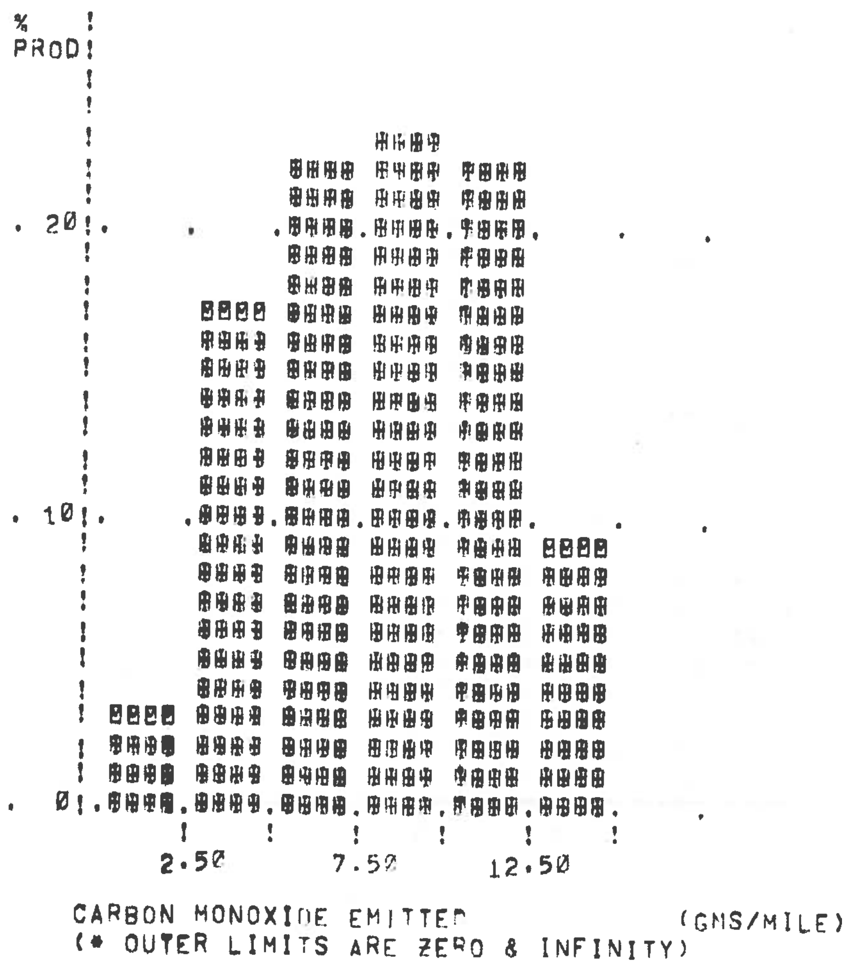


FIGURE 3-36. HISTOGRAM OF CARBON MONOXIDE EMITTED (49 STATE) VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR FLEET PRODUCTION

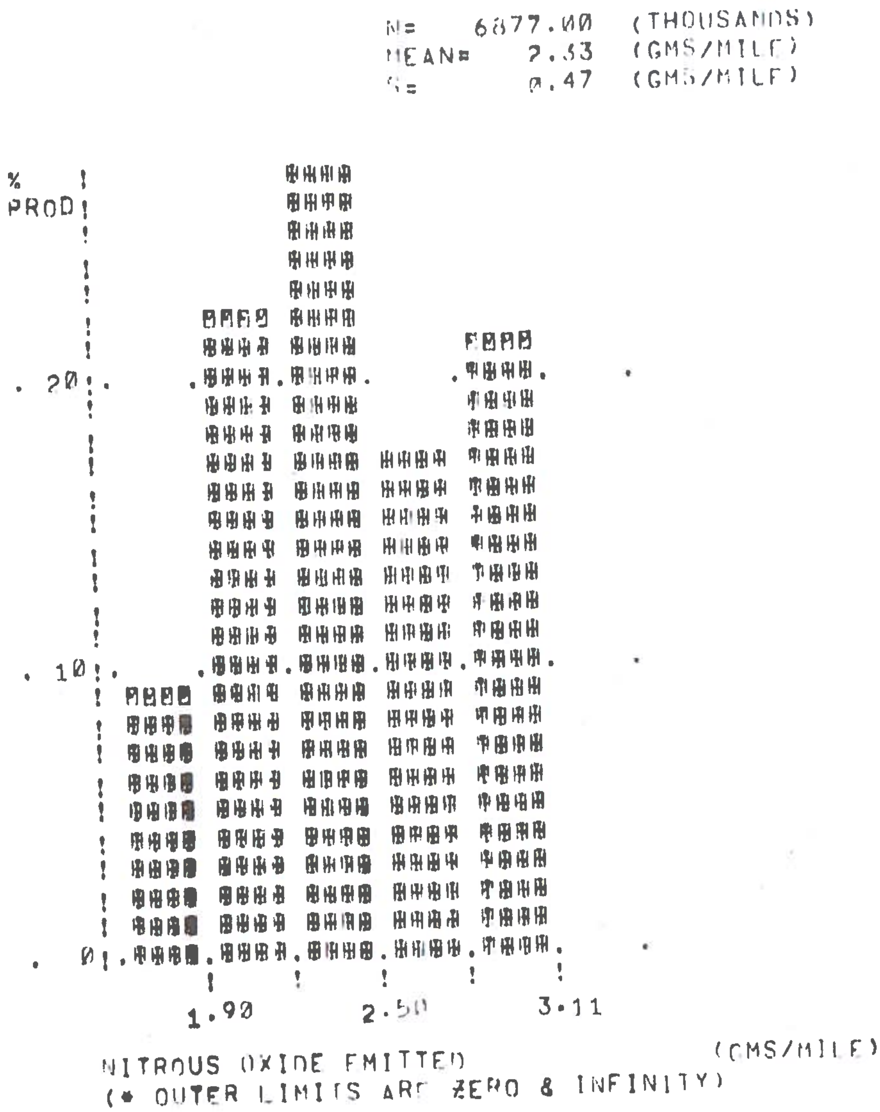


FIGURE 3-37. HISTOGRAM OF NITROUS OXIDE EMITTED (49 STATE) VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR DOMESTIC PRODUCTION

N=   1073.50   (THOUSANDS)
MEAN=   1.78   (GMS/MILE)
S=   0.62   (GMS/MILE)

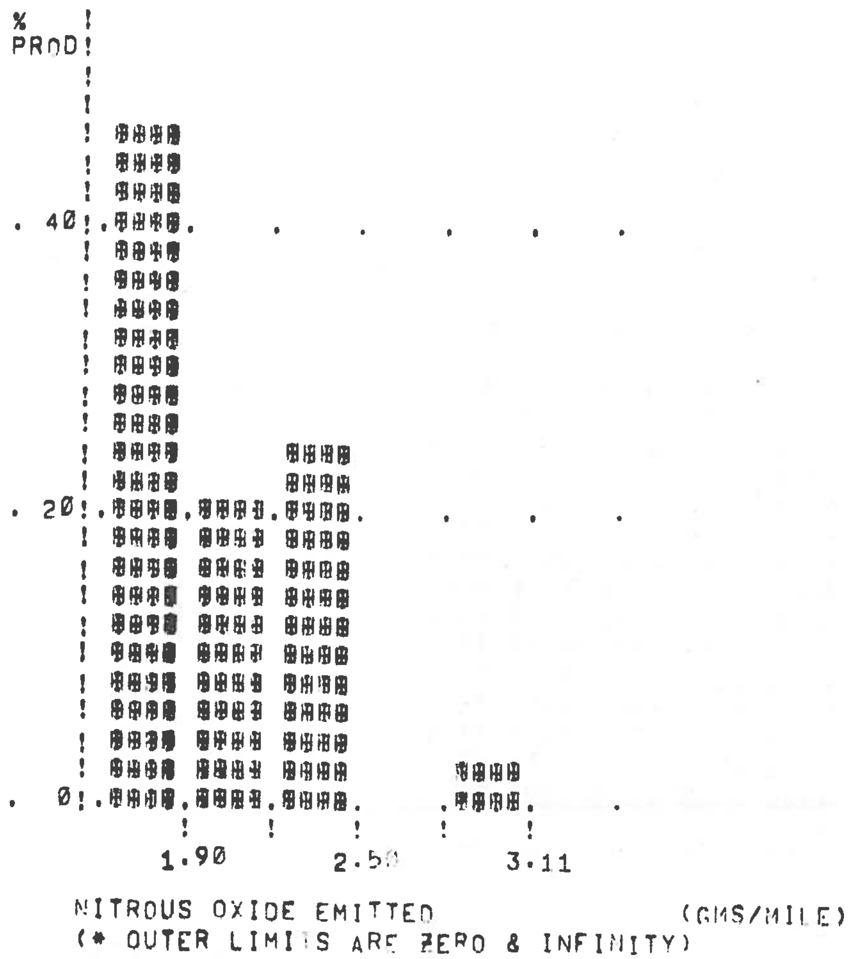


FIGURE 3-38. HISTOGRAM OF NITROUS OXIDE EMITTED (49 STATE) VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR IMPORT PRODUCTION

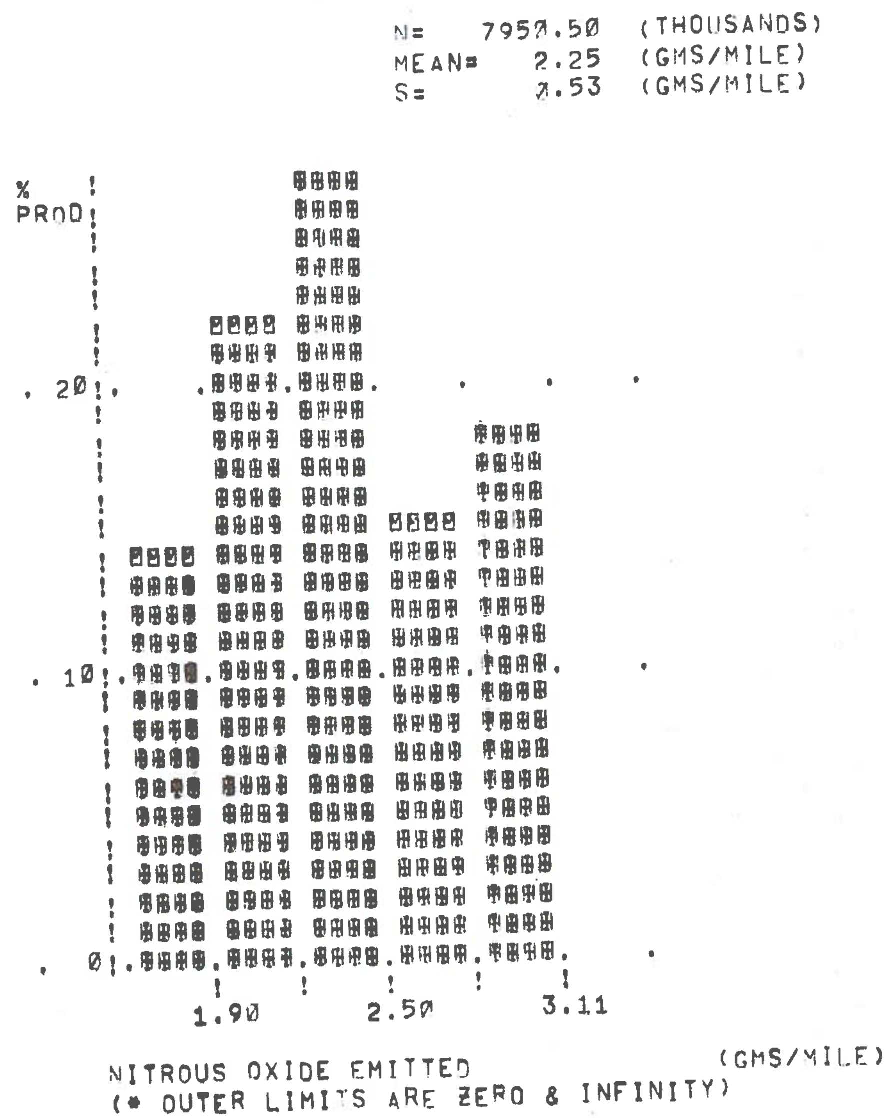


FIGURE 3-39. HISTOGRAM OF NITROUS OXIDE EMITTED (49 STATE) VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR FLEET PRODUCTION

N=   6877.00   (THOUSANDS)
MEAN=4989.06   ($)
S=   1384.61   ($)

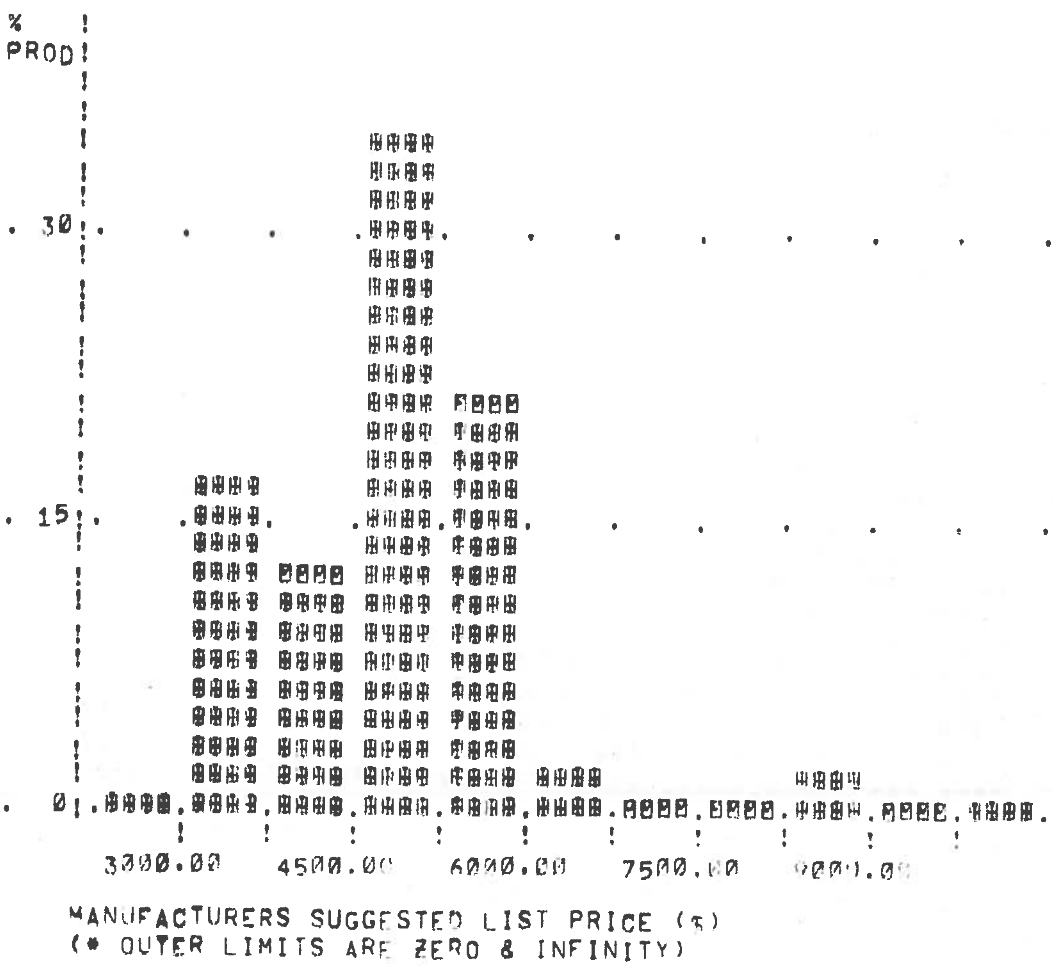


FIGURE 3-40. HISTOGRAM OF MANUFACTURERS SUGGESTED LIST PRICE VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR DOMESTIC PRODUCTION

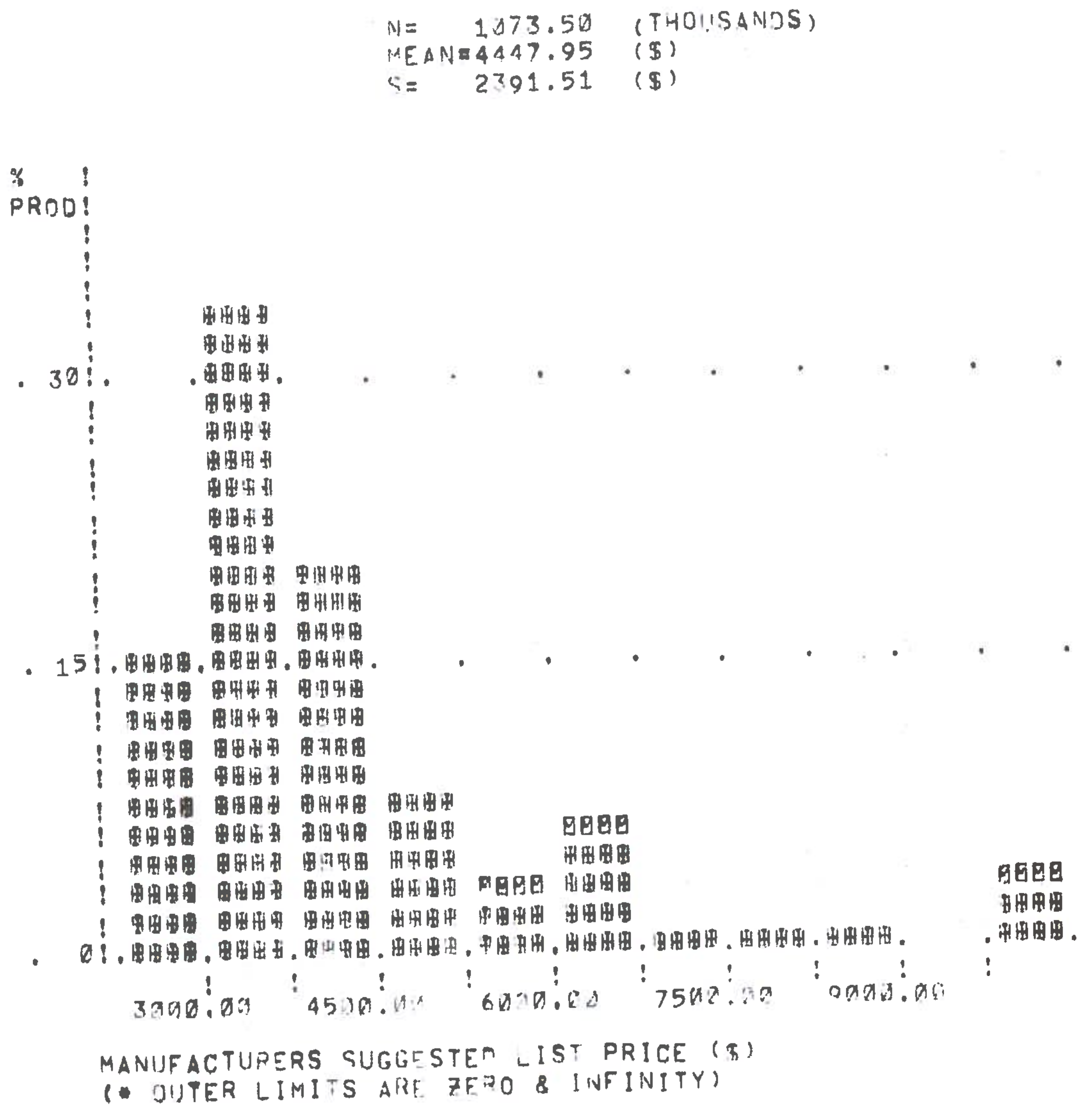


FIGURE 3-41. HISTOGRAM OF MANUFACTURERS SUGGESTED LIST PRICE VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR IMPORT PRODUCTION

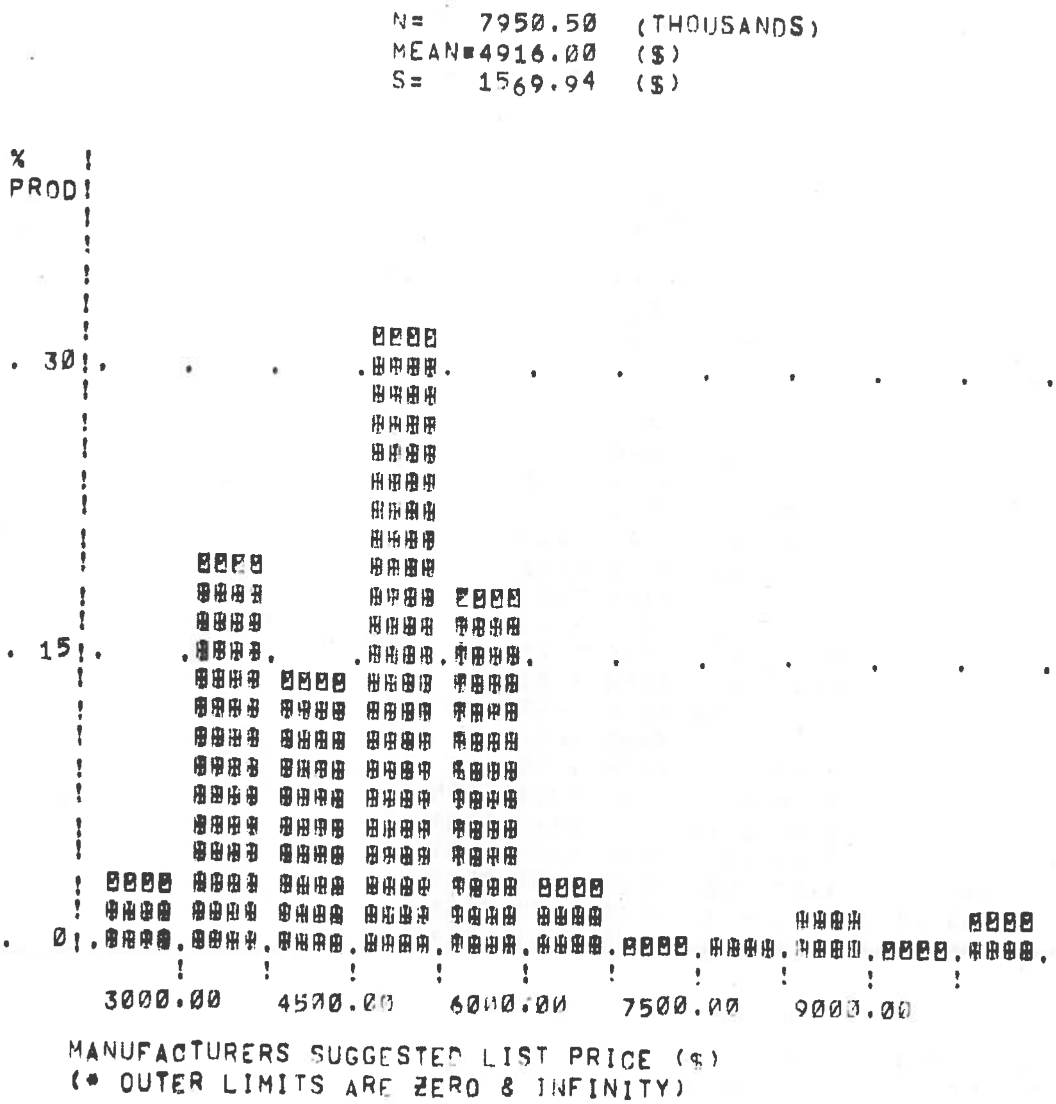


FIGURE 3-42. HISTOGRAM OF MANUFACTURERS SUGGESTED LIST PRICE VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR FLEET PRODUCTION

N= 6877.00 (THOUSANDS)
Mean= .032 (HP/LB)
S= 0.05 (HP/LB)

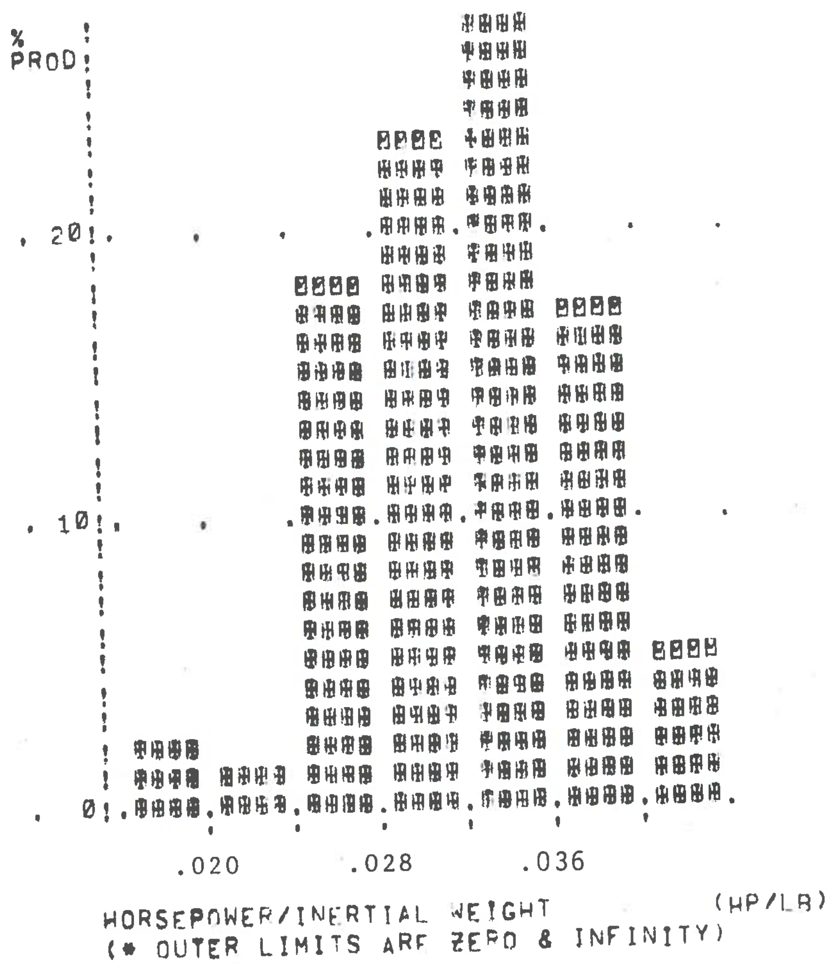


FIGURE 3-43. HISTOGRAM OF HORSEPOWER/INERTIAL (TEST)WEIGHT VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR DOMESTIC PRODUCTION

N= 1073.50 (THOUSANDS)
MEAN= .031 (HP/LB)
S= 0.06 (HP/LB)

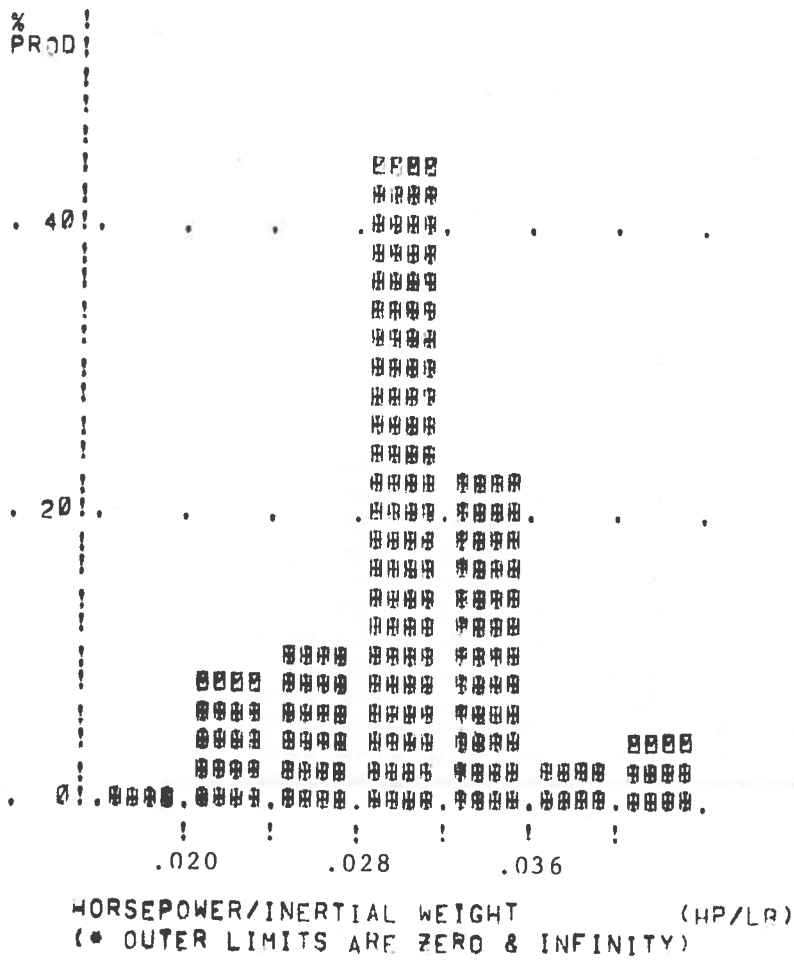


FIGURE 3-44. HISTOGRAM OF HORSEPOWER/INTERTIAL (TEST) WEIGHT VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR IMPORT PRODUCTION

N= 7950.50 (THOUSANDS)
Mean= .032 (HP/LB)
S= 0.05 (HP/LB)

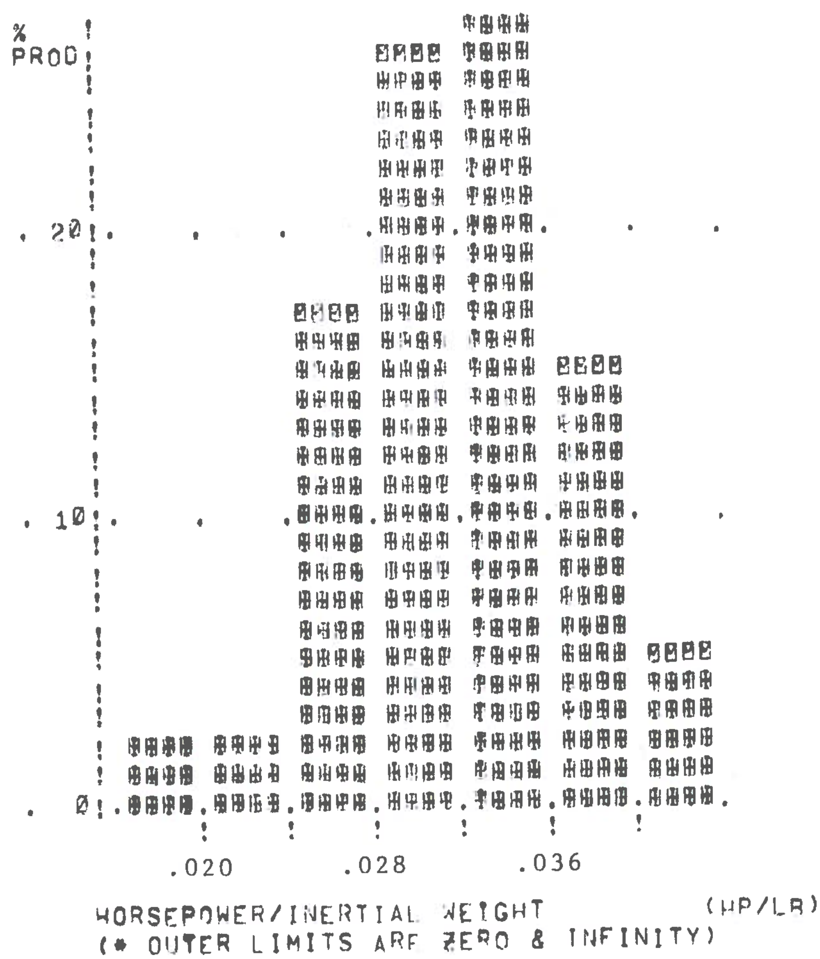


FIGURE 3-45. HISTOGRAM OF HORSEPOWER/INERTIAL (TEST) WEIGHT VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR FLEET PRODUCTION

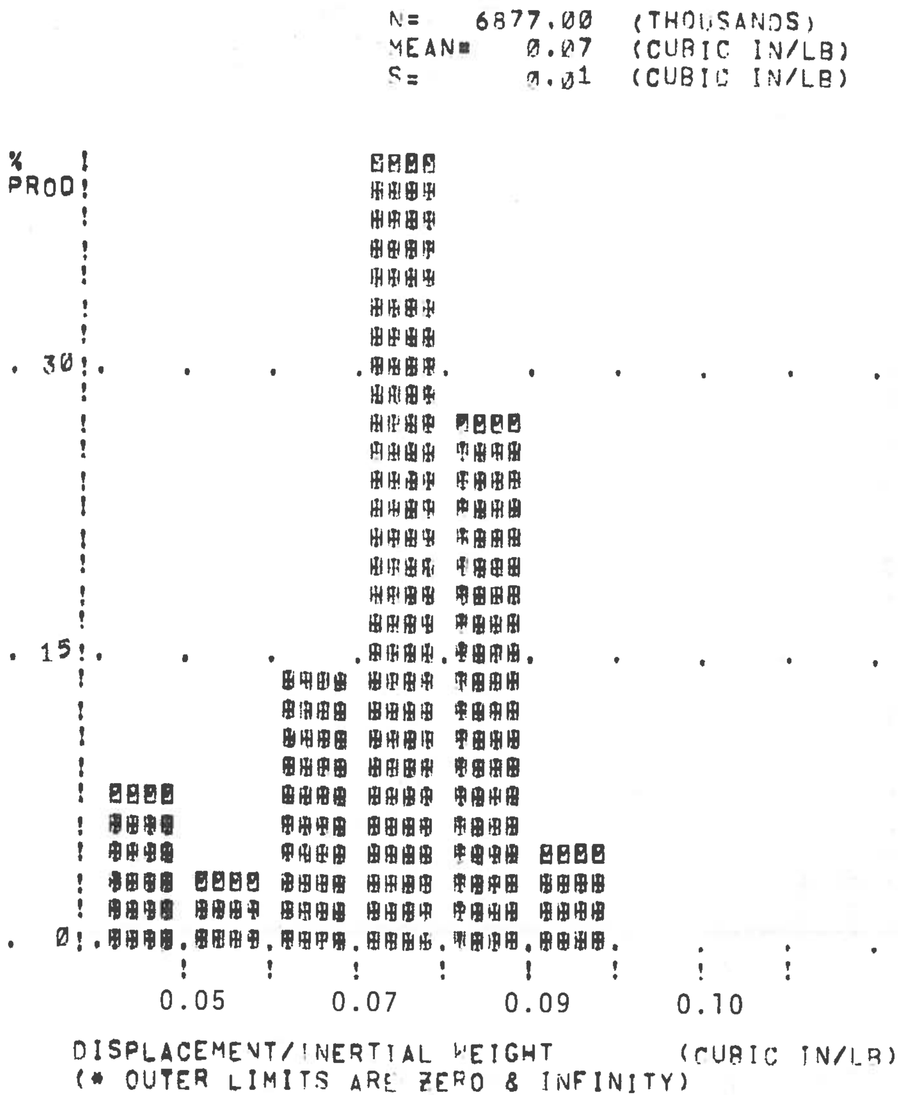


FIGURE 3-46. HISTOGRAM OF DISPLACEMENT/INERTIAL (TEST) WEIGHT VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR DOMESTIC PRODUCTION

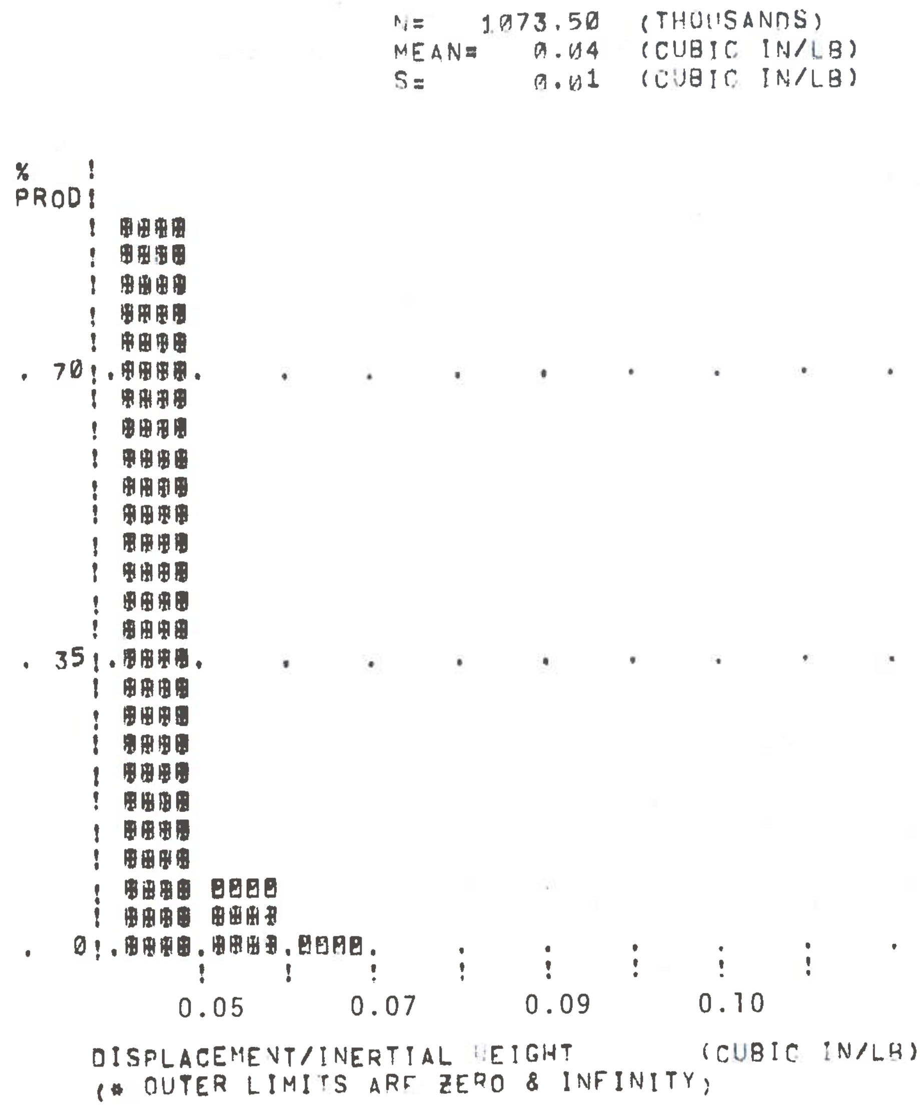


FIGURE 3-47. HISTOGRAM OF DISPLACEMENT/INTERTIAL (TEST) WEIGHT VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR IMPORT PRODUCTION

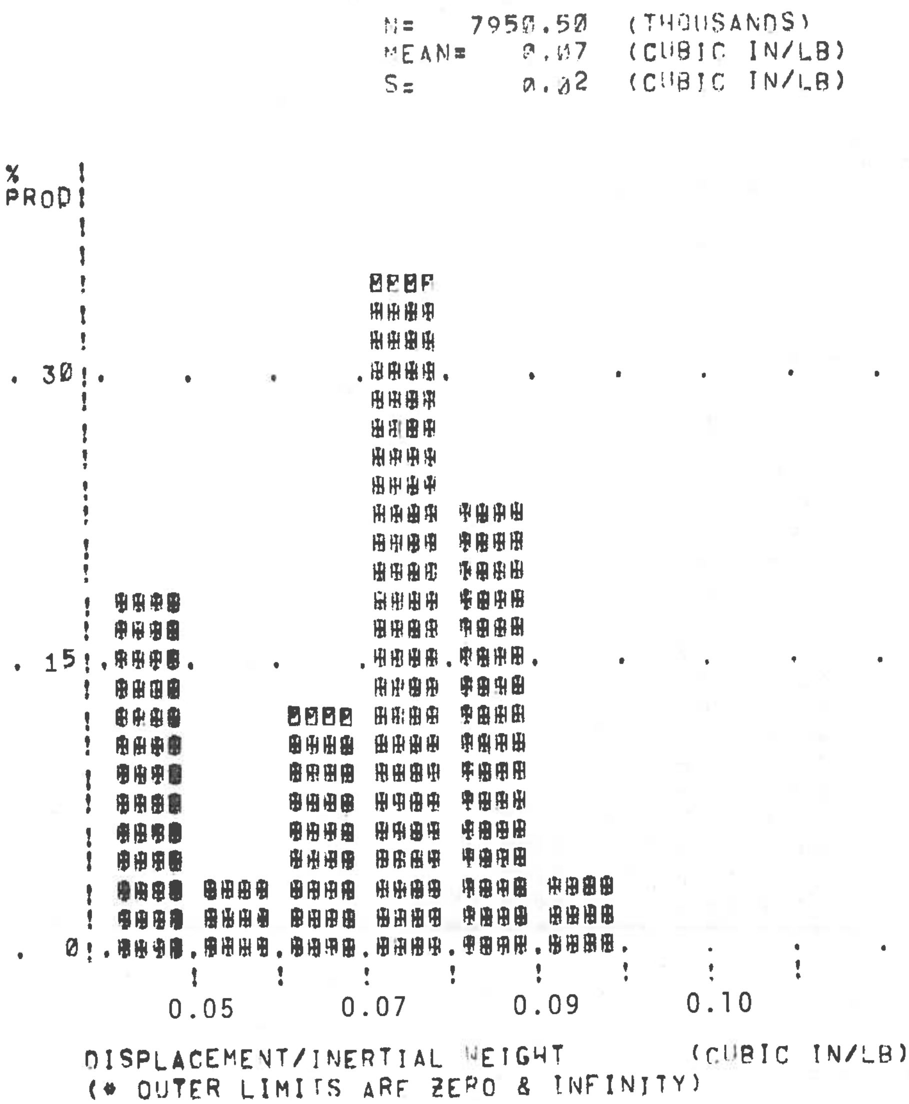


FIGURE 3-48. HISTOGRAM OF DISPLACEMENT/INERTIAL (TEST WEIGHT VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR FLEET PRODUCTION

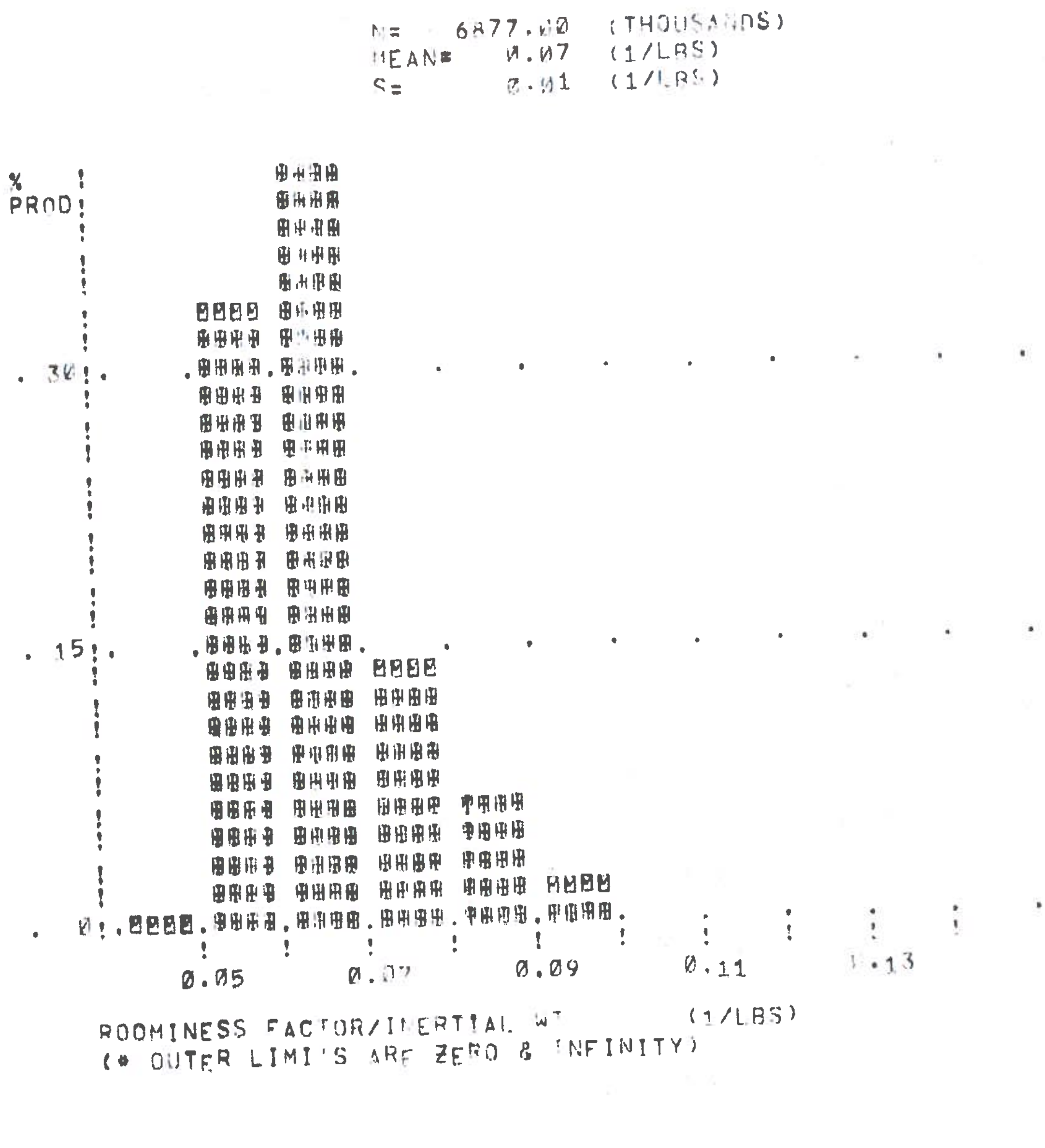


FIGURE 3-49. HISTOGRAM OF ROOMINESS FACTOR/INERTIAL (TEST) WEIGHT VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR DOMESTIC PRODUCTION

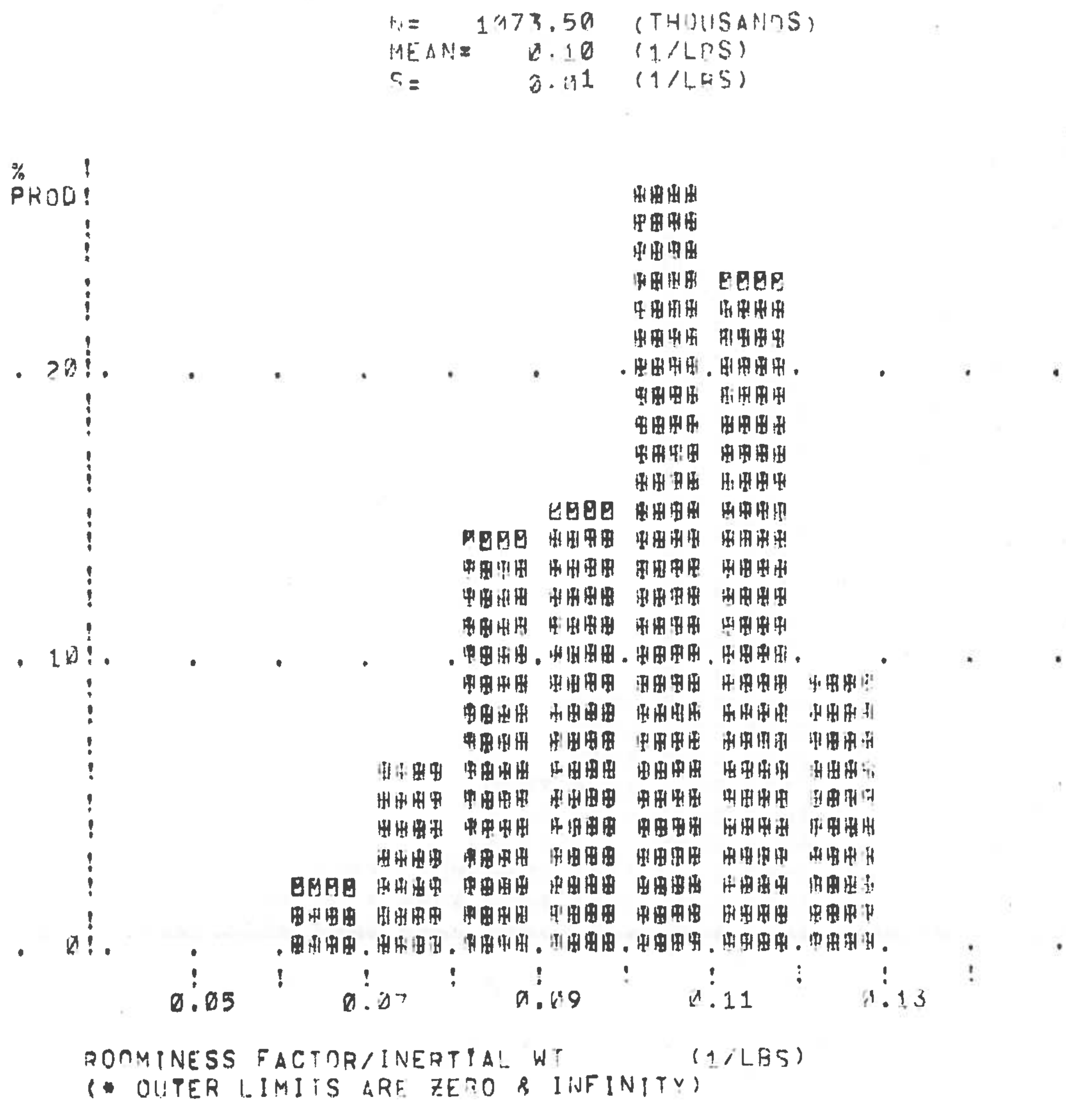


FIGURE 3-50. HISTOGRAM OF ROOMINESS FACTOR/INERTIAL (TEST) WEIGHT VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR IMPORT PRODUCTION

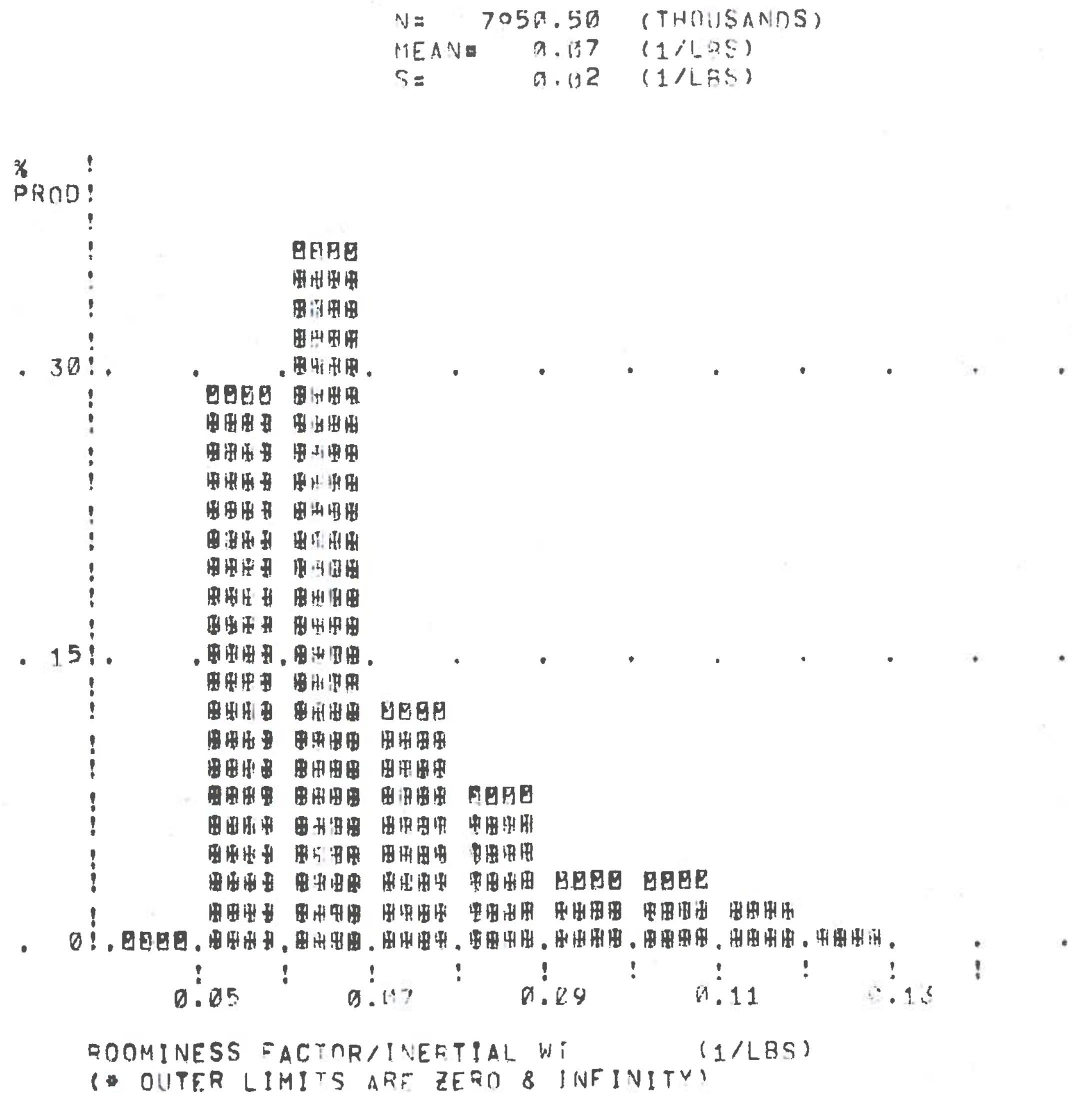


FIGURE 3-51. HISTOGRAM OF ROOMINESS FACTOR/INERTIAL (TEST) WEIGHT VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR FLEET PRODUCTION

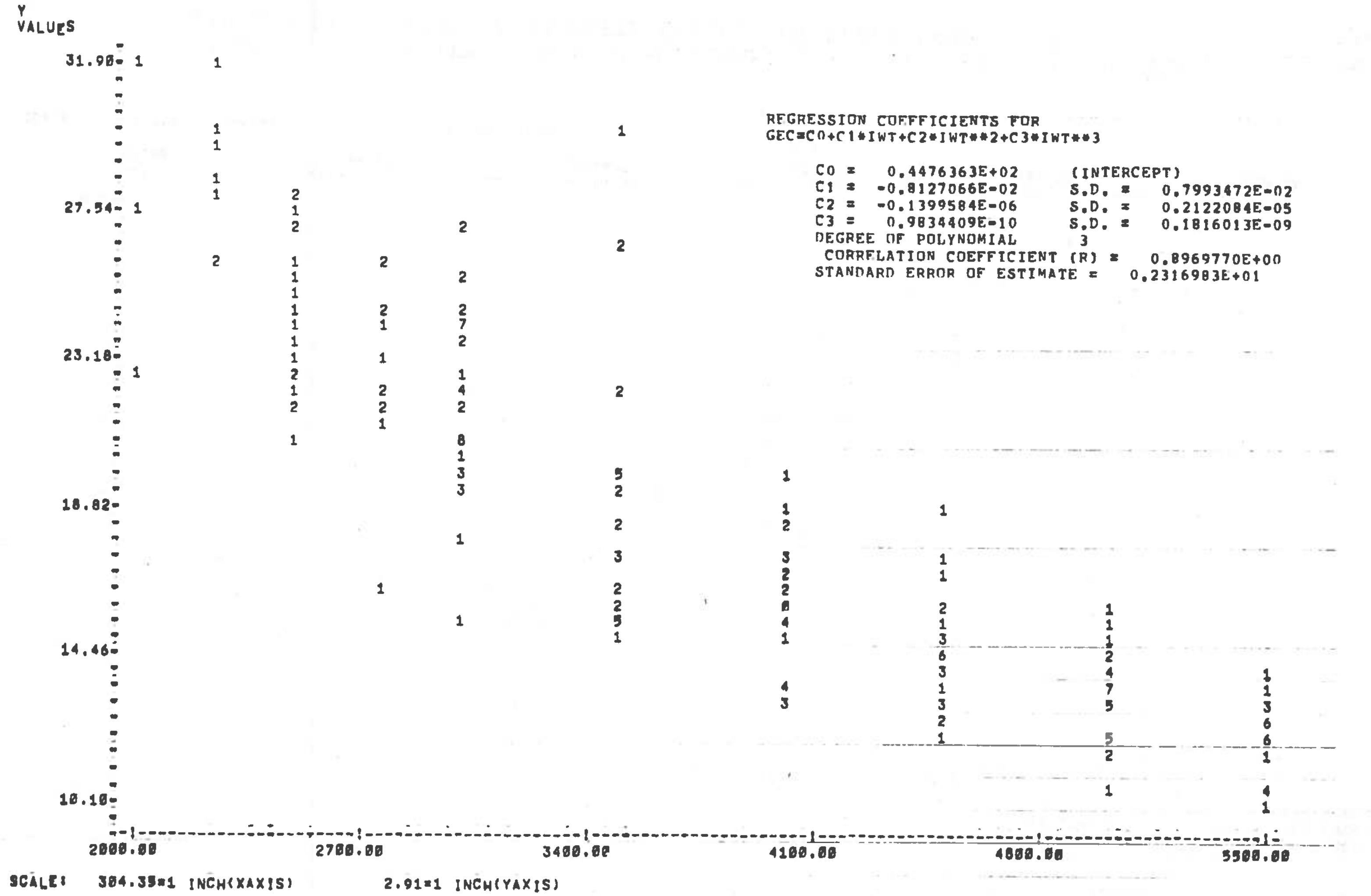


FIGURE 3-52. SCATTER PLOT OF INERTIAL WEIGHT CLASS (X-AXIS) VERSUS GAS ECONOMY (49 STATE) (Y-AXIS) (COMPOSITE CYCLE) FOR FLEET PRODUCTION

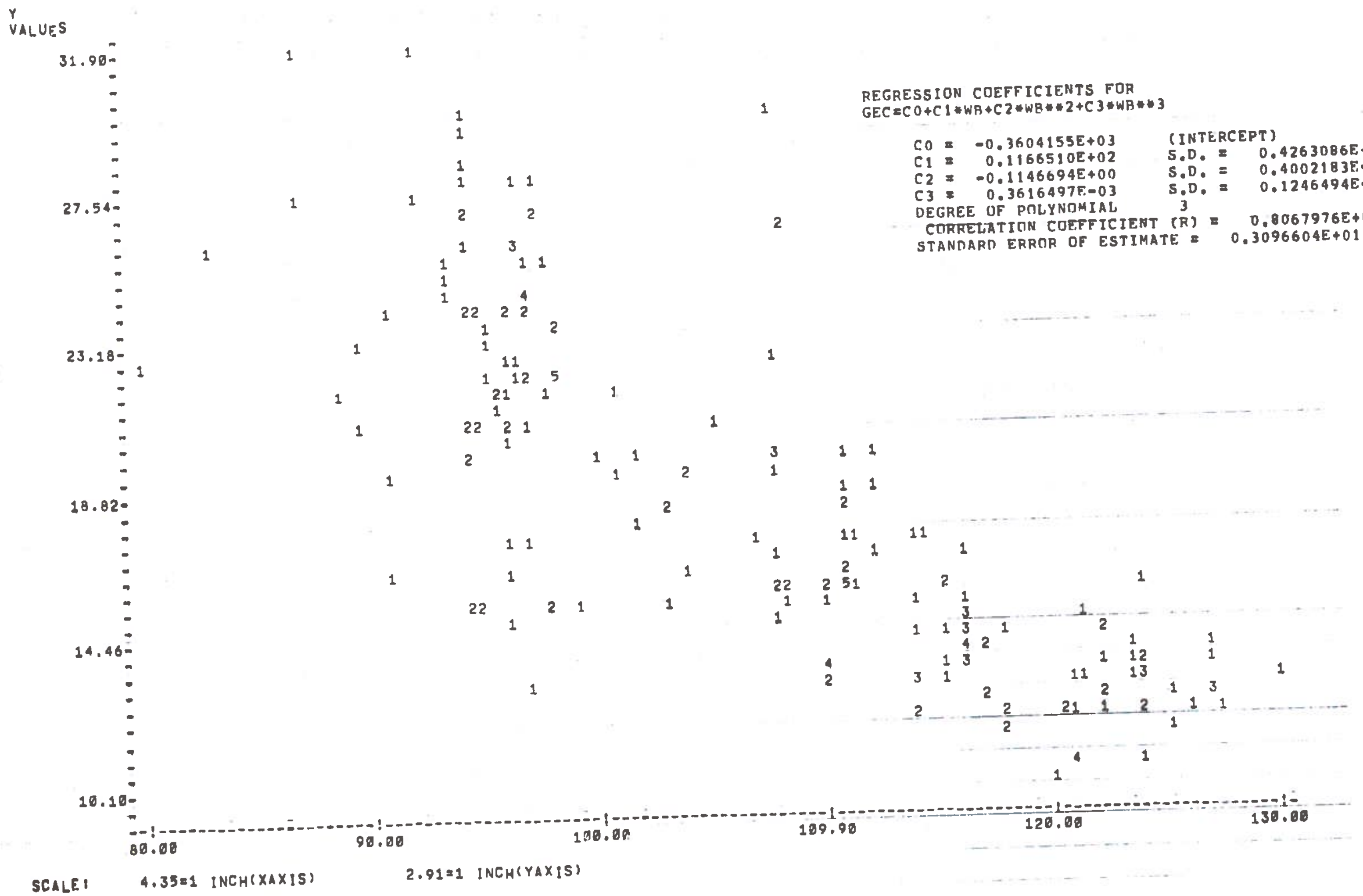


FIGURE 3-53. SCATTER PLOT OF WHEELBASE (X-AXIS) VERSUS GAS ECONOMY (49 STATE) (Y-AXIS) (COMPOSITE CYCLE) FOR FLEET PRODUCTION

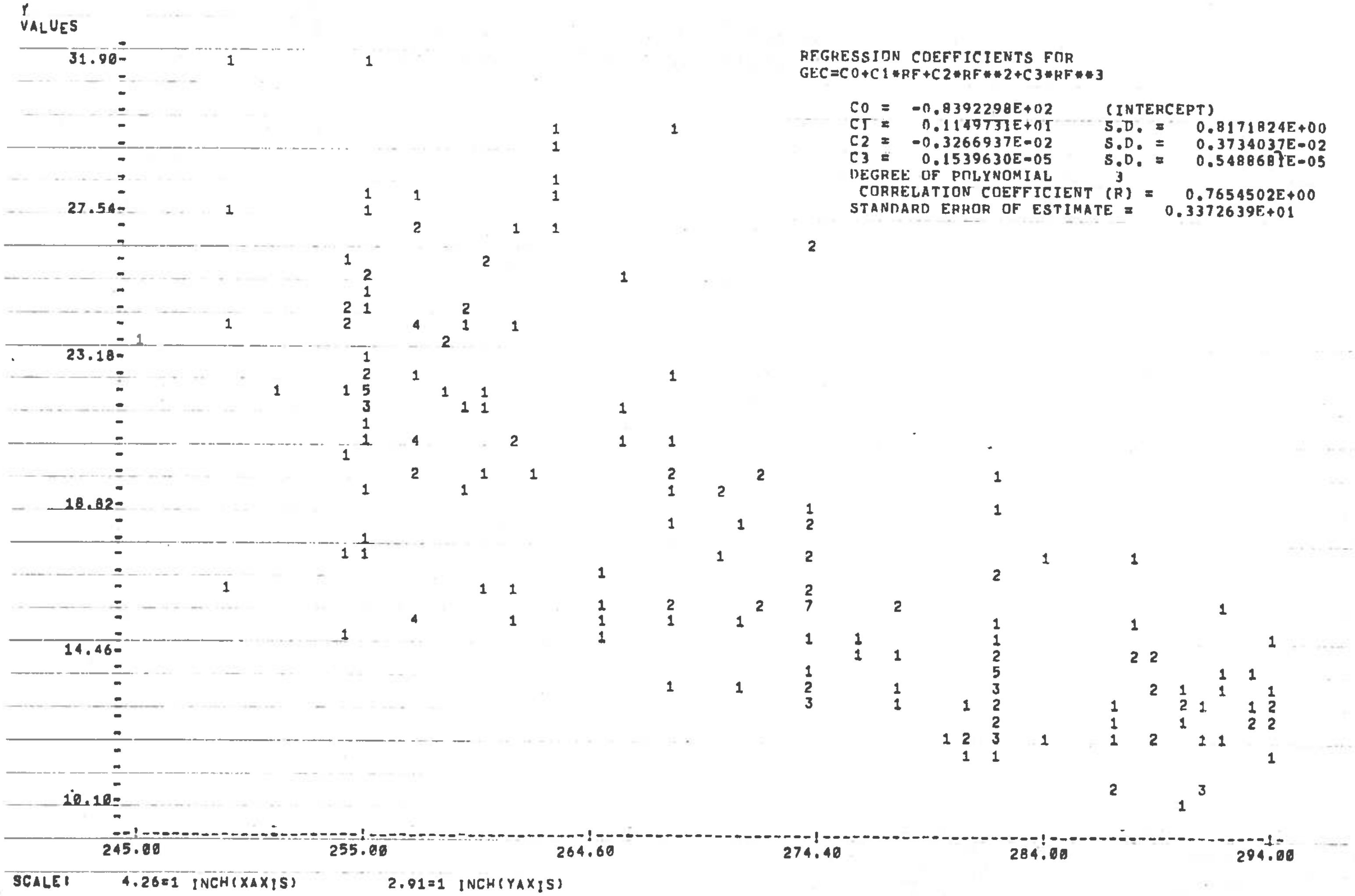


FIGURE 3-54. SCATTER OF ROOMINESS FACTOR (X-AXIS) VERSUS GAS ECONOMY (49 STATE) (Y-AXIS) (COMPOSITE CYCLE) FOR FLEET PRODUCTION

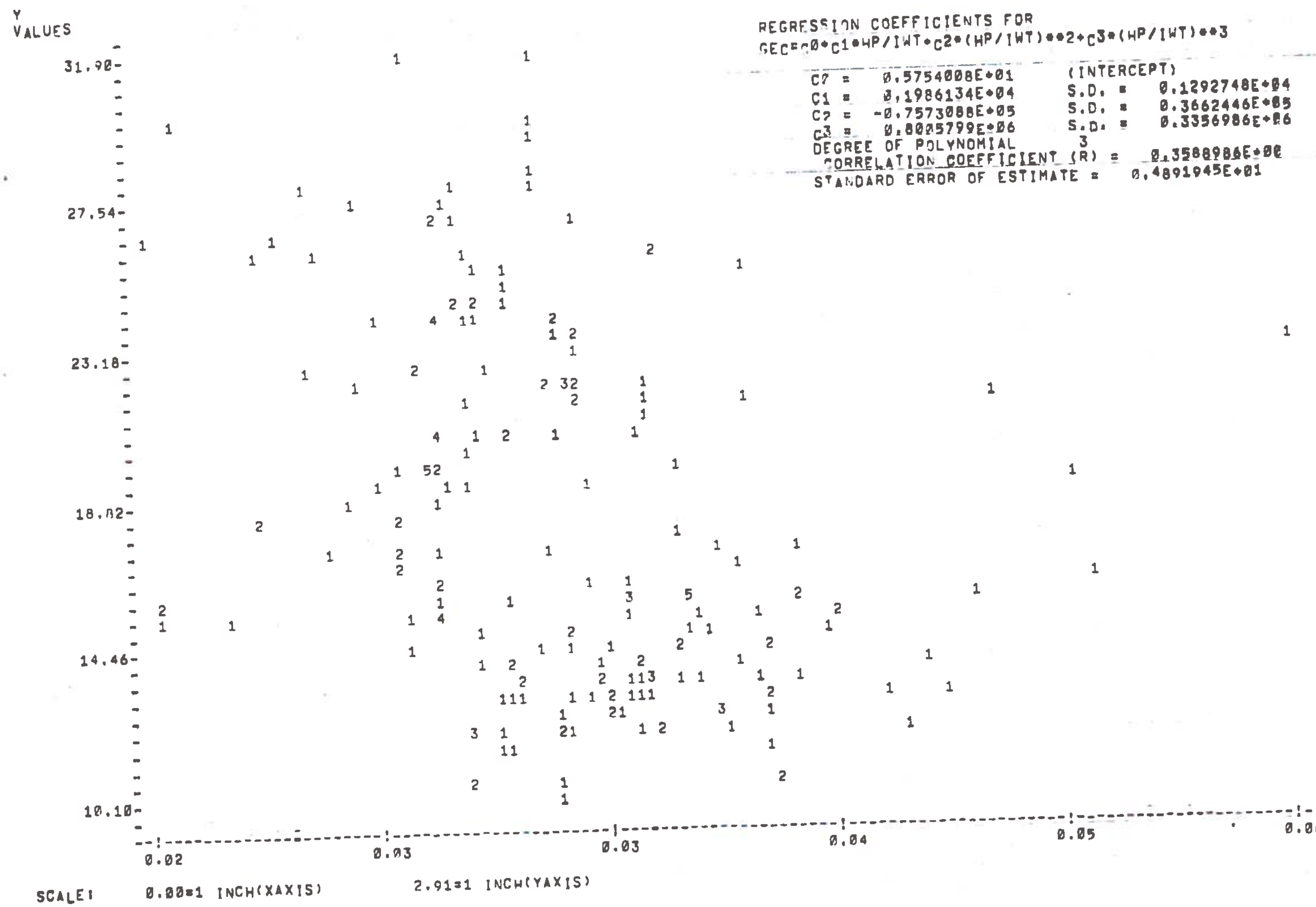


FIGURE 3-55. SCATTER PLOT OF HORSEPOWER/INERTIAL (TEST) WEIGHT (X-AXIS) VERSUS GAS ECONOMY (49 STATE) (Y-AXIS) (COMPOSITE CYCLE) FOR FLEET PRODUCTION

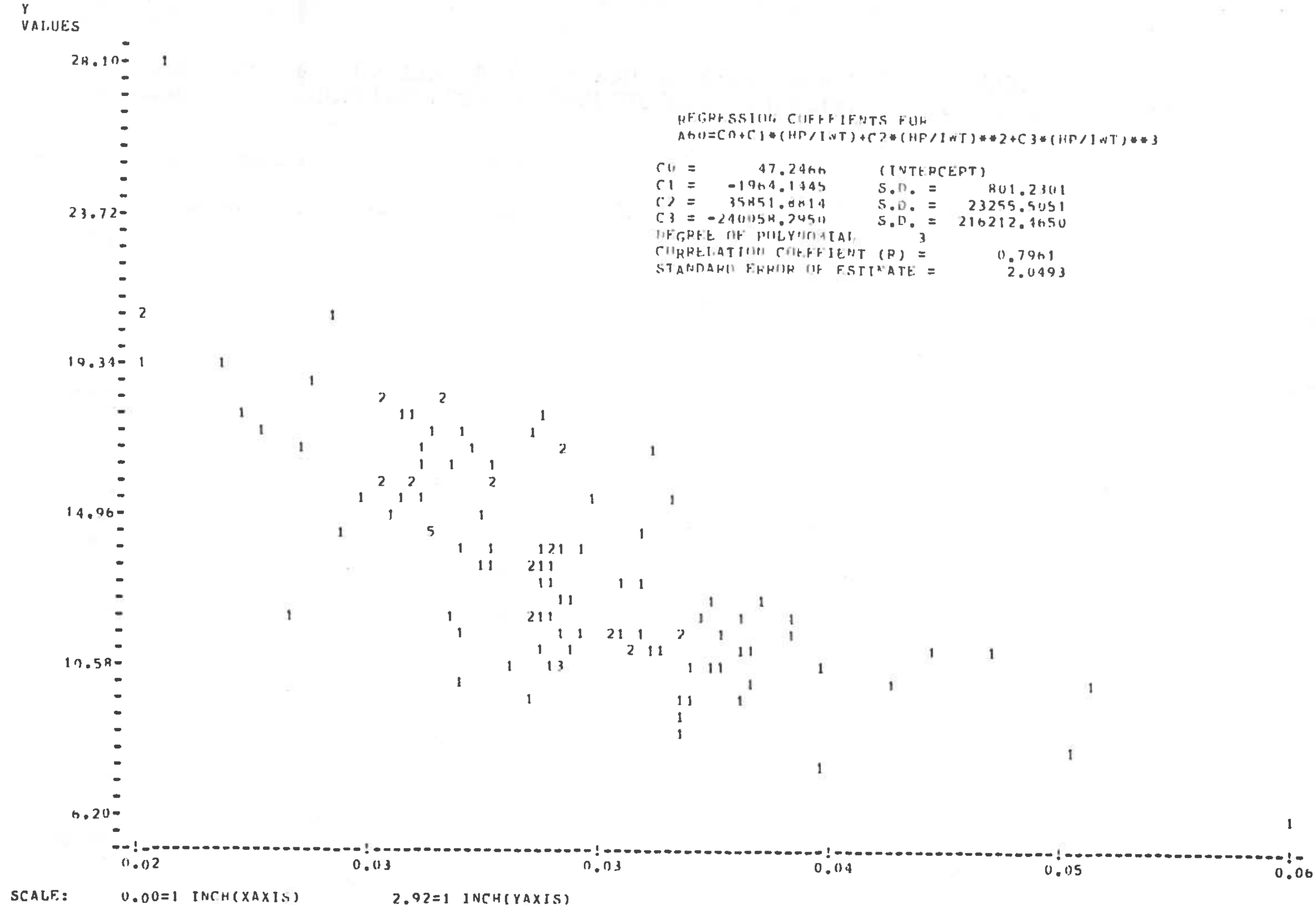
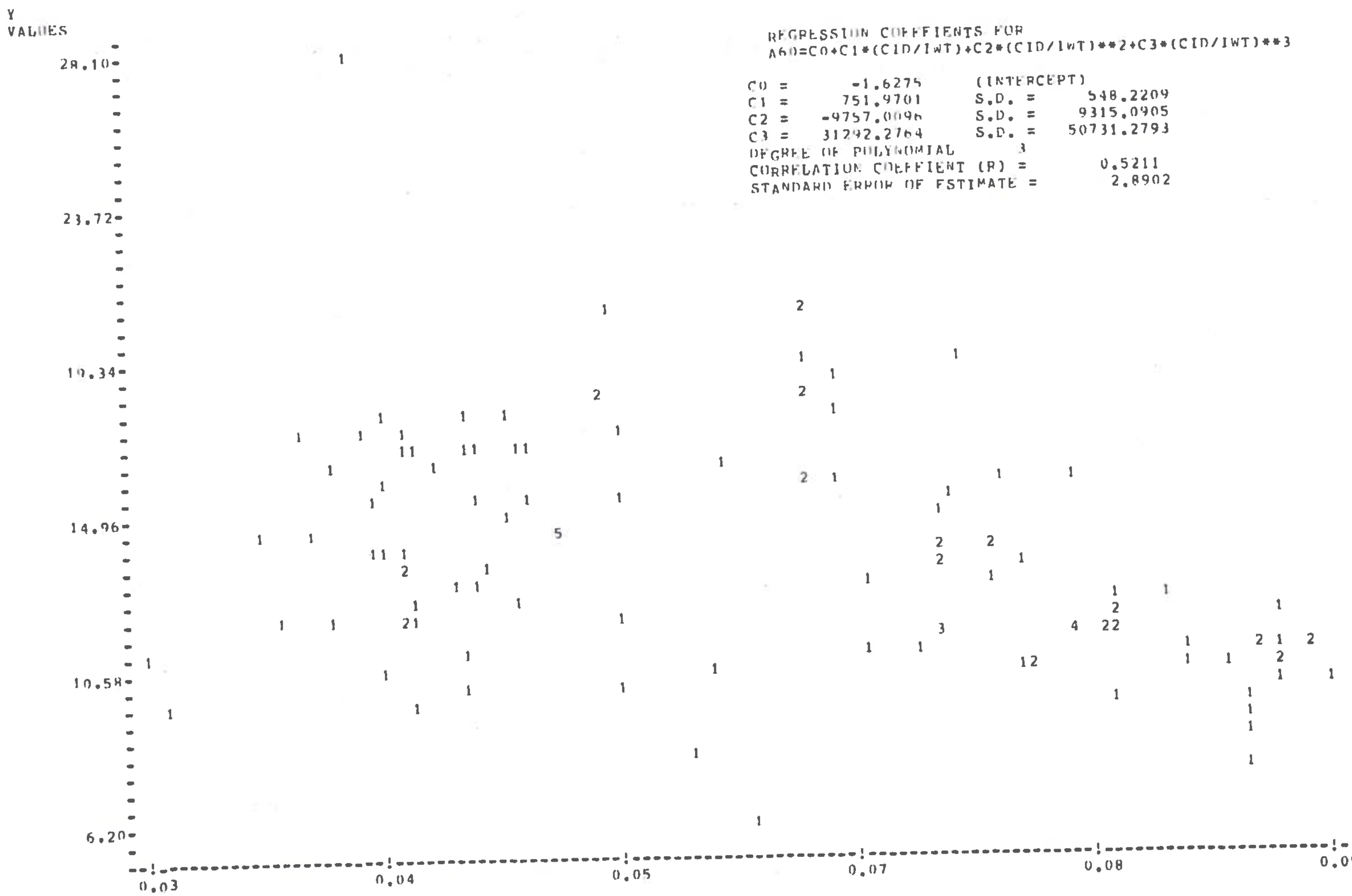


FIGURE 3-56. SCATTER PLOT OF HORSEPOWER/INERTIAL (TEST) WEIGHT (X-AXIS) VERSUS ACCELERATION TIME 0 TO 60 MPH (Y-AXIS) FOR FLEET PRODUCTION



SCALE: 0.01=1 INCH(XAXIS) 2.92=1 INCH(YAXIS)

FIGURE 3-57. SCATTER PLOT OF DISPLACEMENT INERTIAL (TEST) WEIGHT (X-AXIS) VERSUS ACCELERATION TIME 0 TO 60 MPH (Y-AXIS) FOR FLEET PRODUCTION

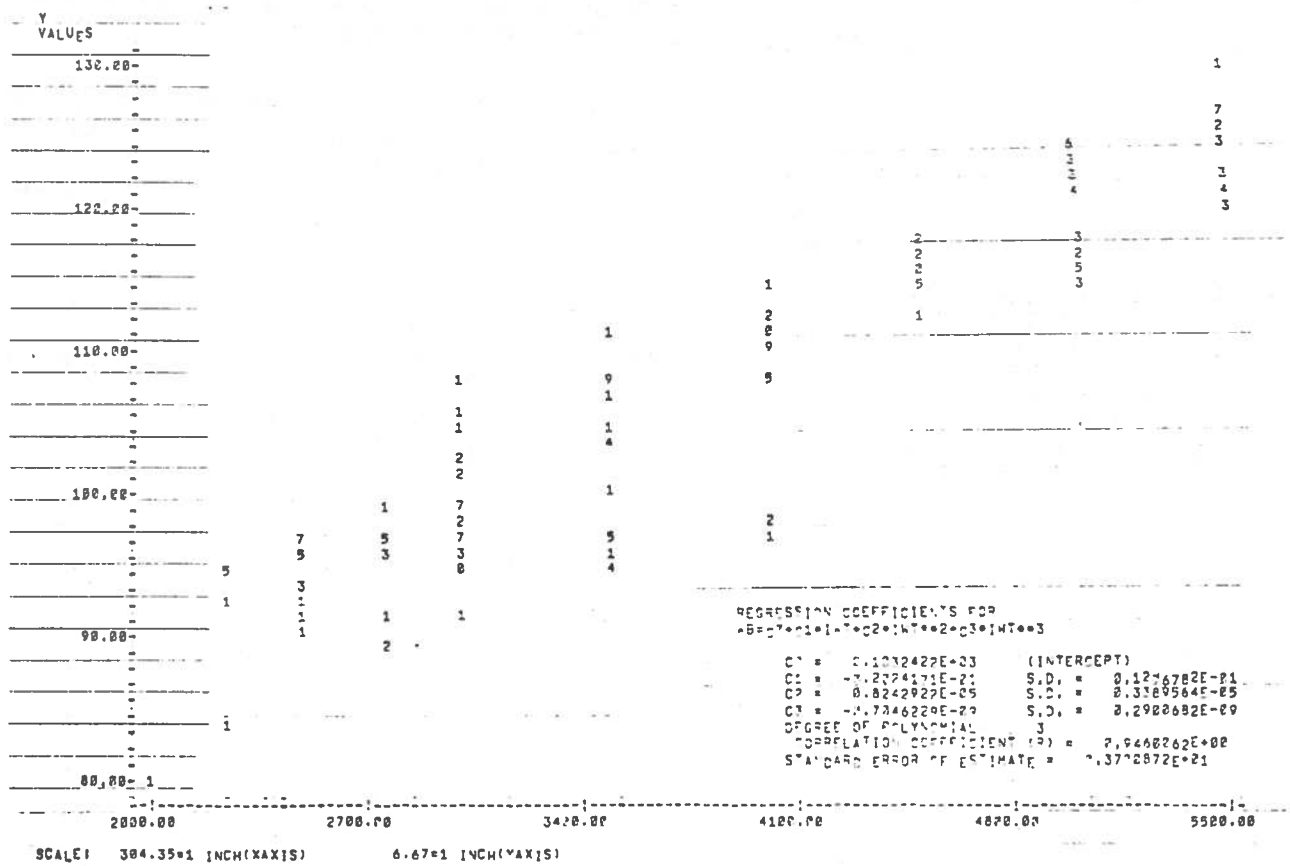


FIGURE 3-58. SCATTER PLOT OF INERTIAL CLASS (X-AXIS VERSUS WHEELBASE (Y-AXIS) FOR FLEET PRODUCTION

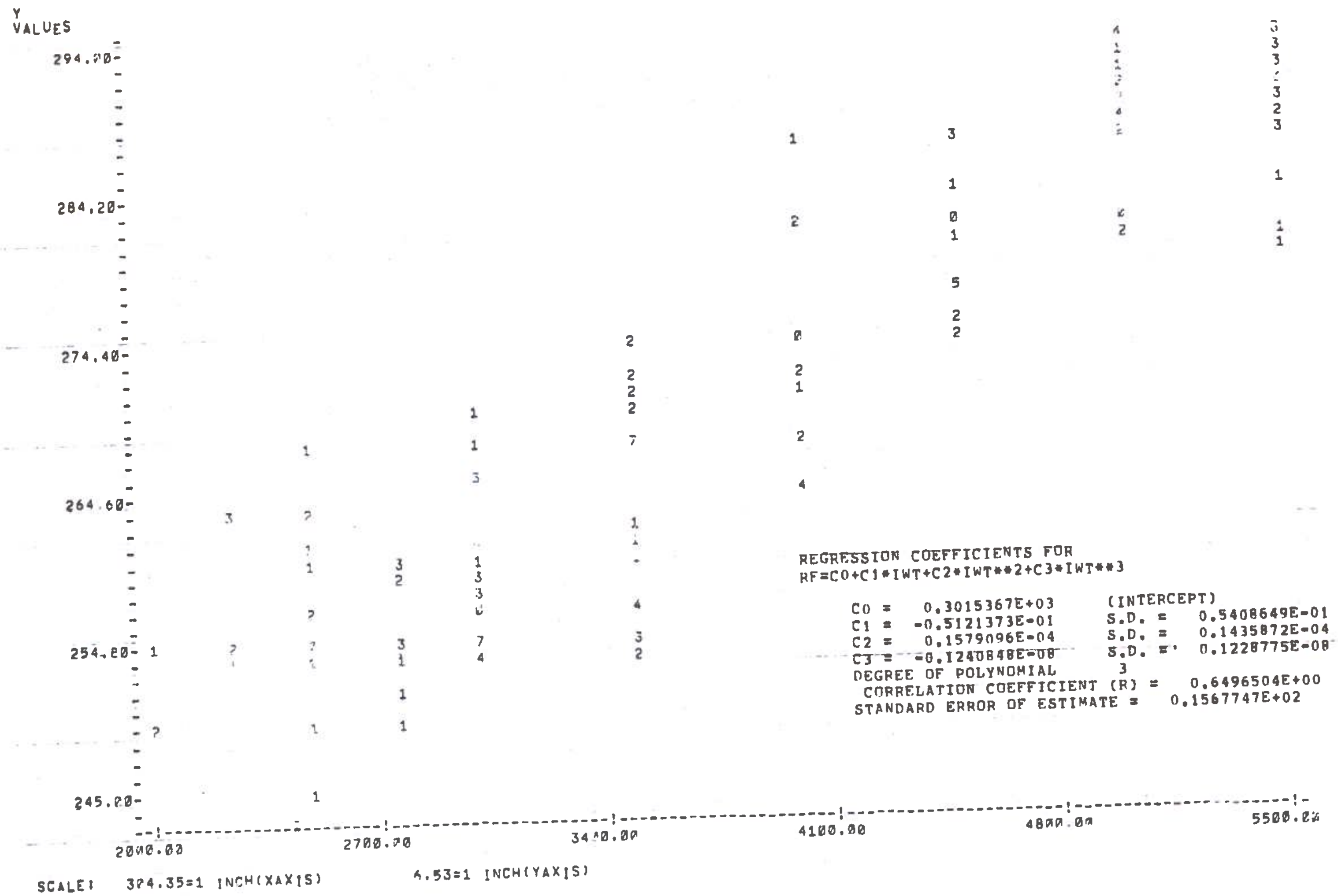


FIGURE 3-59. SCATTER PLOT OF INERTIAL WEIGHT CLASS (X-AXIS) VERSUS ROOMINESS FACTOR (Y-AXIS) FOR FLEET PRODUCTION

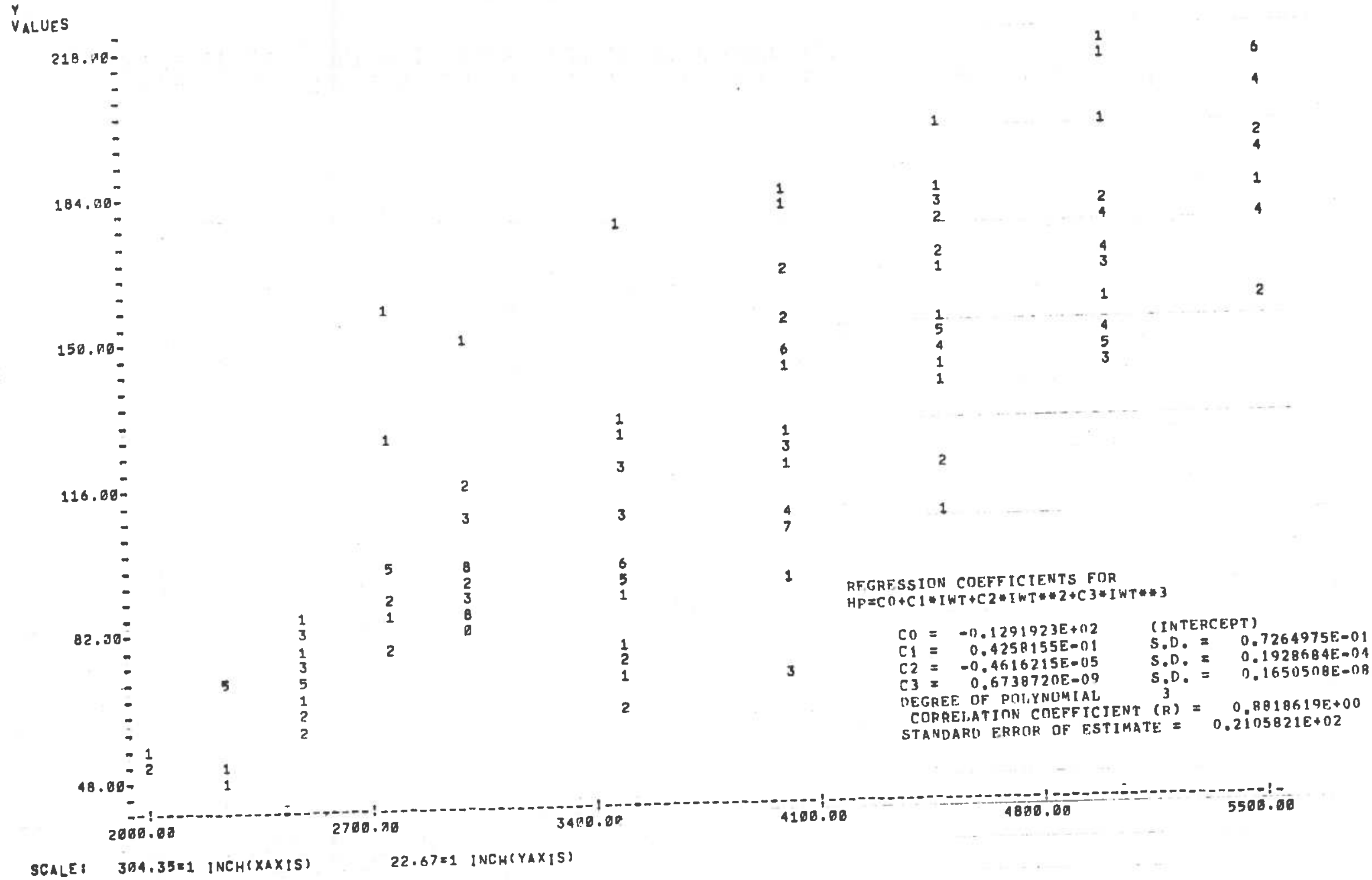


FIGURE 3-60. SCATTER PLOT OF INERTIAL WEIGHT CLASS (X-AXIS) VERSUS SAE HORSEPOWER (Y-AXIS) FOR FLEET PRODUCTION

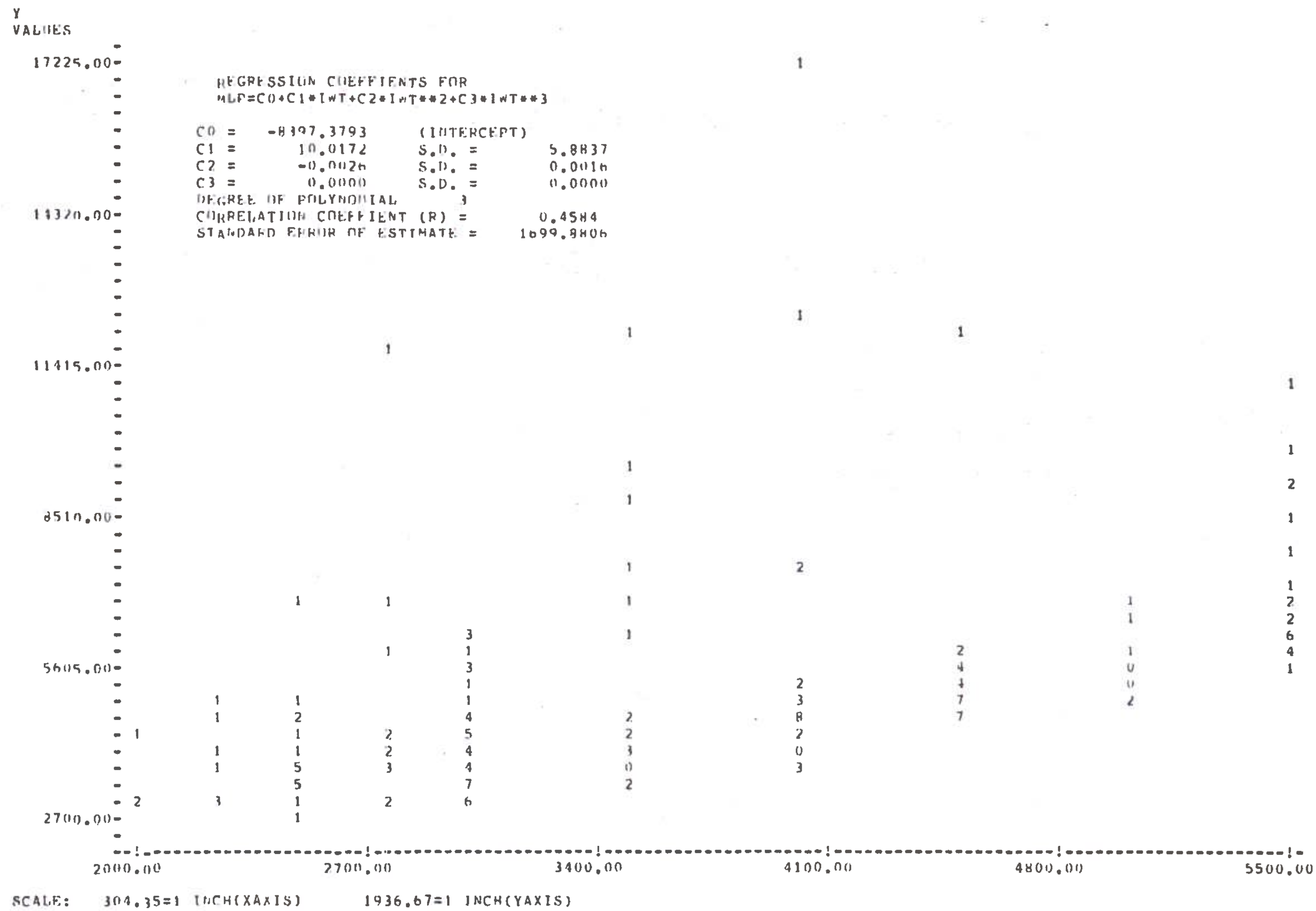


FIGURE 3-61. SCATTER PLOT OF INERTIAL WEIGHT (X-AXIS) VERSUS MANUFACTURERS SUGGESTED LIST PRICE (Y-AXIS) FOR FLEET PRODUCTION

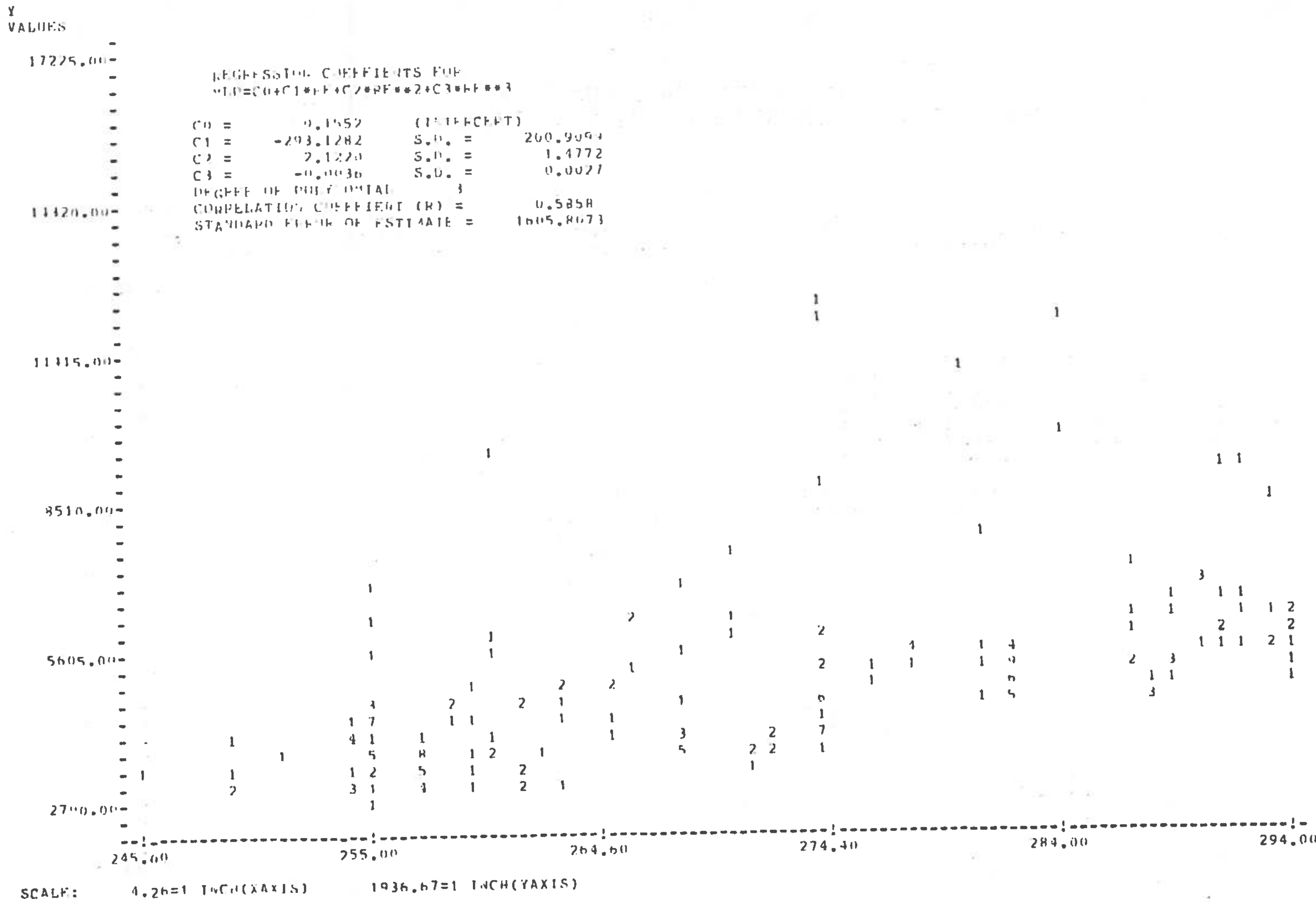


FIGURE 3-62. SCATTER PLOT OF ROOMINESS FACTOR (X-AXIS) VERSUS MANUFACTURERS SUGGESTED LIST PRICE (Y-AXIS) FOR FLEET PRODUCTION

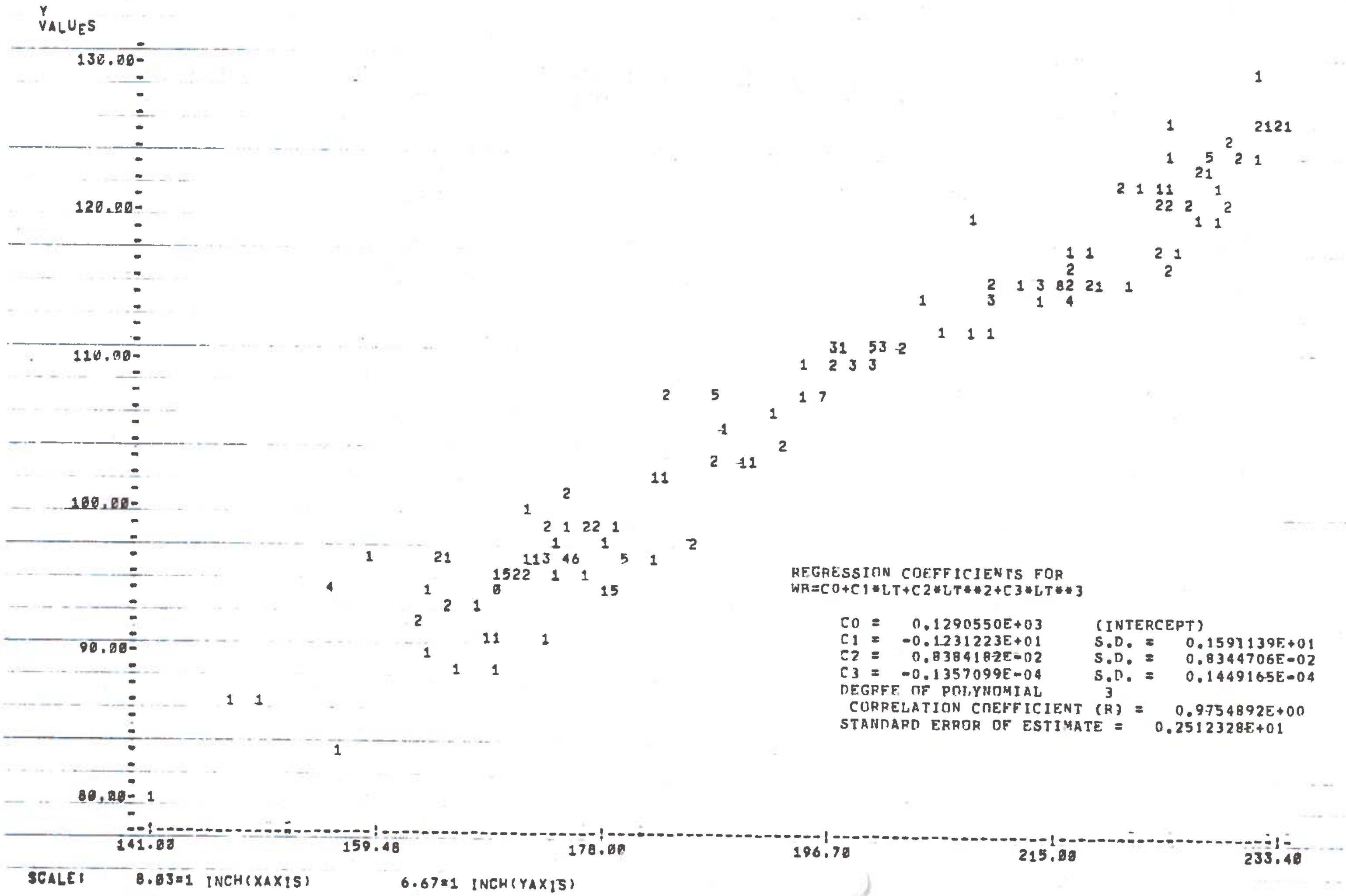


FIGURE 3-63. SCATTER PLOT OF LENGTH (X-AXIS) VERSUS WHEELBASE (Y-AXIS) FOR FLEET PRODUCTION

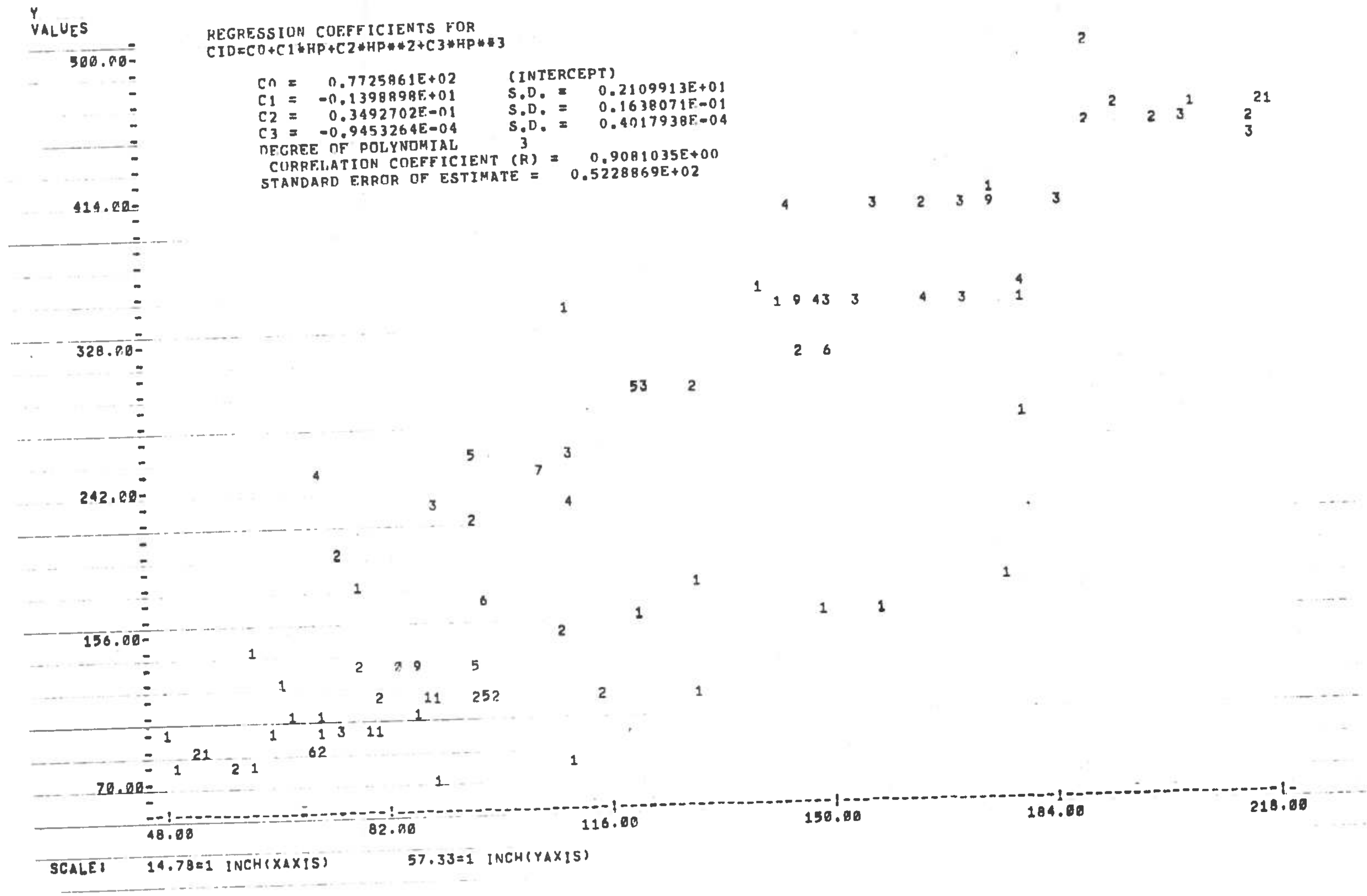


FIGURE 3-64. SCATTER PLOT OF SAE NTE HORSEPOWER (X-AXIS) VERSUS CUBIC INCH DISPLACEMENT (Y-AXIS) FOR FLEET PRODUCTION

4. USER INFORMATION

4.1 INTRODUCTION

This User's Guide Chapter contains instructions which will enable a user with minimum computer experience, to use effectively 75% of the Automotive Characteristics Data Base (ACDB). Presentation of the instructions contained in the guide is so ordered as to represent a logical flow of information concerning the required user's actions and the computer's response relative to the ACDB and the System 1022 Data Management language. The case study approach is used to demonstrate the capabilities of ACDB. Problems and questions are proposed and solved in a step by step demonstration approach using ACDB. This methodical approach enables the new user to propose and solve many more hypothetical questions than the basic questions and solutions incorporated within the System 1022 Data Management Manual. This manual, available through TSC's Data Services Division, should be consulted for greater clarity and a more detailed explanation of any concept that is unfamiliar to the user.

The order of presentation of concepts is: 1) an explanation of the sign-on procedure; 2) use of information and help functions; 3) use of System 1022 commands arithemetic functions applicable to ACDB; 4) applications and utility of ACDB routines; 5) use of the proper sign-off procedure. Also, key references are made to specific examples that are included in Appendix A.

4.2 USER INSTRUCTIONS

4.2.1 SIGN-ON and LOG-IN Procedure

a) Access to computer

The basic steps required to gain access to the computer and place the user's teletype (TTY) in the System 1022 operational mode are explained and demonstrated in this section. For a more detailed presentation of the system sign-on procedure, refer to the System 1022 manual.

The System 1022 user must provide the correct identification codes in order to attach his input device (data terminal) from a remote location. The LOGIN command informs the computer facility that a new job seeks access to the DEC System-10 computer. A prompted response will request the following identification codes from the user:

1) Job Number - A seven digit job accounting code; reading from left to right, four digits, a comma, and then three digits.

2) Name - The user's last name or the name of the person assigned to the job number.

3) Password - A user-defined alphanumeric word with up to six characters.

The methods used in this manual to indicate a response from the computer and the user input actions are:

1) C: The letter "C" placed at the left sides of the page in this manual and followed by a colon is indicative of the computer's response to a command.

2) U: The letter "U" followed by a colon is indicative of a required input action by the user. Also, a "↓ " indicated a carriage return.

The actual steps required to "Log-In" are presented below.

1) Establish contact with the DEC System 10 computer via an acoustic coupler, telephone, dataphone, etc. An On-Line indicator will indicate that a TTY data line is available. Type a C↓ (depress CTRL key and type C). If the response is a period (.) contact has been established and the DEC System-10 is available to receive the LOGIN command.

2) Type LOGIN then depress the carriage return key (RETURN).

The terminal will identify the DEC System-10 computer and the TTY data line, and will respond with a # symbol. The # is the system prompting function which requires the user to type his or her job number.

3) Type the seven digit job number then depress the carriage return key. The terminal response is "NAME:". The user's name or the name assigned to the job number is required from the user.

4) Type the assigned name after the response NAME: and depress the carriage return key. The response is "PASSWORD:". The user's assigned password is required by the system prompting function.

5) Type the assigned password after the response, PASSWORD:

An example of the above procedure is as follows:

EXAMPLE

U: LOGIN ↓

C: #

U: User's Job Number ↓

C: NAME:

U: User's Name ↓

C: PASSWORD:

U: User's password

COMPUTER PRINT-OUT

On the computer print-out, the computer and data line identifications are included after LOGIN. Also, the user name and password are not printed-out.

```
U: .LOGIN
C: JOB 19 TSC DECSYSTEM-10 3078-3 TTY44
U: 99999,999
C: NAME: PASSWORD:
```

Upon the correct execution of the above steps, the teletype (TTY) responds with the time, date, day of the week, and the message of the day, as shown below:

```
C: [illegible]     20-Jan-76          Tue
                         ATTENTION ALL USERS
   THE DECSYSTEM-10 WILL NOT BE AVAILABLE FOR GENERAL USE JANUARY 24TH AND
   25TH DUE TO MODIFICATIONS BEING MADE TO THE ELECTRICAL SYSTEM...THIS
   NOTICE WILL BE UPDATED WHEN FURTHER DETAILS ARE AVAILABLE.
```

(b) Access to ACDB

After the message of the day is presented, the System 1022 is automatically activated and the following information is given:

```
C: [illegible]
   SYSTEM 1022A (112-2)

   OPENING CAR75 DATA BASE
   216 RECS FOUND.
   NEW USERS TYPE  @INFORM
   *
```

NOTE: The "*" indicates that the computer is waiting for the user to respond with a command.

The first option available to the new user is to learn the names and functions of the various ACDB software program routines by typing @INFORM.

EXAMPLE:

```
U: * @INFORM

C: (FOLLOWING A *)
   FOR HELP RE:

   BASIC SYSTEM 1022 COMMANDS          TYPE  @SYS1
   LIBRARY OF DATABASE ROUTINES        TYPE  @LIB1
   DEC-10 MONITOR LEVEL COMMANDS       TYPE  @MON1
```

The @INFORM command contains instructions for the implementation of the @LIB1, @SYS1 and MON1 commands which type out a list of routines, and a series of instructions as an aid to new users. When the user is in doubt about the correct routine necessary to generate a particular output, the user can call up the @LIB1 command for a complete library listing.

EXAMPLE:

```
U: * @LIST

C: (FOLLOWING A *)
   TYPE           TO

   @ACODE         TYPE ATTRIBUTE CODE ON TTY
   @DMIDF         GENERATE NEW.DMI FROM CAR75D.DMS
   @GPO           TYPE GENERAL PRINT OUT REPORT ON TTY
   @HIST          BEGIN HISTOGRAM ROUTINE
   @IDV           TYPE IDV TRANSLATION ON TTY
   @PGPO          GENERATE GENERAL PRINT OUT AS DSK-FILE GPODF.RPT
   @PIDV          GENERATE IDV TRANSLATION AS DSK-FILE IDVDF.RPT
   @RGRS          BEGIN REGRESSION ROUTINE
   @SAPO          BEGIN SELECTED ATTRIBUTES PRINT OUT ROUTINE ON TTY
   @SPLOT         BEGIN SCATTER PLOT ROUTINE
   @SPLRG         BEGIN COMBINED SCATTER PLOT & REGRESSION ROUTINE
```

The @SYS1 file contains specific information concerning the general System 1022 commands.

EXAMPLE

```
U: * @SYS1

C: (FOLLOWING A *)
   TYPE                      TO

   OPEN CAR75                OPEN CAR75.DMS DATABASE & CLOSE OTHERS
   FIND ID BET 6 44          SELECT ALL RECORDS WITH ID BETWEEN 6 & 44
   SEARCH F02 GT 71          FROM SET OF RECORDS ALREADY FOUND
                               SELECT SUBSET WITH F02 GREATER THAN 71
   SORT BY ATT5              SORT SELECTED RECORDS IN ORDER OF ASCENDING ATT5
   TYPE ATT1 ATT2            TYPE ATTRIBUTE LIST FOR EACH RECORD SELECTED
   @RUTINE                   PERFORM COMMANDS IN DSK-FILE RUTINE
   CONTROL-O                 SUPPRESS TYPING & RETURN TO * (SYSTEM 1022)
   CONTROL-C                 INTERRUPT PROCESSING & GO TO . (MONITOR LEVEL)
   INFORM ON CAR75.DMD STRUCTURE
                             GENERATE CAR75.DMD USING CAR75.DMS
   LOAD CAR75.DMD            GENERATE CAR75.DMS USING CAR75.DMI & CAR75.DMD
   QUIT                      COMPLETE PROCESSING & GO TO . (MONITOR LEVEL)
       (COMPLETE LIST OF COMMANDS IN SYSTEM 1022 HANDBOOK)

   CHARACTER    MEANING

   .            READY FOR MONITOR LEVEL COMMAND (TYPE R 1022 TO GET *)
   *            READY FOR SYSTEM 1022 COMMAND OR ROUTINE
   #            READY FOR COMPLETION OF FORMAT STATEMENT (TYPE END. TO GET *)
   :            READY FOR TECO COMMAND (TYPE EX<ESC><ESC> TO GET *)
   *(D)         READY FOR DPL STATEMENT (TYPE DPL END. TO GET *)
```

The @MON1 file contains information concerning the general PDP-10 monitor level commands.

EXAMPLE:

U:
```
* @MON1
```

C:
```
(FOLLOWING A .)
TYPE                      TO

CONTROL-C                 INTERRUPT PROCESSING AND RETURN TO .
R 1022                    ENTER SYSTEM 1022
PRINT LPT0:=FILNAM.EXT    PRINT FILNAM.EXT ON U/L-CASE LINE PRINTE
R QUOLST                  TYPE OUT DSK STORAGE QUOTA & STATUS
DELETE FILNAM.EXT         DELETE FILNAM.EXT
DIR                       TYPE OUT DSK FILE DIRECTORY
R JOBCOS                  TYPE OUT ROUGH COST OF JOB SINCE LOGIN
K/S                       LOG OFF (KILL JOB) DELETING TEMPORARY F
  (COMPLETE LIST OF COMMANDS IN DECSYSTEM-10 HANDBOOK)
```

NOTE:

1. These "help" messages, normally typed at log-in time, may be rquested after any* when operating in the System 1022 mode.

2. A user enters system 1022 from monitor level by typing "RUN SET1".

EXAMPLE:

U:
```
.RUN SET1
```

C:
```
[illegible]
SYSTEM 1022A (112-2)

OPENING CHR75 DATA BASE
216 RECS FOUND.
NEW USERS TYPE  @INFORM
*
```

When it is unclear whether a user is under the control of the monitor or System 1022, he depresses the carriage return key. A period in response shows that the monitor is awaiting a command; an asterisk indicates System 1022 is awaiting a command. The log-in or job initiating procedure has been programmed to enter System 1022 automatically as indicated by the asterisk return at the end of the procedure.

4.2.2 Using System 1022 in the ACDB Program

The basic System 1022 commands are discussed and explained in this section. The FIND, SEARCH, SORT, TYPE, and TOTAL commands are defined and presented with examples and some special applications. Also, System 1022 arithemetic functions are defined, and examples of their use are presented.

a) FIND/SEARCH Commands

These algorithms are initiated for the purpose of selecting specific record groupings for detailed analysis and reporting requirements. Logical expressions and attribute names may be used in conjunction with numeric values when selecting groups of records for analysis and generation of output for reports. The SEARCH command initates a search algorithm to retrieve a record containing the attribute as specified in its command string. It searches only those records found in the last FIND or SEARCH command. FIND commands are exclusive, as they function only as a result of keyed attributes or special system names. Therefore, whenever possible, the FIND command should be used instead of the SEARCH command.

NOTE: In the ACDB programs, the keyed attributes are important attributes that can be used with the FIND command for analysis and report generation. Refer to the following table:

ATTRIBUTE CODE	NOMENCLATURE
CID	cubic inch displacement
GEU	gas economy (urban)
GEH	gas economy (highway)
GEC	gas economy (composite)
ID	record identification number
MOD	vehicle model
CWT	curb weight
IWT	inertia weight

HP	horsepower
MDS	percent production for vehicle configuration
MLP	suggested manufacturer's list price

A list of all program attribute code abbreviations along with their descriptions can be obtained by typing the command @CODE. Refer to Appendix A for a complete print out of the attribute codes.

Other important aspects of the FIND and SEARCH commands are the logical statements used in retrieving data. These functions are:

FUNCTION CODE	FUNCTIONS
GE	greater than or equal
GT	greater than
LE	less than or equal
LT	less than
NE	not equal
EQ	equal
BET	between, i.e., sets attribute range

NOTE: See pages 42 of the System 1022 manual for more details and examples

EXAMPLE 1 The FIND Command

Examples of the FIND and SEARCH command and logic functions are presented below:

```
U:   FIND MOD CHEV
C:   4 RECS FOUND.
```

The user has asked the computer to find all models (MOD) called Cheverolet (CHEV). Four Cheverolet vehicles were found.

EXAMPLE 2 The GE logic function used with the FIND command.

This configuration of the FIND command will retrieve all records with a value greater than or equal to the attribute value. Only those records containing the specified attribute value are considered for comparison.

```
U:   FIND CID GE 475
C: 2 RECS FOUND.
   *
```

The user has instructed the computer to find all the vehicles in the data base with engines that have a cubic inch displacement (CID) greater than or equal to 475 CID. Two vehicles were found.

<u>EXAMPLE 3</u> The BET (Between) logic function used with the FIND command.

This configuration of the FIND command will retrieve all records with X values that are between the two limiters (a $\leq$ X $\leq$ b).

```
U:   FIND CID BET 300 400
C: 76 RECS FOUND.
   *
```

The user has instructed the computer to find all vehicles with engines that have a CID between 300 and 400. 76 vehicles were found.

<u>EXAMPLE 4</u> The SEARCH command used with the FIND command and LT (less than) logic function.

```
U:   FIND MOD CHEV
C: 4 RECS FOUND.
U: * SEARCH CID LT 360
C: FOUND.
```

The user has requested the computer to retrieve all the records of the Chevrolet models. Four records were found. Next, the user seeks to determine how many of the four Chevrolet models have engines with less than (LT) 360 CID. One vehicle was found.

b) TYPE Command

TYPE (PRINT) - Data may be retrieved from the ACDB and printed on the user's terminal by executing a standard System-1022 type command. The data will be listed in tabulated format without headings or general report formating. The utility of the standard type command as an attribute listing function becomes apparent when a model characteristics review or model characteristics look-up requirement occurs.

EXAMPLE:

```
U: * F MOD VOLO
C: 3 RECS FOUND.
U: * TYPE MOD CID TR
C: VOLO   121.00000 M5
   VOLO   121.00000 M4
   VOLO   132.00000 A3
```

In this example, after the FIND MOD VOLO (VOLVO) string is executed, the TYPE command is used to print out the three models name, cubic inch displacement (CID), and transmission configuration (TR).

- Arithmetic Functions - Basic operations in the Automotive Characteristics Data Base analysis and output algorithms are: Add (+), Multiply (*), Subtract (-), Divide (/).

EXAMPLE:

```
U:   FIND MOD CHEV
C: 4 RECS FOUND.
U: * TYPE MOD TP3 TP2 HP INT
C: CHEV   159.44000 138.72000 145.00000 5000.0000
   CHEV   130.61000 106.93000 175.00000 5000.0000
   CHEV   45.890000 37.570000 175.00000 5500.0000
   CHEV   7.0600000 5.7799999 215.00000 5500.0000

U: * TYPE TP3-TP2
C: 20.720001
   23.680000
   8.2199997
   1.2800000
   *

U:   TYPE HP/INT
C: .02900000
   .03500000
   .03181818
   .03909090
   *
```

In this example, four Chevrolet vehicles were found. The production (X1000) through June (TP3) and March (TP2), horsepower (HP) and inertia weight (IWT) were then typed for each Chevrolet. The production of each configuration from April through June (TP3-TP2) was found, and, finally, the horsepower to weight (HP/IWT) ratios were calculated.

c) SORT Command - A selected group of records may be sorted in an ascending or descending order as specified by the selected attributes. TYPE commands after a SORT command will produce outputs in the same order as the result of the SORT command. The order in which attributes are listed in the command string will determine the order of the SORT command results unless ASCENDING or DESCENDING is included in the command string. The ASCENDING or DESCENDING function acts on all attributes preceding it in the command string. The FIND, SEARCH, and SORT commands, when used in the ACDB program, enable the user to select ordered groups of vehicle records for analysis and report generation.

<u>EXAMPLE</u>: Unsorted Output

```
U: * FIND ALL
C: 216 RECS FOUND.
U: * SEARCH LHC SET .2 .3
C: 7 RECS FOUND.
U: * TYPE MOD CID LHC
C: CHYRS 440.00000 .30000000
   IMPER 440.00000 .30000000
   MBEN  147.00000 .20000000
   MBEN  183.00000 .20000000
   MBEN  167.00000 .30000000
   BMW   121.00000 .30000000
   BMW   182.00000 .20000000
   *
```

<u>EXAMPLE: Sorted Output</u>

```
U: * SORT CID UP
U: * TYPE MOD CID LHC
C: BMW   121.00000 .30000000
   MBEN  147.00000 .20000000
   MBEN  167.00000 .30000000
   BMW   182.00000 .20000000
   MBEN  183.00000 .20000000
   IMPER 440.00000 .30000000
   CHYRS 440.00000 .30000000
   *
```

The illustrated examples in this section show a comparison of outputs for the unsorted and sorted data. In each case the user executes a command string to retrieve all records from the data base that have hydrocarbon emission level between .2 and .3 grams per mile. In the unsorted version, the user executes a TYPE command to print the vehicle model, CID, and hydrocarbon emission level on the TTY Terminal. The sorted output in the illustrative example is an ascending order starting with an engine CID of 121 and ending with an engine CID of 440. In the command string, "SORT CID UP", the word "UP" is equivalent to a descending order sort. Also, the "DOWN" would be equivalent to a descending order sort.

d) Totals Functions

The TOT command acts on group of currently selected records in order to collect and evaluate data for the purpose of generating totals of selected attributes. The TOT function is used only in TYPE commands where selected record groups are implied.

EXAMPLE 1:

```
U: * FIND MOD NOVA
C: 3 RECS FOUND.
U: * TYPE MOD CID TPS
C: NOVA  250.00000 105.35000
   NOVA  262.00000 46.550000
   NOVA  350.00000 93.100000
U: * TYP TOT TPS
C: 245.00000
```

Three Nova vehicles were found. The CID and production of each of these configurations was then typed and finally the total production (245,000) for all Nova vehicles produced through June 31 was typed on the data terminal.

A more complex configuration of the TOT function can be used for analysis and report generation.

Problem: The user wishes to know the harmonic production weighted average composite fuel economy, of all Vega models.

EXAMPLE 2:

```
U: * FIND MOD VEGA
C: 3 RECS FOUND.
U: * TYP MOD CEC TP3
C: VEGA   [illegible].600000 26.550000
   VEGA   24.500000 106.20000
   VEGA   24.000000 44.250000
U: * TYP (TOT TP3)/(TOT TP3/CEC)
C: [illegible]
```

In this example, the FIND command is used to retrieve all Vega models. Next, the production and fuel economy of each configuration is presented, and, finally, the harmonic production-weighted composite fuel economy was found by using the TYPE command in conjunction with the TOTAL command.

e) Mean, Max, Min Functions

These functions may be used when considering numerical valued attributes selected from the Automotive Characteristics Data Base. An illustrative problem and example follows:

Problem: Determine the Mean, Max, and Min, Cubic Inch Displacement (CID) of all Nova models.

```
U: * FIND MOD NOVA
C: 3 RECS FOUND.
U: * TYP MOD CID
C: NOVA   [illegible]
   NOVA   [illegible]
   NOVA   [illegible]
U: * TYP MEAN CID
C: [illegible]
U: * TYP MAX CID
C: [illegible]
U: * TYP MIN CID
C: [illegible]
```

For this example, the mean CID for Nova models was found to be 287.33 in^3, the maximum CID was 350 in^3, and the minimum CID was 250 in^3.

4.2.3 Routines

a) @GPO - a general printout report on the TTY which includes all data base attributes. This routine presents the data in a formated output with labeled group headings. The attribute data are grouped under the following headings:

Vehicle Identification
Dimensions
Engine Parameters
Transmission
Performance
Emissions
Fuel Economy
Production
Comments

Use of the @GPO routine.
Procedure:

Use FIND or SEARCH commands in order to select the vehicle models to be included in the @GPO report.

Type @GPO and depress the carriage return key (RETURN).

EXAMPLE:

```
U: [illegible]
C: [illegible]
U: * @GPO
```

Figure 4-1 presents the GPO output

A printout from the line printer can be obtained for large vehicle group selections (i.e., more than 10 vehicles for the @GPO routine) by following the above procedure, except, the user types @ PGPO instead of @ GPO.

b) @ SAPO - Produces a selected attributes printout report on the TTY with proper column headings. A maximum of 11 attributes are presented, nine of the 11 attributes may be selected by the user. The vehicle model and CID are inherent in the @ SAPO routine. These two attributes are always included along with any attributes selected by the user in the TTY printout. This routine is especially useful in case studies where only selected attributes are required and the need for a GPO of all the attributes is not necessary.

Procedure:

1) @ SAPO, for new users, will generate a set of instructions on the correct sequence commands required to execute the @ SAPO (Selected Attributes Print Out) routine.

GENERAL PRINT OUT
(GPO)

VEHICLE IDENTIFICATIONS

ID#	ENTERED	YEAR	D/I	MFGR	DIVISION	MODEL	VEHICLE TYPE
87	APR-17-75	1975	DOM	GM	CHEVROLET	NOVA	SED/HT AUT TRAN
88	APR-17-75	1975	DOM	GM	CHEVROLET	NOVA	SED/HT AUT TRAN
89	APR-17-75	1975	DOM	GM	CHEVROLET	NOVA	HBACK AUT TRAN

DIMENSIONS

ID#	WEIGHT INRTL	WEIGHT CURB	WHL. BASE	LEN.	WID	HT	TRUNK SPACE	TIRE	ROOM-INESS	# PASS	IDV
87	4000	3225	111.0	196.7	72.2	53.6	13.0	FR7814	274.0	5	7511141250
88	4000	3534	111.0	196.7	72.2	53.6	13.0	FR7814	274.0	5	7511141262
89	4000	3895	111.6	196.7	72.2	53.6	13.0	FR7814	274.0	5	7511145350

	ENGINE PARAMETERS							TRANSM		PERFORMANCE		
ID#	TYPE	CID	CY	COMP RAT	HP	RPM	FUEL INJ	TYPE	REAR END	ACC. 0-60	40-60	PASS. 45-65
87	ICE	250	6	8.3	105	3800	C1	A3	2.72	16.10	9.10	10.00
88	ICE	262	8	8.5	110	3600	C2	A3	2.73	.00	.00	.00
89	ICE	350	8	8.5	145	3800	C2	A3	3.08	8.70	4.80	5.50

	EMISSIONS								FUEL ECONOMY (MPG)				
	CONTROLS				LEVEL (GM/MI)				EPA CYCLE			STEADY STATE	
ID#	HC	CO	NOX	OTH	HC	CO	NOX	OTH	URB	HW	COMP	50	40
87	0	CAT	EGR	EFE	1.00	4.00	2.70	.000	16.0	20.0	17.6	20.5	22.0
88	AIR	CAT	EGR	EFE	.800	7.00	3.00	.000	14.0	20.0	16.2	.0	.0
89	0	CAT	EGR	EFE	.500	5.00	2.80	.000	14.0	19.0	15.9	.0	.0

PRODUCTION

ID#	% MODEL VOLUME	TOTAL PROD X 1000 1ST	2ND	3RD	TOT	LIST PRICE
87	.51	41.0	71.8	105.4	139.2	3725
88	.17	26.2	31.7	46.6	46.4	3975
89	.32	46.7	63.5	93.1	87.4	4100

ID#	COMMENTS
87	
88	
89	EPA DATA W/RR=2.56

FIGURE 4-1. GENERAL PRINT OUT (GPO)

EXAMPLE:

```
      *
U:    FIND MOD CHEV
C: 4 RECS FOUND.
U: * @SAPO
C: TO GENERATE A TTY REPORT OF UP TO 11 SELECTED ATTRIBUTES
   BEGINNING WITH MOD AND CID:

   (1.)   SELECT RECORDS USING FIND & SEARCH COMMANDS
   (2.)   TYPE @T12<CR>          (<CR> = CARRIAGE RETURN)
   (3.)   FOLLOWING THE # TYPE AN ATTRIBUTE FOLLOWED BY
            ENOUGH SPACES TO TOTAL 7 COLUMNS, THEN <CR>
            (EXCLUDE ATTRIBUTES IDV(F02) & CO1(F41) WHICH EXCEED FIELD SIZE)
   (4.)   REPEAT (3.) UNTIL AS MANY AS 9 ATTRIBUTES HAVE BEEN TYPED
   (5.)   FOLLOWING THE NEXT # TYPE @T13.
```

2) Following the instructions presented in (1) above, the @ T12 followed by a carriage return is executed. The attributes, desired to be printed, are listed followed by a carriage return. Finally, @ T13 followed by a carriage return is typed.

EXAMPLE:

```
U: * FIND MOD CHEV
C: 4 RECS FOUND.
U: * @T12
C:  #    HP        CEU       GEH       GEC
U:  # @T13
```

NOTE: Typing of @ SAPO is not necessary for this sub-routine to be executed. The user can proceed directly to the @ T12 command.

3) The following is then typed on the TTY:

```
C:                SELECTED ATTRIBUTES PRINT-OUT
                             (SAPO)


   MOD    CID     HP       CEU      GEH      GEC
   CHEV   350   145.00   13.000   18.000   14.900
   CHEV   400   175.00   11.000   17.000   13.100
   CHEV   400   175.00   11.000   15.000   12.500
   CHEV   454   215.00   10.000   14.000   11.500
```

NOTE: The data presented in @ SAPO output format can be used for reports. It is a more efficient version of the System 1022 TYPE Command. When using the TYPE command, a separate format must be used to type out the headings and attribute values each time a change occurs in the attribute grouping. When using the @ SAPO routine, the headings and attribute values are properly spaced in the output report by the spacing used when inserting the desired attribute names.

c) @ ACODE - This routine presents a TTY listing of all data base attributes with a description.

Procedure:

U: @ CODE ↓

C: (Output List of Attributes)

NOTE: See Appendix A for a complete print out.

d) @HIST - Initiates the Bar Chart (Histogram) Routine along with procedural instructions. A demonstration of the @ HIST routine is presented in the following problem and illustrative example.

Problem: The user desires a histogram of the fleets' EPA composite fuel economy. The data must be arranged such that any percentage of the total model production may be compared with its corresponding composite gas economy.

Solution:

1) Type @ HIST for user instructions on how to generate desired histogram. As per instructions, find the record group to be used.

EXAMPLE:

```
U: * @HIST
C: FIRST MAKE SELECTION OF RECORDS USING FIND AND/OR SEARCH COMMANDS
   THEN TYPE @T22 ATTRI-Y-AXIS ATTRI-X-AXIS @T23.
U: * FIND ALL
C: 218 RECS FOUND.
```

2) As per the @ HIST instructions, type @T22 TP4 GEC @T23, where TP4 is the total vehicle model year production and GEC is the vehicle's composite fuel economy. Next, the computer will ask the user a series of questions on the desired output format. The user will supply the proper answers.

EXAMPLE:

```
U: * @T22 TP4 GEC @123

C: TYPE T OR D FOR OUTPUT TO TELETYPE OR DISKFILE: T

U: WRITE 3RD LINE: FOR TOTAL FLEET

C: TYPE 1,2,OR T FOR BREAK POINT
   SET1, SET2, OR TYPED IN: 1
```

NOTE: For setting the breakpoint (last question) "1" and "2" are specific formats for fuel economy and "T" is a general format which allows the user to specify the desired breakpoints. All attributes used in this program, besides fuel economy, must use the "T" format.

3) After the user answers the last question, the computer responds with:

(a) Results Table

```
C: RESULTING RANGES ARE:

 GAS ECONOMY (COMPOSITE CYCLE)        % OF PRODUCTION OF MODEL (FULL YEAR)
 (MPG)
  GE     0.00, LT   10.00                0.00 %
  GE    10.00, LT   12.00                6.62 %
  GE    12.00, LT   14.00               25.44 %
  GE    14.00, LT   16.00               28.45 %
  GE    16.00, LT   18.00                9.43 %
  GE    18.00, LT   20.00                5.75 %
  GE    20.00, LT   22.00                8.55 %
  GE    22.00, LT   24.00                2.62 %
  GE    24.00, LT   26.00                7.83 %
  GE    26.00, LT   28.00                1.73 %
  GE    28.00, LT   30.00                1.54 %
  GE    30.00, LT   32.00                2.04 %
  GE    32.00, LT   34.00                0.00 %
  GE    34.00, LT   INFIN                0.00 %
```

(b) Statistics

```
 HISTOGRAM OF GAS ECONOMY (COMPOSITE CYCLE)
 VERSUS PRODUCTION OF MODEL (FULL YEAR)
 FOR TOTAL FLEET

            N=     7950.50   (THOUSANDS)
            MEAN=    16.95   (MPG)
            S=        4.77   (MPG)
```

(c) Histogram (Figure 4-2)

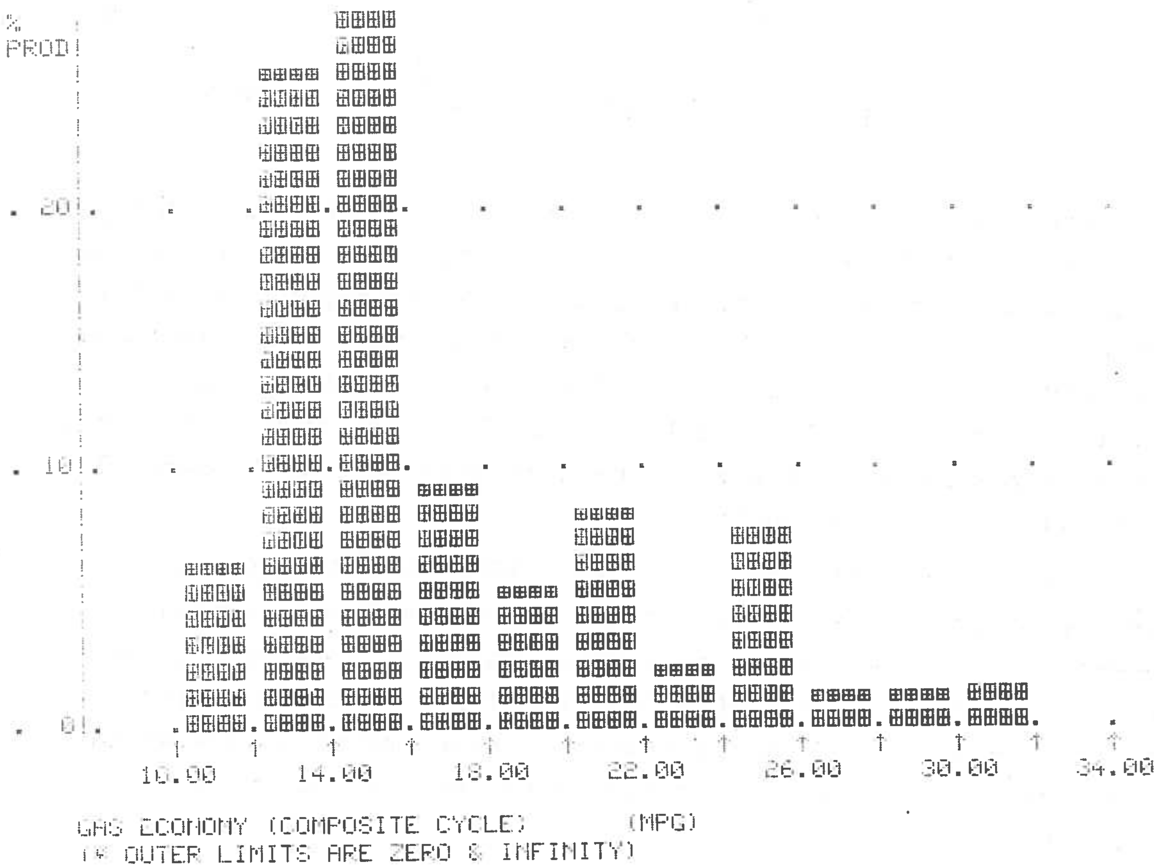


FIGURE 4-2. HISTOGRAM OF GAS ECONOMY (COMPOSITE CYCLE) VERSUS PRODUCTION OF MODEL (FULL YEAR) FOR TOTAL FLEET.

e) Regression/Correlations Analysis Routines (RGRS)

The RGRS routine allows the user to: specify attributes as dependent and independent variables; to specify one of three functional relationships; to determine the equation of that type which best fits the data; and to determine how well it fits the data. The three functional relationships currently implemented are:

$$y = C_0+C_1X_1+C_2X_2+C_3X_3+\ldots+C_6X_6 \quad \text{(multiple linear, STD)}$$

$$y = C_0X_1^{c_1}.X_2^{c_2}.X_3^{c_3}.....X_6^{c} \quad \text{(multiple linear, LOG)}$$

$$y = C_0+C_1X+C_2X^2+C_3X^3+C_4X^4+C_5X^5+C_6X^6 \quad \text{(polynomial)}$$

When the teletype types 'ENTER REGRESSION EQUATION', the user types an identifying caption indicating which of the three equations he has chosen to fit. When the teletype types 'ENTER TYPE OF REGRESSION TO BE USED', the user types M for multiple linear and then STD for the first equation; M and the LOG for the second equation; or P for polynominal for the third equation. If a polynomial regression is selected, the user also sets what degree is to be used with a maximum of 6.

When the teletype types 'ENTER NUMBER OF OBSERVATIONS', the user types the number of records selected (data points being processed). When the output for a given case has been typed, the teletype types: 'IS ALL WORK ON CURRENT DATA FILE COMPLETED ?' Answering yes exits from the routine; answering no allows another functional relationship to be fit using the data points already selected.

The use of this routine will be illustrated by the following problem.

Problem: The user wishes to find the relationships between fuel economy, inertia weight, rear end ratio, and CID to inertia weight ratio for AMC vehicles.

1) The user first finds all AMC vehicles in the data base and then types @ RGRS for program instructions.

EXAMPLE:

```
U: * FIND IDVC 4
C: 14 RECS FOUND.

U: * DRGRS

C: TO BEGIN REGRESSION ROUTINE TYPE

U: @T92 ATT1 ATT2 . . . ATT7 @T93.

C: WITH THE DEPENDENT VARIABLE ATTRIBUTE
   FIRST (IN POSITION 1) AND A MAXIMUM
   OF 7 ATTRIBUTES

   "ENTER REGRESSION EQUATION" PROMPTS A HEADER LINE FOR OUTPUT

   "ENTER TYPE OF REGRESSION TO BE USED (M,P,S)" PROMPTS

    M   FOR MULTIPLE LINEAR     Y = C0+C1(X1)+C2(X2)+C3(X3)+ ETC.
    P   FOR POLYNOMIAL          Y = C0+C1(X)+C2(X**2)+C3(X**3)+ ETC.
    S   FOR SPECIAL FUNCTION    NOT YET IMPLEMENTED
```

NOTE: "FIND IDVC 4" means Find Mfg. AMC

2) The user follows the instructions as presented in (1) above and answers all questions presented by the computer.

EXAMPLE:

```
U: * @T92 GEC INT RR CID/INT @T93

C:      ENTER REGRESSION EQUATION.
U: GEC = (C0*(INT**C1)*(RR**C2)*((CID/INT)**C3))

C:      ENTER TYPE OF REGRESSION TO BE USED.   (M,P,S)
U: M

C:      ENTER THE NUMBER OF VARIABLES.   (MAXIMUN OF 7)
U: 4

C:      ENTER THE NUMBER OF OBSERVATIONS. (MAXIMUN OF 500)
U: 14

C:      ENTER OPERATION MODE.   (STD OR LOG)
U: LOG

C:      ENTER THE POSITION OF THE DEPENDENT VARIABLE.
U: 1

C:      ENTER THE NUMBER OF INDEPENDENT VARIABLES
U: 3

C:      ENTER THE POSITIONS OF THE INDEPENDENT VARIABLES
        IN ASCENDING ORDER.
   2 3 4
```

NOTE:

1. The numbers of observations is equal to the number of AMC vehicles found in (1) above.
2. The dependent variable, in position 1 is GEC.
3. The computer output is as follows:

```
C: REGRESSION COEFFICIENTS FOR
   GEC = (C0*(IWT**C1)*(RR**C2)*((CID/IWT)**C3))

        C0 =     8736.3093       (INTERCEPT)
        C1 =       -0.7413       S.D. =          0.2476
        C2 =       -0.8712       S.D. =          0.4458
        C3 =       -0.3177       S.D. =          0.1813
        MULTIPLE CORRELATION COEFFICIENT (R) =             0.9383
        STANDARD ERROR OF ESTIMATE =             0.0636


C:      IS ALL WORK ON CURRENT DATA FILE COMPLETED?  (YES OR NO)
U:  YES
```

NOTE: After the regression coefficients are presented, the user must answer the question "Is all work on current data file completed?"

f) <u>Plot Routine</u> - The SPLOT routine generates a scatter plot relating two attributes graphically. The user has the option of generating the plot on the teletype or as a disk file named H?????.DAT to be printed later on the line printer. Also, the user has the option of labeling the Y-Axis scale.

Again, a problem is presented which will show the user how to use this routine.

Problem: The user wishes to see "usually" the relationship between CID and inertia weight for the domestic fleet.

1) The SPLOT is typed, and instructions on how to use this routine are presented

<u>EXAMPLE</u>:

```
U: * @SPLOT
C: FIRST MAKE SELECTION OF RECORDS USING FIND AND/OR SEARCH COMMANDS
   THEN TYPE @T28 ATTRI-Y-AXIS ATTRI-X-AXIS @T29.
```

2) Following the instructions presented in (1) above, the vehicles which comprise the domestic fleet are found. Then " @ T28 CID IWT @ T29" is typed. This initiates the plot routine and defines the X axis (inertia weight) and the Y axis (CID). The user then must answer the questions presented by the computer.

<u>EXAMPLE</u>:

```
U: * FIND IDUS 1
C: 150 RECS FOUND.
U: * @T28 CID IWT @T29

C: TYPE T OR D FOR OUTPUT TO TELETYPE OR DISKFILE: T

C: WRITE 3RD LINE: FOR DOMESTIC PRODUCTION

C: TYPE S OR V FOR YAXIS WITH SCALE OR VALUES: S
```

NOTE: For the last question, "S" causes the Y axis to be scaled according to the maximum and minimum values found.

3) The resulting plot is presented in figure 4-3.

NOTE: The plot numbers refer to the number of occurrences. A Ø indicates 10 or more observations.

g) <u>Combined Regression and Plot Routine</u> - The SPLRG routine combines the @ SPLOT and the @ RGRS functions to generate a scatter plot relating two attributes and also fit the data to a polynomial equation.

Procedure:

1) Type @SPLRG for instructions.

Example:

```
U: * @SPLRG
C: FIRST MAKE SELECTION OF RECORDS USING FIND AND/OR SEARCH COMMANDS
   THEN TYPE @TR28 ATTRI-Y-AXIS ATTRI-X-AXIS @TR29.
```

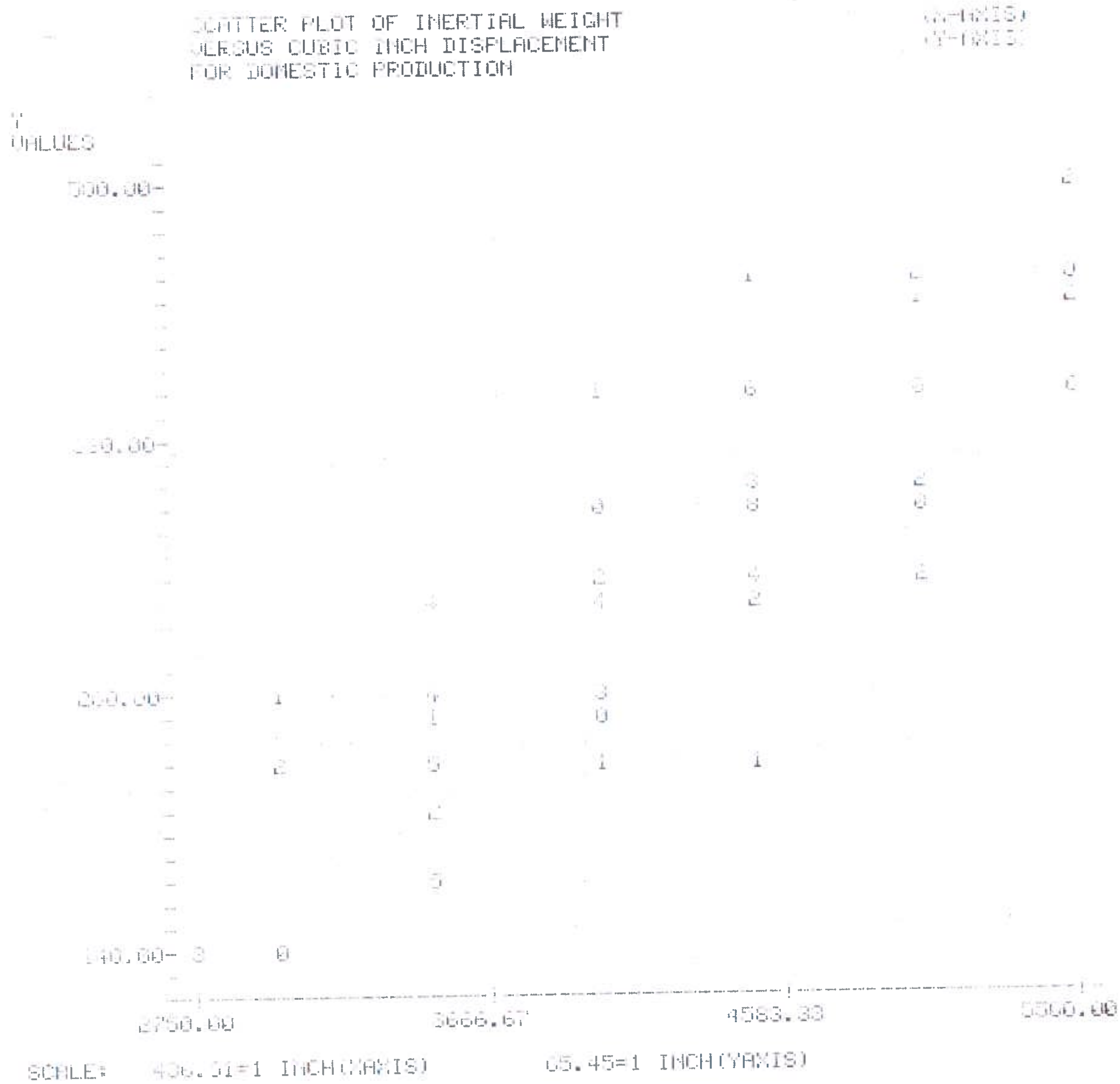


FIGURE 4-3. SCATTER PLOT OF INTERTIAL WEIGHT VERSUS CUBIC INCH DISPLACEMENT FOR DOMESTIC PRODUCTION

2) Following instructions as presented above, the selected vehicles are first found (in this case GMC automobiles). Then, @ TR28 GEC IWT @ TR29 is typed (we wish to plot and find the relationships between fuel economy and inertia weight). The routine is initiated and the user answers a series of questions posed by the computer.

EXAMPLE:

```
U:* FIND IDMC 1
C:66 RECS FOUND.
U:* @TR28 GEC IWT @TR29

C:TYPE T OR D FOR OUTPUT TO TELETYPE OR DISKFILE: T

C:WRITE 3RD LINE: FOR GMC VEHICLES

C:TYPE S OR V FOR YAXIS WITH SCALE OR VALUES: S

C:ARE REGRESSION COEFFIENTS TO BE COMPUTED? (TYPE Y OR N):Y

C:ENTER REGRESSION EQUATION:
U:GEC = C0 + C1*IWT + C2*IWT**2 +C3*IWT**3

C:ENTER THE NUMBER OF OBSERVATIONS. (MAXIMUM OF 500) :66

C:ENTER THE DEGREE OF POLYNOMIAL. (<= 3) :3

C:ENTER OPERATION MODE. (STD OR LOG) :STD
```

3) The resulting regression is performed and plot typed and is presented in figure 4-4.

4.2.4 SIGN-OFF Procedure

a) *exit↓ (To exit System 1022 and correctly close the ACDB file.

NOTE: Avoid use of ↑C function to exit from System 1022.

b) .K/F (This is the correct sign-off format to use when logging off the PDP-10 system.

Sign-Off EXAMPLE:

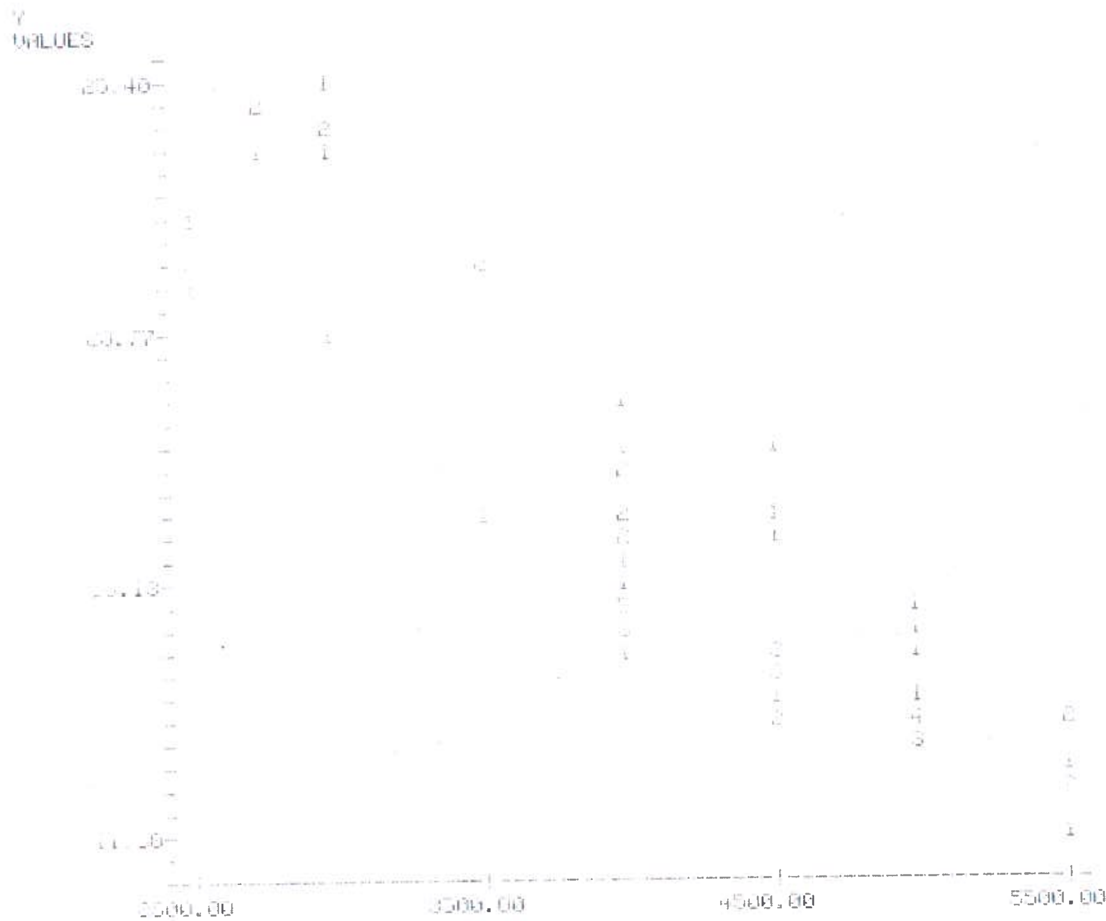
```
U: K/F

C: .JOB 41, USER [4104,1431] LOGGED OFF TTY10     1337  15-JAN-76
   SAVED ALL FILES (1305 BLOCKS)
   RUNTIME 8.17 SEC
```

SCATTER PLOT OF INERTIAL WEIGHT (X-AXIS)
VERSUS GAS ECONOMY (COMPOSITE CYCLE) (Y-AXIS)
FOR GMC VEHICLES

REGRESSION COEFFIENTS FOR
GEC = C0 +0C1*IWT + C2*IWT**2 +C3*IWT**3

C0 =	12.7644	(INTERCEPT)		
C1 =	0.0163	S.D. =	0.0164	
C2 =	-0.0000	S.D. =	0.0000	
C3 =	0.0000	S.D. =	0.0000	

DEGREE OF POLYNOMIAL 3
CORRELATION COEFFIENT (R) = 0.9246
STANDARD ERROR OF ESTIMATE = 1.4775



SCALE: 476.19=1 INCH(XAXIS) 2.33=1 INCH(YAXIS)

FIGURE 4-4. SCATTER PLOT OF INERTIAL WEIGHT VERSUS GAS ECONOMY (COMPOSITE CYCLE) FOR GMC VEHICLES

NOTE: When user is prepared to kill his or her timesharing job and break contact with the system, he or she types K/S or K/F. Either command kills the user's job. Also, K/S deletes temporary (filename.TMP) files which may have been created during processing. Obviously, K/S should not be used while another user is also on the system; so, a warning is typed if this situation occurs. Warnings are also typed if the user's sign-off quota is exceeded. On any warning, the system waits until the user aborts the command with a ↑C. Then, the user may use a more correct sign-off procedure.

EXAMPLE:

U: K/S

C: (sign-off data)

U: # EX

C: EXIT

U: K/S

C: JOB 1, USER [4104,143] LOGGED OFF TTY10 1611 15-JAN-76
SAVED ALL FILES (1233 BLOCKS)
RUNTIME 33.65 SEC

APPENDIX A
CODES

FIELD CODES TABLE

FIELD	CONTAINS
I.D	RECORD NUMBER
DE	DATE OF ENTRY
IDVA	YEAR
IDVB	DOM/IMP CODE
IDVC	MFGR CODE
IDVD	DIVISION CODE
IDVE	MODEL CODE
IDVF	VEHICLE DESCRIPTION CODE
IDVG	DISPLACEMENT
IDM	MFGRS IDENTIFICATION CODE
MOD	MAKE
PAS	# PASSENGERS
TS	TRUNK SPACE
WD	WIDTH
HT	HEIGHT
LT	LENGTH
WB	WHEELBASE
AER	AERODYNAMIC TYPE
CWT	CURB WEIGHT
IWT	INERTIA WEIGHT
TR	TRANSMISSION TYPE AND NUMBER OF GEARS
RR	REAR END RATIO
ET	ENGINE TYPE
CY	# OF CYLINDERS
CR	COMPRESSION RATIO
CID	CUBIC INCH DISPLACEMENT
HP	SAE NET HORSEPOWER
RPM	REV/MIN FOR THAT HORSEPOWER
FI	FUEL INJECTION TYPE AND # BARRELS
TIR	TIRE SPECIFICATION
EAT	AFTER TREATMENT EMISSION CONTROL SYSTEM
EHC	HYDROCARBON EMISSION CONTROL SYSTEM
ENO	N-OXIDE EMISSION CONTROL SYSTEM
ETH	OTHER TYPE EMISSION CONTROL SYSTEM
GEU	GAS ECONOMY (EPA URBAN CYCLE)
GEH	GAS ECONOMY (EPA HIGHWAY CYCLE)
GEC	GAS ECONOMY (COMPOSITE HIGHWAY CYCLE)
G50	GAS ECONOMY AT 50MPH (STEADY SPEED)
G40	GAS ECONOMY AT 40MPH (STEADY SPEED)
GOT	GAS ECONOMY AT OTHER CYCLES
LHC	HYDROCARBON EMISSION (EPA)
LCO	CARBON MONOXIDE EMISSION (EPA)
LNO	NITROGEN OXIDE EMISSION (EPA)
LTH	OTHER EMISSIONS
A60	TIME TO ACCELERATE FROM 0 TO 60 MPH
A1P	TIME TO ACCELERATE FROM 40 TO 60 MPH
A2P	TIME TO ACCELERATE FROM 45 TO 65 MPH
MDS	% MODEL SALES
MS1	MAKE PRODUCTION AS OF DEC 31
MS2	MAKE PRODUCTION AS OF MAR 31
MS3	MAKE PRODUCTION AS OF JUN 30
MS4	MAKE PRODUCTION FOR MODEL YEAR
TP1	MODEL PRODUCTION AS OF DEC 31
TP2	MODEL PRODUCTION AS OF MAR 31
TP3	MODEL PRODUCTION AS OF JUN 30
TP4	MODEL PRODUCTION FOR MODEL YEAR
MLP	MANUFACTURERS SUGGESTED LIST PRICE
RF	ROOMINESS FACTOR
C01	COMMENTS