TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
FHWA/TX-87/ 68+420-2		

4. Title and Subtitle	5. Report Date
Analysis of Truck Traffic Between 1977 and 1983	May 1987
	6. Performing Organization Code

7. Author(s)	8. Performing Organization Report No.
D. R. Middleton, J. M. Mason, T. Chira-Chavala and H. S. Nassiri	Research Report 420-2

9. Performing Organization Name and Address	10. Work Unit No.
Texas Transportation Institute The Texas A&M University System College Station, Texas 77843	11. Contract or Grant No. Study No. 2-18-84-420
	13. Type of Report and Period Covered Interim - September 1983 May 1987
12. Sponsoring Agency Name and Address Texas State Department of Highways and Public Transportation; Transportation Planning Division P.O. Box 5051 Austin, Texas 78763	14. Sponsoring Agency Code

15. Supplementary Notes

Research performed in cooperation with DOT, FHWA.
Research Study Title: Indentification of Special-Use Truck Traffic

16. Abstract

This report studies characteristics of truck traffic on various classes of highways in Texas using the data available form the Texas Manual Count Annual Report between 1977 and 1983. Regional stratifications were devised based on the predominance of "special-use" industries and the existing highway-district boundaries. Various truck classifications were analyzed as a proportion of total vehicular traffic and total truck traffic by different road classes.

17. Key Words	18. Distribution Statement
Special-Use, Vehicular Traffic, Total Truck Traffic.	No restrictions. This document is available to the public through the National Technical Information Service 5285 Port Royal Road Springfield, Virginia 22161

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	167	

Form DOT F 1700.7 (8-69)

ANALYSIS OF TRUCK TRAFFIC BETWEEN 1977 AND 1983

by

D. R. Middleton

J. M. Mason

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and

H. S. Nassiri

RESEARCH REPORT 420-2

Research Study Number 2-18-84-420

Identification Of Special-Use Truck Traffic

Sponsored by

Texas State Department Of Highways And Public Transportation

in cooperation with

U.S. Department of Transportation, Federal Highway Administration

TEXAS TRANSPORTATION INSTITUTE
THE TEXAS A&M UNIVERSITY SYSTEM
COLLEGE STATION, TEXAS 77843

May 1987

METRIC CONVERSION FACTORS

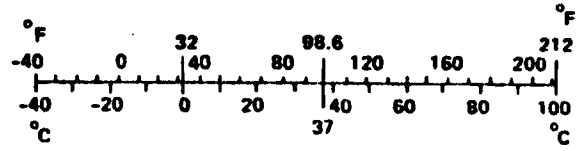
Approximate Conversions to Metric Measures

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

*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price $2.25, SD Catalog No. C13.10:286.

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



ACKNOWLEDGEMENT

This phase of the project was sponsored by the Texas State Department of Highways and Public Transportation and Federal Highway Administration. John Mason served as the Principal Investigator. Dan Middleton was the Principal Staff Engineer, assisted by Ted Chira-Chavala. Habibollah Nassiri served as Graduate Research Assistant. Mr. Robert Guinn was the Contact Representative for the State Department of Highways and Public Transportation. The authors appreciate the cooperation and assistance of various members of the Department.

ABSTRACT

This report studies characteristics of truck traffic on various classes of highways in Texas using the data available from the Texas Manual Count Annual Report between 1977 and 1983. Regional stratifications were devised based on the predominance of "special-use" industries and the existing highway-district boundaries. Various truck classifications were analyzed as a proportion of total vehicular traffic and total truck traffic by different road classes.

SUMMARY

Traffic growth in Texas has resulted in the need to investigate the trend of truck traffic on various classes of highways. The report is an analysis of truck traffic in Texas from 1977 to 1983. Different truck categories were analyzed as a proportion of total traffic, and as a proportion of total truck traffic by various road classes.

The study of the truck traffic as a percentage of total traffic indicated that there were no easily discernible trends in the proportions of 5-or-more-axle tractor semitrailers or SU-1 trucks but that their variation was mostly location specific. The proportions of other trucks were not "practically" significant.

The study of the truck traffic as percentage of truck population indicated that although slight differences in the ranges of these proportions existed among Interstate, U.S., and State highway classes for many truck types, the differences within highway classes were more significant. These variabilities in truck proportions were highly attributed to specific locations of the count stations.

IMPLEMENTATION STATEMENT

The findings of this investigation provide a basis against which the distributions of truck traffic from "special use" activity centers may be compared. Additionally, the significant variation which was found among count stations within the same regions and within the same roadway classes has serious implications in roadway design.

DISCLAIMER

interpretations, analyses, and conclusions expressed or implied in this report are those of the authors. They do not represent a standard, policy, or recommended practice established by the sponsors.

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1.0 INTRODUCTION

1.1 OBJECTIVE

The objective of this analysis was to study characteristics of truck traffic on various classes of highways and in various regions in Texas using the data available from the Texas Manual Count Annual Report between 1977 and 1983. (1) The outcome of this analysis can be used as the "datum" against which the distributions of truck traffic from "special-use" activity centers may be compared. (2) The validity of SDHPT counts was not questioned during the course of this study. Obviously, if improper and/or inconsistent methods were used to collect data, the conclusions could be different.

1.2 BACKGROUND

The Texas State Department of Highways and Public Transportation (SDHPT) has maintained a large number of traffic count stations on various highway classes. The number of count stations between 1977 and 1983 varied as shown below:

Year	Number of Counts
1977	623
1978	677
1979	670
1980	766
1981	376
1982	474
1983	476

Traffic count monitoring has been extensive on Interstate highways, U.S. highways, and State highways, as evidenced by a large number of count stations and the frequencies of the traffic count activities on these highways. On Farm-to-Market (FM) roads (including a small number of county roads), the coverage has been less extensive in both the number of count locations and the frequencies of count activities.

Data from these count stations also provided vehicle classification information such as passenger cars, small vans and pickups, single-unit trucks, combination trucks, busses, and motorcycles. For single-unit (S-U) trucks and combination trucks, information on axle configurations was also reported. For example, S-U trucks were further classified as 2-axle trucks (SU-1) or 3-axle trucks (SU-2). Combination trucks were primarily 5-axle tractor semitrailer (or 3-S2: 3-axle tractor pulling tandem-axle trailers), although a significant number of 2-S2 vehicles and truck and trailer combinations were also reported.

Two analyses were conducted using the 1977-1983 count data. The first analysis examined percentages of total traffic that were trucks of various configurations, while the second analysis examined the classification proportions within the truck population alone. In this report, a "truck" was defined as a vehicle with a gross vehicle weight (GVW) over 10,000 pounds. This definition included all combination and S-U trucks, but excluded small vans and pickups. Both analyses are fully described below.

2.0 ANALYSIS OF TRUCK TRAFFIC AS PERCENTAGE OF TOTAL TRAFFIC

This analysis was aimed at studying proportions of total traffic that were SU-1, SU-2, 3-S2, or other combination trucks. Road classes of interest were Interstate highways, U.S. highways, State highways, and Farm-to-Market roads (including a few county roads). It was assumed that the amount of truck traffic and the types of trucks operating on these highways were likely to be influenced by regional industries, the products of which were transported by trucks. The first step in the analysis, therefore, was to subdivide the State into smaller regions based on the concentration of "special-use" industries and the existing highway-district boundaries. Figure 1 depicts the five regions defined for this analysis. Figure 1 is further expanded into 5 separate figures, each representing a region, as shown in Figures 2 through 6. In these five figures, the approximate locations of the count stations are identified. The following is a list of SDHPT districts making up the 5 regions:

	Region	Districts
1.	Panhandle	4, 5, 8, 25
2.	West	6, 7, 24
3.	South	13, 14, 15, 16, 21
4.	East	1, 10, 11, 12, 19, 20
5.	North	2, 3, 9, 17, 18, 23

Preliminary analysis of truck types operating on the Texas highways revealed that there were more 3S-2 trucks than SU-1, SU-2, 2-S2, truck and trailer combinations, or any other truck type. This led to the following categorization of truck types for this analysis:

1. Tractor semitrailers with 5 or more axles
2. Single-unit trucks with 2 axles (SU-1)
3. Single-unit (SU) trucks with 3 axles (SU-2)
4. Tractor semitrailers with less than 5 axles (2-S2)
5. Truck and Trailer combinations
6. Double combinations

2.1 PROPORTIONS OF 5-OR-MORE-AXLE TRACTOR - SEMITRAILERS IN TOTAL TRAFFIC

2.1.1 Farm-to-Market Roads

The proportion of 5-or-more-axle semitrailers in total traffic at a count location was defined as the percentage of 5-or-more-axle semitrailers in total traffic at that location. To determine whether these proportions might be influenced by traffic volume (ADT) at the count locations and/or region of the State, a plot of these proportions versus ADT for 1983 data were produced for FM roadways. The plot is included as Figure 7. The numbers 1 through 5 refer to the 5 regions.

Figure 7 illustrates that a relationship between proportions of 5-or-more-axle semitrailers and ADT was not found. Figure 7 was subsequently expanded into 5 separate plots, one for each region, as shown in Figures 8 through 12. These 5 plots helped identify different ranges of ADT on Farm-to-Market roads for different regions. For example, Region 1 (the Panhandle) and Region 4 (East) indicated an ADT range up to about

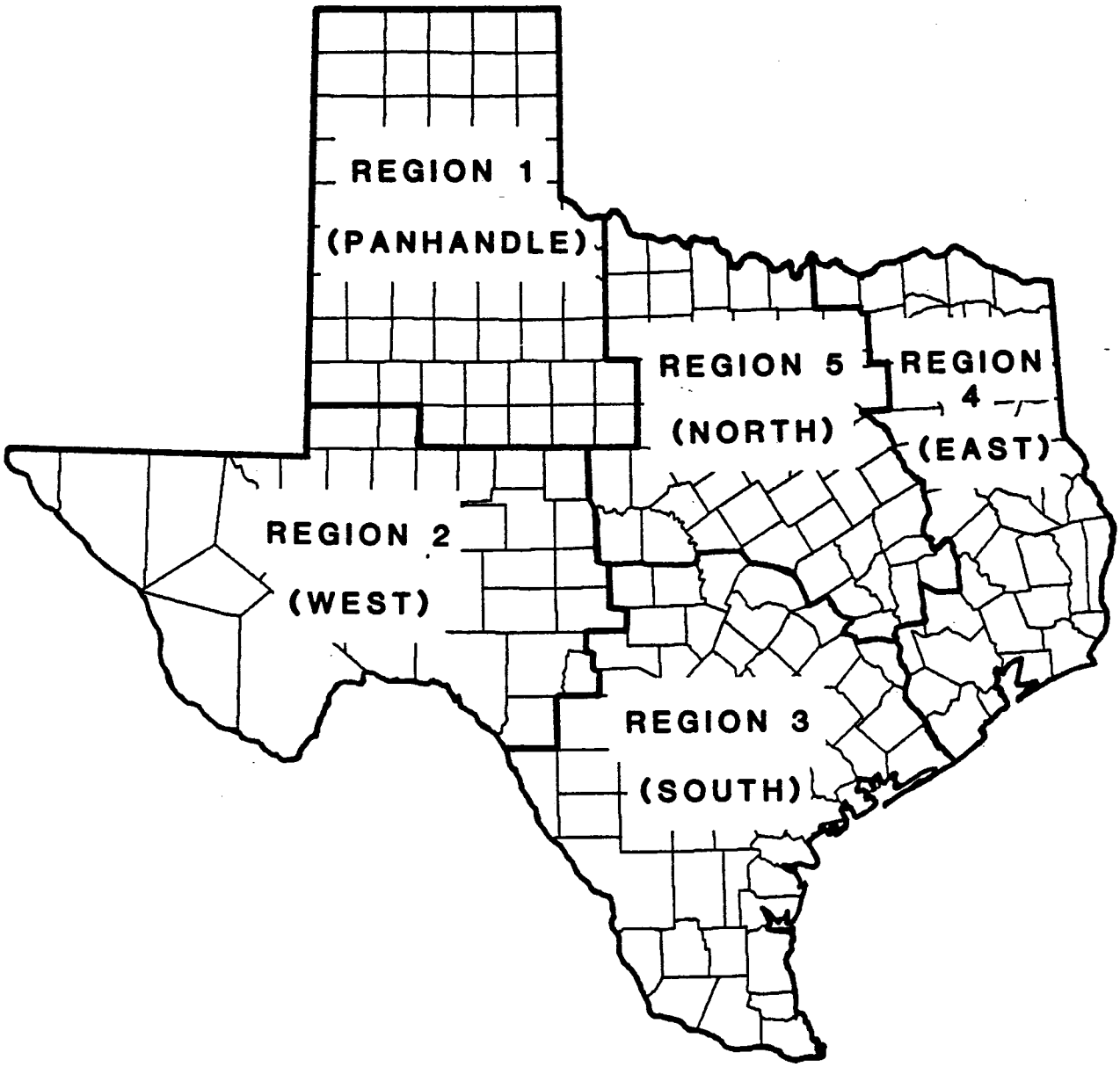


Figure 1. Analysis Regions Based on "Special-Use" Truck Traffic

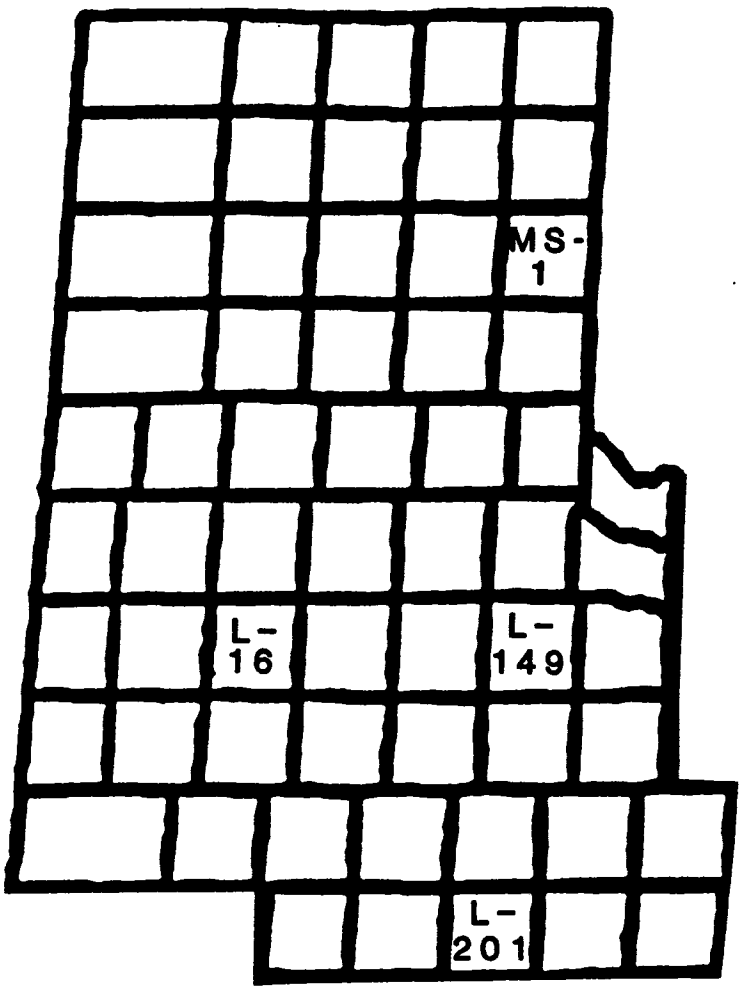


Figure 2. Common Count Locations for Region 1 (Panhandle)

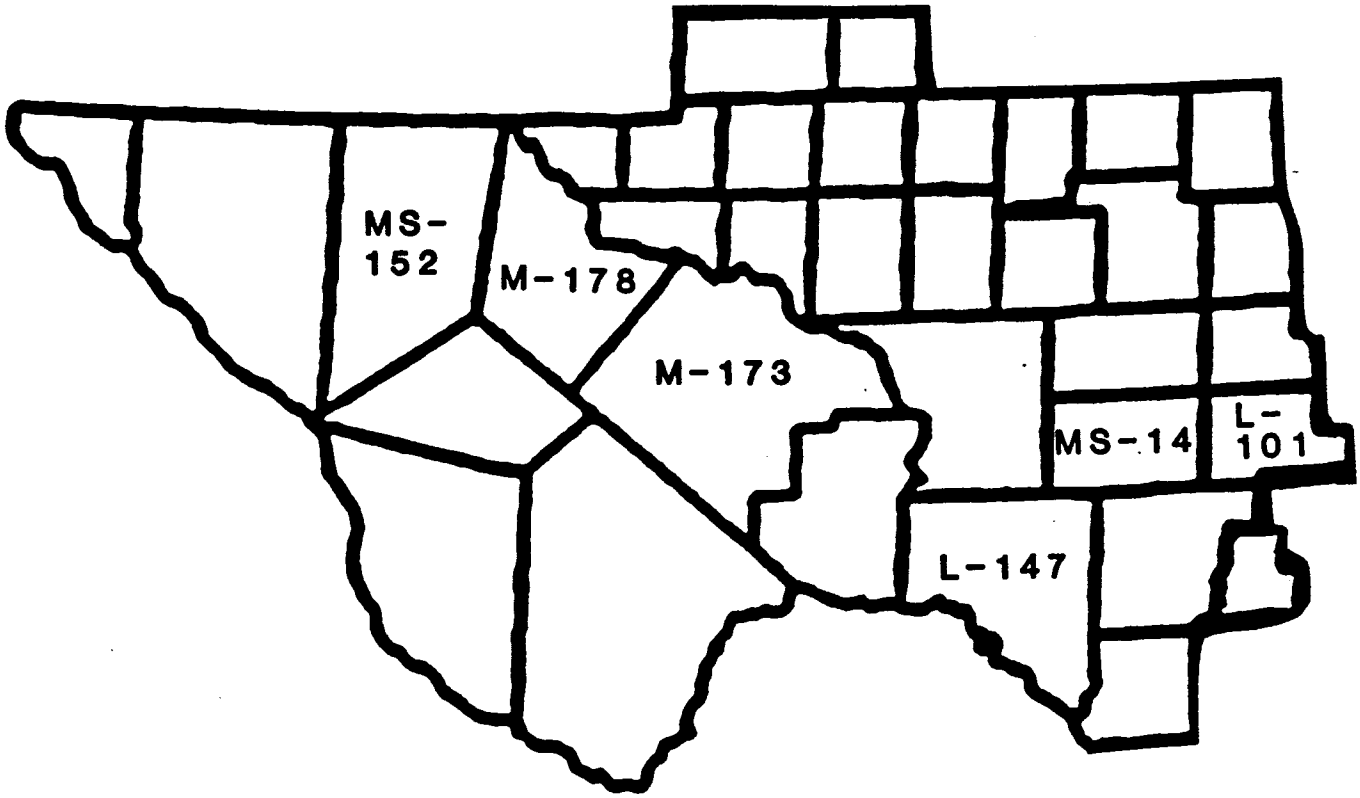


Figure 3. Common Count Locations for Region 2 (West)

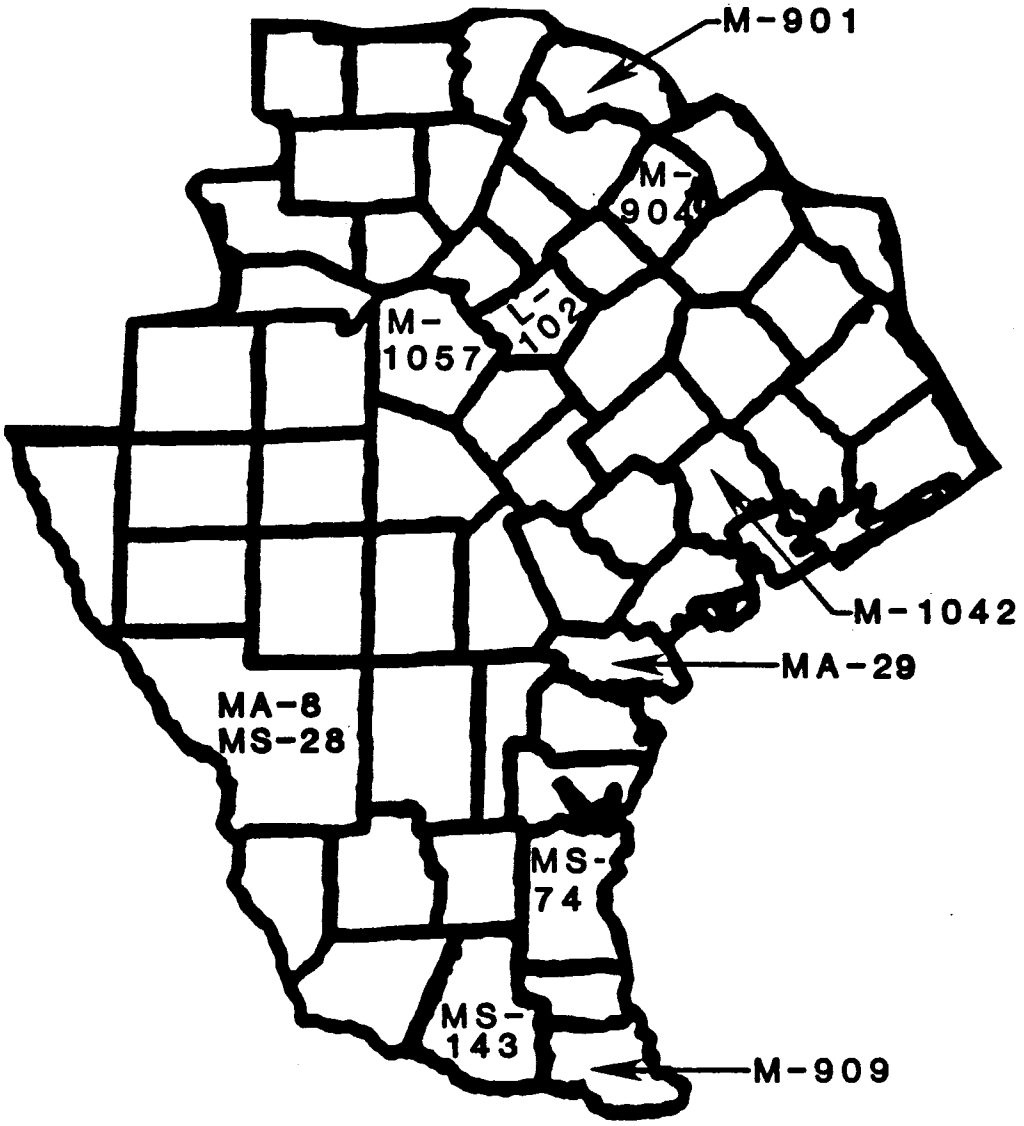


Figure 4. Common Count Locations for Region 3 (South)

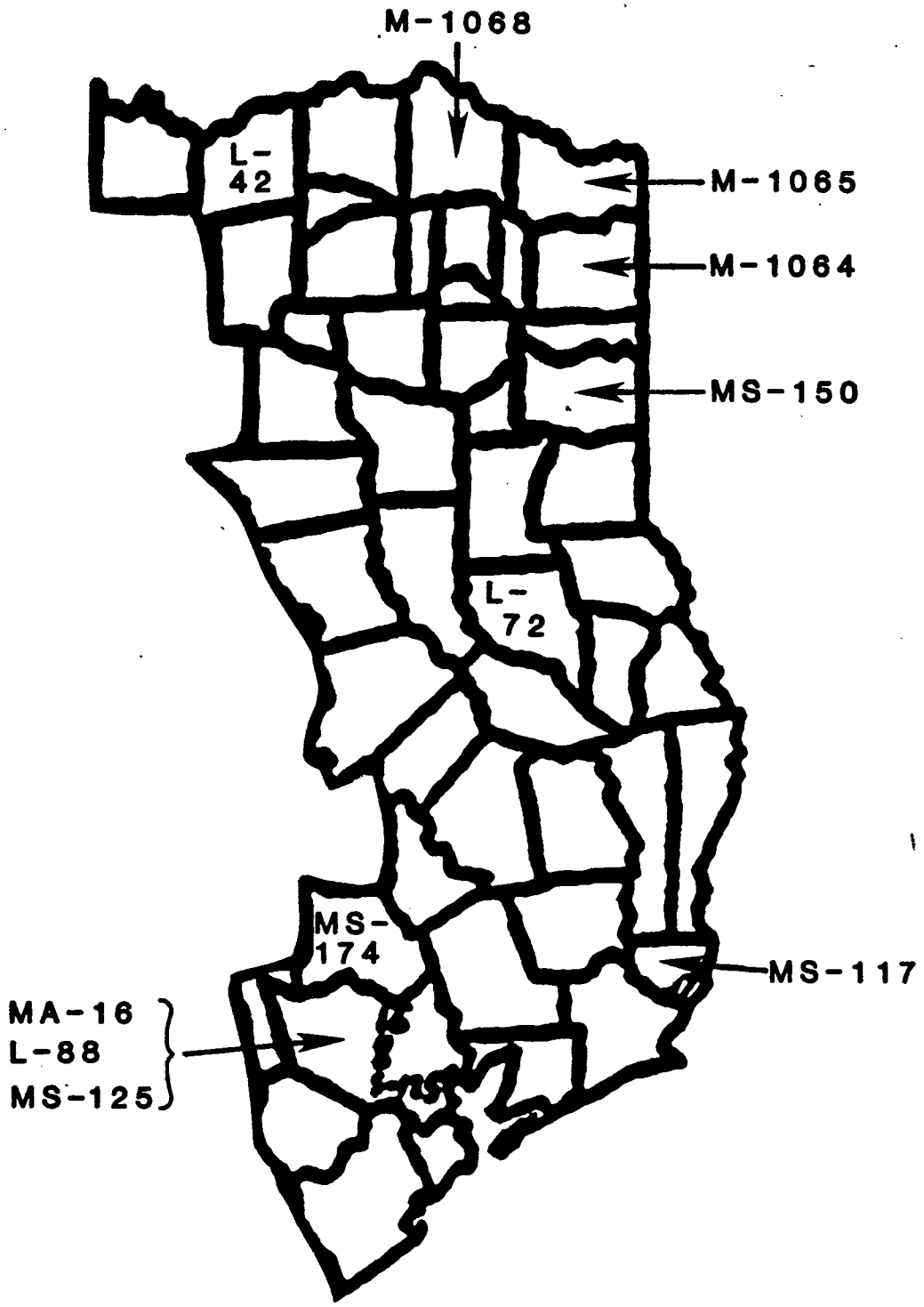


Figure 5. Common Count Locations for Region 4 (East)

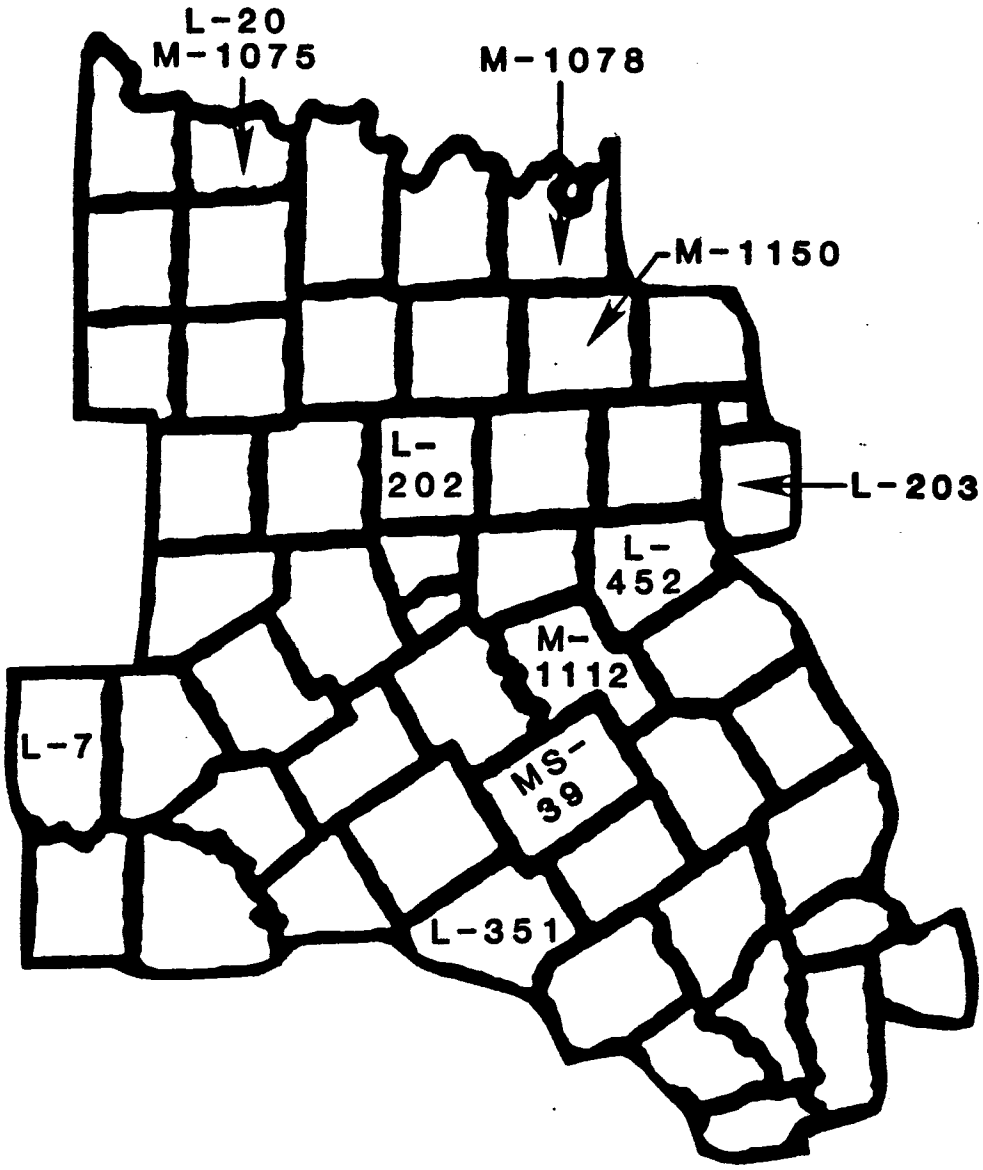


Figure 6. Common Count Locations for Region 5 (North)

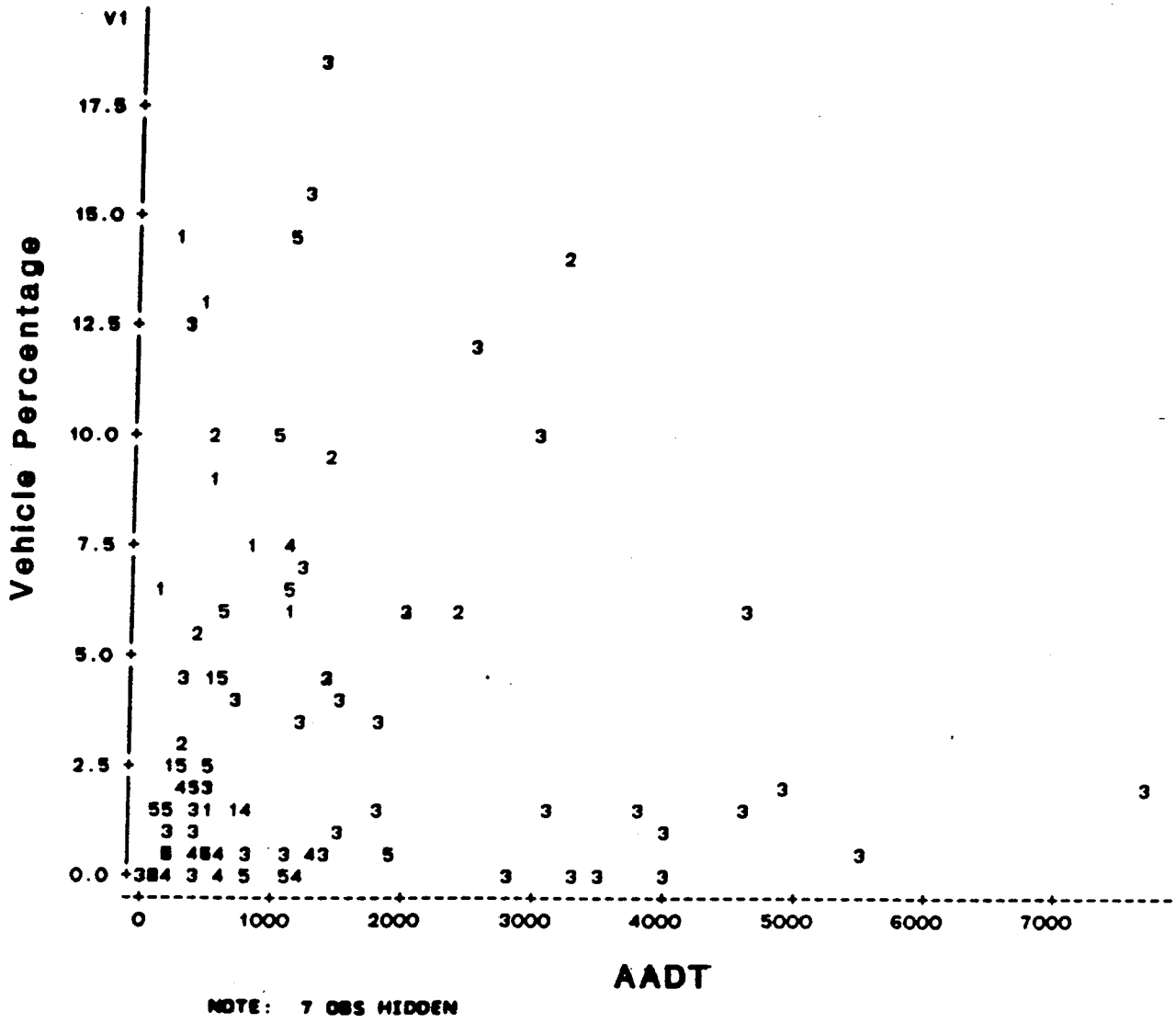


FIGURE 7. Plot of Proportions of 5-or-More-Axle Tractor - Semitrailers in Total Traffic Versus AADT for FM Roads

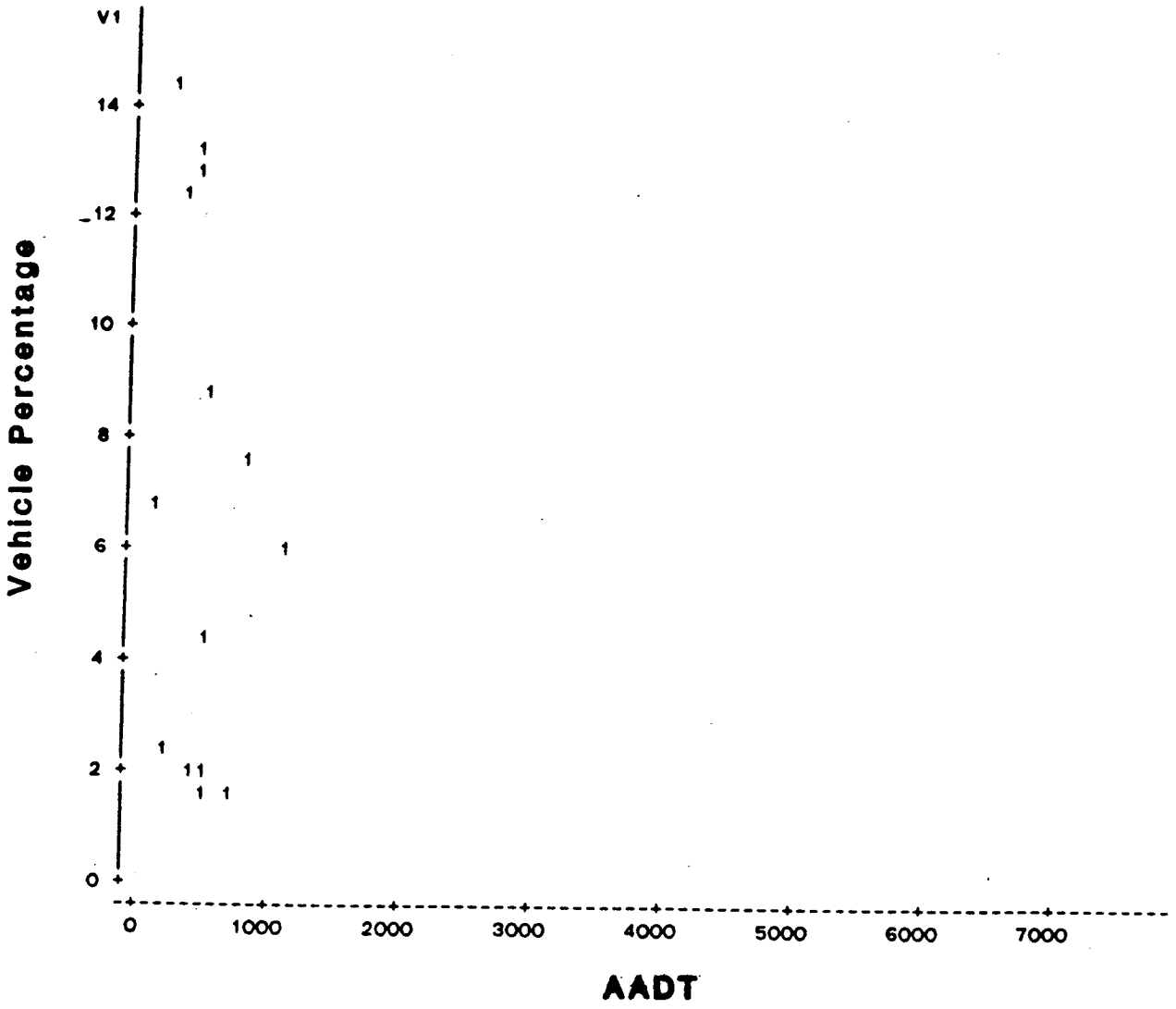


Figure 8. Plots of Proportions of 5-or-More-Axle Tractor - Semitrailers in Total Traffic Versus AADT for FM Roads in Region 1

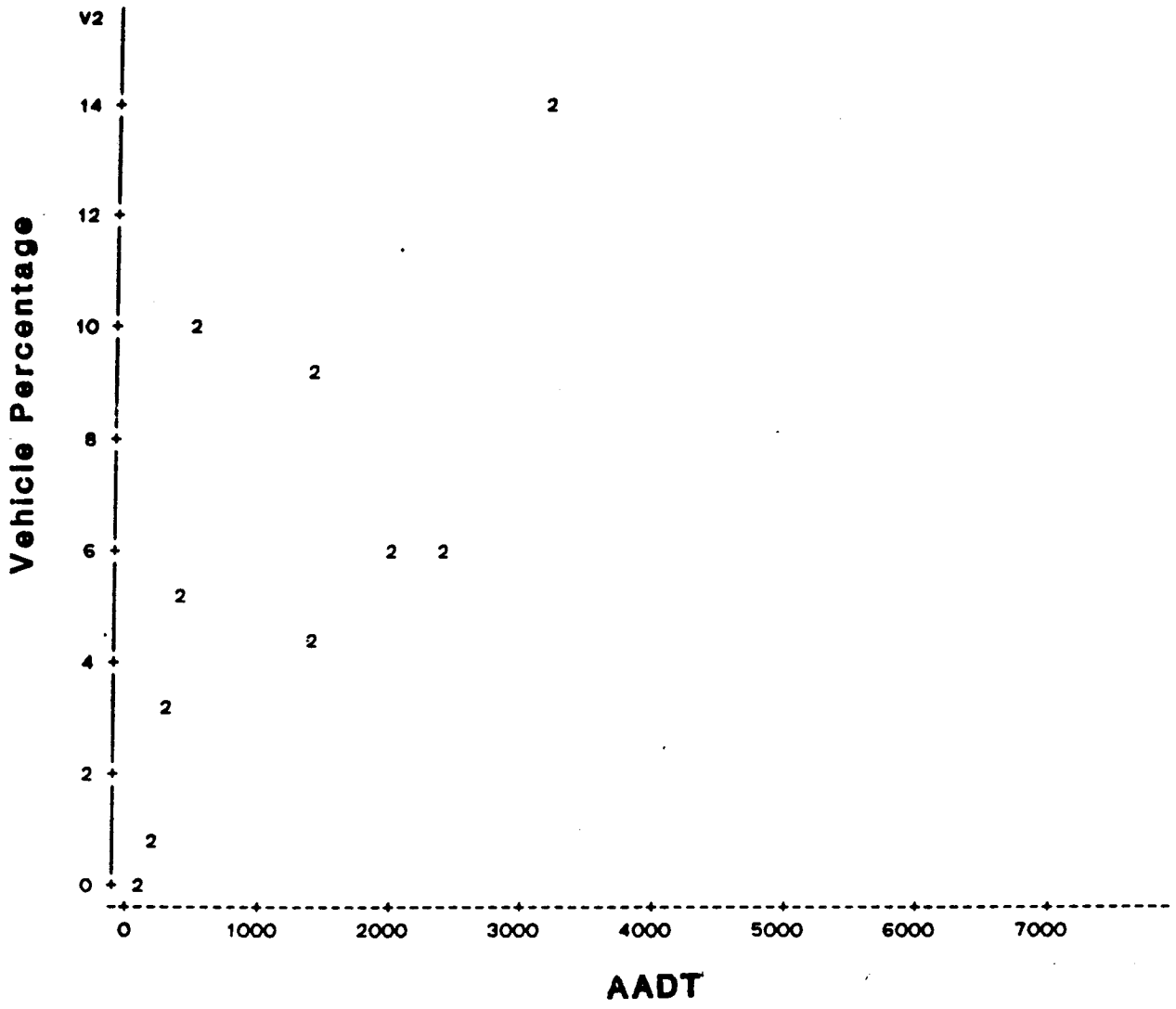


Figure 9. Plots of Proportions of 5-or-More-Axle Tractor - Semitrailers in Total Traffic Versus AADT for FM Roads in Region 2

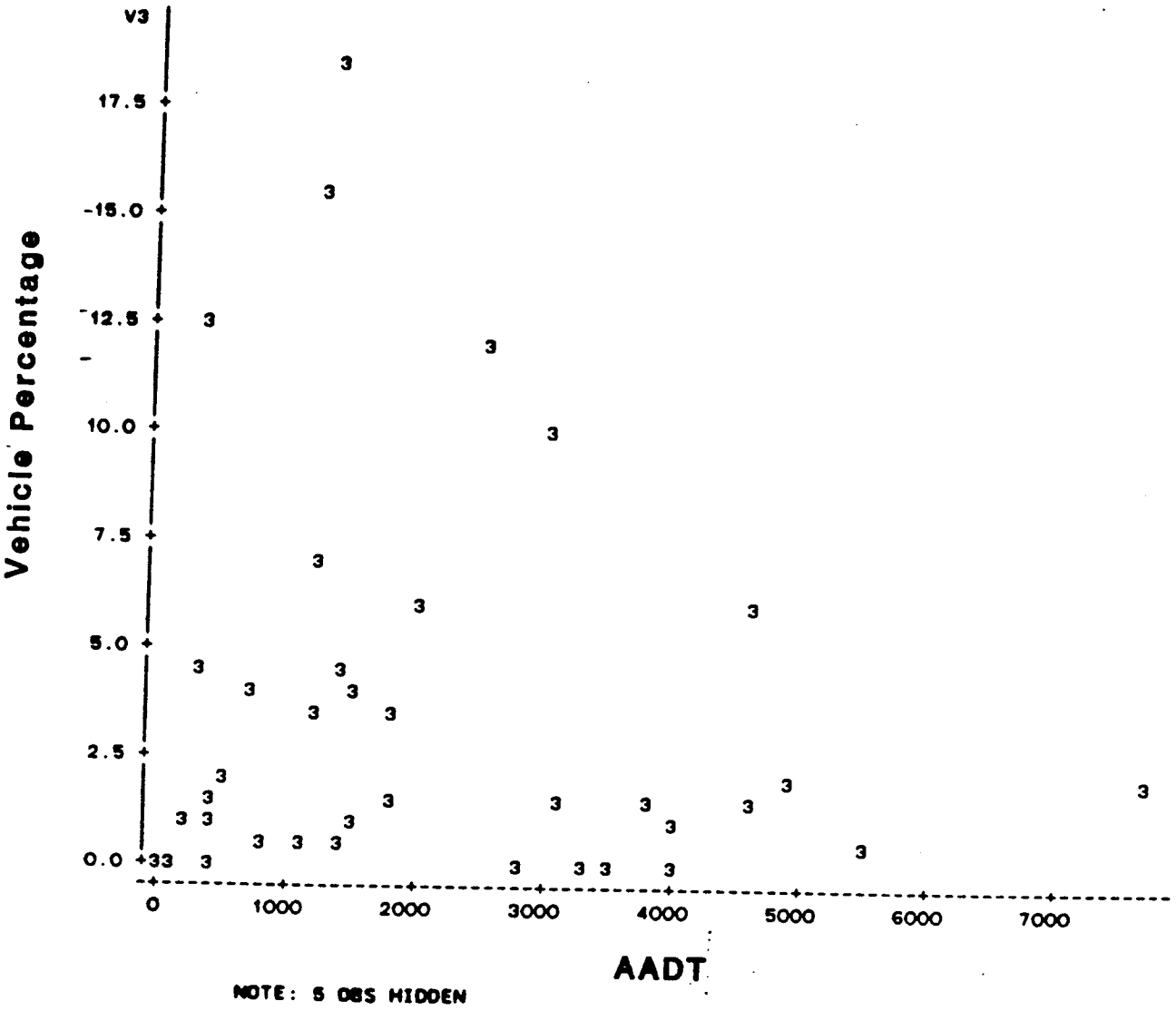


Figure 10. Plots of Proportions of 5-or-More-Axle Tractor - Semitrailers in Total Traffic Versus AADT for FM Roads in Region 3

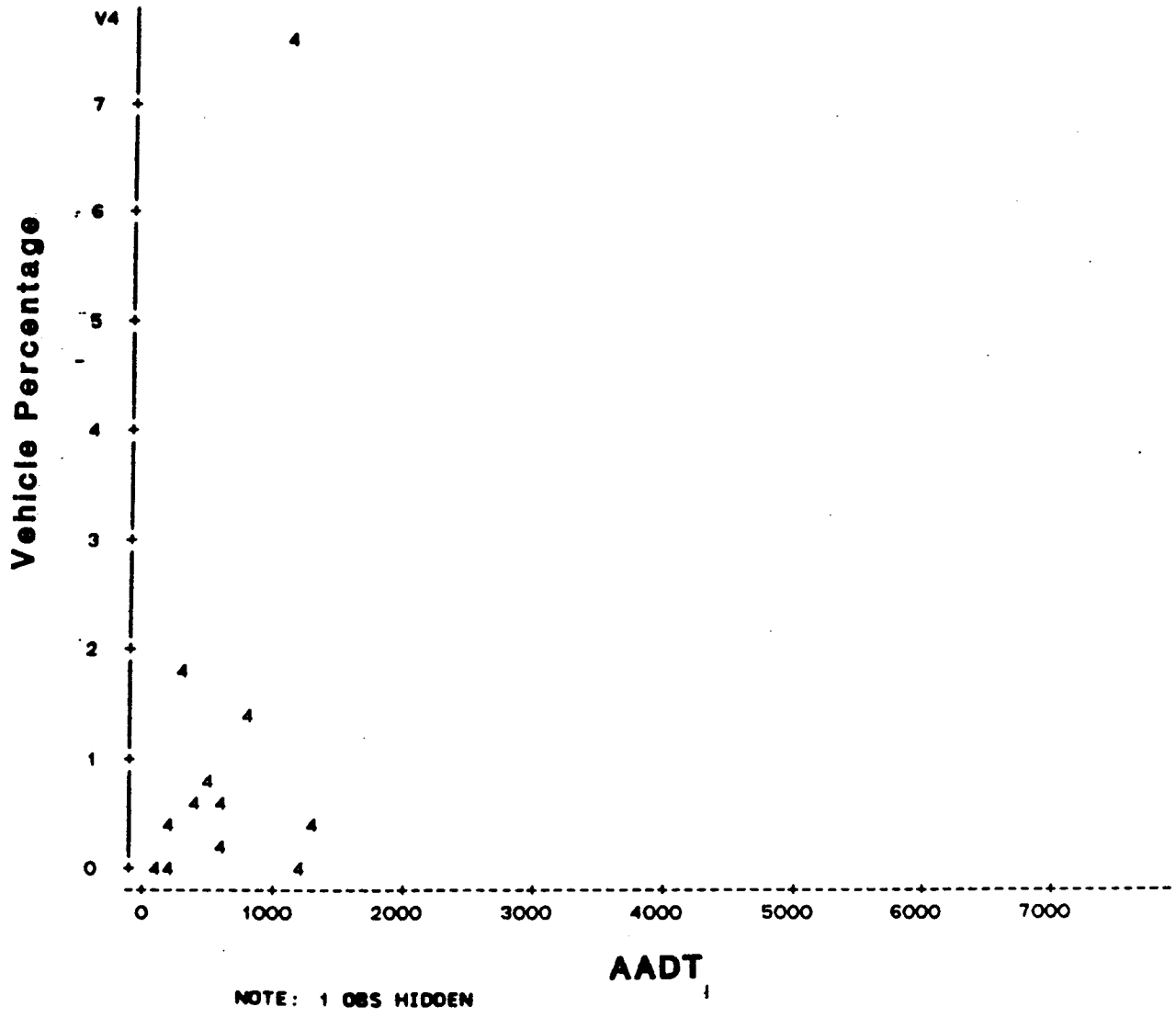


Figure 11. Plots of Proportions of 5-or-More-Axle Tractor - Semitrailers in Total Traffic Versus AADT for FM Roads in Region 4

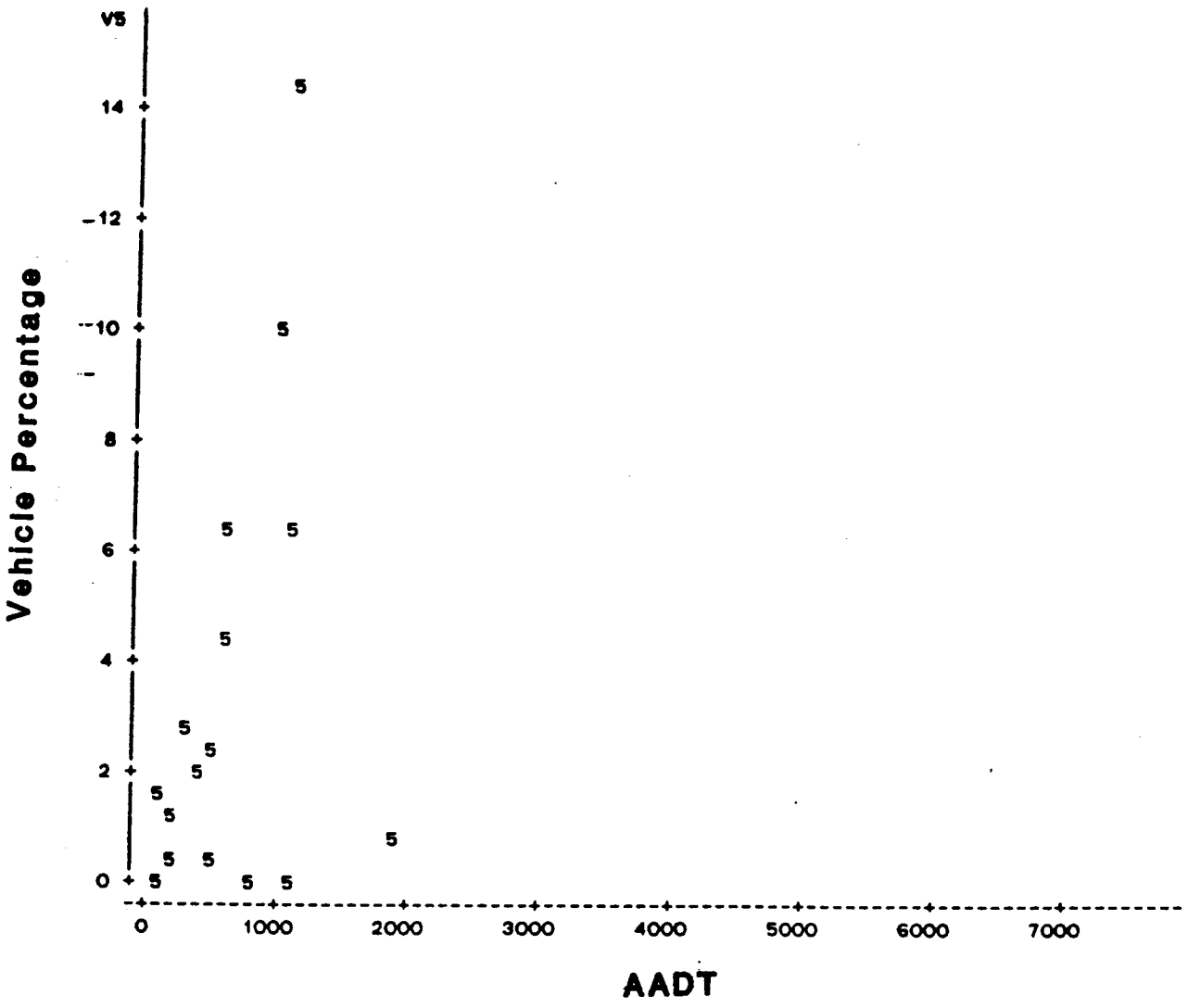


Figure 12. Plots of Proportions of 5-or-More-Axle Tractor - Semitrailers in Total Traffic Versus AADT for FM Roads in Region 5

1,300. Region 5 (North) indicated a range of ADT up to 2,000. Region 2 (West) showed a range up to 3,000, while Region 3 (South) showed a range extending to over 7,000. In Region 1, 3, 4, and 5, no correlation was found between proportions of 5-or-more-axle tractor - semitrailers and ADT. For Region 2, because of a relatively small number of data points and a wide range in ADT, the plot did not provide conclusive evidence one way or the other.

Figures 7 through 12 indicated that the proportions of 5-or-more-axle tractor - semitrailers in the total traffic did not appear to be influenced by ADT or regions of the state on FM roadways. This was also confirmed by a series of plots of these proportions over time from 1977 to 1983 for those count stations on Farm-to-Market roads for which more than two years of counts were reported (see Appendix 6.1). Each plot in Appendix 6.1 contains count locations in a certain region with a certain level of ADT. Four ADT ranges were considered: 50-250, 250-400, 400-750, and 750-1500. Examination of these plots also revealed that, with rare exceptions, the proportions of 5-or-more-axle tractor - semitrailers in total traffic at each location were relatively unchanged from year to year for which the count data were available. However, these proportions varied significantly from one count location to another. These proportions exhibited no apparent relationship with either ADT or region. This was evidenced by the considerable difference in the proportions among the different count locations in the same range of ADT within the same region, as well as the difference which existed among the regions and ADT levels.

For all count locations evaluated, the proportions of 5-or-more-axle tractor - semitrailers in the total traffic stream ranged from almost zero to about 40 percent.

2.1.2 U.S. and State Highways

There were 22 count locations on U.S. highways and 6 count locations on State highways for which count data were continually reported from 1977 to 1983. Table 1 contains the locations of these count stations. Proportions of 5-or-more-axle tractor - semitrailers in total traffic were estimated for all these count locations by years and by regions. Appendix 6.2 contains plots of these proportions versus years for U.S. highways within the 5 regions. For State highways, the 8 count stations were unfortunately located only in Region 3 (South) and in Region 5 (North). Therefore, only 2 plots were available for state highways.

Appendix 6.2 indicated that at each count location, the proportions of 5-or-more-axle tractor - semitrailers changed very little from year to year. Overall, there appeared to be a slight increase in the proportions from 1977 to 1983 at most of these locations. The proportions varied from one count station to another within the regions and to a lesser extent among the regions. This implies that there was probably no correlation between the proportions and regions. The proportions ranged from 2 percent to about 25 percent on U.S. highways, and from 4 percent to 15 percent on state highways.

2.1.3 Interstate Highways

There were 23 count locations on Interstate highways for which count

Table 1
Common Count Locations in Texas 1977-1983

Ref. No.	LOCATION	COUNTY	PLACEMENT
1	L-7	COLEMAN	US 67 & 84 - EAST OF SANTA ANNA
2	L-16	LUBBOCK	IH 27 - NORTH OF LUBBOCK
3	L-20	WICHITA	US 287 - WEST OF WICHITA FALLS
4	L-42	FANNIN	US 82 - WEST OF BONHAM
5	L-72	NACOGDOCHES	US 59 - SOUTH OF NACOGDOCHES
6	L-81	BRAZOS	SH 6 - SOUTHEAST OF BRYAN
7	L-88	HARRIS	US 90 - NORTHEAST OF HOUSTON
8	L-101	KIMBLE	IH 10 - SOUTHEAST OF JUNCTION
9	L-102-A	GUADLUPE	IH 10 - SOUTHWEST OF SEGUIN
10	L-147	VAL VERDE	US 90 - EAST OF DEL RIO
11	L-149	KING	US 82 - SOUTH OF GUTHRIE
12	L-201	NOLAN	IH 20 - WEST OF SWEETWATER
13	L-202	PARKER	IH 20 - EAST OF SWEETWATER
14	L-203	KAUFMAN	IH 20 - SOUTHEAST OF TERRELL
15	L-351	BELL	IH 35 - SOUTHWEST OF TEMPLE
16	L-452	ELLIS	IH 45 - SOUTHEAST OF ENNIS
17	M-173-A	PECOS	IH 10 - EAST OF FT. STOCKTON
18	M-178-A	REEVES	IH 20 - SOUTHWEST OF PECOS
19	M-901 3	WILLIAMSON	SH 29 E - NORTHWEST OF AUSTIN
20	M-901 4	WILLIAMSON	US 183 SE - NORTHWEST OF AUSTIN
21	M-901 7	WILLIAMSON	SH 29 W - NORTHWEST OF AUSTIN
22	M-901 8	WILLIAMSON	US 183 NW - NORTHWEST OF AUSTIN
23	M-904 3	BASTROP	SH 21 E - WEST OF BASTROP
24	M-904 6	BASTROP	SH 21 SW - WEST OF BASTROP
25	M-904 8	BASTROP	SH 71 NW - WEST OF BASTROP
26	M-909-A	CAMERON	US 77 - SOUTHEAST OF SAN BENITO
27	M-1042-A 1	VICTORIA	US 77 N - SOUTH OF VICTORIA
28	M-1042-A 3	VICTORIA	FM 445 E - SOUTH OF VICTORIA
29	M-1042-A 6	VICTORIA	US 77 SW - SOUTH OF VICTORIA
30	M-1042-A 7	VICTORIA	Co.Rd. 77 W - SOUTH OF VICTORIA
31	M-1057	BEXAR	IH 35 - SOUTHWEST OF SAN ANTONIO
32	M-1064	CASS	US 59 - NORTH OF ATLANTA
33	M-1065	BOWIE	IH 30 - WEST OF TEXARKANA
34	M-1068 2	LAMAR	US 271 NE - NORTH OF PARIS
35	M-1068 5	LAMAR	US 271 S - NORTH OF PARIS
36	M-1068 7	LAMAR	FM 1499 W - NORTH OF PARIS
37	M-1072	COOKE	IH 35 - NORTH OF GAINSVILLE
38	M-1075	WICHITA	US 277 - NE OF BURKBURNETT
39	M-1112	HILL	IH 35 E - NORTHEAST OF HILLSBORO
40	M-1150	DENTON	IH 35 E - SE OF FM 2181 INTERCHANGE
41	MA-8	WEBB	IH 35 - NORTH OF LAREDO
42	MA-16	HARRIS	IH 45 - NORTH OF HOUSTON
43	MA-29	SAN PATRICIO	US 181 - NE OF CORPUS CHRISTI
44	MS-1	WHEELER	IH 40 - EAST OF SHAMROCK
45	MS-14	SUTTON	IH 10 - WEST OF SONORA
46	MS-28	WEBB	SH 359 - EAST OF LAREDO
47	MS-39	MC LENNAN	SH 6 - WEST OF WACO
48	MS-74	KENEDY	US 77 - SOUTH OF RIVIERA
49	MS-117	ORANGE	IH 10 -NECHES RIVER BRIDGE, BEAUMONT
50	MS-125	HARRIS	IH 10 - EAST OF HOUSTON
51	MS-143	HIDALGO	US 83 EXPRESSWAY - NE OF PHARR
52	MS-150	HARRISON	IH 20 - SOUTHEAST OF MARSHALL
53	MS-152	HUDSPETH	IH 10 - WEST OF VAN HORN
54	MS-174	MONTGOMERY	US 59 - NORTH OF HUMBLE

data were continually reported from 1977 to 1983. These locations are shown in Table 1. Proportions of 5-or-more-axle tractor - semitrailers in total traffic were computed for all these locations by year and region. Appendix 6.3 shows five plots of these proportions versus years for the five regions. The plots all indicated that there was no evidence of decline in the proportions of these vehicles in total traffic stream from 1977 to 1983. Actually, a slight increasing trend was indicated, particularly for Region 2 (West). As with Farm-to-Market roads, there was a significant difference in the proportions among count locations within the regions, more so than the differences among the regions. This implies that the proportions varied from one count location to another apparently without being influenced by region.

Overall, the proportions of 5-or-more-axle tractor - semitrailers at count locations on Interstate highways were shown to vary from about 6 percent to 45 percent.

2.2 PROPORTIONS OF SU TRUCKS IN TOTAL TRAFFIC

2.2.1 Farm-to-Market Roads

Proportions of SU-1 trucks in total traffic at count locations on Farm-to-Market roads were calculated. These proportions were then plotted against years as shown in Appendix 6.4. Each plot contains count locations within a certain region and a certain ADT range. Four ADT ranges were considered: 50-250, 250-400, 400-750, and 750-1500.

Examination of Appendix 6.4 revealed that, with few exceptions, the proportion of SU-1 trucks in the total traffic stream at any one location changed little between 1977 and 1983. The proportions varied from one count location to another, with a range between almost zero and 15 percent. No relationship between these proportions and regions was detected.

2.2.2 U.S. and State Highways

Proportions of SU-1 trucks in total traffic stream were calculated for all count locations on U.S. and State highways. They were also plotted against years as shown in Appendix 6.5. Each plot contains the count locations within the same region. These plots indicated that the proportions of SU-1 trucks in total traffic were small -- about 3 to 5 percent for all regions. The proportions did not change between 1977 and 1983 for most count locations.

Similar proportions for SU-2 trucks in total traffic were also calculated and plotted against years, as shown in Appendix 6.6. These plots indicated a very small percentage of SU-2 trucks on U.S./State highways -- about 1 percent. The proportions did not change with time or region.

2.2.3 Interstate Highways

Proportions of SU-1 trucks in total traffic were calculated for all count locations on Interstate highways and were plotted against years in Appendix 6.7. Each plot contains count locations within the same region. Examination of these plots revealed that the proportions were all small -- about 3 to 6 percent. The proportions did not change with time, or within

regions or among regions.

Similar plots of proportions of SU-2 trucks in total traffic were obtained, as shown in Appendix 6.8. These plots revealed that the proportions of SU-2 trucks were very small -- about 1 percent for all years between 1977 and 1983, for all regions.

2.3 PROPORTION OF 2-S2 TRUCKS IN TOTAL TRAFFIC

2.3.1 Farm-to-Market Roads

Only 3 count locations on Farm-to-Market roads reported traffic counts continually from 1977 to 1983. The proportions of 2-S2 trucks in total traffic were calculated for these count locations and plotted against years. The plots, shown in Appendix 6.9, indicated that these proportions were small -- about 1 to 3 percent of total traffic. There was no apparent change in the data with time. The influence of regions could not be determined with data from only 3 count locations.

2.3.2 U.S. and State Highways

Proportions of 2-S2 trucks in total traffic were calculated for all count stations on U.S./State highways. Appendix 6.10 contains plots of these proportions against years for all regions. These plots revealed that the proportions of 2-S2 at all count locations were very low -- only 1 to 2 percent of total traffic. No significant variation with years or with regions was indicated.

2.3.3 Interstate Highways

Proportions of 2S-2 trucks in total traffic were calculated for all count locations on Interstate highways for all 5 regions. The proportions were then plotted against years (between 1977 and 1983), as shown in Appendix 6.11. Each plot contains the count locations within the same region. Overall, the proportions were very small -- about 2 to 3 percent. The proportions did not change with years or within regions.

2.4 PROPORTIONS OF OTHER TRUCK TYPES IN TOTAL TRAFFIC

Similar analyses were also conducted for truck and trailer combinations, as well as for double combinations. For truck and trailer combinations, their proportion in total traffic was extremely small -- less than or about 1 percent in all road classes and regions. As with all other truck types, the variation in the proportion with time was not evident from the data.

Similar conclusions were found for doubles. Overall, doubles accounted for less than or about 1 percent of total traffic.

2.5 Summary of Percent Trucks in Total Traffic

Table 2 provides a summary of the range of truck traffic as percentages of total traffic by road class and truck type. It should be noted that although the ranges of the proportions for SU-1 trucks and for 5-or-more-axle tractor - semitrailers differed by road classes, there was also great

Table 2. Summary of Percent Trucks of Total Traffic

Truck Type	Percent of Total Traffic		
	Interstate Highways	U.S./State Highways	Farm-to-Market
5-or-more-axle semitrailers	6-45	2-25	0-40
SU-1	3-6	3-5	0-15
SU-2	1	1	*
2-S2	2-3	1-2	1-3
Other	$\leq$ 1	$\leq$ 1	$\leq$ 1

* No data continually for a number of years

variation in these proportions among count locations within the same road class. This, plus the fact that neither ADT nor regions were found to be correlated with these proportions, implied that proportions of 5-or-more-axle tractor - semitrailers and of SU-1 trucks varied significantly from one count location to another. Since there were no easily discernible patterns or trends in the proportions of 5-or-more-axle semitrailers or SU-1 trucks, their variation was mostly location specific. The proportions of SU-2, 2-S2, and other trucks were so small that any variation among these road classes would not be "practically" significant.

3.0 ANALYSIS OF CLASSIFICATION PROPORTIONS WITHIN TRUCK POPULATION

This analysis investigated the mix of various truck types operating on Interstate highways, U.S. highways, State highways, and Farm-to-Market roads. Specifically, this study sought to illuminate factors that may affect the mix of trucks, as well as changes in the mix proportions between 1977 and 1983.

Truck classifications used herein categorize vehicles as follows:

1. Tractor - semitrailers with 5 or more axles
2. Single-unit trucks with 2 axles (SU-1)
3. Single-unit trucks with 3 axles (SU-2)
4. Semitrailers with less than 5 axles (2-S2)
5. Truck and trailer combinations
6. Double combinations

Truck classification count data were analyzed for 54 count locations which had continuous data from 1977 to 1983. These locations were listed earlier in Table 1. At each count location, percentages of each truck configuration were calculated. These percentages, obtained for every year from 1977 to 1983, were examined to determine factors that might affect their trends -- factors such as time, region, and road class. The findings are presented below.

3.1 PROPORTIONS OF TRUCKS THAT WERE 5-OR-MORE-AXLE TRACTOR - SEMITRAILERS

3.1.1 U.S. Highways

Proportions of trucks that were 5-or-more-axle tractor semitrailers on U.S highways were plotted against time as shown in Figures 13 through 15, with one plot for each region. Compared with interstate highways, the proportions on U.S. highways varied more widely among count locations.

For Region 3 (South), the proportions of 5-or-more-axle tractor - semitrailers in truck traffic from 8 count locations varied from about 30 percent to 70 percent. The proportions were location specific, as evidenced in the plot for this region (Figure 13). There were 2 count locations on U.S. 183 (M-901-4 and M-901-8) on either side of the intersection with S.H. 29 -- northwest of Austin, yet the proportions on these 2 count locations differed as much as 20 percent. Also, there were 4 count locations on U.S. 77. Three locations showed relatively similar proportions which were up to 25 percent higher than the proportion at the other location. Overall, increases in the proportions of these vehicles for the following count locations were indicated:

* U.S. 77 - south of Riviera
* U.S. 83 Expressway - northeast of Pharr
* U.S. 183 & S.H. 29 - northwest of Austin

For the other count locations, not much change occurred from 1977 to 1983.

For Region 4 (East), the proportions of 5-or-more-axle tractor - semitrailers in truck traffic from 7 count locations ranged from about 35

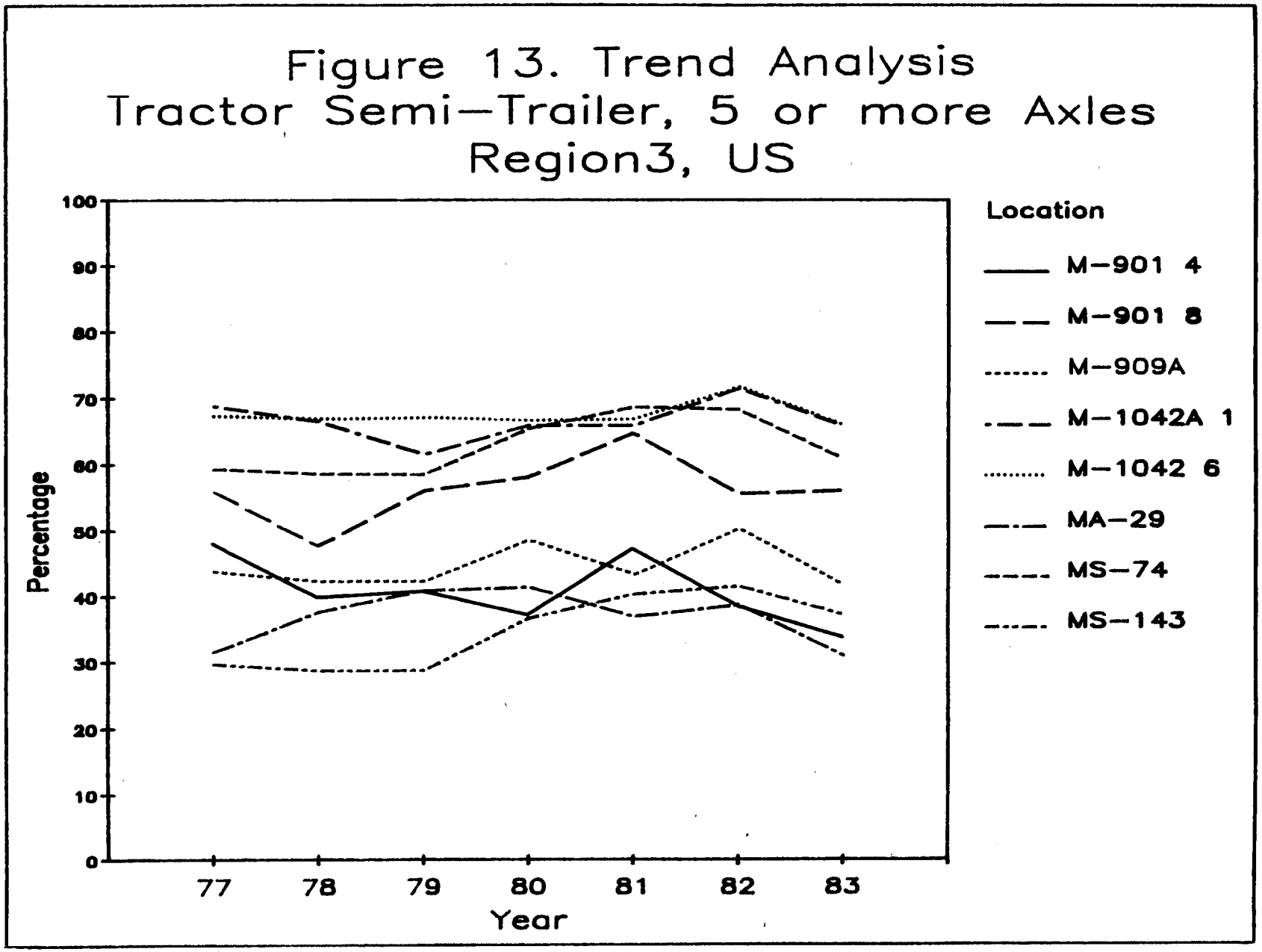


Figure 13. Trend Analysis
Tractor Semi—Trailer, 5 or more Axles
Region3, US
Percentage
100
90
80
70
60
50
40
30
20
10
0
77
78
79
80
81
82
83
Year
Location
M—901 4
M—901 8
M—909A
M—1042A 1
M—1042 6
MA—29
MS—74
MS—143

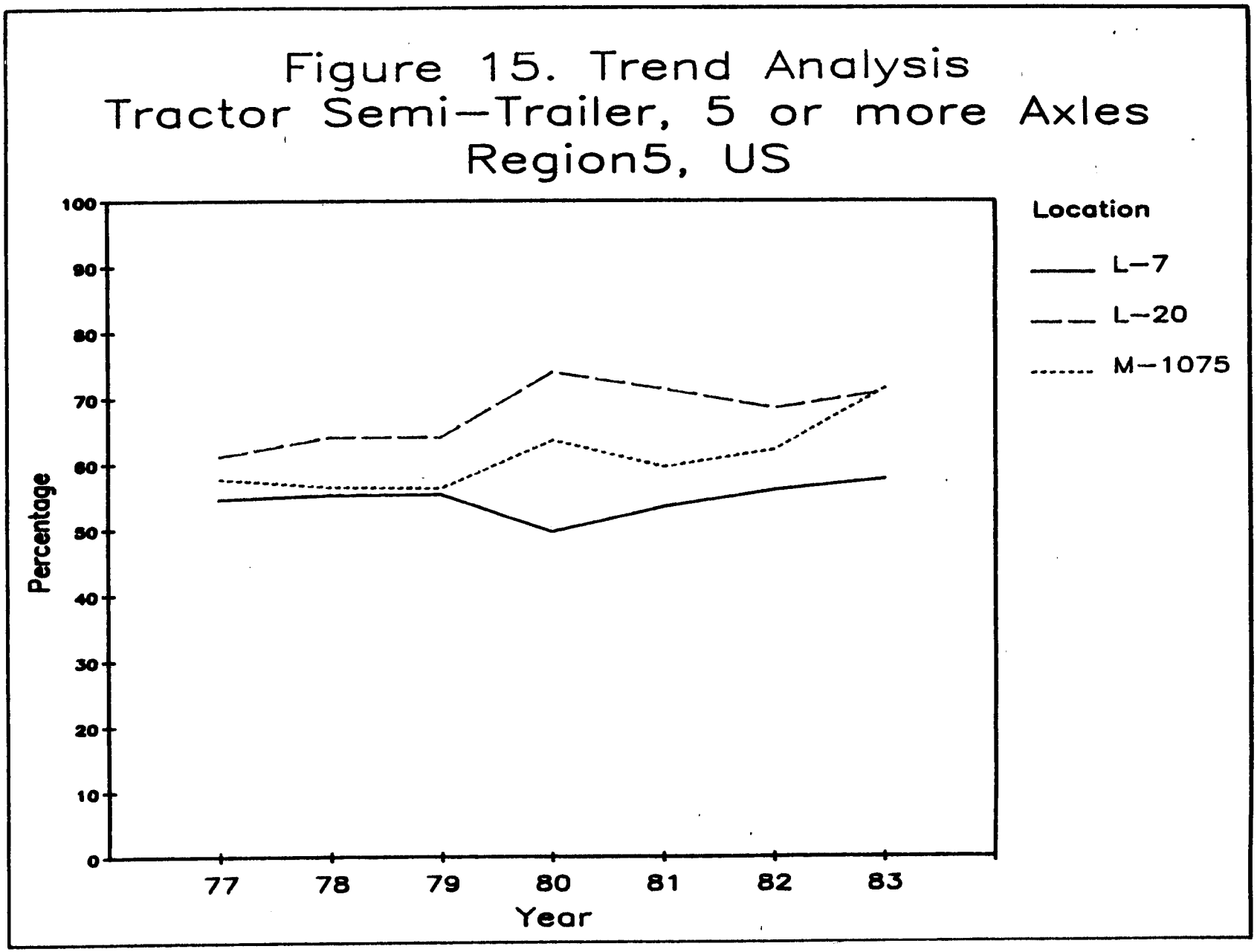
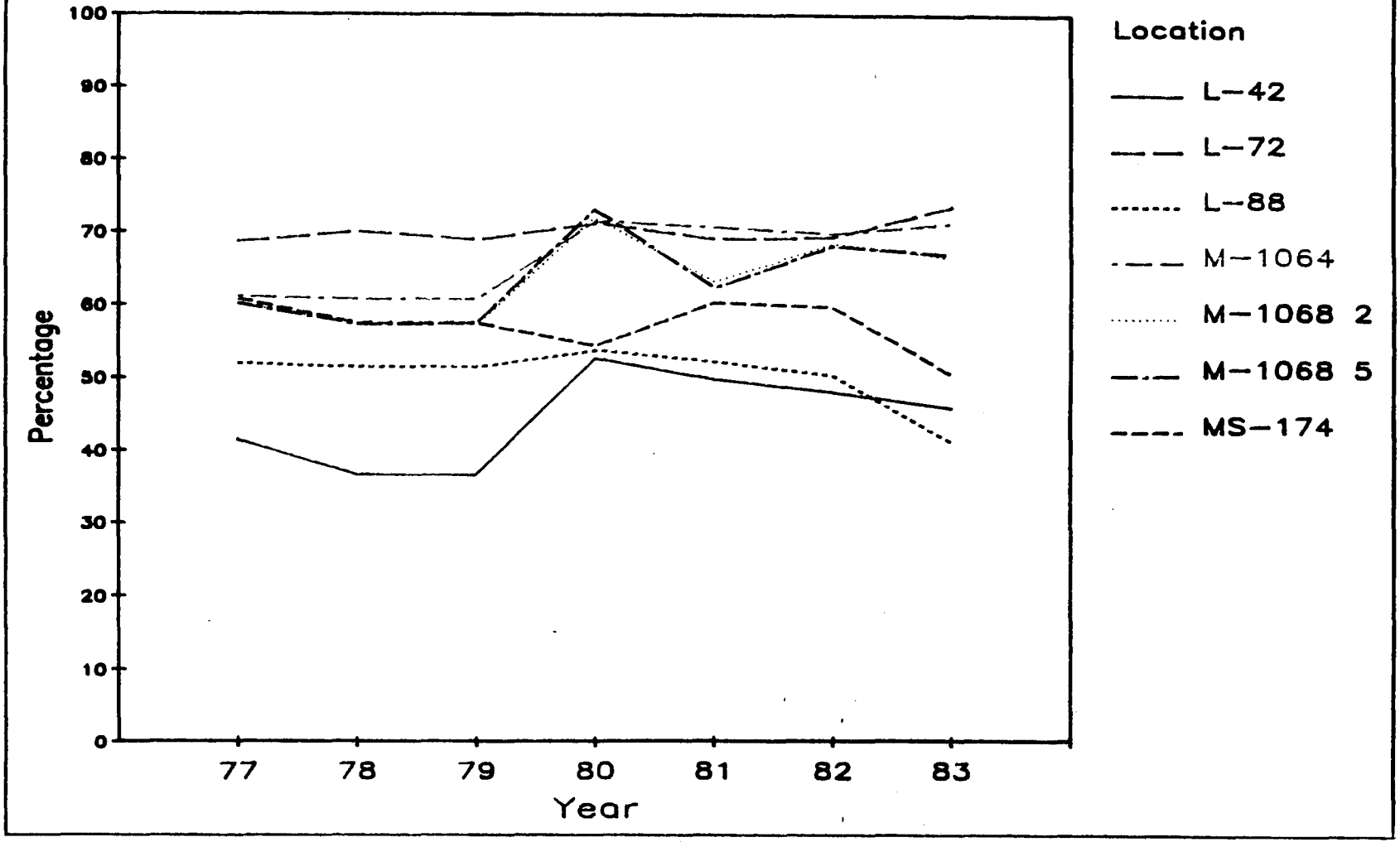


Figure 15. Trend Analysis
Tractor Semi—Trailer, 5 or more Axles
Region5, US
Location
L—7
L—20
M—1075
Percentage
100
90
80
70
60
50
40
30
20
10
0
77
78
79
80
81
82
83
Year

Figure 14. Trend Analysis
Tractor Semi—Trailer, 5 or more Axles
Region4, US



percent to 70 percent. Those count locations showing some increases in these proportions were U.S. 82, west of Bonham, U.S. 59, north of Atlanta, and F.M. 1499, north of Paris. The remaining count locations showed relatively small changes from year to year. Again, the proportions of 5-or-more-axle semitrailers appeared to be location specific.

For Region 5 (North), the proportions of 5-or-more-axle semitrailers at 3 count locations ranged from 50 percent to 75 percent. Slightly increasing trends in the proportions were indicated for U.S. 277, Burkburnett and U.S. 287, Wichita Falls. For U.S. 67, at Santa Anna, the proportion was relatively constant over the years.

3.1.2 State Highways

There were 8 count locations in Regions 3 and 5 where truck classifications were recorded continually from 1977 to 1983. The proportion of trucks that were 5-or-more-axle tractor - semitrailers at each count location was calculated and plotted against time, as shown in Figures 16 and 17. The proportions ranged from 30 percent to 70 percent. The proportions on S.H. 21, west of Bastrop, were higher than those at other count locations. The proportion at S.H. 359, east of Laredo was the lowest but increased rapidly over the given year period. Trends at other count locations during this period were stable or very slightly increasing. As with Interstate and U.S. highways, the proportions of 5-or-more-axle tractor semitrailers on State highways were also location specific, as evidenced by large variations in the proportion within regions, as well as by two very different proportions at 2 count locations on S.H. 29 northwest of Austin.

3.1.3 Interstate Highways

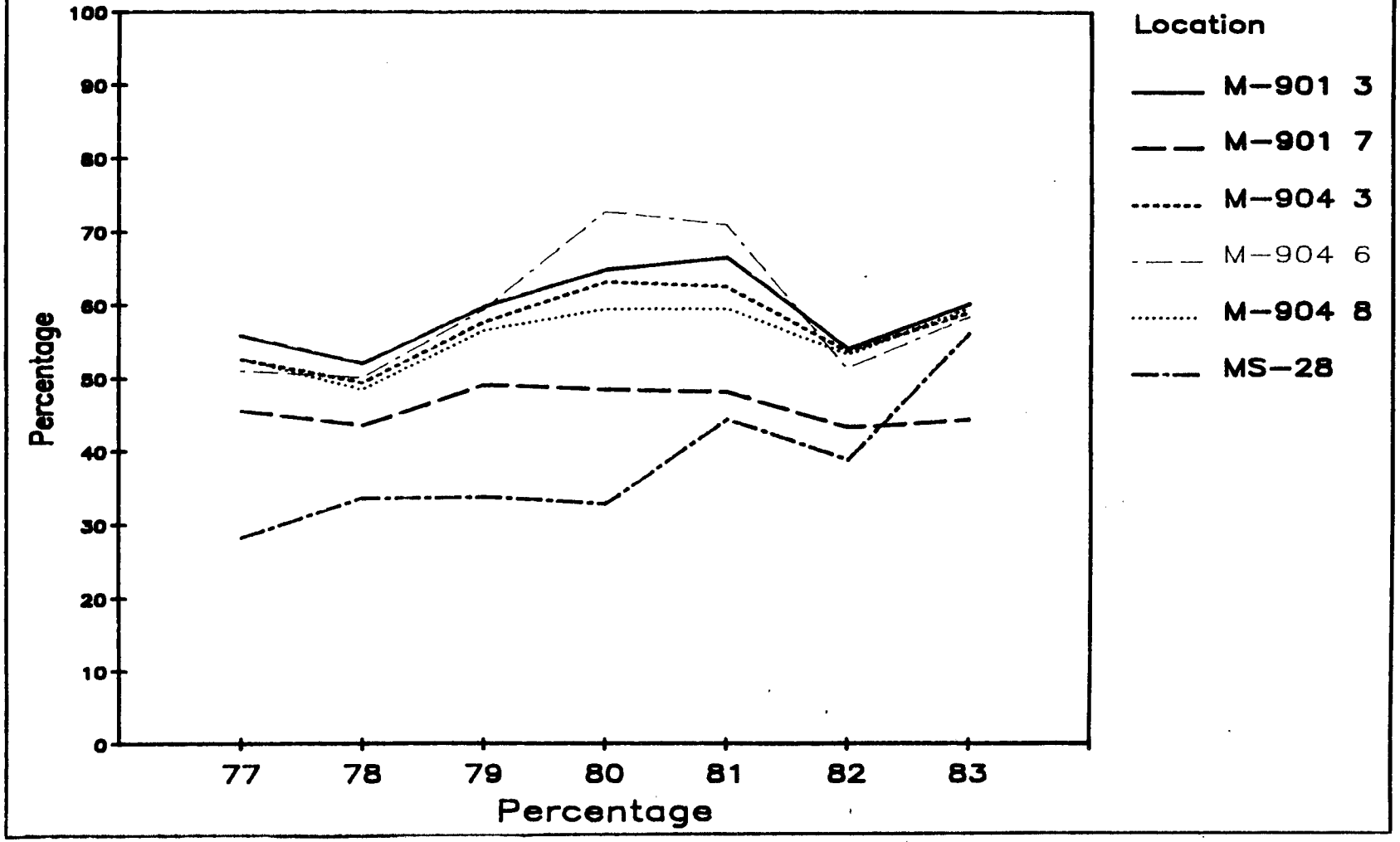
Proportions of 5-or-more-axle tractor - semitrailers of total truck traffic on Interstate highways were plotted against time, one plot for each region, as shown in Figures 18 through 22. For Region 1 (the Panhandle), the proportions of these vehicles changed little from 1977 to 1983. Actually, a slightly increasing trend was observed in the data for the 7-year period at all 3 count locations. The proportions ranged from 55 percent to 80 percent.

For Region 2 (West), the 5-or-more-axle tractor - semitrailer proportions at 5 count locations ranged from 50 to 80 percent. An increasing trend was observed, particularly for count locations on Interstate 10, over the 7-year period. This increase on I.H. 10 was as much as 20 percent. In general, the proportions varied among count locations. The count location on I.H. 20 displayed higher proportions of 5-or-more-axle semitrailers than did the count locations on I.H. 10 for all 7 years.

For Region 3 (South), the proportions of these vehicles also ranged from 50 to 80 percent. Overall, a slightly increasing trend over the 7-year period was indicated. The count locations on Interstate 10 showed a higher proportion of 5-or-more-axle semitrailers than did those on Interstate 35 for all 7 years.

For Region 4 (East), the proportion of 5-or-more-axle semitrailers again ranged from 50 to 80 percent. Overall, a slightly increasing trend between 1977 and 1983 was detected. The same can also be said for Region 5 (North),

Figure 16. Trend Analysis
Tractor Semi—Trailer, 5 or more Axles
Region3, SH



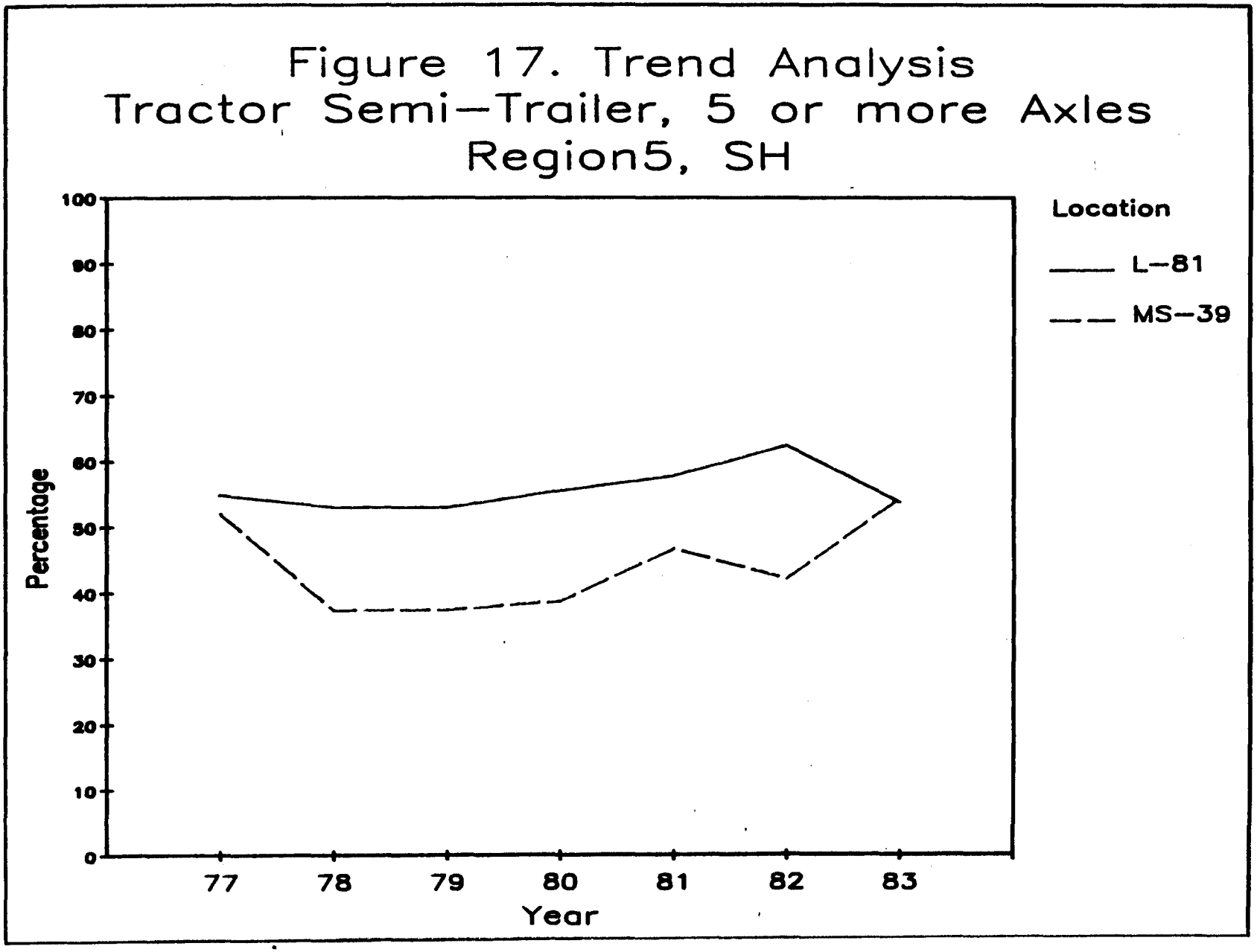


Figure 17. Trend Analysis
Tractor Semi—Trailer, 5 or more Axles
Region5, SH
Location
L—81
MS—39
Percentage
100
90
80
70
60
50
40
30
20
10
0
77
78
79
80
81
82
83
Year

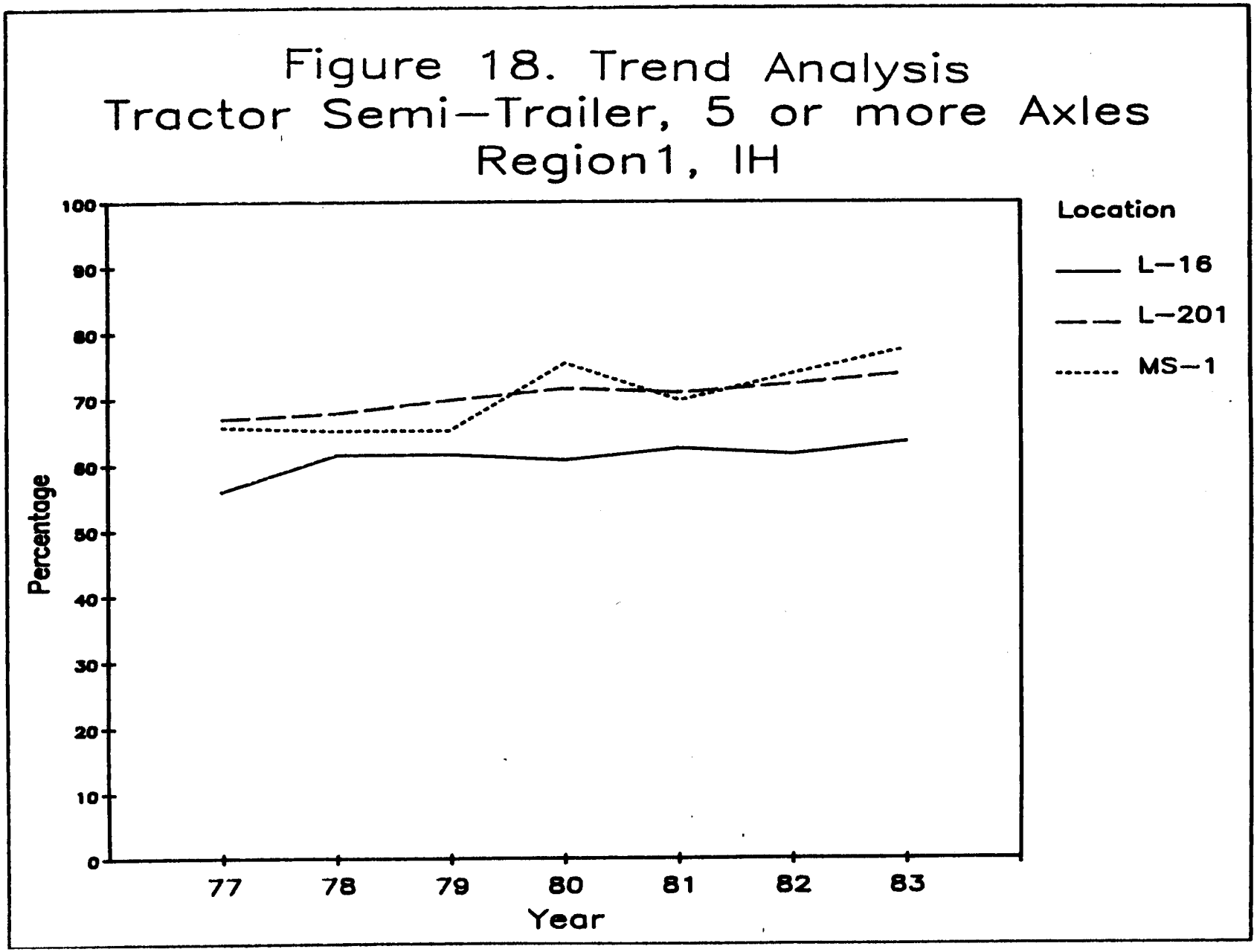


Figure 18. Trend Analysis
Tractor Semi—Trailer, 5 or more Axles
Region1, IH
Location
L—16
L—201
MS—1
Percentage
100
90
80
70
60
50
40
30
20
10
0
77
78
79
80
81
82
83
Year

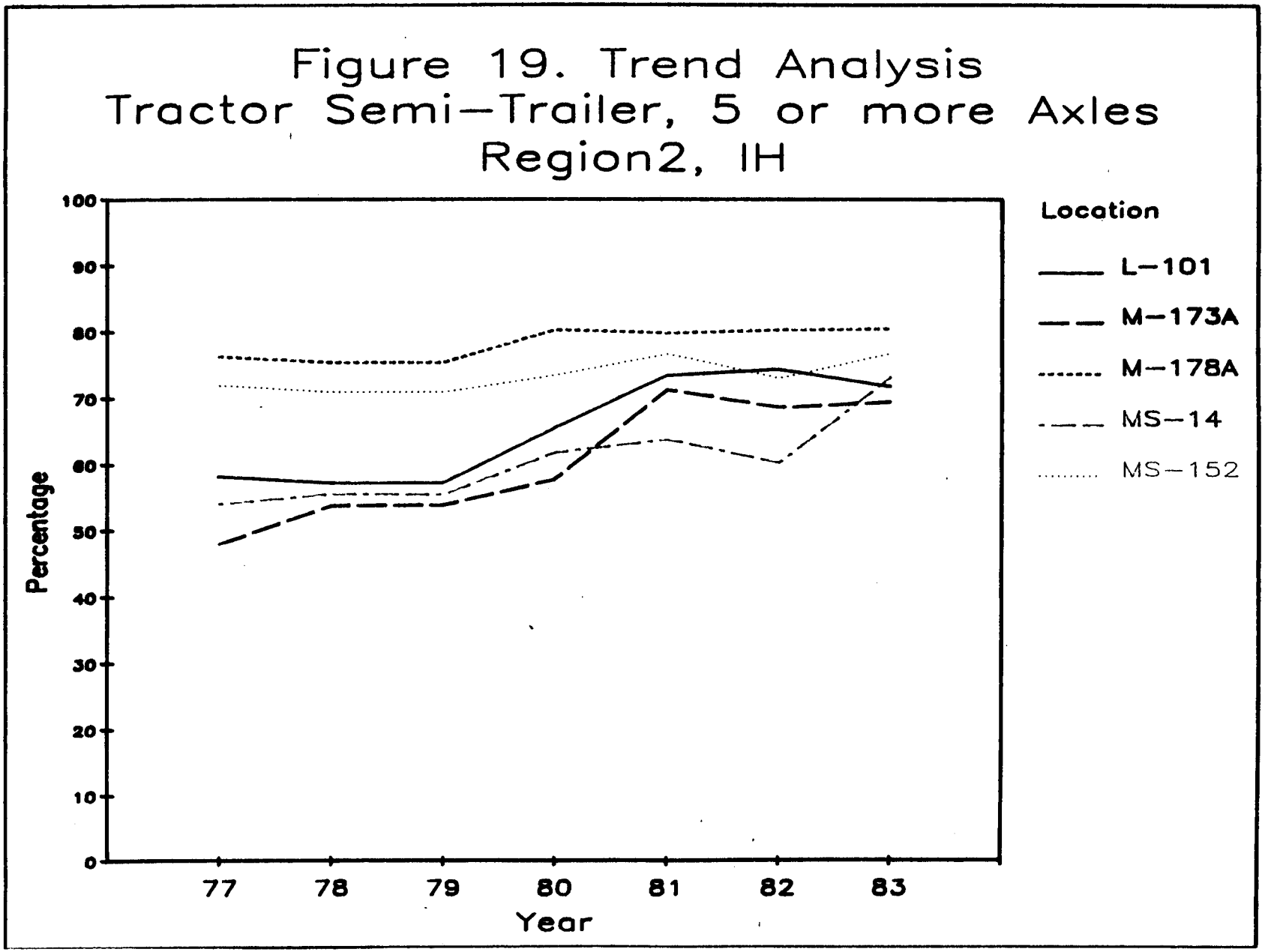


Figure 19. Trend Analysis
Tractor Semi—Trailer, 5 or more Axles
Region2, IH
Percentage
100
90
80
70
60
50
40
30
20
10
0
77
78
79
80
81
82
83
Year
Location
L—101
M—173A
M—178A
MS—14
MS—152

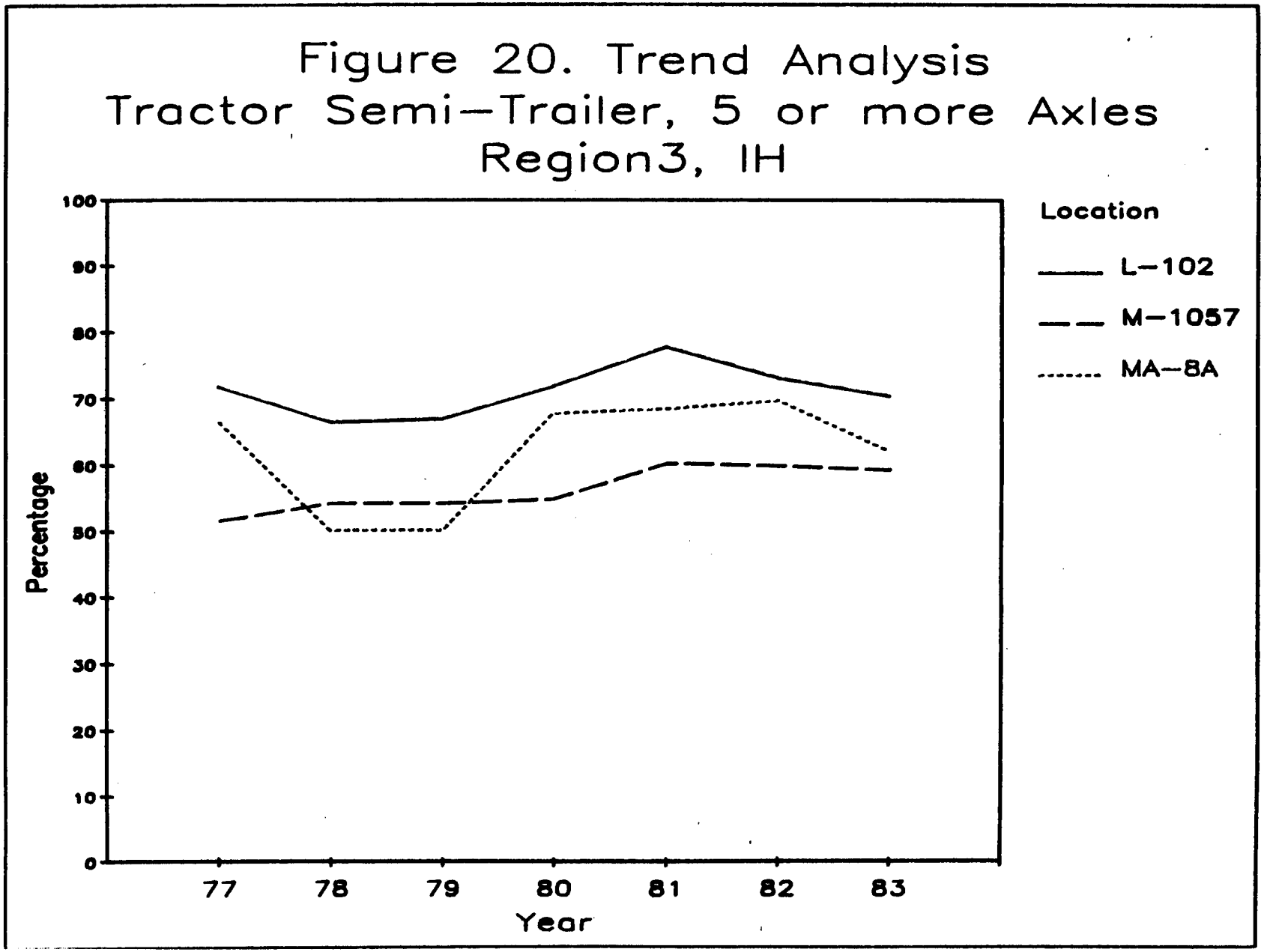


Figure 20. Trend Analysis
Tractor Semi—Trailer, 5 or more Axles
Region3, IH
Percentage
100
90
80
70
60
50
40
30
20
10
0
77
78
79
80
81
82
83
Year
Location
L—102
M—1057
MA—8A

Figure 21. Trend Analysis
Tractor Semi—Trailer, 5 or more Axles
Region4, IH

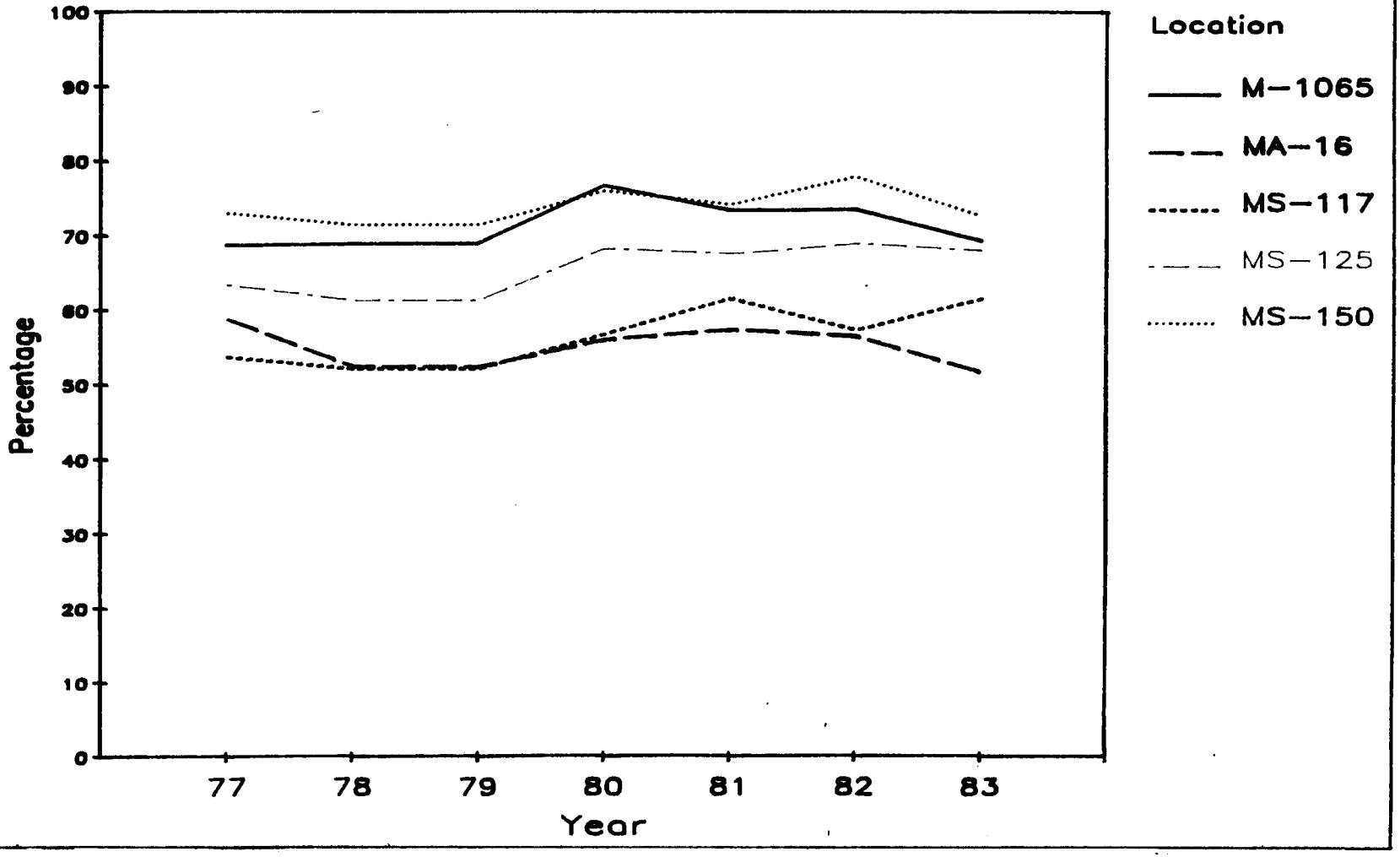
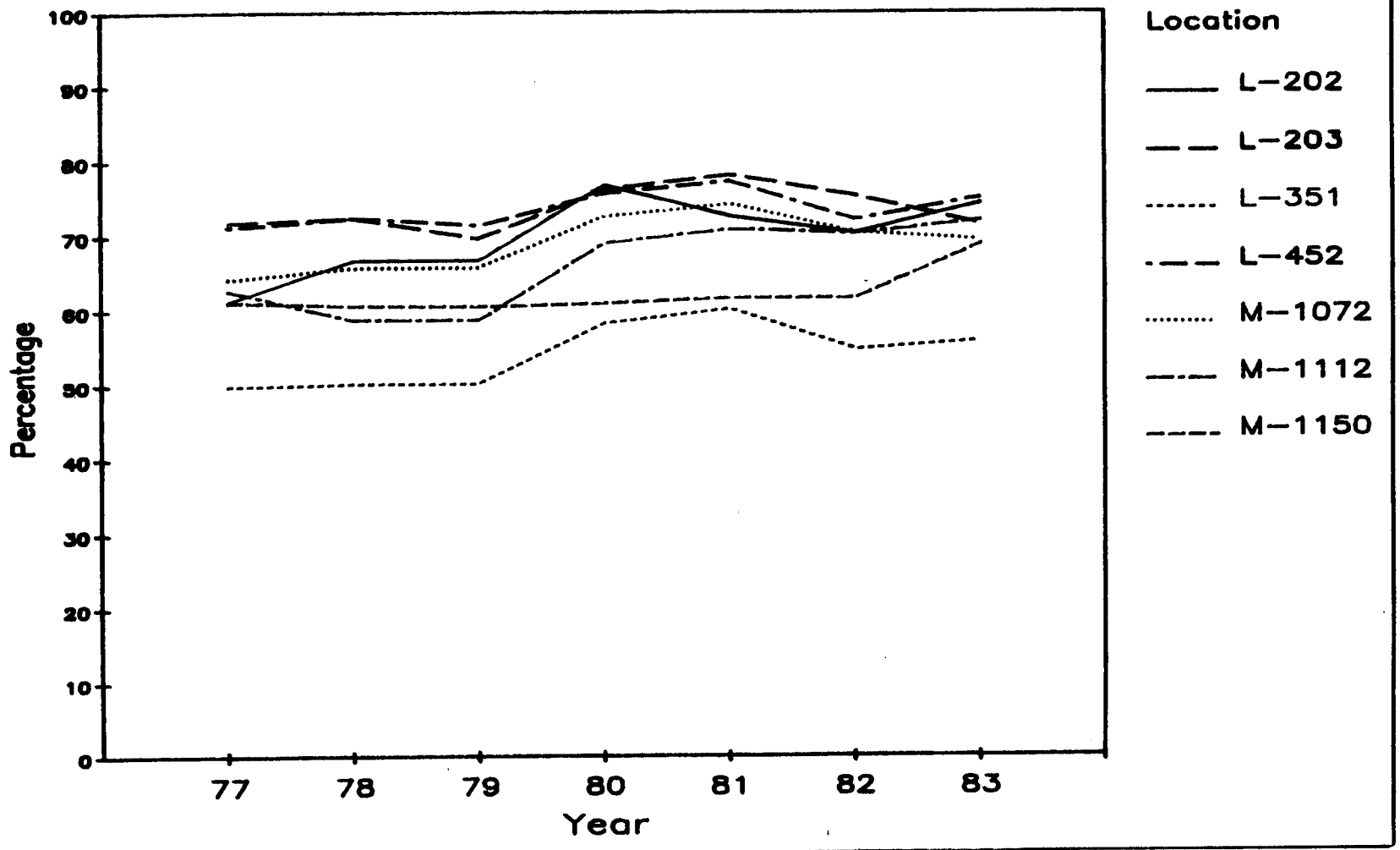


Figure 22. Trend Analysis
Tractor Semi—Trailer, 5 or more Axles
Region5, IH



where there were 7 count locations on I.H. 35 E., I.H. 20, and I.H. 45.

Figures 18 through 22 indicated that the proportions of 5-or-more-axle semitrailers in total truck traffic on interstate highways ranged from 50 to 80 percent for the entire state. Because the variation in these proportions among regions was almost negligible compared with the variation among count locations within regions, it was very likely that differences in the proportions were location specific. The proportions did not appear to necessarily depend on region, specific interstate routes, or the distance between count locations. Of all the count locations considered, the proportions of 5-or-more-axle semitrailers were observed to have increased proportionally more over the years on I.H. 10 in Region 2 than anywhere else.

3.2 PROPORTIONS OF S-U TRUCKS

3.2.1 U.S. Highways

The proportions of SU-1 trucks as percentages of truck traffic at count locations on U.S. highways were plotted against time, as shown in Figures 23 through 25, one figure for each region. For Region 3 (South), there were 8 count locations and they showed proportions ranging from 10 percent to 50 percent. U.S. 183, northwest of Austin and U.S. 83 Expressway, northeast of Pharr showed slightly declining trends and considerable fluctuation over the years, while U.S. 77, southeast of San Benito showed a slight increasing trend over the years. The other count station indicated, more or less, stable trends in the SU-1 trucks proportions. The proportions of SU-1 trucks were location specific.

For Region 4 (East), the proportions of SU-1 trucks at 7 count locations ranged from 15 percent to 40 percent. Most locations show little change in these proportions over time, although U.S. 59, north of Humble and U.S. 90, northeast of Houston showed slight increasing trends. Again, the proportion of SU-1 trucks appeared to be location specific.

For Region 5 (North), the proportions of SU-1 trucks as percentages of truck traffic from 3 count locations ranged from 10 to 30 percent. Two of the 3 locations showed slightly decreasing trends, while the other location showed a stable trend over time.

The proportion of SU-2 trucks as percentages of truck traffic on U.S. highways were also plotted against time, as shown in Figures 26 through 28. These proportions were considerably smaller than those for SU-1 trucks. They ranged from 1 percent to 15 percent. Although fluctuating trends were indicated at a few count locations over the 7 year period, no significant changes in these proportions were observed for other count locations.

3.2.2 State Highways

Proportions of SU-1 trucks as percentages of truck traffic were plotted against time for 8 count locations on State highways in 2 regions, as shown in Figures 29 and 30. These proportions of SU-1 trucks ranged from 15 percent to 50 percent. All count locations showed slightly declining trends or small changes from year to year.

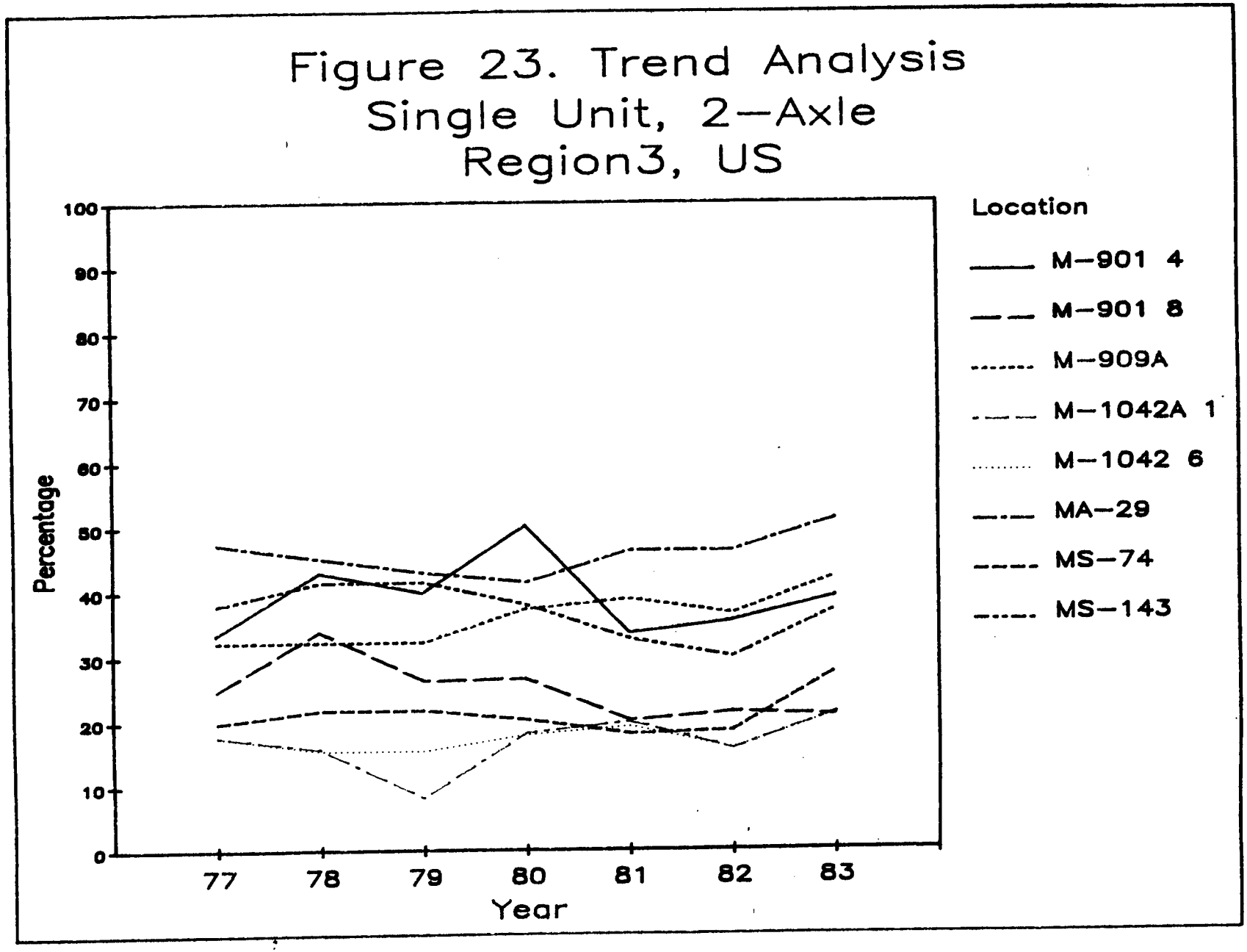


Figure 23. Trend Analysis
Single Unit, 2—Axle
Region3, US
Percentage
100
90
80
70
60
50
40
30
20
10
0
77
78
79
80
81
82
83
Year
Location
M—901 4
M—901 8
M—909A
M—1042A 1
M—1042 6
MA—29
MS—74
MS—143

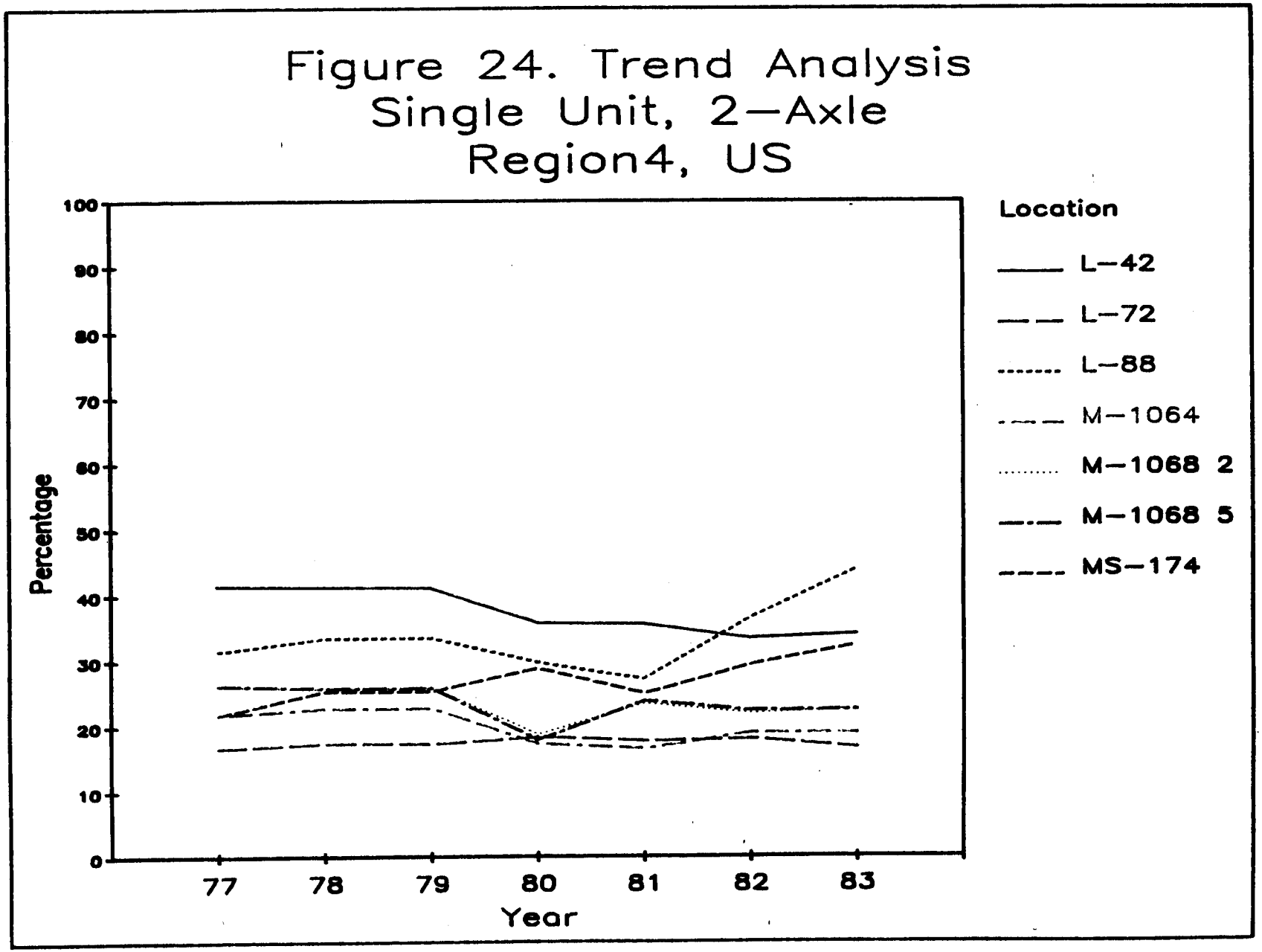


Figure 24. Trend Analysis
Single Unit, 2—Axle
Region4, US
Percentage
100
90
80
70
60
50
40
30
20
10
0
77
78
79
80
81
82
83
Year
Location
L—42
L—72
L—88
M—1064
M—1068 2
M—1068 5
MS—174

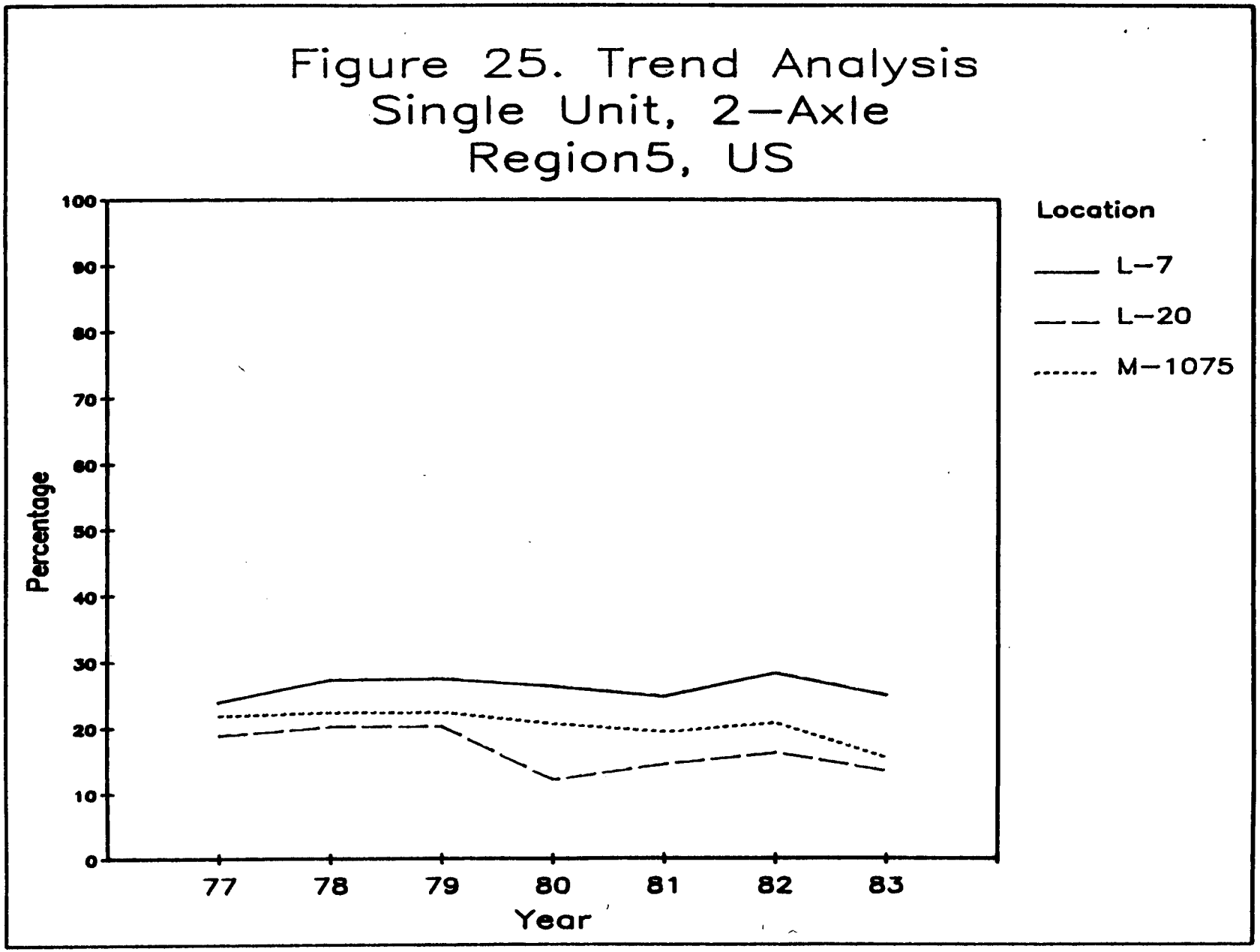
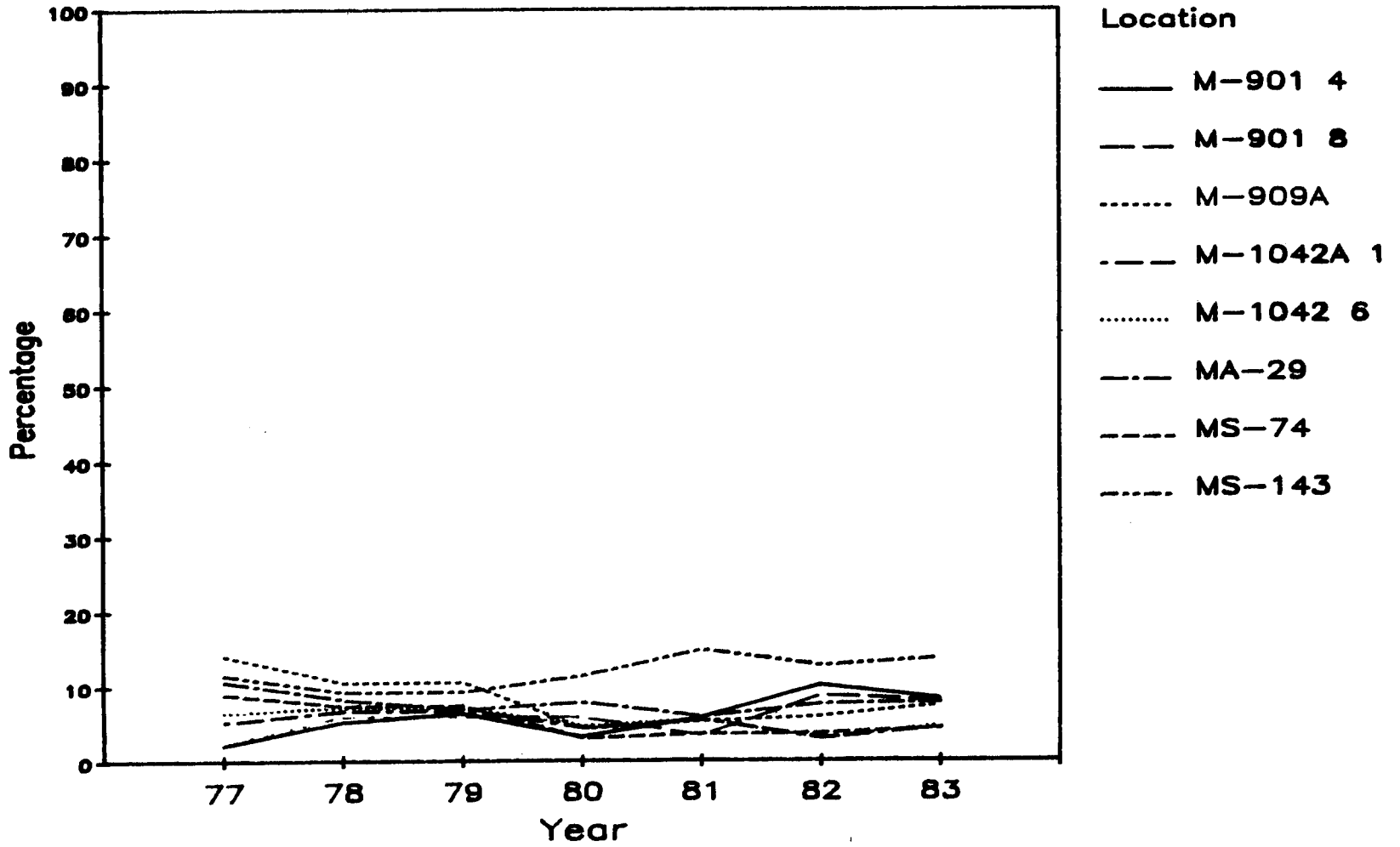


Figure 25. Trend Analysis
Single Unit, 2—Axle
Region5, US
Location
L—7
L—20
M—1075
Percentage
100
90
80
70
60
50
40
30
20
10
0
77
78
79
80
81
82
83
Year

Figure 26. Trend Analysis Single Unit, 3—Axle Region3, US



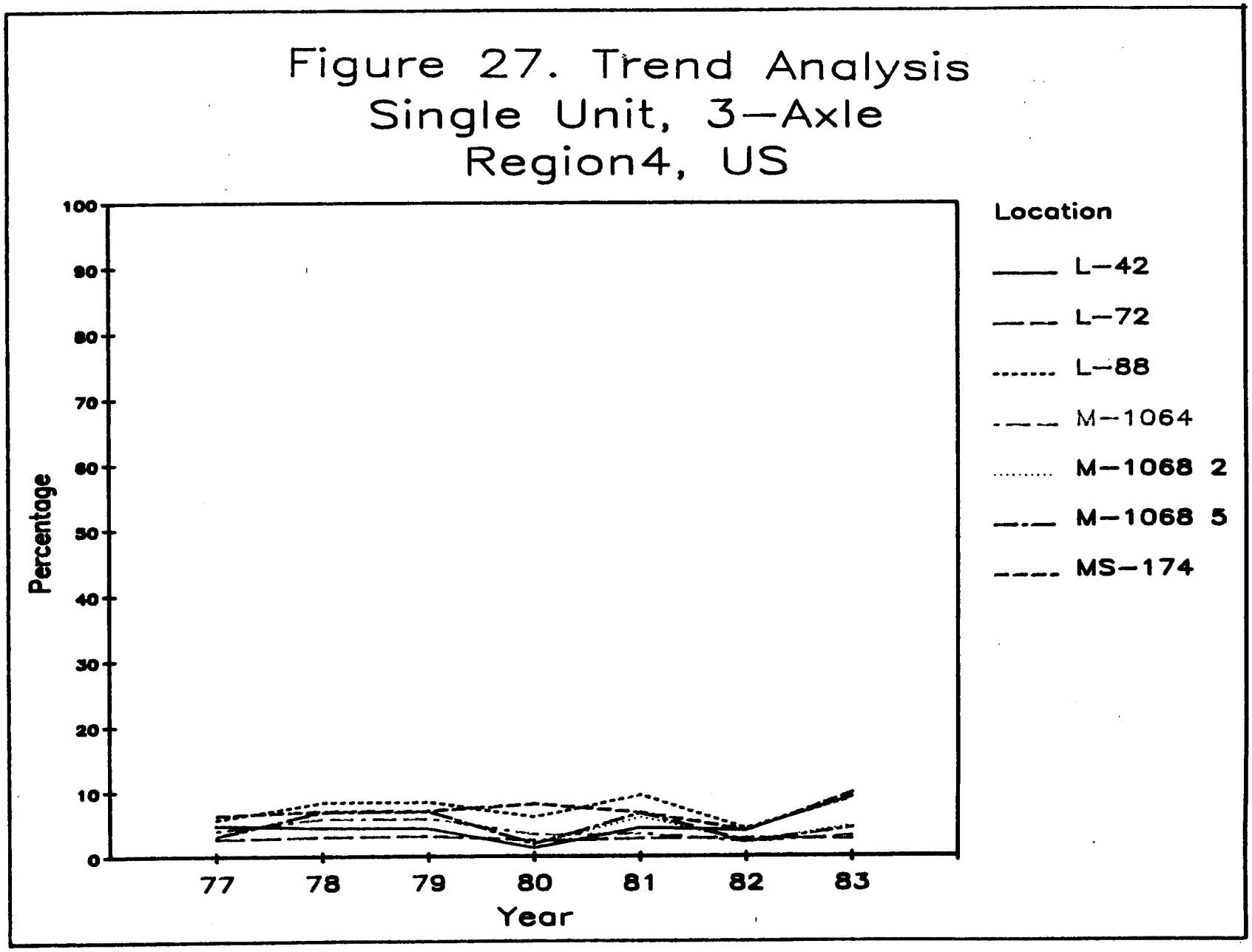


Figure 27. Trend Analysis
Single Unit, 3-Axle
Region4, US
Percentage
100
90
80
70
60
50
40
30
20
10
0
77
78
79
80
81
82
83
Year
Location
L-42
L-72
L-88
M-1064
M-1068 2
M-1068 5
MS-174

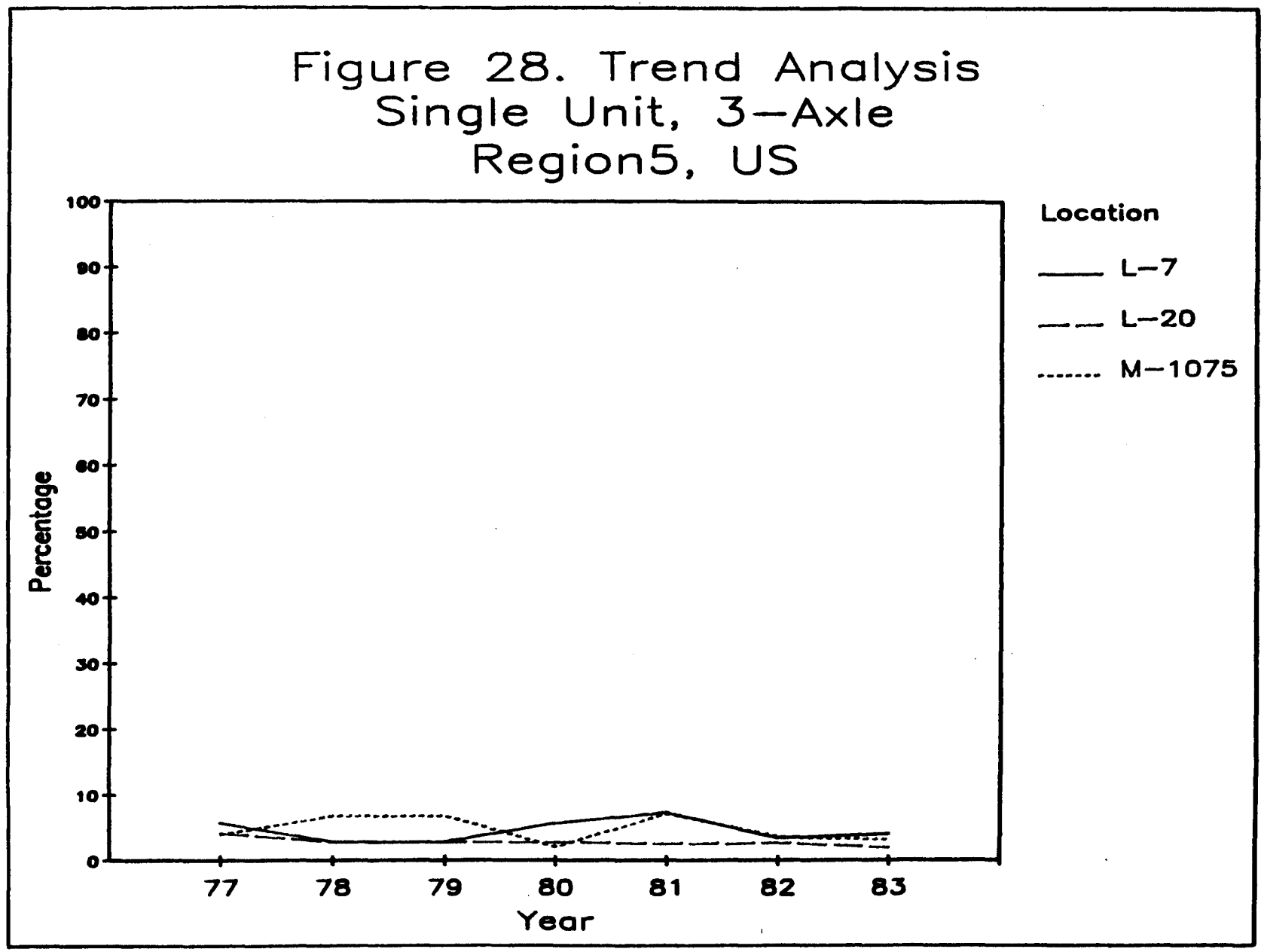
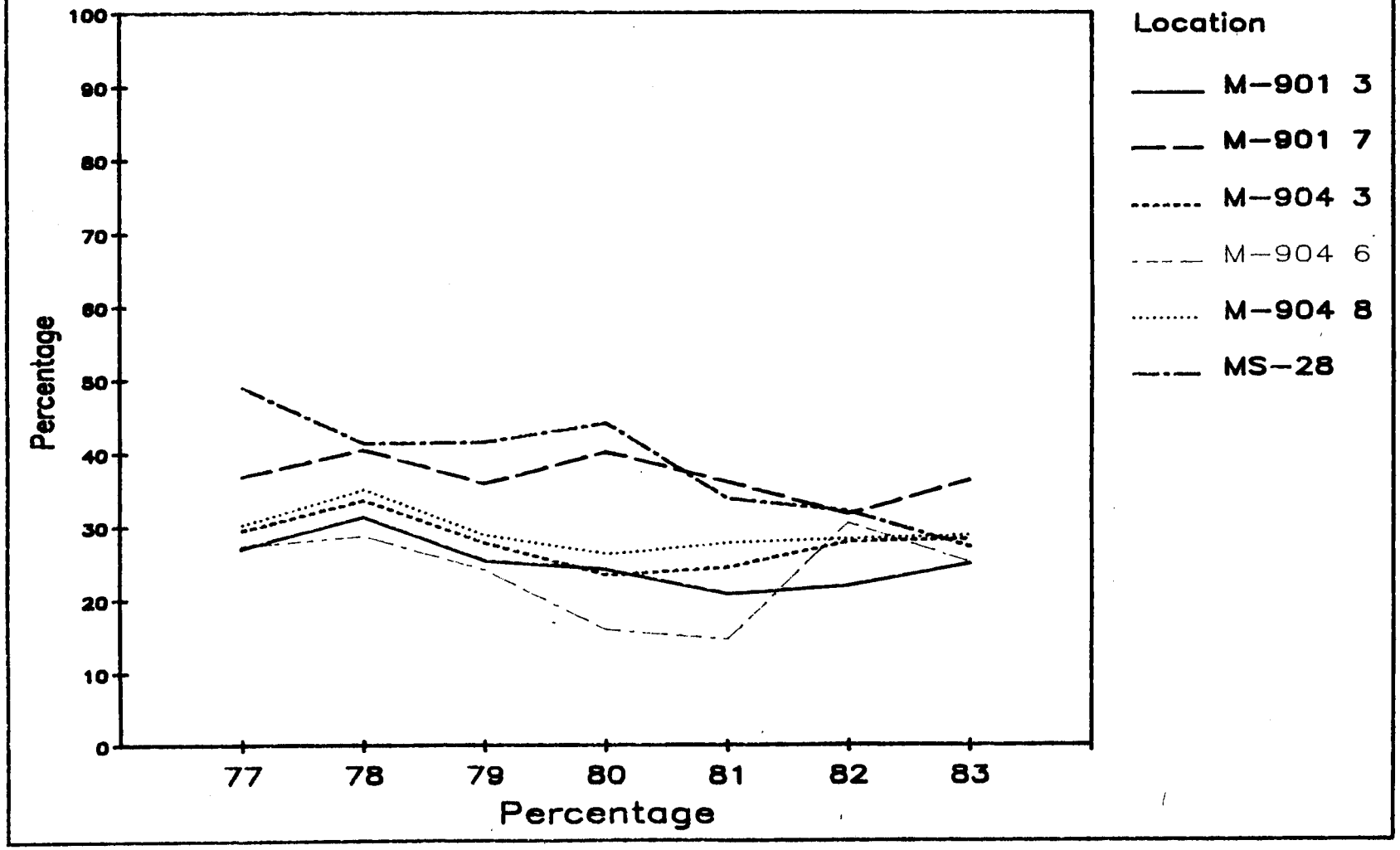


Figure 28. Trend Analysis
Single Unit, 3-Axle
Region5, US
Percentage
100
90
80
70
60
50
40
30
20
10
0
77
78
79
80
81
82
83
Year
Location
L-7
L-20
M-1075

Figure 29. Trend Analysis Single Unit, 2—Axle Region3, SH



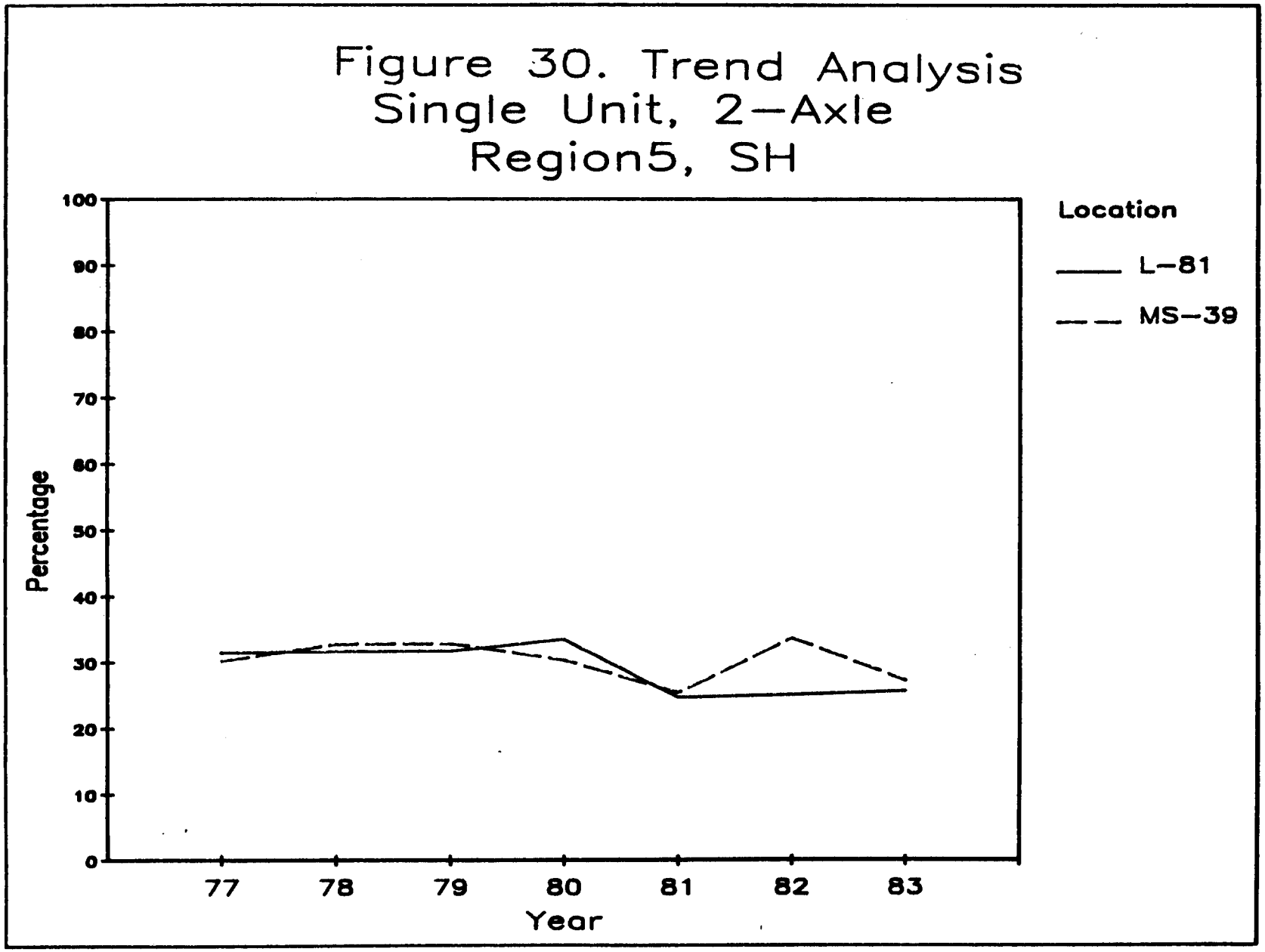


Figure 30. Trend Analysis
Single Unit, 2-Axle
Region5, SH
Location
L-81
MS-39
Percentage
100
90
80
70
60
50
40
30
20
10
0
77
78
79
80
81
82
83
Year

Proportions of SU-2 trucks as percentages of truck traffic were also plotted against time for State highways, as shown in Figures 31 and 32 for Region 3 and Region 5, respectively. Out of the 8 count locations, 6 showed relatively small proportions of SU-2 trucks -- about 1 percent to 10 percent. The other 2 count locations, S.H. 259, east of Laredo and S.H. 6, west of Waco, showed much higher proportions (up to 22 percent). For the former 6 locations, the proportions were relatively stable over time, with slightly increasing trends after 1981. There was little difference in the proportions of SU-2 trucks among these 6 count locations for any one year.

As can be seen above, the proportion of SU-1 trucks was significant on Interstate, U.S., and State highways. Region, distance between count locations, and highway route numbers were not good predictors of these proportions. This implied that the proportions of SU-1 trucks were likely to be location specific, as was the case with 5-or-more-axle tractor - semitrailers. The proportion of SU-2 trucks on Interstate highways, U.S. highways, and State highways was usually small. At many count locations, they were almost negligible. Two exceptions were S.H. 359 (east of Laredo) and S.H. 6 (west of Waco), which showed at least twice the proportions of SU-2 trucks found elsewhere.

3.2.3 Interstate Highways

Proportions of trucks that were 2-axle, SU trucks on interstate highways were plotted against time as shown in Figures 33 through 37, one figure for each region. For Region 1 (the Panhandle), the proportions of SU-2 trucks ranged from 12 percent to 28 percent. All 3 count locations indicated small changes in these proportions between 1977 and 1983.

For Region 2 (West), the proportions of SU-1 trucks at 5 count locations ranged from 6 percent to 30 percent. Those count locations showed slightly declining trends over the years while 2 others showed relatively stable trends. The proportions appeared to be location specific and not dependent on interstate routes or distance between count locations.

For Region 3 (South), the proportions of SU-1 trucks at 3 count locations ranged from 10 percent to 30 percent. I.H. 35, north of Laredo showed a fluctuating trend between 1977 to 1983, while the other 2 count locations showed relatively stable trends.

For Region 4 (East), the proportions of SU-1 trucks ranged from 10 percent to 30 percent. All 5 count locations showed little change in these proportions over the years. If anything, very slightly decreasing trends might be present with 4 out of the 5 count locations. The proportions of SU-2 trucks appeared to be location specific.

For Region 5 (North), the proportions of SU-1 trucks ranged from 10 percent to 30 percent. All 7 count locations showed relatively stable trends in these proportions over the years. Again, the proportions appeared to be location specific.

Figures 33 through 37 also indicated that within each region, the relative magnitudes of SU-1 truck proportions at different count locations on Interstate highways were in reverse order of the relative magnitude of

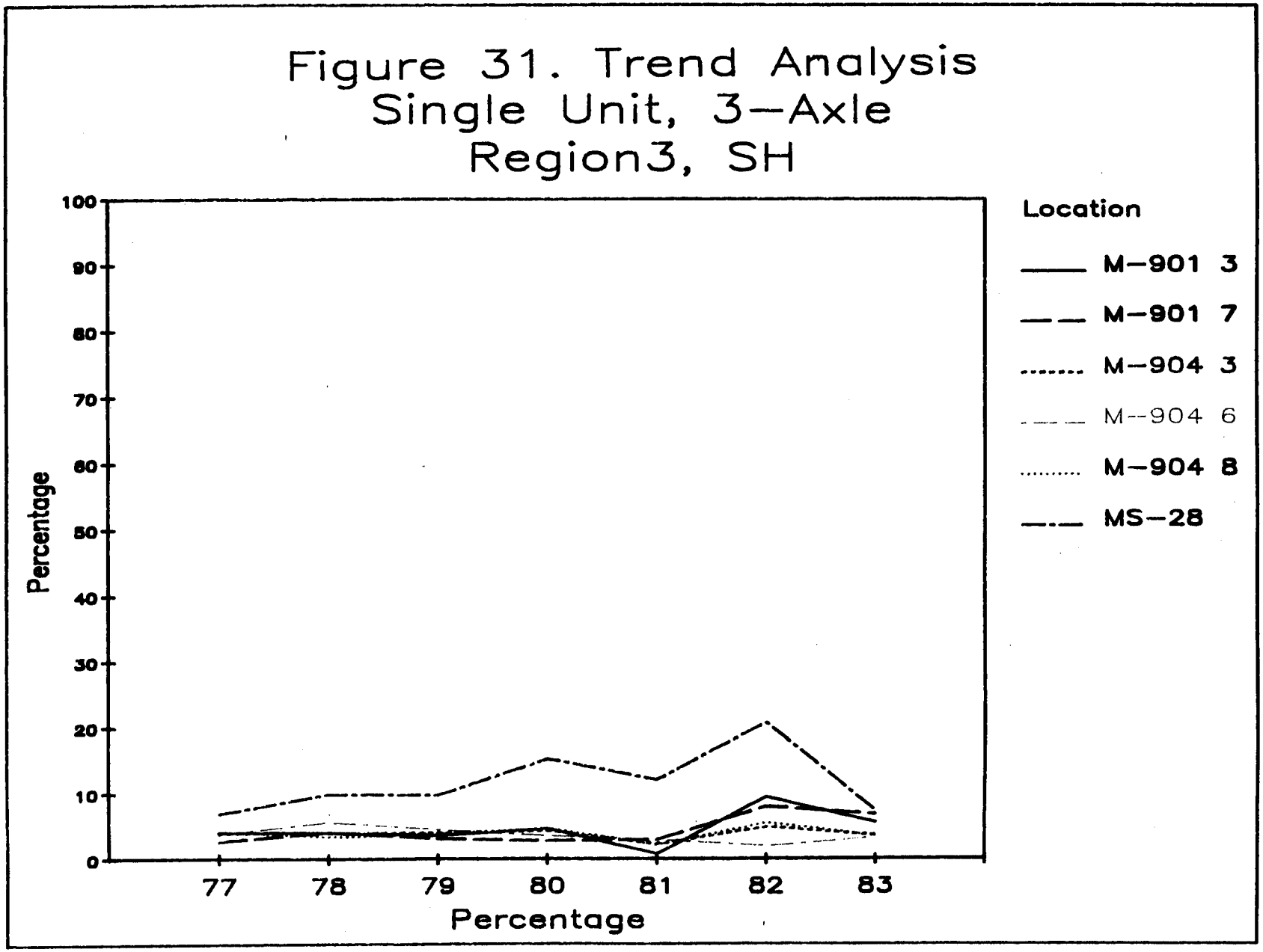


Figure 31. Trend Analysis
Single Unit, 3-Axle
Region3, SH
Location
M-901 3
M-901 7
M-904 3
M-904 6
M-904 8
MS-28
Percentage
100
90
80
70
60
50
40
30
20
10
0
77
78
79
80
81
82
83
Percentage

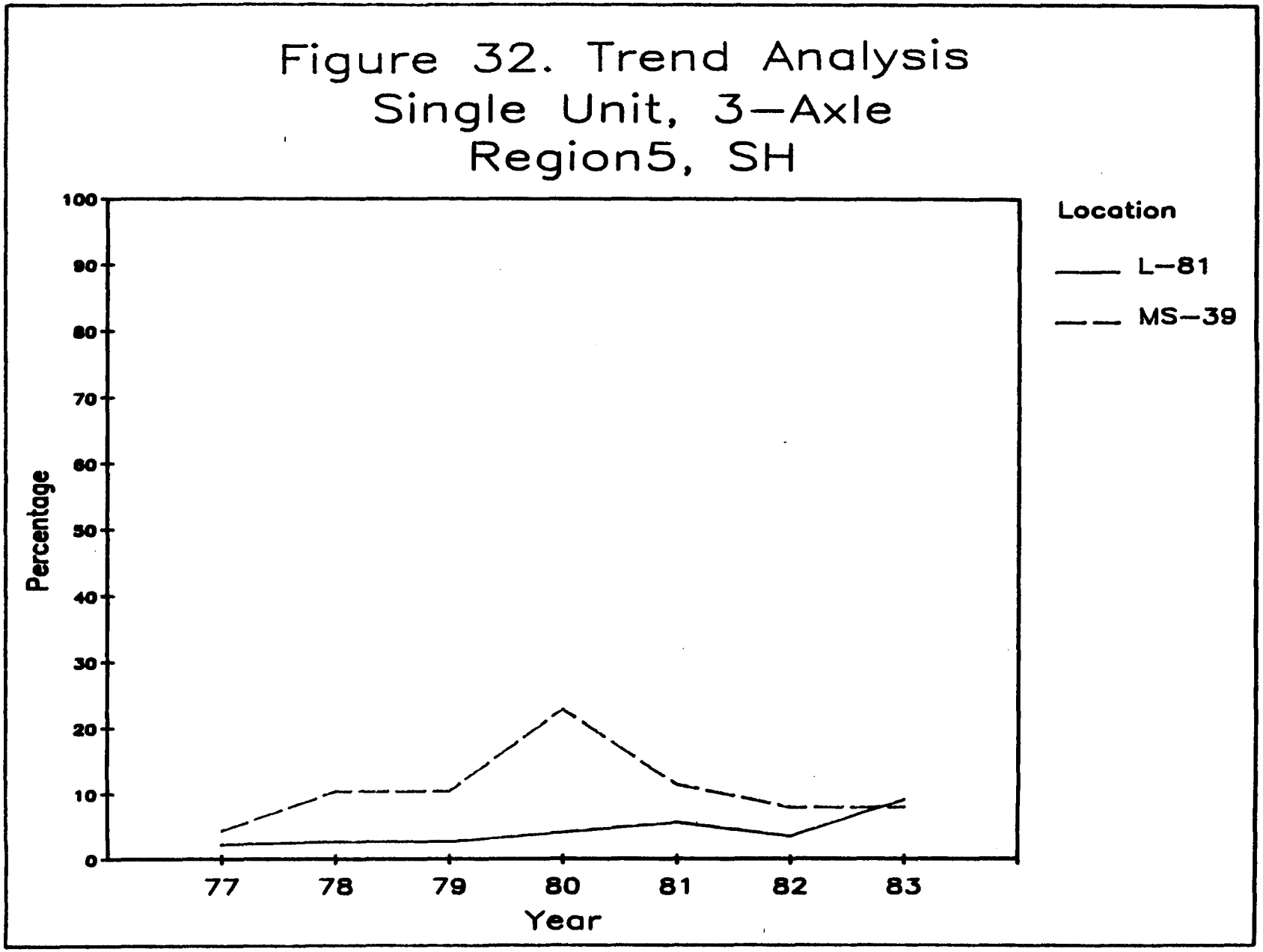


Figure 32. Trend Analysis
Single Unit, 3-Axle
Region5, SH
Location
L-81
MS-39
Percentage
100
90
80
70
60
50
40
30
20
10
0
77
78
79
80
81
82
83
Year

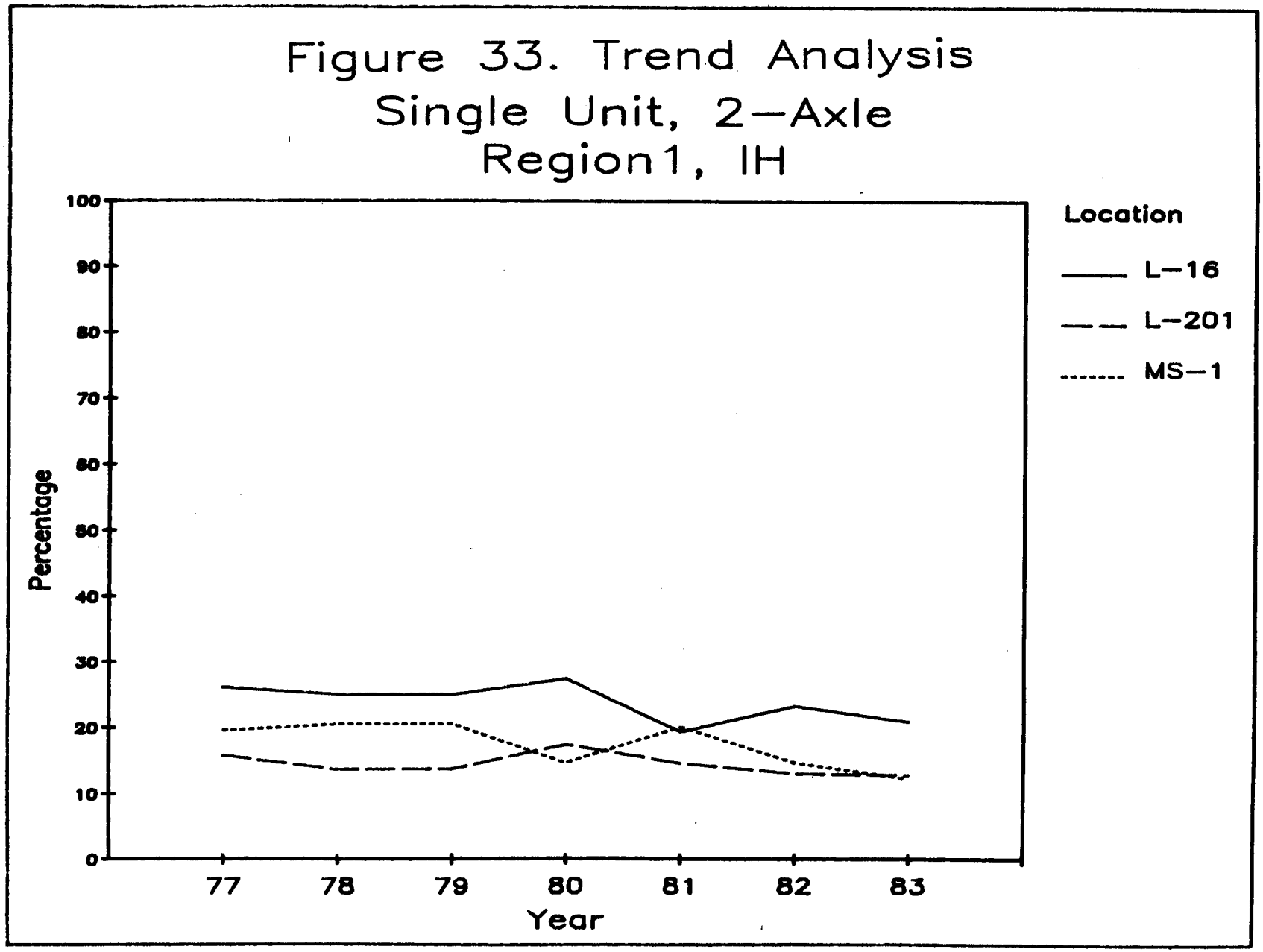


Figure 33. Trend Analysis
Single Unit, 2-Axle
Region1, IH
Location
L-16
L-201
MS-1
Percentage
100
90
80
70
60
50
40
30
20
10
0
77
78
79
80
81
82
83
Year

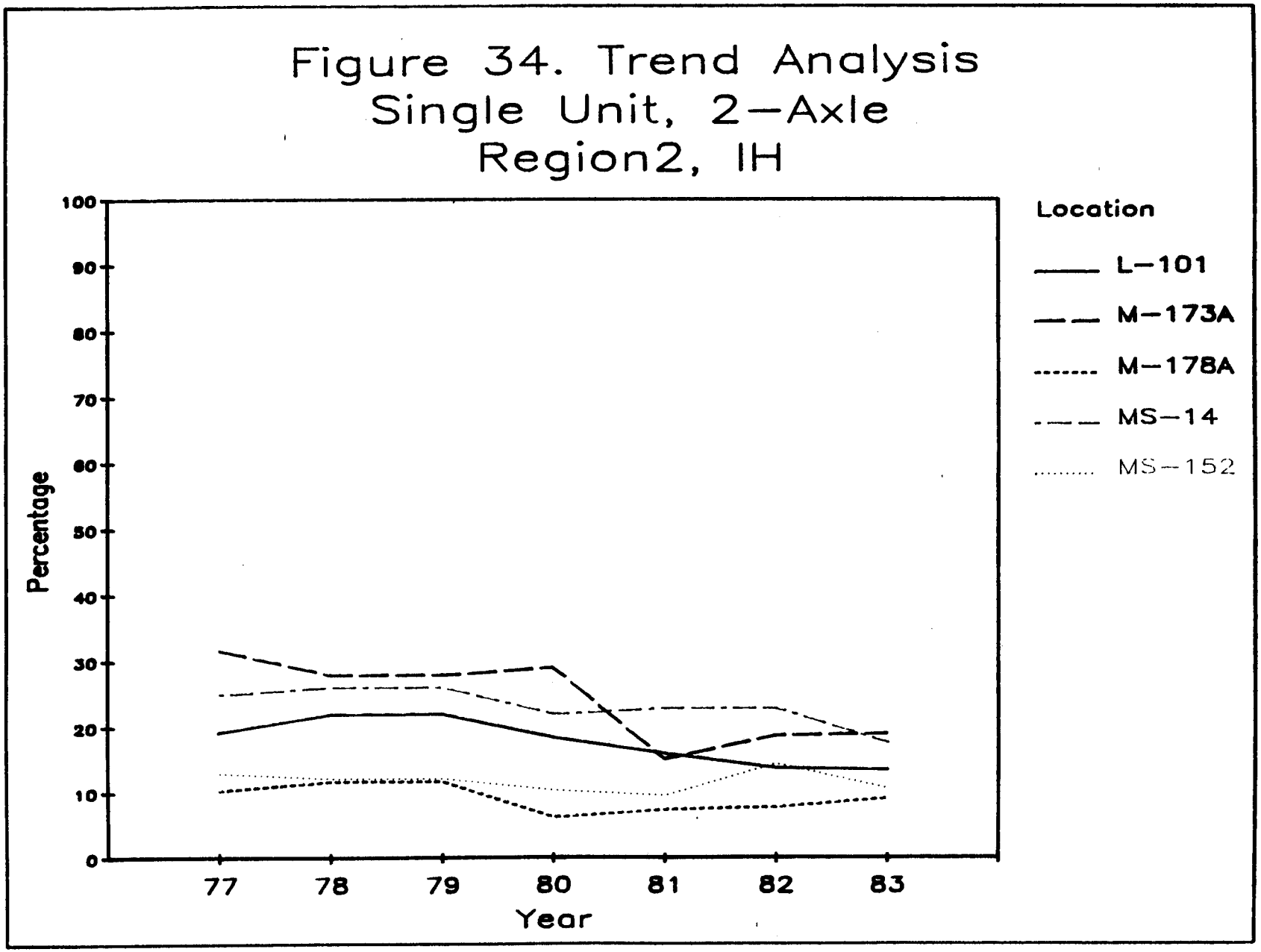


Figure 34. Trend Analysis
Single Unit, 2-Axle
Region2, IH
Percentage
100
90
80
70
60
50
40
30
20
10
0
77
78
79
80
81
82
83
Year
Location
L-101
M-173A
M-178A
MS-14
MS-152

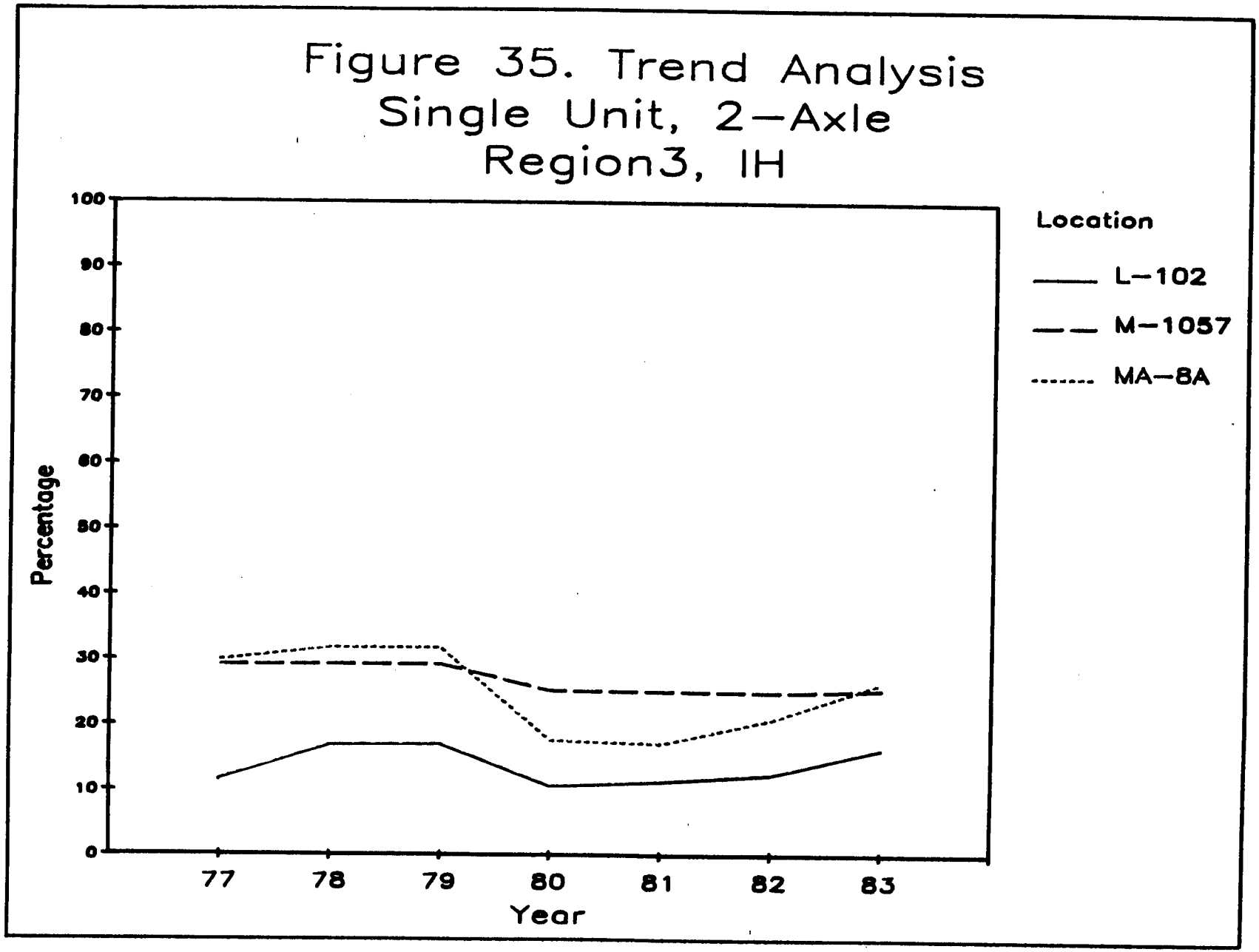


Figure 35. Trend Analysis
Single Unit, 2-Axle
Region3, IH
Location
L-102
M-1057
MA-8A
Percentage
100
90
80
70
60
50
40
30
20
10
0
77
78
79
80
81
82
83
Year

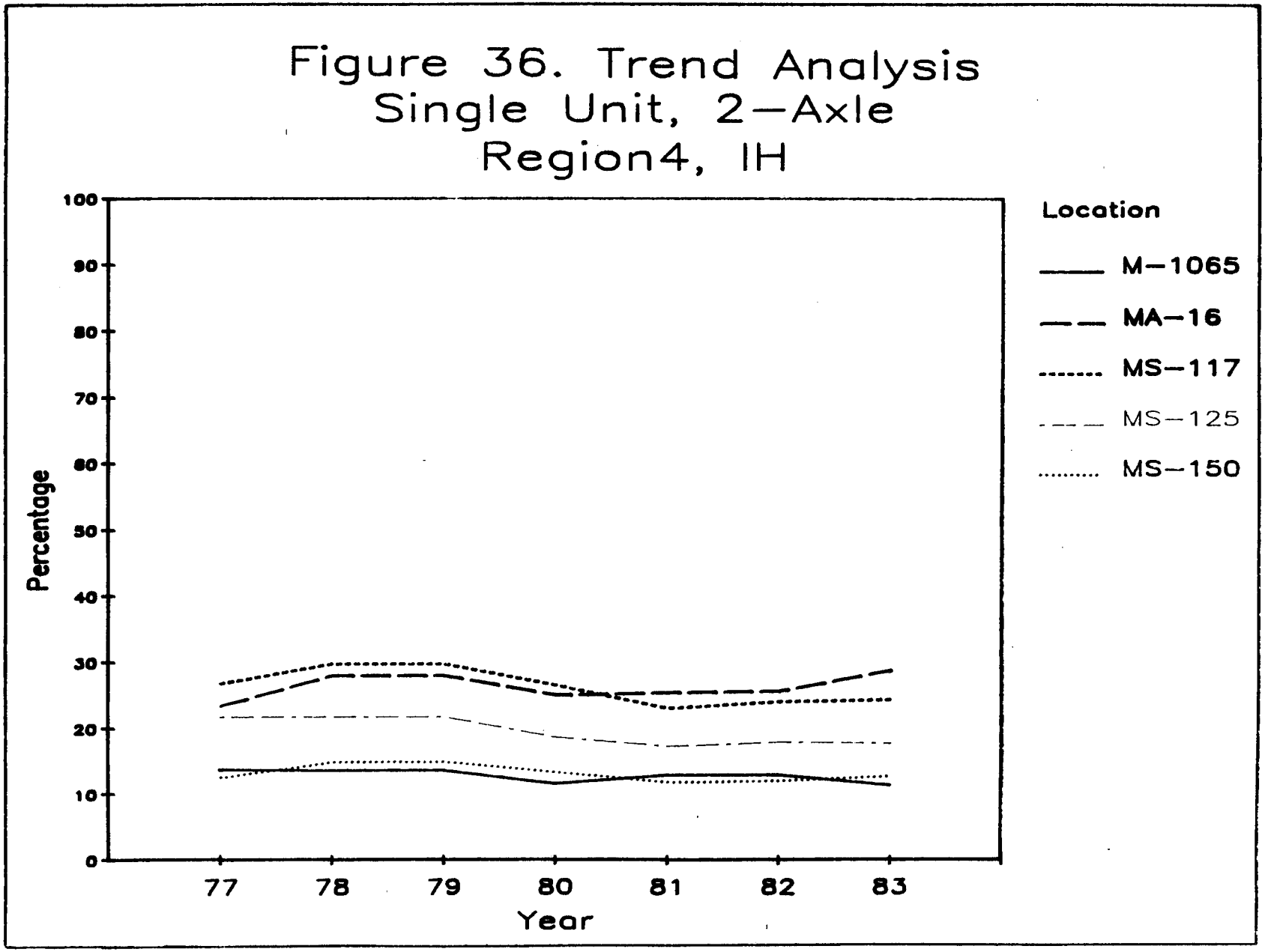


Figure 36. Trend Analysis
Single Unit, 2—Axle
Region4, IH
Percentage
100
90
80
70
60
50
40
30
20
10
0
77
78
79
80
81
82
83
Year
Location
M—1065
MA—16
MS—117
MS—125
MS—150

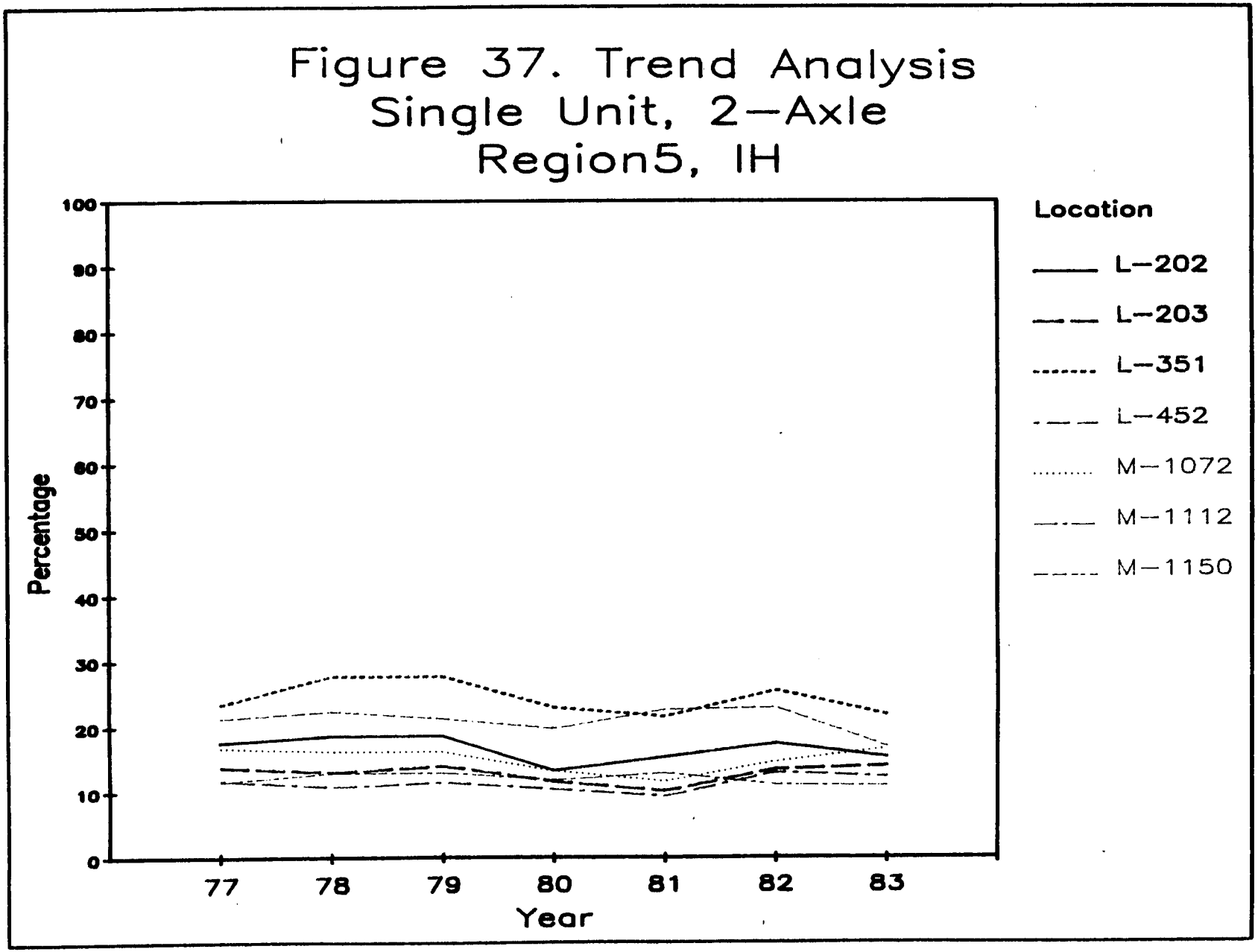


Figure 37. Trend Analysis
Single Unit, 2—Axle
Region5, IH
Percentage
100
90
80
70
60
50
40
30
20
10
0
77
78
79
80
81
82
83
Year
Location
L—202
L—203
L—351
L—452
M—1072
M—1112
M—1150

the 5-or-more-axle semitrailer proportions on Interstate highways. In other words, count locations showing higher proportions of 5-or-more-axle semitrailers always showed lower proportions of SU-1 trucks. This was so because 5-or-more-axle semitrailers and SU-1 trucks were the two dominant truck types on Interstate highways.

Proportions of trucks that were SU-2 trucks at various count locations on Interstate highways were also plotted against time, as shown in Figures 38 through 42, one figure for each region. For all 5 regions, these proportions were small -- ranging from 1 percent to about 8 percent. The year-to-year variation for these proportions was also negligibly small for all count locations in all regions.

3.3 PROPORTIONS OF TRUCKS THAT WERE 2-S2

3.3.1 U.S. Highways

Proportions of 2-S2 tractor - semitrailers as percentages of truck traffic on U.S. highways were plotted against time, as shown in Figures 43 through 45. Most count locations indicated these proportions to be about 5 to 10 percent, particularly between 1980 and 1983. As with Interstate highways, difference in the proportions among different count locations for any one year was small.

3.3.2 State Highways

Proportions of 2-S2 tractor - semitrailers as percentages of total trucks on State highways were plotted against time, as shown in Figures 46 and 47. These proportions ranged from 5 to 15 percent. The trends over time at all count locations were relatively stable or decreasing.

3.3.3 Interstate Highways

Proportions of 2-S2 tractor - semitrailers as percentages of total trucks on Interstate highways were plotted against time, as shown in Figures 48 through 52, one graph for each region. These proportions ranged from 3 percent to 10 percent for Regions 1 through 4, and 6 to 14 percent for Region 5. Difference in these proportions among count locations for any one year was small, and appeared to be location specific.

3.4 PROPORTIONS OF TRUCKS THAT WERE TRUCK AND TRAILER COMBINATIONS

The proportions of truck & trailer combinations as percentages of total trucks were usually very small. They ranged from almost zero to 8 percent on Interstate, U.S., and State highways between 1977 and 1983. Slight changes in these proportions over time were indicated and the difference among count locations for any one year was small to negligible.

3.5 PROPORTIONS OF TRUCKS THAT WERE DOUBLES

Doubles accounted for the smallest fraction in truck traffic, compared with all other truck types. On Interstate highways, they ranged from zero to six percent. On U.S. and State highways, they represented less than five percent of total trucks. Variation in these proportions with time was negligible.

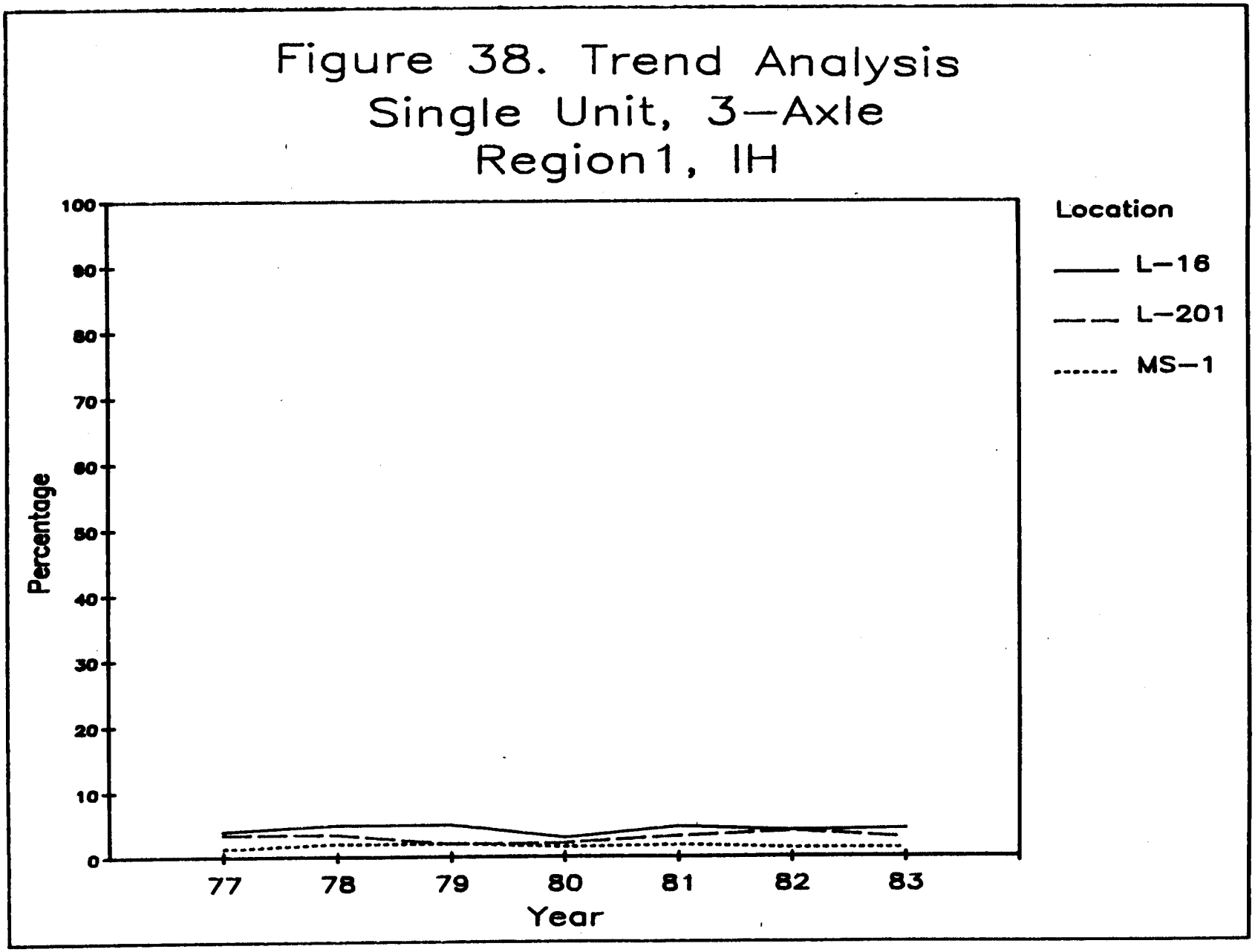


Figure 38. Trend Analysis
Single Unit, 3-Axle
Region1, IH
Location
L-16
L-201
MS-1
Percentage
100
90
80
70
60
50
40
30
20
10
0
77
78
79
80
81
82
83
Year

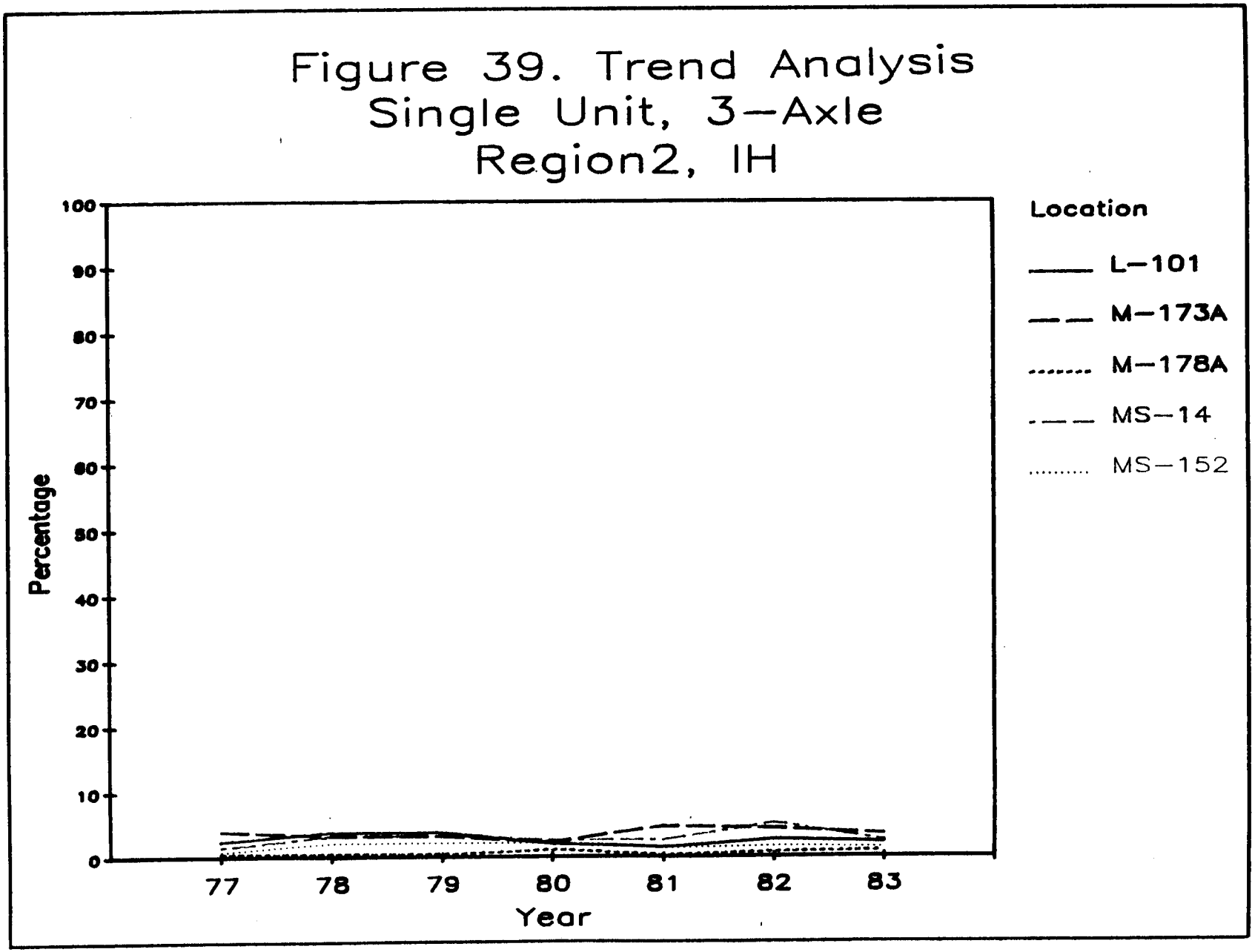


Figure 39. Trend Analysis
Single Unit, 3-Axle
Region2, IH
Location
L-101
M-173A
M-178A
MS-14
MS-152
Percentage
100
90
80
70
60
50
40
30
20
10
0
77
78
79
80
81
82
83
Year

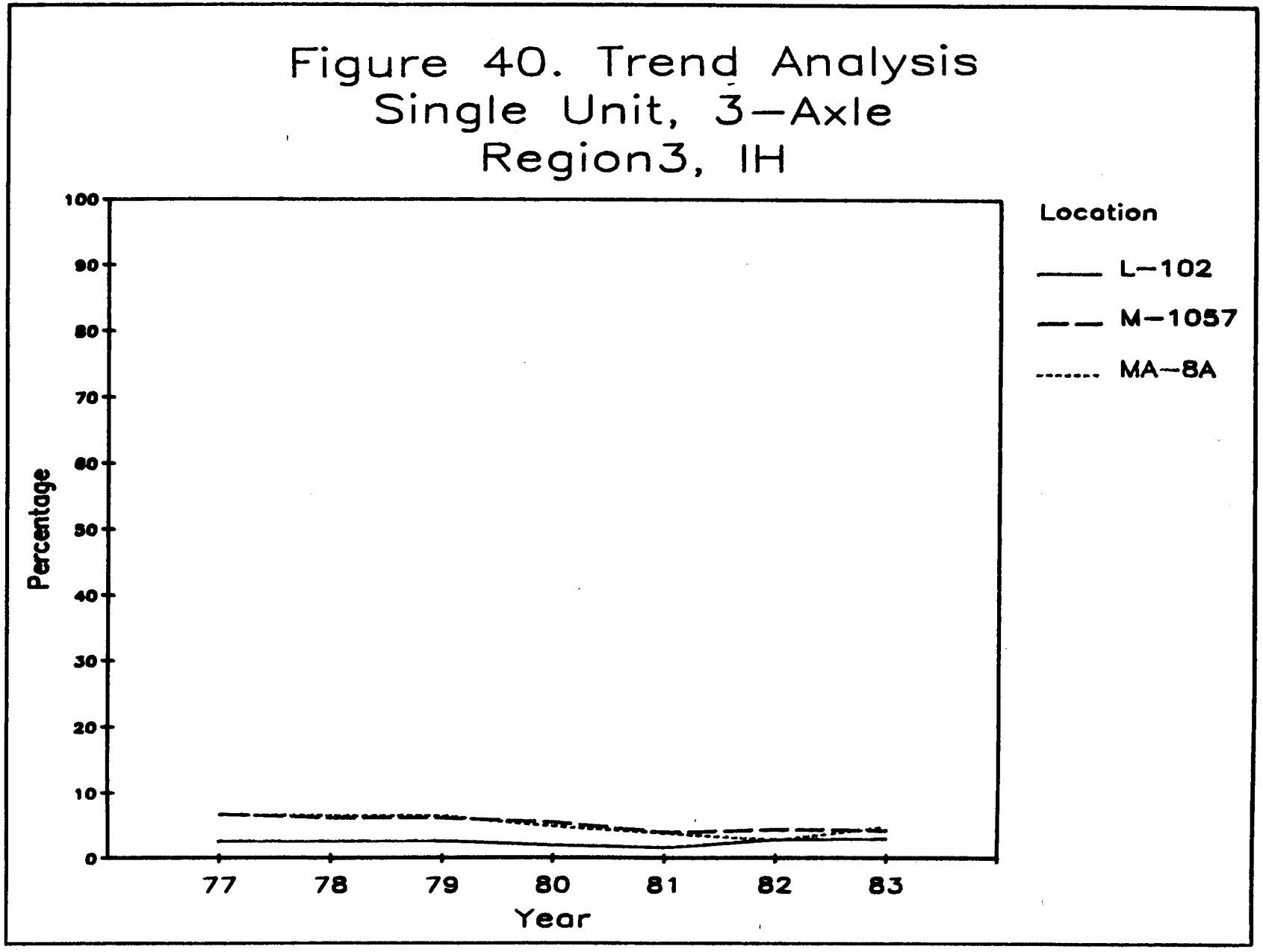
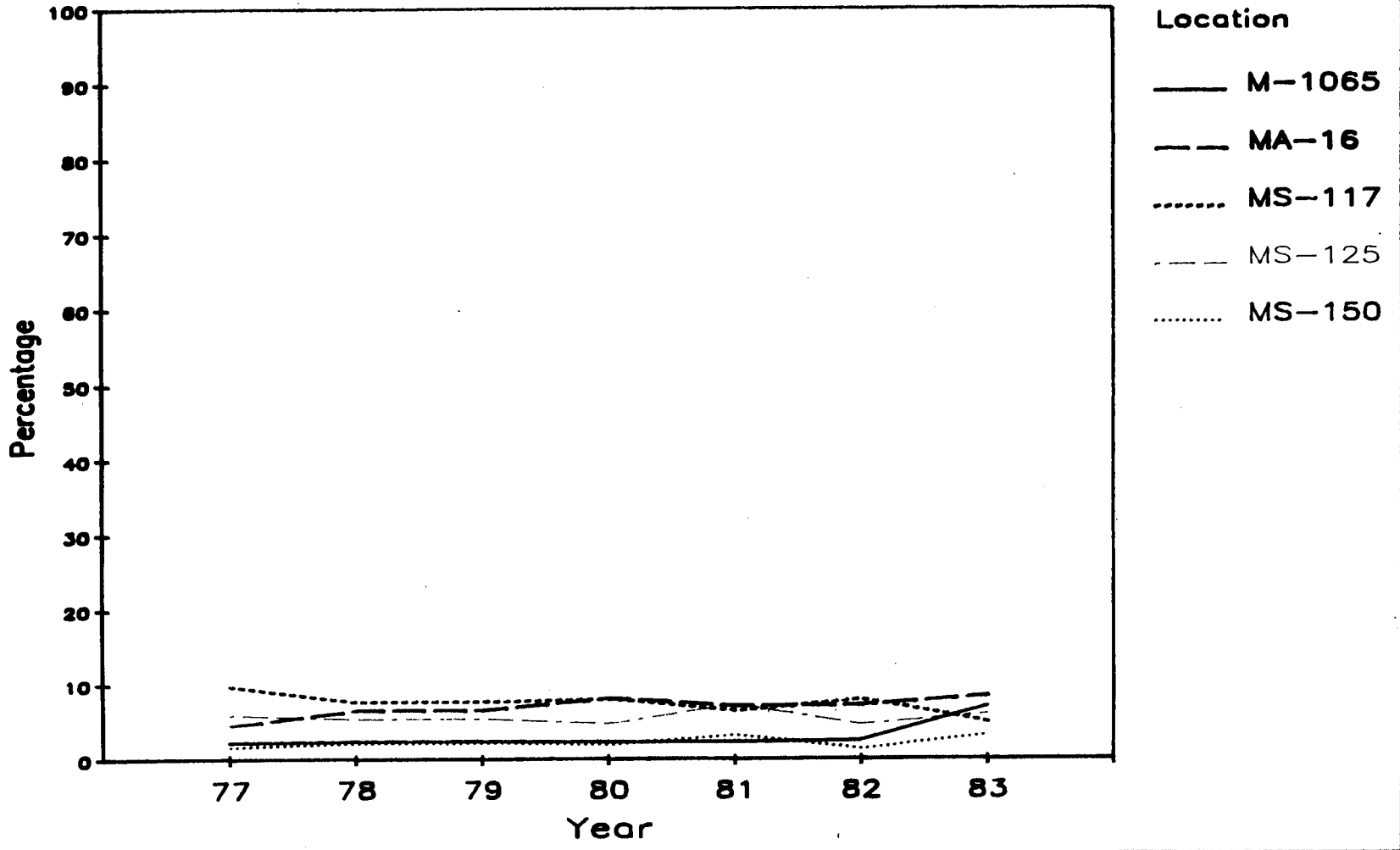


Figure 40. Trend Analysis
Single Unit, 3—Axle
Region3, IH
Location
L—102
M—1057
MA—8A
Percentage
100
90
80
70
60
50
40
30
20
10
0
77
78
79
80
81
82
83
Year

Figure 41. Trend Analysis
Single Unit, 3-Axle
Region4, IH



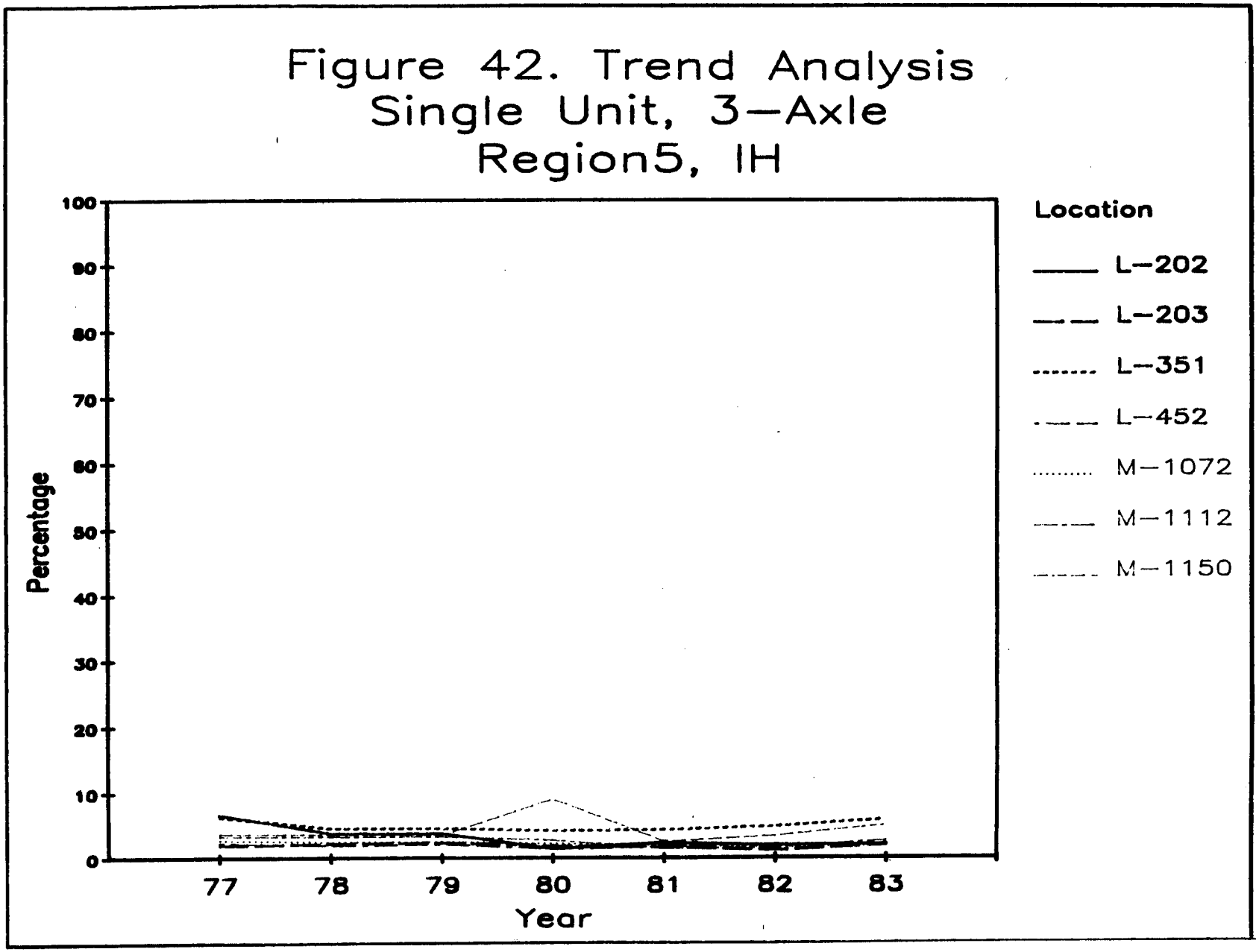


Figure 42. Trend Analysis
Single Unit, 3—Axle
Region5, IH
Percentage
100
90
80
70
60
50
40
30
20
10
0
77
78
79
80
81
82
83
Year
Location
L—202
L—203
L—351
L—452
M—1072
M—1112
M—1150

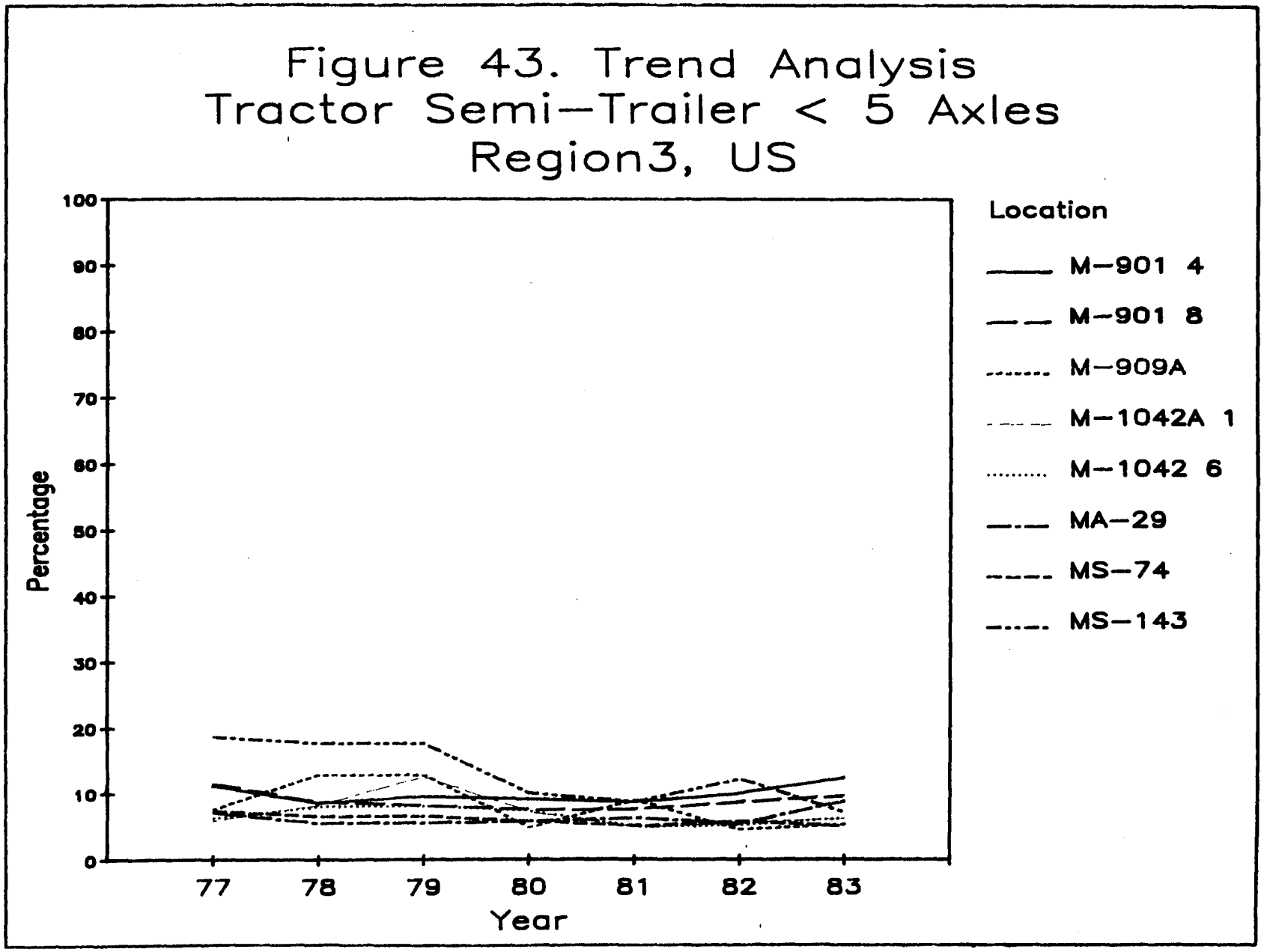
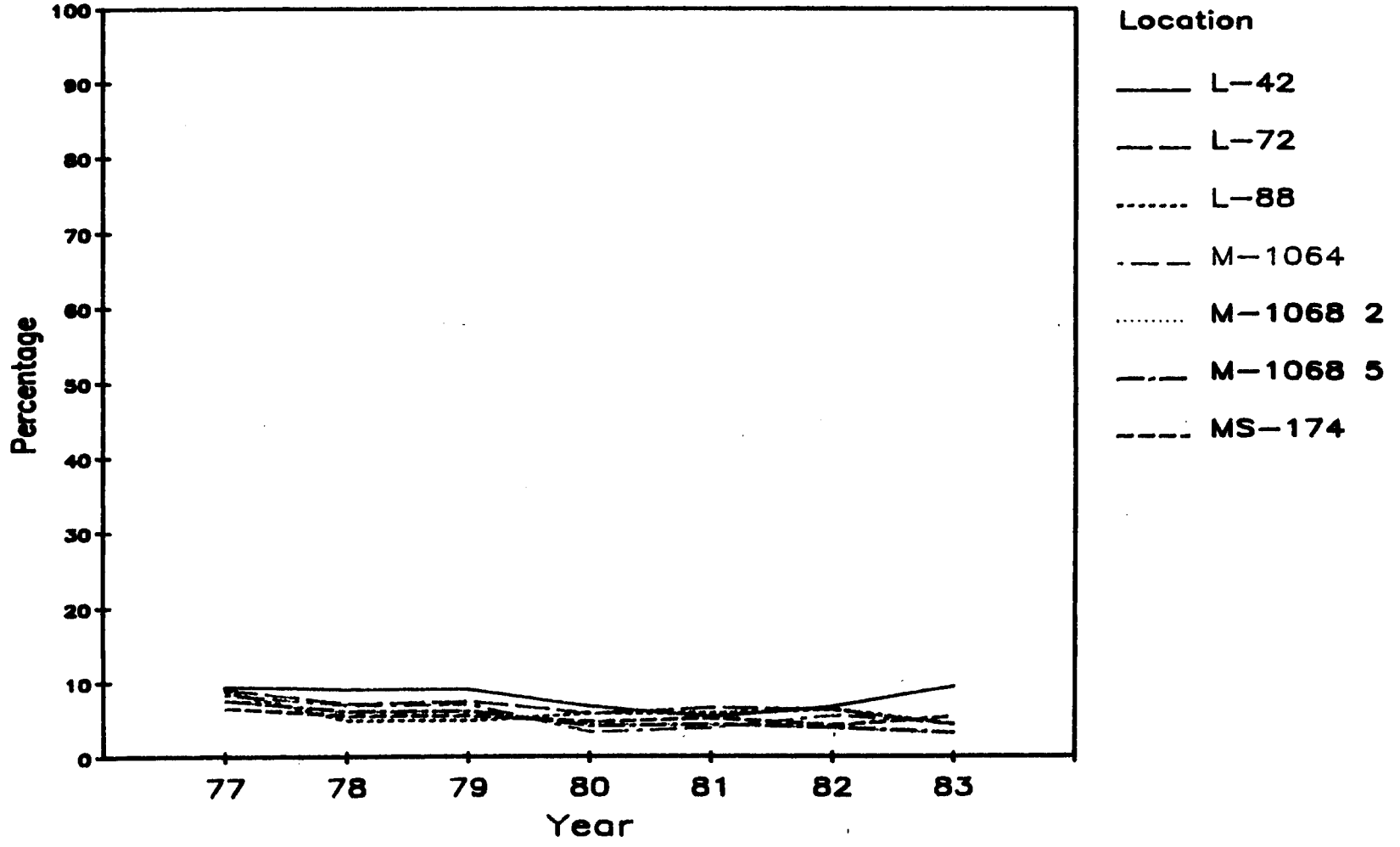


Figure 43. Trend Analysis
Tractor Semi—Trailer < 5 Axles
Region3, US
Percentage
100
90
80
70
60
50
40
30
20
10
0
77
78
79
80
81
82
83
Year
Location
M—901 4
M—901 8
M—909A
M—1042A 1
M—1042 6
MA—29
MS—74
MS—143

Figure 44. Trend Analysis
Tractor Semi—Trailer < 5 Axles
Region4, US



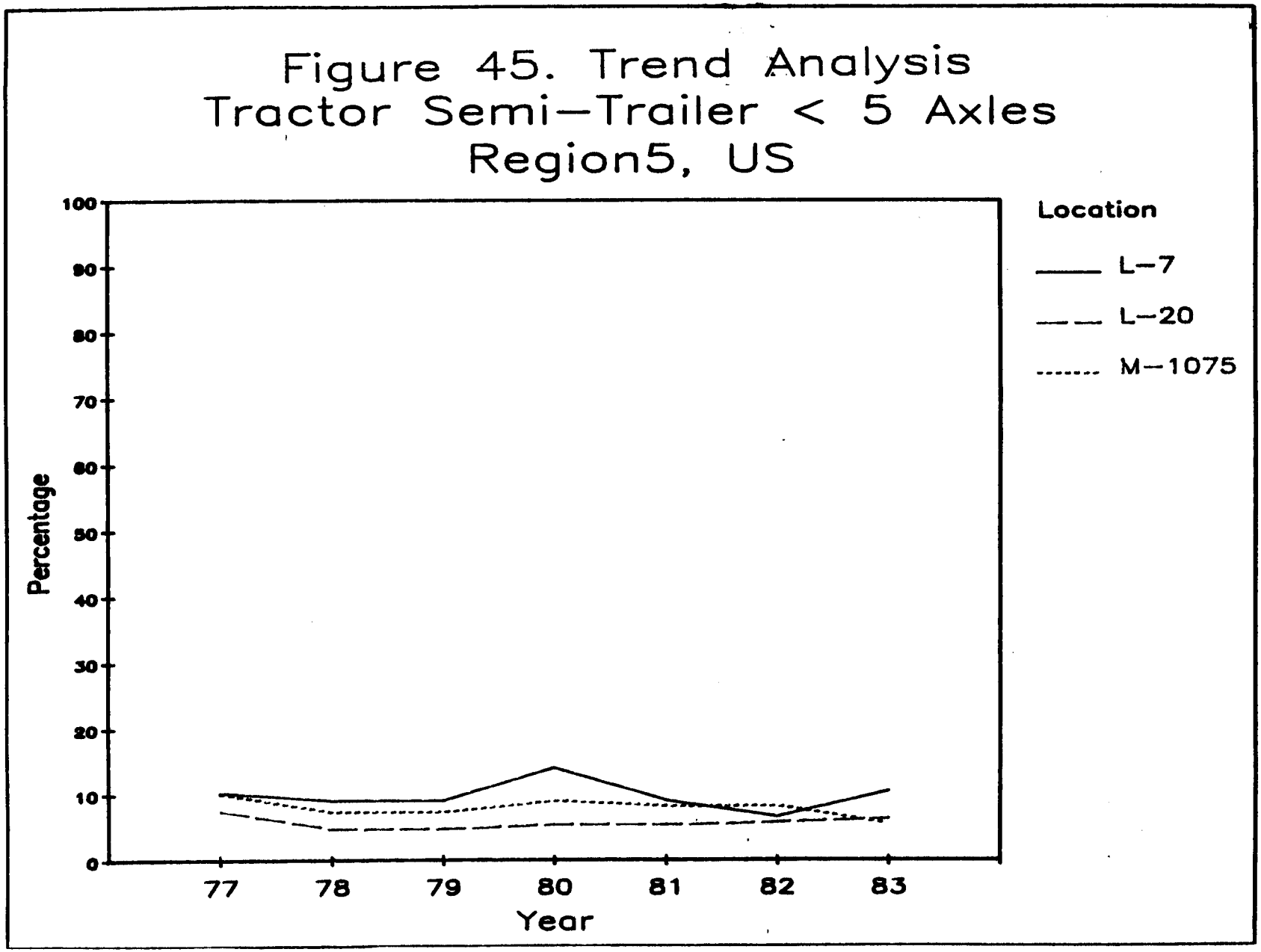
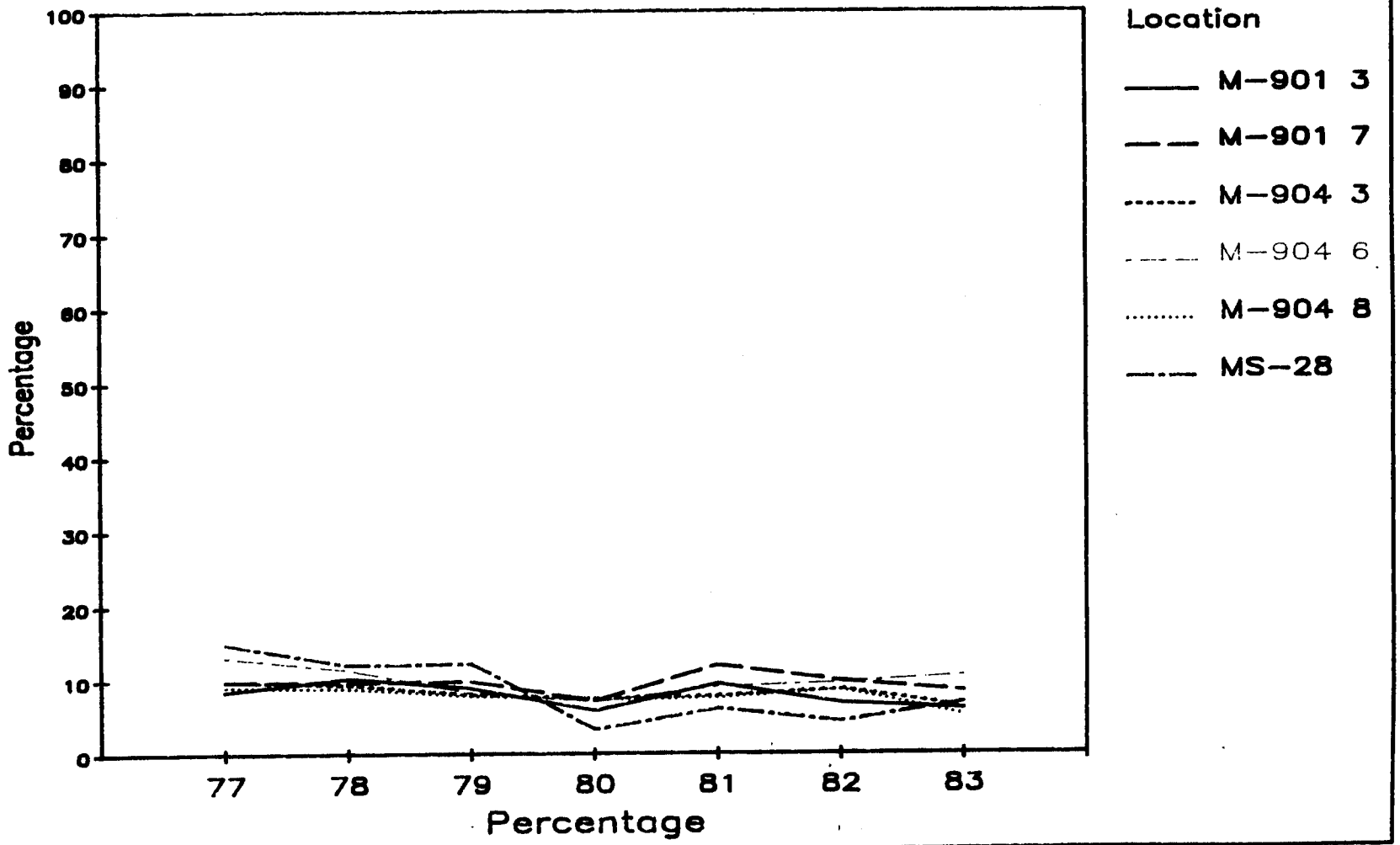


Figure 45. Trend Analysis
Tractor Semi—Trailer < 5 Axles
Region5, US
Location
L—7
L—20
M—1075
Percentage
100
90
80
70
60
50
40
30
20
10
0
77
78
79
80
81
82
83
Year

Figure 46. Trend Analysis
Tractor Semi—Trailer < 5 Axles
Region3, SH



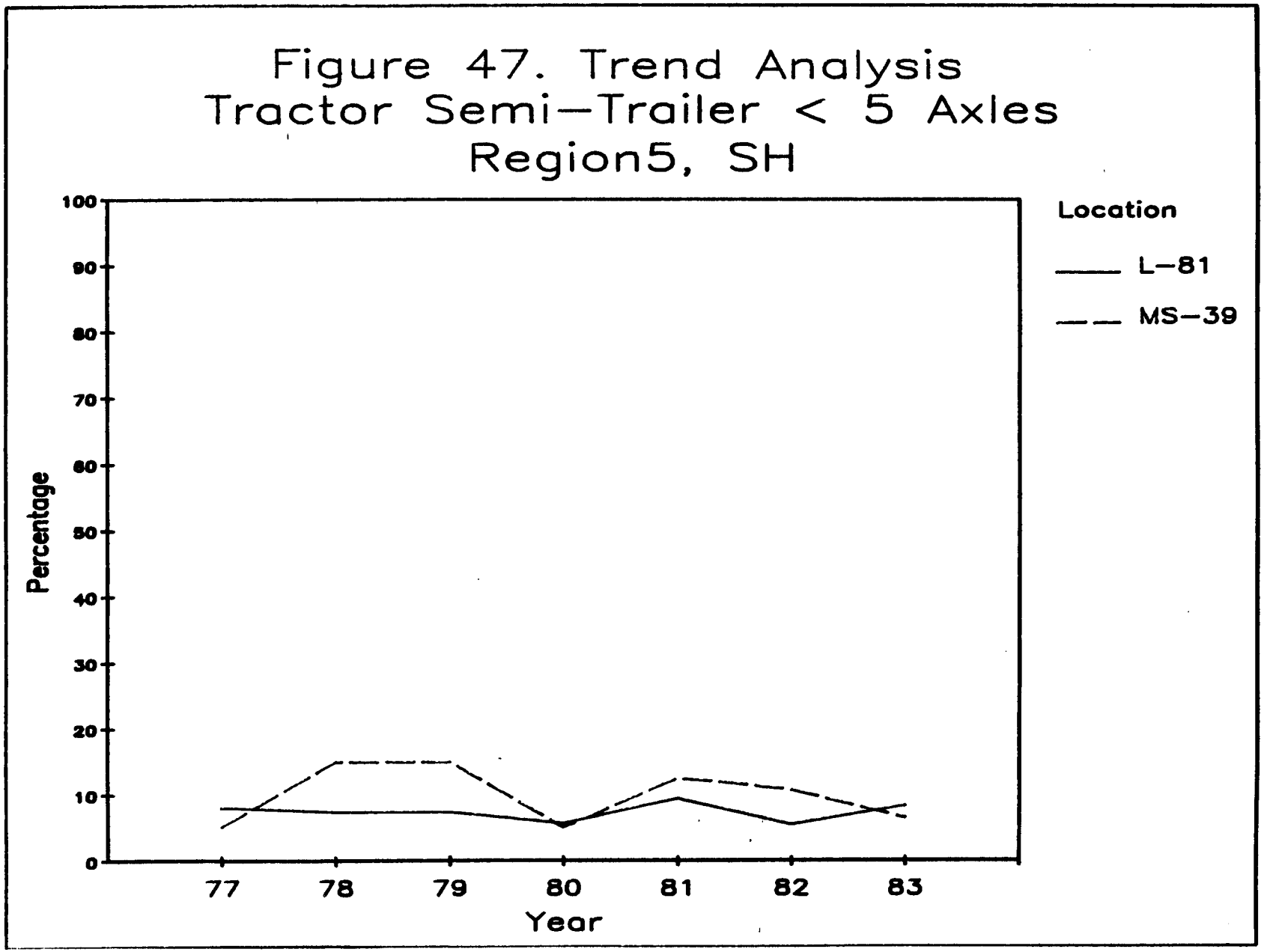


Figure 47. Trend Analysis
Tractor Semi—Trailer < 5 Axles
Region5, SH
Location
L—81
MS—39
Percentage
100
90
80
70
60
50
40
30
20
10
0
77
78
79
80
81
82
83
Year

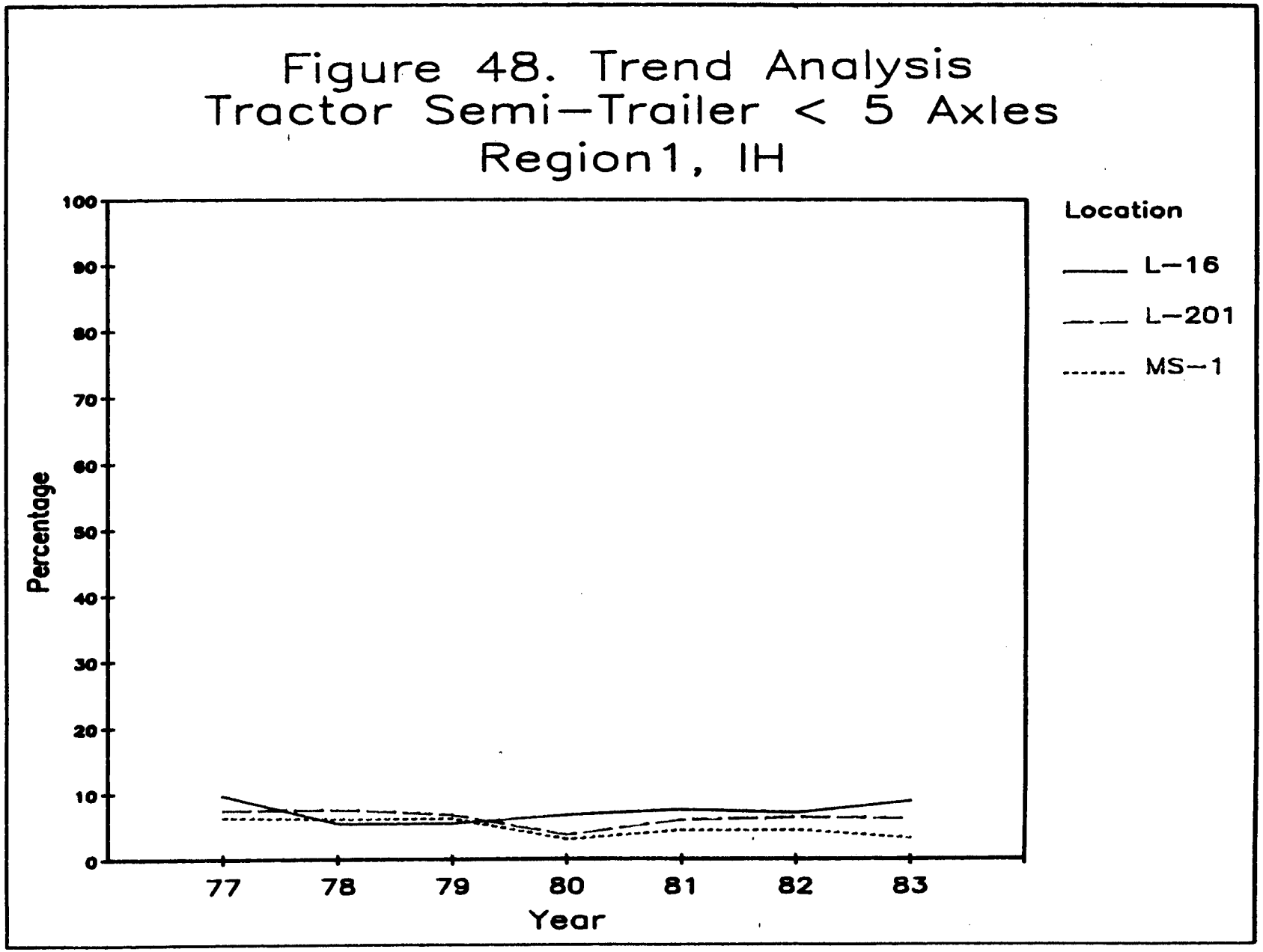
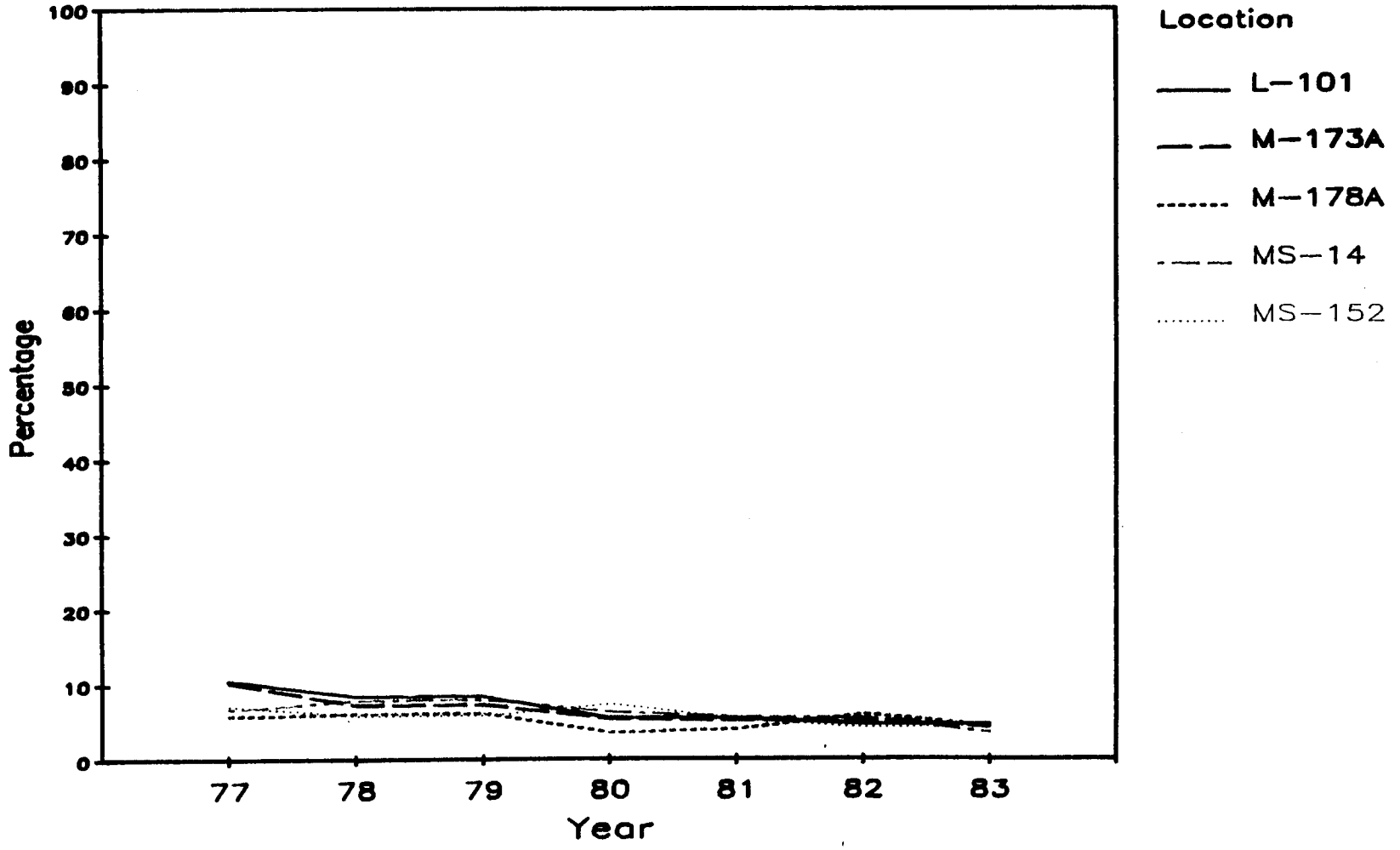


Figure 48. Trend Analysis
Tractor Semi—Trailer < 5 Axles
Region1, IH
Location
L—16
L—201
MS—1
Percentage
100
90
80
70
60
50
40
30
20
10
0
77
78
79
80
81
82
83
Year

Figure 49. Trend Analysis
Tractor Semi–Trailer < 5 Axles
Region2, IH



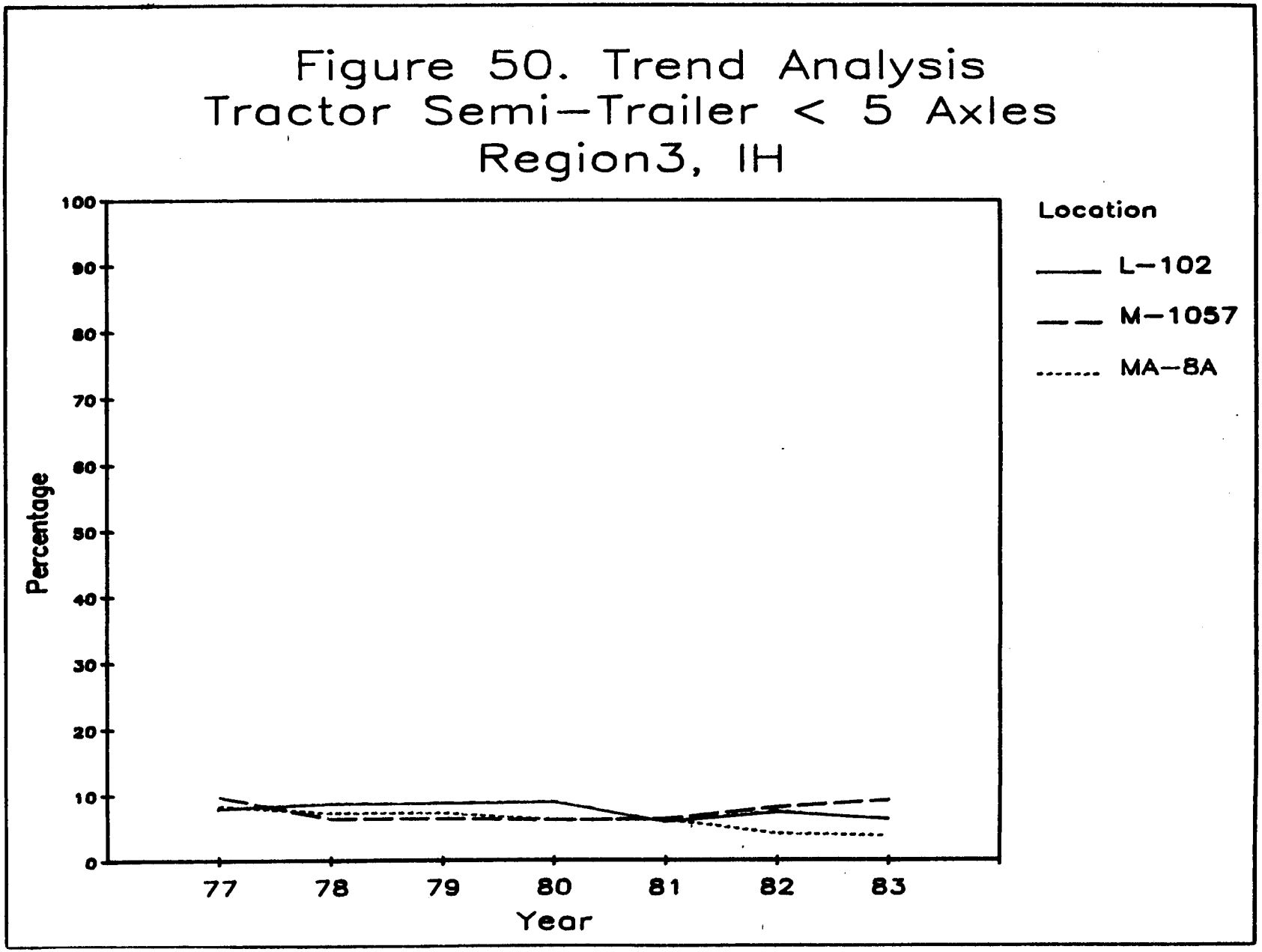


Figure 50. Trend Analysis
Tractor Semi—Trailer < 5 Axles
Region3, IH
Location
L—102
M—1057
MA—8A
Percentage
100
90
80
70
60
50
40
30
20
10
0
77
78
79
80
81
82
83
Year

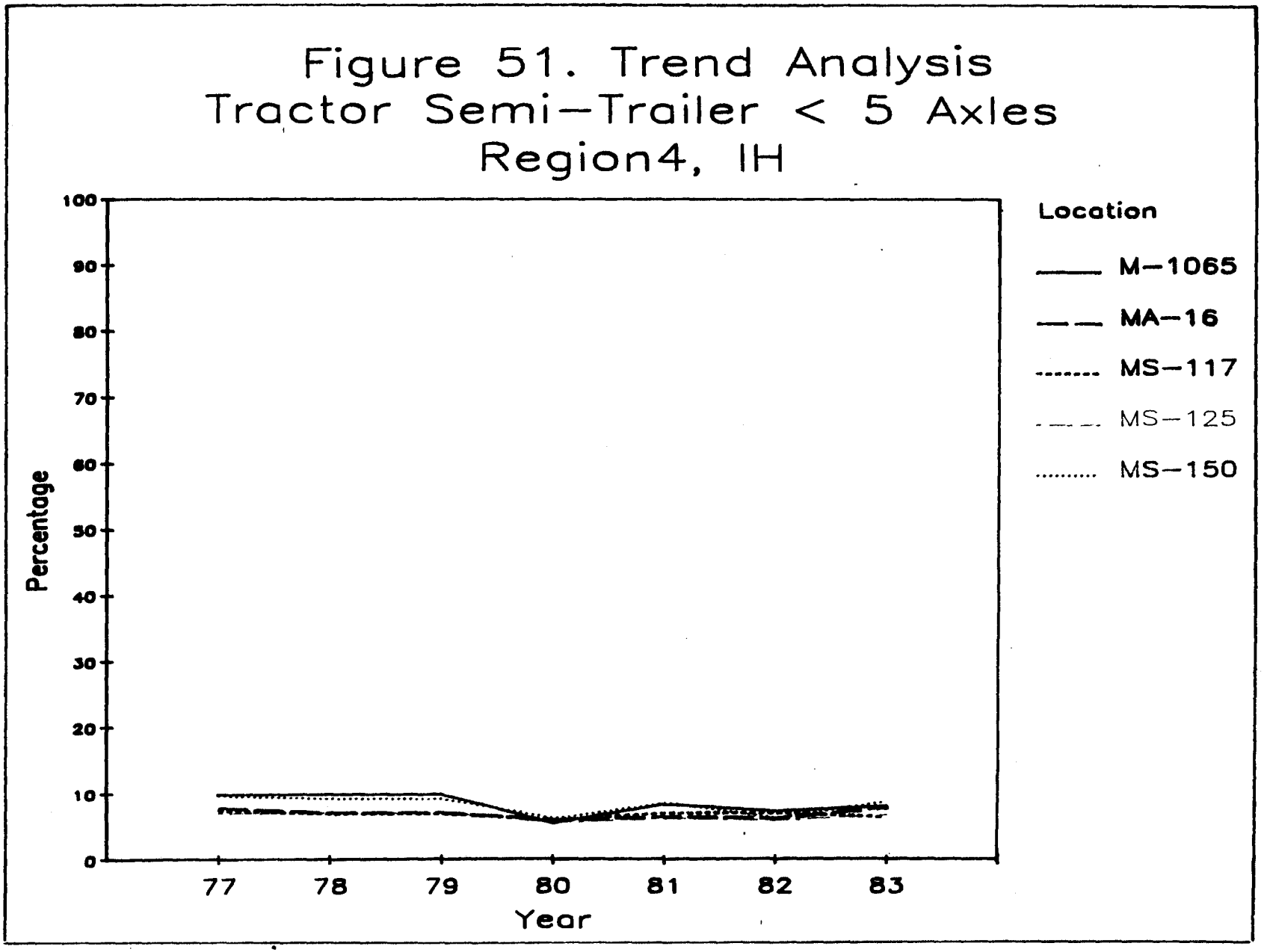


Figure 51. Trend Analysis
Tractor Semi—Trailer < 5 Axles
Region4, IH
Percentage
100
90
80
70
60
50
40
30
20
10
0
77
78
79
80
81
82
83
Year
Location
M—1065
MA—16
MS—117
MS—125
MS—150

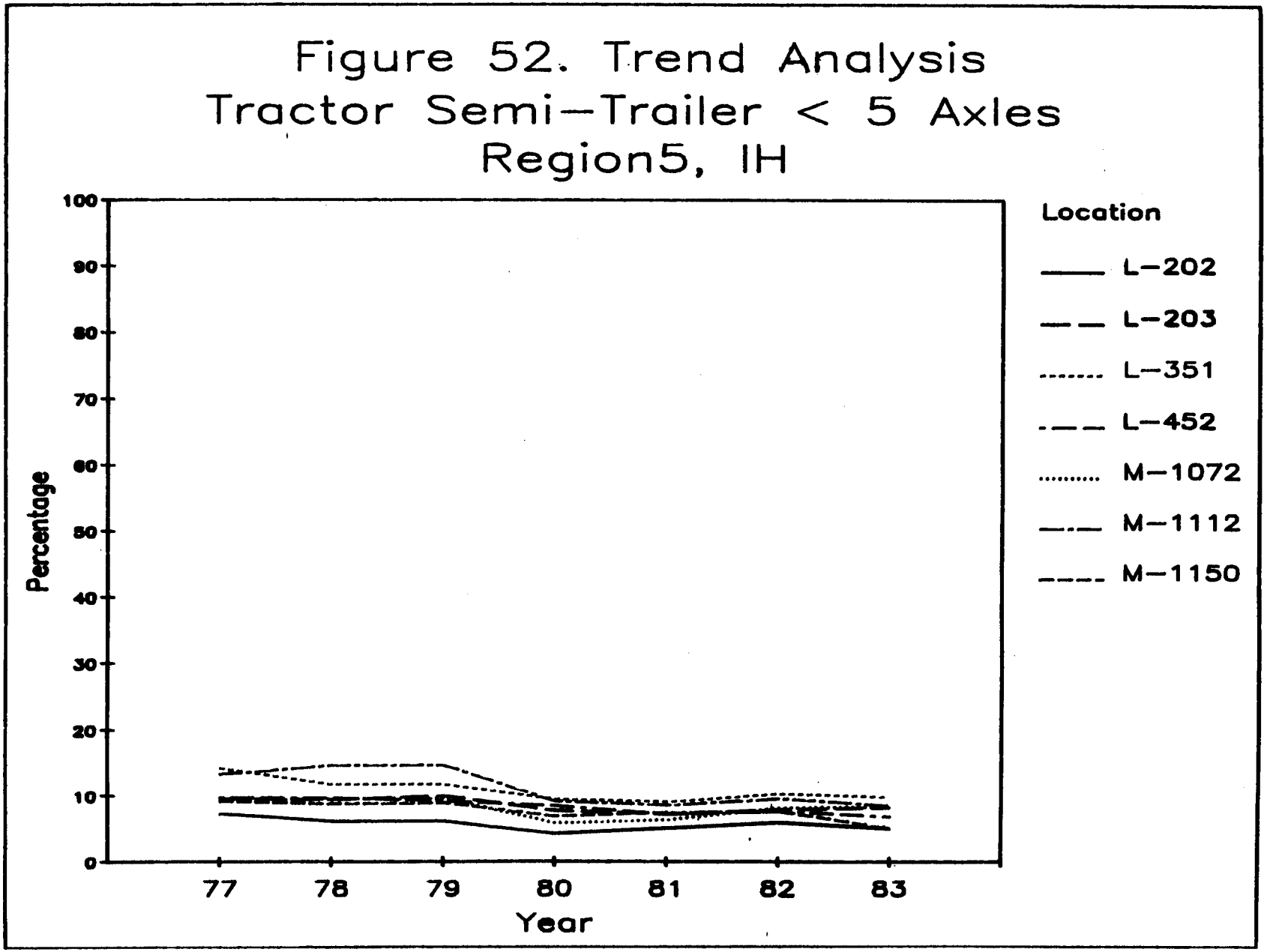


Figure 52. Trend Analysis
Tractor Semi—Trailer < 5 Axles
Region5, IH
Percentage
100
90
80
70
60
50
40
30
20
10
0
77
78
79
80
81
82
83
Year
Location
L—202
L—203
L—351
L—452
M—1072
M—1112
M—1150

3.6 SUMMARY OF TRUCK CLASSIFICATION PROPORTIONS

Table 3 summarizes the proportions of trucks that were 5-or-more-axle tractor - semitrailers, SU-1, SU-2, 2-S2, trucks and trailers, and doubles for Interstate, U.S., and State highways. It can be seen that 5-or-more-axle tractor - semitrailers were the dominant truck type on all three highway classes, followed by SU-1 trucks, and all other truck types. It is noted that although slight differences in the ranges of these proportions existed among the three highway classes for many truck types, the differences within highway classes were more significant. The differences in these proportions were not attributable to regions (or highway districts). It was likely that the variability in truck proportions was highly attributable to specific locations of the count stations. Highway class, region of the state, and year, therefore, would not necessarily provide sufficient information for an accurate prediction of the mix of trucks at that location. In order to predict the mix of trucks at a specific location and time, one must know more about other factors such as surrounding industries, economic factors, and seasonal influences upon truck traffic.

Table 3. Proportions of Each Truck Type As Percentages of Total Trucks

Truck Type	Percent of Total Trucks		
	Interstate Highways	U.S. Highways	State Highways
5-or-more axle semitrailers	50-80	30-75	30-70
SU-1	6-30	10-50	15-50
SU-2	1-8	1-15	1-22
2-S2	5-15	5-20	5-15
Truck & Trailer	< 10	< 10	< 10
Doubles	< 5	< 5	< 5

4.0 FINDINGS AND RECOMMENDATIONS

The validity of SDHPT counts was not questioned during the course of this study. Obviously, if improper and/or inconsistent methods were used to collect data, the conclusions could be different.

Analysis of truck characteristics as a proportion of total traffic and total truck population for various road classes indicates that the 3-S2 vehicle is the predominant cargo vehicle on the highway system.

In the study of truck traffic as a percentage of total traffic, large variations were observed in the proportion of 3-S2 and SU-1 trucks. Neither ADT nor regions was found to be correlated with these proportions. Hence, no easily discernible pattern or trends in the proportions of these two truck types were identified.

In the study of truck traffic as a percentage of total truck population, a large difference in the proportions was noted within highway classifications. The large variability in truck proportions was highly attributable to specific locations of the count stations. To be able to predict the mix of trucks at a specific location and time, more information concerning economic factors, surronding industrial activities, and seasonal influence upon truck traffic is required.

4.1 RECOMMENDATIONS FOR IMPLEMENTATION

The results of this study could be beneficial to State Agencies in scheduling their highway maintenances based on the concentration and trends of different truck categories throughout the state. The findings also demonstrates a need for classification data at or very near the site being considered for redesign. A low cost, portable, vehicle classifier system is needed to accomplish this goal.

4.2 RECOMMENDATIONS FOR FUTURE RESEARCH

The results from this analysis highlight the complexity of the truck element in highway maintenance, planning, and pavement and geometric design. The truck traffic mix tends to be industry specific and, therefore, the percentage of such vehicles in the traffic vary widely between locations in the same road class. It should be stressed, however, that appropriate application of random samples allows statistically reliable estimates of functional and State level traffic characteristics. A microscopic modeling approach to truck classification prediction could offer some greater insight into variations observed.

5.0 REFERENCES

1. "Manual Count Annual Computer Tapes Between 1977 and 1983," Texas Department of Highways and Public Transportation, District 10, Austin, Texas.

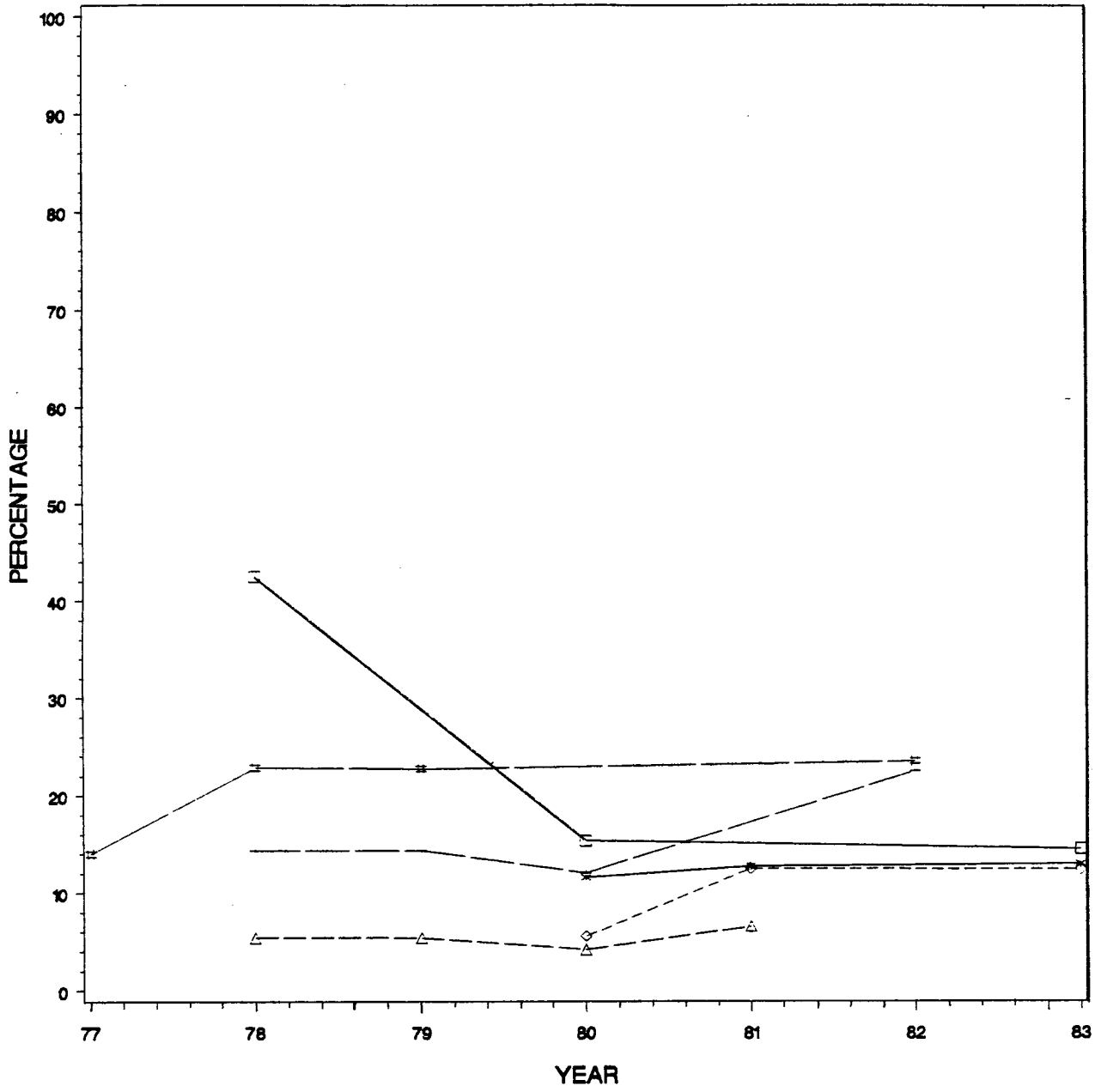
2. Mason, J.M., D. Middleton, K. Simmons, and R. Becker. "Identification of Special-Use Truck Traffic." Research Report 420-1, Texas Transportation Institute, Texas A&M University, College Station, Texas, June 1985.

6.0 APPENDIX

Appendix 6.1 Proportions of 5-or-More-Axle Tractor - Semitrailers in Total Traffic, Farm-to-Market Roads

TREND ANALYSIS

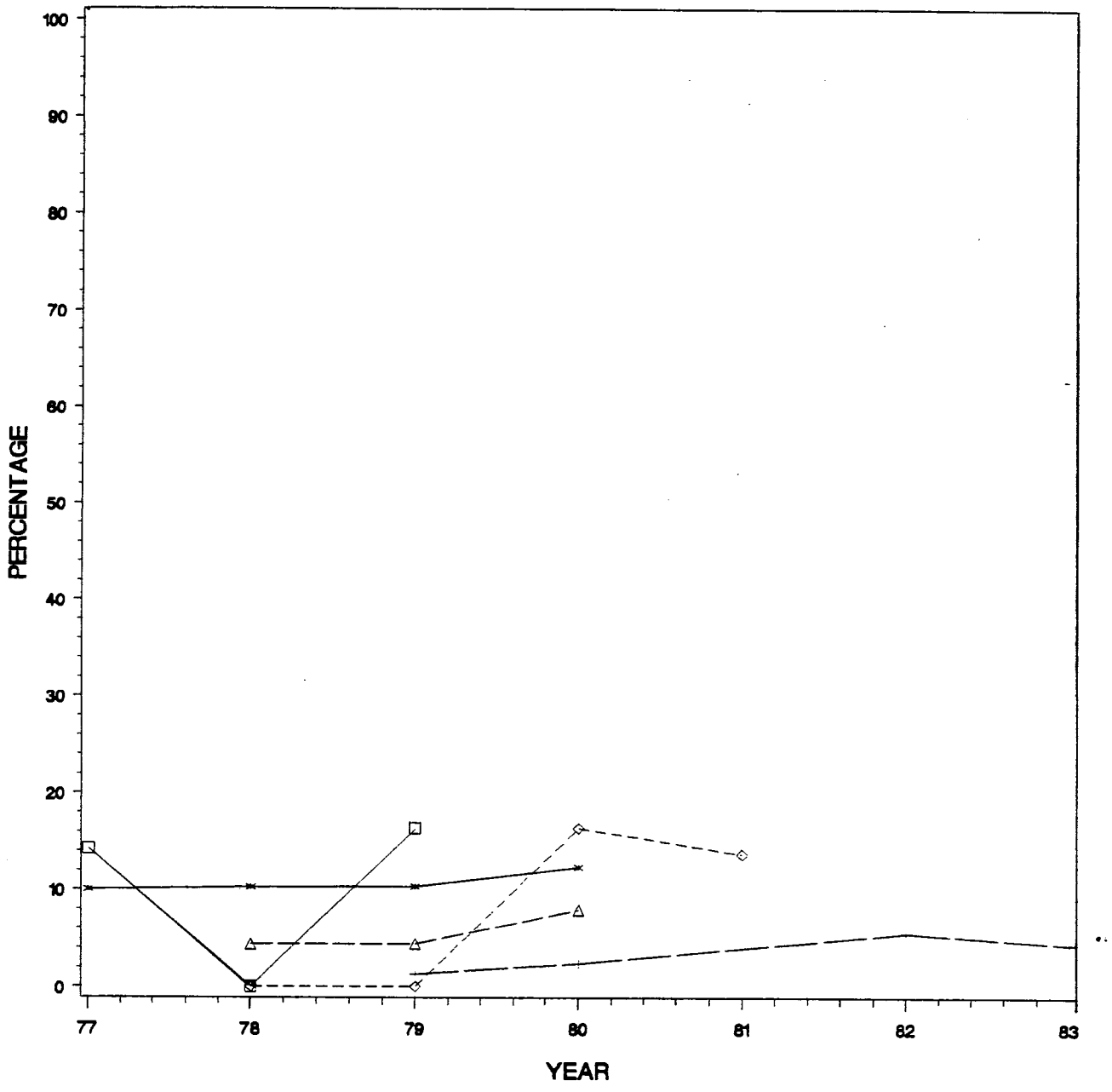
TRACTOR SEMI-TRAILER, 5 OR MORE AXLES
REGION 1, FM, 50< =AADT <=250



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

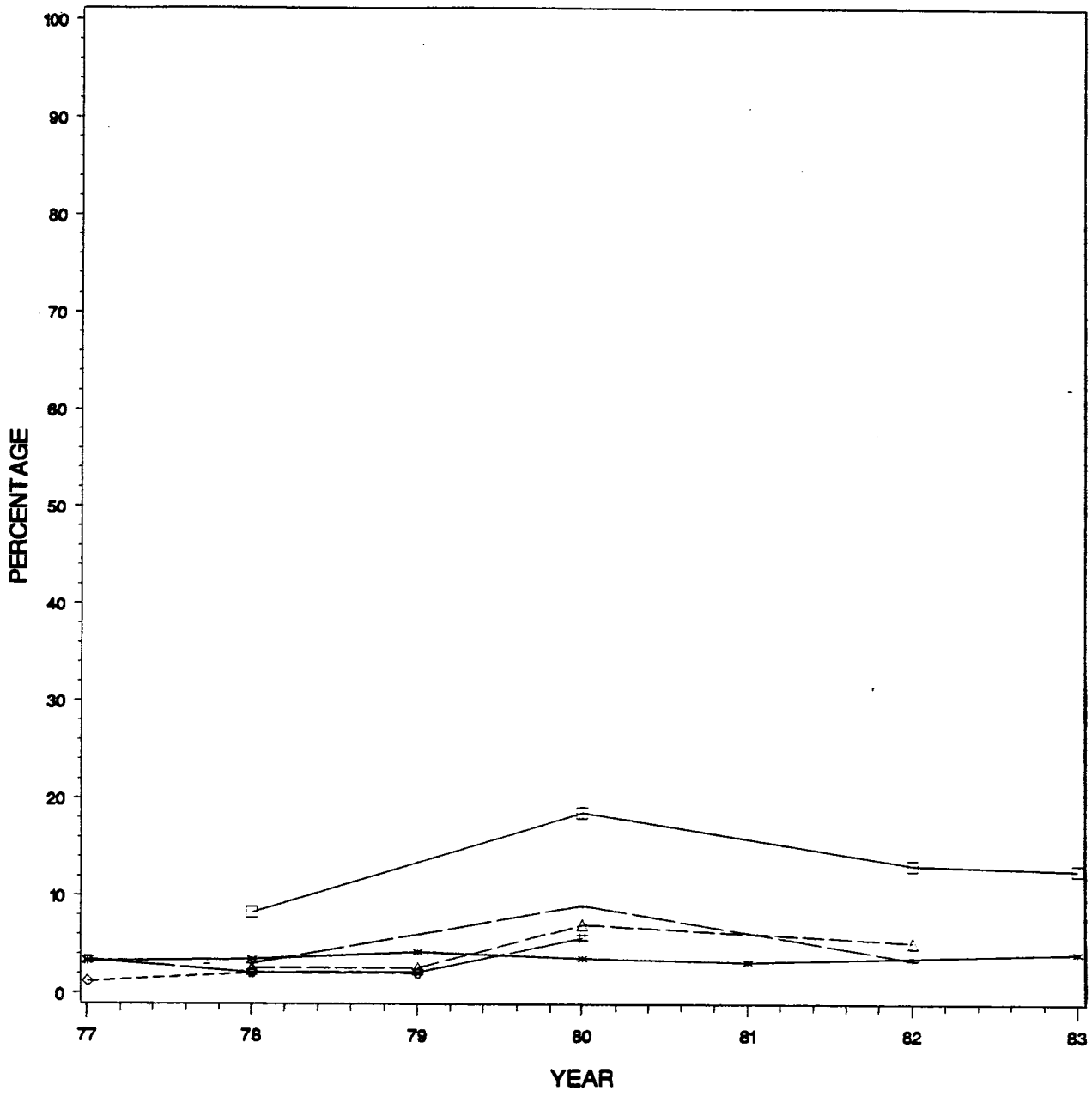
TRACTOR SEMI-TRAILER, 5 OR MORE AXLES
REGION 2, FM, 50 <=AADT< =250



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

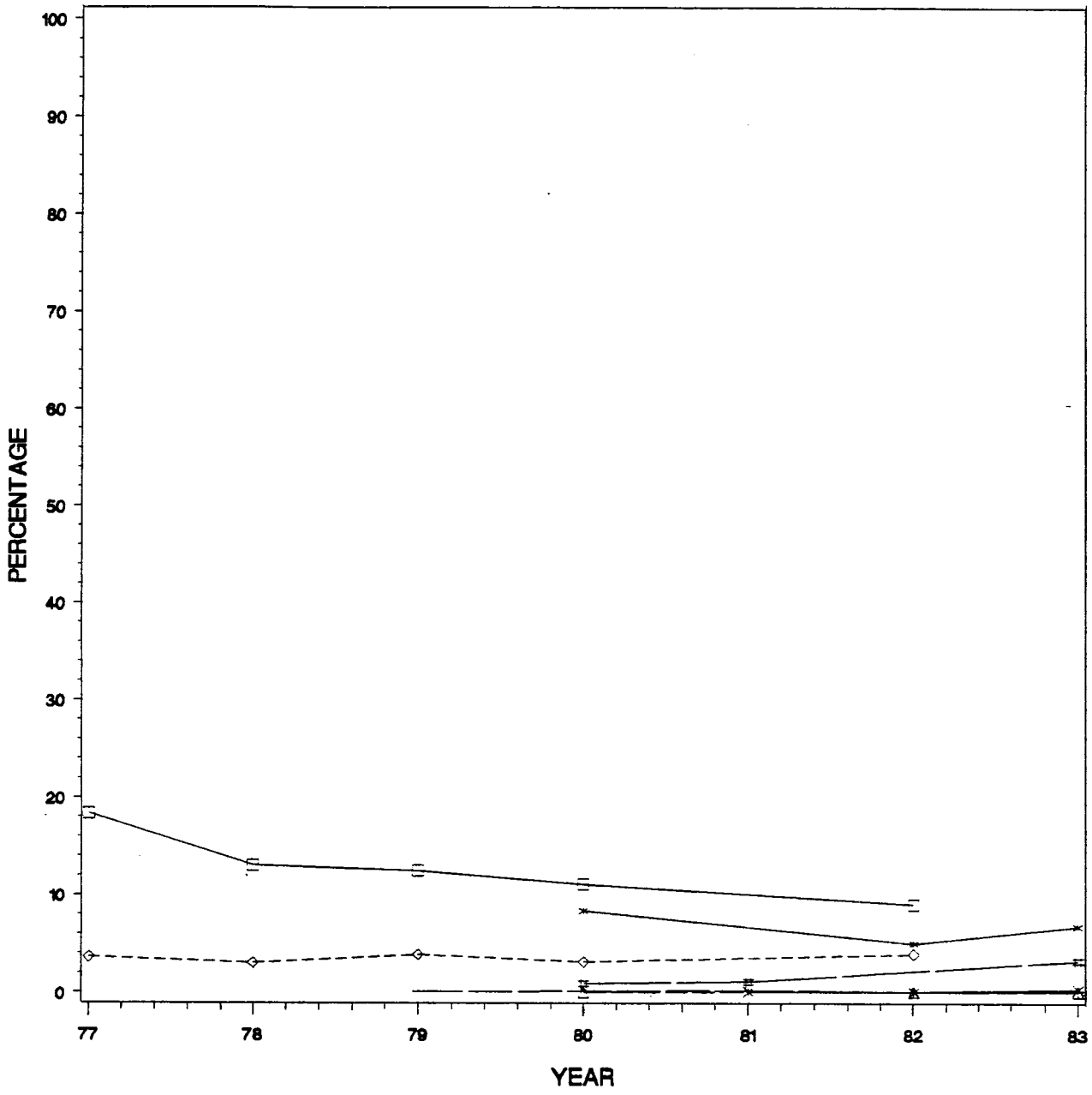
TRACTOR SEMI-TRAILER, 5 OR MORE AXLES
REGION 3, FM, 50 <=AADT< =250



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

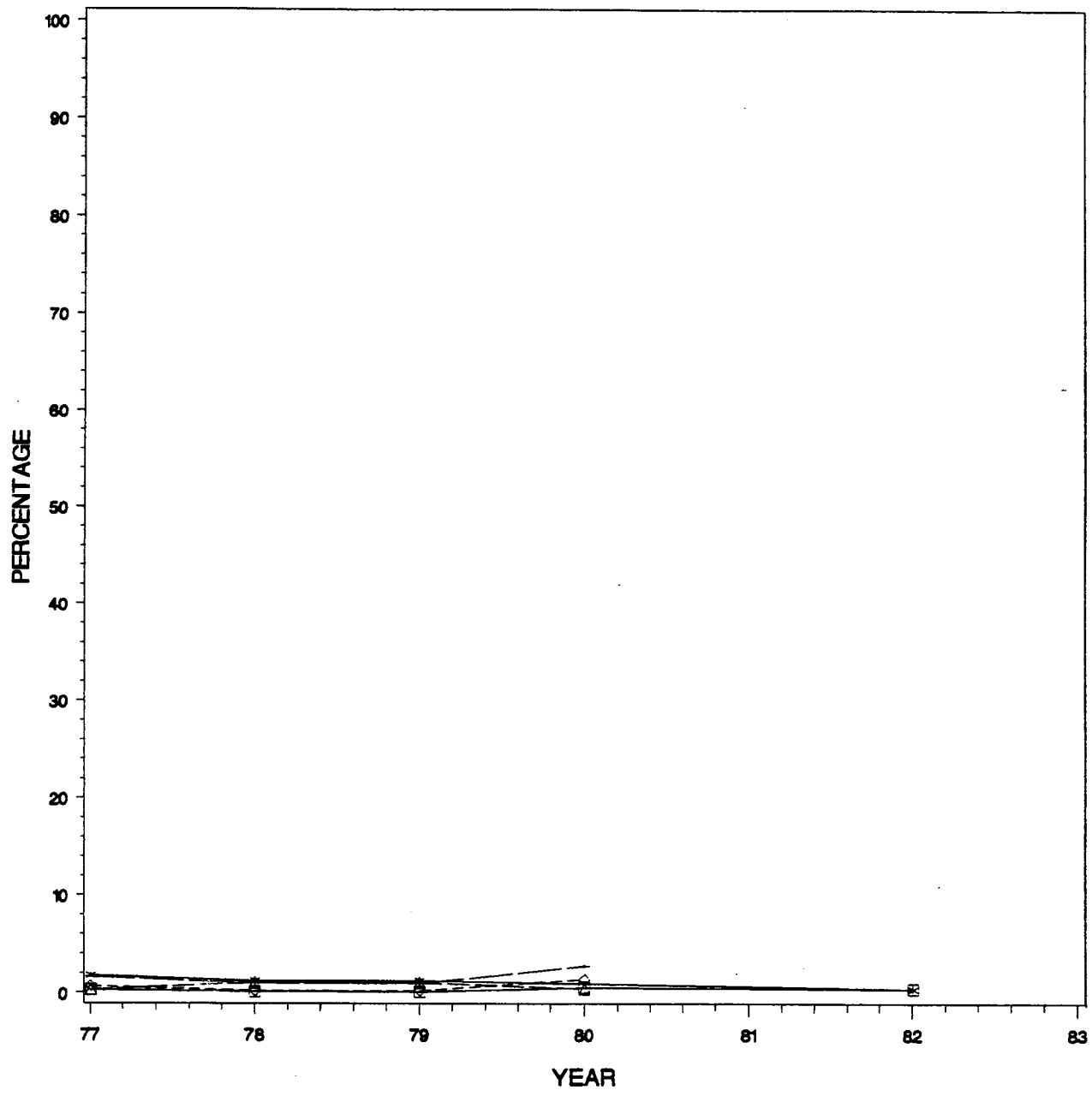
TRACTOR SEMI-TRAILER, 5 OR MORE AXLES
REGION 3, FM, 50 <=AADT< =250



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

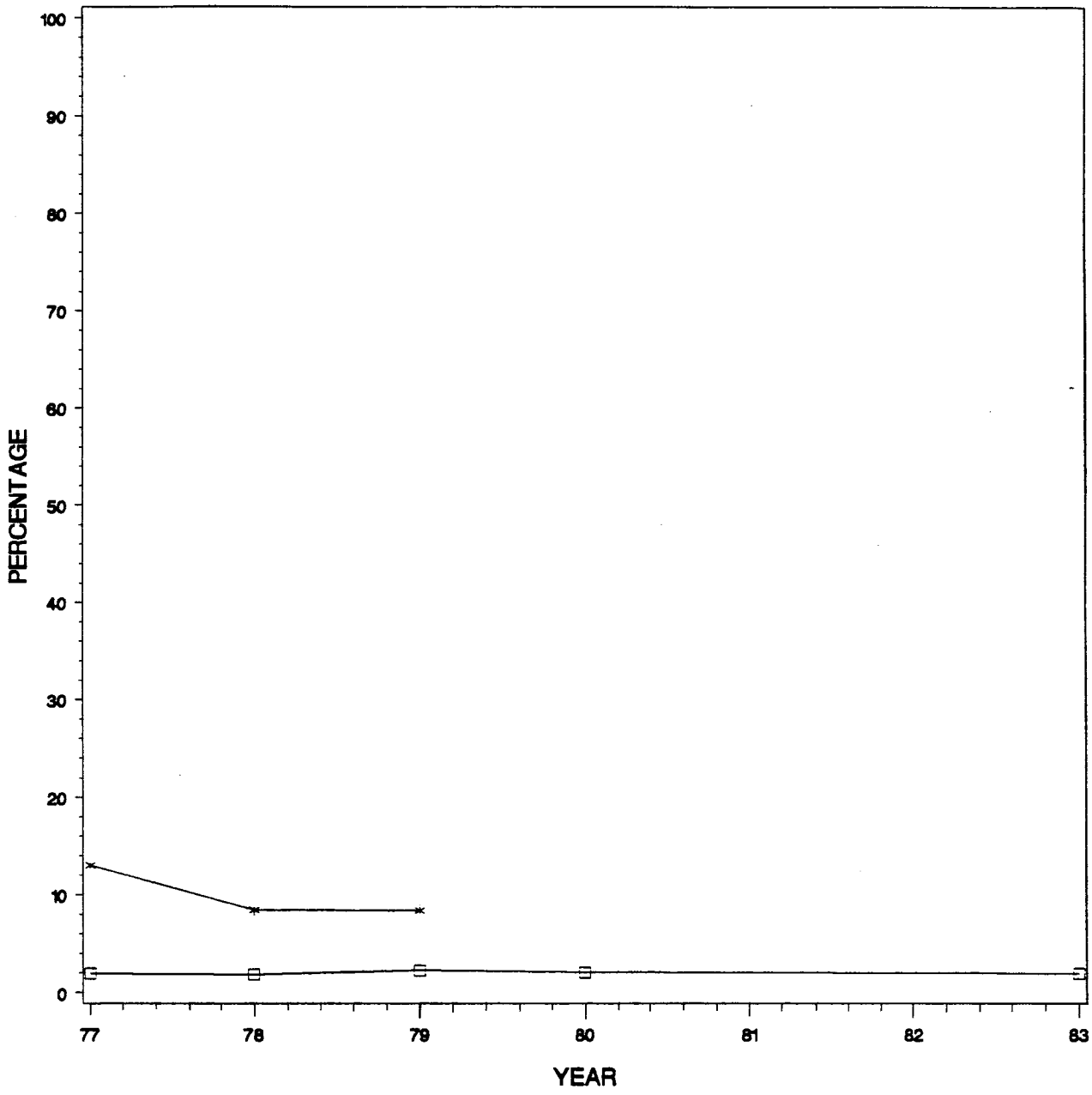
TRACTOR SEMI-TRAILER, 5 OR MORE AXLES
REGION 4, FM, 50 <= AADT <= 250



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

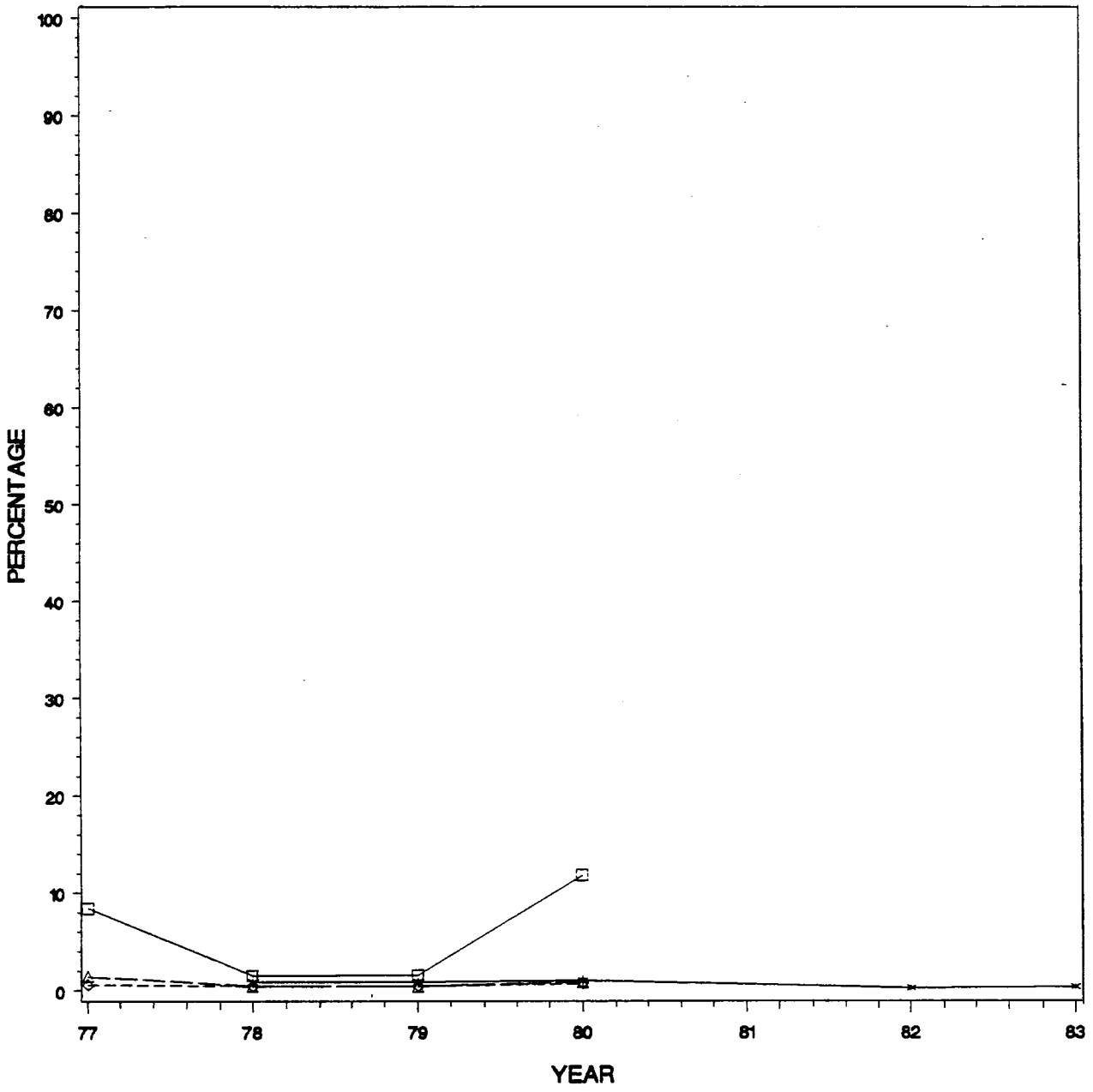
TRACTOR SEMI-TRAILER, 5 OR MORE AXLES
REGION 3, FM, 250< =AADT <=400



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

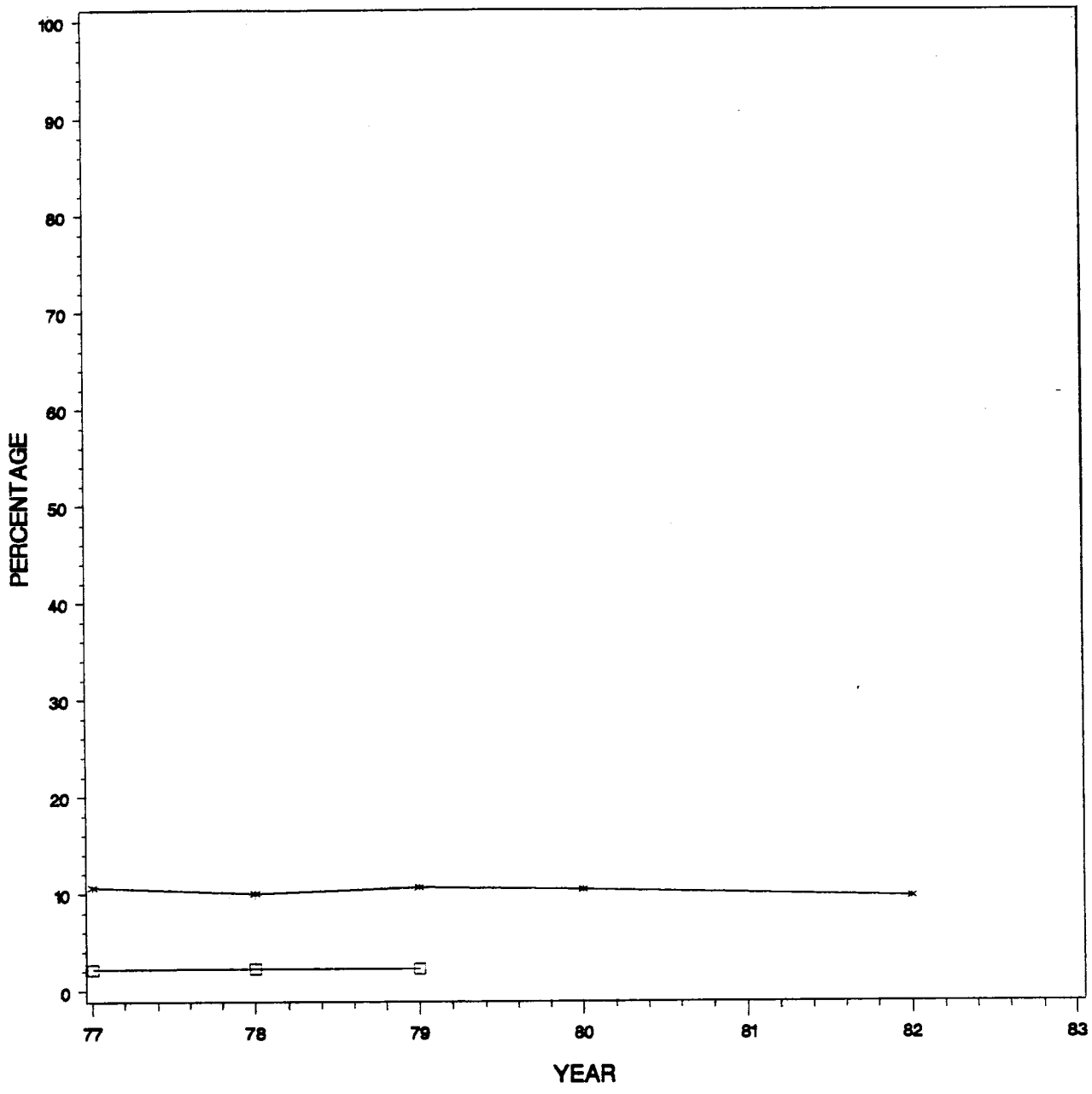
TRACTOR SEMI-TRAILER, 5 OR MORE AXLES
REGION 4, FM, 50<=AADT<=250



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

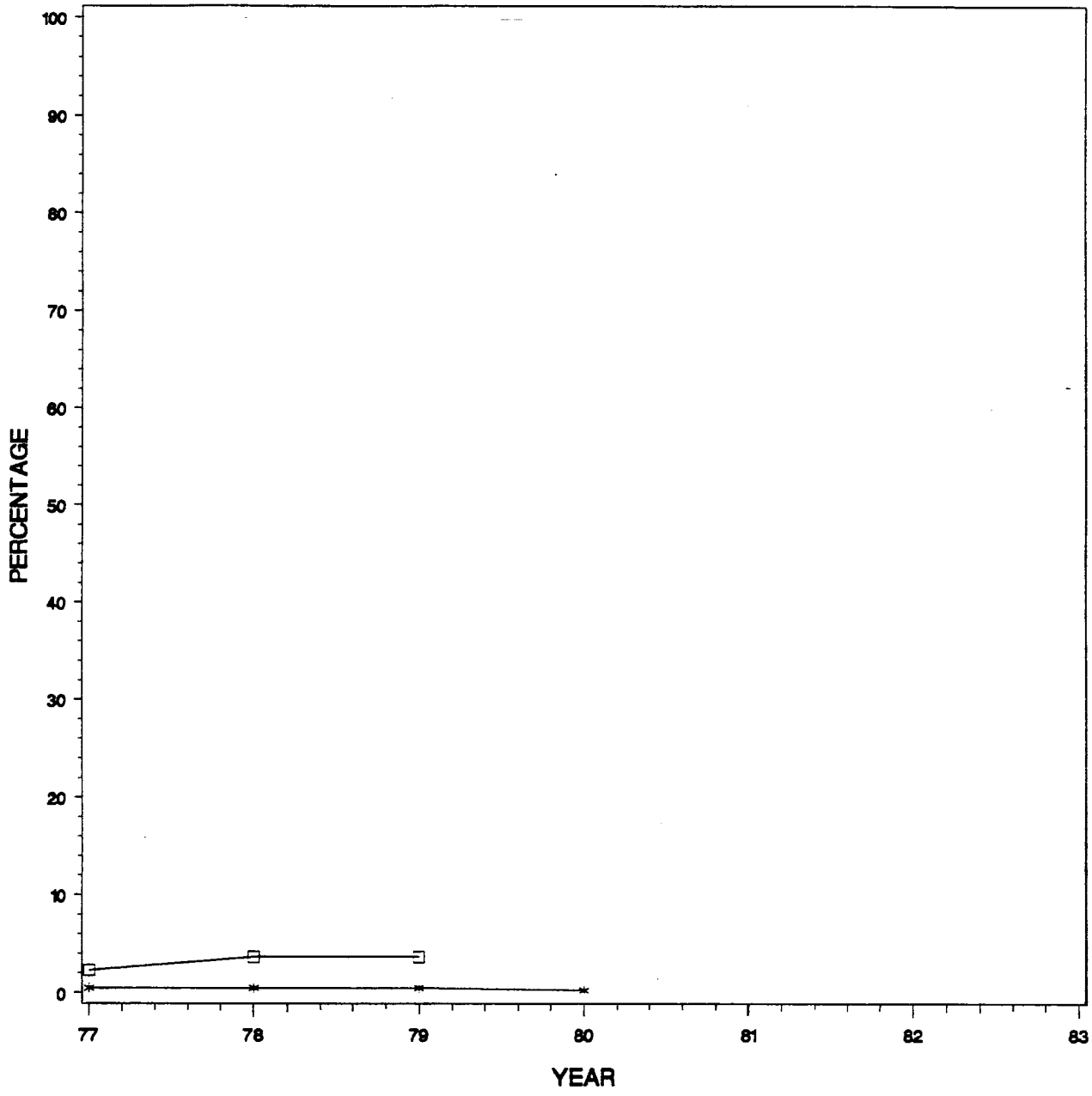
TRACTOR SEMI-TRAILER, 5 OR MORE AXLES
REGION 4, FM, 250< =AADT <=400



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

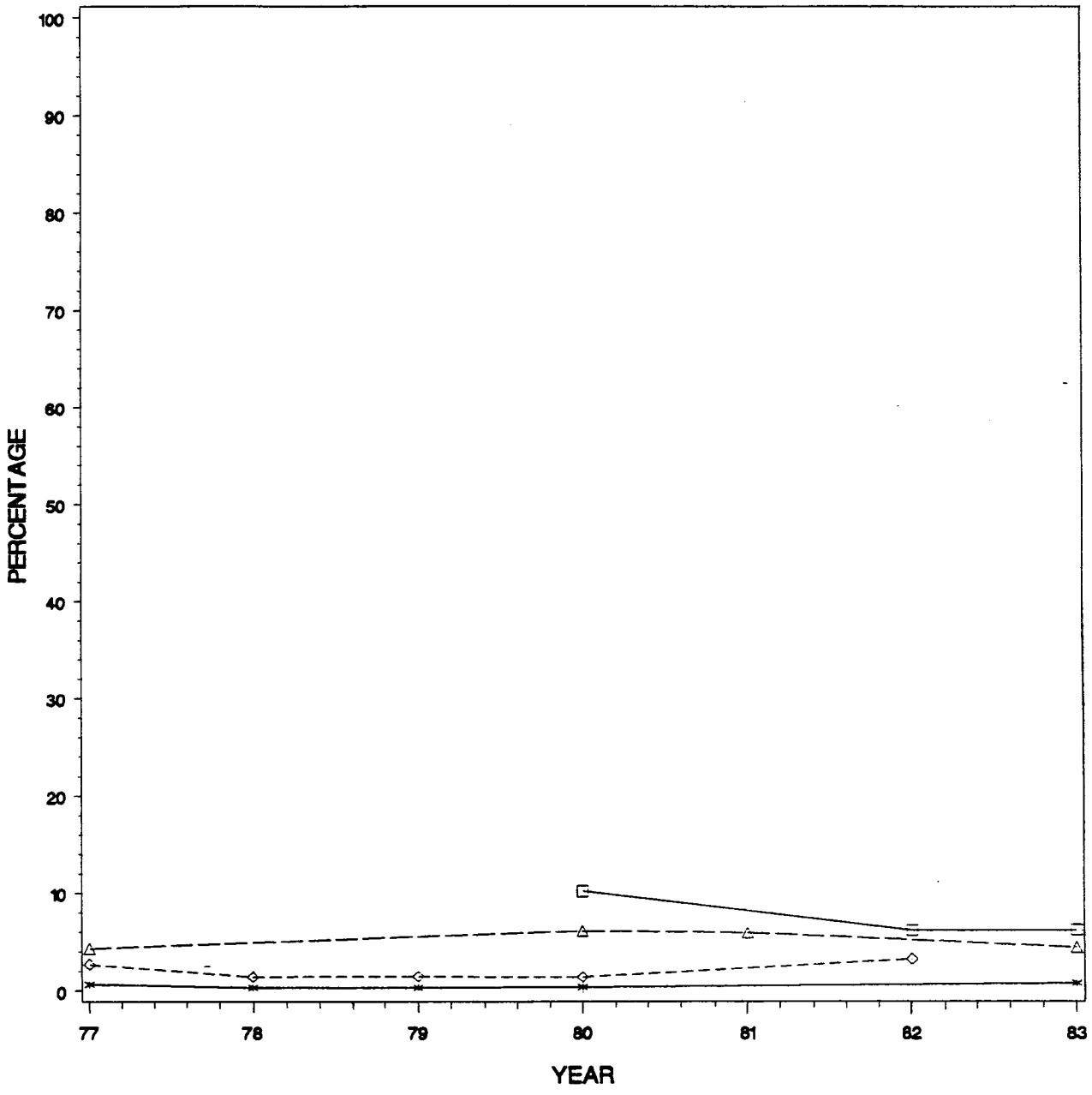
TRACTOR SEMI-TRAILER, 5 OR MORE AXLES
REGION 4, FM, 750<=AADT<=1500



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

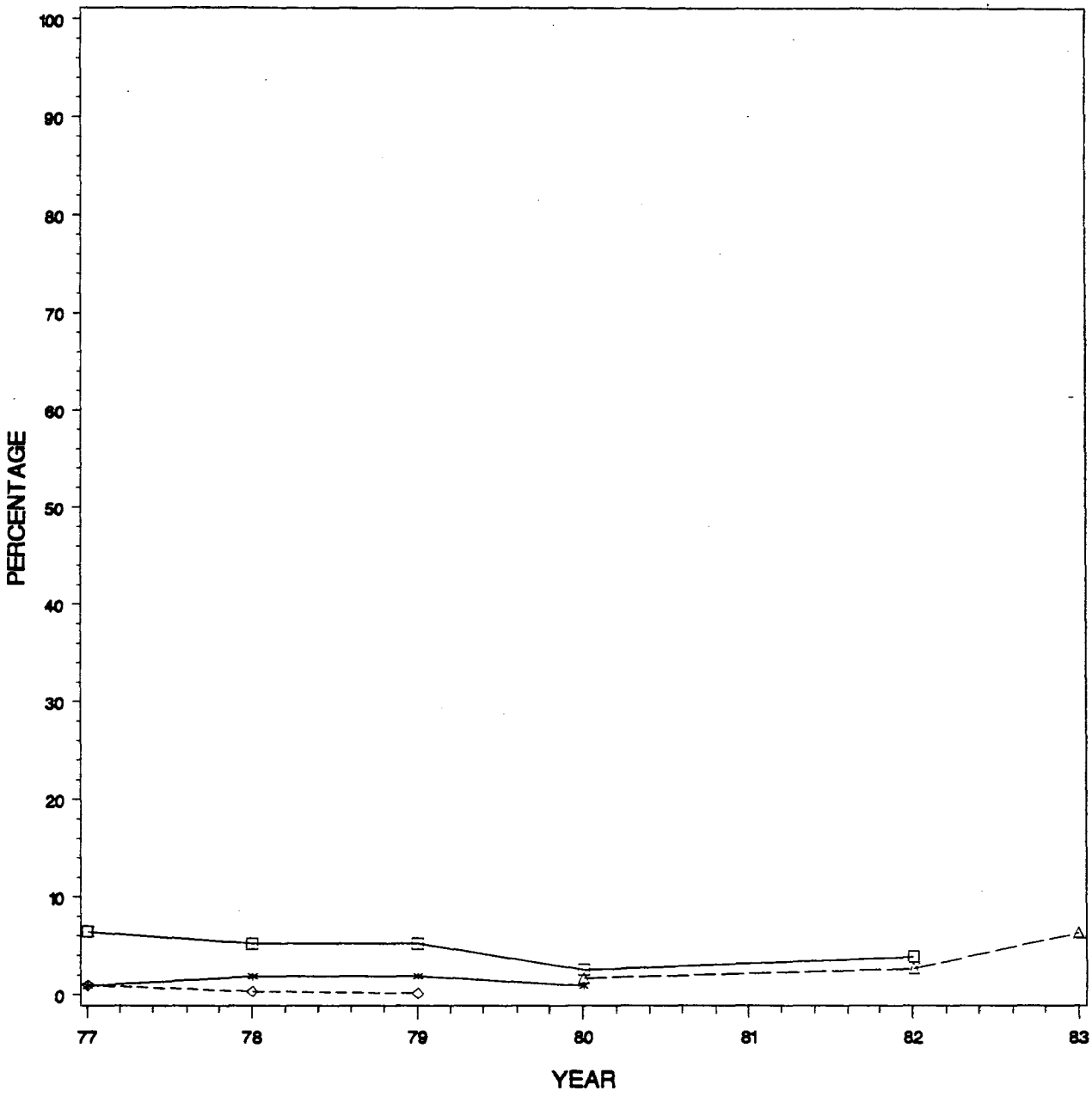
TRACTOR SEMI-TRAILER, 5 OR MORE AXLES
REGION 5, FM, 50<=AADT<=250



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

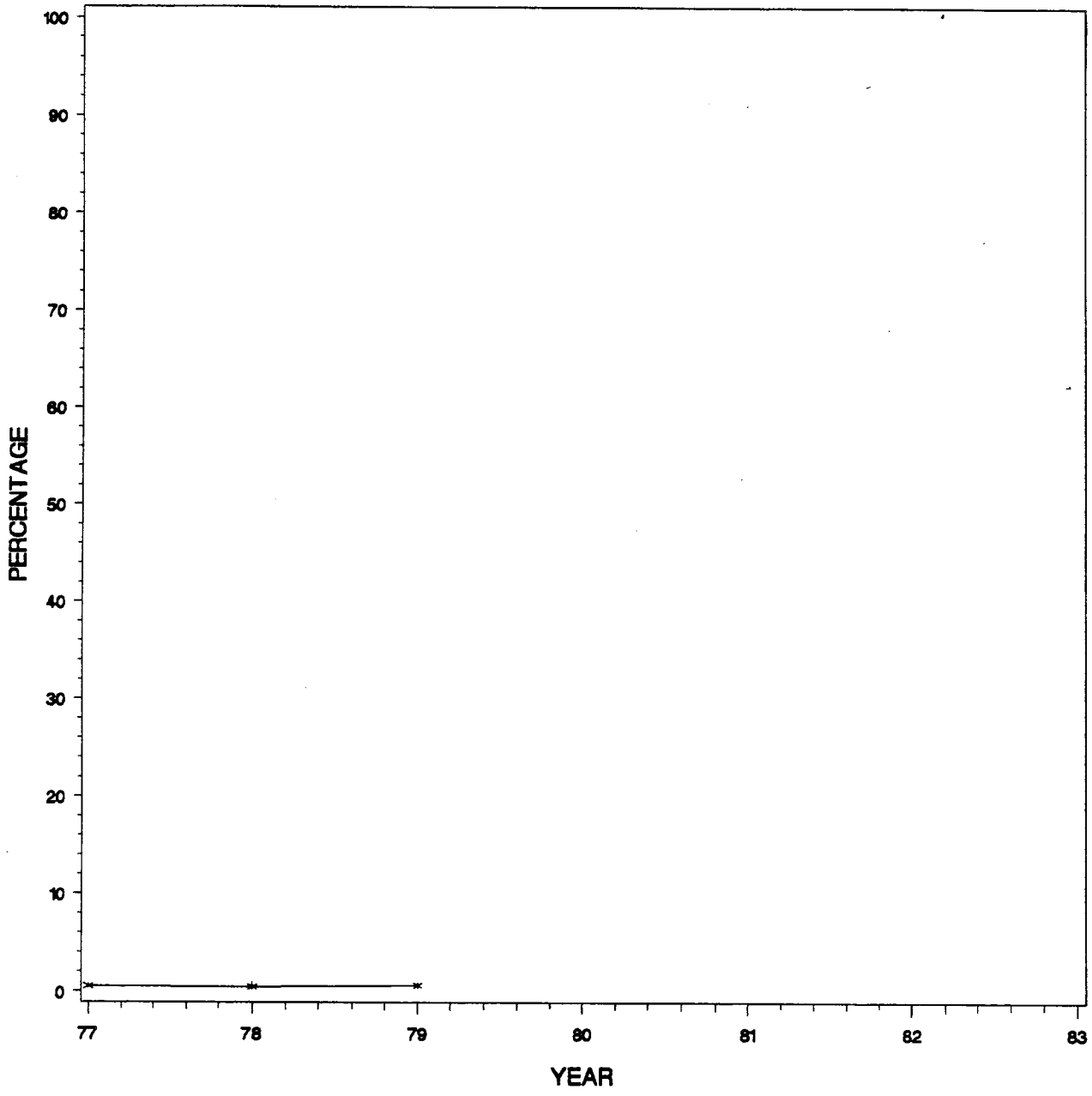
TRACTOR SEMI-TRAILER, 5 OR MORE AXLES
REGION 5, FM, 50 <=AADT< =250



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

TRACTOR SEMI-TRAILER, 5 OR MORE AXLES
REGION 5, FM, 250< =AADT <=400

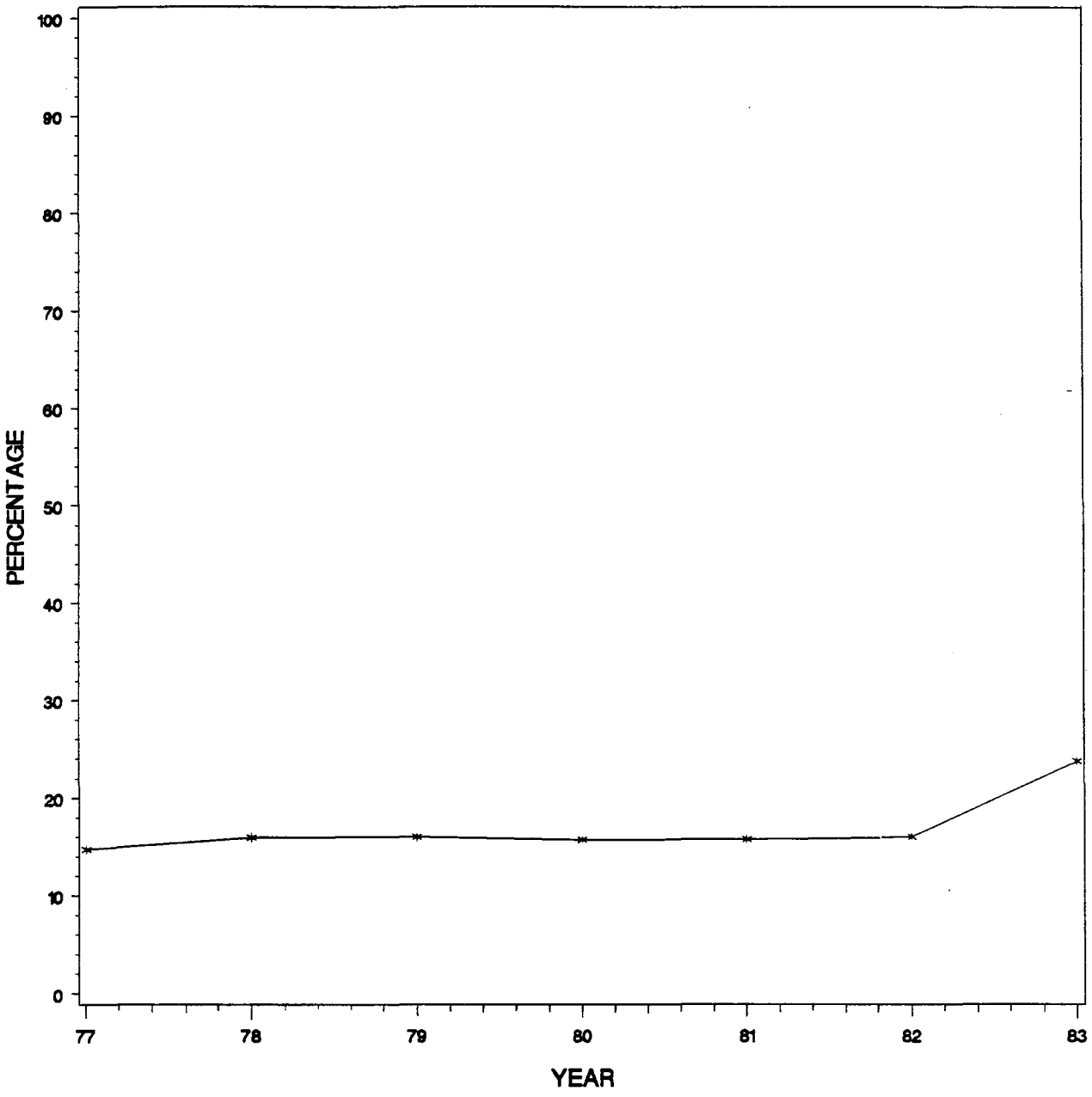


SOURCE: MANUAL COUNT
ANNUAL REPORT

Appendix 6.2 Proportions of 5-or-More-Axle Tractor - Semitrailers in Total Traffic, U.S. and State Highways

TREND ANALYSIS

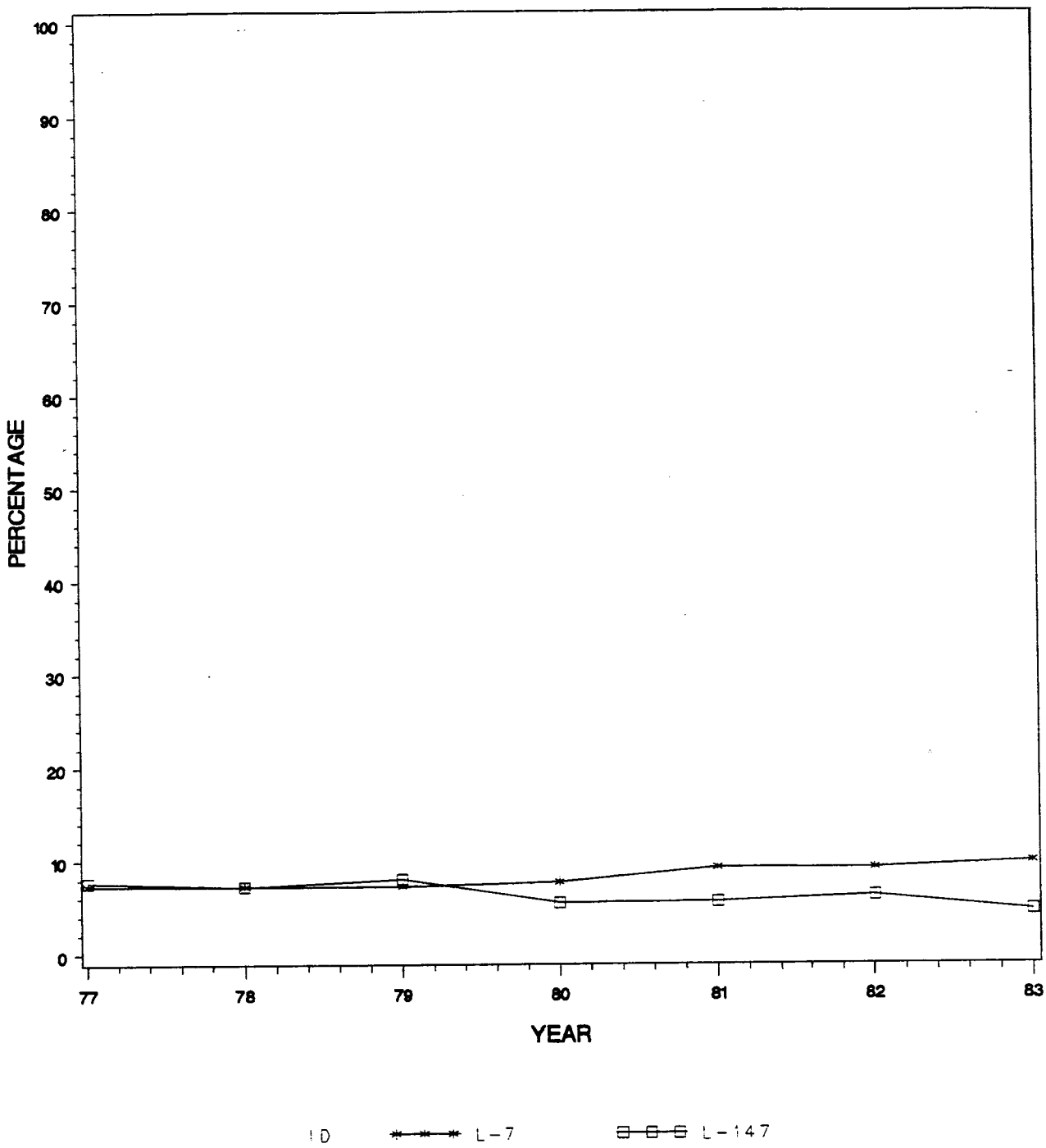
TRACTOR SEMI-TRAILER, 5 OR MORE AXLES
REGION 1, US



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

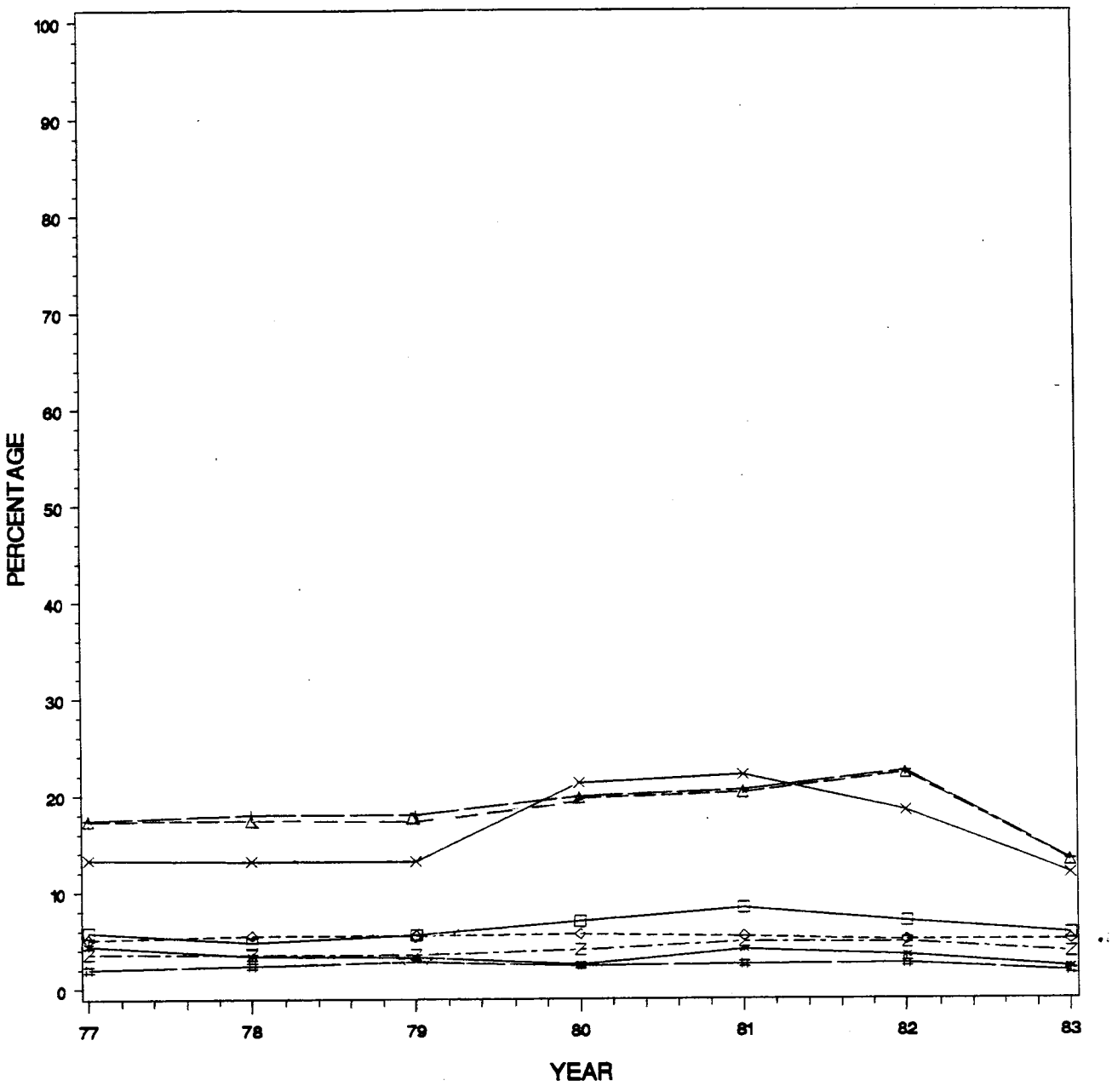
TRACTOR SEMI-TRAILER, 5 OR MORE AXLES
REGION 2, US



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

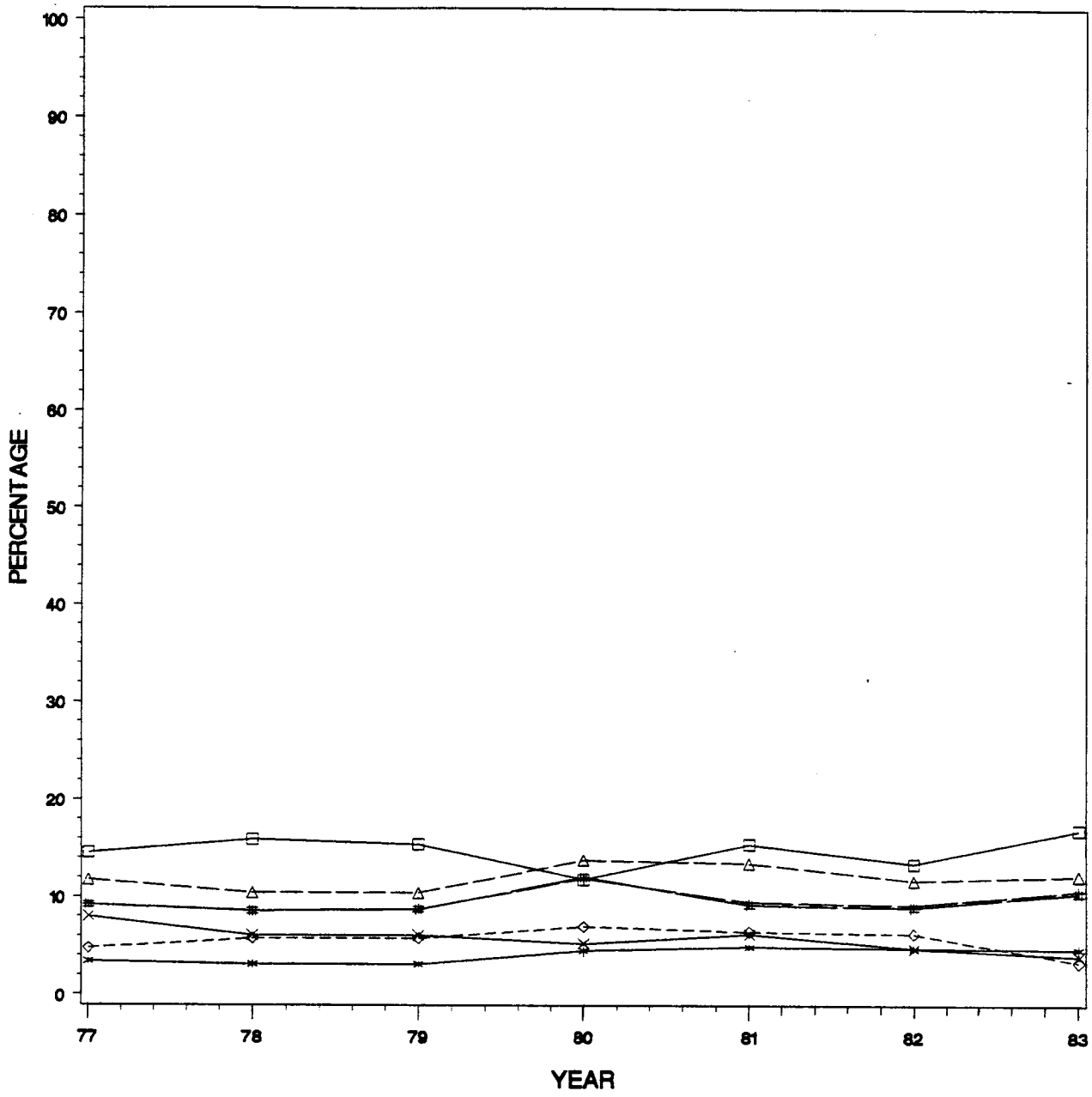
TRACTOR SEMI-TRAILER, 5 OR MORE AXLES
REGION 3, US



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

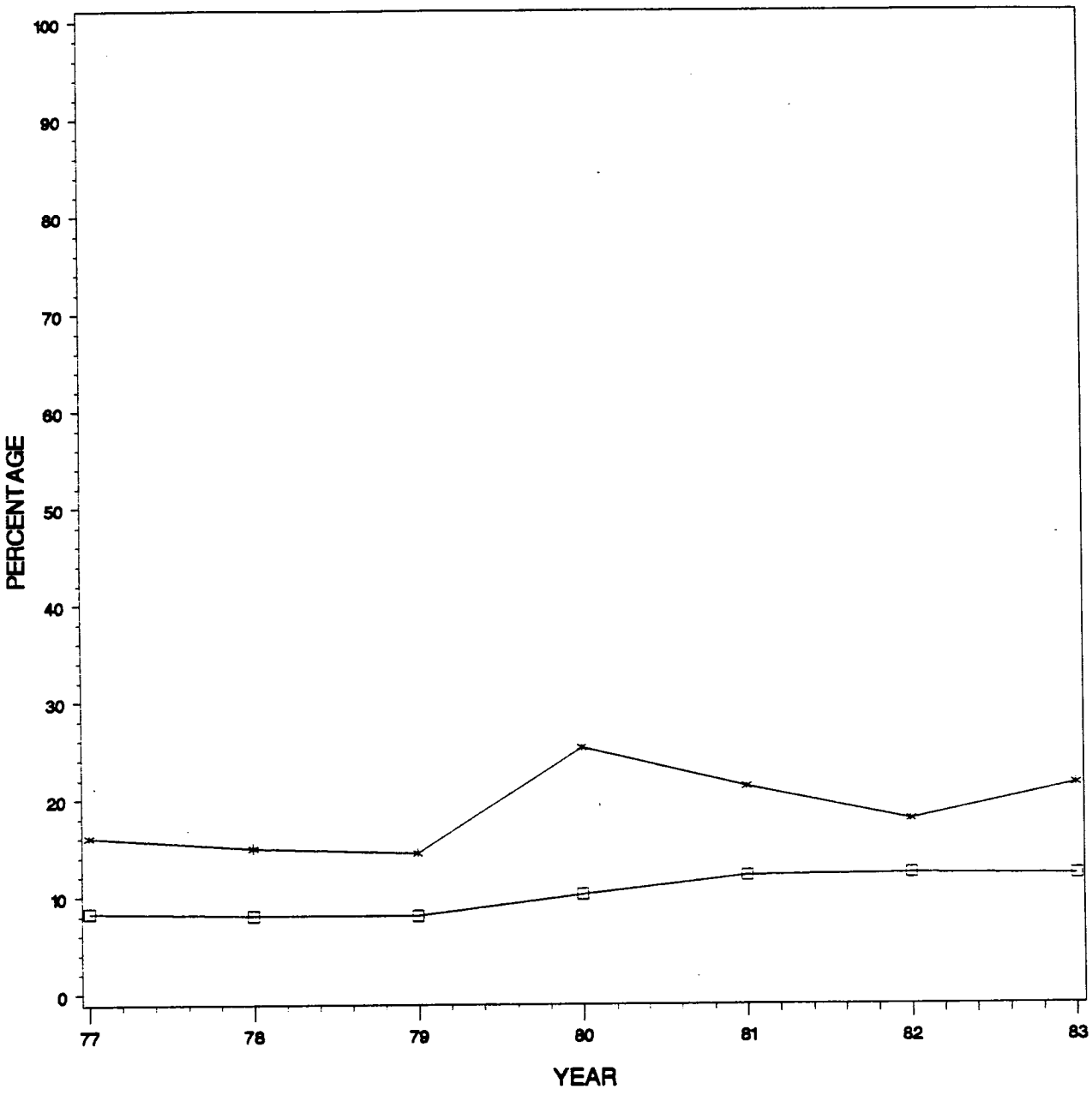
TRACTOR SEMI-TRAILER, 5 OR MORE AXLES
REGION 4, US



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

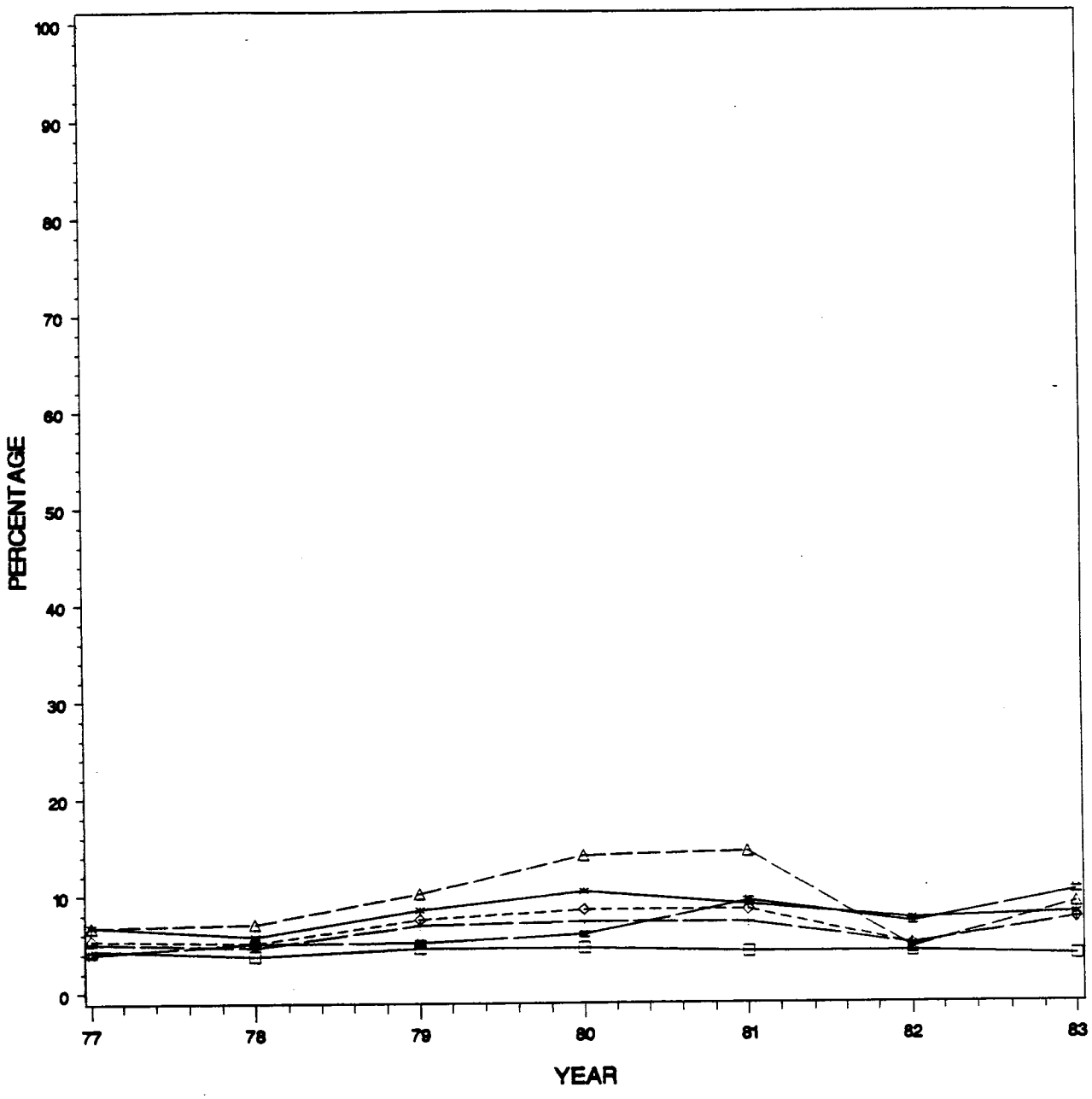
TRACTOR SEMI-TRAILER, 5 OR MORE AXLES
REGION 5, US



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

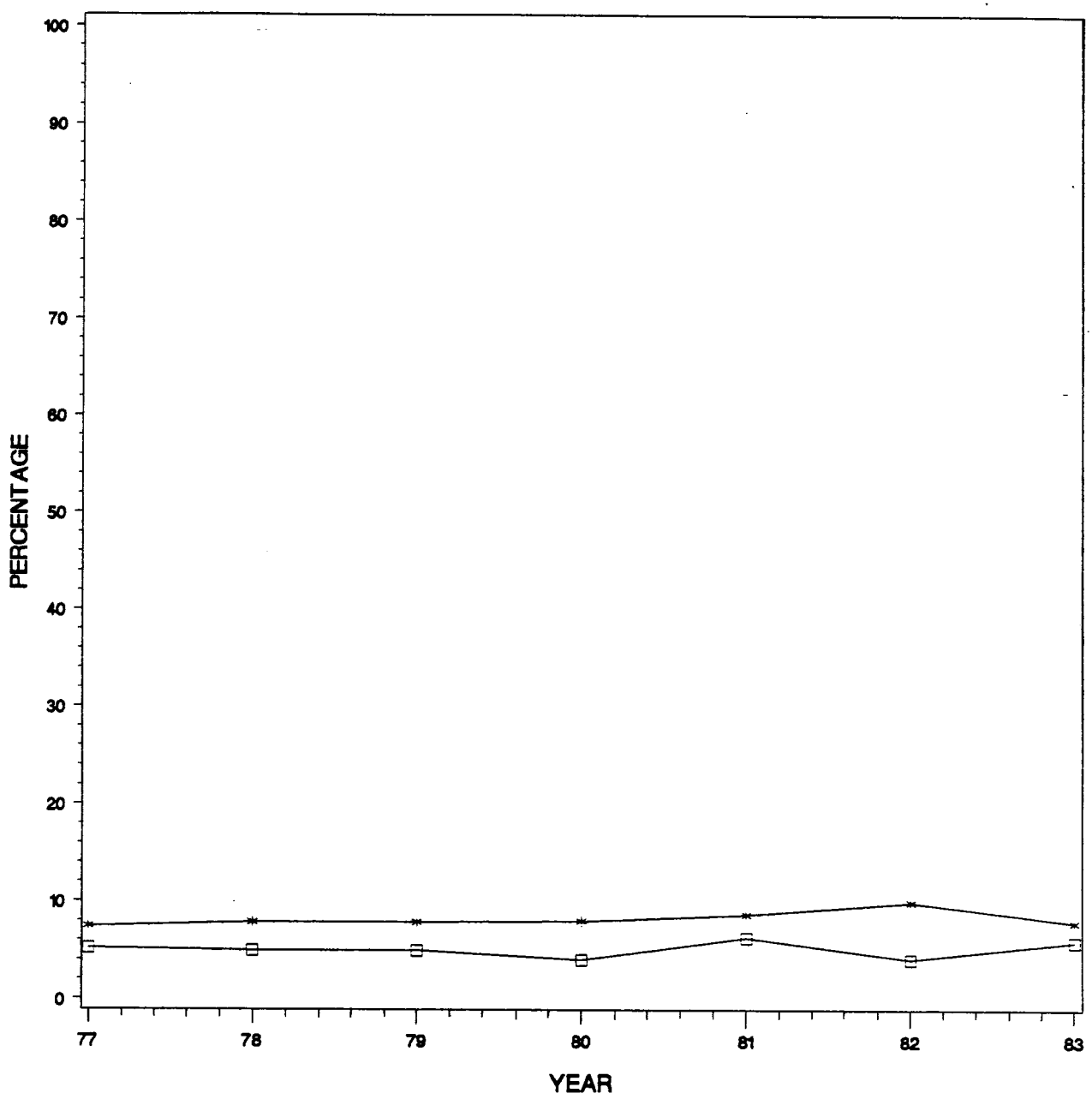
TRACTOR SEMI-TRAILER, 5 OR MORE AXLES
REGION 3, SH



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

TRACTOR SEMI-TRAILER, 5 OR MORE AXLES
REGION 5, SH

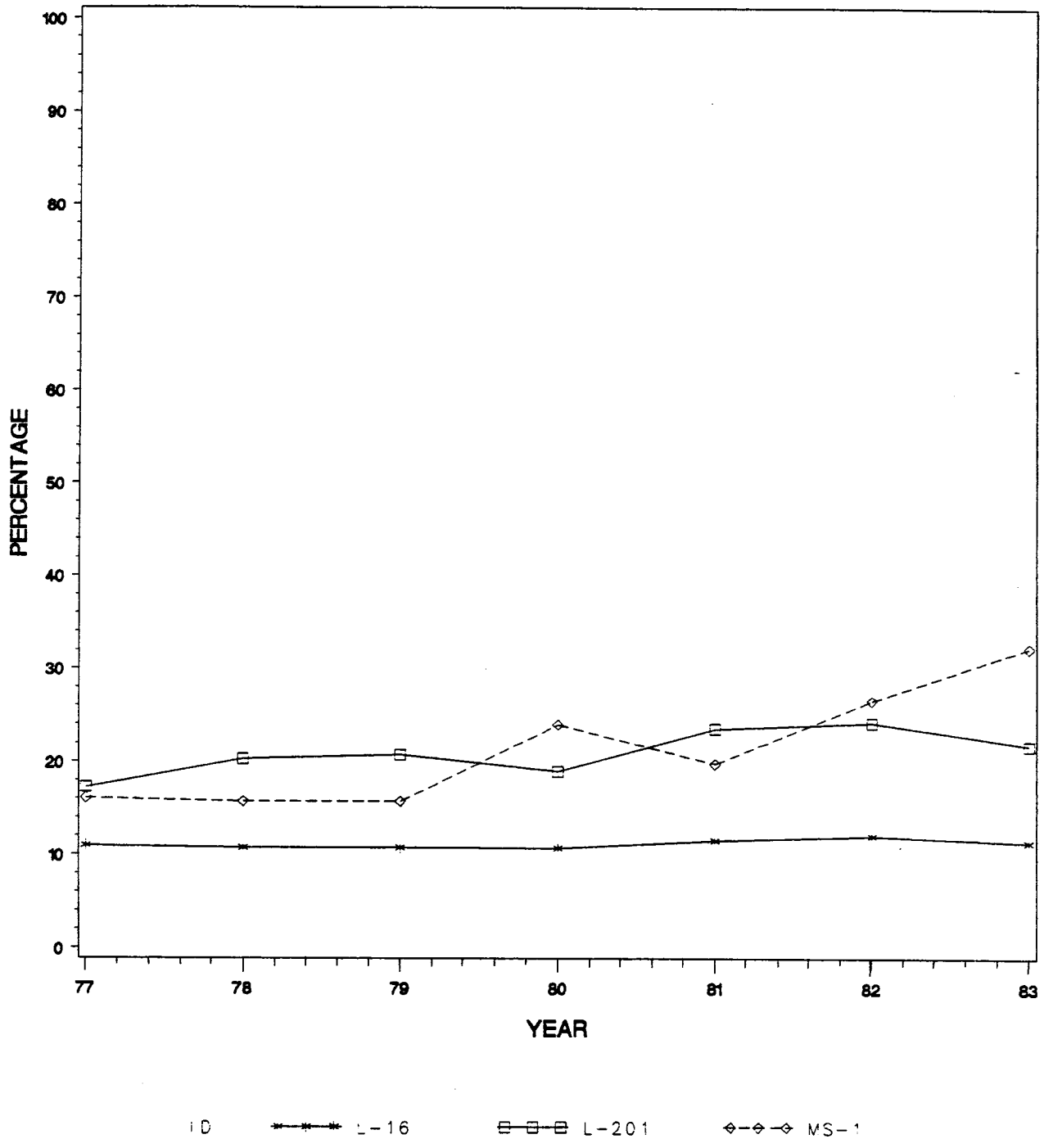


SOURCE: MANUAL COUNT
ANNUAL REPORT

Appendix 6.3 Proportions of 5-or-More-Axle Tractor - Semitrailers in Total Traffic, Interstate Highways

TREND ANALYSIS

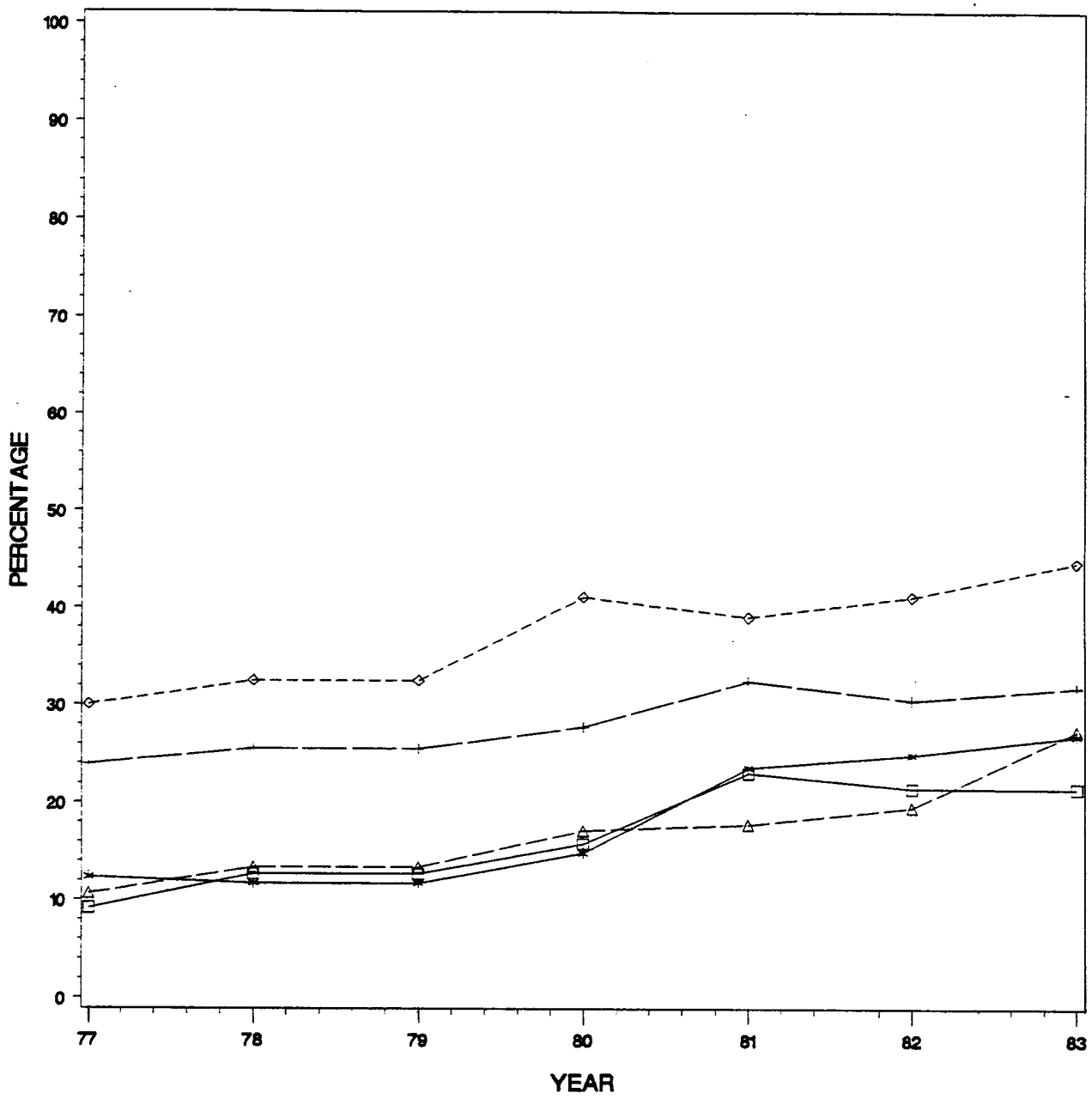
TRACTOR SEMI-TRAILER, 5 OR MORE AXLES
REGION 1, IH



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

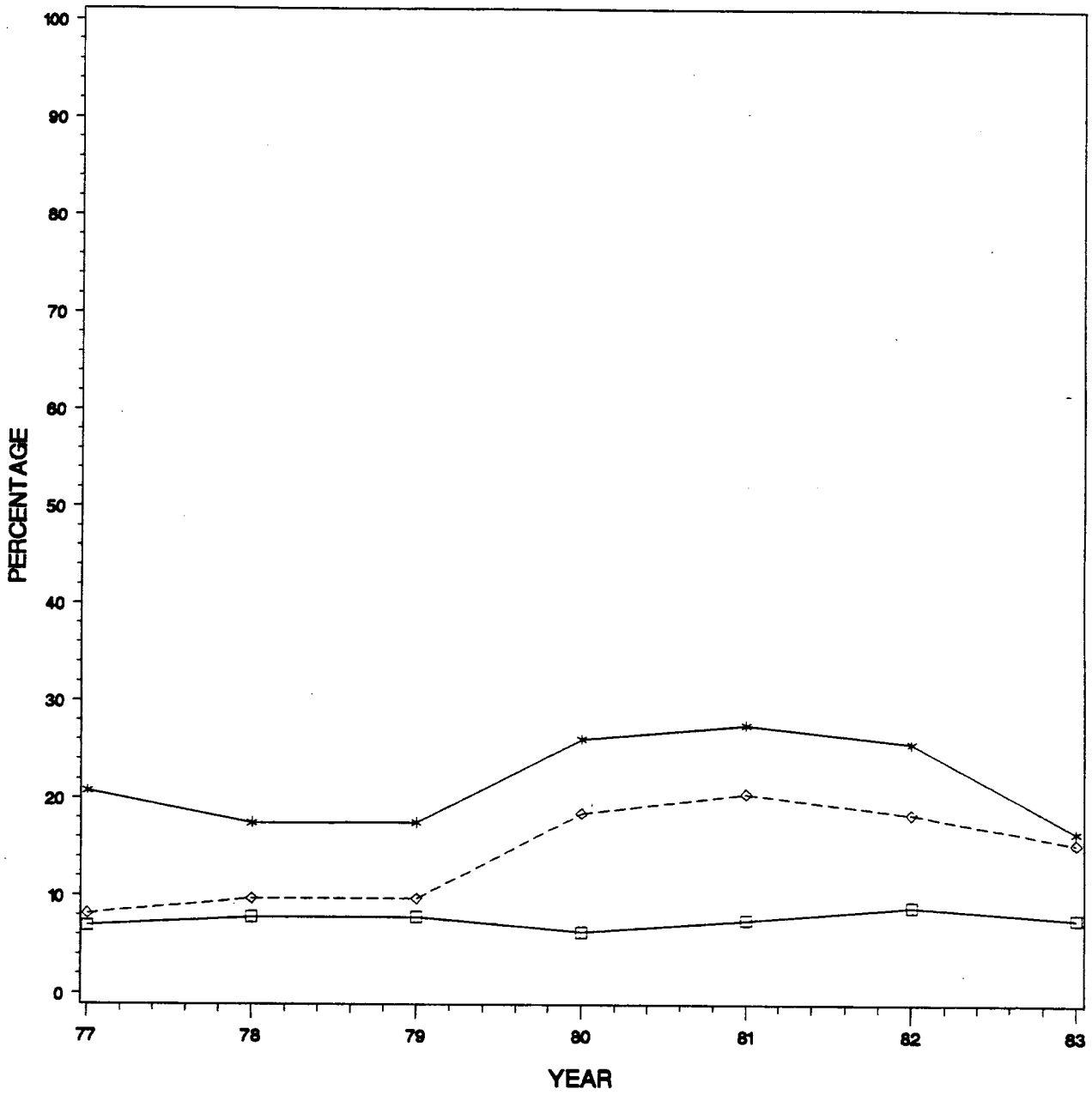
TRACTOR SEMI-TRAILER, 5 OR MORE AXLES
REGION 2, IH



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

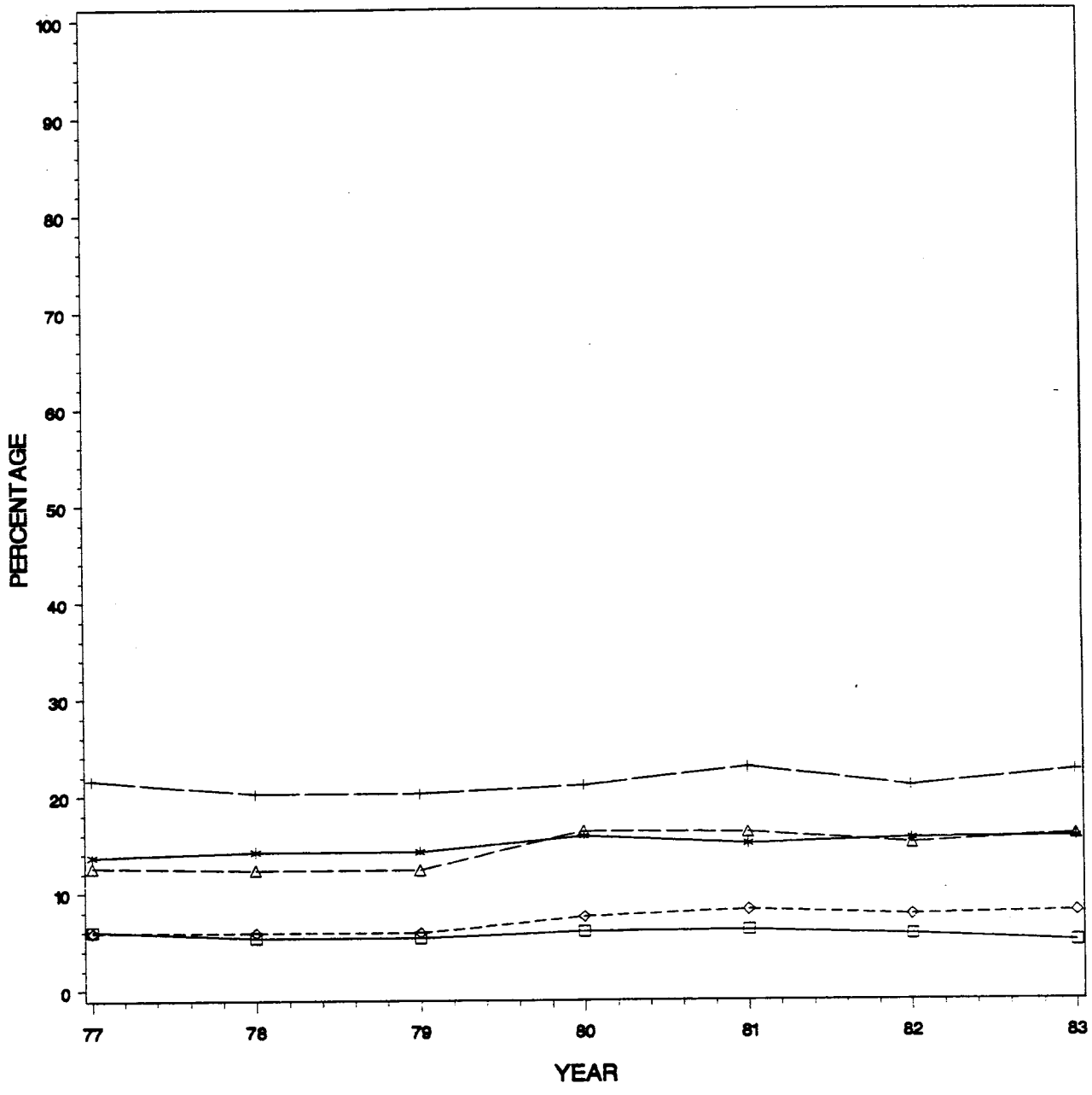
TRACTOR SEMI-TRAILER, 5 OR MORE AXLES
REGION 3, IH



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

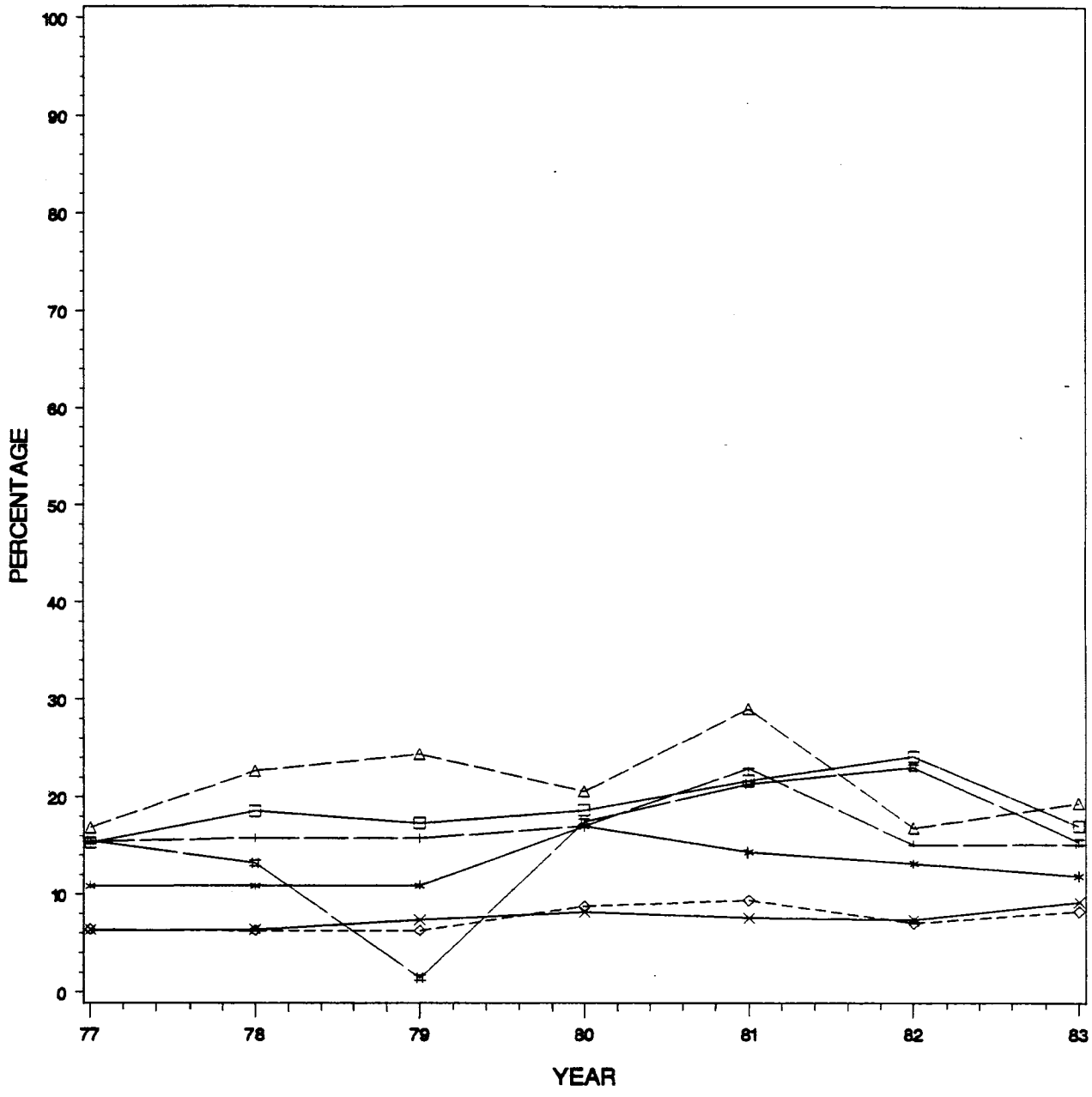
TRACTOR SEMI-TRAILER, 5 OR MORE AXLES
REGION 4, IH



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

TRACTOR SEMI-TRAILER, 5 OR MORE AXLES
REGION 5, IH

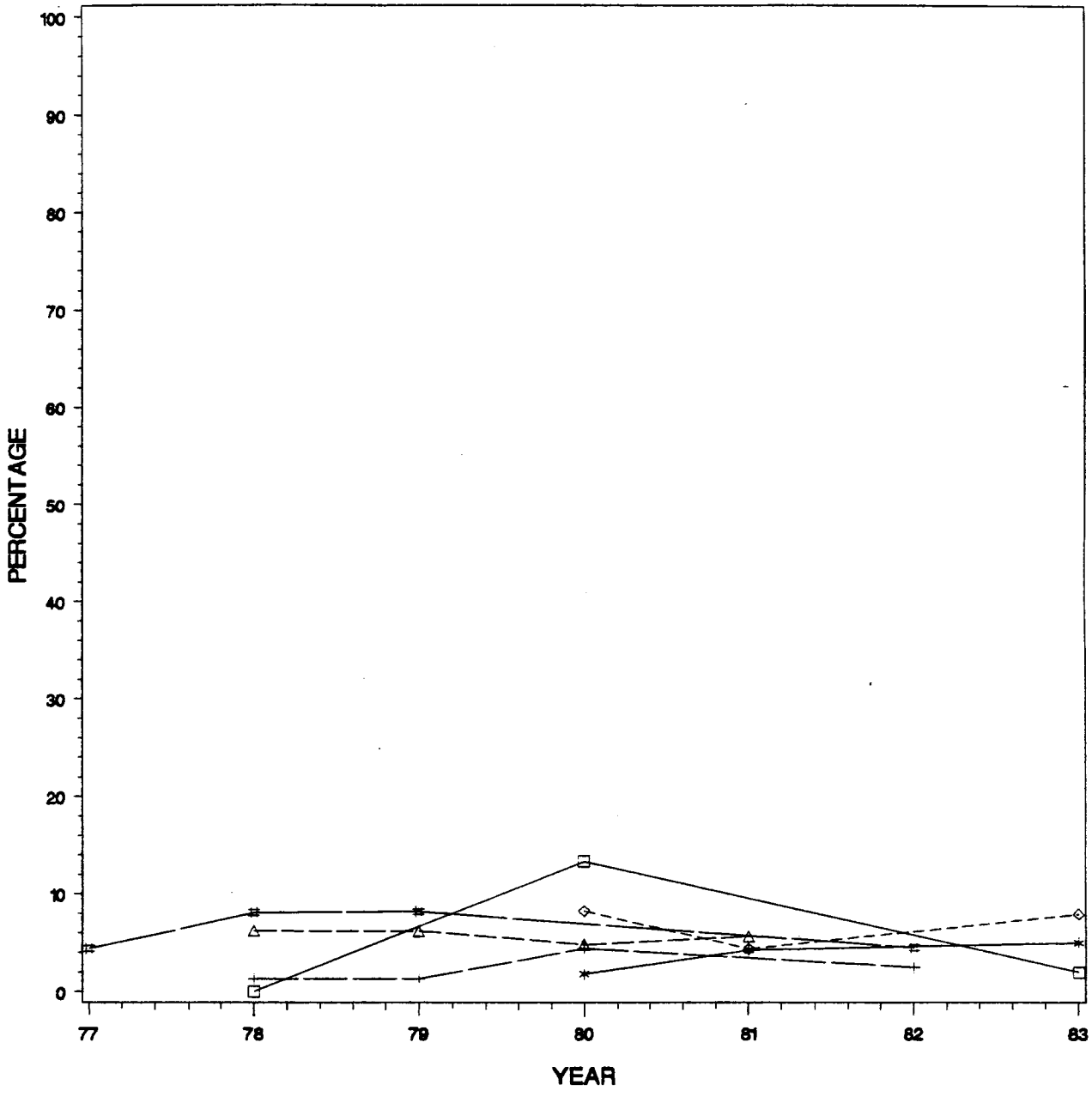


SOURCE: MANUAL COUNT
ANNUAL REPORT

Appendix 6.4 Proportions of SU-1 Trucks in Total Traffic, Farm-to-Market Roads

TREND ANALYSIS

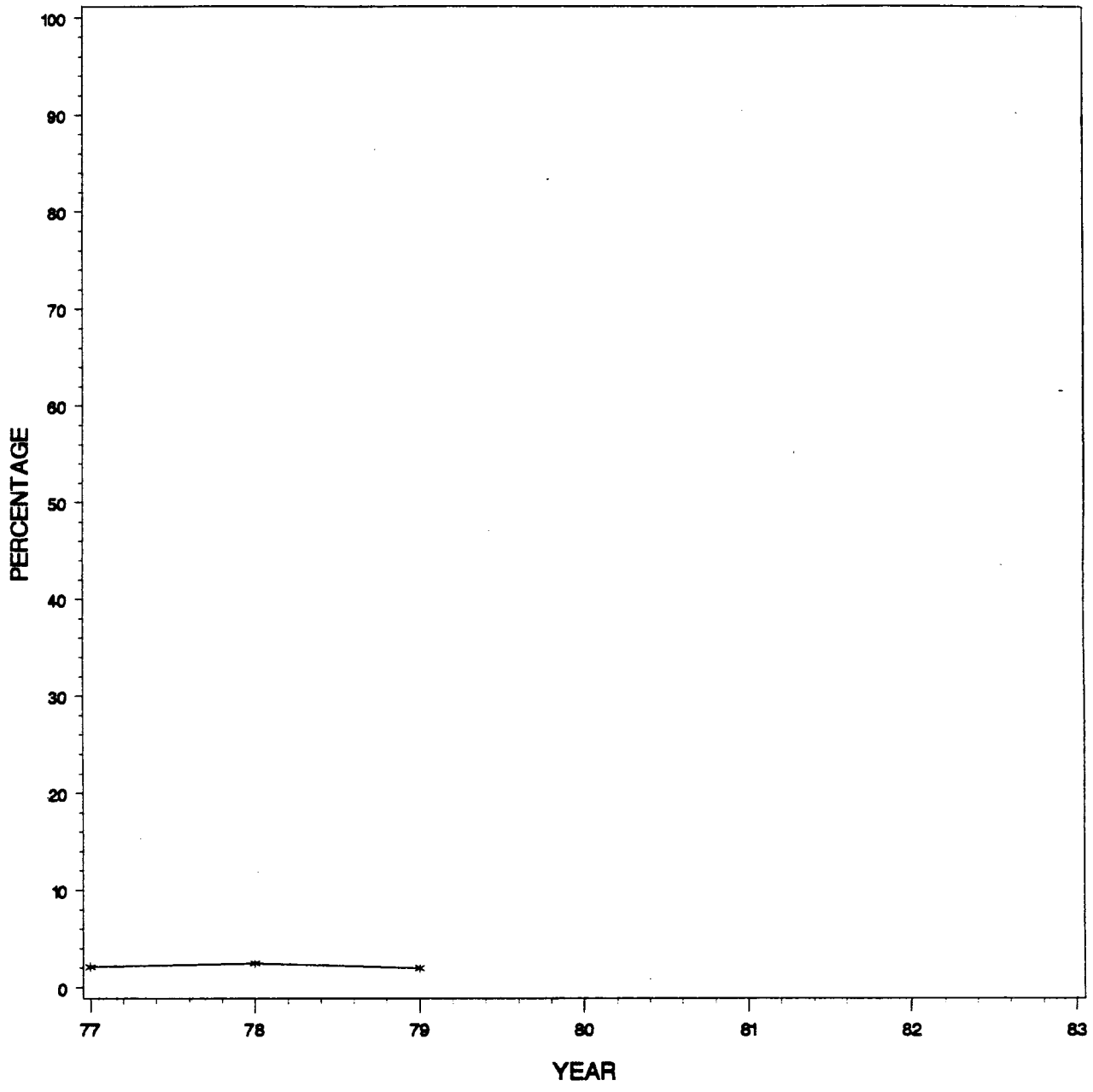
SINGLE UNIT, 2 AXLES
REGION 1, FM, 50<=AADT<=250



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

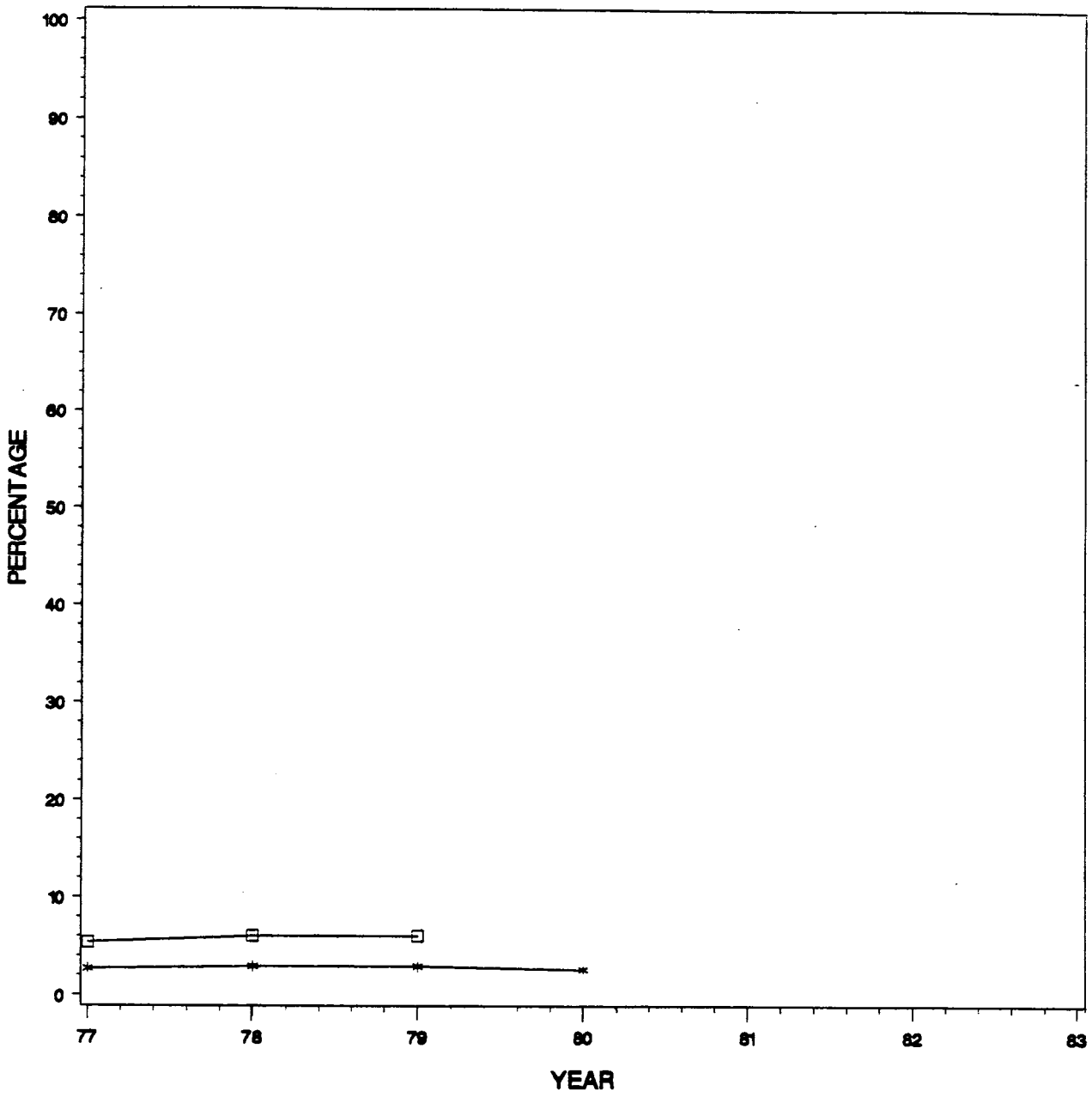
SINGLE UNIT, 2 AXLES
REGION 5, FM, 250 <=AADT<=400



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

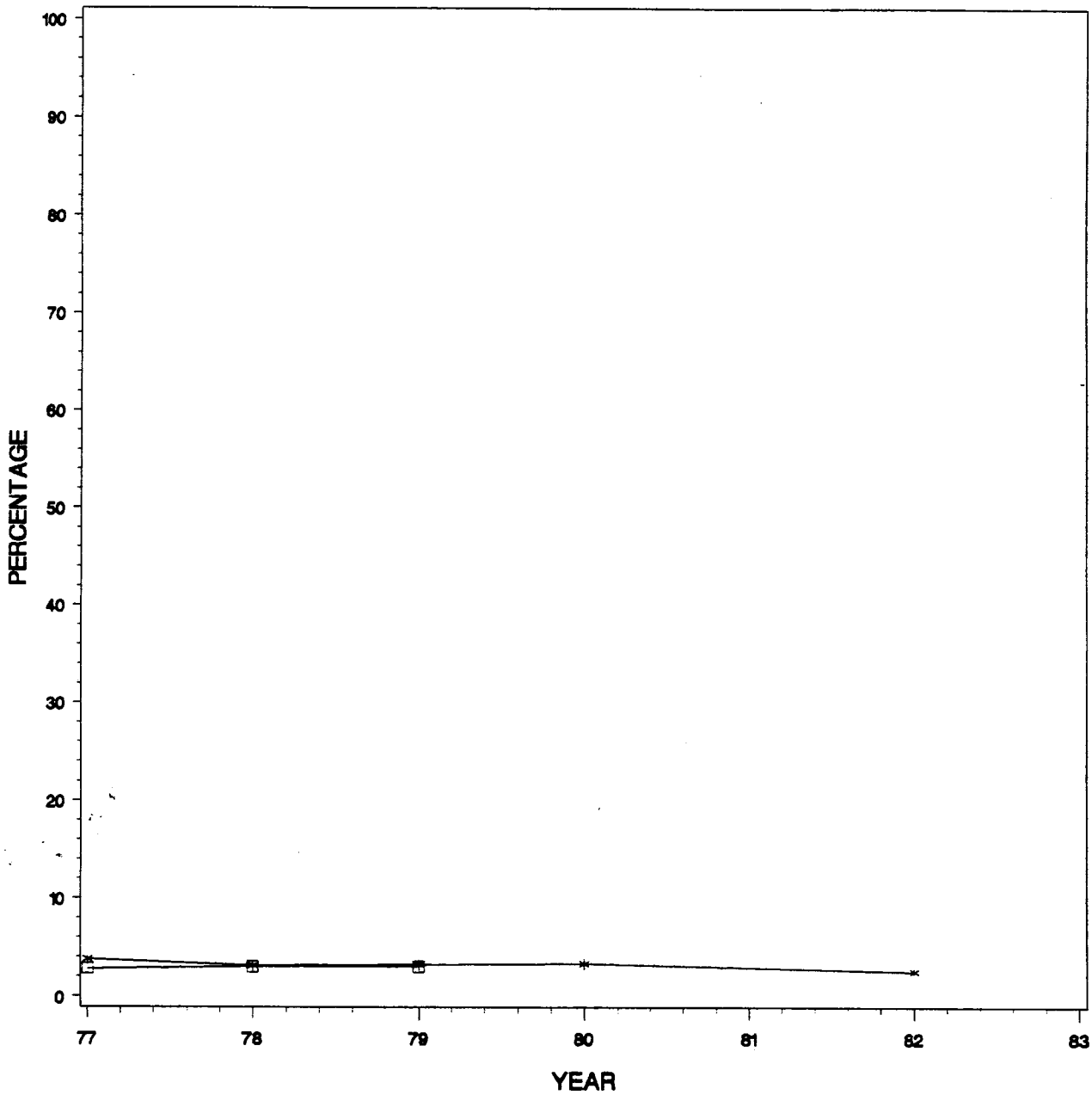
SINGLE UNIT, 2 AXLES
REGION 4, FM, 750< =AADT <=1500



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

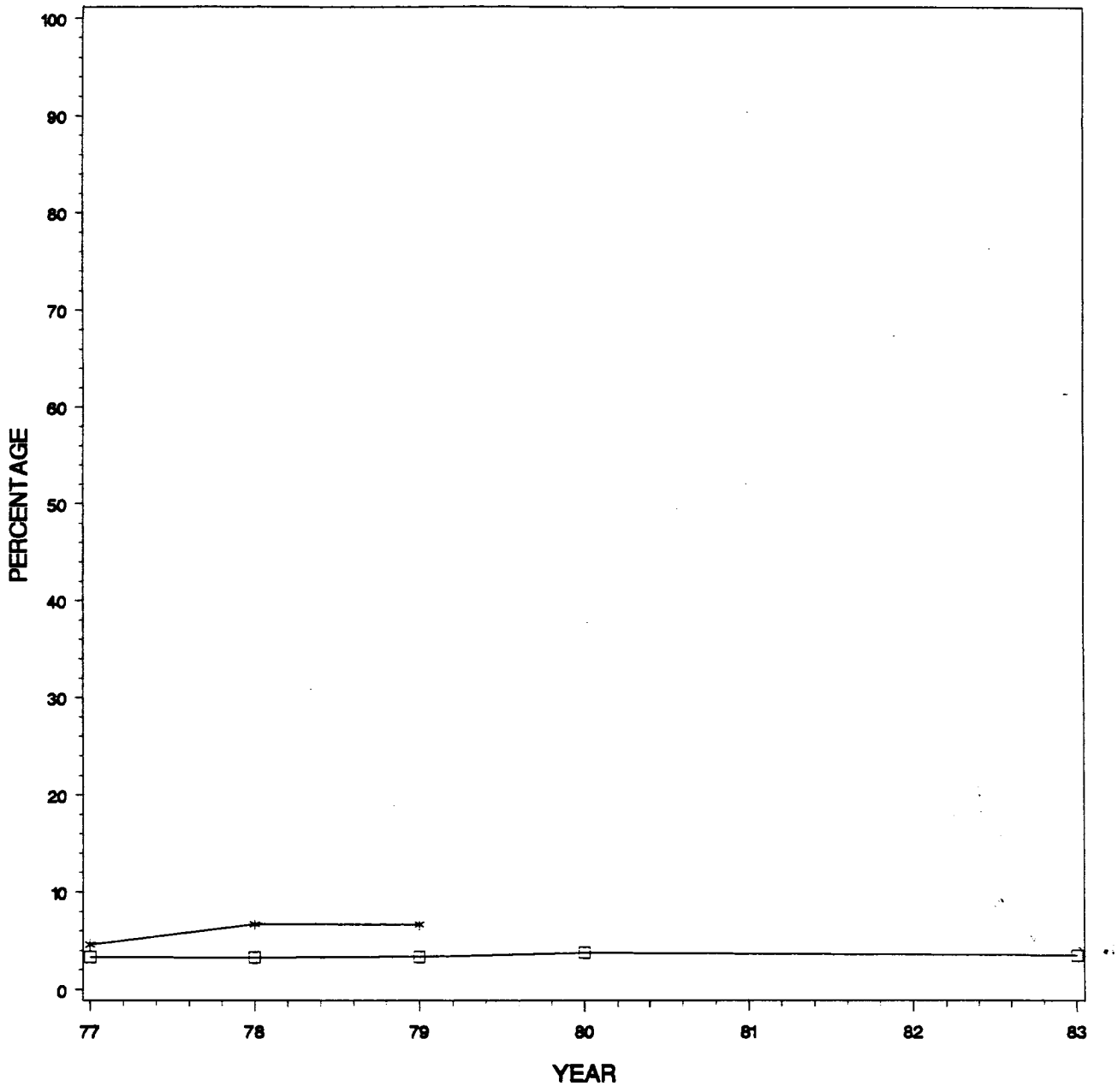
SINGLE UNIT, 2 AXLES
REGION 4, FM, 250< =AADT <=400



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

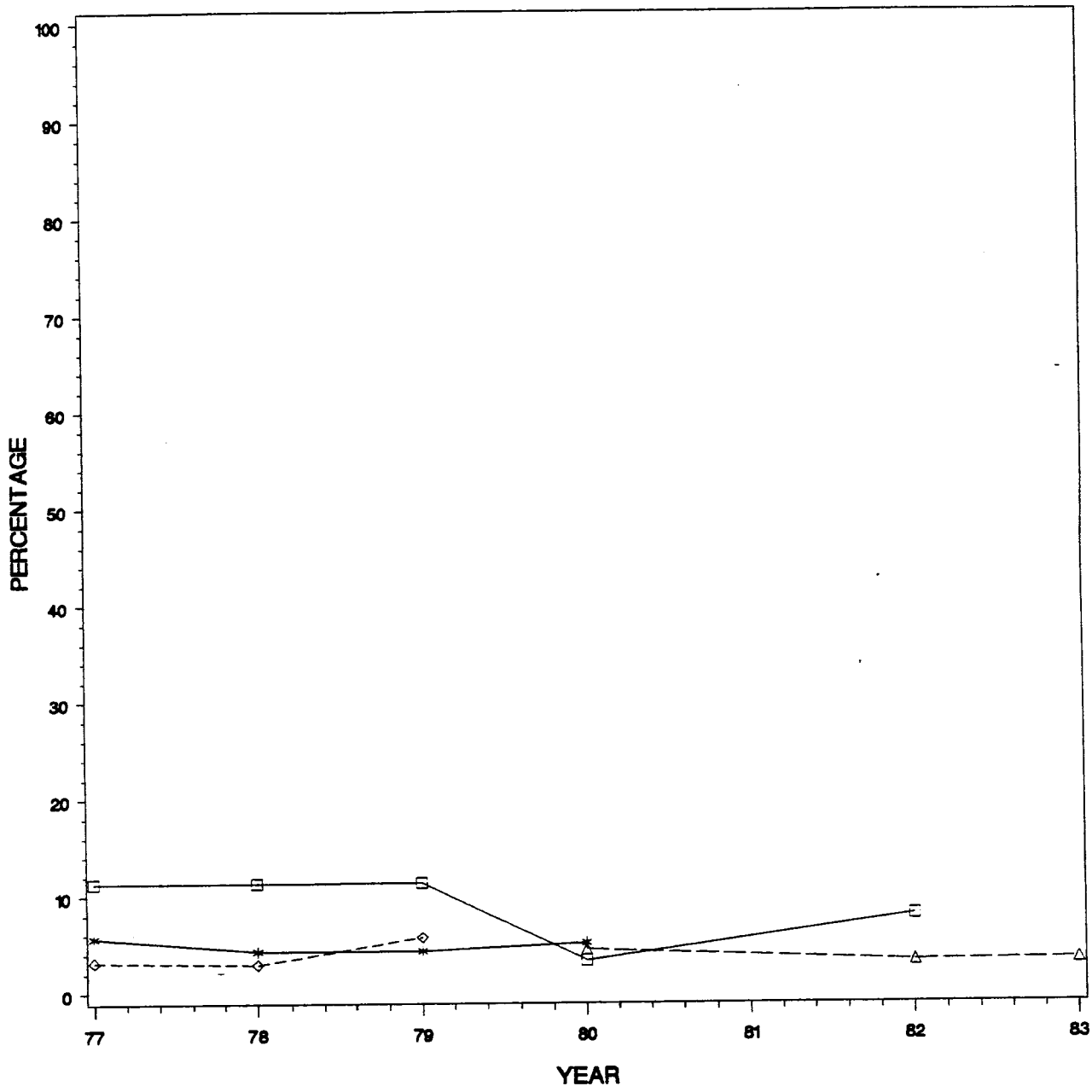
SINGLE UNIT, 2 AXLES
REGION 3, FM, 250<=AADT<=400



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

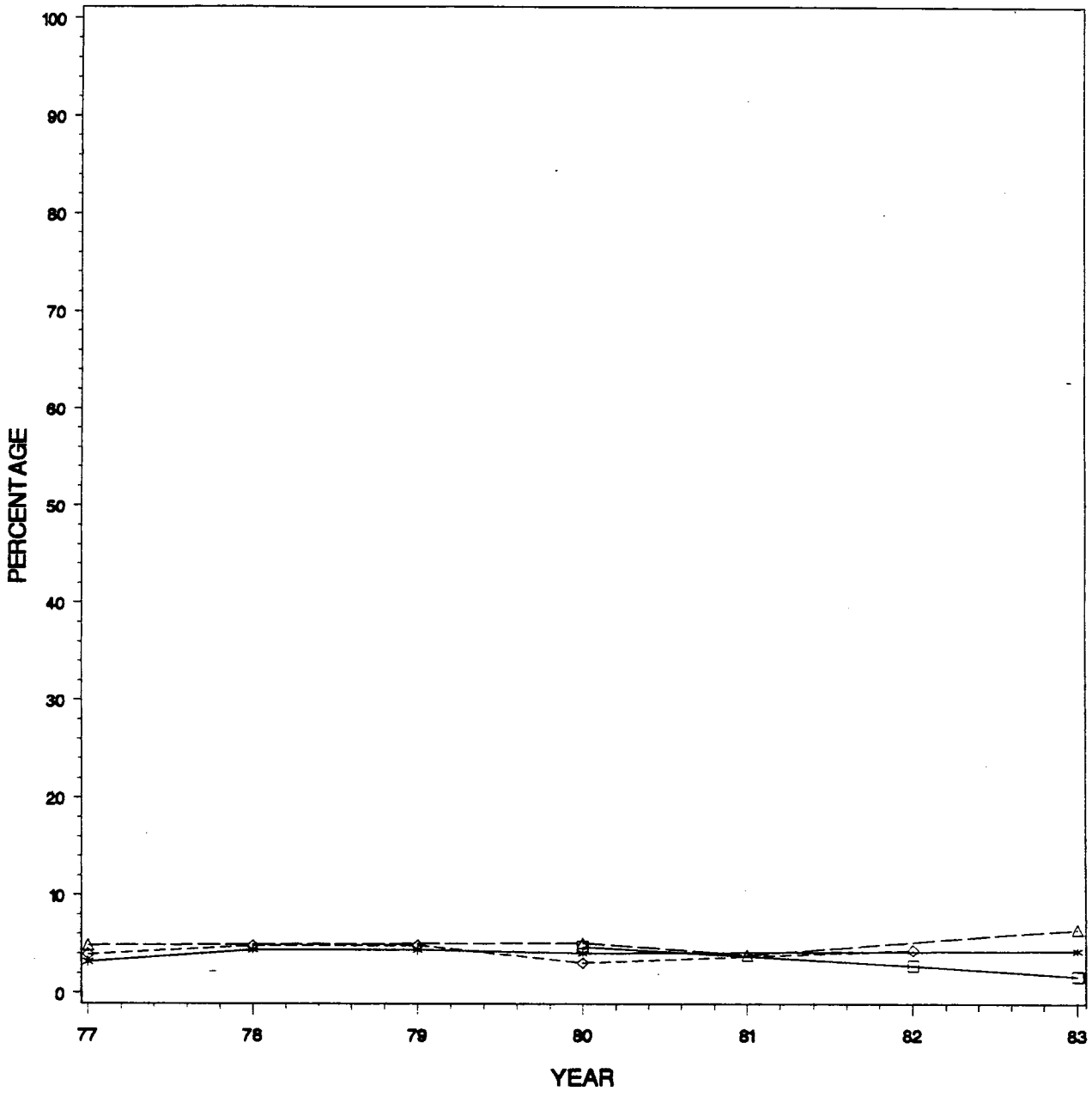
SINGLE UNIT, 2 AXLES
REGION 5, FM, 50<=AADT<=250



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

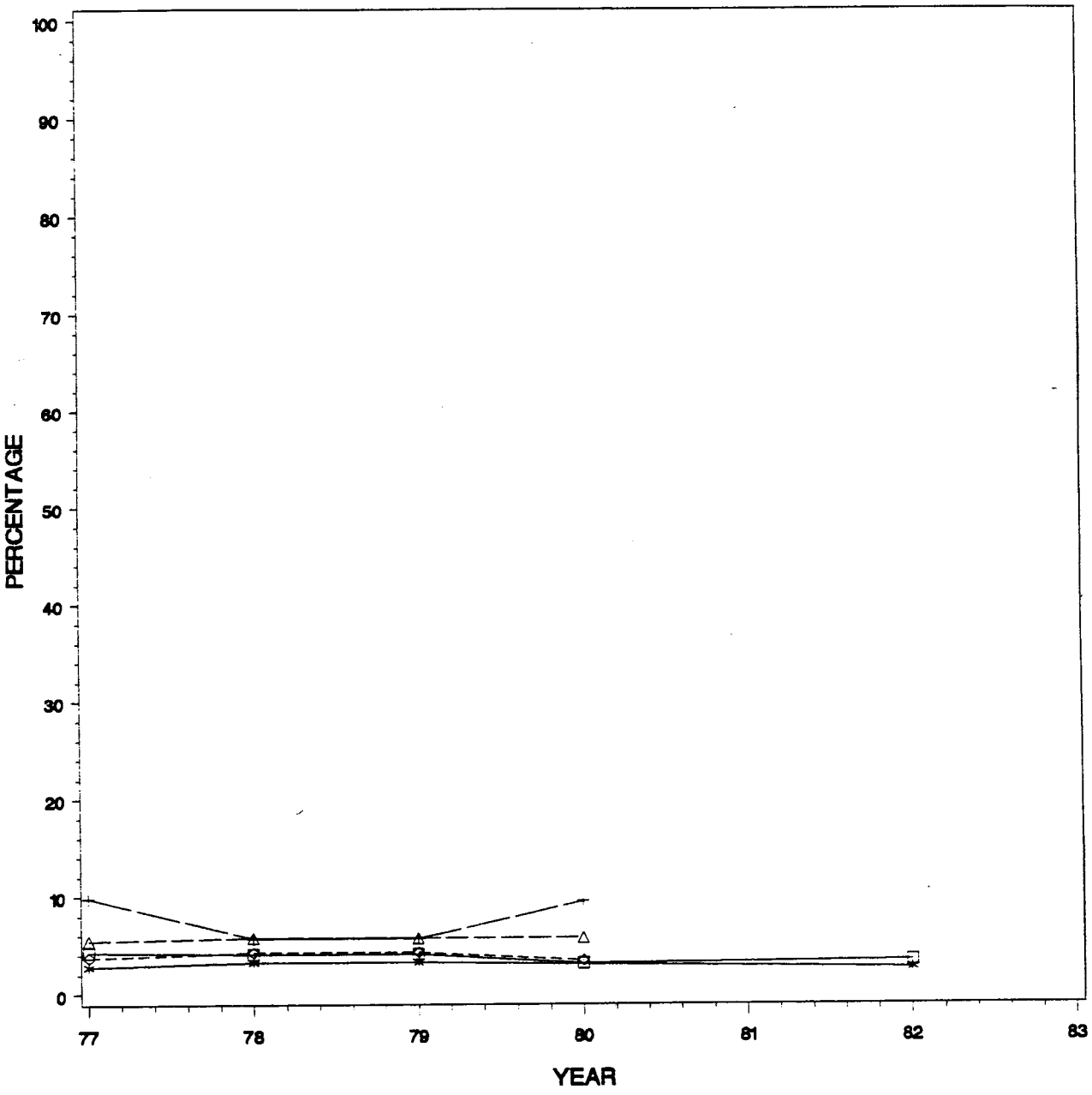
SINGLE UNIT, 2 AXLES
REGION 5, FM, 50 <=AADT< =250



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

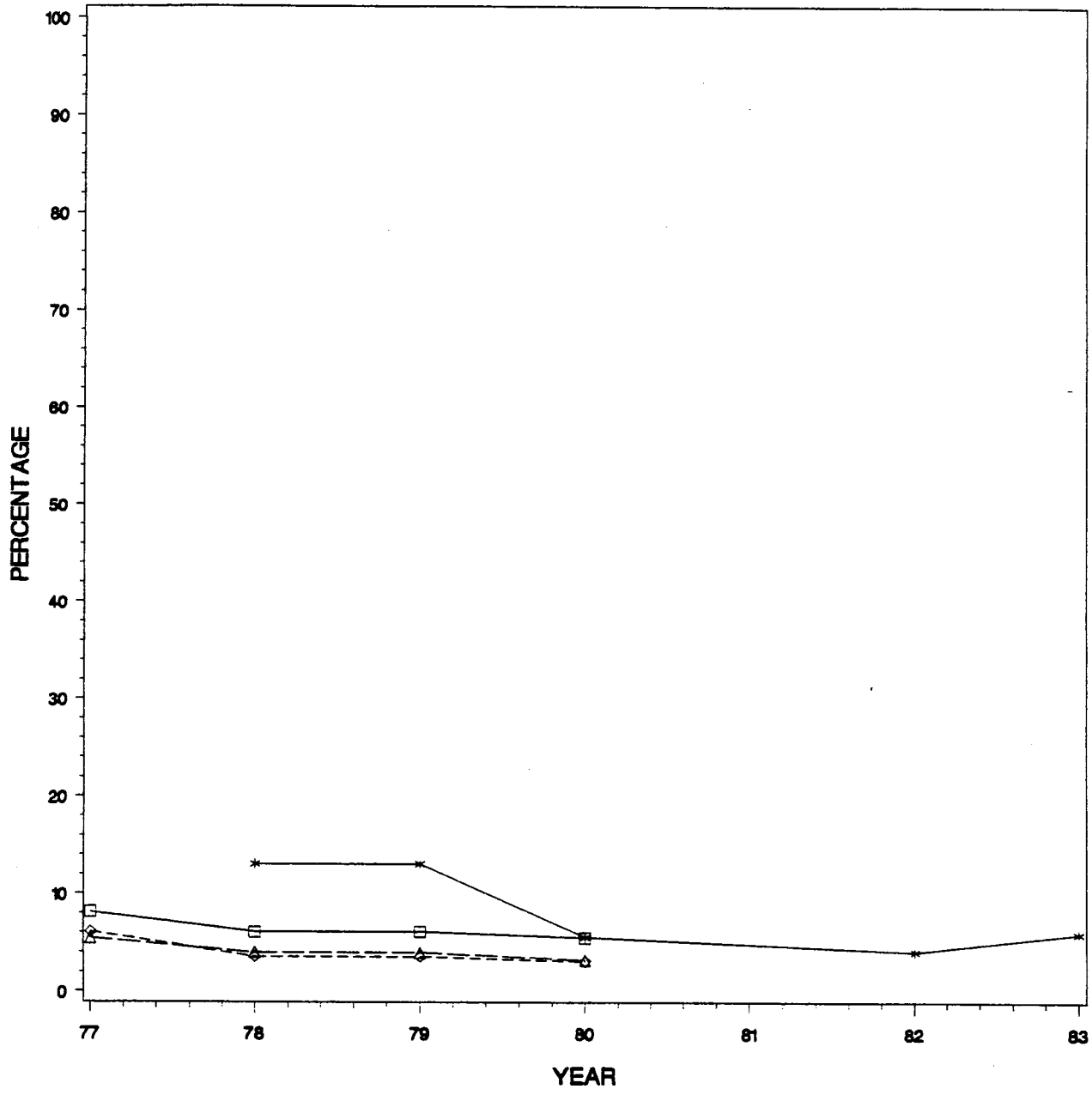
SINGLE UNIT, 2 AXLES
REGION 4, FM, 50 <=AADT <=250



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

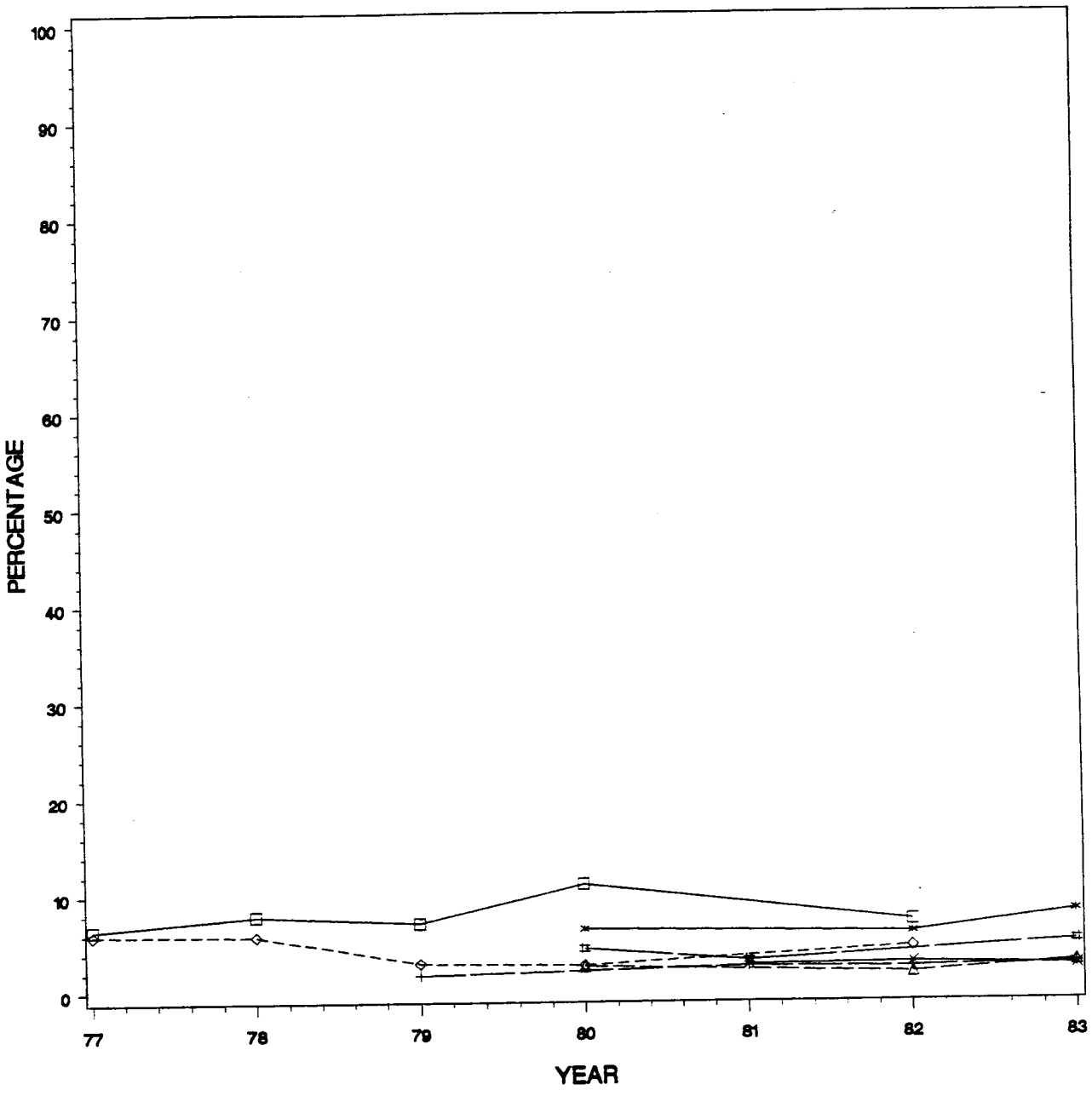
SINGLE UNIT, 2 AXLES
REGION 4, FM, 50< =AADT <=250



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

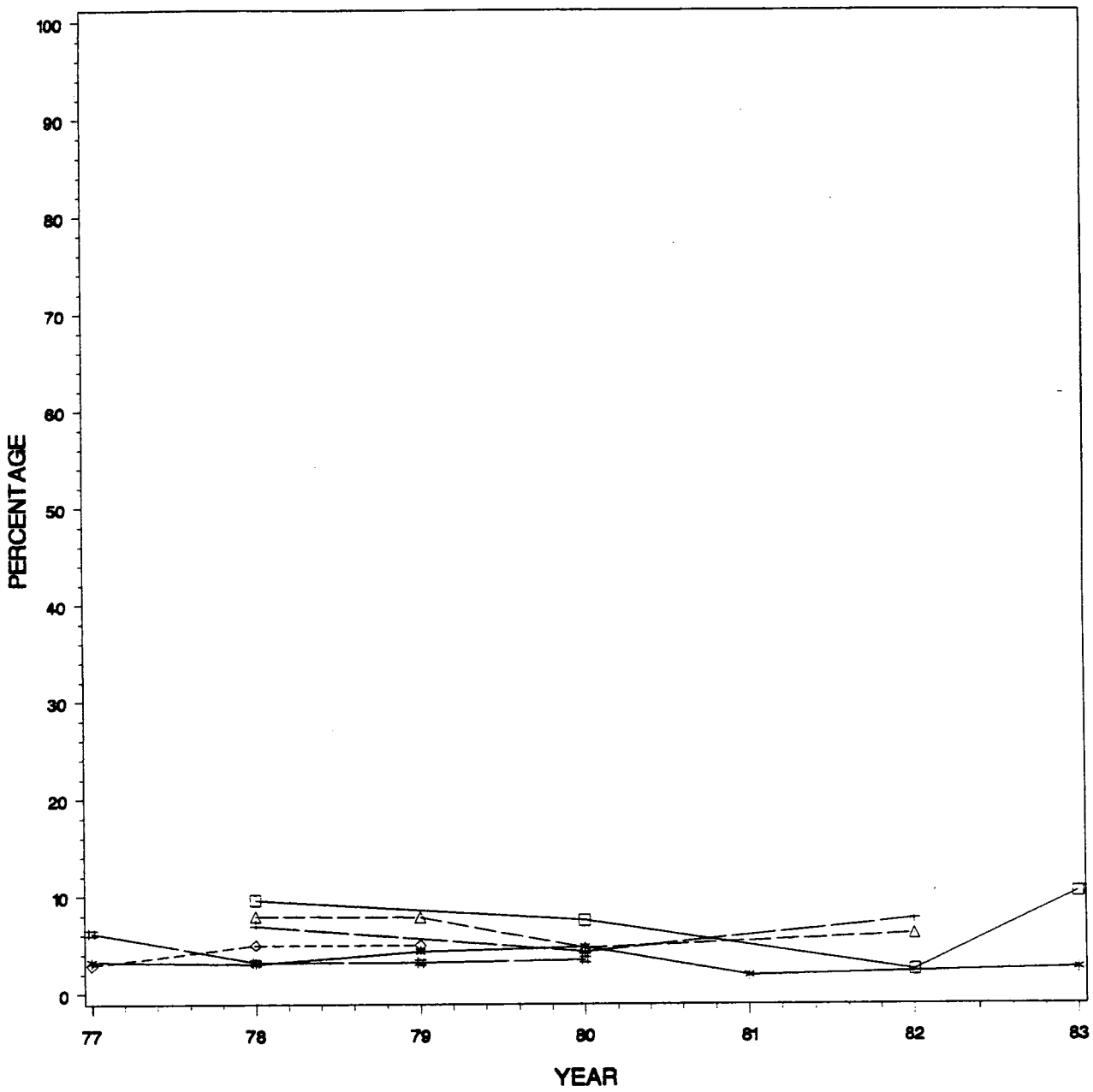
SINGLE UNIT, 2 AXLES
REGION 3, FM, 50< =AADT <=250



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

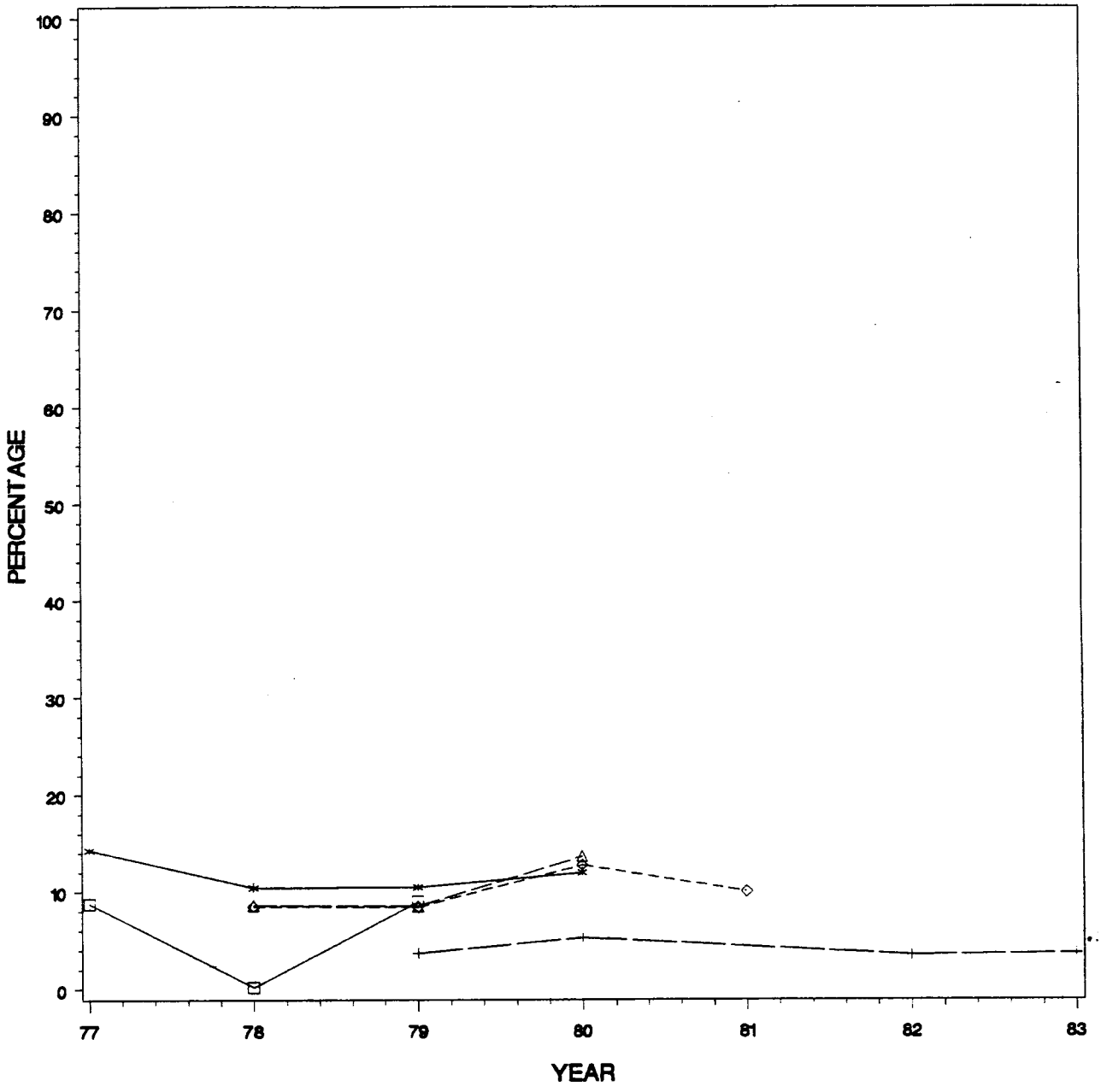
SINGLE UNIT, 2 AXLES
REGION 3, FM, 50< =AADT <=250



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

SINGLE UNIT, 2 AXLES
REGION 2, FM, 50 <= AADT <= 250

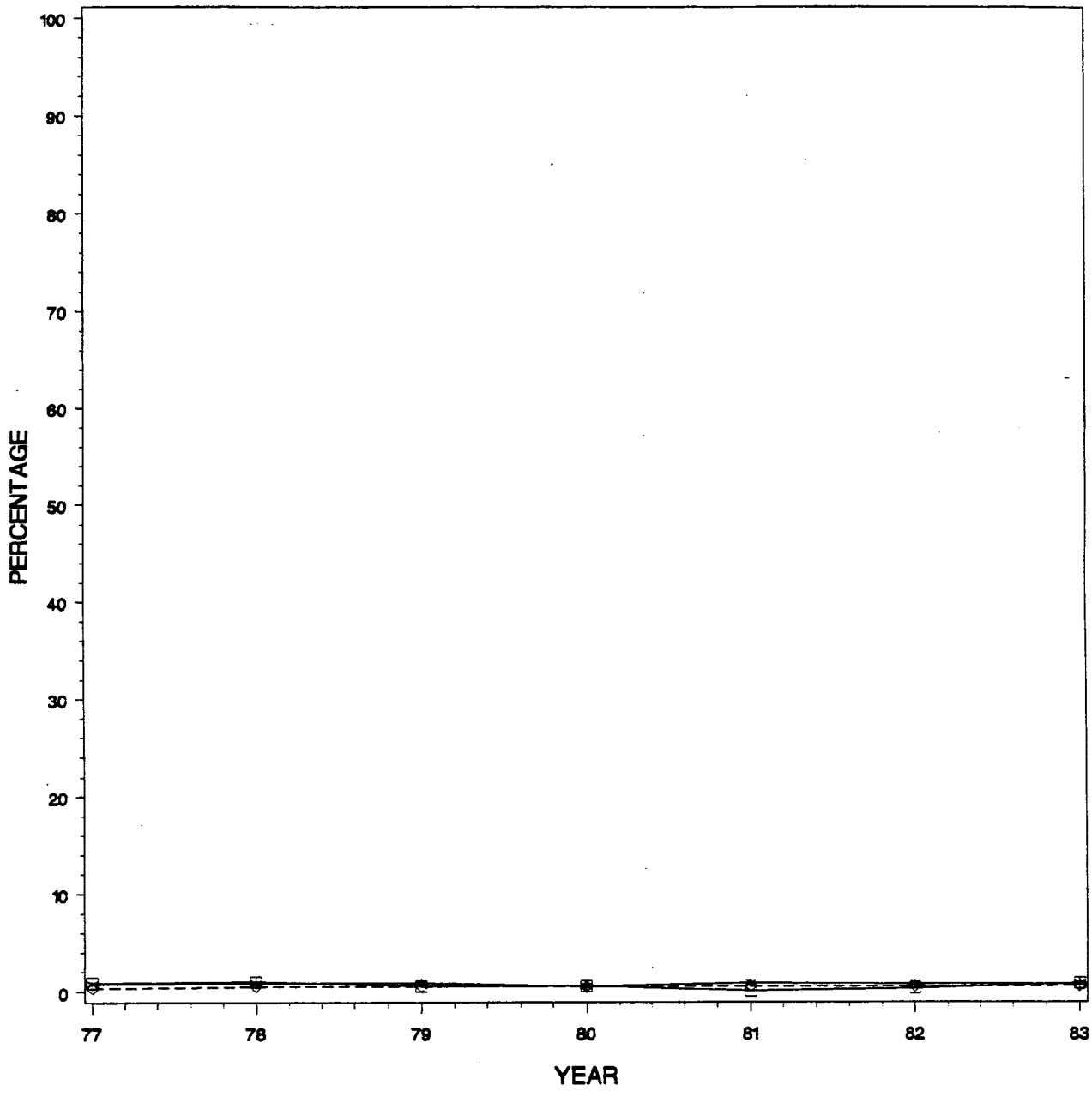


SOURCE: MANUAL COUNT
ANNUAL REPORT

Appendix 6.5 Proportions of SU-1 Trucks in Total Traffic, U.S. and State Highways

TREND ANALYSIS

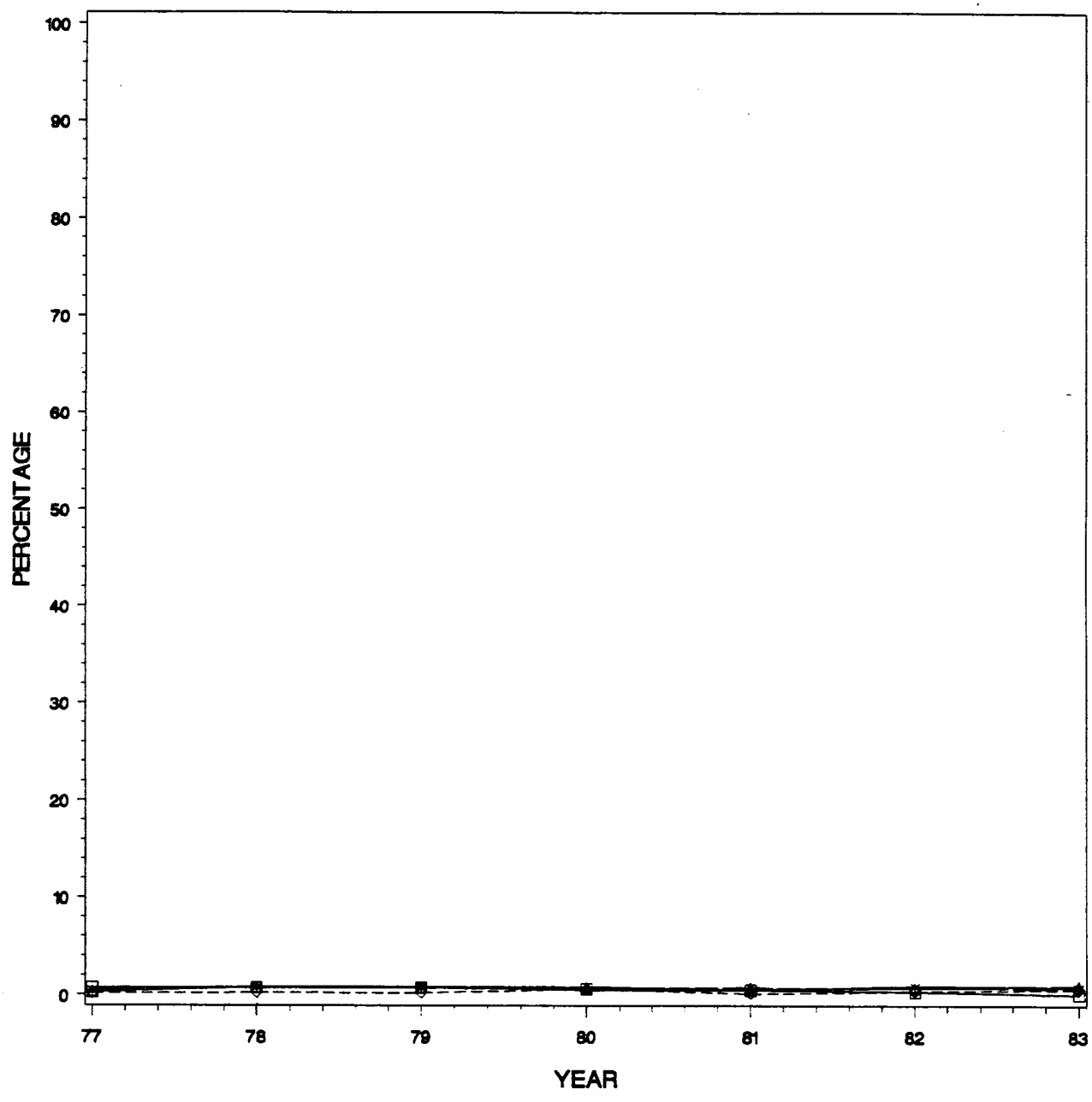
SINGLE UNIT, 3 AXLE
REGION 1, IH



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

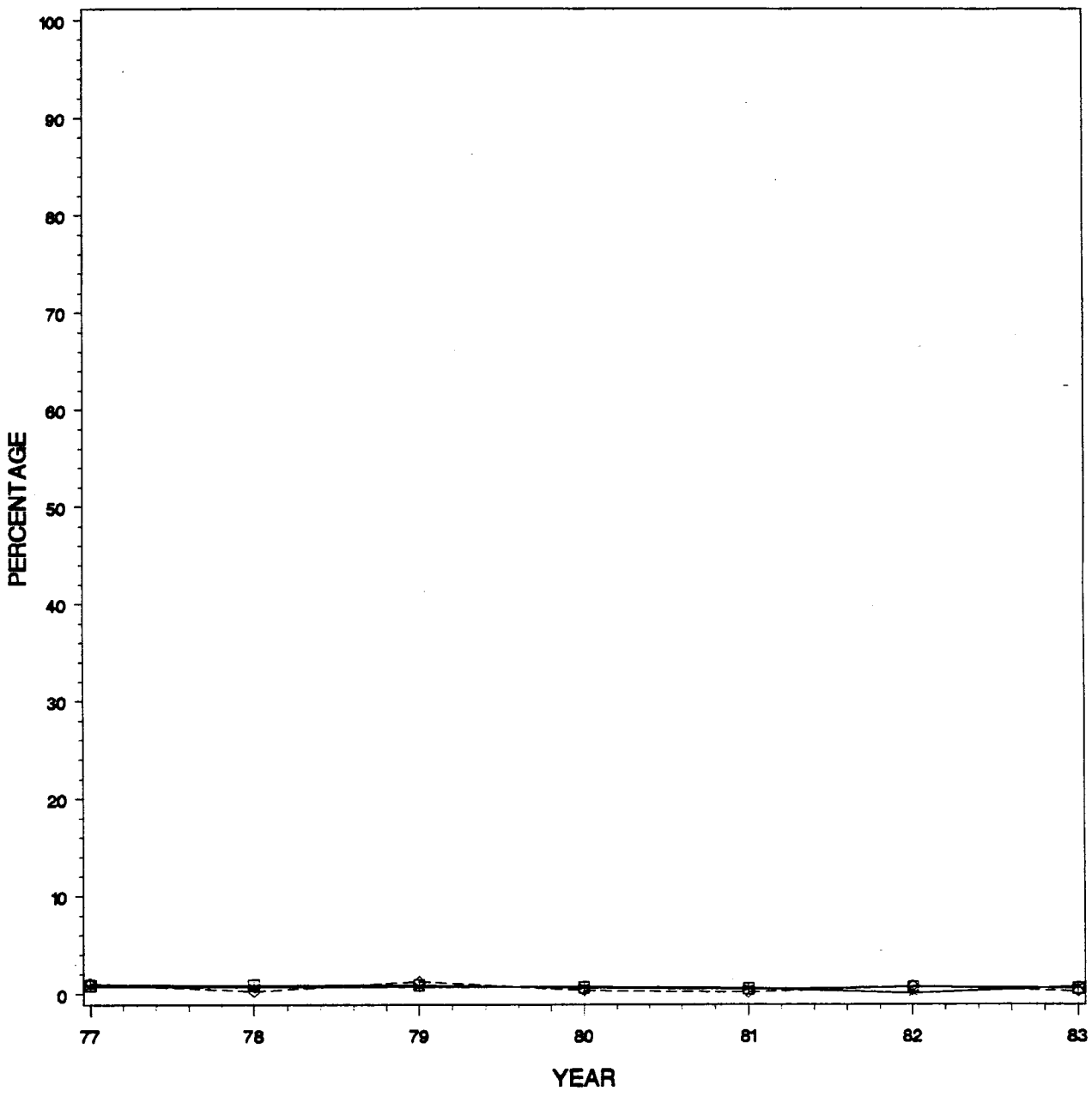
SINGLE UNIT, 3 AXLE
REGION 2, IH



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

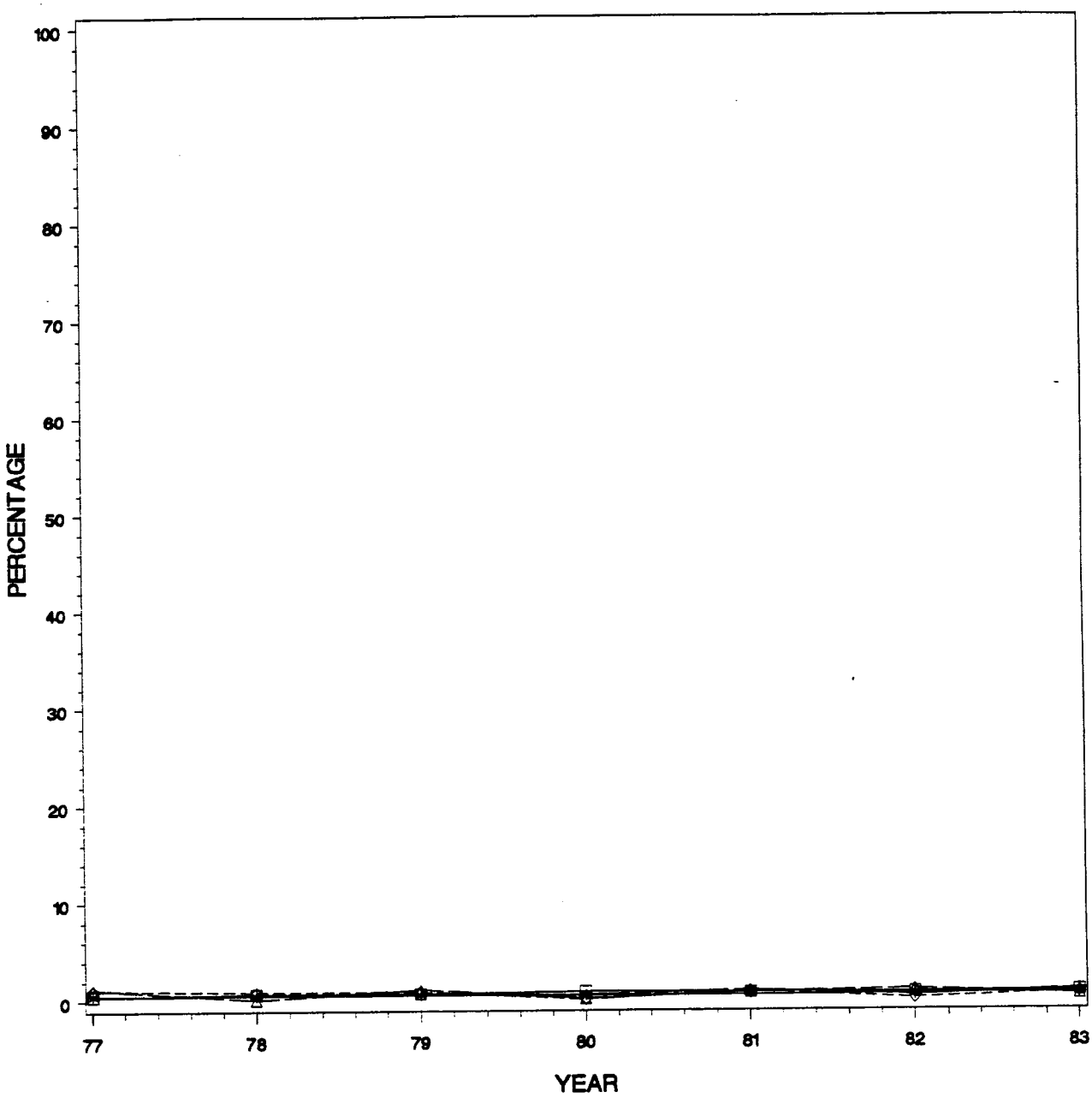
SINGLE UNIT, 3 AXLE
REGION 3, IH



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

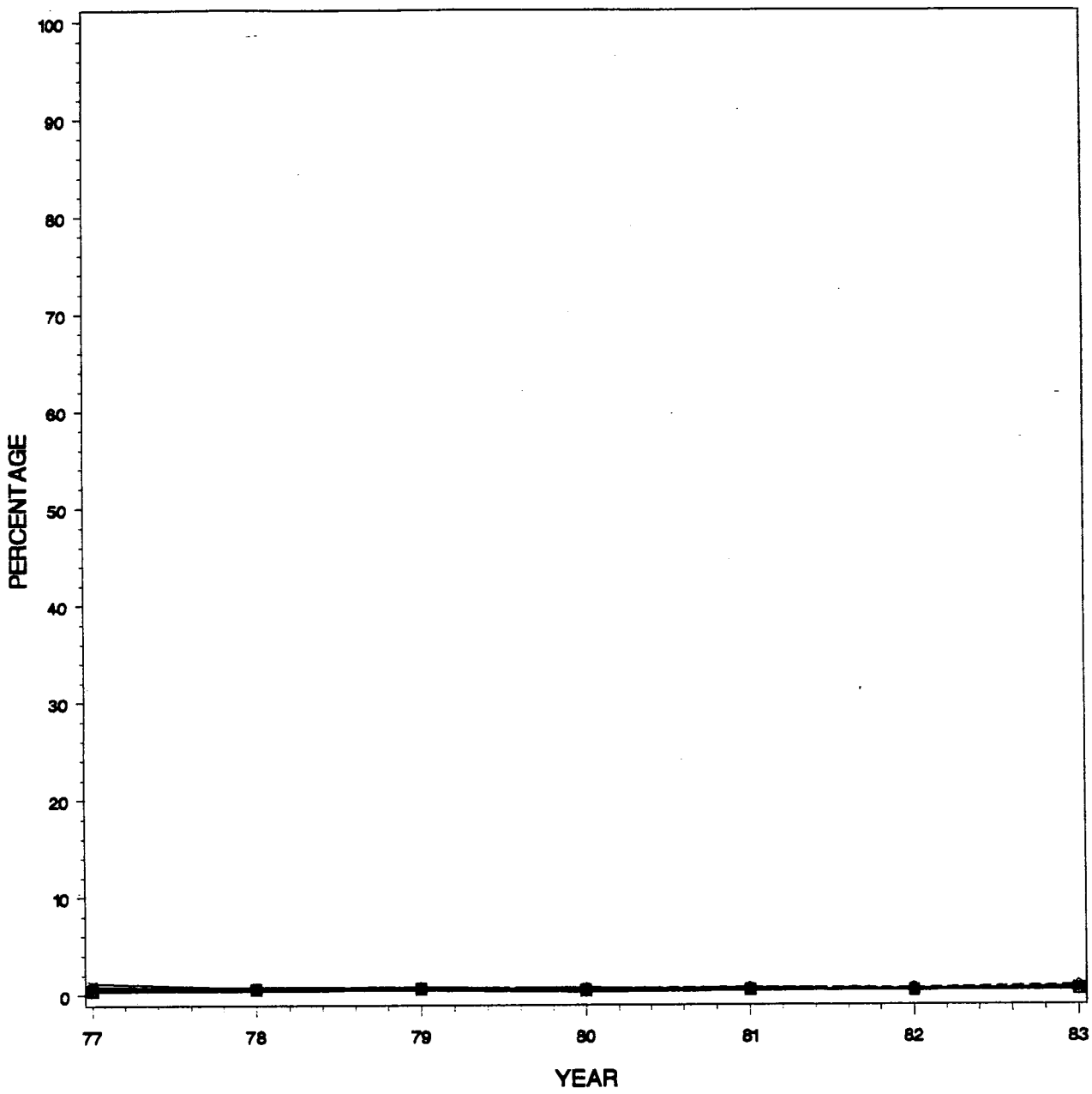
SINGLE UNIT, 3 AXLE
REGION 4, IH



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

SINGLE UNIT, 3 AXLE
REGION 5, IH

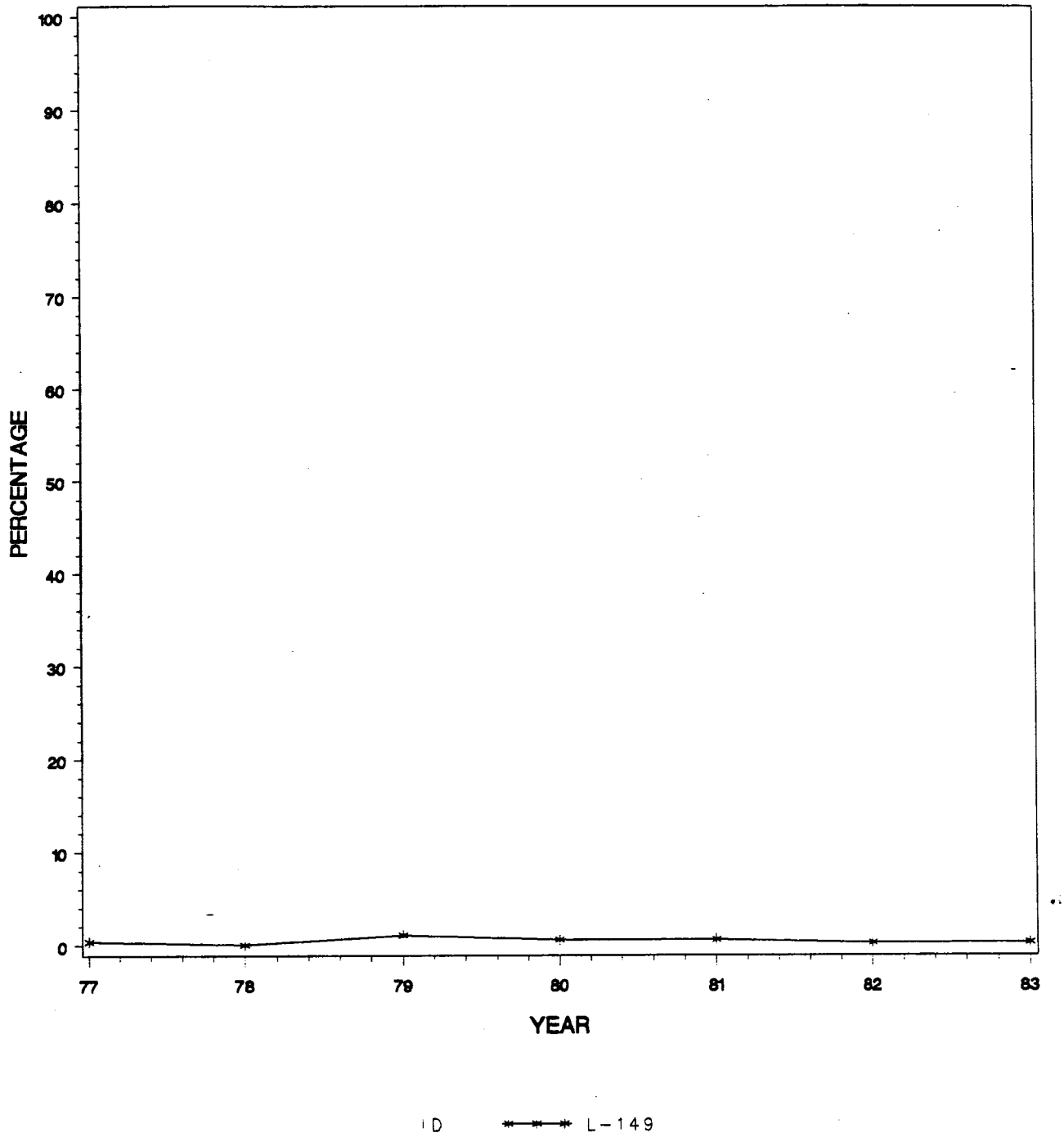


SOURCE: MANUAL COUNT
ANNUAL REPORT

Appendix 6.6 Proportions of SU-2 Trucks in Total Traffic, U.S. and State Highways

TREND ANALYSIS

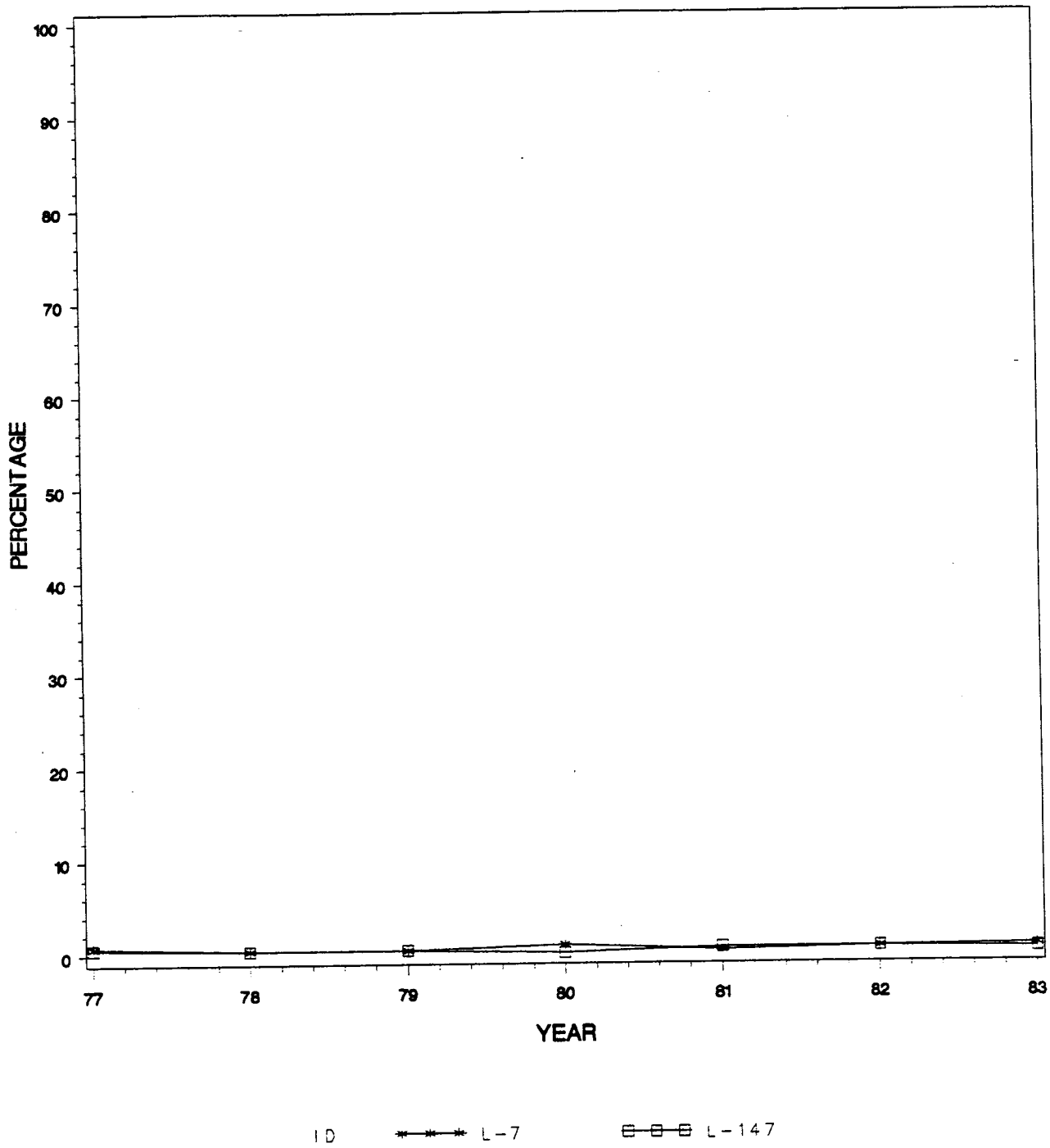
SINGLE UNIT, 3 AXLE
REGION 1, US



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

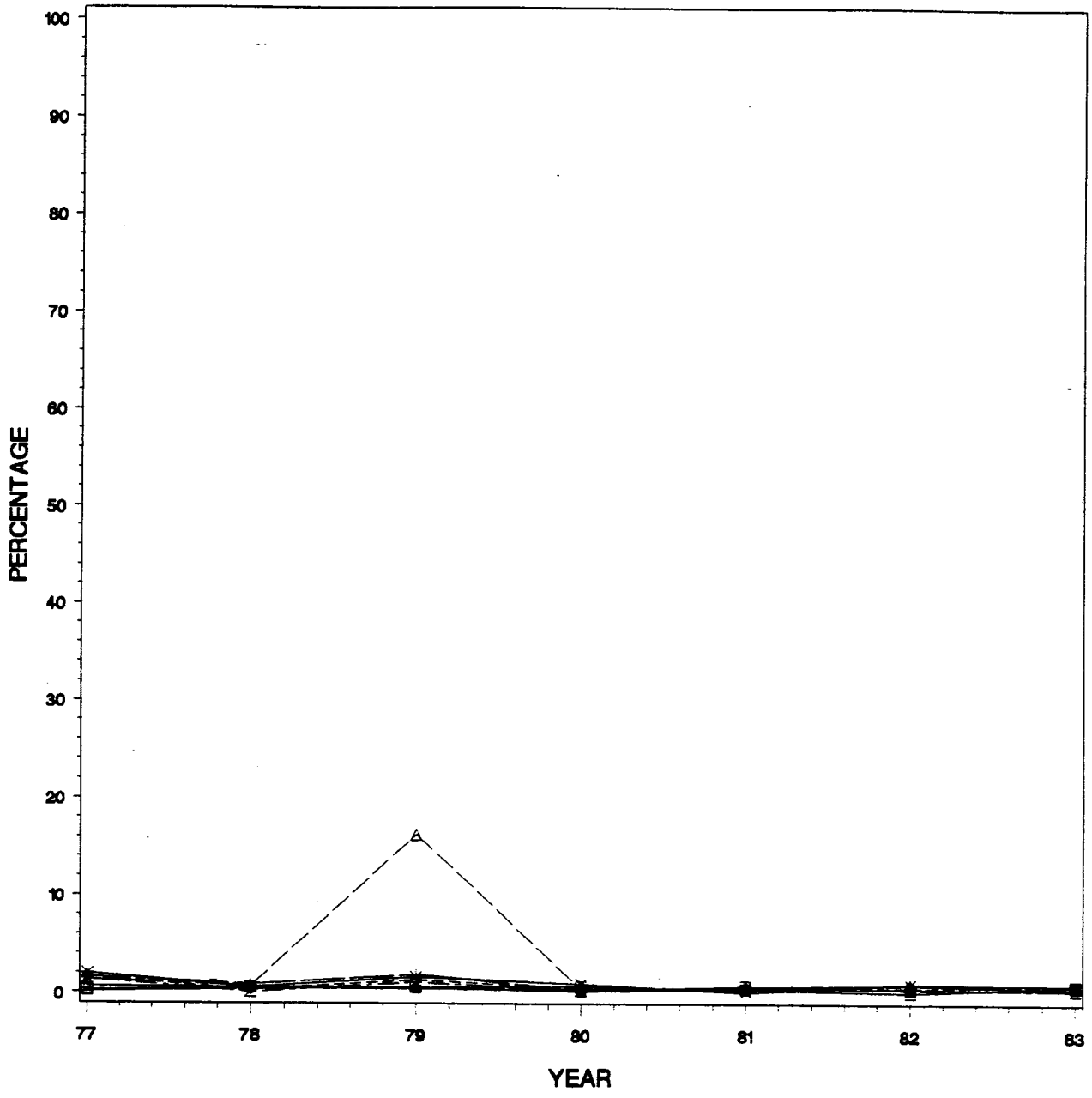
SINGLE UNIT, 3 AXLE
REGION 2, US



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

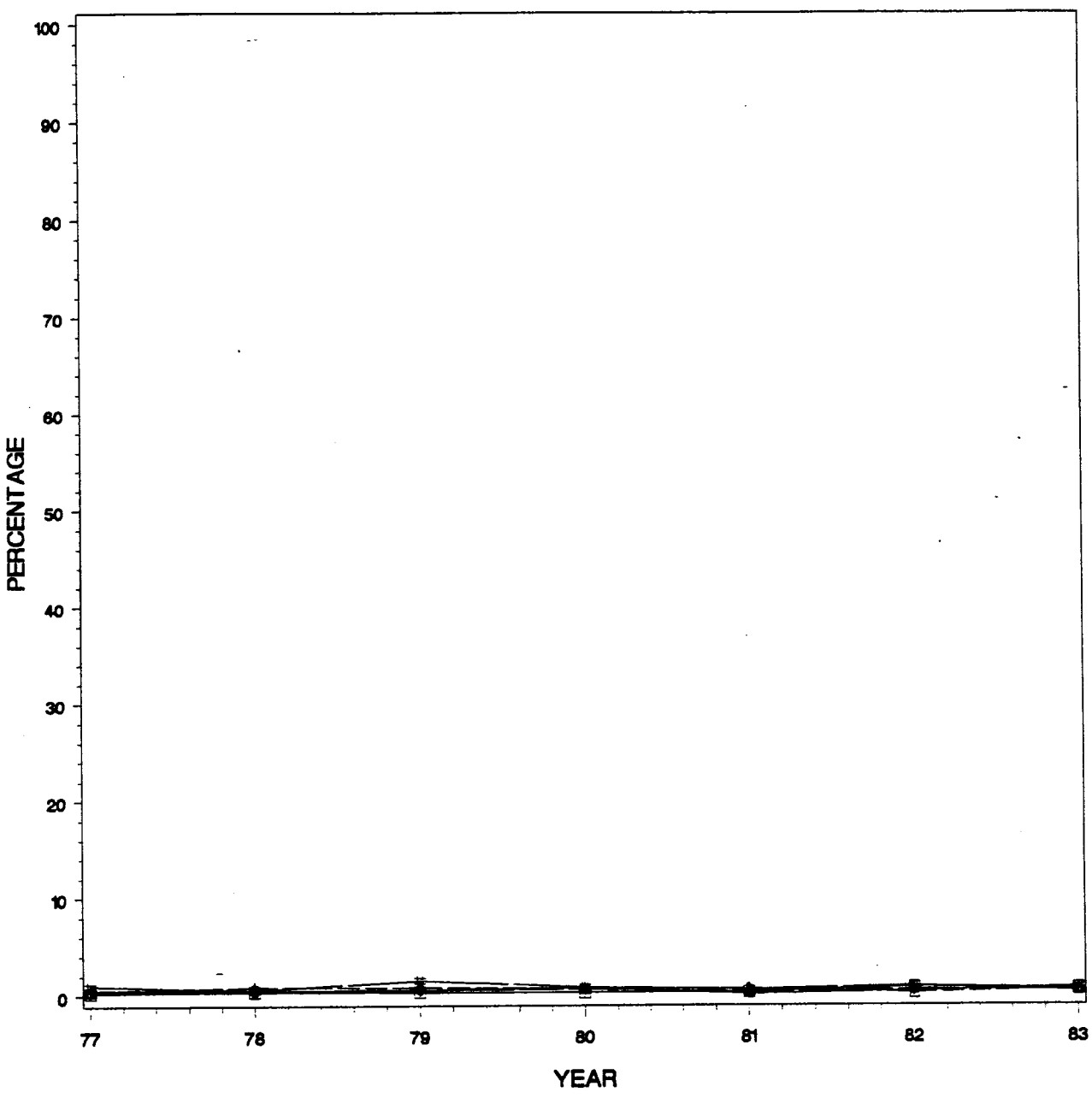
SINGLE UNIT, 3 AXLE
REGION 3, US



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

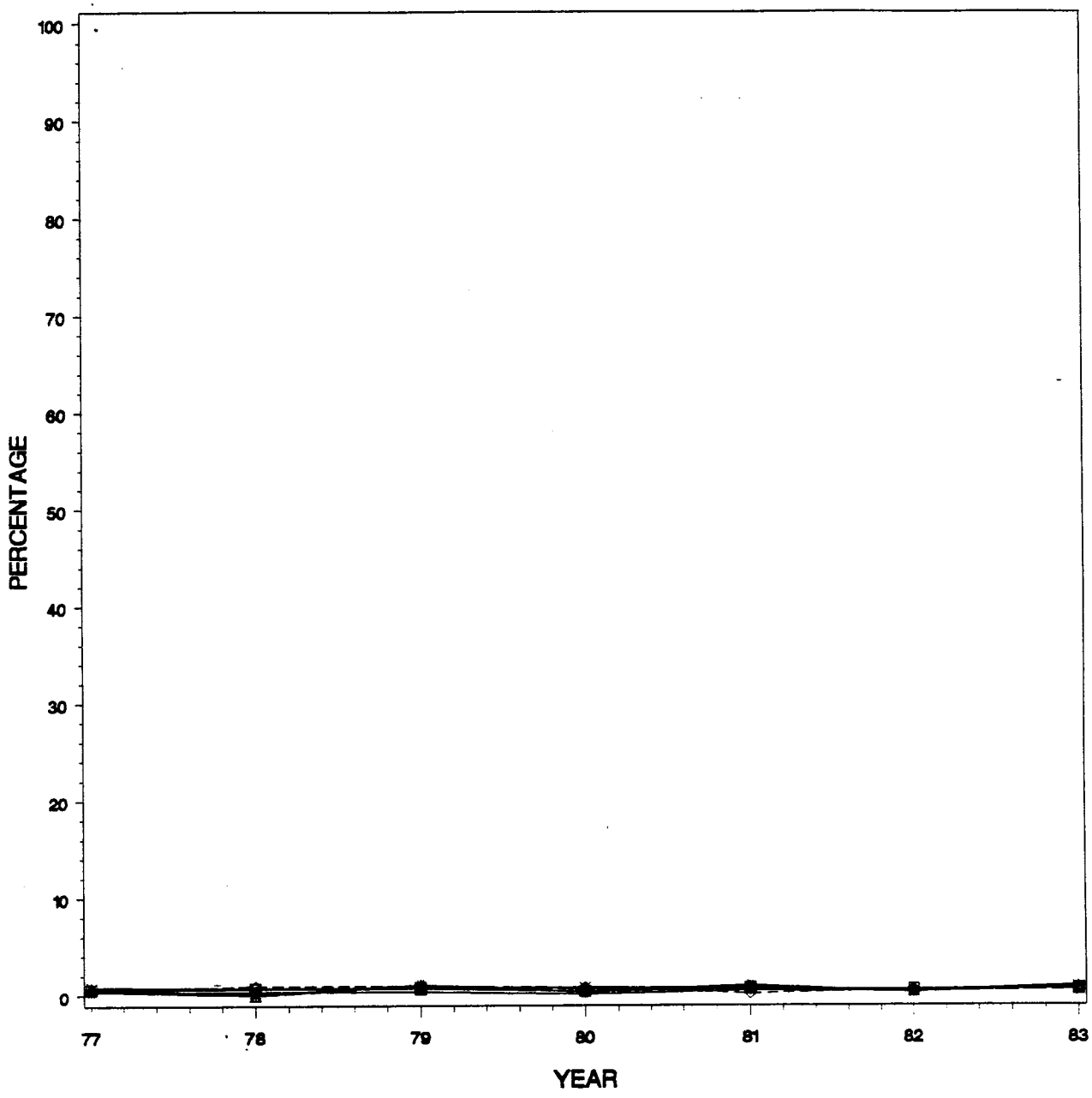
SINGLE UNIT, 3 AXLE
REGION 3, SH



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

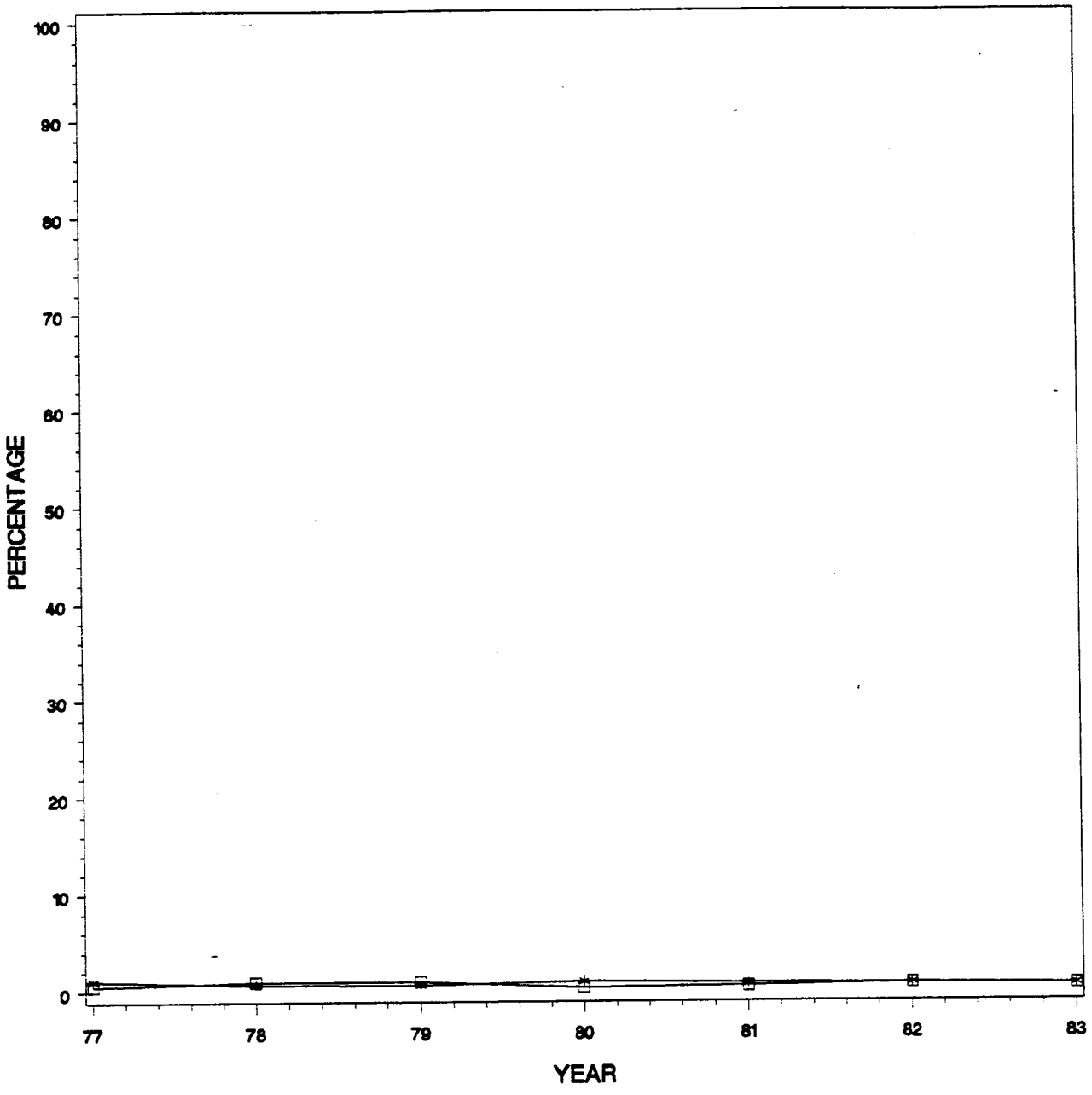
SINGLE UNIT, 3 AXLE
REGION 4, US



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

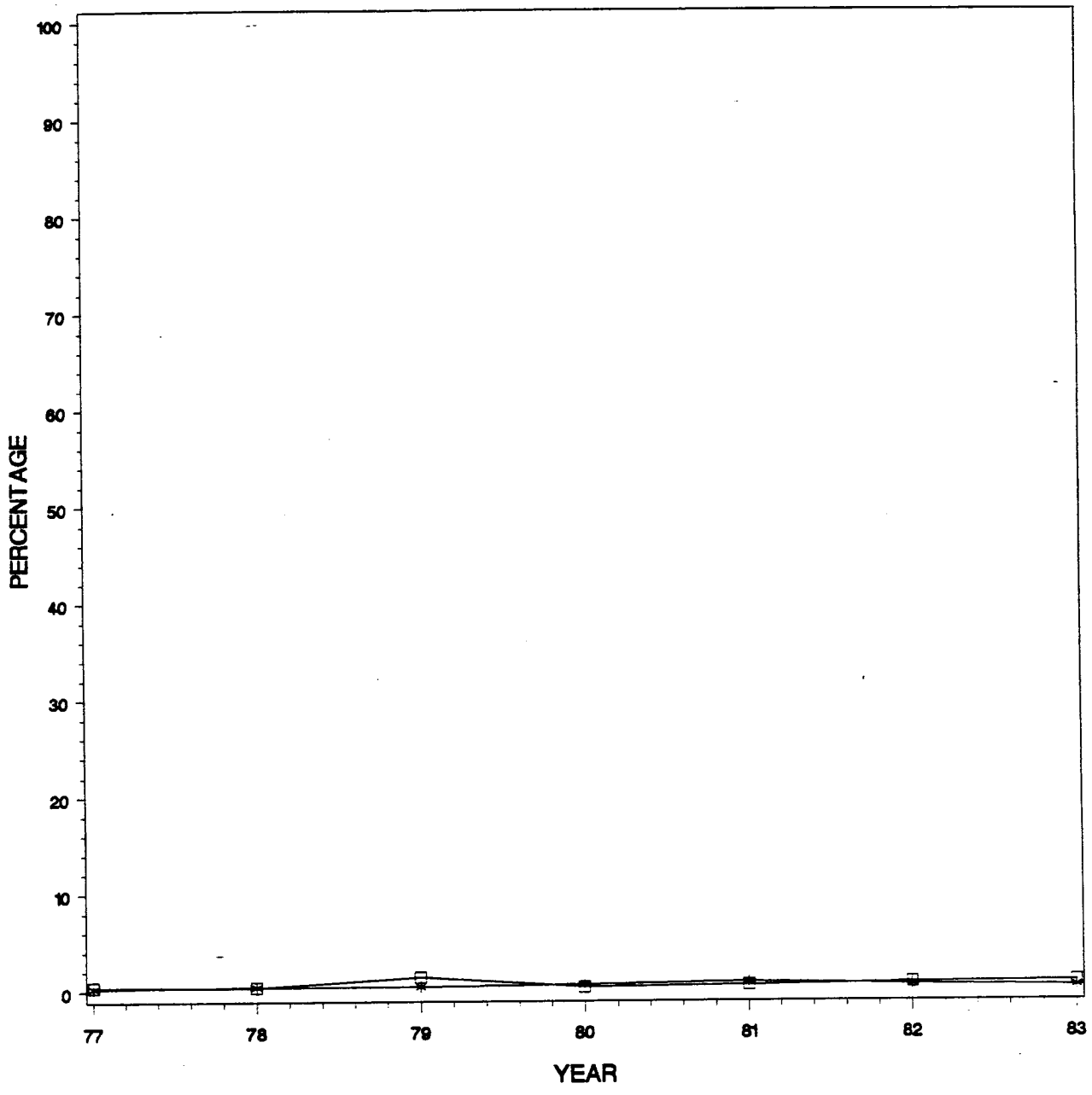
SINGLE UNIT, 3 AXLE
REGION 5, US



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

SINGLE UNIT, 3 AXLE
REGION 5, SH

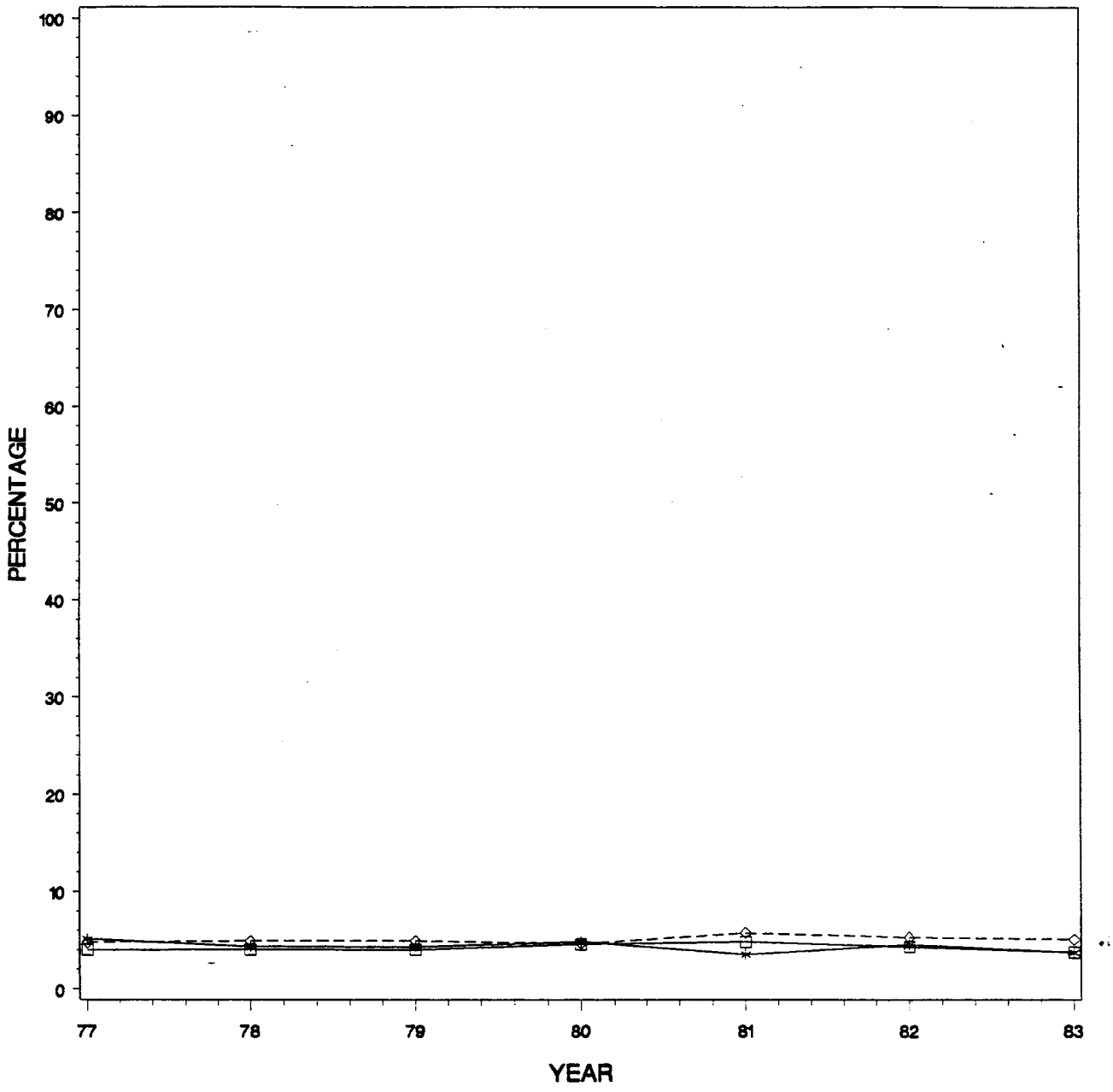


SOURCE: MANUAL COUNT
ANNUAL REPORT

Appendix 6.7 Proportions of SU-1 Trucks in Total Traffic, Interstate Highways

TREND ANALYSIS

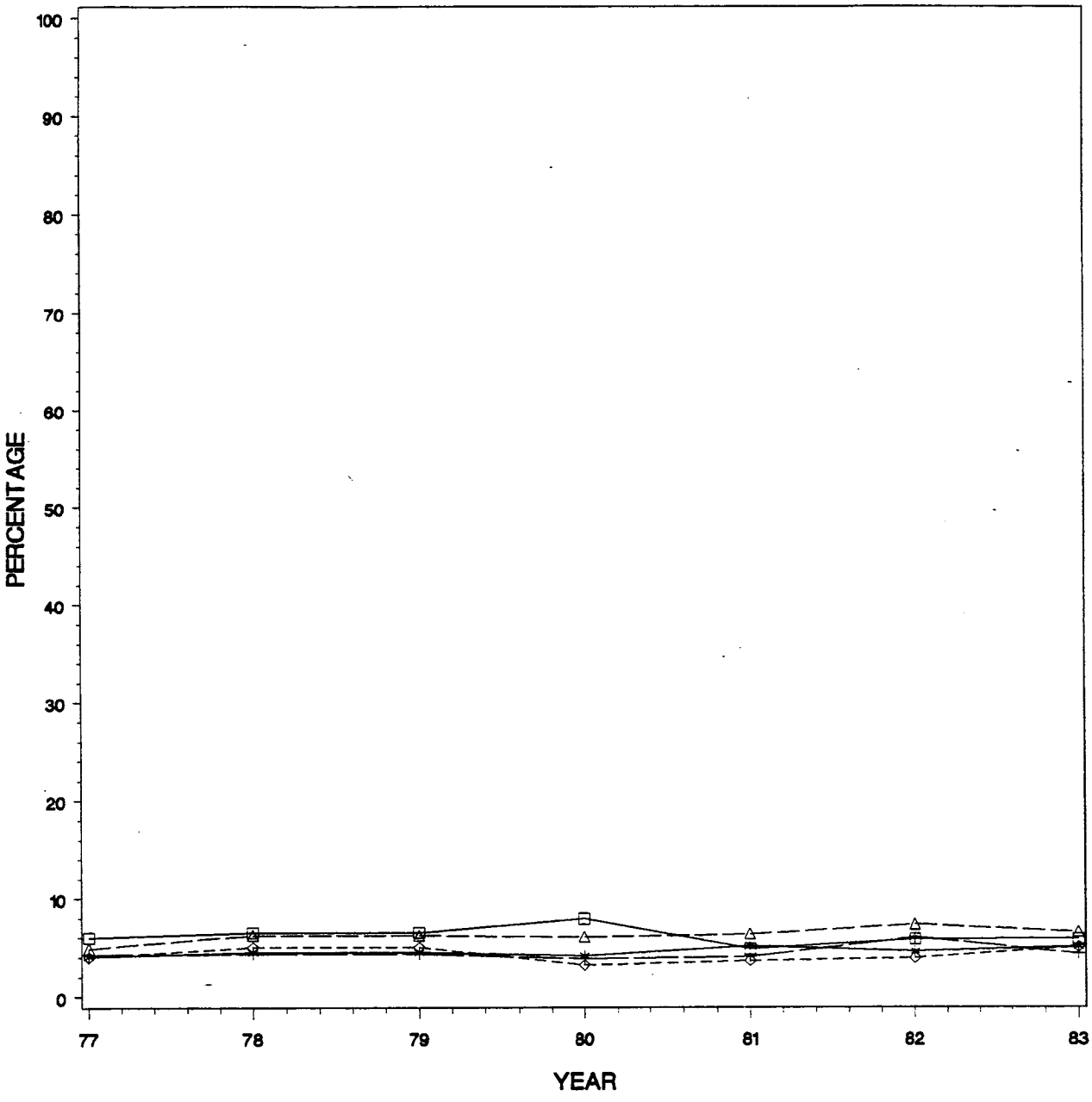
SINGLE UNIT, 2 AXLE
REGION 1, IH



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

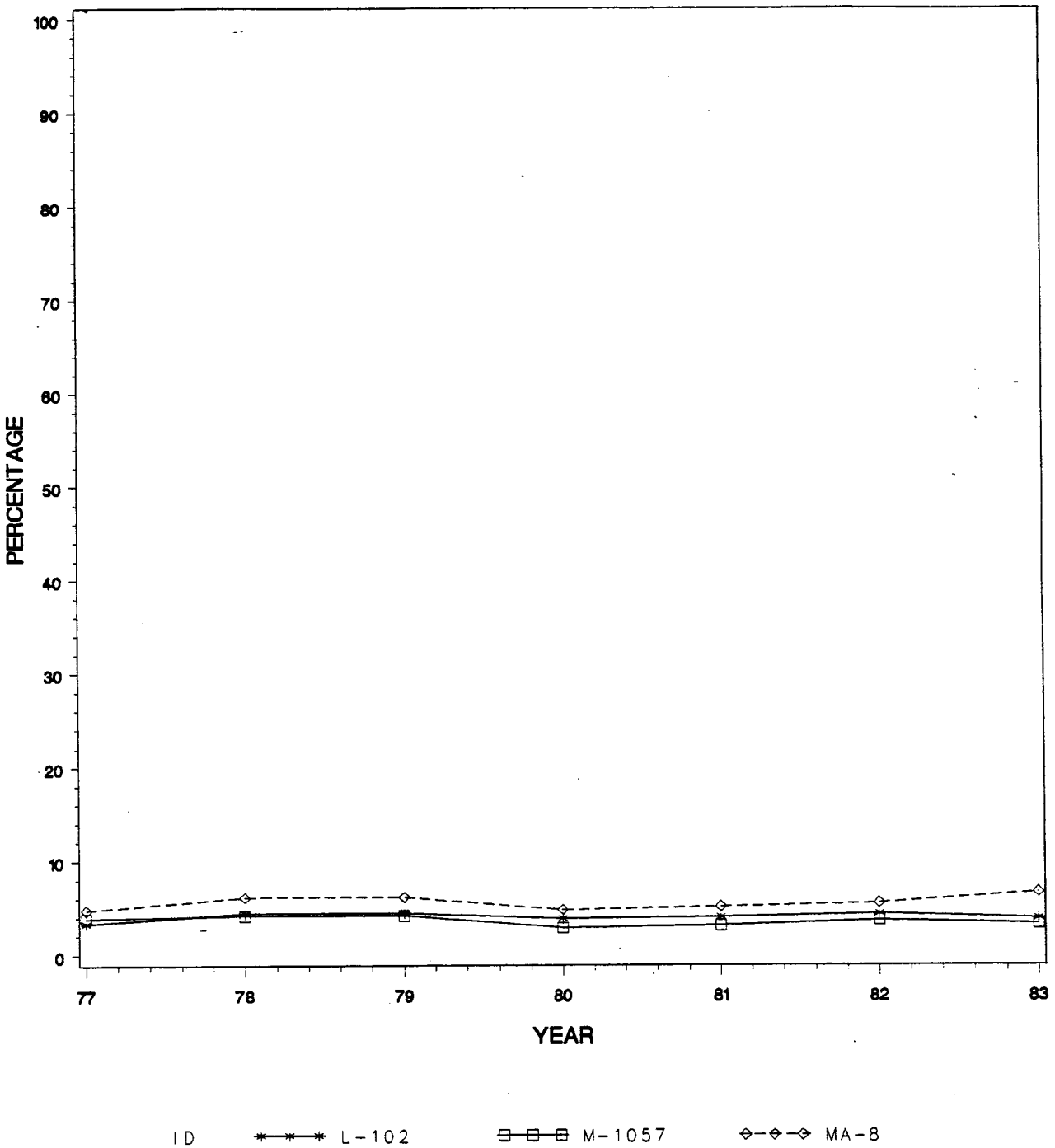
SINGLE UNIT, 2 AXLE
REGION 2, IH



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

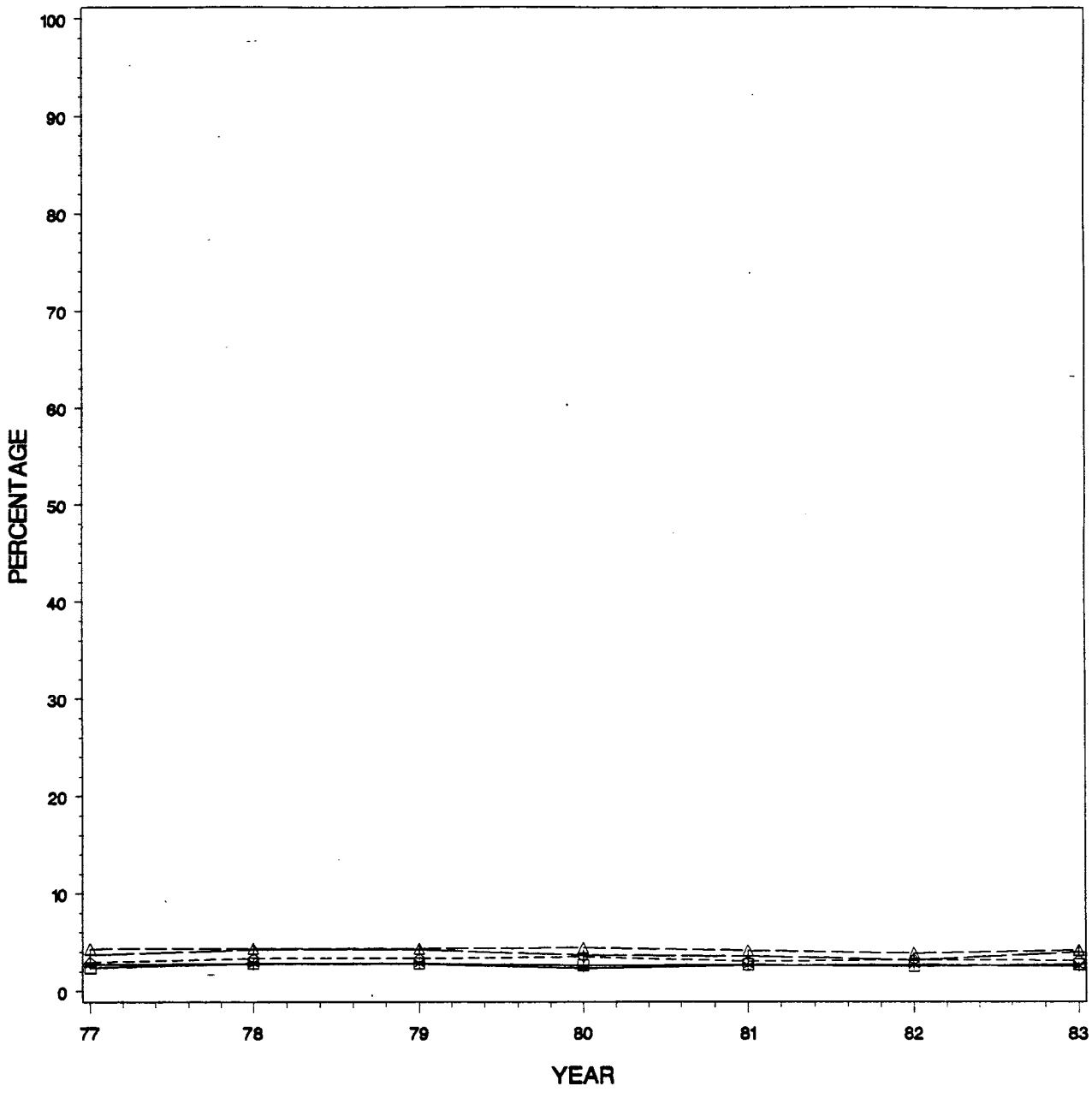
SINGLE UNIT, 2 AXLE
REGION 3, IH



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

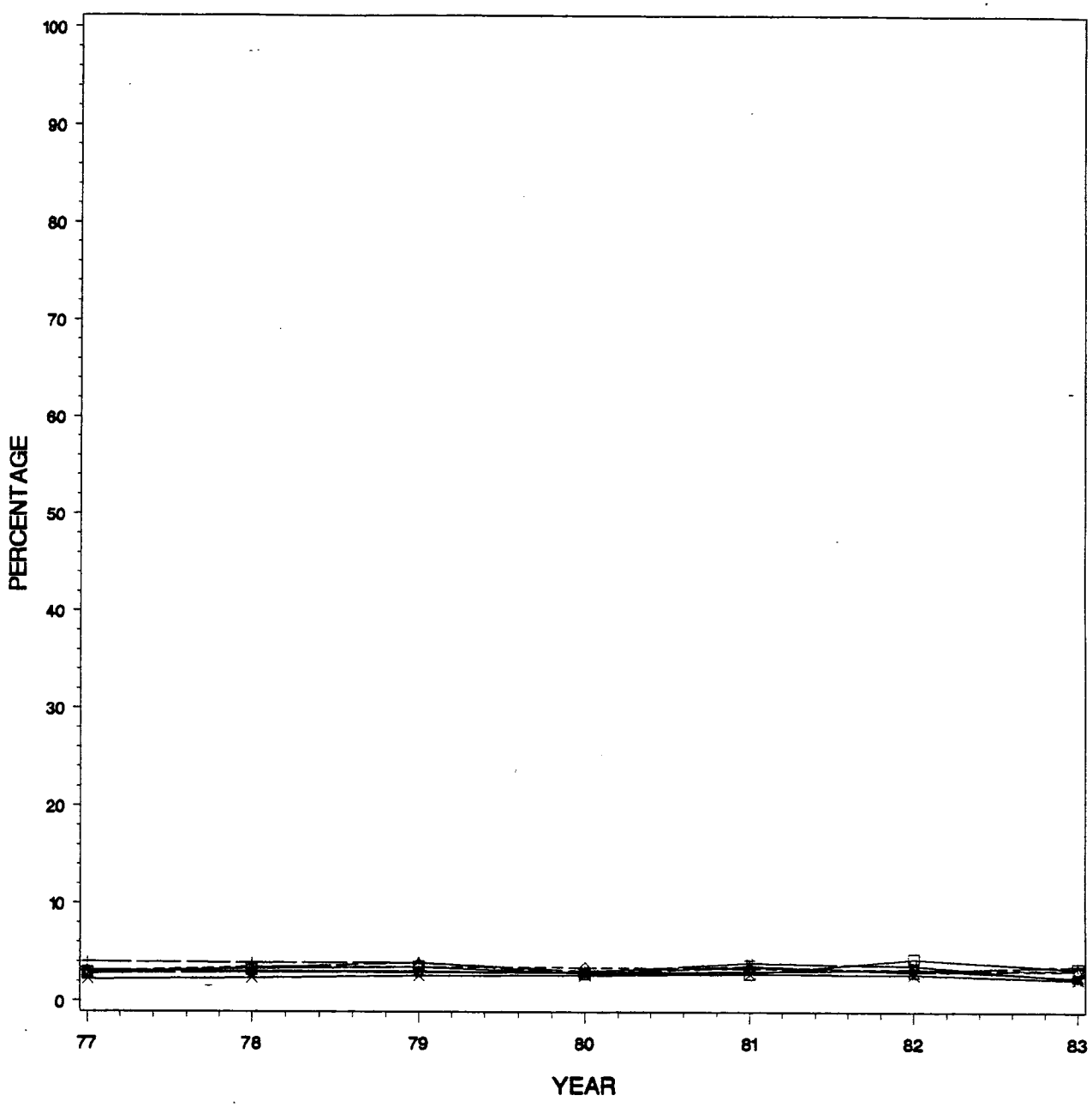
SINGLE UNIT, 2 AXLE
REGION 4, IH



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

SINGLE UNIT, 2 AXLE
REGION 5, IH

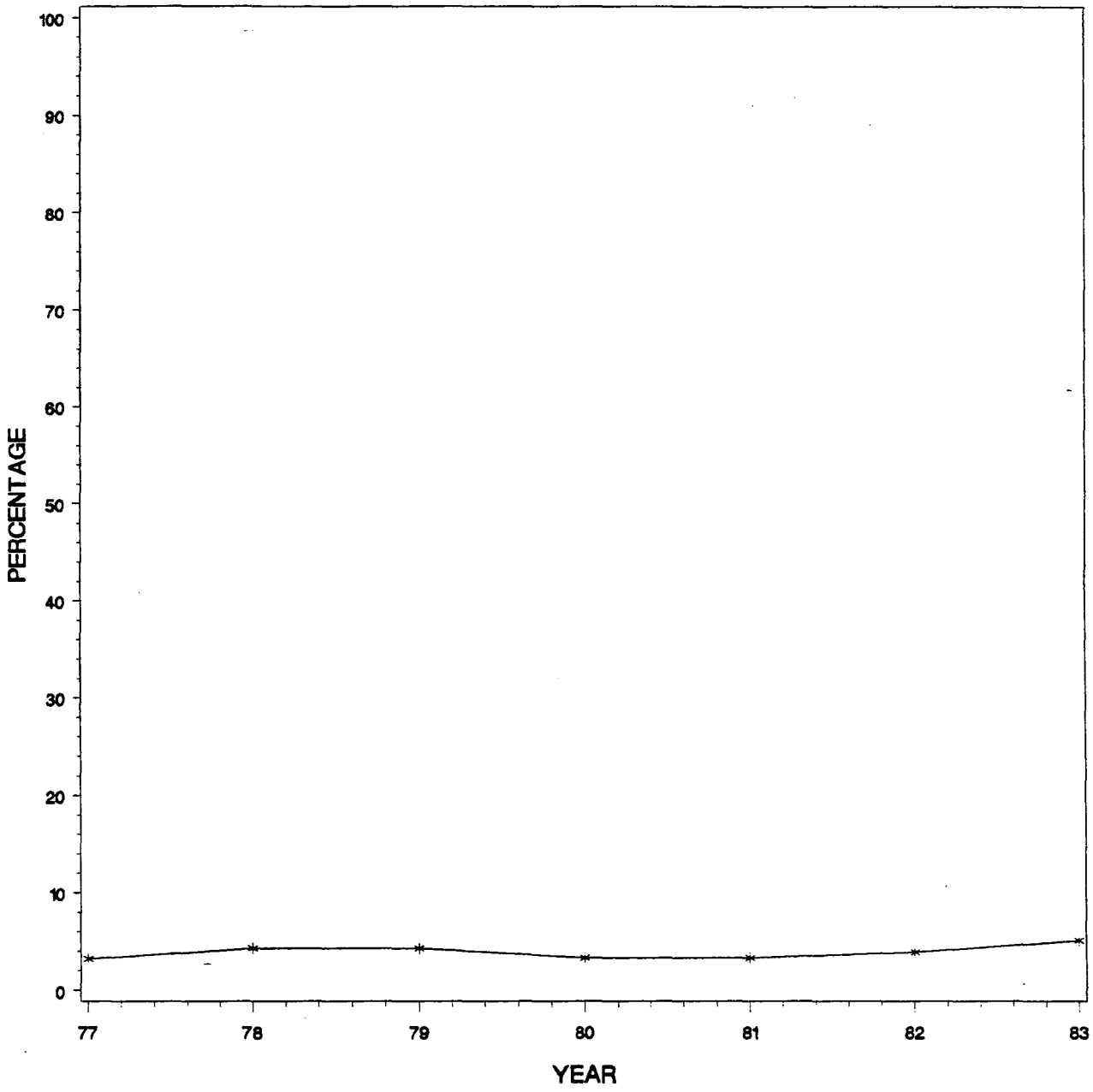


SOURCE: MANUAL COUNT
ANNUAL REPORT

Appendix 6.8 Proportions of SU-2 Trucks in Total Traffic, Interstate Highways

TREND ANALYSIS

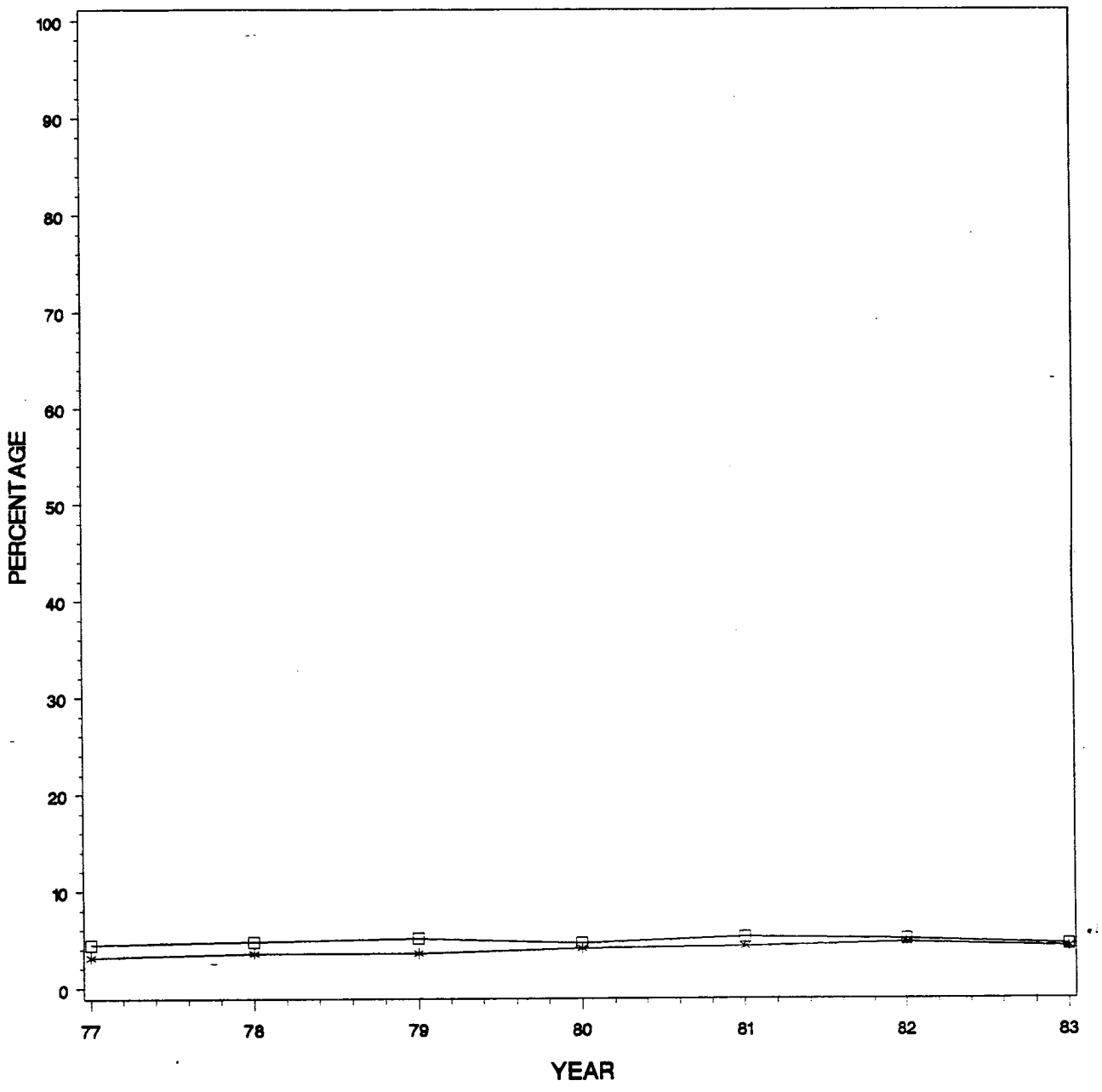
SINGLE UNIT, 2 AXLE
REGION 1, US



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

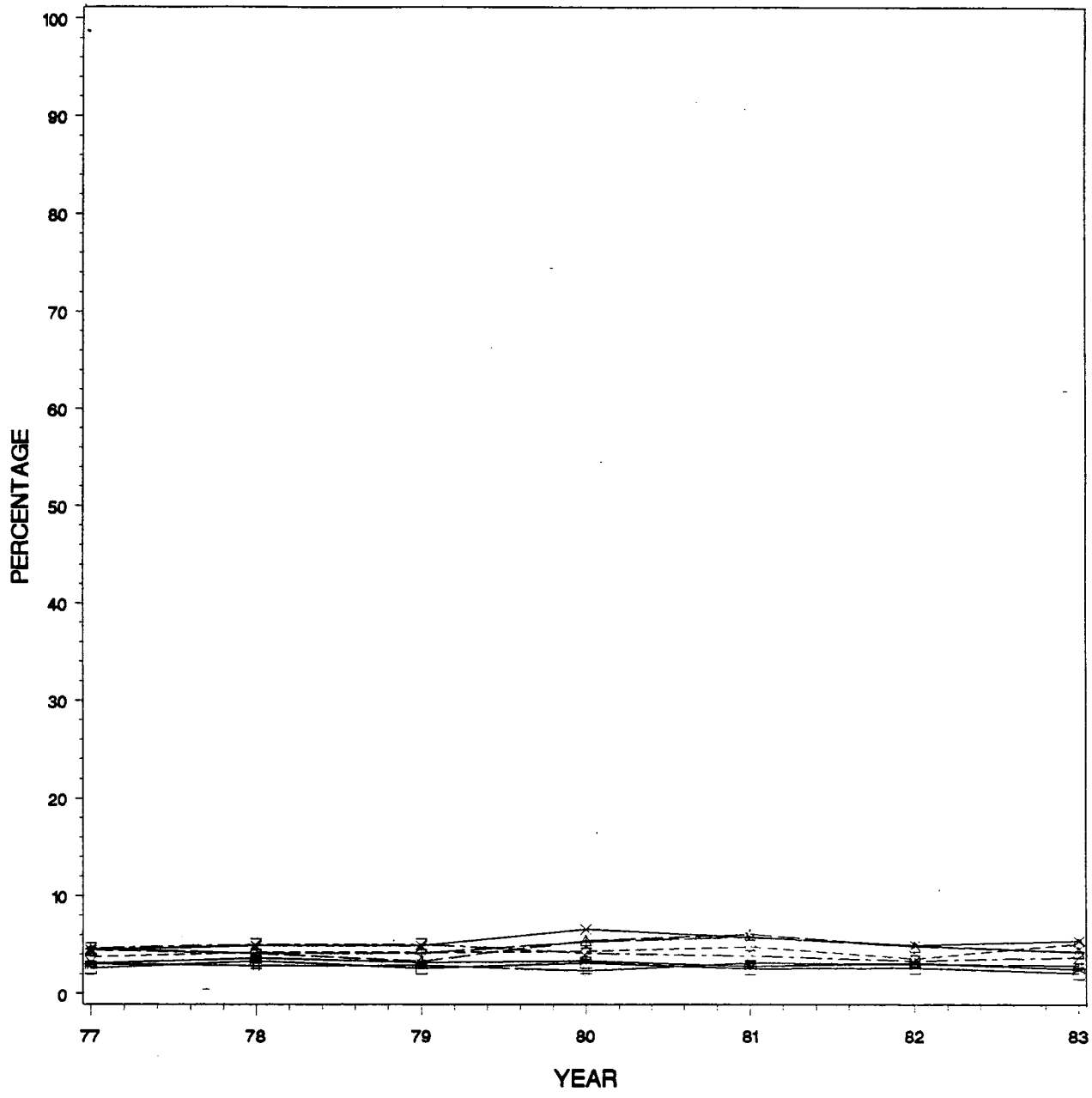
SINGLE UNIT, 2 AXLE
REGION 2, US



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

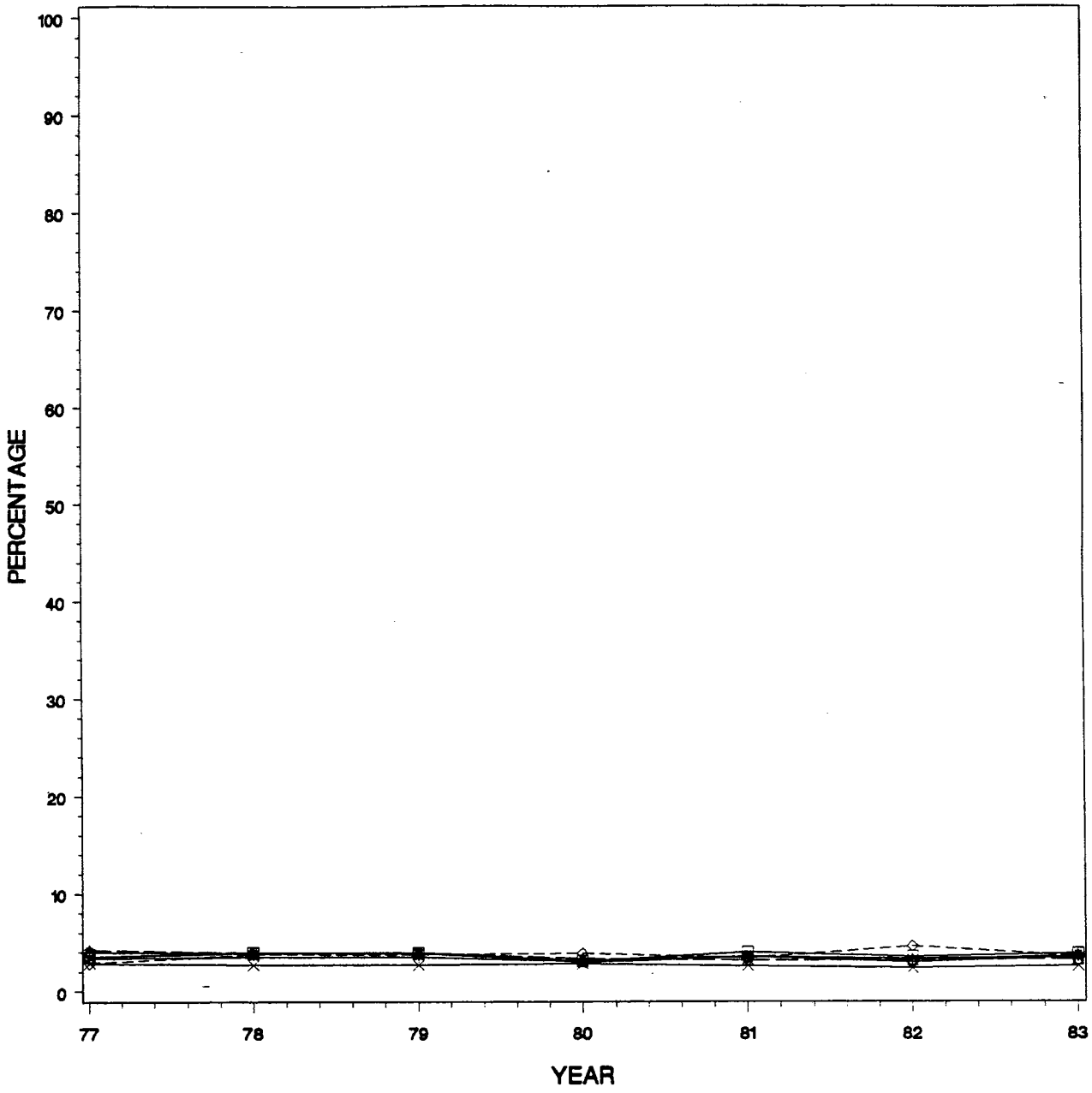
SINGLE UNIT, 2 AXLE
REGION 3, US



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

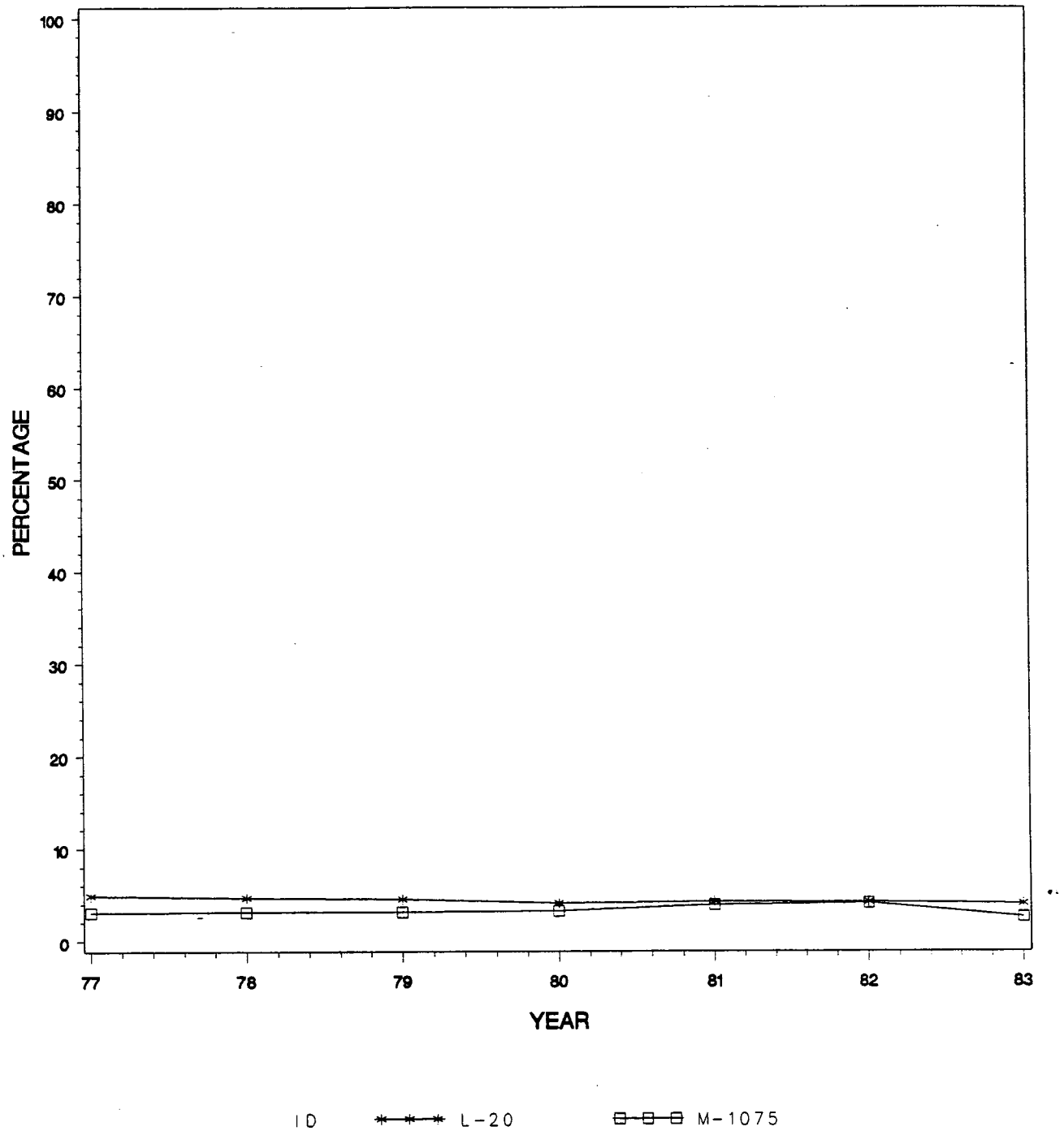
SINGLE UNIT, 2 AXLE
REGION 4, US



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

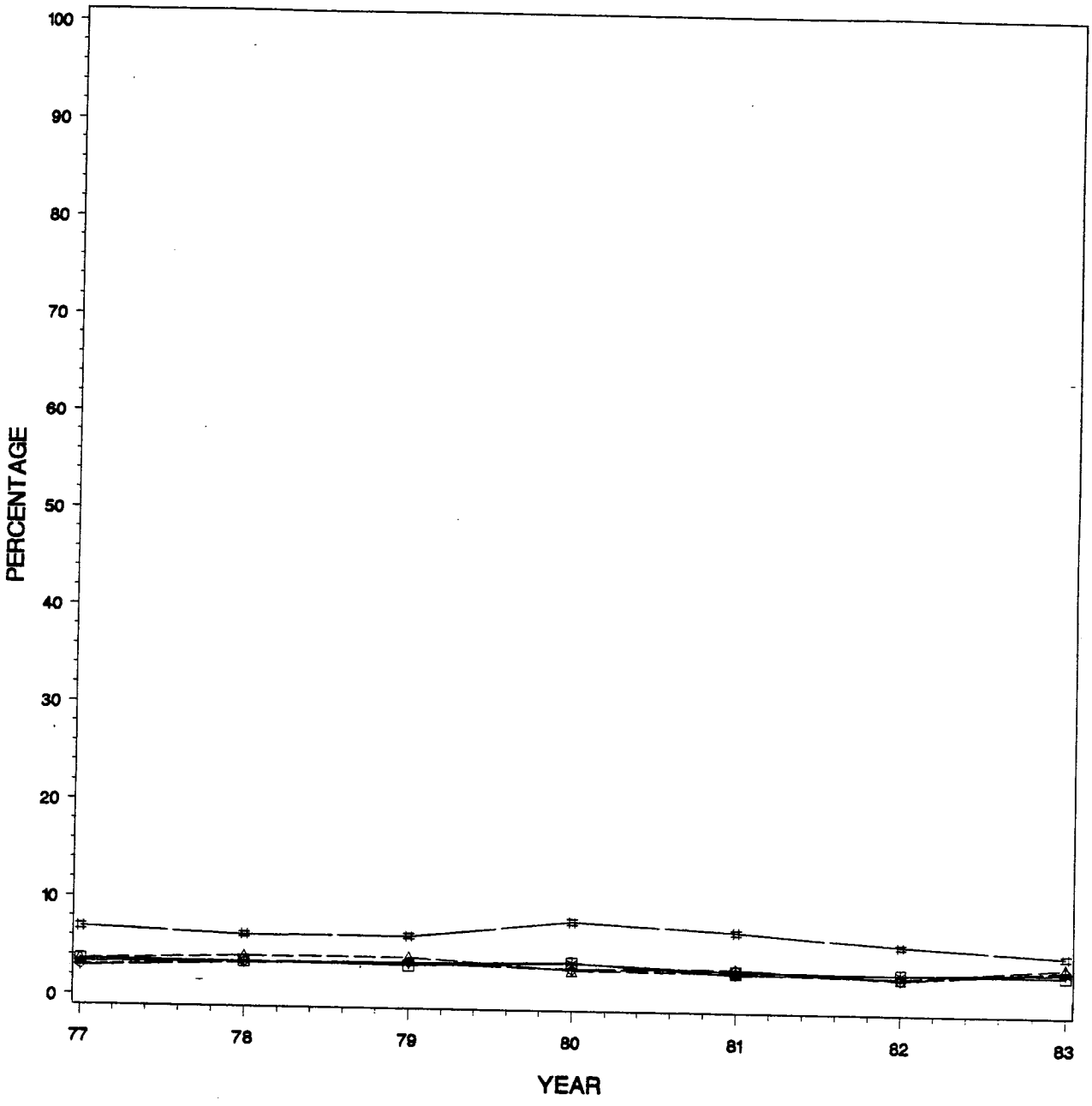
SINGLE UNIT, 2 AXLE
REGION 5, US



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

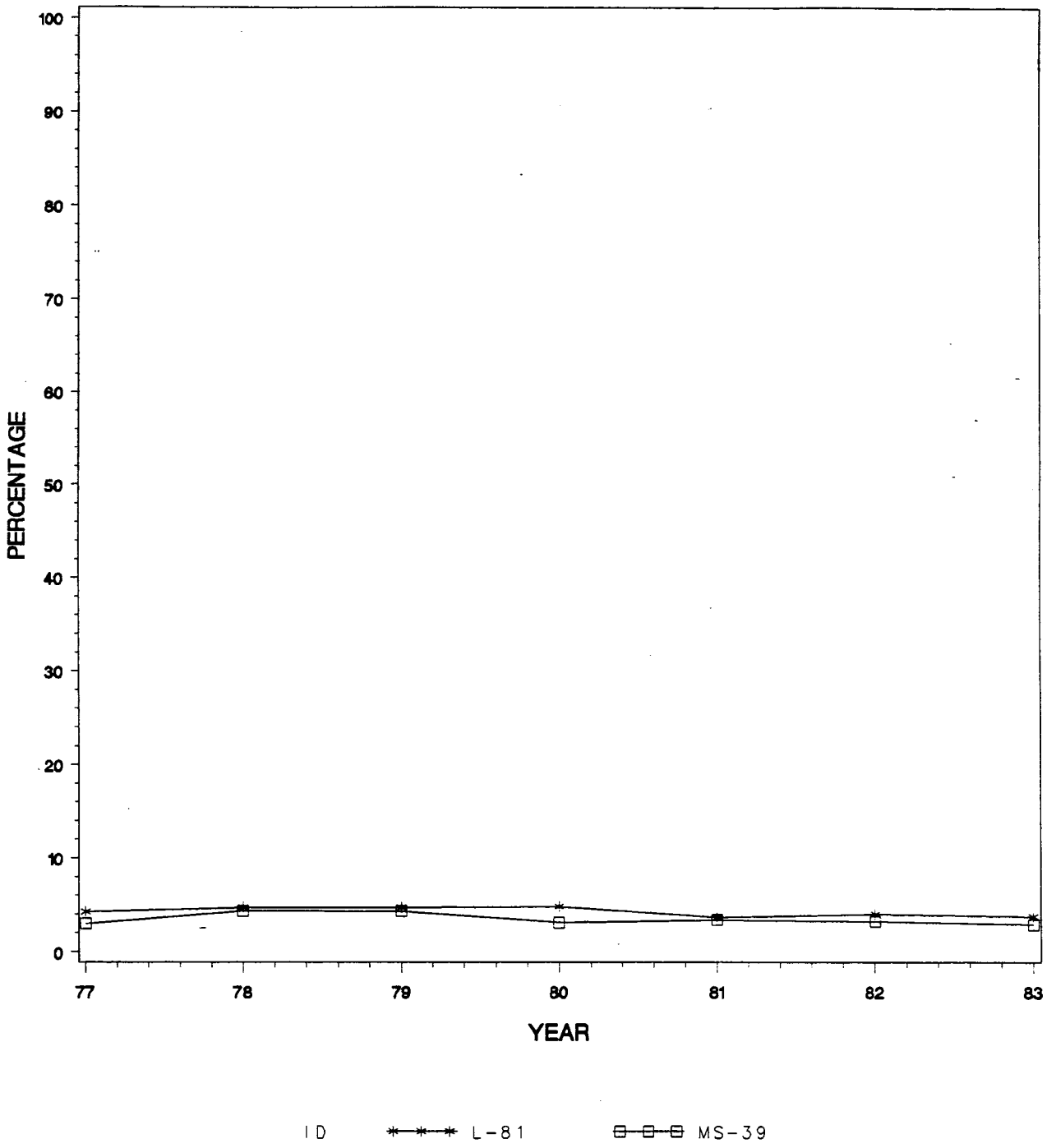
SINGLE UNIT, 2 AXLE
REGION 3, SH



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

SINGLE UNIT, 2 AXLE
REGION 5, SH

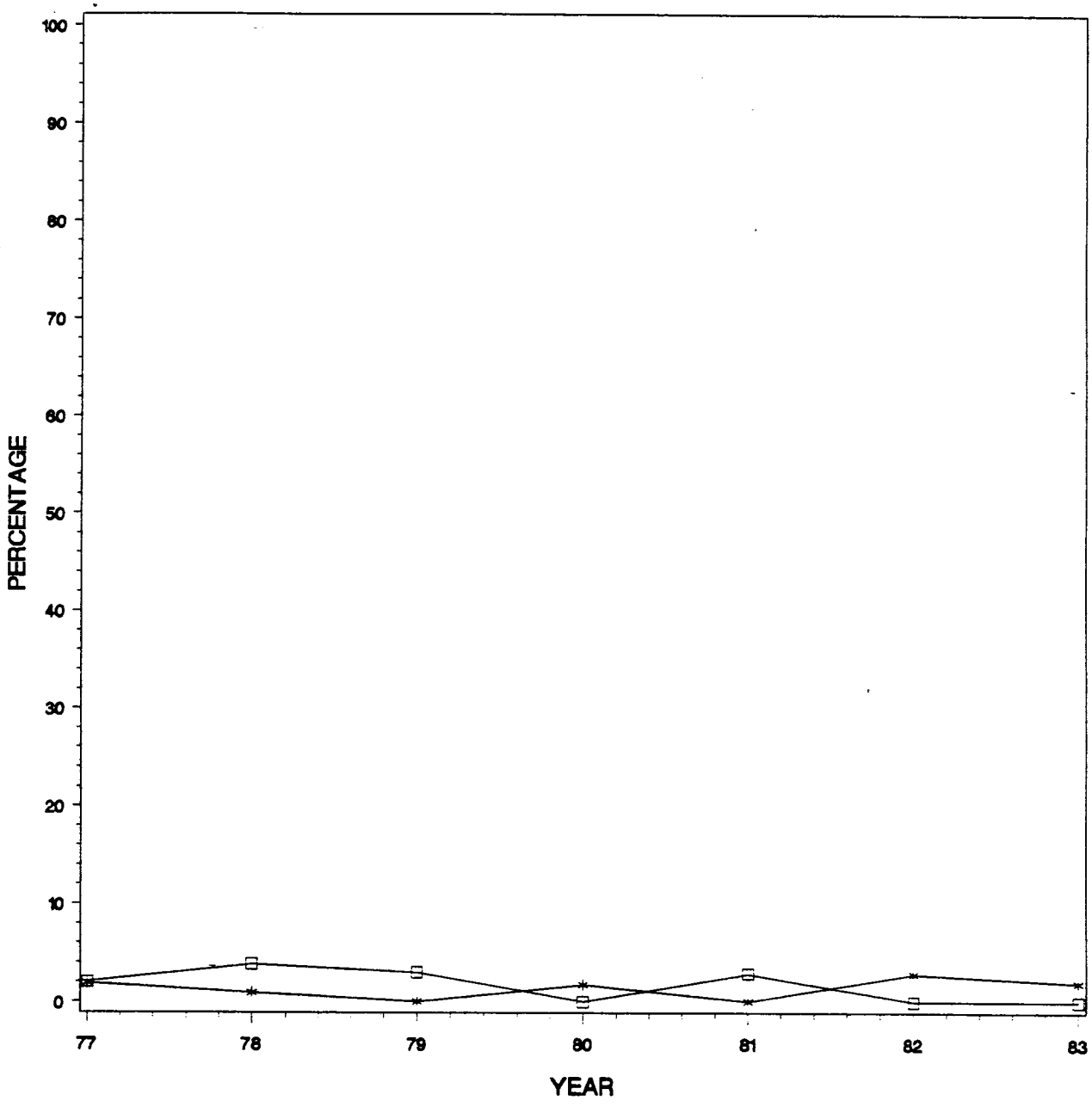


SOURCE: MANUAL COUNT
ANNUAL REPORT

Appendix 6.9 Proportions of 2-S2 Trucks in Total Traffic, Farm-to-Market Roads

TREND ANALYSIS

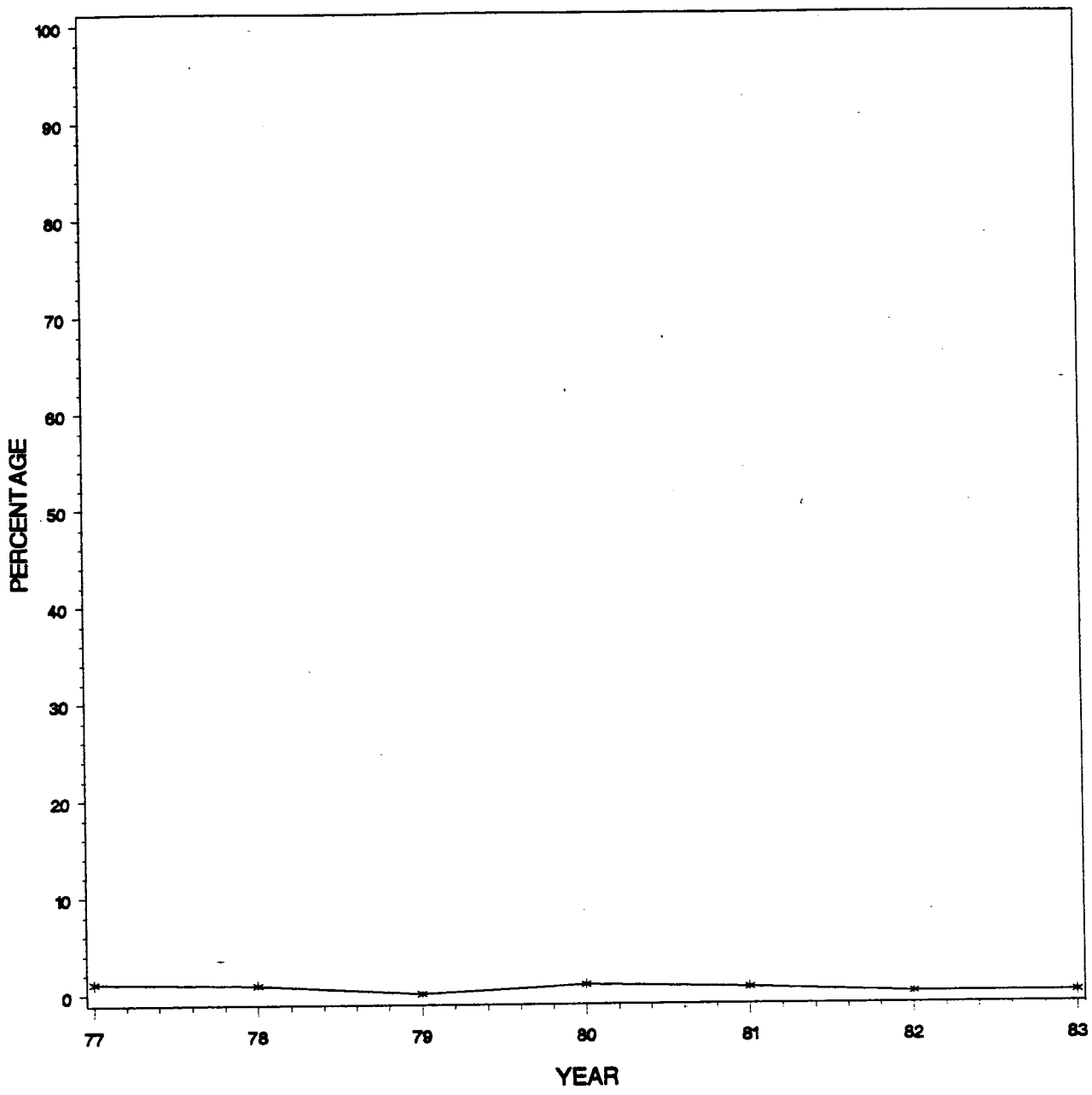
TRACTOR SEMI-TRAILER < 5 AXLES AXLES
REGION 3, FM



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

TRACTOR SEMI-TRAILER <5 AXLES AXLES
REGION 4, FM

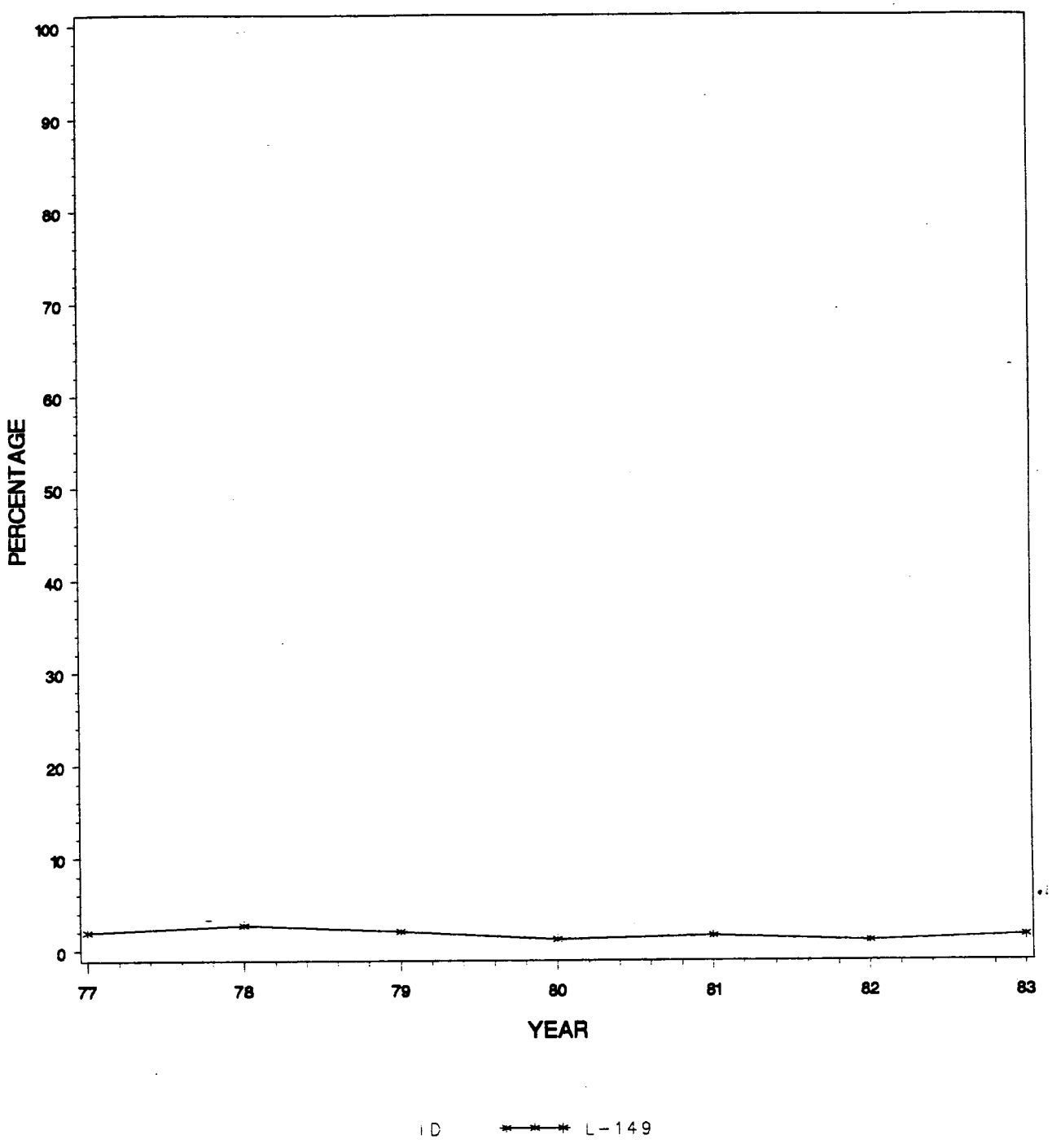


SOURCE: MANUAL COUNT
ANNUAL REPORT

Appendix 6.10 Proportions of 2-S2 Trucks in Total Traffic, U.S. and State Highways

TREND ANALYSIS

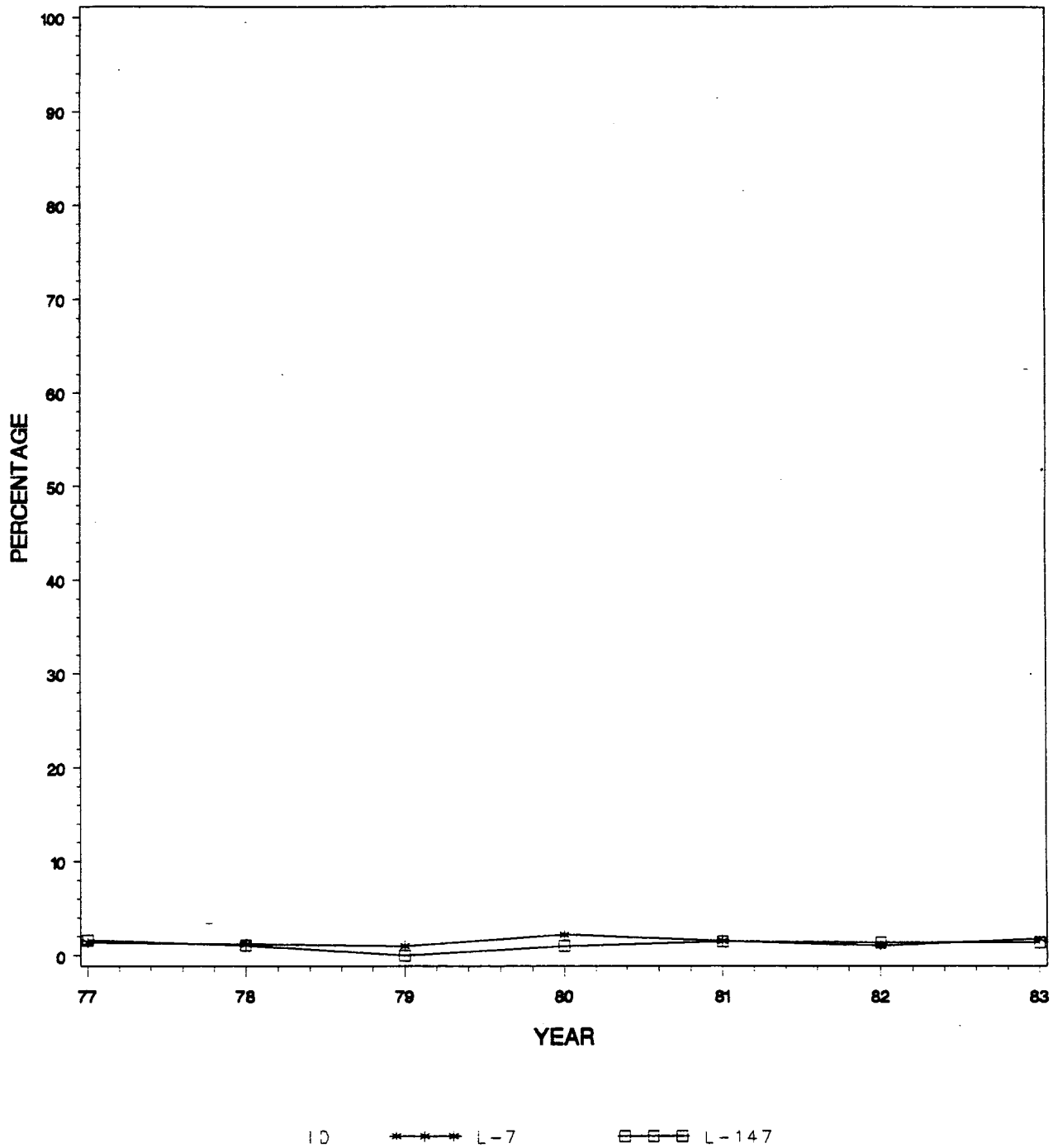
TRACTOR SEMI-TRAILER < 5 AXLES AXLES
REGION 1, US



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

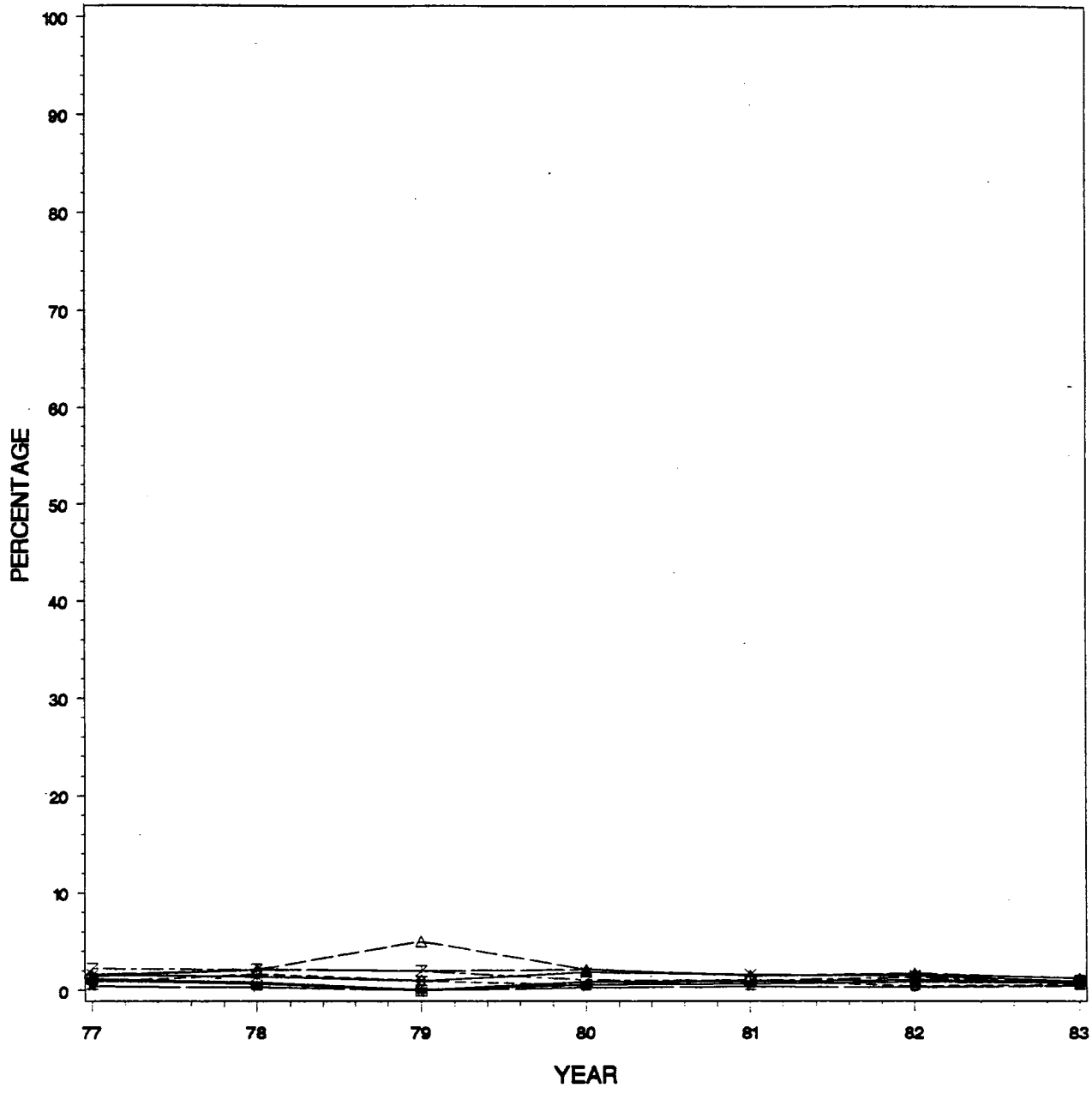
TRACTOR SEMI-TRAILER < 5 AXLES AXLES
REGION 2, US



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

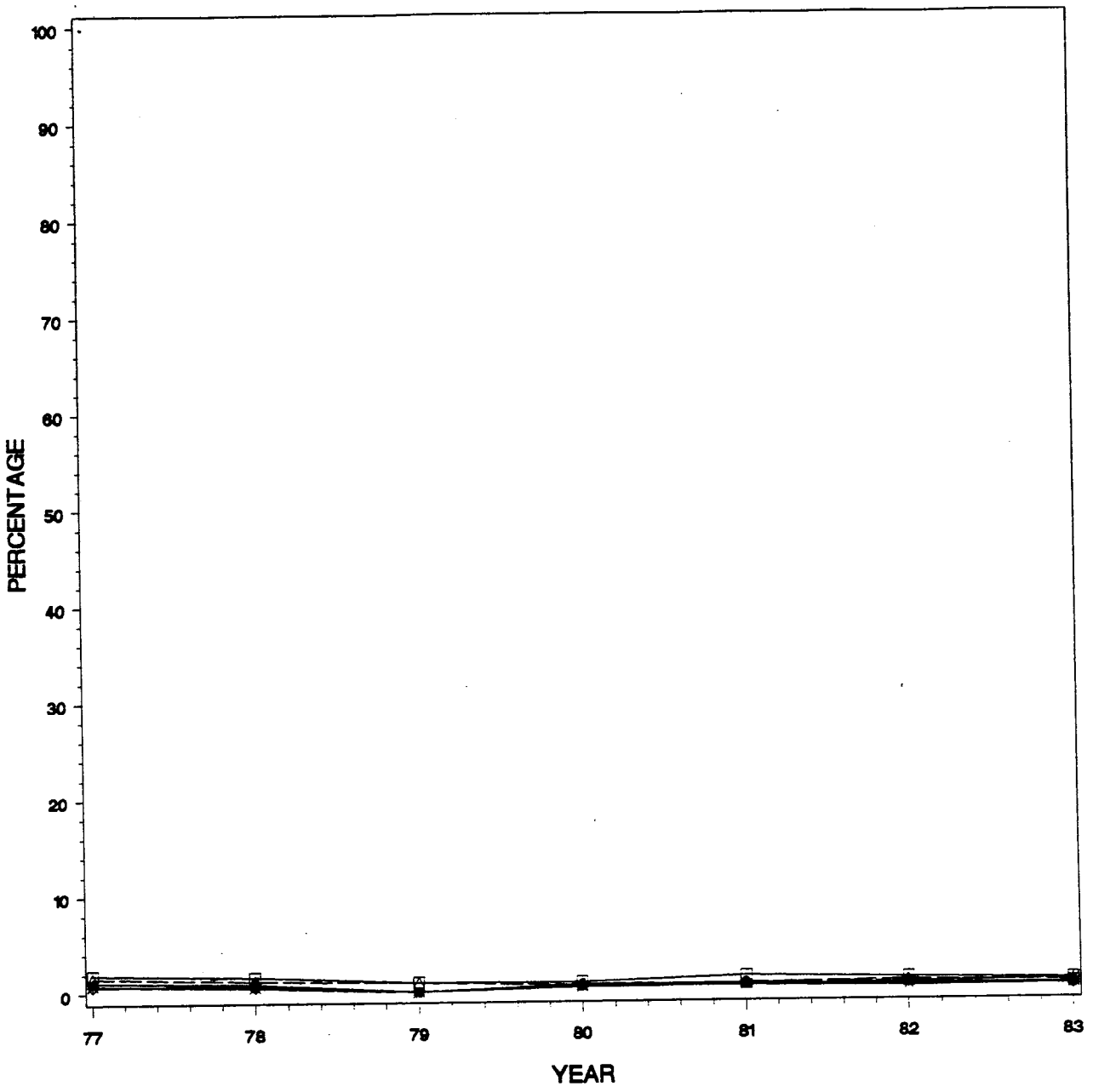
TRACTOR SEMI-TRAILER <5 AXLES AXLES
REGION 3, US



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

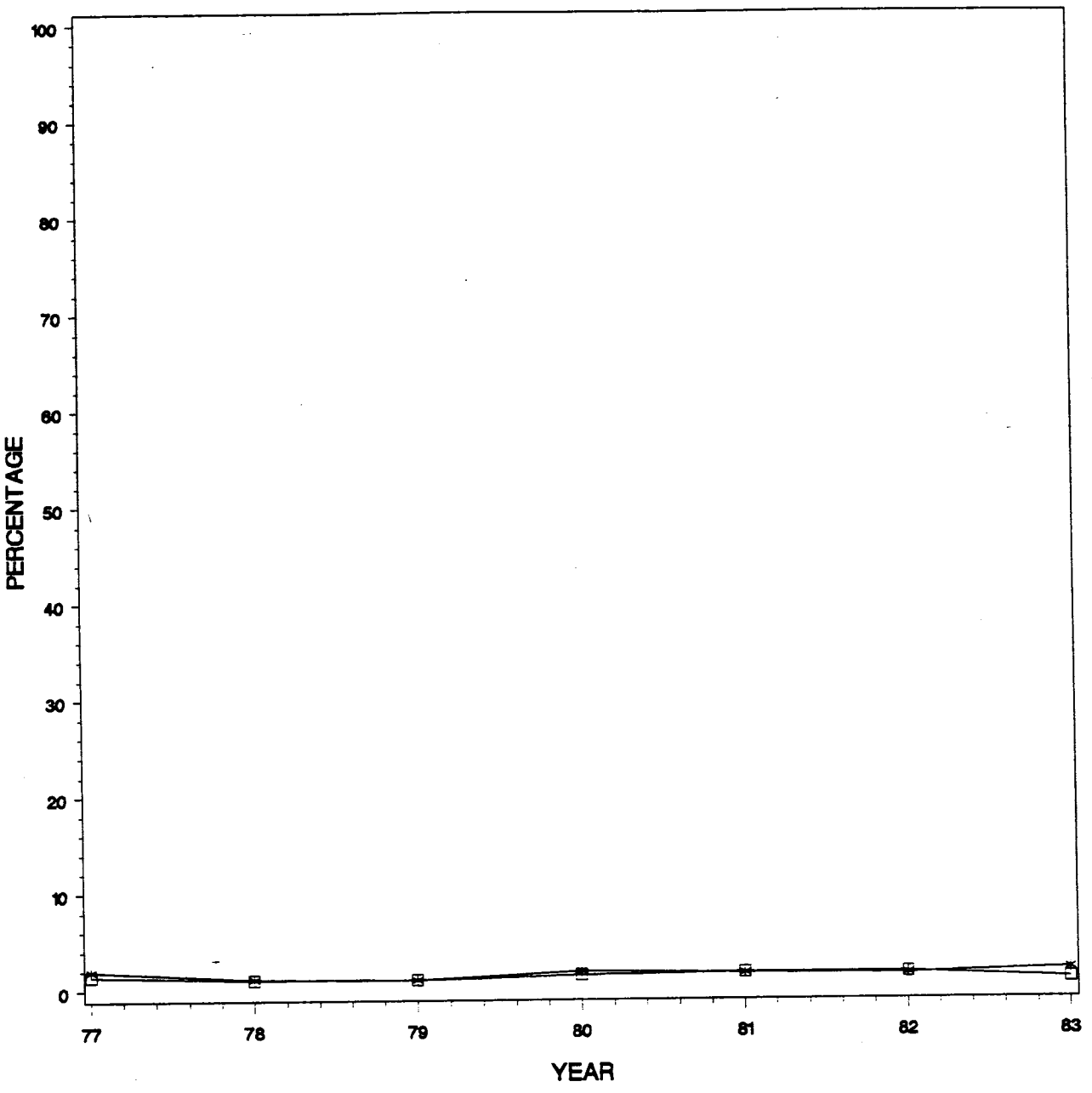
TRACTOR SEMI-TRAILER < 5 AXLES AXLES
REGION 4, US



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

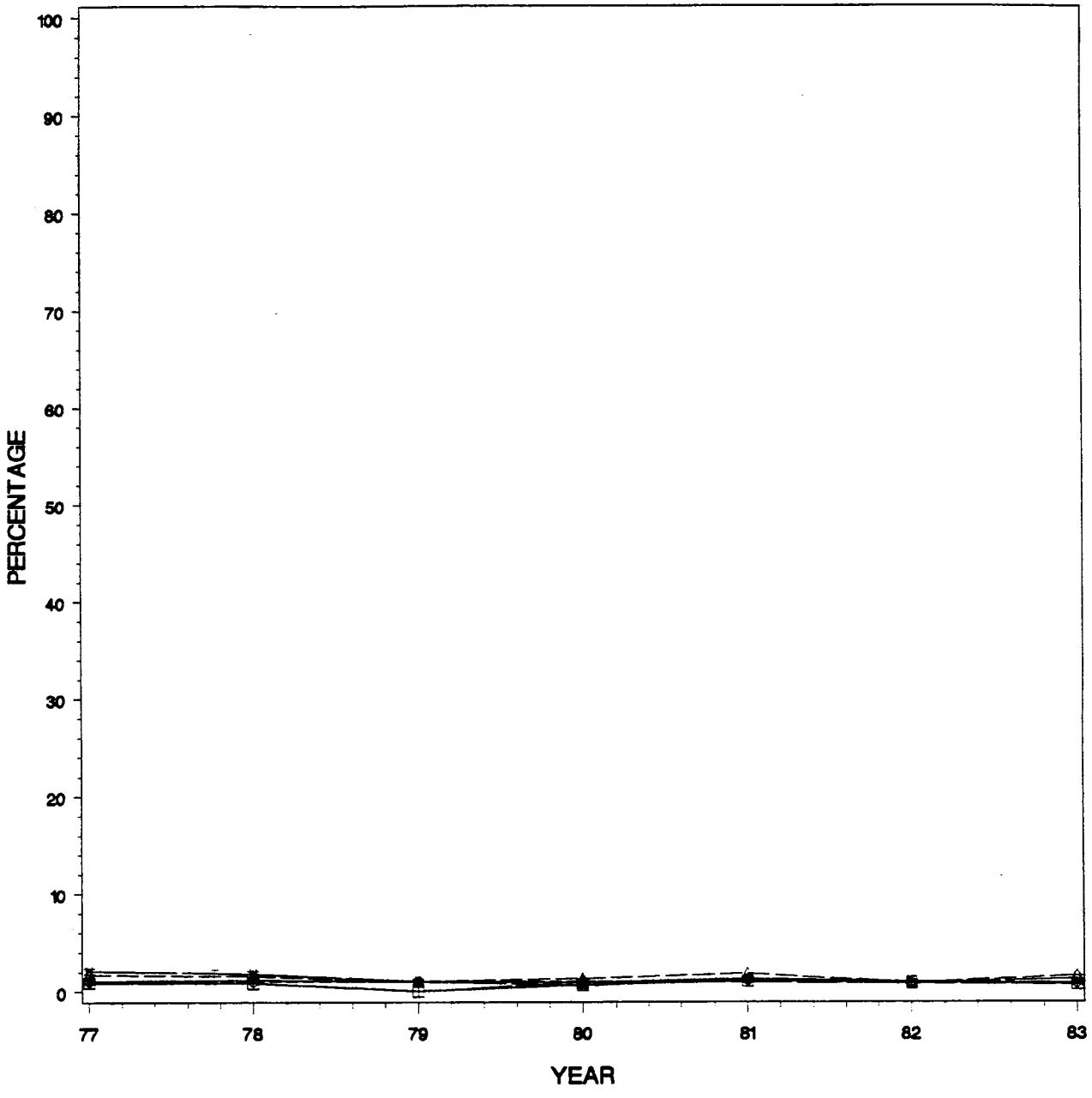
TRACTOR SEMI-TRAILER <5 AXLES AXLES
REGION 5, US



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

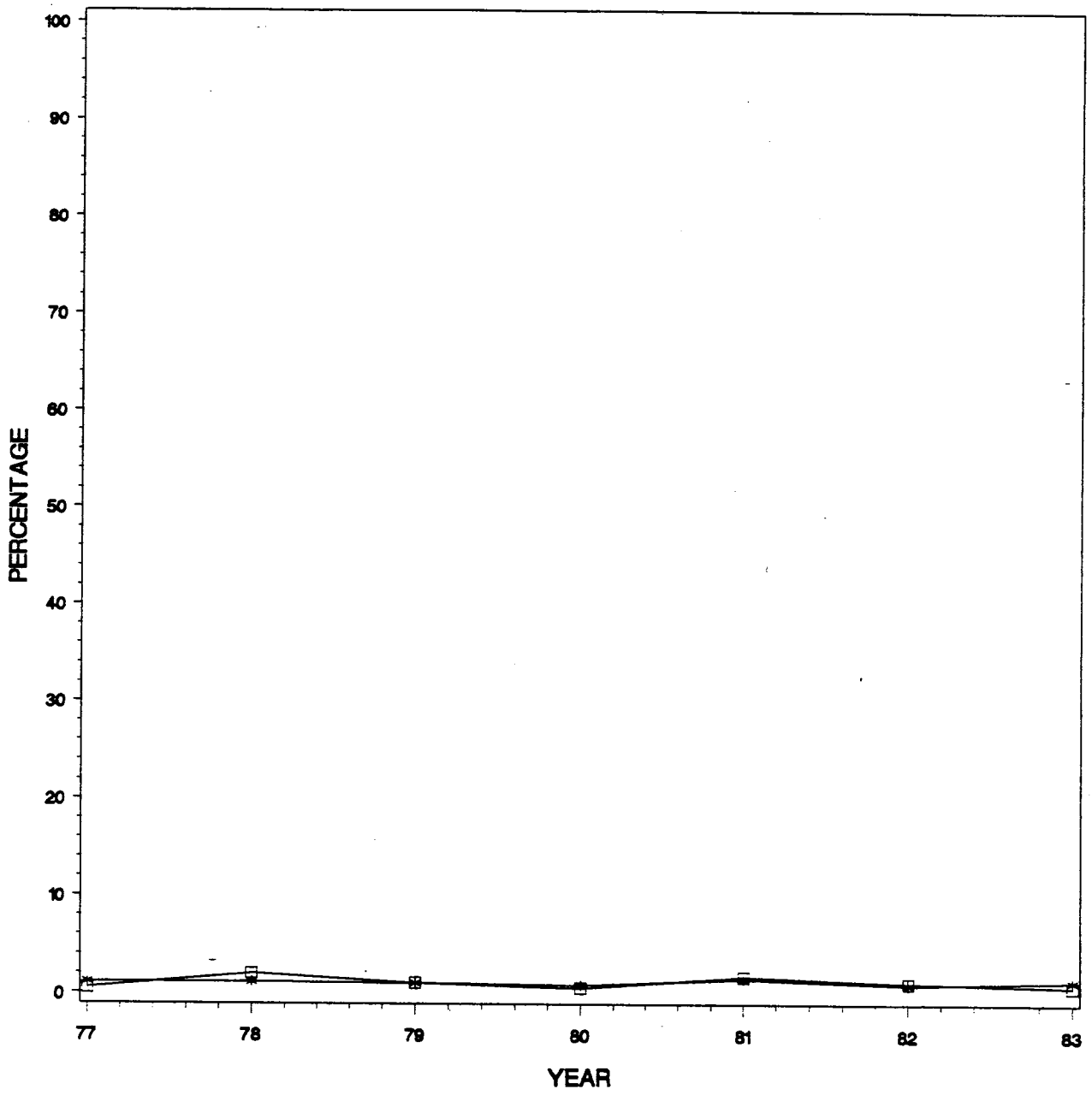
TRACTOR SEMI-TRAILER < 5 AXLES AXLES
REGION 3, SH



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

TRACTOR SEMI-TRAILER < 5 AXLES AXLES
REGION 5, SH

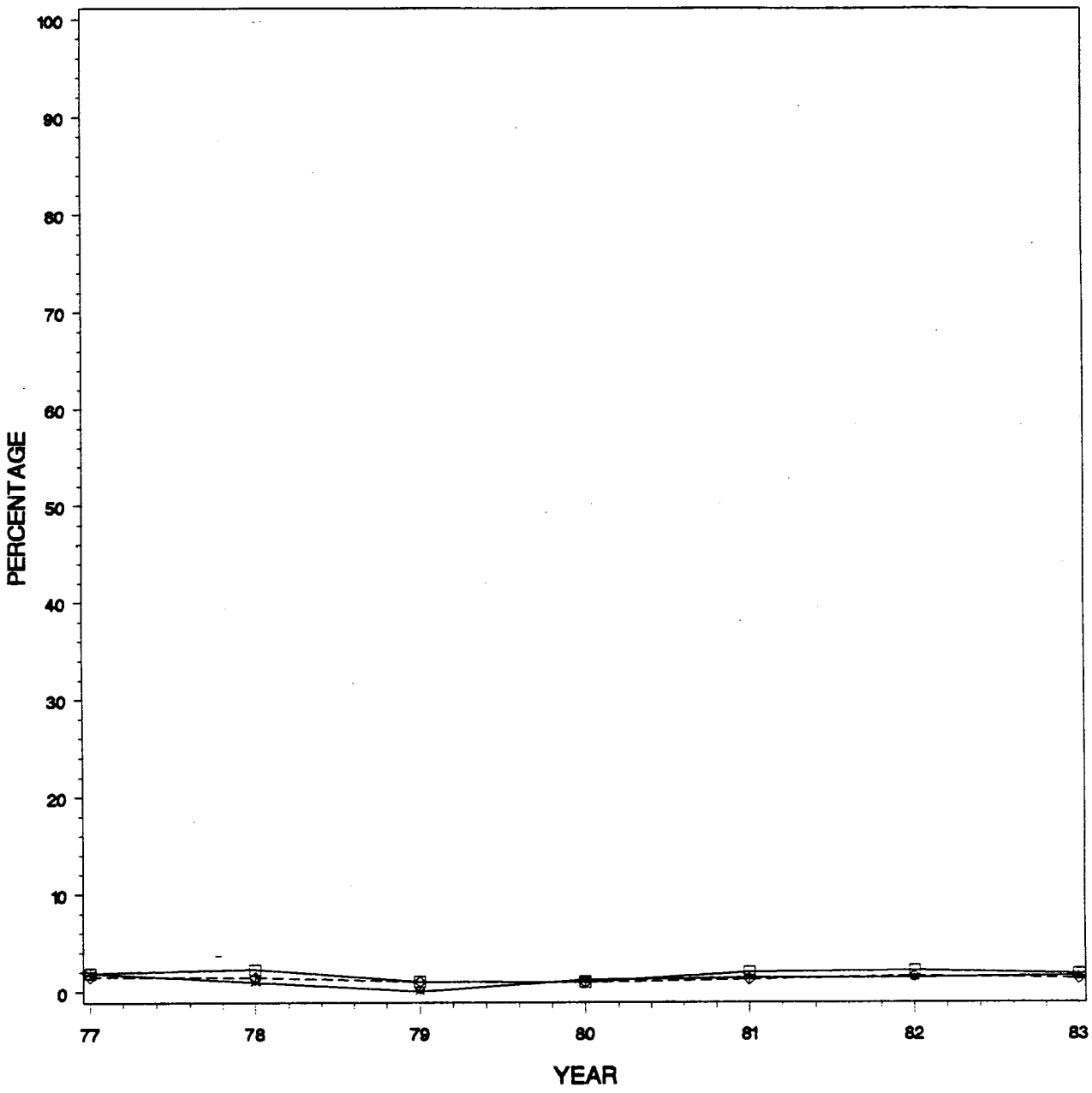


SOURCE: MANUAL COUNT
ANNUAL REPORT

Appendix 6.11 Proportions of 2-S2 Trucks in Total Traffic, Interstate Highways

TREND ANALYSIS

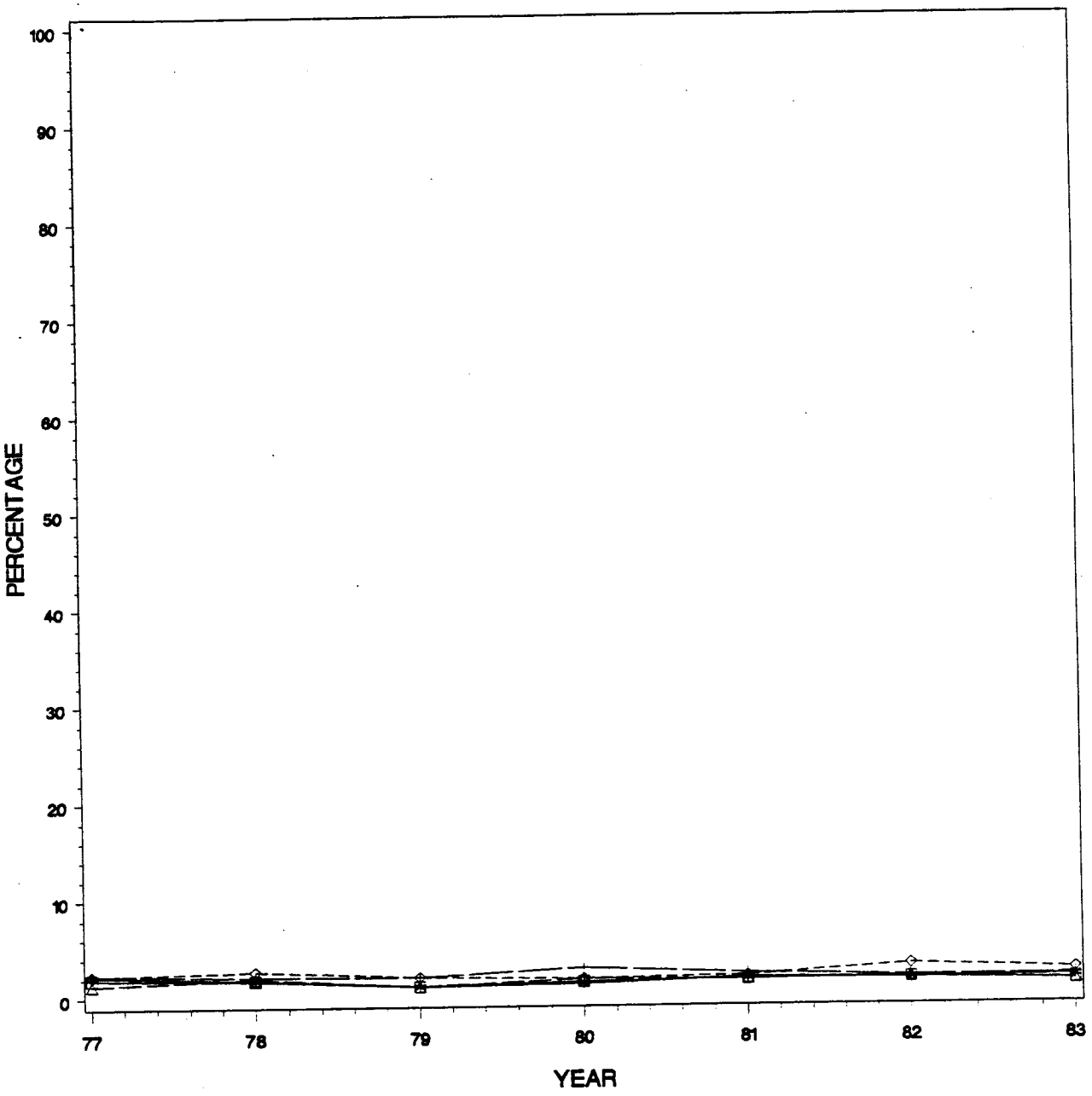
TRACTOR SEMI-TRAILER <5 AXLES AXLES
REGION 1, IH



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

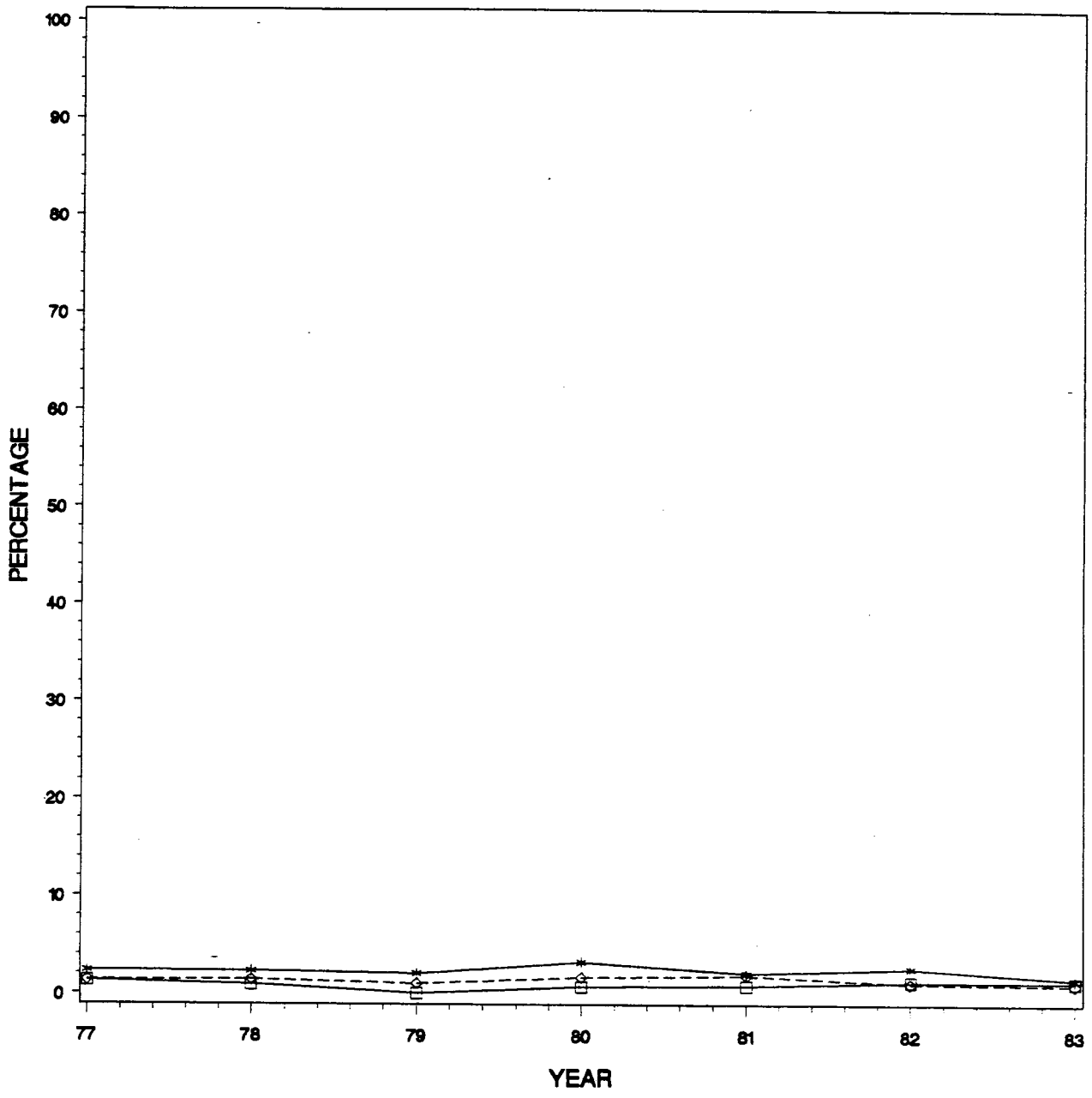
TRACTOR SEMI-TRAILER < 5 AXLES AXLES
REGION 2, IH



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

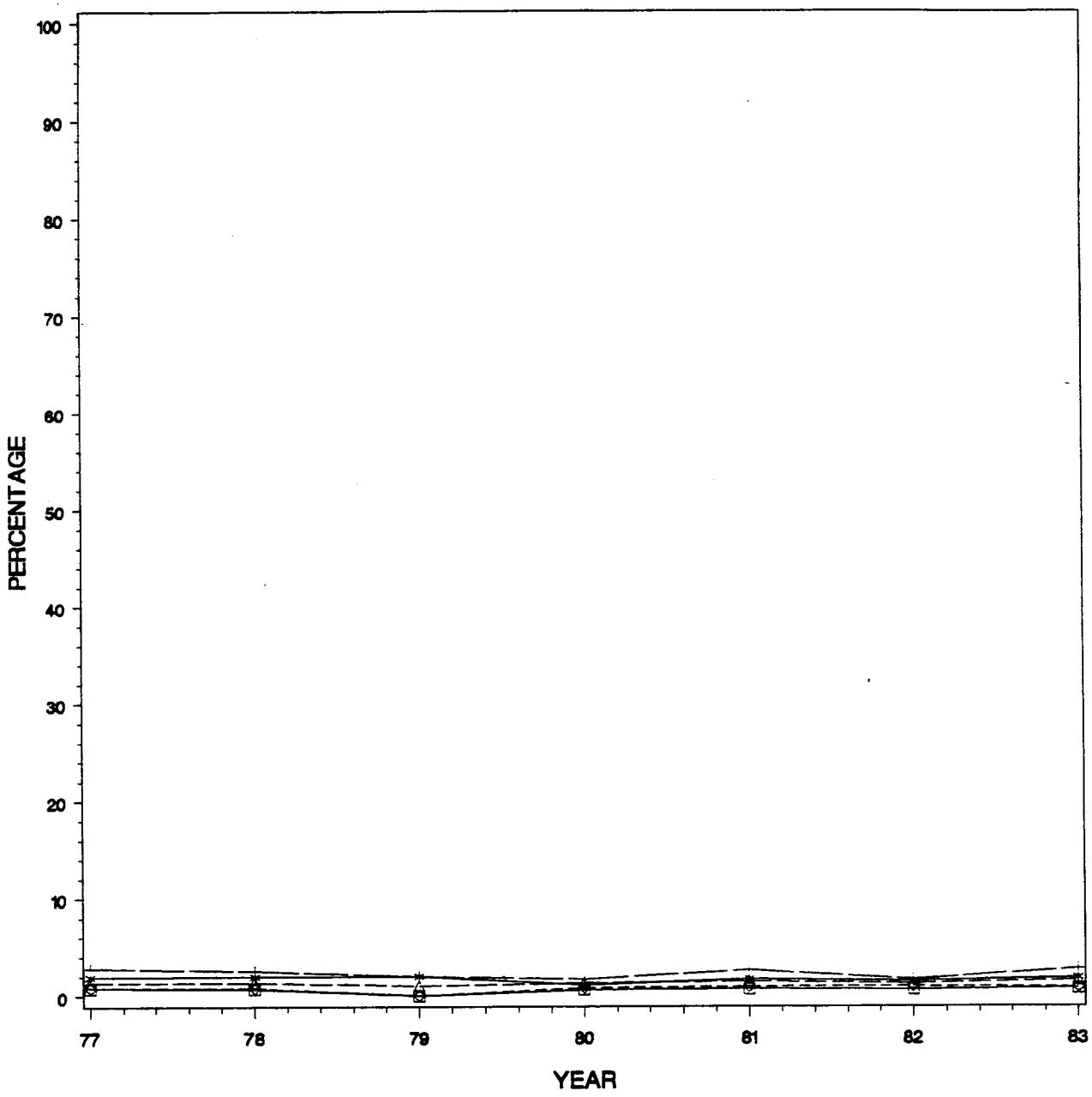
TRACTOR SEMI-TRAILER < 5 AXLES AXLES
REGION 3, IH



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

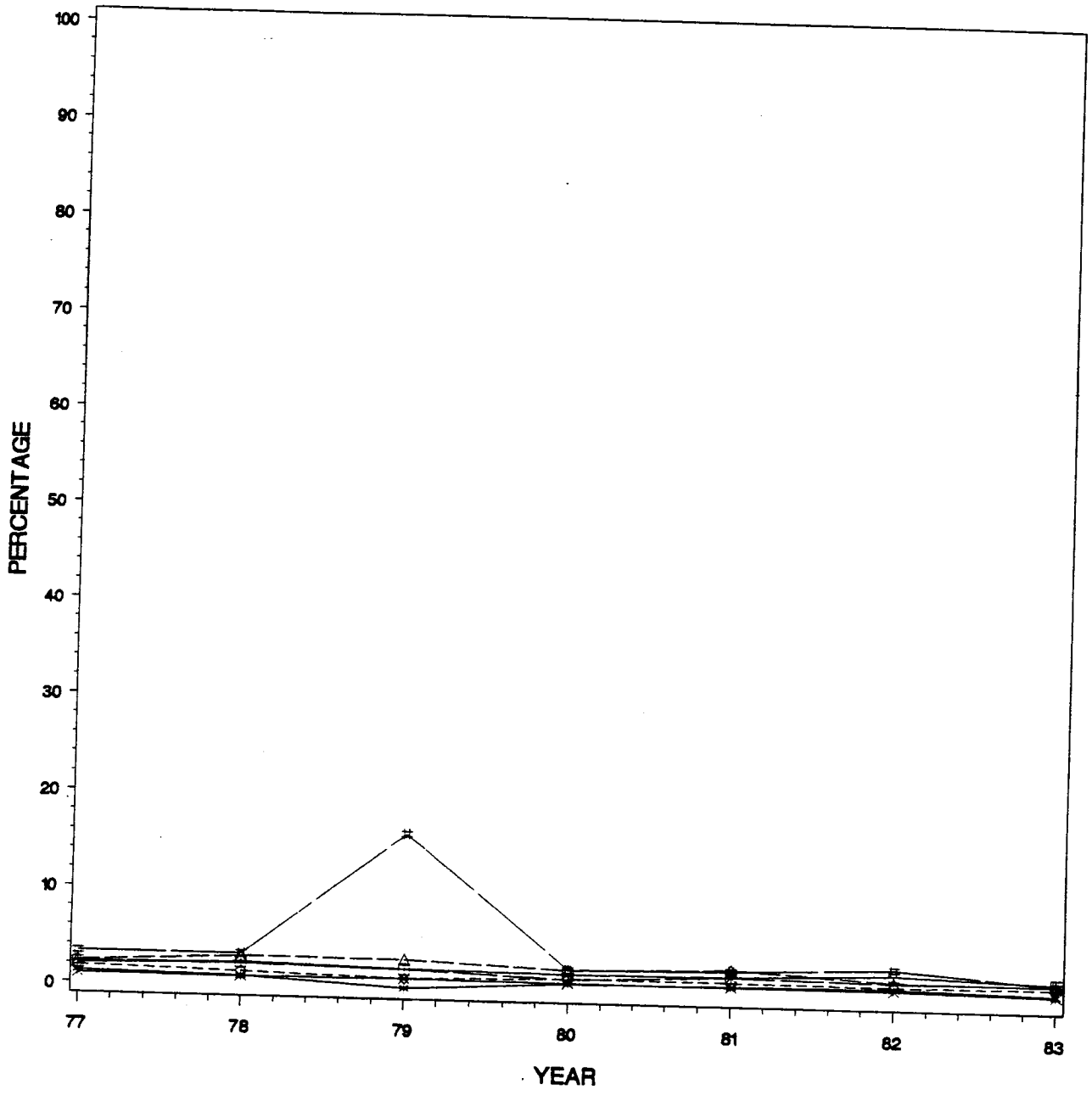
TRACTOR SEMI-TRAILER < 5 AXLES AXLES
REGION 4, IH



SOURCE: MANUAL COUNT
ANNUAL REPORT

TREND ANALYSIS

TRACTOR SEMI-TRAILER < 5 AXLES AXLES
REGION 5, IH



SOURCE: MANUAL COUNT
ANNUAL REPORT