ORT NO. UMTA-MA-06-0041-77-11

LORAN AUTOMATIC VEHICLE MONITORING SYSTEM, PHASE I
Volume II: Appendices

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Northridge CA 91324

AUGUST 1977

FINAL REPORT

Prepared for

U.S. DEPARTMENT OF TRANSPORTATION

URBAN MASS TRANSPORTATION ADMINISTRATION
Office of Technology Development and Deployment
Washington DC 20590

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Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
UMTA-MA-06-0041-77-11		

4. Title and Subtitle	5. Report Date
LORAN AUTOMATIC VEHICLE MONITORING SYSTEM, PHASE 1 Volume II - Appendices	August 1977 6. Performing Organization Code
7. Author(s) R. Stapleton and F. Chambers	8. Performing Organization Report No. 50463-2 DOT-TSC-UMTA-77-30, II
9. Performing Organization Name and Address Teledyne Systems Company* 19601 Nordhoff Street Northridge CA 91324	10. Work Unit No. (TRAIS) UM711/R7716 11. Contract or Grant No. DOT-TSC-1238-2
12. Sponsoring Agency Name and Address U.S. Department of Transportation Urban Mass Transportation Administration Office of Technology Development & Deployment Washington DC 20590	13. Type of Report and Period Covered Final Report Oct. 1976 - Feb. 1977 14. Sponsoring Agency Code

15. Supplementary Notes

*Under contract to: U.S. Department of Transportation
Transportation Systems Center
Kendall Square
Cambridge MA 02142

16. Abstract

This volume presents results of the evaluation phase of a two-phase program to develop an automatic vehicle monitoring (AVM) system for the Southern California Rapid Transit District in Los Angeles, California. Tests were conducted in Philadelphia, Pennsylvania, on a LORAN-based location subsystem to evaluate system and subsystem performance on fixed route and random route vehicles. Performance characteristics measured include location accuracy, time of passage accuracy, and coverage. This report consists of two volumes. Volume I contains the test results.

17. Key Words	18. Distribution Statement
Vehicle Location Automatic Vehicle Monitoring LORAN C AVM	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	160	

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

PREFACE

This final report, submitted to the Department of Transportation under contract DOT-TSC-1238, presents the results of all tests conducted under this contract. The purpose of the program was to evaluate vehicle location technology as a preliminary step in the development of a multi-user automatic vehicle location system suitable for any transit property or other vehicle fleet operator. This contract covered test and evaluation of the vehicle location subsystem only but included a system simulation in the off-line data reduction.

Teledyne Systems Co. wishes to acknowledge the valuable assistance of Department of Transportation representative B. Blood, B. Kliem, and J. Herlihy. Teledyne personnel who were invaluable in the execution of this task were R. Stapleton, B. Breen, and J. Holdsworth.

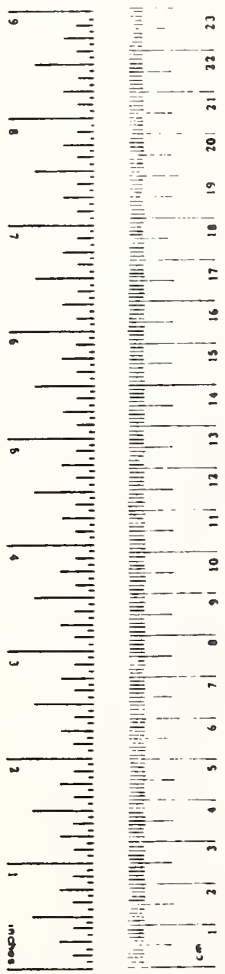
DOT-TSC-NOTE

During the winter of 1976-77, four different techniques for automatically locating land vehicles were tested in both the low- and high-rise regions in Philadelphia, Pennsylvania. The tests were carried out by four different companies under separate contracts to the U.S. Department of Transportation, Transportation Systems Center. The tests were designed to evaluate the techniques for their applicability as location subsystems for automatic vehicle monitoring systems. This document represents one of the contractors' final report. A summary report on all systems tested is available as report no. UMTA-MA-06-0041-77-2.

METRIC CONVERSION FACTORS

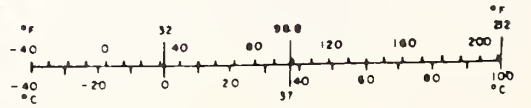
Approximate Conversions to Metric Measures

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



APPENDIX A - LORAN CALIBRATION DATA

LORAN calibration of the fixed and random route test areas was accomplished in sectors. Four sectors were defined and are shown in Figure A-1. Separate lists of calibration points by sector are provided. The list contains all points where an attempt was made to obtain calibration data. No data is included in the listing for points where a valid LORAN measurement was not possible or where the point was thrown out by the screening process.

Calibration points 600 and up are used in the special case tests only.

The calibration point lists were generated by using the software program which is shown at the end of this appendix. Also, at the end of that program, a sample execution of the program is included. The sample happens to be the calibration data reduction for the LORAN bridge special case run.

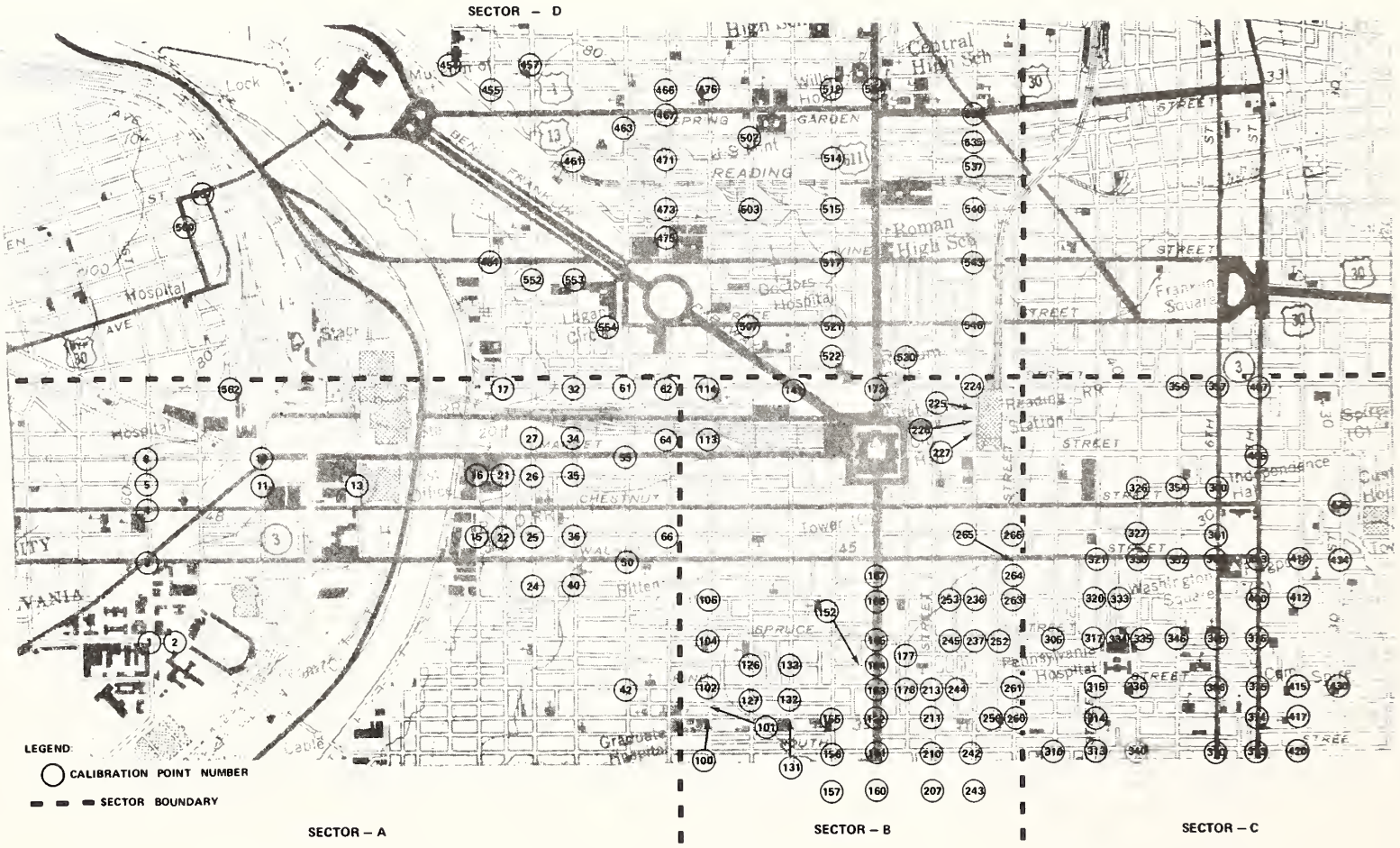


Figure A-1. Calibration Area

LORAN Calibration Data

Sector A

CAL Pt. No.	Intersection	X	Y	TDA Mean TD	TDA Std. Dev.	TDB Mean TD	TDB Std. Dev.
1	34th St. & Spruce	1115	1190	51,763.576	34ns	82,232.300	93ns
2	33rd St. & Spruce	1340	1190	51,763.316	46ns	82,232.326	56ns
3	34th St. & Walnut	1100	2000	51,762.996	29ns	82,230.781	32ns
4	34th St. & Chestnut	1100	2610	51,761.582	21ns	82,229.855	41ns
5	34th St. & Ludlow	1100	2850	51,761.185	39ns	82,229.296	62ns
6	34th St. & Market	1100	3175	51,760.738	32ns	82,228.966	63ns
10	32nd & Market	2000	3188	51,759.700	23ns	82,229.453	62ns
11	32nd & Ludlow	2000	2922	51,759.757	47ns	82,229.978	48ns
13	30th & Ludlow	3375	2875	51,758.910	41ns	82,230.998	78ns
15	24th & Sansom	4650	2300	51,758.285	23ns	82,232.573	44ns
16	24th & Ludlow	4650	3000	51,757.717	77ns	82,231.791	140ns
17	23rd & Arch	4940	3860	51,755.613	32ns	82,230.328	53ns
21	23rd & Ludlow	4930	2975	51,757.046	88ns	82,231.203	114ns
22	23rd & Sansom	4940	2310	51,757.984	33ns	82,232.789	74ns
24	22nd & St. James	5260	1800	51,758.129	39ns	82,233.820	48ns
25	22nd & Sansom	5260	2360	51,757.457	22ns	82,232.797	67ns
26	22nd & Ludlow	5260	2970	51,756.376	17ns	82,231.762	86ns
27	22nd & Commerce	5260	3422	51,755.906	16ns	82,231.097	47ns
32	21st & Arch	5725	3905	51,754.587	40ns	82,230.694	72ns
34	21st & Commerce	5720	3422	51,755.434	23ns	82,231.432	75ns
35	21st & Ludlow	5720	2945	51,756.246	29ns	82,232.226	80ns
36	21st & Sansom	5720	2355	51,757.508	51ns	82,233.233	91ns
40	21st & Chancellor	5720	1800	51,758.259	103ns	82,234.210	89ns
42	20th & Pine	6260	690	51,759.015	67ns	82,236.128	45ns
50	20th & Walnut	6260	2025	51,756.840	41ns	82,234.014	95ns
55	20th & Market	6260	3240	51,755.117	65ns	82,231.406	110ns
61	20th & Arch	6260	3880	51,753.975	17ns	82,230.655	51ns
62	19th & Arch	6720	3940	51,753.605	84ns	82,231.462	59ns
64	19th & Commerce	6720	3422	51,754.475	59ns	82,231.844	80ns
66	19th & Sansom	6720	2320	51,756.228	46ns	82,233.676	165ns

Total Number of Calibration Points - 30 Mean Radial Error 131.66 feet

LORAN Calibration Data

Sector B

CAL Pt. No.	Intersection	X	Y	TDA Mean TD	TDA Std. Dev.	TDB Mean TD	TDB Std. Dev.
100	18th St. & Lombard	7150	300	51,758.333	35ns	82,237.306	80ns
101	18th St. & Addison	7150	475	51,758.008	68ns	82,237.105	119ns
102	18th St. & Pine	7150	640	51,757.351	80ns	82,236.504	189ns
104	18th St. & Spruce	7150	1220	51,757.057	42ns	82,236.228	269ns
106	18th St. & Locust	7150	1670	51,756.107	70ns	82,235.195	163ns
113	18th St. & Commerce	7150	3300	51,753.416	52ns	82,232.222	90ns
114	18th St. & Arch	7150	3945	51,752.513	60ns	82,231.365	122ns
126	17th St. & Delancy	7605	545	51,757.209	56ns	82,236.949	127ns
127	17th St. & Waverly	7605	545	51,757.617	34ns	82,237.543	154ns
131	16th St. & Lombard	8020	395	51,757.059	29ns	82,237.623	64ns
132	16th St. & Waverly	8020	540	51,757.249	42ns	82,237.726	87ns
133	16th St. & Delancy	8020	935	51,756.408	40ns	82,236.737	111ns
141	16th St. & Arch	8500	3900	51,751.488	72ns	82,232.364	198ns
152	Delancy & Rosewood	8785	955	51,755.868	26ns	82,231.652	50ns
155	15th St. & Lombard	8500	340	51,757.057	34ns	82,238.030	101ns
156	15th St. & South	8500	70	51,757.840	66ns	82,238.921	206ns
157	15th St. & Bainbridge	8500	- 293	51,758.307	52ns	82,239.492	90ns
160	Broad & Bainbridge	9000	- 293	51,757.331	27ns	82,239.310	87ns
161	Broad & South	9000	45	51,756.969	20ns	82,238.859	31ns
162	Broad & Lombard	9000	310	51,756.441	22ns	82,238.351	44ns
163	Broad & Pine	9000	690	51,756.019	34ns	82,237.836	59ns
164	Broad & Delancy	9000	855	51,755.672	25ns	82,237.472	84ns
165	Broad & Spruce	9000	1215	51,754.902	33ns	82,236.918	79ns
166	Broad & Locust	9000	1650	51,754.285	52ns	82,236.355	96ns
167	Broad & Chancellor	9010	1835	51,753.819	77ns	82,235.690	162ns
173	Broad & Arch	9000	3950	51,750.620	41ns	82,232.083	85ns
176	Juniper & Pine	9300	675	51,755.837	83ns	82,238.194	120ns
177	Juniper & Cypress	9300	1000	51,754.818	58ns	82,237.782	147ns
207	13th St. & Bainbridge	9580	- 293	51,757.556	44ns	82,240.690	67ns
210	13th St. & South	9580	45	51,756.152	20ns	82,239.433	33ns

LORAN Calibration Data

Sector B (Continued)

CAL Pt. No.	Intersection	X	Y	TDA Mean TD	TDA Std. Dev.	TDB Mean TD	TDB Std. Dev.
211	13th St. & Lombard	9580	380	51,754.867	72ns	82,238.679	84ns
213	13th St. & Pine	9580	710	51,755.004	31ns	82,238.220	62ns
224	12th St. & Arch	10,000	3950	51,749.748	50ns	82,233.324	131ns
225	12th St. & Cuthbert	10,000	3752	51,750.156	58ns	82,233.422	59ns
226	12th St. & Filbert	10,000	3575	51,749.375	52ns	82,233.324	111ns
227	12th St. & Commerce	10,000	3435	51,749.948	52ns	82,233.897	93ns
236	12th St. & Locust	10,000	1640	51,753.099	34ns	82,236.840	84ns
237	12th St. & Spruce	10,000	1225	51,753.949	59ns	82,237.433	82ns
242	12th St. & South	10,000	25	51,755.755	27ns	82,239.566	60ns
243	12th St. & Bainbridge	10,000	- 375	51,758.185	78ns	82,241.541	59ns
244	Camac & Pine	9825	690	51,754.894	49ns	82,238.738	90ns
245	Camac & Spruce	9810	1200	51,753.969	73ns	82,237.523	243ns
250	Quince & Lombard	10,250	365	51,754.902	33ns	82,239.515	56ns
252	Quince & Spruce	10,250	1200	51,753.494	122ns	82,237.873	142ns
253	Quince & Locust	10,250	1640	51,752.947	48ns	82,237.157	87ns
260	11th St. & Lombard	10,500	320	51,754.476	85ns	82,239.652	109ns
261	11th St. & Pine	10,500	690	51,753,910	43ns	82,238.664	116ns
263	11th St. & Locust	10,500	1680	51,751.422	42ns	82,236.273	83ns
264	11th St. & Chancellor	10,500	1875	51,750.616	72ns	82,235.937	120ns
265	11th St. & Walnut	10,500	2085	51,751.306	163ns	82,236.080	139ns
266	11th St. & Sansom	10,500	2350	51,749.719	54ns	82,235.519	216ns

Total Number of Calibration Points - 51
Mean Radial Error - 191 feet

LORAN Calibration Data

Sector C

CAL Pt. No.	Intersection	X	Y	TDA Mean TD	TDA Std. Dev.	TDB Mean TD	TDB Std. Dev.
305	10th St. & Spruce	10,910	1275	51,753.238	100ns	82,238.567	142ns
310	10th St. & South	10,910	0	51,754.805	74ns	82,240.156	70ns
313	9th St. & South	11,355	50	51,753.883	33ns	82,240.504	147ns
314	9th St. & Lombard	11,355	320	51,753.726	42ns	82,239.495	80ns
315	9th St. & Pine	11,370	660	51,752.871	79ns	82,239.281	64ns
317	9th St. & Spruce	11,360	1245	51,752.430	77ns	82,238.621	104ns
320	9th St. & Locust	11,360	1675	51,751.523	26ns	82,237.816	57ns
321	9th St. & Walnut	11,371	2030	51,750.981	22ns	82,237.289	53ns
326	8th St. & Ranstead	11,825	2875	51,749.449	84ns	82,236.606	149ns
327	8th St. & Sansom	11,825	2405	51,750.106	67ns	82,237.090	123ns
330	8th St. & Walnut	11,835	2100	51,750.590	29ns	82,237.551	69ns
333	Darien & Locust	11,585	1640	51,751.297	17ns	82,237.945	38ns
334	Darien & Spruce	11,585	1220	51,752.191	34ns	82,238.783	76ns
335	8th & Spruce	11,795	1220	51,751.719	74ns	82,238.519	89ns
336	8th & Pine	11,815	660	51,752.746	19ns	82,239.742	100ns
340	8th & South	11,815	40	51,753.746	12ns	82,240.816	29ns
346	7th & Spruce	12,240	1255	51,751.121	61ns	82,239.101	122ns
352	7th & Walnut	12,260	2115	51,750.008	55ns	82,237.875	106ns
354	7th & Ranstead	12,260	2865	51,748.854	28ns	82,236.606	57ns
356	7th & Arch	12,260	3865	51,747.168	46ns	82,234.878	60ns
357	6th & Arch	12,700	3995	51,746.458	20ns	82,235.147	55ns
360	6th & Ranstead	12,695	2825	51,748.305	33ns	82,236.967	62ns
361	6th & Sansom	12,690	2335	51,749.102	49ns	82,237.875	186ns
362	6th & Walnut	12,690	2070	51,749.609	150ns	82,238.664	156ns
365	6th & Spruce	12,680	1215	51,751.047	31ns	82,239.582	78ns
366	6th & Pine	12,675	695	51,751.734	27ns	82,240.304	55ns
370	6th & South	12,655	0	51,752.879	26ns	82,241.344	76ns
373	5th & South	13,120	25	51,752.023	31ns	82,241.523	82ns
374	5th & Lombard	13,125	390	51,751.559	34ns	82,241.012	60ns
375	5th & Pine	13,120	700	51,750.855	34ns	82,240.346	67ns

LORAN Calibration Data

Sector C (Continued)

CAL Pt. No.	Intersection	X	Y	TDA Mean TD	TDA Std. Dev.	TDB Mean TD	TDB Std. Dev.
376	5th & Spruce	13,120	1210	51,750.012	37ns	82,239.336	103ns
400	5th & Locust	13,120	1660	51,748.980	57ns	82,238.490	120ns
403	5th & Chestnut	13,145	2660	51,747.990	28ns	82,237.469	33ns
405	5th & Market	13,120	3035	51,747.223	50ns	82,236.477	71ns
407	5th & Arch	13,130	4030	51,745.559	26ns	82,235.047	73ns
410	4th & Chestnut	13,590	2705	51,747.746	37ns	82,237.773	84ns
412	4th & Locust	13,580	1685	51,749.281	20ns	82,239.406	58ns
415	4th & Pine	13,575	695	51,750.746	34ns	82,240.855	62ns
417	4th & Lombard	13,570	370	51,751.473	37ns	82,241.578	64ns
420	4th & South	13,570	25	51,752.215	64ns	82,242.390	116ns
430	3rd & Pine	14,000	1245	51,750.262	37ns	82,241.484	44ns
434	3rd St. & Walnut	14,000	2045	51,748.098	26ns	82,239.000	49ns
435	3rd St. & Chestnut	14,000	2605	51,747.305	12ns	82,238.179	33ns

Total Calibration Points - 43
Mean Radial Error - 148 feet

LORAN Calibration Data
Sector D

CAL Pt. No.	Intersection	X	Y	TDA Mean TD	TDA Std. Dev.	TDB Mean TD	TDB Std. Dev.
451	Vine & 24th St.	4320	5790	51,754.062	32ns	82,227.512	49ns
454	24th St. & Green	4370	7385	51,750.833	34ns	82,224.644	24ns
455	23rd St. & Brandywine	4830	7130	51,750.750	38ns	82,225.299	78ns
457	22nd St. & Green	5270	7410	51,749.783	28ns	82,224.839	50ns
461	21st St. & Hamilton	5720	6370	51,750.937	26ns	82,226.726	17ns
463	20th St. & Nectarine	6280	6725	51,749.648	18ns	82,226.359	61ns
466	19th St. & Brandywine	6725	7120	51,748.576	71ns	82,226.063	117ns
467	19th St. & Spg. Garden	6725	6910	51,748.930	20ns	82,226.707	69ns
471	19th St. & Hamilton	6725	6390	51,749.402	41ns	82,227.137	85ns
473	19th St. & Callowhill	6725	5820	51,750.890	79ns	82,228.445	86ns
475	19th St. & Wood	6725	5535	51,751.227	38ns	82,228.957	64ns
476	18th St. & Brandywine	7225	7130	51,748.203	39ns	82,226.367	234ns
502	17th St. & Buttonwood	7640	6630	51,747.984	27ns	82,227.644	49ns
503	17th St. & Callowhill	7640	5840	51,749.469	42ns	82,228.781	68ns
507	17th St. & Race	7620	4520	51,751.270	33ns	82,230.707	70ns
512	15th St. & Brandywine	8500	7140	51,746.648	58ns	82,227.395	71ns
514	15th St. & Hamilton	8500	6400	51,747.773	48ns	82,228.433	46ns
515	15th St. & Callowhill	8500	5890	51,748.543	41ns	82,229.171	55ns
517	15th St. & Vine	8500	5360	51,749.441	26ns	82,230.018	41ns
521	15th St. & Race	8500	4630	51,760.628	85ns	82,231.141	111ns
522	15th St. & Cherry	8500	4295	51,750.707	36ns	82,231.536	76ns
524	Broad & Brandywine	9000	7170	51,746.008	31ns	82,227.520	42ns
530	Juniper & Cherry	9265	4270	51,750.326	52ns	82,232.078	126ns
533	12th St. & Spg. Garden	10,040	6815	51,745.504	34ns	82,228.832	57ns
535	12th St. & Buttonwood	10,040	6715	51,745.523	27ns	82,228.890	62ns
537	12th St. & Noble	10,040	6380	51,746.379	37ns	82,229.938	134ns
540	12th St. & Callowhill	10,040	5900	51,746.699	42ns	82,230.145	76ns
543	12th St. & Vine	10,040	5270	51,747.679	31ns	82,231.185	59ns
546	12th St. & Race	10,040	4655	51,748.594	73ns	82,232.387	252ns
552	22nd St. & Winter	5280	5090	51,753.332	19ns	82,238.434	89ns
553	21st St. & Winter	5720	5090	51,752.906	38ns	82,238.672	69ns

LORAN Calibration Data

Sector D (Continued)

CAL Pt. No.	Intersection	X	Y	TDA Mean TD	TDA Std. Dev.	TDB Mean TD	TDB Std. Dev.
554	Race & Woodstock	6075	4560	51,753.145	50ns	82,239.492	90ns
557	31st St. & Spg. Garden	1734	6031	51,755.772	26ns	82,234.875	64ns
560	32nd St. & Howelton	1750	5000	51,757.000	25ns	82,236.334	89ns
562	32nd St. & Arch	1950	3848	51,758.277	34ns	82,237.582	63ns

LORAN Calibration Data

Sector Special Case - LORAN Only Area

CAL Pt. No.	Intersection	X	Y	TDA Mean TD	TDA Std. Dev.	TDB Mean TD	TDB Std. Dev.
600	4th St. & Ducannon	1633	609	51,705.629	41ns	82,193.546	58ns
601	4th St. & Lindley	1633	1156	51,706.520	50ns	82,193.395	60ns
602	4th St. & Ruscomb	1633	1719	51,707.305	37ns	82,194.094	66ns
603	4th St. & Rockland	1633	2312	51,708.183	81ns	82,195.063	96ns
604	4th St. & Loudon	1633	2835	51,709.019	29ns	82,195.488	67ns
605	4th St. & Wyoming	1633	3398	51,709.879	54ns	82,196.719	74ns
606	10th St. & Wyoming	1172	3398	51,711.410	50ns	82,196.188	38ns
607	10th St. & Loudon	1172	2835	51,710.156	32ns	82,195.027	58ns
610	10th St. & Rockland	1172	2312	51,710.176	70ns	82,195.766	128ns
611	10th St. & Ruscomb	1172	1719	51,708.297	64ns	82,192.961	95ns
612	10th St. & Lindley	1172	1156	51,707.633	42ns	82,193.430	105ns
613	10th St. & Ducannon	1172	609	51,706.984	55ns	82,193.402	117ns
614	Hutchinson & Ducannon	1375	609	51,706.109	38ns	82,192.832	53ns
615	Hutchinson & Lindley	1375	1156	51,706.887	76ns	82,193.234	105ns
616	Hutchinson & Ruscomb	1375	1719	51,707.472	26ns	82,193.992	51ns
617	Hutchinson & Rockland	1375	2312	51,708.766	59ns	82,195.020	74ns
620	Hutchinson & Loudon	1375	2835	51,709.230	49ns	82,195.254	101ns
621	Hutchinson & Wyoming	1375	3398	51,710.320	25ns	82,196.367	45ns
622	Warnock & Wyoming	945	3398	51,710.555	25ns	82,196.125	51ns
623	Warnock & Loudon	945	2835	51,709.676	61ns	82,195.309	87ns
624	Warnock & Rockland	945	2312	51,710.347	57ns	82,195.451	90ns
625	Warnock & Ruscomb	945	1719	51,707.965	47ns	82,193.301	105ns
626	Warnock & Lindley	945	1156	51,707.765	38ns	82,193.654	98ns
627	Warnock & Ducannon	945	609	51,706.805	61ns	82,192.813	98ns
630	11th St. & Ducannon	723	609	51,707.241	75ns	82,192.500	162ns
631	11th St. & Lindley	723	1156	51,707.339	50ns	82,192.891	101ns
632	11th St. & Ruscomb	723	1719	51,708.778	63ns	82,192.868	98ns
633	11th St. & Rockland	723	2312	51,709.201	40ns	82,194.492	39ns
634	11th St. & Loudon	723	2835	51,710.184	26ns	82,195.313	55ns
635	11th St. & Wyoming	723	3398	51,711.027	41ns	82,195.824	65ns

LORAN Calibration Data

Sector Special Case (Continued)

CAL Pt. No.	Intersection	X	Y	TDA Mean TD	TDA Std. Dev.	TDB Mean TD	TDB Std. Dev.
636	Marvine & Wyoming	500	3398	51,711.152	64ns	82,195.824	54ns
637	Marvine & Loudon	500	2835	51,710.031	31ns	82,194.988	37ns
640	Marvine & Rockland	500	2312	51,709.160	46ns	82,194.164	42ns
641	Marvine & Ruscomb	500	1719	51,708.406	16ns	82,193.148	46ns
642	Marvine & Lindley	500	1156	51,707.348	39ns	82,192.699	65ns
643	Marvine & Ducannon	500	609	51,706.938	62ns	82,192.004	109ns
644	12th St. & Ducannon	313	609	51,706.816	46ns	82,191.625	106ns
645	12th St. & Lindley	313	1164	51,707.750	20ns	82,192.500	32ns
646	12th St. & Ruscomb	313	1719	51,708.582	45ns	82,193.133	75ns
647	12th St. & Rockland	313	2312	51,709.535	43ns	82,194.051	99ns
650	12th St. & Loudon	313	2835	51,710.168	64ns	82,194.824	87ns
651	12th St. & Wyoming	313	3398	51,711.352	69ns	82,195.637	61ns
652	Windbrim & Marvine	500	340	51,704.324	45ns	82,192.816	81ns
653	Windbrim & 11th St.	723	156	51,707.023	16ns	82,191.230	56ns
654	Windbrim & Warnock	945	55	51,705.941	29ns	82,191.277	64ns
655	Fisher & 10th St.	1172	23	51,705.383	25ns	82,191.398	44ns
656	Fisher & Hutchinson	1375	18	51,704.586	27ns	82,191.113	94ns
657	Fisher & 4th St.	1633	10	51,704.492	32ns	82,191.328	49ns

LORAN Calibration Data

Sector Special Case - Unusual Coverage Bridge Area

CAL Pt. No.	Intersection	X	Y	TDA Mean TD	TDA Std. Dev.	TDB Mean TD	TDB Std. Dev.
700	North & Point	19,452	6,188	51,731.940	115 ns	82,232.207	109 ns
701	Delaware & Penn	19,149	3,751	51,740.070	31 ns	82,239.690	25 ns
702	State & 2nd	20,216	5,566	51,736.186	38 ns	82,237.800	76 ns
703	5th & Penn	21,164	2,642	51,737.898	40 ns	82,241.163	36 ns
704	Willow & 2nd	14,607	6,237	51,741.132	26 ns	82,232.917	41 ns
705	4th & Arch	13,528	4,024	51,745.183	37 ns	82,235.105	107 ns
706	Race & Delaware	15,412	4,596	51,742.890	32 ns	82,236.089	75 ns
707	Front & Chestnut	15,069	2,661	51,746.093	32 ns	82,238.875	36 ns
710	4th & Walnut	13,591	2,077	51,748.425	32 ns	82,238.550	91 ns

A.2 CALIBRATION DATA REDUCTION PROGRAM AND SAMPLE PROGRAM EXECUTION (BRIDGE RUN)

```
REMOTE     START JOB 261   CALIB261 CUST=06689551003     I.D.=ESMS0035 TERM.=9013 DATE=FRI. 11 MAR 1977     TIME=17.06.53
REMOTE     START JOB 261   CALIB261 CUST=06689551003     I.D.=ESMS0035 TERM.=9013 DATE=FRI. 11 MAR 1977     TIME=17.06.53
REMOTE     START JOB 261   CALIB261 CUST=06689551003     I.D.=ESMS0035 TERM.=9013 DATE=FRI. 11 MAR 1977     TIME=17.06.53

                                   H A S P   S Y S T E M   L O G

$ 16.50.22 JOB 261 -- CALIB261 -- BEGINNING EXEC - INIT A - CLASS A
$ 16.54.36 JOB 261 END EXECUTION.


SYSTEM/JOB STATISTICS ----------------------------- TELEDYNE RYAN AERONAUTICAL ----------------------------- SYSTEM/JOB STATISTICS

O/S MVT RELEASE 21.8B WITH HASP-II VERSION 3.1, CICS VERSION 2.3 WITH DL/I VERSION 2.4.1 AND TSO RELEASE 21.8B WITH TCAM LEVEL 5E,
370/155 2.0 MEG., 1-3215, 1-2540, 2-1403, 1-1018, 1-3705, 2-3272, 22-3670, 2-3420 7/9 TRACK DUAL-DEN, 6-3420 9 TRACK 1600BPI.

   0.21 MIN CPU TIME -- MU=     .29 --    344 CARDS READ --      811 LINES PRINTED --      0 CARDS PUNCHED -- TIME ON READER 16.30
```

```
//CALIB261 JOB (ESMS0035,9999,2,1),'0AAR9551003',                    , JOB 261
// TIME=0002,MSGLEVEL=1,REGION=100K
// EXEC FORTGCLG
XXFORT     EXEC PGM=IEYFORT,REGION=100K                                00000100
XXSYSPRINT DD  SYSOUT=A                                                00000200
XXSYSPUNCH DD  SYSOUT=B                                                00000300
XXSYSLIN   DD  UNIT=SYSDA,DISP=(MOD,PASS),SPACE=(80,(200,100),RLSE),   00000400
XX             DSN=&&LOADSET,DCB=BLKSIZE=80                            00000500
//SYSIN  DD *
IEF236I ALLOC. FOR CALIB261 FORT
IEF237I 0E7   ALLOCATED TO SYSPRINT
IEF237I 0D1   ALLOCATED TO SYSPUNCH
IEF237I 253   ALLOCATED TO SYSLIN
IEF237I 0B9   ALLOCATED TO SYSIN
IEF142I - STEP WAS EXECUTED - COND CODE 0000
IEF285I   SYS77069.T044750.RV000.CALIB261.LOADSET       PASSED
IEF285I   VOL SER NOS= WORK03.
IEF373I STEP /FORT     / START 77070.1650
IEF374I STEP /FORT     / STOP  77070.1652 CPU    0MIN 10.13SEC MAIN  90K LCS    0K
XXLKED EXEC PGM=IEWL,REGION=110K,PARM=(XREF,LET,LIST),COND=(4,LT,FORT)  00000600
XXSYSLIB   DD  DSNAME=SYS1.FORTLIB,DISP=SHR                            00000700
XXSYSPRINT DD  SYSOUT=A                                                00000800
XXSYSLMOD  DD  UNIT=SYSDA,DISP=(NEW,PASS),SPACE=(1024,(20,10,1),RLSE), 00000900
XX             DSN=&&GOSET(MAIN),DCB=BLKSIZE=1024                      00001000
XXSYSUT1   DD  UNIT=SYSDA,SPACE=(1024,(100,10)),DCB=BLKSIZE=1024       00001100
XXSYSLIN   DD  DSN=&&LOADSET,DISP=(OLD,DELETE)                         00001200
XX         DD  DDNAME=SYSIN                                            00001300
IEF236I ALLOC. FOR CALIB261 LKED
IEF237I 130   ALLOCATED TO SYSLIB
IEF237I 0F0   ALLOCATED TO SYSPRINT
IEF237I 253   ALLOCATED TO SYSLMOD
IEF237I 252   ALLOCATED TO SYSUT1
IEF237I 253   ALLOCATED TO SYSLIN
IEF142I - STEP WAS EXECUTED - COND CODE 0000
IEF285I   SYS1.FORTLIB                                  KEPT
IEF285I   VOL SER NOS= SYS218.
IEF285I   SYS77069.T044750.RV000.CALIB261.GOSET         PASSED
IEF285I   VOL SER NOS= WORK03.
IEF285I   SYS77069.T044750.RV000.CALIB261.R0012248      DELETED
IEF285I   VOL SER NOS= WORK02.
IEF285I   SYS77069.T044750.RV000.CALIB261.LOADSET       DELETED
IEF285I   VOL SER NOS= WORK03.
IEF373I STEP /LKED     / START 77070.1652
IEF374I STEP /LKED     / STOP  77070.1654 CPU    0MIN 02.19SEC MAIN 100K LCS    0K
XXGO EXEC PGM=*.LKED.SYSLMOD,COND=((4,LT,FORT),(4,LT,LKED))            00001400
XXFT05F001 DD  DDNAME=SYSIN                                            00001500
XXFT06F001 DD  SYSOUT=A                                                00001600
XXFT07F001 DD  SYSOUT=B                                                00001700
//GO.SYSIN DD *
//
IEF236I ALLOC. FOR CALIB261 GO
IEF237I 253   ALLOCATED TO PGM=*.DD
IEF237I 0BF   ALLOCATED TO FT05F001
IEF237I 0E0   ALLOCATED TO FT06F001
IEF237I 0D1   ALLOCATED TO FT07F001
IEF142I - STEP WAS EXECUTED - COND CODE 0000
IEF285I   SYS77069.T044750.RV000.CALIB261.GOSET         PASSED
IEF285I   VOL SER NOS= WORK03.
IEF373I STEP /GO       / START 77070.1654
IEF374I STEP /GO       / STOP  77070.1654 CPU    0MIN 00.82SEC MAIN  68K LCS    0K
```

```
IEF285I   SYS77069.T000750.RV000.CALIH261.GOSET          DELETED
IEF285I   VOL SER NOS= WORK03.
IEF376I JOB /CALIH261/ START 77070.1450
IEF377I JOB /CALIH261/ STOP  77070.1454 CPU    0MIN 13.10SEC
```

```
              C      THIS DECK IS A STAND ALONE DECK FOR CALIBRATION
 0001                COMMON/INDTPT/ITA,ITB,IX,IY
 0002                ITA=1
 0003                ITB=2
 0004                IX=3
 0005                IY=4
              C      READ TOTAL NUMBER OF SECTORS
 0006                READ(5,10) NSECTS
 0007             10 FORMAT(I5)
 0008                WRITE(6,20) NSECTS
 0009             20 FORMAT('0','NSECTS=',I5)
 0010                DO 30 I=1,NSECTS
 0011                CALL CALIB
 0012             30 CONTINUE
 0013                END
```

COMMON BLOCK /INDIRT / MAP SIZE 10

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
ITA	0	ITB	4	IX	8	IY	C		

SUBPROGRAMS CALLED

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
IBCOM#	9A	CALIA	9C						

SCALAR MAP

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
NSECTS	A0	I	A4						

FORMAT STATEMENT MAP

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
10	AP	20	AC						

```
*OPTIONS IN EFFECT*   ID,EBCDIC,SOURCE,NOLIST,NODECK,LOAD,MAP
*OPTIONS IN EFFECT*   NAME = MAIN      , LINECNT =      59
*STATISTICS*     SOURCE STATEMENTS =        13,PROGRAM SIZE =      4A4
*STATISTICS*  NO DIAGNOSTICS GENERATED
```

```
0001                SUBROUTINE CALIB
0002                COMMON/CALWRK/WORK(100,51),U(20),V(20)
0003                COMMON/CALIBR/ICALID(100)
0004                DIMENSION TDS(10,2,20),REF(10,5),SECTRS(10,4)
0005                COMMON/INDIPT/ITA,ITH,IX,IY
0006              2000 FORMAT(I10,(6F10.0))
0007              2001 FORMAT(16I5)
0008              2002 FORMAT(' ',I5,6F11.4)
0009              2003 FORMAT(8F10.3)
0010              2005 FORMAT('0','INPUT DATA FROM CODING FORMS')
0011              2006 FORMAT('0','X COEFFS FOR SECTOR',I5,5E12.4)
0012              2007 FORMAT('0','Y COEFFS FOR SECTOR',I5,5E12.4)
0013              2008 FORMAT('0','SECTOR NUMBER=',I5,' REF POINT NUMBER=',I5,' NUMBER OF
                     1 CALIBRATION POINTS=',I5)
0014              2009 FORMAT('0','COORDINATES OF SECTOR BOUNDARY POINTS')
0015                   READ(5,2001) IN,IR,ISECT,N
0016                   WRITE(6,2008) ISECT,IR,N
0017                   READ(5,2003) (SECTRS(ISECT,J),J=1,4)
0018                   WRITE(6,2009)
0019                   WRITE(6,2003)  (SECTRS(ISECT,J),J=1,4)
                  C    READ CARDS
0020                   WRITE(6,2005)
0021               1   DO 10 J=1,N
0022                   READ(5,2000) ICALID(J),(WORK(J,K),K=1,4),A,B
                  C.....KLUGE FOR STAND ALONE LOAD=REMOVE NEXT TWO CARDS AFTER THIS RUN
                  C    WORK(J,2)=WORK(J,2)+A0.
                  C    WORK(J,1)=WORK(J,1)+520.
                  C    END OF KLUGE
0023                   WRITE(6,2002) ICALID(J),(WORK(J,K),K=1,4),A,B
0024                   WORK(J,5)=A**2+B**2
0025                10 CONTINUE
0026                   DO 1000 I=1,N
0027                   IF(ICALID(I).EQ.IR) IR=I
0028              1000 CONTINUE
0029              100  CALL COEF(WORK,U,V,N,IR,IN)
0030                   IDIM=(IN+1)*(IN+2)/2+1
0031                   DO 13 J=1,IDIM
0032                   TDS(ISECT,1,J)=U(J)
0033              13   TDS(ISECT,2,J)=V(J)
0034                   WRITE(6,2006) ISECT,(U(J),J=1,5)
0035                   WRITE(6,2007) ISECT,(V(J),J=1,5)
0036                   DO 14 J=1,4
0037              14   REF(ISECT,J)=WORK(IR,J)
0038                   REF(ISECT,5)=IN
0039                   REF(ISECT,5)=1.0
0040                   RETURN
0041                   END
```

COMMON BLOCK /CALWRK / MAP SIZE 820

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
WORK	0	U	700	V	820				

COMMON BLOCK /CALIBR / MAP SIZE 190

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
ICALIB	0								

COMMON BLOCK /INDIRT / MAP SIZE 10

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
ITA	0	ITH	4	IX	8	IY	C		

SUBPROGRAMS CALLED

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
IBCOM#	C8	CORE	CC						

SCALAR MAP

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
IN	E8	IR	EC	ISECT	F0	N	F4	J	F8
K	FC	A	100	B	104	I	108	IDIM	10C

ARRAY MAP

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
IDS	110	REF	750	SECTRS	840				

FORMAT STATEMENT MAP

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
2000	8E0	2001	8EC	2002	8F2	2003	8FE	2005	905
2006	928	2007	949	2008	964	2009	989		

OPTIONS IN EFFECT ID,EBCDIC,SOURCE,NOLIST,NODECK,LOAD,MAP
OPTIONS IN EFFECT NAME = CALIB , LINECNT = 59
STATISTICS SOURCE STATEMENTS = 41,PROGRAM SIZE = 3724
STATISTICS NO DIAGNOSTICS GENERATED

```
0001              SUBROUTINE COEF(WORK,S,T,INUM,IREF,N)
0002              COMMON/INDXPT/ITA,ITB,IX,IY
0003              COMMON/CALIBR/ICALID(100)
0004              DIMENSION S(1),T(1)
0005              DIMENSION WORK(100,1),U(100),V(100)
0006              DIMENSION D(100),E(100),H(100,20),U1(20),V1(20),A(20),B(20),G(100)
0007              DOUBLE PRECISION U1,V1,E,D,H
0008         1000 FORMAT(5X,(10E12.4))
0009         1001 FORMAT(I5,(10E12.4))
0010         1002 FORMAT(1H1)
0011         1003 FORMAT(9X,'XC',8X,'X',8X,'ERRX',7X,'YC',8X,'Y',8X,'ERRY',//)
0012         1004 FORMAT('0','MEAN RADIAL ERROR=',F14.5,' RADIAL ERROR STANDARD DEVI
                 1ATION=',F14.5)
0013         1005 FORMAT('0','RANK ORDER STATISTICS OF CALIBRATION POINT RADIAL ERRO
                 1RS')
0014         1006 FORMAT('0','CALIBRATION POINT ERROR MAP')
0015              IF( N .NE. 0) GO TO 13
0016         13   CONTINUE
0017              J1=1
0018              J2=INUM
0019              IDIM=(N+1)*(N+2)/2-1
0020              IF(IREF .EQ. 0) GO TO 14
0021              J1=IREF
0022              J2=IREF
0023              G1=1.0 E 20
0024              GO TO 15
0025         14   IREF=1
0026         15   DO 10 I=J1,J2
0027              G(I)=0.0
0028              DO 1 K=1,INUM
0029              D(K)=(WORK(K,IX)-WORK(I,IX))/WORK(K,5)
0030         1    E(K)=(WORK(K,IY)-WORK(I,IY))/WORK(K,5)
0031              CALL HMAT(WORK,INUM,I,H,N)
0032              CALL LINEAR(V1,E ,H,INUM,IDIM)
0033              CALL LINEAR(U1,D ,H,INUM,IDIM)
0034              WRITE(6,1006)
0035              WRITE(6,1003)
0036              DO 3 J=1,INUM
0037              DELX=0.0
0038              DELY=0.0
0039              DO 2 K=1,IDIM
0040                DELX=DELX+U1(K)*H(J,K)*WORK(J,5)
0041         2      DELY=DELY+V1(K)*H(J,K)*WORK(J,5)
0042              DX=DELX-D(J)*WORK(J,5)
0043              DY=DELY-E(J)*WORK(J,5)
0044              U(J)=WORK(IREF,IX)+DELX
0045              V(J)=WORK(IREF,IY)+DELY
0046              AX=DX**2+DY**2
0047              AX=SQRT(AX)
0048              WRITE(6,1001) ICALID(J),U(J),WORK(J,IX),DX,V(J),WORK(J,IY),DY,AX
0049              U(J)=AX
0050         3    G(I)=G(I)+DX**2+DY**2
0051              CALL RANK(U,INUM)
0052              CALL MEAN(U,INUM,RMEAN,VAR,SIGR)
0053              WRITE(6,1005)
0054              DO 20 J=1,INUM
0055         20   WRITE(6,1001) J,U(J)
```

```
0056                IF (I .NE. 1) GO TO 5
0057                G1=G(I)
0058                GO TO 4
0059           5    IF(G1.LT. G(I)) GO TO 10
0060                G1=G(I)
0061                IREF=I
0062           4    DO 6 K=1,IDIM
0063                S(K)=U1(K)
0064           6    T(K)=V1(K)
0065          10    CONTINUE
0066                WRITE(6,1004) RMEAN,SIGN
0067                RETURN
0068                END
```

COMMON BLOCK /INDIPT / MAP SIZE 10

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
ITA	0	ITB	4	IX	8	IY	C		

COMMON BLOCK /CALIBR / MAP SIZE 190

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
ICALID	0								

SUBPROGRAMS CALLED

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
HMAT	F4	LINEAR	FA	THCOM#	FC	RANK	100	MEAN	104
SQRT	108								

SCALAR MAP

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
N	168	J1	16C	I2	170	INDM	174	IDIM	178
IREF	17C	G1	180	I	184	K	188	J	18C
DELX	190	DELY	194	DX	198	DY	19C	AX	1A0
RMEAN	1A4	VAR	1A8	SIGR	1AC				

ARRAY MAP

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
S	1B0	T	1B4	WORK	1B8	U	1BC	V	34C
D	4E0	E	800	H	820	U1	4940	V1	4A40
A	4AE0	R	4B30	G	4BB0				

FORMAT STATEMENT MAP

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
1000	4D10	1001	4D1C	1002	4D28	1003	4D2D	1004	4D57
1005	4D99	1006	4DDB						

OPTIONS IN EFFECT ID,EBCDIC,SOURCE,NOLIST,NODECK,LOAD,MAP
OPTIONS IN EFFECT NAME = COEF , LINECNT = 59
STATISTICS SOURCE STATEMENTS = 66,PROGRAM SIZE = 21716
STATISTICS NO DIAGNOSTICS GENERATED

```
FORTRAN IV G LEVEL 21          MEAN          DATE = 77070      16/50/31          PAGE 0001

0001                SUBROUTINE MEAN(FRR,ICOUNT,RMEAN,VAR,SIGMA)
0002                DIMENSION FRR(1)
0003                DOUBLE PRECISION SUM,SUMSQ
0004                SUM=0.0
0005                SUMSQ=0.0
0006                RMEAN=0.0
0007                VAR=0.0
0008                SIGMA=0.0
0009                IF(ICOUNT .EQ. 0) RETURN
0010                DO 2 J=1,ICOUNT
0011           2    SUM=SUM+FRR(J)
0012                RMEAN=SUM/ICOUNT
0013                IF(ICOUNT .EQ. 1) RETURN
0014                DO 3 J=1,ICOUNT
0015           3    SUMSQ=SUMSQ+(FRR(J)-RMEAN)**2
0016                VAR=SUMSQ/ICOUNT
0017                SIGMA=SQRT(VAR)
0018                RETURN
0019                END
```

SUBPROGRAMS CALLED

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
SQRT	A0								

SCALAR MAP

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
SUM	A8	SUMSQ	B0	RMEAN	B8	VAR	BC	SIGMA	C0
ICOUNT	C4	J	C8						

ARRAY MAP

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
ERR	CC								

```
*OPTIONS IN EFFECT*   ID,EBCDIC,SOURCE,NOLIST,NODECK,LOAD,MAP
*OPTIONS IN EFFECT*   NAME = MEAN      , LINECNT =      59
*STATISTICS*     SOURCE STATEMENTS =       19,PROGRAM SIZE =      704
*STATISTICS*  NO DIAGNOSTICS GENERATED
```

```
FORTRAN IV G LEVEL 21          HMAT          DATE = 77070      16/50/31          PAGE 0001

0001                SUBROUTINE HMAT(WORK,INUM,IREF,D,N)
0002                COMMON/INOUT/ITA,ITB,IX,IY
0003                DIMENSION WORK(100,1),D(100,1)
0004                DIMENSION C(20)
0005                DOUBLE PRECISION D
0006                IDIM=(N+1)*(N+2)/2-1
0007                DO 1 J=1,INUM
0008                A=WORK(J,ITA)-WORK(IREF,ITA)
0009                B=WORK(J,ITB)-WORK(IREF,ITB)
0010                CALL EXPAND(A,B,C,N)
0011                DO 1 K=1,IDIM
0012              1 D(J,K)=C(K)/WORK(I,5)
0013                RETURN
0014                END
```

COMMON BLOCK /INDIRT / MAP SIZE 10

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
ITA	0	ITB	4	IX	8	IY	C		

SUBPROGRAMS CALLED

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
EXPAND	9C								

SCALAR MAP

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
IDIM	B0	N	B4	J	B8	INDX	BC	A	C0
IREF	C4	B	C8	K	CC				

ARRAY MAP

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
WORK	00	D	D4	C	D8				

```
*OPTIONS IN EFFECT*   ID,EBCDIC,SOURCE,NOLIST,NODECK,LOAD,MAP
*OPTIONS IN EFFECT*   NAME = HMAT     , LINECNT =      59
*STATISTICS*     SOURCE STATEMENTS =       14,PROGRAM SIZE =     842
*STATISTICS*  NO DIAGNOSTICS GENERATED
```

```
FORTRAN IV G LEVEL  21                  LINEAR          DATE = 77070        16/50/31          PAGE 0001

0001                SUBROUTINE LINEAR(X,Z,H,M,N)
0002                DIMENSION H(100,1),X(1),Z(1)
0003                DIMENSION A(20,20),B(20,20)
0004                DIMENSION C(20)
0005                DOUBLE PRECISION X,Z,H,A,B,C,D
0006                DO 1 I=1,N
0007                DO 1 J=1,N
0008                A(I,J)=0.0
0009                DO 1 K=1,M
0010              1 A(I,J)=A(I,J)+H(K,I)*H(K,J)
0011                DO 2 I=1,N
0012                C(I)=0.
0013                DO 2 J=1,M
0014              2 C(I)=C(I)+H(J,I)*Z(J)
0015                CALL DECOMP(N,A,B)
0016                CALL SOLVE(N,B,C,X)
                  C CALL IMPROV(N,A,B,C,X,D)
                  C CALL LINERR(A,C,X,N)
0017                RETURN
0018                END
```

SUBPROGRAMS CALLED

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
DECOMP	A8	SOLVE	AC						

SCALAR MAP

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
I	CC	N	D0	J	D4	K	D8	M	DC

ARRAY MAP

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
H	E0	X	E4	Z	E8	A	F0	B	D70
C	19F0								

OPTIONS IN EFFECT ID,EBCDIC,SOURCE,NOLIST,NODECK,LOAD,MAP
OPTIONS IN EFFECT NAME = LINEAR , LINECNT = 59
STATISTICS SOURCE STATEMENTS = 18,PROGRAM SIZE = 7402
STATISTICS NO DIAGNOSTICS GENERATED

```
      SUBROUTINE DECOMP (NN, A, UL)
      IMPLICIT REAL*8 (A-H,O-Z)
      DIMENSION A(20,20), UL(20,20), SCALES(20), IPS(20)
      COMMON IPS
      N = NN
C
C     INITIALIZE IPS, UL AND SCALES
      DO 5 I = 1,N
      IPS(I) = I
      ROWNRM = 0.0
      DO 2 J = 1,N
      UL(I,J) = A(I,J)
      IF(ROWNRM-DABS(UL(I,J))) 1,2,2
    1 ROWNRM =DABS(UL(I,J))
    2 CONTINUE
      IF (ROWNRM) 3,4,3
    3 SCALES(I) = 1.0/ROWNRM
      GO TO 5
    4 CALL SING(1)
      SCALES(I) = 0.0
    5 CONTINUE
C
C     GAUSSIAN ELIMINATION WITH PARTIAL PIVOTING
      NM1 = N-1
      DO 17 K = 1,NM1
      BIG = 0.0
      DO 11 I = K,N
      IP = IPS(I)
      SIZE =DABS(UL(IP,K))*SCALES(IP)
      IF (SIZE-BIG) 11,11,10
   10 BIG = SIZE
      IDXPIV = I
   11 CONTINUE
      IF (BIG) 13,12,13
   12 CALL SING(2)
      GO TO 17
   13 IF (IDXPIV-K) 14,15,14
   14 J = IPS(K)
      IPS(K) = IPS(IDXPIV)
      IPS(IDXPIV) = J
   15 KP = IPS(K)
      PIVOT = UL(KP,K)
      KP1 = K+1
      DO 16 I = KP1,N
      IP = IPS(I)
      EM = -UL(IP,K)/PIVOT
      UL(IP,K) = -EM
      DO 16 J = KP1,N
      UL(IP,J) = UL(IP,J) + EM*UL(KP,J)
C     INNER LOOP. USE MACHINE LANGUAGE CODING IF COMPILER
C     DOES NOT PRODUCE EFFICIENT CODE.
   16 CONTINUE
   17 CONTINUE
      KP = IPS(N)
      IF (UL(KP,N)) 19,18,19
   18 CALL SING(2)
   19 RETURN
```

```
0052          END
```

COMMON BLOCK / / MAP SIZE 50

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
IPS	0								

SUBPROGRAMS CALLED

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
SING	11C								

SCALAR MAP

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
ROWNRM	138	BIG	140	SIZE	148	PIVOT	150	EM	158
N	160	NN	164	I	168	J	16C	NM1	170
K	174	IP	178	IDXPIV	17C	KP	180	KP1	184

ARRAY MAP

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
A	188	UL	18C	SCALES	190				

OPTIONS IN EFFECT ID,EBCDIC,SOURCE,NOLIST,NODECK,LOAD,MAP
OPTIONS IN EFFECT NAME = DECOMP , LINECNT = 59
STATISTICS SOURCE STATEMENTS = 52,PROGRAM SIZE = 1630
STATISTICS NO DIAGNOSTICS GENERATED

FORTRAN IV G LEVEL 21 EXPAND DATE = 77070 16/50/31 PAGE 0001

```
      SUBROUTINE EXPAND(X,Y,D,N)
      DIMENSION D(1)
      IADD=0
      DO 10 I=1,N
      I1=I +1
      DO 9 J=1,I1
      IF(J .NE. 1 .AND.J .NE. I1 ) GO TO 8
      IF(J .EQ. 1) D(IADD+J)=X**(I1-J)
      IF(J .EQ. I1) D(IADD+J)=Y**(J-1)
      GO TO 9
    8 D(IADD+J)=X**(I1-J)*Y**(J-1)
    9 CONTINUE
   10 IADD=IADD+I1
      RETURN
      END
```

SUBPROGRAMS CALLED

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
FRXPI*	B4								

SCALAR MAP

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
IADD	D8	I	DC	N	E0	I1	E4	J	E8
X	EC	Y	F0						

ARRAY MAP

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
D	F4								

OPTIONS IN EFFECT ID,EBCDIC,SOURCE,NOLIST,NODECK,LOAD,MAP
OPTIONS IN EFFECT NAME = EXPAND , LINECNT = 59
STATISTICS SOURCE STATEMENTS = 15,PROGRAM SIZE = 776
STATISTICS NO DIAGNOSTICS GENERATED

```
FORTRAN IV G LEVEL  21                SING               DATE = 77070        16/50/31              PAGE 0001

 0001                SUBROUTINE SING (IWHY)
 0002             11 FORMAT(54H0MATRIX WITH ZERO ROW IN DECOMPOSE.                     )
 0003             12 FORMAT(54H0SINGULAR MATRIX IN DECOMPOSE.  ZERO DIVIDE IN SOLVE.  )
 0004             13 FORMAT(54H0NO CONVERGENCE IN IMPRUV. MATRIX IS NEARLY SINGULAR.  )
 0005                NOUT=6
             C       NOUT = STANDARD OUTPUT UNIT
 0006                GO TO (1,2,3),IWHY
 0007              1 WRITE (NOUT,11)
 0008                GO TO 10
 0009              2 WRITE (NOUT,12)
 0010                GO TO 10
 0011              3 WRITE (NOUT,13)
 0012             10 RETURN
 0013                END
```

SUBPROGRAMS CALLED

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
IBCOM#	80								

SCALAR MAP

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
NOUT	84	IWHY	88						

FORMAT STATEMENT MAP

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
11	BC	12	F6	13	130				

```
*OPTIONS IN EFFECT*   ID,EBCDIC,SOURCE,NOLIST,NODECK,LOAD,MAP
*OPTIONS IN EFFECT*   NAME = SING    , LINECNT =      59
*STATISTICS*    SOURCE STATEMENTS =       13,PROGRAM SIZE =     628
*STATISTICS*  NO DIAGNOSTICS GENERATED
```

```
FORTRAN IV G LEVEL  21                    SOLVE              DATE = 77070         16/50/31              PAGE 0001

            SUBROUTINE SOLVE (NN, UL, B, X)
            IMPLICIT REAL*8 (A-H,O-Z)
            DIMENSION UL(20,20), B(20), X(20), IPS(20)
            COMMON IPS
            N = NN
            NP1 = N+1
C
            IP = IPS(1)
            X(1) = B(IP)
            DO 2 I = 2,N
            IP = IPS(I)
            IM1 = I-1
            SUM = 0.0
            DO 1 J = 1,IM1
          1 SUM = SUM + UL(IP,J)*X(J)
          2 X(I) = B(IP) - SUM
C
            IP = IPS(N)
            X(N) = X(N)/UL(IP,N)
            DO 4 IBACK = 2,N
            I = NP1-IBACK
C           I GOES (N-1),....,1
            IP = IPS(I)
            IP1 = I+1
            SUM = 0.0
            DO 3 J = IP1,N
          3 SUM = SUM + UL(IP,J)*X(J)
          4 X(I) = (X(I)-SUM)/UL(IP,I)
            RETURN
            END
```

```
                                   COMMON BLOCK /        / MAP SIZE      50
SYMBOL     LOCATION     SYMBOL     LOCATION     SYMBOL     LOCATION     SYMBOL     LOCATION     SYMBOL     LOCATION
IPS               0

                                   SCALAR MAP
SYMBOL     LOCATION     SYMBOL     LOCATION     SYMBOL     LOCATION     SYMBOL     LOCATION     SYMBOL     LOCATION
SUM              A8     N                B0     NN               B4     NP1              B8     IP               BC
I                C0     IM1              C4     J                C8     IBACK            CC     IP1              D0

                                   ARRAY MAP
SYMBOL     LOCATION     SYMBOL     LOCATION     SYMBOL     LOCATION     SYMBOL     LOCATION     SYMBOL     LOCATION
UL               D4     B                D8     X                DC

    *OPTIONS IN EFFECT*  ID,EBCDIC,SOURCE,NOLIST,NODECK,LOAD,MAP
    *OPTIONS IN EFFECT*  NAME = SOLVE    , LINECNT =       59
    *STATISTICS*    SOURCE STATEMENTS =       27,PROGRAM SIZE =      1012
    *STATISTICS*  NO DIAGNOSTICS GENERATED
```

```
FORTRAN IV G LEVEL 21                RANK              DATE = 77070      16/50/31          PAGE 0001

0001                  SUBROUTINE RANK(R,IC)
0002                  DIMENSION R(1)
0003                2 IFLAG=0
0004                  I1=IC-1
0005                  DO 19 I=1,I1
0006                  IF(R(I).LE.R(I+1))GO TO 19
0007                  TEMP=R(I)
0008                  R(I)=R(I+1)
0009                  R(I+1)=TEMP
0010                  IFLAG= 1
0011               19 CONTINUE
0012                  IF(IFLAG.NE.0) GO TO 2
0013                  RETURN
0014                  END
```

```
F44-LEVEL LINKAGE EDITOR OPTIONS SPECIFIED XREF,LET,LIST
        DEFAULT OPTION(S) USED - SIZE=(102400,49152)
```

CROSS REFERENCE TABLE

CONTROL SECTION

NAME	ORIGIN	LENGTH
MAIN	00	18C
CALIB	1C0	E8C
COEF	1050	5404
MEAN	6528	2C0
HMAT	67EA	34A
LINEAR	6838	1CEA
DECOMP	8828	65E
EXPAND	8E88	308
SING	9190	274
SOLVE	9408	3F4
RANK	9800	1D0
IHCFRXPI*	99D0	141
IHCECOMH*	9B18	F61
IHCCOMR2*	AA80	65D
IHCSSQRT*	B0E0	145
IHCFCVTH*	B228	1185
IHCEFNTH*	C3E0	542
IHCEFIOS*	C928	F28
IHCFIO82*	D850	52E
IHCERRM *	DD80	5DC
IHCUOPT *	E360	300
IHCETRCH*	E660	28E
IHCUATBL*	E8F0	638
INDIPT	EF2A	10
CALWRK	EF38	870
CALIBR	F7A8	190
$BLANKCOM	F938	50

ENTRY

NAME	LOCATION	NAME	LOCATION	NAME	LOCATION	NAME	LOCATION
FRXPI#	99D0						
IBCOM#	9B1A	FDIOC$#	9BD4	INT$WTCH	AA5E		
SEQDASD	ADF8						
SQRT	B0E0						
ADCON#	B228	FCVAOUTP	B2D2	FCVLOUTP	B362	FCVZOUTP	B4BA
FCVIOUTP	B86F	FCVEOUTP	BD70	FCVCOUTP	BF8A	INT6$WCH	C273
ARITH#	C3E0	ADJ$WTCH	C77C				
FIOC$#	C928	FIOC$BEP	C92E				
ERRMON	DD80	IHCERRE	DD98				
IHCTRCH	E660	ERRTRA	E668				

LOCATION	REFERS TO SYMBOL	IN CONTROL SECTION	LOCATION	REFERS TO SYMBOL	IN CONTROL SECTION
78	INDIPT	INDIPT	98	IBCOM#	IHCECOMH
9C	CALIB	CALIB	BDC	CALWRK	CALWRK

```
FORTRAN IV G LEVEL  21                RANK              DATE = 77070        16/50/31           PAGE 0002

                                   SCALAR MAP
SYMBOL     LOCATION        SYMBOL    LOCATION       SYMBOL     LOCATION       SYMBOL     LOCATION       SYMBOL     LOCATION
IFLAG            AC        I1              80       IC               84       I                88       TEMP             BC

                                   ARRAY MAP
SYMBOL     LOCATION        SYMBOL    LOCATION       SYMBOL     LOCATION       SYMBOL     LOCATION       SYMBOL     LOCATION
R                C0

    *OPTIONS IN EFFECT*  ID,EBCDIC,SOURCE,NOLIST,NODECK,LOAD,MAP
    *OPTIONS IN EFFECT*  NAME = RANK    , LINECNT =       59
    *STATISTICS*    SOURCE STATEMENTS =       14,PROGRAM SIZE =       464
    *STATISTICS*  NO DIAGNOSTICS GENERATED

    *STATISTICS*  NO DIAGNOSTICS THIS STEP
```

LOCATION	REFERS TO SYMBOL	IN CONTROL SECTION
8D4	CALWRK	CALWRK
238	CALWRK	CALWRK
240	INDIPT	INDIPT
294	CALWRK	CALWRK
298	IBCOM#	IHCECOMH
8E0	CALWRK	CALWRK
10CC	CALIBR	CALIBR
1148	LINEAR	LINEAR
1150	RANK	RANK
1158	SQRT	IHCBSQRT
65C8	SQRT	IHCBSQRT
6884	EXPAND	EXPAND
6RE4	SOLVE	SOLVE
8840		
8A90		
9240	IBCOM#	IHCECOMH
9510		
9AA4	IHCERRM	IHCERRM
A964	ADCON#	IHCFCVTH
A9AR	ARITH#	IHCEFNTH
A984	IHCUOPT	IHCUOPT
A970	FCVLOUTP	IHCFCVTH
A978	FCVCOUTP	IHCFCVTH
A980	FCVZOUTP	IHCFCVTH
A93C	IHCCOMH2	IHCCOMH2
A914	IHCCOMH2	IHCCOMH2
A91C	IHCCOMH2	IHCCOMH2
AD10	IHCECOMH	IHCECOMH
AACR	IHCERRM	IHCERRM
AF30	IHCECOMH	IHCECOMH
AF50	IHCECOMH	IHCECOMH
B10A	IHCERRM	IHCERRM
C230	IHCERRM	IHCERRM
C7D0	INTSWTCH	IHCECOMH
C774	IHCUOPT	IHCUOPT
C7D4	FIOCS#	IHCEFIOS
C490	IHCERRM	IHCERRM
D6A0	IHCUATBL	IHCUATBL
D6C1	IHCFIOS2	IHCFIOS2
D849	IHCFIOS2	IHCFIOS2
E350	IBCOM#	IHCECOMH
E358	FIOCSBEP	IHCEFIOS
E7DA	ADCON#	IHCFCVTH

LOCATION	REFERS TO SYMBOL	IN CONTROL SECTION
8D0	CALIBR	CALIBR
23C	CALIBR	CALIBR
290	CALWRK	CALWRK
298	CALWRK	CALWRK
28C	COEF	COEF
10C8	INDIPT	INDIPT
1144	HMAT	HMAT
114C	IBCOM#	IHCECOMH
1154	MEAN	MEAN
5E94	CALIBR	CALIBR
6860	INDIPT	INDIPT
68E0	DECOMP	DECOMP
8A88		
8944	SING	SING
8F3C	FRXPI#	IHCFRXPI
9480		
9AA0	IBCOM#	IHCECOMH
9BD4	SEGDASD	IHCCOMH2
A95C	FIOCS#	IHCEFIOS
A988	ADJSWTCH	IHCEFNTH
A96C	FCVEOUTP	IHCFCVTH
A974	FCVIOUTP	IHCFCVTH
A97C	FCVAOUTP	IHCFCVTH
A910	IHCERRE	IHCERRM
A940	IHCERRM	IHCERRM
A918	IHCCOMH2	IHCCOMH2
A920	IHCCOMH2	IHCCOMH2
AD20	IHCECOMH	IHCECOMH
AAC4	IBCOM#	IHCECOMH
AF4D	IHCECOMH	IHCECOMH
B150	IBCOM#	IHCECOMH
C234	IBCOM#	IHCECOMH
C7CC	IBCOM#	IHCECOMH
C778	INTSWCH	IHCFCVTH
C7D8	ADCON#	IHCFCVTH
C844	IHCERRM	IHCERRM
C494	IHCFIOS2	IHCFIOS2
D6AC	IBCOM#	IHCECOMH
D6D8	IHCFIOS2	IHCFIOS2
E34C	IHCUOPT	IHCUOPT
E354	IHCTRCH	IHCETRCH
E7D4	IBCOM#	IHCECOMH
E7DC	FIOCSBEP	IHCEFIOS

ENTRY ADDRESS 00
TOTAL LENGTH F988

****MAIN DOES NOT EXIST BUT HAS BEEN ADDED TO DATA SET

NSECTS= 1

SECTOR NUMBER= 1 REF POINT NUMBER= 704 NUMBER OF CALIBRATION POINTS= 19

COORDINATES OF SECTOR BOUNDARY POINTS

0.0 0.0 99999.000 99999.000

INPUT DATA FROM CODING FORMS

700	211.9400	312.2068	19542.0000	6188.0000	1.0000	1.0000
701	220.0700	319.6899	19149.0000	3751.0000	1.0000	1.0000
703	217.8980	321.1628	21164.0000	2642.0000	1.0000	1.0000
704	221.1320	312.9170	14607.0000	6237.0000	1.0000	1.0000
705	225.1830	315.1050	13528.0000	4024.0000	1.0000	1.0000
706	222.8900	316.0889	15412.0000	4596.0000	1.0000	1.0000
707	226.0930	318.8750	15069.0000	2661.0000	1.0000	1.0000
710	228.4250	318.3499	13591.0000	2077.0000	1.0000	1.0000
376	230.0120	319.3359	13120.0000	1210.0000	1.0000	1.0000
400	228.9800	318.4900	13120.0000	1660.0000	1.0000	1.0000
403	227.9900	317.4690	13145.0000	2660.0000	1.0000	1.0000
405	227.2230	316.4768	13120.0000	3035.0000	1.0000	1.0000
407	225.5590	315.0469	13130.0000	4030.0000	1.0000	1.0000
410	227.7460	317.7729	13590.0000	2705.0000	1.0000	1.0000
412	229.2810	319.4058	13580.0000	1685.0000	1.0000	1.0000
415	230.7460	320.8550	13575.0000	695.0000	1.0000	1.0000
417	231.4730	321.5779	13570.0000	370.0000	1.0000	1.0000
420	232.2150	322.3899	13570.0000	25.0000	1.0000	1.0000
434	228.0980	319.0000	14000.0000	2045.0000	1.0000	1.0000

CALIBRATION POINT ERROR MAP

	XC	X	ERRX	YC	Y	ERRY	
700	0.1955E 05	0.1954E 05	0.7953E 01	0.6219E 04	0.6188E 04	0.3098E 02	0.3198E 02
701	0.1911E 05	0.1915E 05	-0.3873E 02	0.3540E 04	0.3751E 04	-0.2109E 03	0.2144E 03
703	0.2118E 05	0.2116E 05	0.1237E 02	0.2726E 04	0.2642E 04	0.8367E 02	0.8458E 02
704	0.1461E 05	0.1461E 05	0.0	0.6237E 04	0.6237E 04	0.0	0.0
705	0.1348E 05	0.1353E 05	-0.4341E 02	0.4203E 04	0.4024E 04	0.1787E 03	0.1839E 03
706	0.1541E 05	0.1541E 05	-0.3979E 00	0.4557E 04	0.4596E 04	-0.3942E 02	0.3942E 02
707	0.1515E 05	0.1507E 05	0.7737E 02	0.2939E 04	0.2661E 04	0.2783E 03	0.2888E 03
710	0.1346E 05	0.1359E 05	-0.1282E 03	0.2104E 04	0.2077E 04	0.2737E 02	0.1311E 03
376	0.1310E 05	0.1312E 05	-0.2010E 02	0.1204E 04	0.1210E 04	-0.5598E 01	0.2087E 02
400	0.1322E 05	0.1312E 05	0.9558E 02	0.1818E 04	0.1660E 04	0.1575E 03	0.1843E 03
403	0.1320E 05	0.1315E 05	0.5883E 02	0.2446E 04	0.2660E 04	-0.2136E 03	0.2215E 03
405	0.1308E 05	0.1312E 05	-0.4312E 02	0.2995E 04	0.3035E 04	-0.4017E 02	0.5893E 02
407	0.1323E 05	0.1313E 05	0.9706E 02	0.4075E 04	0.4030E 04	0.4475E 02	0.1069E 03
410	0.1353E 05	0.1359E 05	-0.6283E 02	0.2506E 04	0.2705E 04	-0.1992E 03	0.2088E 03
412	0.1357E 05	0.1358E 05	-0.5123E 01	0.1573E 04	0.1685E 04	-0.1125E 03	0.1126E 03
415	0.1356E 05	0.1358E 05	-0.1748E 02	0.7487E 03	0.6950E 03	0.5368E 02	0.5645E 02
417	0.1355E 05	0.1357E 05	-0.1451E 02	0.3574E 03	0.3700E 03	-0.1259E 02	0.2238E 02
420	0.1359E 05	0.1357E 05	0.1924E 02	-0.2499E 02	0.2500E 02	-0.4999E 02	0.5356E 02
434	0.1404E 05	0.1400E 05	0.3750E 02	0.2163E 04	0.2045E 04	0.1183E 03	0.1241E 03

RANK ORDER STATISTICS OF CALIBRATION POINT RADIAL ERRORS

1	0.0
2	0.2087E 02
3	0.2238E 02
4	0.3198E 02
5	0.3942E 02

```
     6  0.5356E 02
     7  0.5645E 02
     8  0.5893E 02
     9  0.8458E 02
    10  0.1069E 03
    11  0.1176E 03
    12  0.1241E 03
    13  0.1311E 03
    14  0.1839E 03
    15  0.1843E 03
    16  0.2088E 03
    17  0.2144E 03
    18  0.2215E 03
    19  0.2888E 03

 MEAN RADIAL ERROR=   0.11287E 03 RADIAL ERROR STANDARD DEVIATION=   0.81001E 02

 X COEFFS FOR SECTOR   1   -590.4443    580.9658     -1.0128      2.1800     -0.9111

 Y COEFFS FOR SECTOR   1   -204.8187   -475.8906    -28.7610     28.4008     11.8919
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REMOTE    END JOB 261   CALIB261 CUST=06689551003    I.D.=ESMS0035 TERM.=9013 DATE=FRI. 11 MAR 1977    TIME=17.08.16
REMOTE    END JOB 261   CALIB261 CUST=06689551003    I.D.=ESMS0035 TERM.=9013 DATE=FRI. 11 MAR 1977    TIME=17.08.16
REMOTE    END JOB 261   CALIB261 CUST=06689551003    I.D.=ESMS0035 TERM.=9013 DATE=FRI. 11 MAR 1977    TIME=17.08.16
REMOTE    END JOB 261   CALIB261 CUST=06689551003    I.D.=ESMS0035 TERM.=9013 DATE=FRI. 11 MAR 1977    TIME=17.08.16
REMOTE    END JOB 261   CALIB261 CUST=06689551003    I.D.=ESMS0035 TERM.=9013 DATE=FRI. 11 MAR 1977    TIME=17.08.16
REMOTE    END JOB 261   CALIB261 CUST=06689551003    I.D.=ESMS0035 TERM.=9013 DATE=FRI. 11 MAR 1977    TIME=17.08.16
REMOTE    END JOB 261   CALIB261 CUST=06689551003    I.D.=ESMS0035 TERM.=9013 DATE=FRI. 11 MAR 1977    TIME=17.08.16
REMOTE    END JOB 261   CALIB261 CUST=06689551003    I.D.=ESMS0035 TERM.=9013 DATE=FRI. 11 MAR 1977    TIME=17.08.16
REMOTE    END JOB 261   CALIB261 CUST=06689551003    I.D.=ESMS0035 TERM.=9013 DATE=FRI. 11 MAR 1977    TIME=17.08.16
REMOTE    END JOB 261   CALIB261 CUST=06689551003    I.D.=ESMS0035 TERM.=9013 DATE=FRI. 11 MAR 1977    TIME=17.08.16
REMOTE    END JOB 261   CALIB261 CUST=06689551003    I.D.=ESMS0035 TERM.=9013 DATE=FRI. 11 MAR 1977    TIME=17.08.16
REMOTE    END JOB 261   CALIB261 CUST=06689551003    I.D.=ESMS0035 TERM.=9013 DATE=FRI. 11 MAR 1977    TIME=17.08.16
REMOTE    END JOB 261   CALIB261 CUST=06689551003    I.D.=ESMS0035 TERM.=9013 DATE=FRI. 11 MAR 1977    TIME=17.08.16
REMOTE    END JOB 261   CALIB261 CUST=06689551003    I.D.=ESMS0035 TERM.=9013 DATE=FRI. 11 MAR 1977    TIME=17.08.16
REMOTE    END JOB 261   CALIB261 CUST=06689551003    I.D.=ESMS0035 TERM.=9013 DATE=FRI. 11 MAR 1977    TIME=17.08.16
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REMOTE    END JOB 261   CALIB261 CUST=06689551003    I.D.=ESMS0035 TERM.=9013 DATE=FRI. 11 MAR 1977    TIME=17.08.16
REMOTE    END JOB 261   CALIB261 CUST=06689551003    I.D.=ESMS0035 TERM.=9013 DATE=FRI. 11 MAR 1977    TIME=17.08.16
REMOTE    END JOB 261   CALIB261 CUST=06689551003    I.D.=ESMS0035 TERM.=9013 DATE=FRI. 11 MAR 1977    TIME=17.08.16
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APPENDIX B - SPECIAL CASE TEST DATA SHEETS

The special case data sheets are divided into five sections:

B. 1 Augmentor Coverage - General
B. 2 Augmentor Coverage In Traffic
B. 3 Augmentor Interference
B. 4 Augmentor Radio Interference
B. 5 Augmentor Antenna Pattern.

B. 1 AUGMENTOR COVERAGE - GENERAL

SPECIAL CASE TEST

DATA SHEET

(1) Date 2-6-71 (2) Time 1335

(2) Test Name: Augmentor Coverage

(3) Distance from Vehicle Start to Augmentor 500'

(4) Distance from Augmentor detection Pt. to Aug. 37' (R.T. ≈10)

(5) Distance from loss of Aug. Detection Pt. to Aug. 85' (R.T. ≈10)

(6) Augmentor ID No. 61 Detected correctly Yes ✓ No ____

(7) Run Number 30101 (8) Vehicle Speed ~~X~~ 10 MPH

(9) Augmentor Elevation 15 (Ft)

(10) Remarks: ____

(11) Test Conductor Barry E. Bu

(12) Assistant [illegible]

(13) Witnesses Joseph [illegible] FSC

SPECIAL CASE TEST

DATA SHEET

(1) Date 2-6-72 (2) Time 1340

(2) Test Name: Augmentor Coverage

(3) Distance from Vehicle Start to Augmentor 500'

(4) Distance from Augmentor detection Pt. to Aug. 35' (R.T. ≈10)

(5) Distance from loss of Aug. Detection Pt. to Aug. 90' (R.T. ≈10)

(6) Augmentor ID No. 61 Detected correctly Yes ✓ No _____

(7) Run Number 30102 (8) Vehicle Speed ~~X~~ 10 MPH

(9) Augmentor Elevation 15 (Ft)

(10) Remarks: _____

(11) Test Conductor [signature]

(12) Assistant ~~[signature]~~

(13) Witnesses [signature] SC

SPECIAL CASE TEST

DATA SHEET

(1) Date 2-6-77 (2) Time 1340

(2) Test Name: Augmentor Coverage

(3) Distance from Vehicle Start to Augmentor 500'

(4) Distance from Augmentor detection Pt. to Aug. 23' (+R.T. ≈ 20')

(5) Distance from loss of Aug. Detection Pt. to Aug. 108' (-R.T. ≈ 20')

(6) Augmentor ID No. 61 Detected correctly Yes ✓ No ______

(7) Run Number 30103 (8) Vehicle Speed 15 MPH

(9) Augmentor Elevation 15 (Ft)

(10) Remarks: ______

(11) Test Conductor Barry E. B[illegible]

(12) Assistant [illegible]

(13) Witnesses Joseph [illegible] TSC

SPECIAL CASE TEST

DATA SHEET

(1) Date 2-6-77 (2) Time 1345

(2) Test Name: Augmentor Coverage

(3) Distance from Vehicle Start to Augmentor 500'

(4) Distance from Augmentor detection Pt. to Aug. 21' (+R.T. ≈ 20')

(5) Distance from loss of Aug. Detection Pt. to Aug. 110' (-R.T. ≈ 20')

(6) Augmentor ID No. 61 Detected correctly Yes ✓ No _____

(7) Run Number 30104 (8) Vehicle Speed 15 MPH

(9) Augmentor Elevation 15 (Ft)

(10) Remarks: _____

(11) Test Conductor Barry E. Brown

(12) Assistant _____

(13) Witnesses _____

SPECIAL CASE TEST

DATA SHEET

(1) Date 2-6-77 (2) Time 1352

(2) Test Name: Augmentor Coverage

(3) Distance from Vehicle Start to Augmentor 1000'

(4) Distance from Augmentor detection Pt. to Aug. -60+(R.T. 88')

(5) Distance from loss of Aug. Detection Pt. to Aug. 160-(R.T. 88)

(6) Augmentor ID No. 61 Detected correctly Yes ✓ No ____

(7) Run Number 30110 (8) Vehicle Speed 55 MPH

(9) Augmentor Elevation 15 (Ft)

(10) Remarks: ____

(11) Test Conductor Barry E. Br

(12) Assistant [signature]

(13) Witnesses [signature]

SPECIAL CASE TEST

DATA SHEET

(1) Date 2-6-77 (2) Time 1352

(2) Test Name: Augmentor Coverage

(3) Distance from Vehicle Start to Augmentor 1000'

(4) Distance from Augmentor detection Pt. to Aug. -50' + (R.T. 88')

(5) Distance from loss of Aug. Detection Pt. to Aug. 150' - (R.T. 88')

(6) Augmentor ID No. 61 Detected correctly Yes ✓ No _____

(7) Run Number 30107 (8) Vehicle Speed 55 MPH

(9) Augmentor Elevation 15 (Ft)

(10) Remarks: _____

(11) Test Conductor Barry E. Br

(12) Assistant [illegible]

(13) Witnesses Joseph S. Birch USC

SPECIAL CASE TEST

DATA SHEET

(1) Date 2-6-77 (2) Time 1348

(2) Test Name: Augmentor Coverage

(3) Distance from Vehicle Start to Augmentor 1000'

(4) Distance from Augmentor detection Pt. to Aug. 54 (R.T. 44')

(5) Distance from loss of Aug. Detection Pt. to Aug. 95 - (R.T. 44')

(6) Augmentor ID No. 61 Detected correctly Yes ✓ No _____

(7) Run Number 30106 (8) Vehicle Speed 35 MPH

(9) Augmentor Elevation 15 (Ft)

(10) Remarks: _____

(11) Test Conductor Barry E. Bu

(12) Assistant ~~[illegible]~~

(13) Witnesses [illegible] TSC

SPECIAL CASE TEST

DATA SHEET

(1) Date 2-6-77 (2) Time 1343

(2) Test Name: Augmentor Coverage

(3) Distance from Vehicle Start to Augmentor 1000'

(4) Distance from Augmentor detection Pt. to Aug. 10' + (R.T. 44')

(5) Distance from loss of Aug. Detection Pt. to Aug. 91' - (R.T. 44')

(6) Augmentor ID No. 61 Detected correctly Yes ✓ No _____

(7) Run Number 30105 (8) Vehicle Speed 35 MPH

(9) Augmentor Elevation 15 (Ft)

(10) Remarks: _____

(11) Test Conductor Barry E. Br

(12) Assistant [illegible]

(13) Witnesses [illegible]

SPECIAL CASE TEST

DATA SHEET

(1) Date_____ (2) Time_____

(2) Test Name: Augmentor Coverage

(3) Distance from Vehicle Start to Augmentor

(4) Distance from Augmentor detection Pt. to Aug.

(5) Distance from loss of Aug. Detection Pt. to Aug.

(6) Augmentor ID No._____Detected correctly Yes_____No_____

(7) Run Number 30111 (8) Vehicle Speed ~~85~~ 75 MPH

(9) Augmentor Elevation 15 (Ft)

(10) Remarks: ELEVATION & RANGE TOO LOW FOR MEASUREMENT RESULTING AT THIS SPEED. (DETECTION & LOSS OCCURRED SIMULTANEOUSLY JUST AFTER PASSING)

(11) Test Conductor Barry E. Be

(12) Assistant ~~[illegible]~~

(13) Witnesses [illegible] DSC

_____

_____

_____

SPECIAL CASE TEST

DATA SHEET

(1) Date_____ (2) Time_____

(2) Test Name: Augmentor Coverage

(3) Distance from Vehicle Start to Augmentor

(4) Distance from Augmentor detection Pt. to Aug.

(5) Distance from loss of Aug. Detection Pt. to Aug.

(6) Augmentor ID No._____ Detected correctly Yes_____ No_____

(7) Run Number 30112 (8) Vehicle Speed ~~85~~ 75 MPH

(9) Augmentor Elevation 15 (Ft)

(10) Remarks:_____

Same as # 30111

(11) Test Conductor [signature]

(12) Assistant [signature]

(13) Witnesses

SPECIAL CASE TEST

DATA SHEET

(1) Date 2-6-77 (2) Time 1325

(2) Test Name: Augmentor Coverage

(3) Distance from Vehicle Start to Augmentor 1000'

(4) Distance from Augmentor detection Pt. to Aug. 32' (+R.T. 10')

(5) Distance from loss of Aug. Detection Pt. to Aug. 95' (-R.T. 10')

(6) Augmentor ID No. 61 Detected correctly Yes ✓ No _____

(7) Run Number 30201 (8) Vehicle Speed ~~X~~ 10 MPH

(9) Augmentor Elevation 10 (Ft)

(10) Remarks: _____

(11) Test Conductor Barry E. B

(12) Assistant _____

(13) Witnesses _____

SPECIAL CASE TEST

DATA SHEET

(1) Date 2-6-77 (2) Time 1520

(2) Test Name: Augmentor Coverage 1000'

(3) Distance from Vehicle Start to Augmentor

(4) Distance from Augmentor detection Pt. to Aug. 24' (+R.T. 10')

(5) Distance from loss of Aug. Detection Pt. to Aug. 101' (-R.T. 10')

(6) Augmentor ID No. 61 Detected correctly Yes ✓ No _____

(7) Run Number 30202 (8) Vehicle Speed ~~X~~ 10 MPH

(9) Augmentor Elevation 10 (Ft)

(10) Remarks: _____

(11) Test Conductor Barry E. Br

(12) Assistant _____

(13) Witnesses _____ DSC

SPECIAL CASE TEST

DATA SHEET

(1) Date 2-6-77 (2) Time 1240

(2) Test Name: Augmentor Coverage

(3) Distance from Vehicle Start to Augmentor 1000'

(4) Distance from Augmentor detection Pt. to Aug. 297' (+R.T. 10')

(5) Distance from loss of Aug. Detection Pt. to Aug. 378' (-R.T. 10')

(6) Augmentor ID No. 61 Detected correctly Yes ✓ No _____

(7) Run Number 30203 (8) Vehicle Speed ~~8~~ 10 MPH

(9) Augmentor Elevation 20 (Ft)

(10) Remarks: _____

(11) Test Conductor [signature]

(12) Assistant ~~[signature]~~

(13) Witnesses [signature] SSC

SPECIAL CASE TEST

DATA SHEET

(1) Date 2-6-77 (2) Time 1235

(2) Test Name: Augmentor Coverage

(3) Distance from Vehicle Start to Augmentor 1000'

(4) Distance from Augmentor detection Pt. to Aug. 254' (+R.T. 10')

(5) Distance from loss of Aug. Detection Pt. to Aug. 389' (-R.T. 10')

(6) Augmentor ID No. 61 Detected correctly Yes ✓ No ____

(7) Run Number 30204 (8) Vehicle Speed ~~5~~ 10 MPH

(9) Augmentor Elevation 20 (Ft)

(10) Remarks: ____

(11) Test Conductor [signature]

(12) Assistant [signature]

(13) Witnesses [signature] TSC

SPECIAL CASE TEST

DATA SHEET

(1) Date 2-6-77 (2) Time 1310

(2) Test Name: Augmentor Coverage

(3) Distance from Vehicle Start to Augmentor 1000'

(4) Distance from Augmentor detection Pt. to Aug. 8' (+R.T. 44')

(5) Distance from loss of Aug. Detection Pt. to Aug. 100' (-R.T. 44')

(6) Augmentor ID No. 61 Detected correctly Yes ✓ No _____

(7) Run Number 30207 [redacted] (8) Vehicle Speed 35 MPH

(9) Augmentor Elevation 10 (Ft)

(10) Remarks: _____

(11) Test Conductor Barry E. Br

(12) Assistant [illegible]

(13) Witnesses [illegible]

SPECIAL CASE TEST

DATA SHEET

(1) Date 2-6-77 (2) Time 1315

(2) Test Name: Augmentor Coverage

(3) Distance from Vehicle Start to Augmentor 1000'

(4) Distance from Augmentor detection Pt. to Aug. 22' (+R.T. 44')

(5) Distance from loss of Aug. Detection Pt. to Aug. 121' (-R.T. 44')

(6) Augmentor ID No. 61 Detected correctly Yes ✓ No ____

(7) Run Number 30210/[redacted] (8) Vehicle Speed 35 MPH

(9) Augmentor Elevation 10 (Ft)

(10) Remarks:

(11) Test Conductor

(12) Assistant

(13) Witnesses TSC

SPECIAL CASE TEST

DATA SHEET

(1) Date 2-6-77 (2) Time 1230

(2) Test Name: Augmentor Coverage

(3) Distance from Vehicle Start to Augmentor 1430'

(4) Distance from Augmentor detection Pt. to Aug. 214' (+R.T. 44')

(5) Distance from loss of Aug. Detection Pt. to Aug. 444 (-R.T. 44')

(6) Augmentor ID No. 61 Detected correctly Yes ✓ No ____

(7) Run Number 30211 (8) Vehicle Speed 35 MPH

(9) Augmentor Elevation 20 (Ft)

(10) Remarks: ____

(11) Test Conductor Barry E. Bu

(12) Assistant ~~Dwight H. Brown~~

(13) Witnesses Dwight H. Brown FSC

SPECIAL CASE TEST

DATA SHEET

(1) Date 2-6-77 (2) Time 1225

(2) Test Name: Augmentor Coverage

(3) Distance from Vehicle Start to Augmentor 1430'

(4) Distance from Augmentor detection Pt. to Aug. 195' (+R.T. 44')

(5) Distance from loss of Aug. Detection Pt. to Aug. 525' (-R.T. 44')

(6) Augmentor ID No. 61 Detected correctly Yes ✓ No ____

(7) Run Number 30212 (8) Vehicle Speed 35 MPH

(9) Augmentor Elevation 20 (Ft)

(10) Remarks: ____

(11) Test Conductor [signature]

(12) Assistant [signature]

(13) Witnesses [signature] TSC

SPECIAL CASE TEST

DATA SHEET

(1) Date 2-6-76 (2) Time 1325

(2) Test Name: Augmentor Coverage

(3) Distance from Vehicle Start to Augmentor 1000'

(4) Distance from Augmentor detection Pt. to Aug. -37 (+R.T. 88')

(5) Distance from loss of Aug. Detection Pt. to Aug. 181 (-R.T. 88')

(6) Augmentor ID No. 61 Detected correctly Yes ✓ No _____

(7) Run Number 30216 [redacted] (8) Vehicle Speed 55 MPH

(9) Augmentor Elevation 10 (Ft)

(10) Remarks: _____

(11) Test Conductor [signature]

(12) Assistant [signature]

(13) Witnesses [signature] FSC

SPECIAL CASE TEST

DATA SHEET

(1) Date 2-6-77 (2) Time 1330

(2) Test Name: Augmentor Coverage

(3) Distance from Vehicle Start to Augmentor

(4) Distance from Augmentor detection Pt. to Aug. -72 (+R.T. 88')

(5) Distance from loss of Aug. Detection Pt. to Aug. 165 (-R.T. 88')

(6) Augmentor ID No. 61 Detected correctly Yes ✓ No ____

(7) Run Number 30215 [redacted] (8) Vehicle Speed 55 MPH

(9) Augmentor Elevation 10 (Ft)

(10) Remarks: ____

(11) Test Conductor Barry E. Bu

(12) Assistant [signature]

(13) Witnesses [signature] SC

SPECIAL CASE TEST

DATA SHEET

(1) Date 2-6-77 (2) Time 1220

(2) Test Name: Augmentor Coverage

(3) Distance from Vehicle Start to Augmentor 1430'

(4) Distance from Augmentor detection Pt. to Aug. 161' (+R.T. 88')

(5) Distance from loss of Aug. Detection Pt. to Aug. 624' (-R.T. 88')

(6) Augmentor ID No. 61 Detected correctly Yes ✓ No _____

(7) Run Number 30217 (8) Vehicle Speed 55 MPH

(9) Augmentor Elevation 20 (Ft)

(10) Remarks: _____

(11) Test Conductor Barry T. Brunson

(12) Assistant _____

(13) Witnesses _____

SPECIAL CASE TEST

DATA SHEET

(1) Date 2-6-77 (2) Time 1215

(2) Test Name: Augmentor Coverage

(3) Distance from Vehicle Start to Augmentor 1430'

(4) Distance from Augmentor detection Pt. to Aug. 142' (+R.T. 88')

(5) Distance from loss of Aug. Detection Pt. to Aug. 557' (-R.T. 88')

(6) Augmentor ID No. 61 Detected correctly Yes ✓ No ____

(7) Run Number 30220 (8) Vehicle Speed 55 MPH

(9) Augmentor Elevation 20 (Ft)

(10) Remarks: ____________________

(11) Test Conductor [signature]

(12) Assistant [signature]

(13) Witnesses [signature] TSC

SPECIAL CASE TEST

DATA SHEET

(1) Date 2-6-77 (2) Time 1310

(2) Test Name: Augmentor Coverage

(3) Distance from Vehicle Start to Augmentor 1000'

(4) Distance from Augmentor detection Pt. to Aug.

(5) Distance from loss of Aug. Detection Pt. to Aug.

(6) Augmentor ID No. 61 Detected correctly Yes ____ No ____

(7) Run Number 30223/[redacted] (8) Vehicle Speed ~~65~~ 75 MPH

(9) Augmentor Elevation 10 (Ft)

(10) Remarks: ELEVATION & RESULTING RANGE TOO SHORT FOR MEASUREMENT (- DETECTION & LOSS SIMULTANEOUS) JUST AFTER Augmentor

(11) Test Conductor Barry E. Br

(12) Assistant [illegible]

(13) Witnesses [illegible] TSC

SPECIAL CASE TEST

DATA SHEET

(1) Date 2-6-77 (2) Time 1250

(2) Test Name: Augmentor Coverage

(3) Distance from Vehicle Start to Augmentor 1430'

(4) Distance from Augmentor detection Pt. to Aug. -5' (+R.T. 100')

(5) Distance from loss of Aug. Detection Pt. to Aug. 20' (-R.T. 100')

(6) Augmentor ID No. 61 Detected correctly Yes ✓ No ____

(7) Run Number 30224/[redacted] (8) Vehicle Speed ~~85~~ 75 MPH

(9) Augmentor Elevation 10 (Ft)

(10) Remarks: ELEVATION & RANGE TOO LOW FOR MEASUREMENT (DETECTION & LOSS SIMULTANEOUS JUST AFTER Augmentor)

(11) Test Conductor [signature]

(12) Assistant [signature]

(13) Witnesses [signature] TSC

SPECIAL CASE TEST

DATA SHEET

(1) Date 2-6-77 (2) Time 1210

(2) Test Name: Augmentor Coverage

(3) Distance from Vehicle Start to Augmentor 1430'

(4) Distance from Augmentor detection Pt. to Aug. 169' (+ R.T. 100')

(5) Distance from loss of Aug. Detection Pt. to Aug. 619' (- R.T. 100')

(6) Augmentor ID No. 61 Detected correctly Yes ✓ No ______

(7) Run Number 30225 (8) Vehicle Speed ~~85~~ 75 MPH

(9) Augmentor Elevation 20 (Ft)

(10) Remarks: ______

(11) Test Conductor [signature]

(12) Assistant [signature]

(13) Witnesses [signature] TSC

SPECIAL CASE TEST

DATA SHEET

(1) Date 2-6-76 (2) Time 1208

(2) Test Name: Augmentor Coverage

(3) Distance from Vehicle Start to Augmentor 1430'

(4) Distance from Augmentor detection Pt. to Aug. 32' (+R.T. 100')

(5) Distance from loss of Aug. Detection Pt. to Aug. 588' (-R.T. 100')

(6) Augmentor ID No. 61 Detected correctly Yes ✓ No _____

(7) Run Number 30226 (8) Vehicle Speed ~~85~~ 75 MPH

(9) Augmentor Elevation 20 (Ft)

(10) Remarks: _____

(11) Test Conductor Barry F. Bar

(12) Assistant _____

(13) Witnesses: Joseph O'Brien FSC

SPECIAL CASE TEST

DATA SHEET

(1) Date 2-6-77 (2) Time 1150

(2) Test Name: Augmentor Coverage

(3) Distance from Vehicle Start to Augmentor 1000'

(4) Distance from Augmentor detection Pt. to Aug. 368' (+R.T. 10')

(5) Distance from loss of Aug. Detection Pt. to Aug. 391 (-R.T. 10')

(6) Augmentor ID No. 61 Detected correctly Yes ✓ No _____

(7) Run Number 30206 (8) Vehicle Speed ~~30~~ 10 MPH

(9) Augmentor Elevation ~~30~~ 30 (Ft)

(10) Remarks: _____

(11) Test Conductor Barry F. Bu

(12) Assistant _____

(13) Witnesses _____

SPECIAL CASE TEST

DATA SHEET

(1) Date 2-6-77 (2) Time 1145

(2) Test Name: Augmentor Coverage

(3) Distance from Vehicle Start to Augmentor 1000'

(4) Distance from Augmentor detection Pt. to Aug. 361' (+R.T. 10')

(5) Distance from loss of Aug. Detection Pt. to Aug. 403' (-R.T. 10')

(6) Augmentor ID No. 61 Detected correctly Yes ✓ No _____

(7) Run Number 30205 (8) Vehicle Speed ~~40~~ 10 MPH

(9) Augmentor Elevation ~~40~~ 30 (Ft)

(10) Remarks: _____

(11) Test Conductor Barry E. Bar

(12) Assistant [illegible]

(13) Witnesses [illegible] TSC

SPECIAL CASE TEST

DATA SHEET

(1) Date 2-6-77 (2) Time 1140

(2) Test Name: Augmentor Coverage

(3) Distance from Vehicle Start to Augmentor 1430'

(4) Distance from Augmentor detection Pt. to Aug. 342' (+R.T. 44')

(5) Distance from loss of Aug. Detection Pt. to Aug. 452' (-R.T. 44')

(6) Augmentor ID No. 61 Detected correctly Yes ✓ No ____

(7) Run Number 30214 (8) Vehicle Speed 35 MPH

(9) Augmentor Elevation ~~40~~ 30 (Ft)

(10) Remarks: ____

(11) Test Conductor Barry F. Bra

(12) Assistant [illegible]

(13) Witnesses [illegible]

SPECIAL CASE TEST

DATA SHEET

(1) Date 2-6-77 (2) Time 1135

(2) Test Name: Augmentor Coverage

(3) Distance from Vehicle Start to Augmentor 1430'

(4) Distance from Augmentor detection Pt. to Aug. 326' +R.T. (44')

(5) Distance from loss of Aug. Detection Pt. to Aug. 462' -R.T. (44')

(6) Augmentor ID No. 61 Detected correctly Yes ✓ No _____

(7) Run Number 30213 (8) Vehicle Speed 35 MPH

(9) Augmentor Elevation ~~40~~ 30 (Ft)

(10) Remarks: _____

(11) Test Conductor Barry T. Brown

(12) Assistant _____

(13) Witnesses _____ TSC

SPECIAL CASE TEST

DATA SHEET

(1) Date 2-6-77 (2) Time 1130

(2) Test Name: Augmentor Coverage

(3) Distance from Vehicle Start to Augmentor 1430'

(4) Distance from Augmentor detection Pt. to Aug. 217', +R.T. (88')

(5) Distance from loss of Aug. Detection Pt. to Aug. 497', -R.T. (88')

(6) Augmentor ID No. 61 Detected correctly Yes ✓ No ____

(7) Run Number 30221 (8) Vehicle Speed 55 MPH

(9) Augmentor Elevation ~~20~~ 30 (Ft)

(10) Remarks: _____

(11) Test Conductor Barry E. Brown

(12) Assistant Jay W. Frazier

(13) Witnesses [illegible]

SPECIAL CASE TEST

DATA SHEET

(1) Date 2-6-77 (2) Time 1125

(2) Test Name: Augmentor Coverage

(3) Distance from Vehicle Start to Augmentor 1430'

(4) Distance from Augmentor detection Pt. to Aug. 256' + R.T. (88')

(5) Distance from loss of Aug. Detection Pt. to Aug. 505' - R.T. (88')

(6) Augmentor ID No. 61 Detected correctly Yes ✓ No ____

(7) Run Number 30222 (8) Vehicle Speed 55 MPH

(9) Augmentor Elevation ~~30~~ 30 (Ft)

(10) Remarks: _____

(11) Test Conductor Barry E. Brown

(12) Assistant _____

(13) Witnesses _____

SPECIAL CASE TEST

DATA SHEET

(1) Date 2-6-77 (2) Time 1120

(2) Test Name: Augmentor Coverage

(3) Distance from Vehicle Start to Augmentor 1430'

(4) Distance from Augmentor detection Pt. to Aug. 202' [redacted]'(+ Reaction Time 88')

(5) Distance from loss of Aug. Detection Pt. to Aug. 518'(- " 88')

(6) Augmentor ID No. 61 Detected correctly Yes ✓ No ____

(7) Run Number 30227 (8) Vehicle Speed ~~[redacted]~~ 75 MPH

(9) Augmentor Elevation ~~[redacted]~~ 30 (Ft)

(10) Remarks: _____

(11) Test Conductor Barry E. Bu

(12) Assistant [illegible]

(13) Witnesses [illegible] TSC

SPECIAL CASE TEST

DATA SHEET

(1) Date 2-6-77 (2) Time 1115

(2) Test Name: Augmentor Coverage

(3) Distance from Vehicle Start to Augmentor 1430'

(4) Distance from Augmentor detection Pt. to Aug. 190' + 1 SEC. REACTION (88')

(5) Distance from loss of Aug. Detection Pt. to Aug. 491'

(6) Augmentor ID No. 61 Detected correctly Yes ✓ No ___

(7) Run Number 30230 (8) Vehicle Speed ~~85~~ 75 MPH

(9) Augmentor Elevation ~~40~~ 30 (Ft)

(10) Remarks:

(11) Test Conductor [signature]

(12) Assistant [signature]

(13) Witnesses [signature] TSC

B.2 AUGMENTOR COVERAGE IN TRAFFIC

SPECIAL CASE TEST

DATA SHEET

(1) Date FEB. 9, 1977 (2) Time 1035 EST

(2) Test Name: Augmentor Coverage vs Traffic Conditions

(3) Augmentor ID 61 FULL-LONG WHIP CONFIG. (4) 2nd Augmentor ID 63

(5) Augmentor Elevation * (SEE BELOW) feet

(6) Run

*ELEVATION	Run No.	TEST #	Distance d_1	Distance d_2	Calculated Range, R $R = \sqrt{d_1^2 + d_2^2}$		LOSS + D_2
10	1A	30401	84	225	240	OBSTACLES	350
10	1B		72	195	208		350
15	2A	30402	84	374	392	TRUCK	660
15	2B		72	285	275	HVY TRUCK	650
20	3A	30403	84	325	336	TRUCK	500
	3B		72	300	309		650
28	4A *	30404	84	645 **	**650		900
	4B *		72	685 **	**689		1000
10	5A	30405	84	200	217		400
10	5B		72	175	189		375
15	6A	30406	84	285	297		575
15	6B		72	300	309	4 BUSSES	550
20	7A	30407	84	320	331		600
	7B		72	355	362		605
28	8A **	30410	84	650 **	**655	BUS	875
	8B **		72	690 **	**694		1000

(7) Remarks ** BLOCK NOT LONG ENOUGH - ACQUIRED I.D. PRIOR TO TURNING CORNER ON JFK DUE TO REFLECTION.

(8) Test Conductor [signature]

(9) Witnesses [signature] FSC

[signature] FSC

B. 3 AUGMENTOR INTERFERENCE

SPECIAL CASE TEST

DATA SHEET

(1) Date 2-6-77 (2) Time 1355

(2) Test Name: Augmentor Interference

(3) Augmentor A ID 52 (4) Augmentor B ID 61

(5) Distance

TEST #	A-B (Feet)	A Detection Correct	A Detection Incorrect	B Detection Correct	B Detection Incorrect
30301	200	✓		✓	[redacted]
30302	200	✓		✓	
30303	150	✓		✓	
30304	150	✓		✓	
30305	100		✓	✓	
30306	100	✓ (LATE)		✓	
30307	50		✓		✓
30310	50		✓	✓	

(6) Remarks APPROACHED AUGMENTORS FROM "B" TO "A" DUE TO IMBALANCE IN AUGMENTORS; "A" WAS STRONGER & WAS OVERLAPPING WHEN APPROACHED FROM "A" DIRECTION - THIS PREVENTED AQUISITION OF "B" (UNLESS APPROACHED FROM "B" DIRECTION).

(7) Test Conductor [signature]

(8) Witnesses [signature] JSC

[signature]

[signature]

B. 4 AUGMENTOR RADIO INTERFERENCE

SPECIAL CASE TEST TEST #31001

DATA SHEET

(1) Date FEB. 9, 1977 (2) Time 1600

(2) Test Name: Radio Frequency Interference

(3) Augmentor ID 35

(4) Separation Distance ~~ALL~~ Ft.

(5) Augmentor ON (OFF) Ambient noise -70 db

(6) Frequency / Amplitude

Frequency	Amplitude
67.5	-~~32~~ db
82.1	-45 db
66.6	-55

(7) Remarks

(8) Test Conductor Barry E. B[illegible]

(9) Witnesses Joseph [illegible] TSC

[illegible signature]

TEST #31002

SPECIAL CASE TEST

DATA SHEET

(1) Date FEB 9, 1977 (2) Time 1600

(2) Test Name: Radio Frequency Interference

(3) Augmentor ID 35

(4) Separation Distance 10 Ft.

(5) Augmentor (ON) OFF

(6)

Frequency	Amplitude
72.4	-36 db
76.3	-65 db

(7) Remarks 3 db bandwidth = 350 HZ
NO NOTICEABLE, MEASURABLE SIDE BANDS

(8) Test Conductor [signature]

(9) Witnesses [signature] SSC
[signature illegible]

TEST # 31003

SPECIAL CASE TEST

DATA SHEET

(1) Date FEB. 9, 1977 (2) Time 1600

(2) Test Name: Radio Frequency Interference

(3) Augmentor ID 35

(4) Separation Distance 20 Ft.

(5) Augmentor (ON) OFF

(6)

Frequency	Amplitude
72.4	-40 db

(7) Remarks _____

(8) Test Conductor _____

(9) Witnesses _____

Test # 31004

SPECIAL CASE TEST

DATA SHEET

(1) Date FEB. 9, 1977 (2) Time 1600

(2) Test Name: Radio Frequency Interference

(3) Augmentor ID 35

(4) Separation Distance 30 Ft.

(5) Augmentor (ON) OFF

(6)

Frequency	Amplitude
72.4	~~-46 db~~ -54 db

(7) Remarks _____

(8) Test Conductor [signature]

(9) Witnesses [signature] SSC

[signature]

Test # 31005

SPECIAL CASE TEST

DATA SHEET

(1) Date FEB. 9, 1977 (2) Time 1600

(2) Test Name: Radio Frequency Interference

(3) Augmentor ID 35

(4) Separation Distance 40 Ft.

(5) Augmentor ON OFF

(6) Frequency Amplitude

Frequency	Amplitude
72.4	-50 db

(7) Remarks

(8) Test Conductor [signature]

(9) Witnesses [signature] TSC

[signature]

Test # 31006

SPECIAL CASE TEST

DATA SHEET

(1) Date FEB. 9, 1977 (2) Time 1600

(2) Test Name: Radio Frequency Interference

(3) Augmentor ID 35

(4) Separation Distance 50 Ft.

(5) Augmentor (ON) OFF

(6)

Frequency	Amplitude
72.4	-57 db

(7) Remarks

(8) Test Conductor [signature]

(9) Witnesses [signature] TSC

[signature]

Test # 31007

SPECIAL CASE TEST

DATA SHEET

(1) Date FEB. 9, 1977 (2) Time 1600

(2) Test Name: Radio Frequency Interference

(3) Augmentor ID 35

(4) Separation Distance 60 Ft.

(5) Augmentor (ON) OFF

(6)

Frequency	Amplitude
72.4	-58 db

(7) Remarks _____

(8) Test Conductor _____

(9) Witnesses _____

Test # 31010

SPECIAL CASE TEST

DATA SHEET

(1) Date FEB. 9, 1977 (2) Time 1600

(2) Test Name: Radio Frequency Interference

(3) Augmentor ID 35

(4) Separation Distance 70 Ft.

(5) Augmentor (ON) OFF

(6)

Frequency	Amplitude
72.4	-58 db

(7) Remarks _____

(8) Test Conductor _____

(9) Witnesses _____

Test # 31011

SPECIAL CASE TEST

DATA SHEET

(1) Date FEB. 9, 1977 (2) Time 1600

(2) Test Name: Radio Frequency Interference

(3) Augmentor ID 35

(4) Separation Distance 80 Ft.

(5) Augmentor (ON) OFF

(6)

Frequency	Amplitude
72.4	-62 db

(7) Remarks _____

(8) Test Conductor [signature]

(9) Witnesses [signature] [signature] [signature]

Test # 31012

SPECIAL CASE TEST

DATA SHEET

(1) Date FEB. 9, 1977 (2) Time 1600

(2) Test Name: Radio Frequency Interference

(3) Augmentor ID 35

(4) Separation Distance 90 Ft.

(5) Augmentor (ON) OFF

(6)

Frequency	Amplitude
72.4	-60 db

(7) Remarks _____

(8) Test Conductor _____

(9) Witnesses _____

Test # 31013

SPECIAL CASE TEST

DATA SHEET

(1) Date FEB. 9, 1977 (2) Time 1600

(2) Test Name: Radio Frequency Interference

(3) Augmentor ID 35

(4) Separation Distance 100 Ft.

(5) Augmentor (ON) OFF

(6)

Frequency	Amplitude
LOSS ON SPECTRUM ANALYZER	
	-70 db

(7) Remarks _____

(8) Test Conductor [signature]

(9) Witnesses [signature] GSC

[signature]

[signature]

B.5 AUGMENTOR ANTENNA PATTERN

Test # 32001

SPECIAL CASE TEST

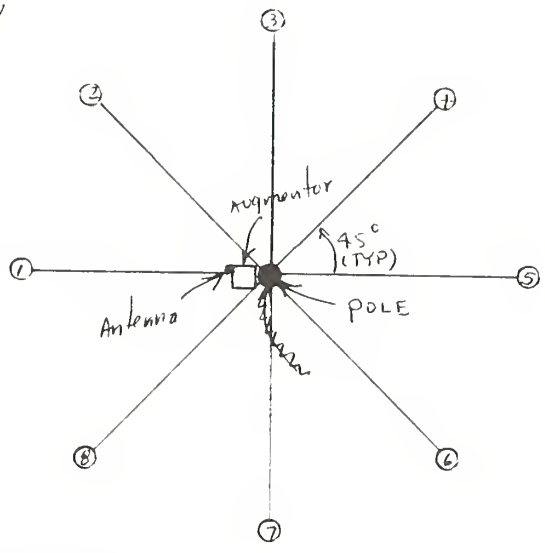
DATA SHEET

(1) Date MARCH 5, 1977 (2) Time 1 PM

(3) Test Name: Augmentor Antenna Pattern

(4) Augmentor ID 67

(5) Plan View



(6) 'Acquire' Light On

Line	Distance	Line	Distance
1	130	5	81
2	123	6	81
3	111	7	71
4	107	8	63

(7) Remarks 1) AUGMENTOR ELEVATION 10 FT.

2) Augmentor Antenna towards "1"

(8) Test Conductor [signature] 3/5/77 (9) Assistant [signature]

(10) Witnesses _____

_____

_____

Test # 32002

SPECIAL CASE TEST

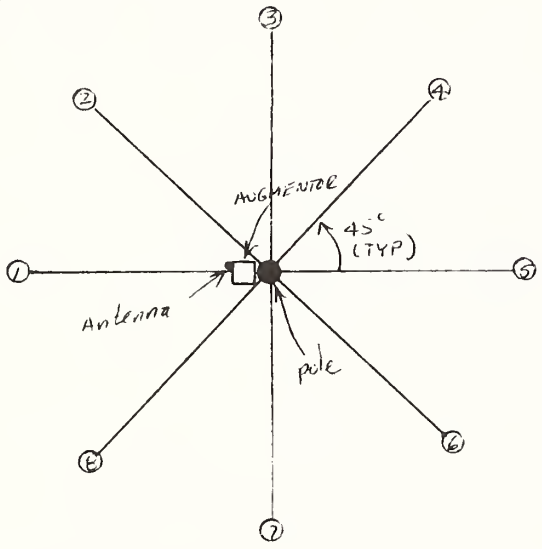
DATA SHEET

(1) Date MARCH 5, 1977 (2) Time 1:20 PM

(3) Test Name: Augmentor Antenna Pattern

(4) Augmentor ID 67

(5) Plan View



(6) 'Acquire' Light On

Line	Distance	Line	Distance
1	135	5	120
2	132	6	122
3	114	7	119
4	130	8	129

(7) Remarks 1) AUGMENTOR ELEVATION 15 FT.
2) AUGMENTOR ANTENNA TOWARDS "0"

(8) Test Conductor Barry F Bru 3/5/77 (9) Assistant Stapleton

(10) Witnesses _____

_____

_____

Test # 32003

SPECIAL CASE TEST

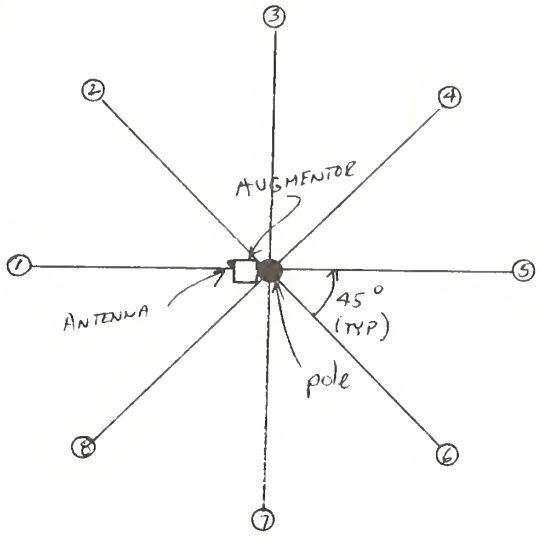
DATA SHEET

(1) Date MARCH 5, 1977 (2) Time 1:45 PM

(3) Test Name: Augmentor Antenna Pattern

(4) Augmentor ID 67

(5) Plan View



(6) 'Acquire' Light On

Line	Distance	Line	Distance
1	168	5	127
2	152	6	129
3	140	7	155
4	125	8	180

(7) Remarks 1) AUGMENTOR ELEVATION 20 FT

2) AUGMENTOR ANTENNA TOWARDS "D"

(8) Test Conductor Barry T. Bu 3/5/77 (9) Assistant Stapleton

(10) Witnesses _____

_____

_____

APPENDIX C
AUGMENTOR LOCATION SUMMARY

This appendix lists all augmentor ID's used in the Philadelphia Phase I tests. A listing according to street location for the fixed and random routes follows this page. In addition, a numerical listing by ID code follows, showing the detailed location coordinates for each augmentor. At the end of the Appendix, Figures C-1 and C-2 show the map locations of each for the fixed and random routes, respectively.

Fixed Route

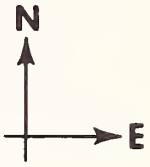
Aug ID	Location	Aug ID	Location
35	Spring Garden & Broad	100	22nd & Chestnut
24	Broad & Arch	15	18th & Vine
30	JFK & Expressway	51	BF Parkway & 22nd
57	20th & Market	53	19th & Pine
31	11th & Market	67	10th & Pine
33	10th & Walnut	54	8th & Spruce
37	18th & Walnut	32	13th & Chestnut
72	33rd & Walnut	110	13th & Spring Garden

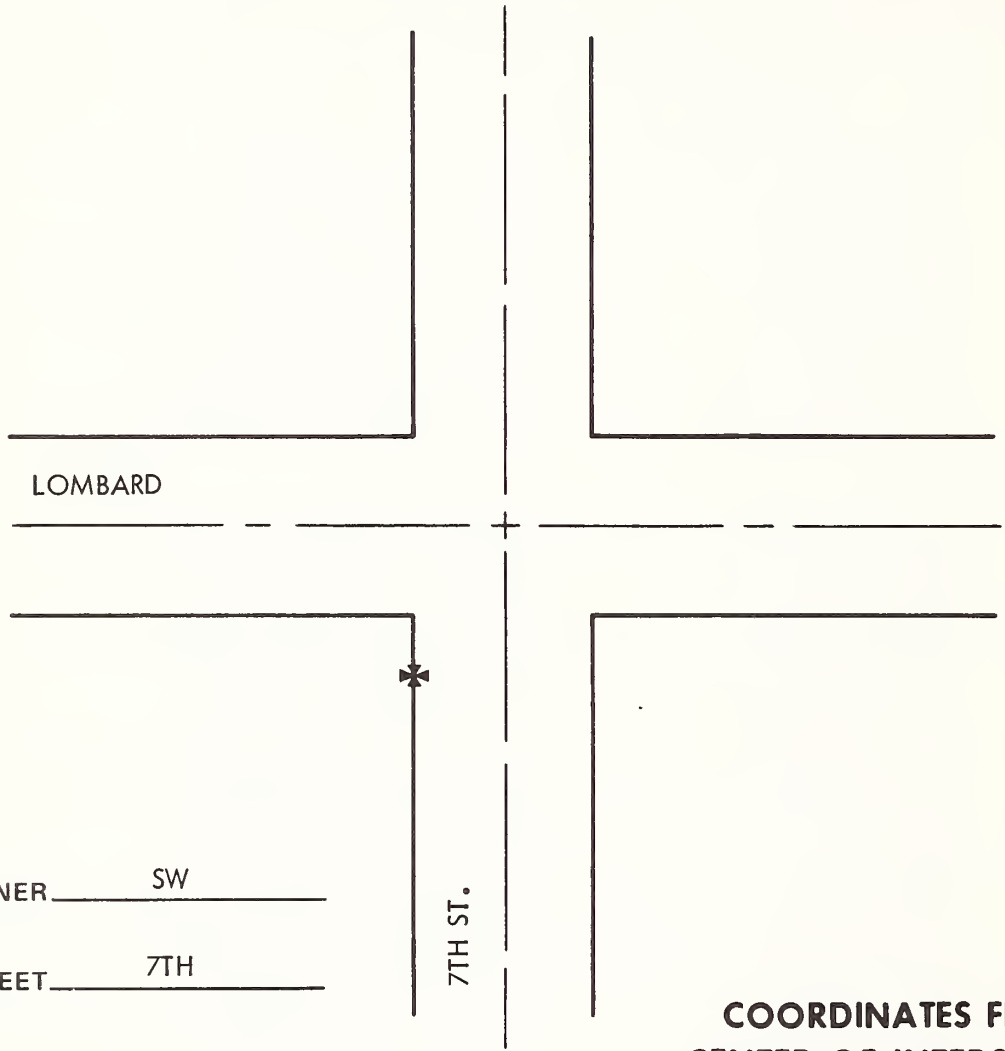
Random Route

50	Broad & Walnut	07	11th & Locust
16	Broad & Locust	111	11th & Spruce
44	Broad & Spruce	112	11th & Pine
70	Broad & Pine	137	11th & Lombard
42	Broad & Lombard	77	10th & Locust
45	13th & Walnut	113	10th & Spruce
43	13th & Locust	67	10th & Pine
17	13th & Spruce	10	9th & Walnut
22	13th & Lombard	11	9th & Locust
26	12th & Walnut	12	9th & Spruce
27	12th & Locust	21	9th & Lombard
40	12th & Spruce	76	8th & Walnut
14	11th & Walnut	74	8th & Pine
75	8th & Lombard	107	8th & South
63	W. Wash. Sq. & Locust	20	S. Wash. Sq. & 7th
6	7th & Lombard	73	6th & Walnut
66	6th & Lomnard	55	5th & Walnut
46	5th & South	13	4th & Spruce
62	4th & Pine	60	4th & Lombard

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 6





CORNER SW

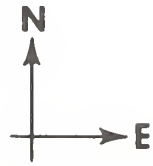
STREET 7TH

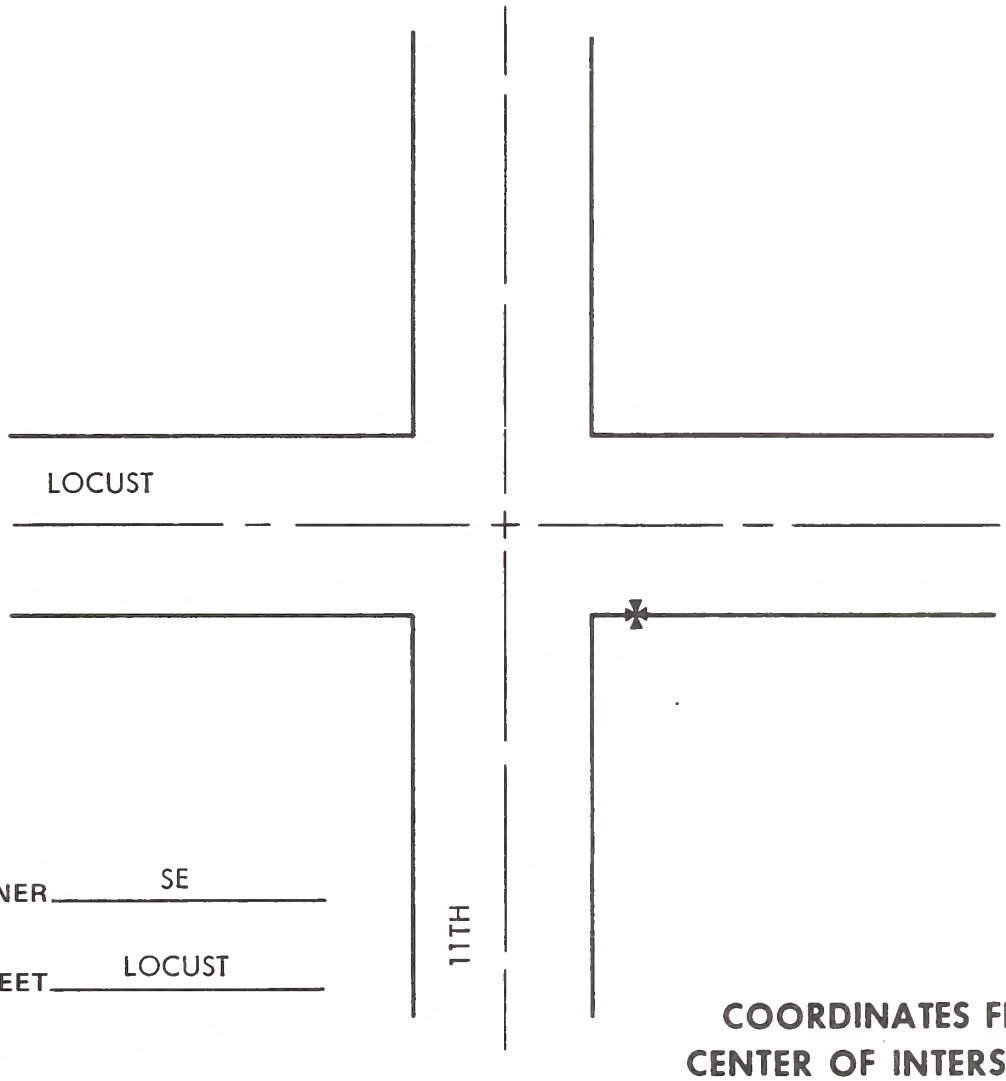
COORDINATES FROM CENTER OF INTERSECTION

27 FT SOUTH
14 FT WEST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 7





CORNER SE

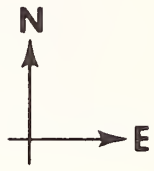
STREET LOCUST

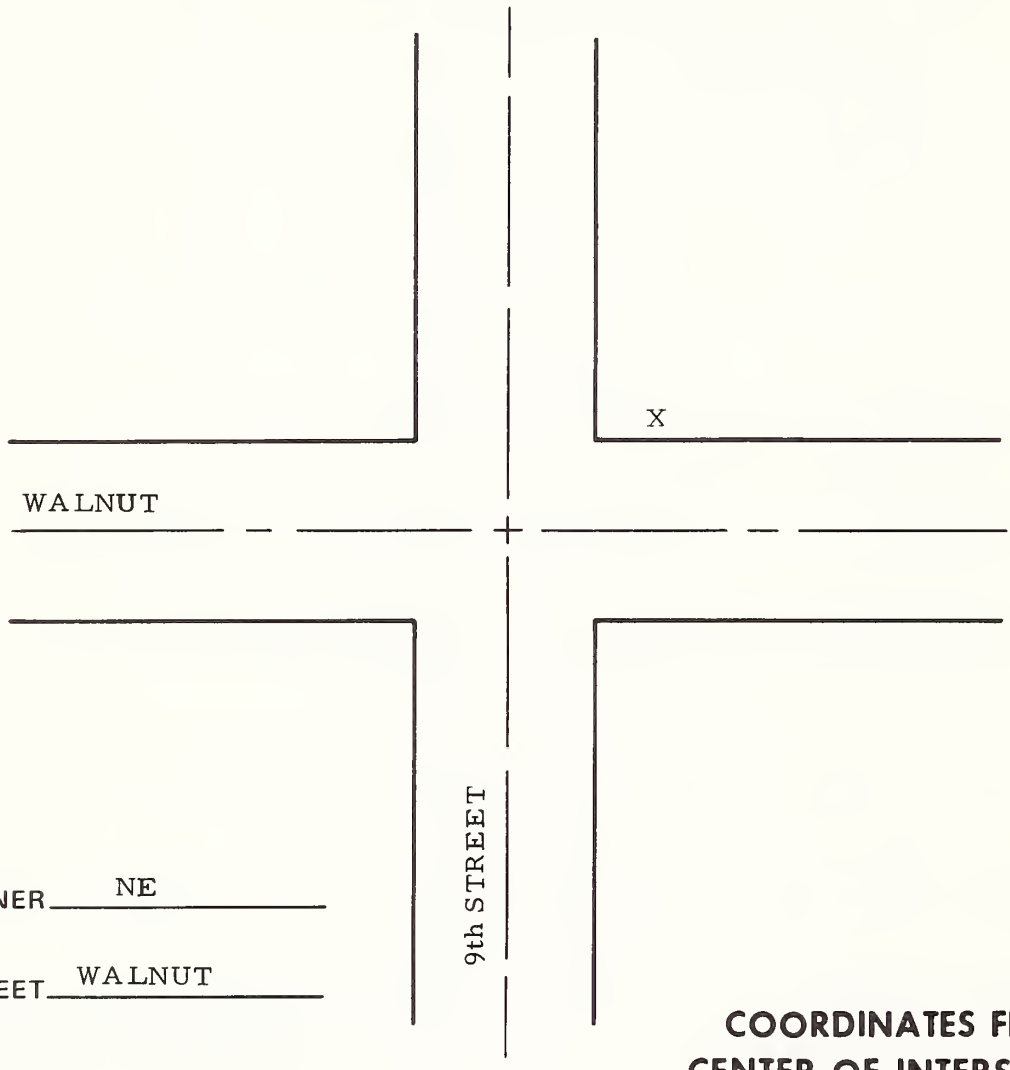
COORDINATES FROM CENTER OF INTERSECTION

14 FT SOUTH
23 FT EAST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 10





CORNER NE

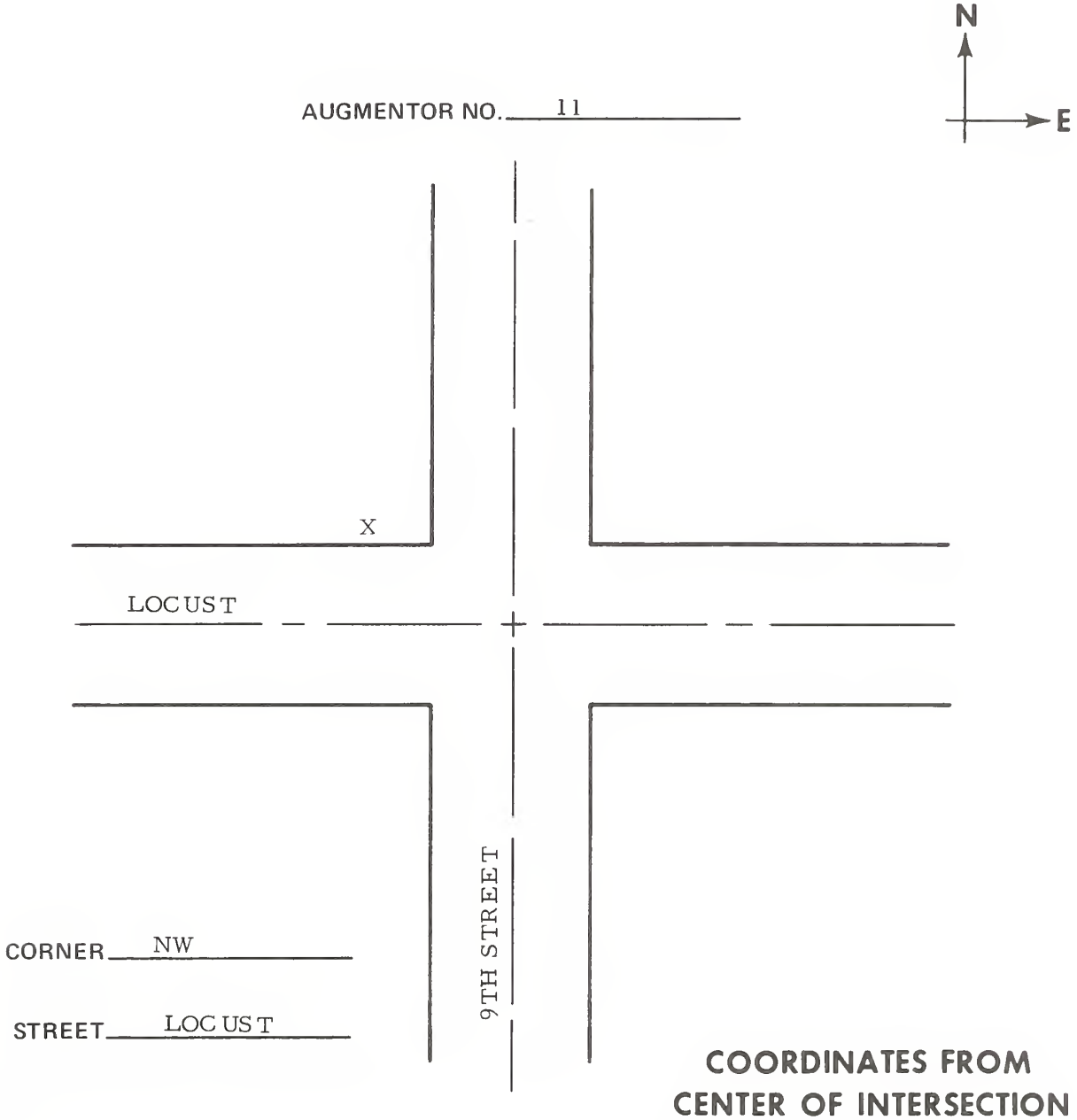
STREET WALNUT

COORDINATES FROM CENTER OF INTERSECTION

15 FT NORTH

26 FT EAST

AUGMENTOR LOCATION DESCRIPTION

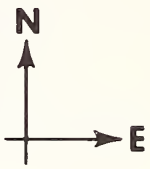


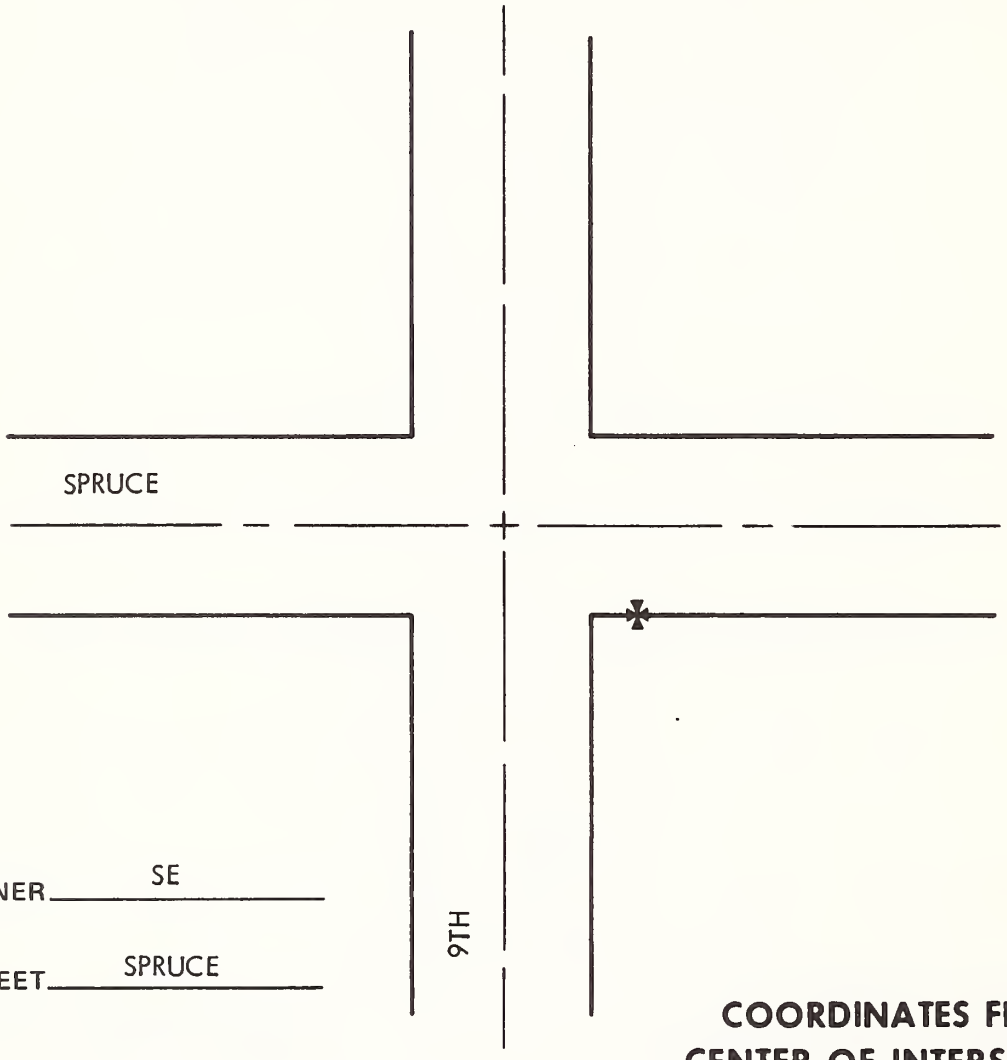
COORDINATES FROM CENTER OF INTERSECTION

14 FT NORTH
22 FT WEST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 12





CORNER SE

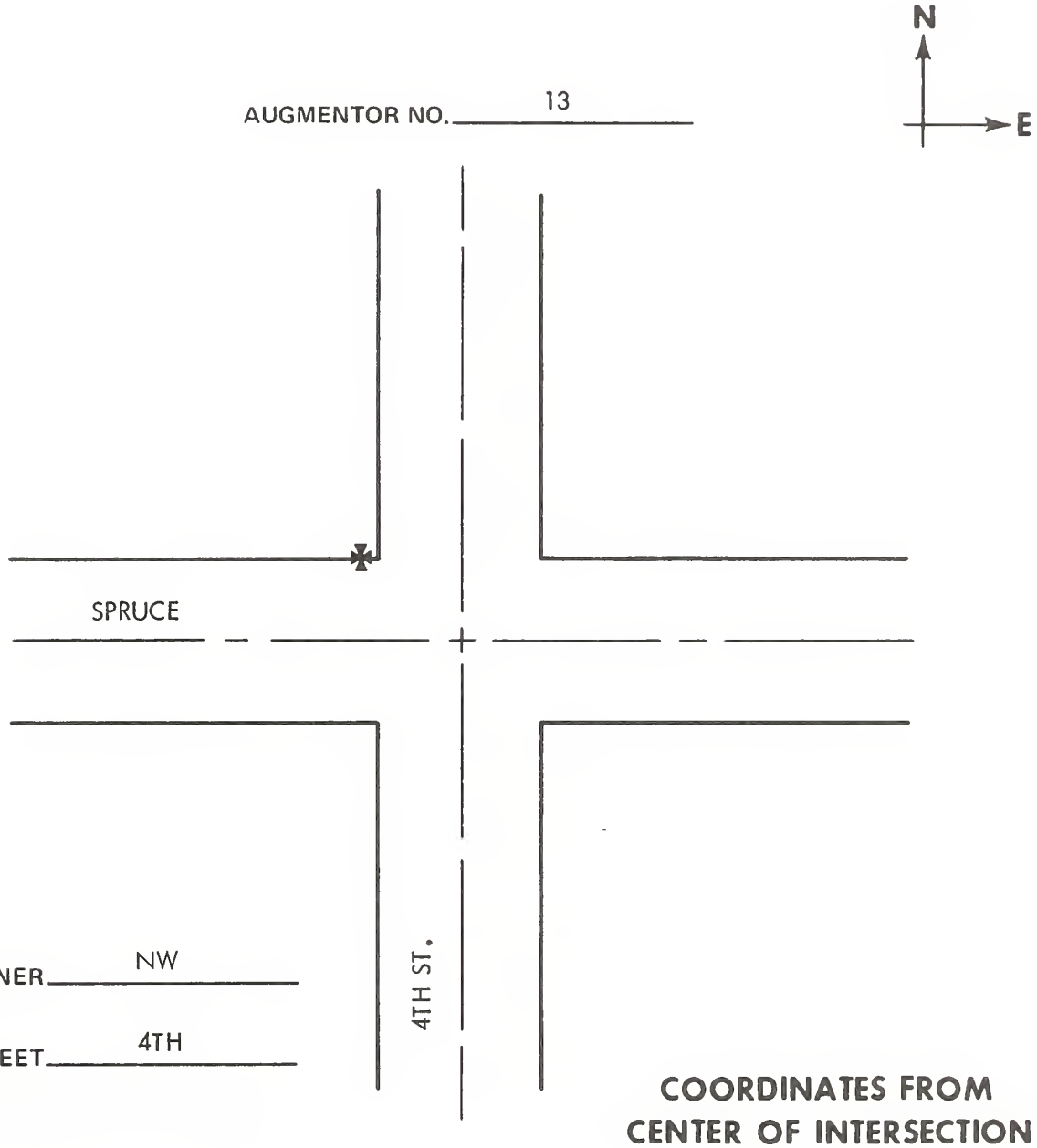
STREET SPRUCE

COORDINATES FROM CENTER OF INTERSECTION

16 FT SOUTH
25 FT EAST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 13



CORNER NW

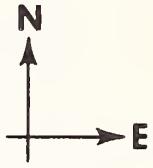
STREET 4TH

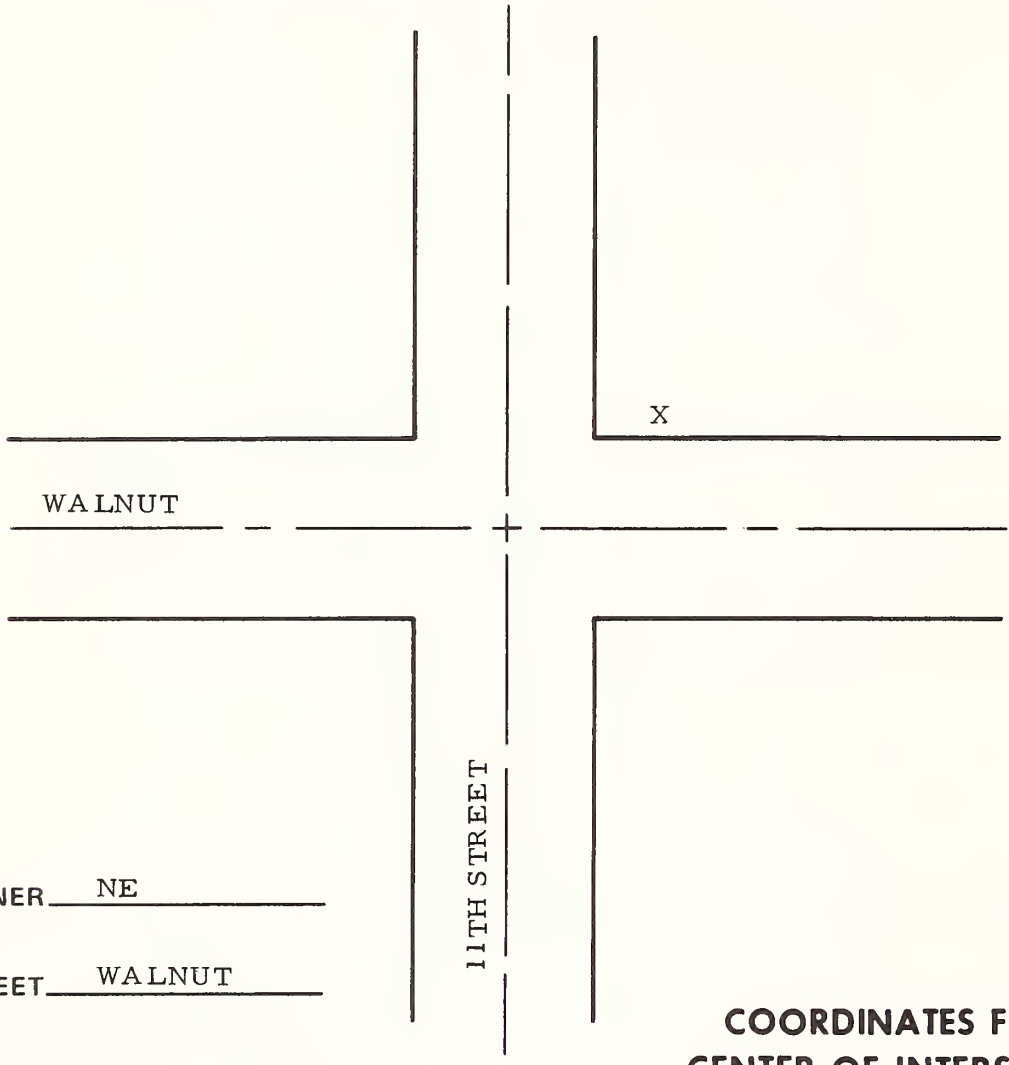
COORDINATES FROM CENTER OF INTERSECTION

24 FT NORTH
14 FT WEST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 14





CORNER NE

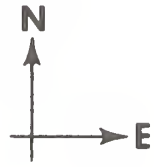
STREET WALNUT

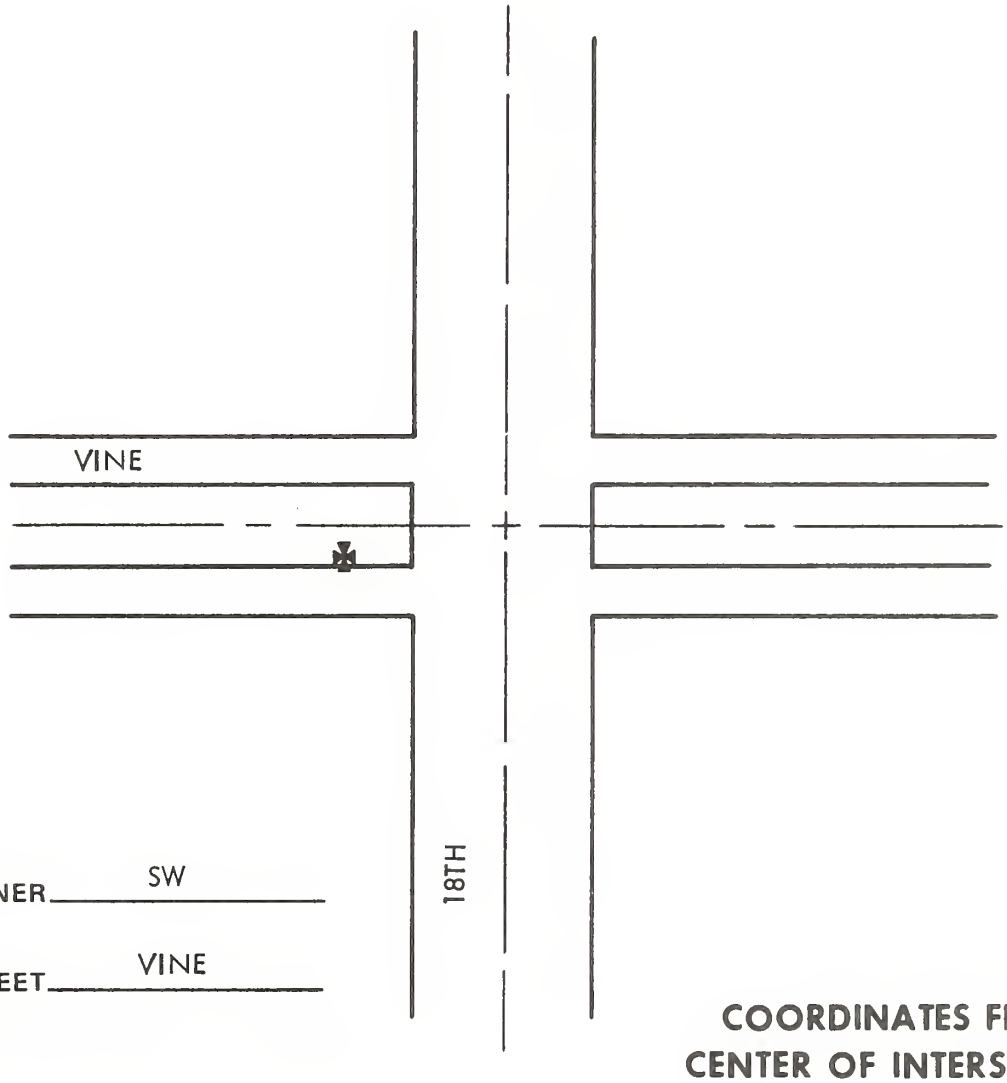
COORDINATES FROM CENTER OF INTERSECTION

15 FT NORTH
25 FT EAST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 15





CORNER SW

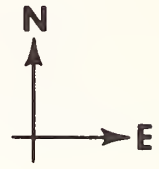
STREET VINE

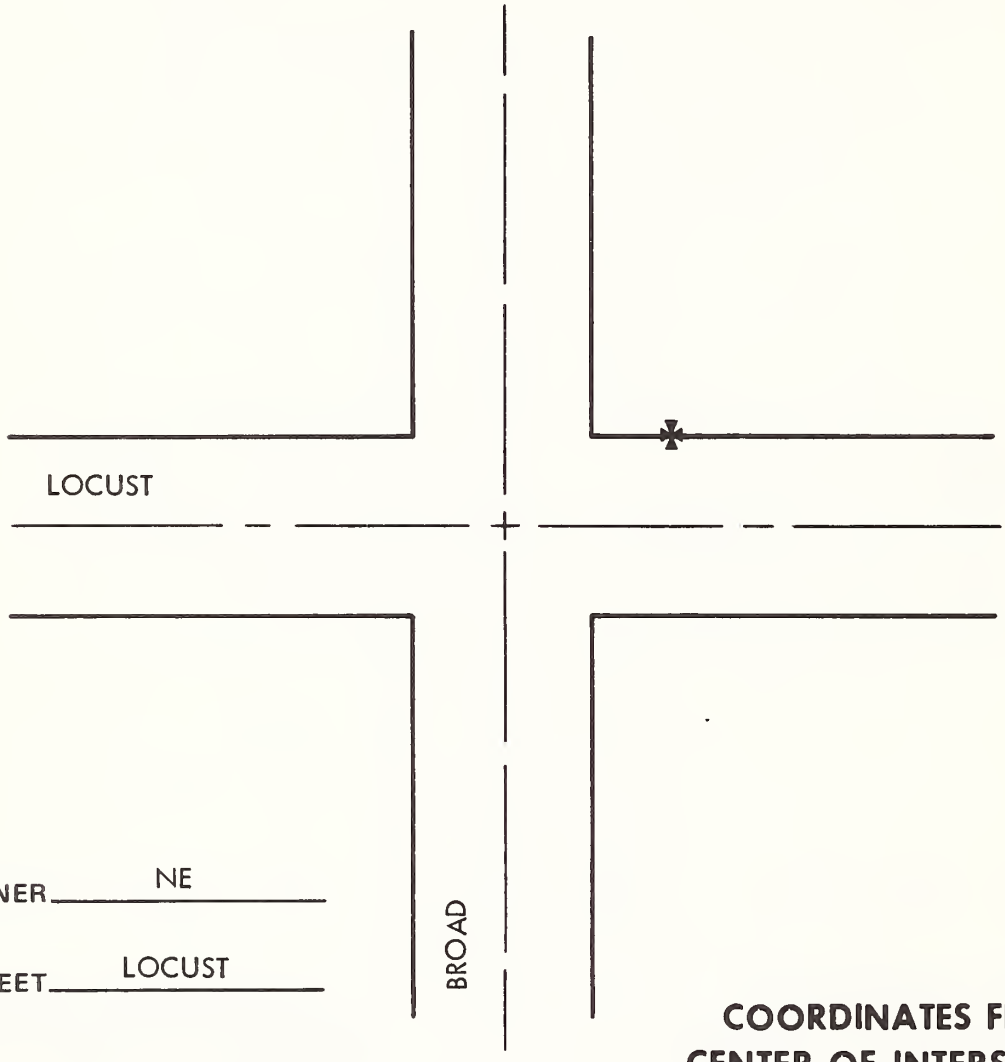
COORDINATES FROM CENTER OF INTERSECTION

64 FT SOUTH
23 FT WEST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 16





CORNER NE

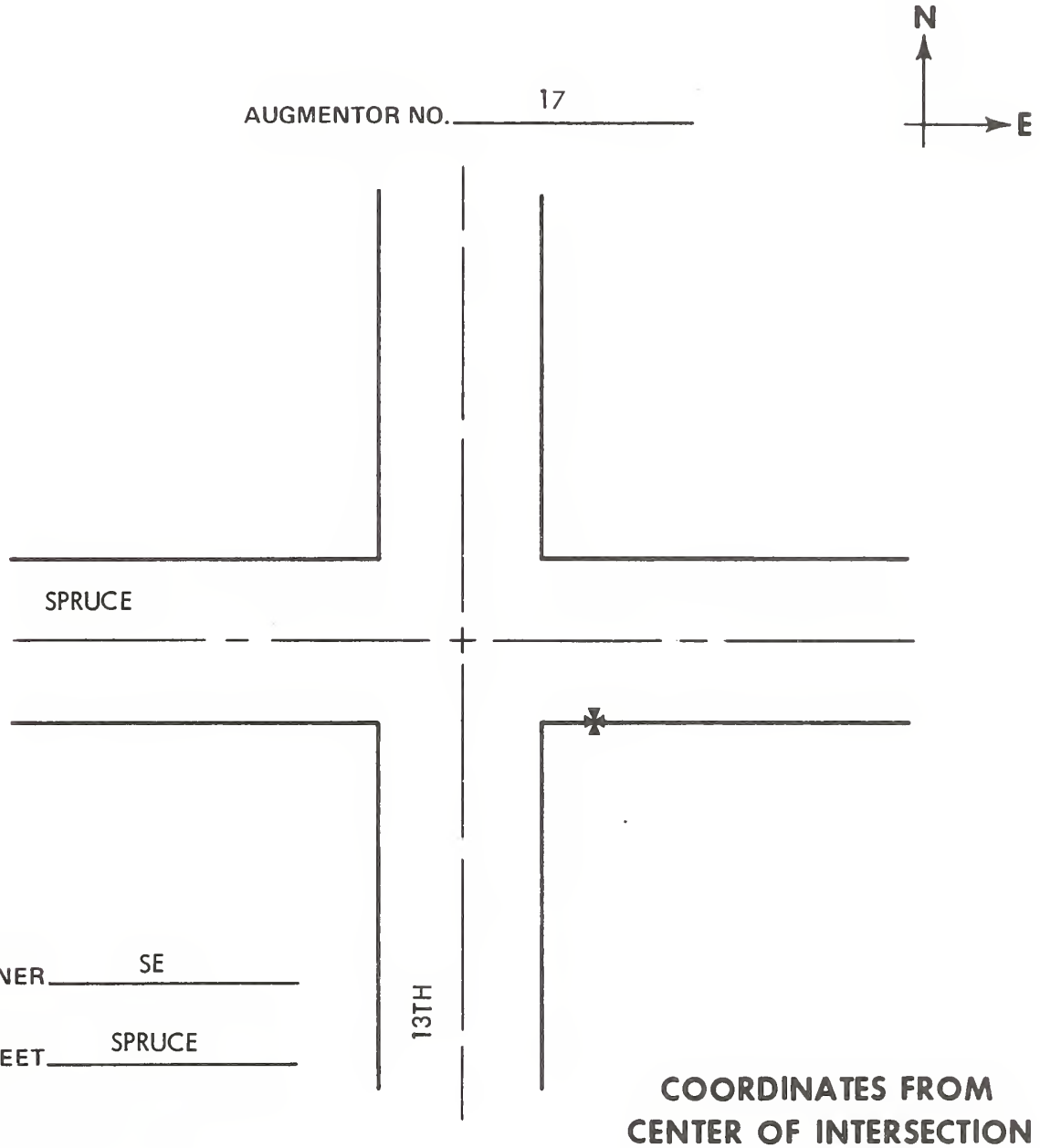
STREET LOCUST

COORDINATES FROM CENTER OF INTERSECTION

22 FT NORTH
54 FT EAST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 17



CORNER SE

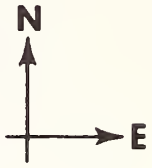
STREET SPRUCE

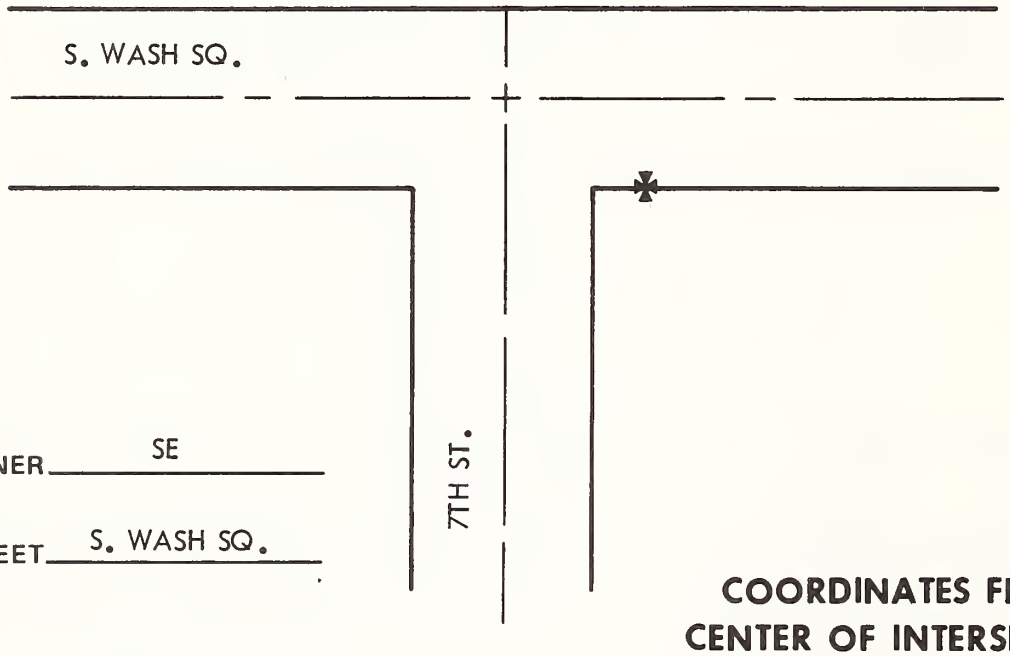
COORDINATES FROM CENTER OF INTERSECTION

15 FT SOUTH
26 FT EAST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 20





CORNER SE

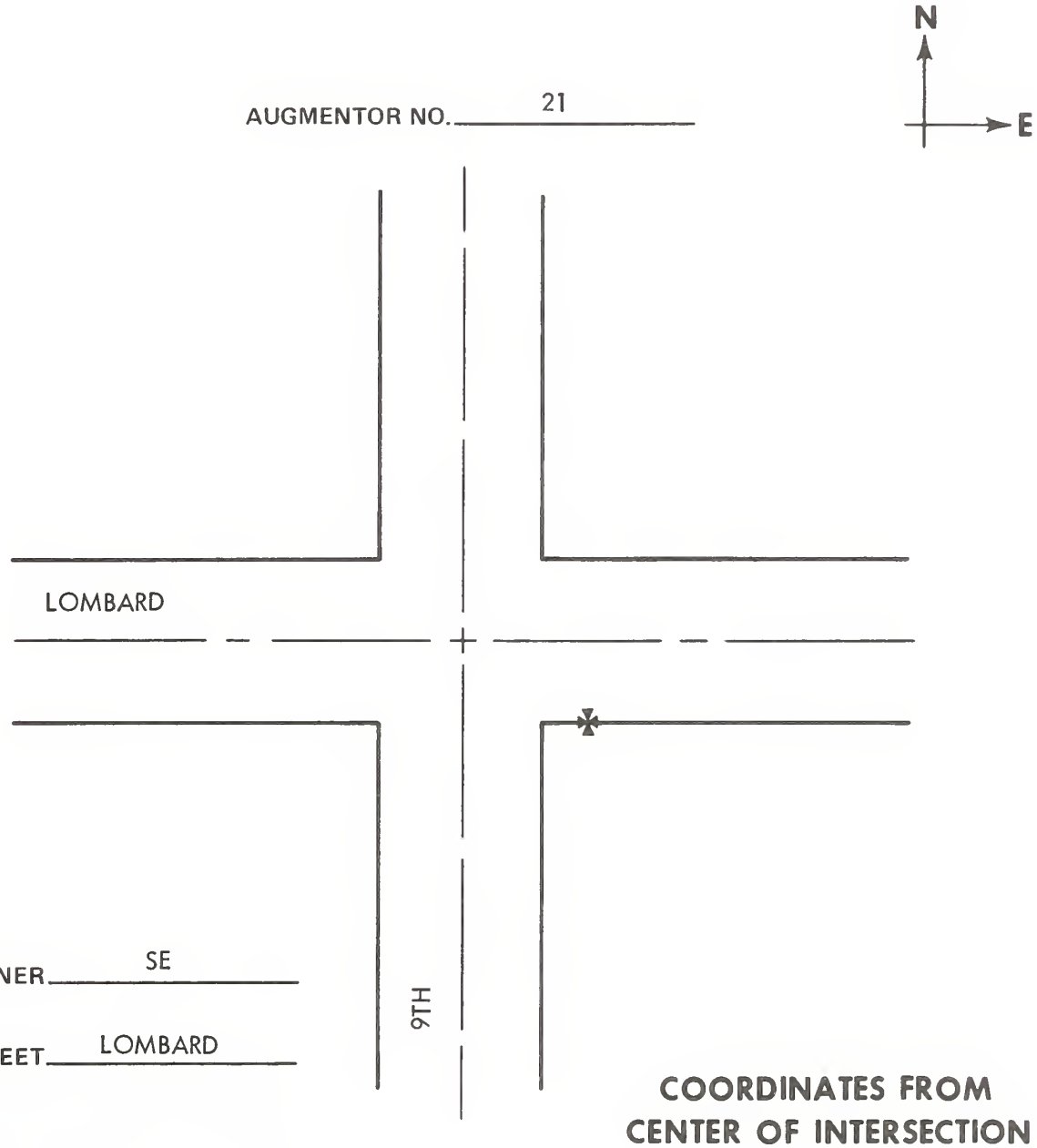
STREET S. WASH SQ.

COORDINATES FROM CENTER OF INTERSECTION

15 FT SOUTH
26 FT EAST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 21



CORNER SE

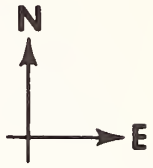
STREET LOMBARD

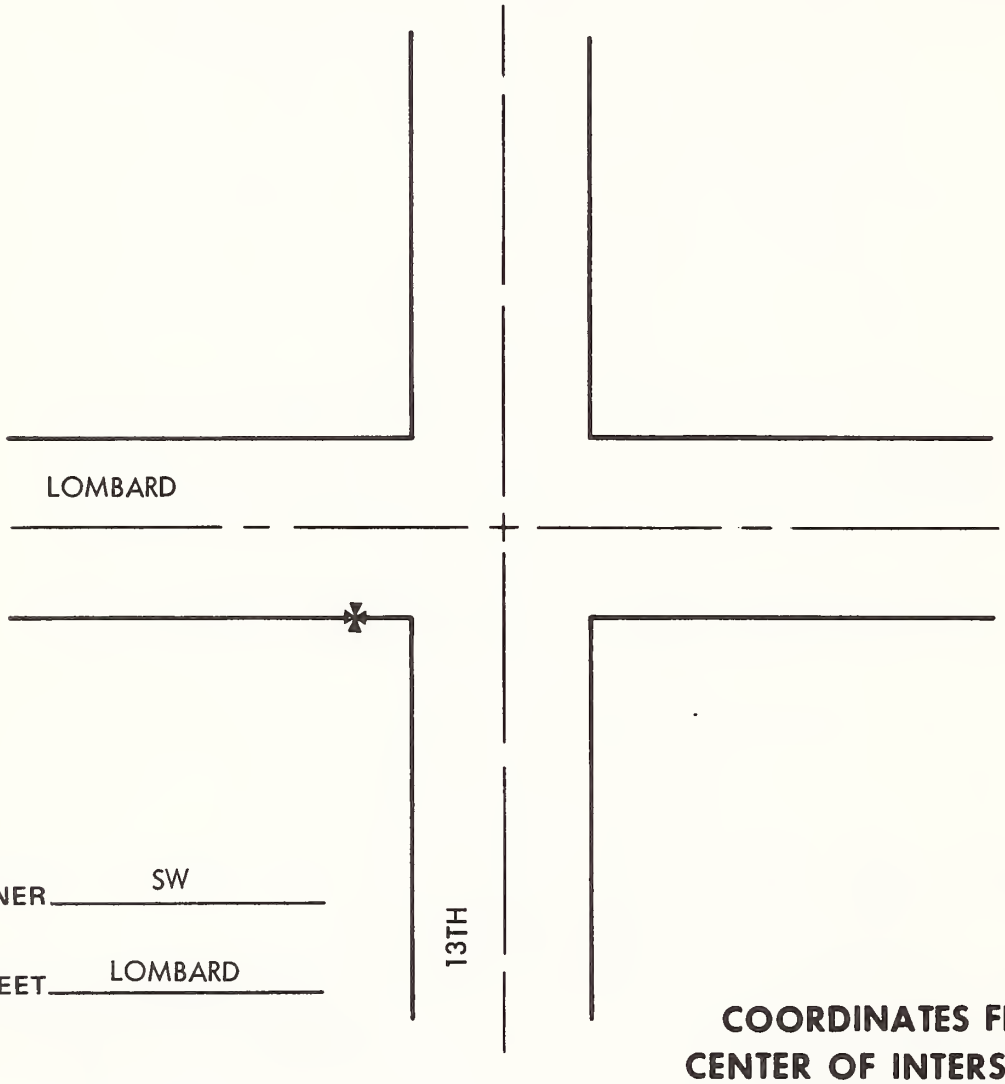
COORDINATES FROM CENTER OF INTERSECTION

16 FT SOUTH
26 FT EAST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 22





CORNER SW

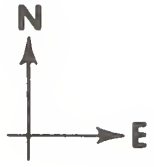
STREET LOMBARD

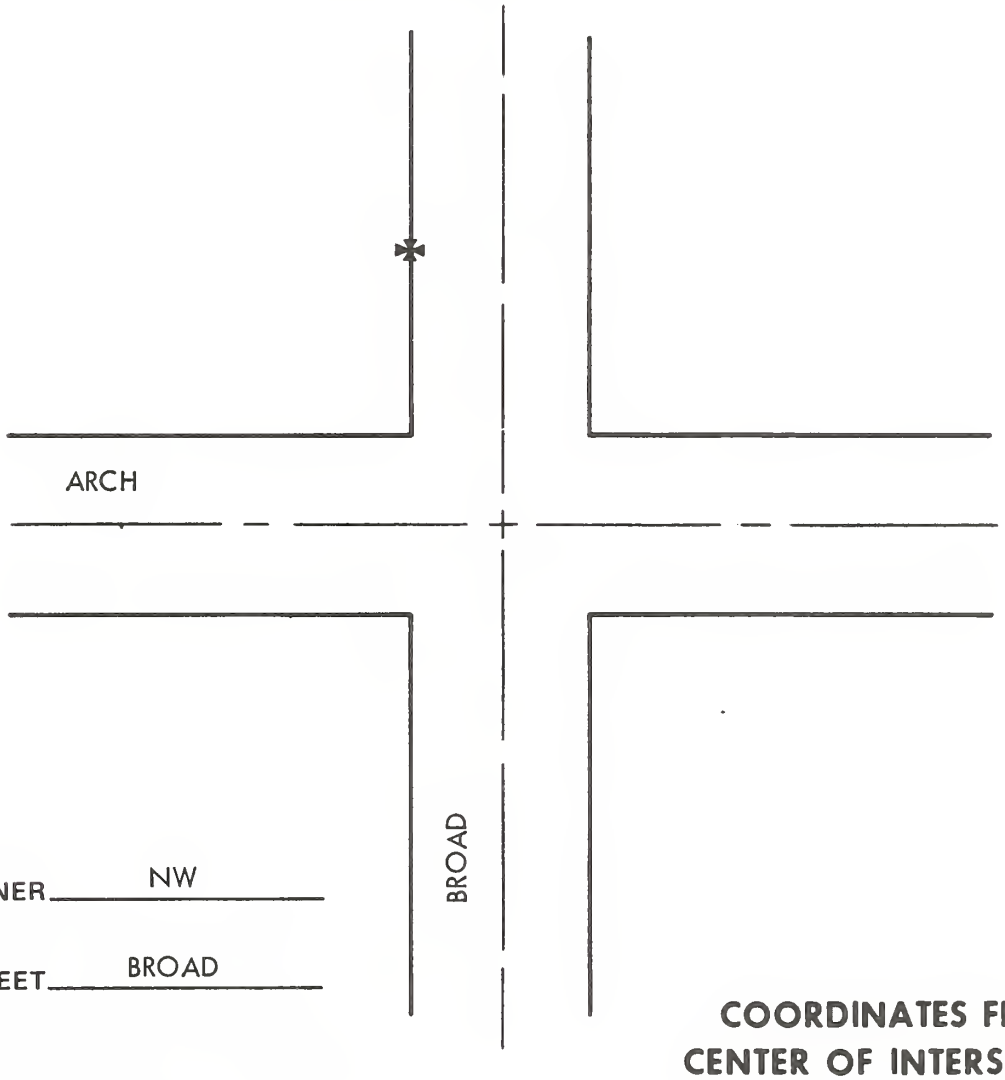
COORDINATES FROM CENTER OF INTERSECTION

16 FT SOUTH
23 FT WEST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 24





CORNER NW

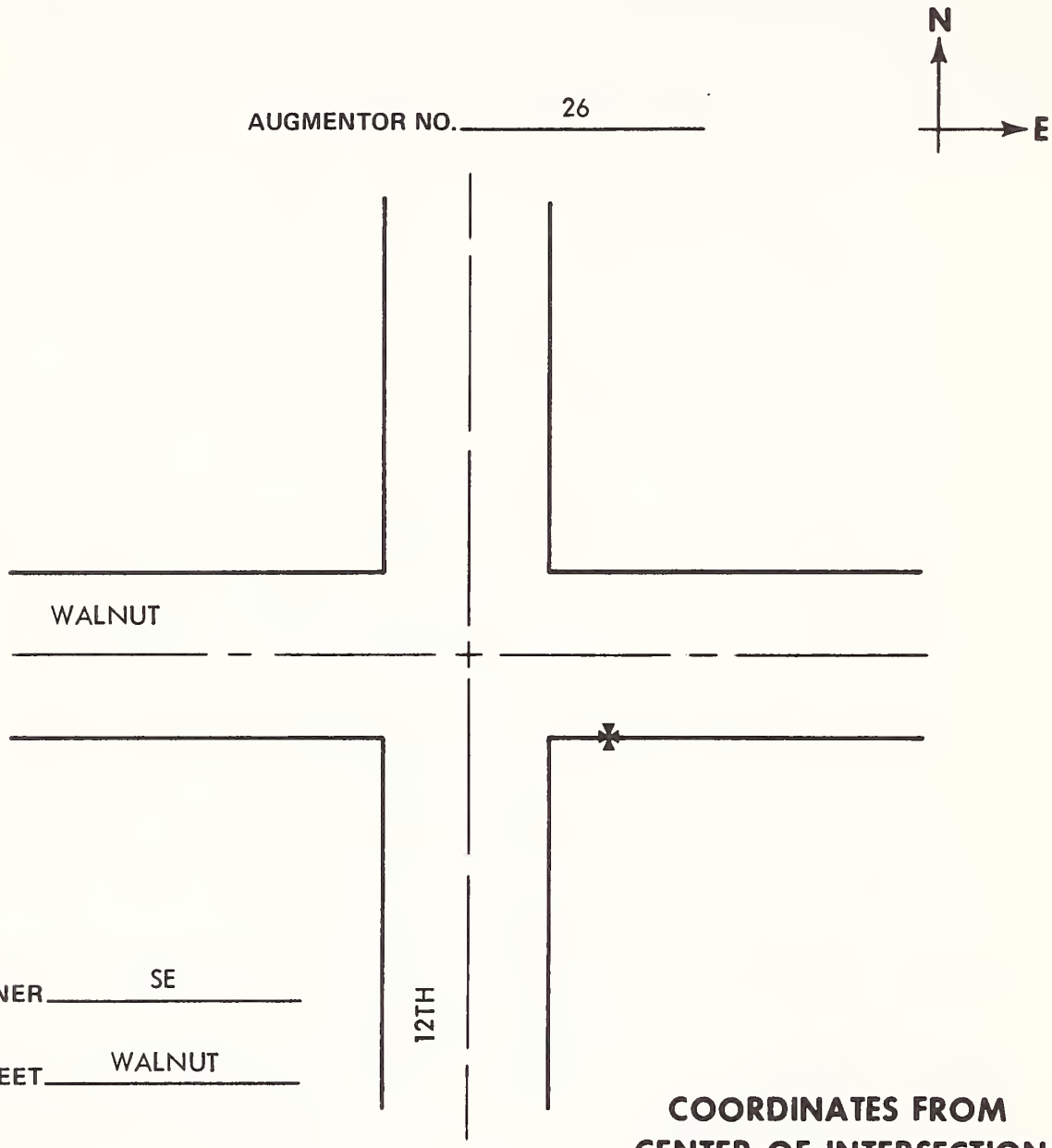
STREET BROAD

COORDINATES FROM CENTER OF INTERSECTION

89 FT NORTH
36.5 FT WEST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 26



CORNER SE

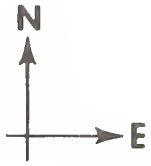
STREET WALNUT

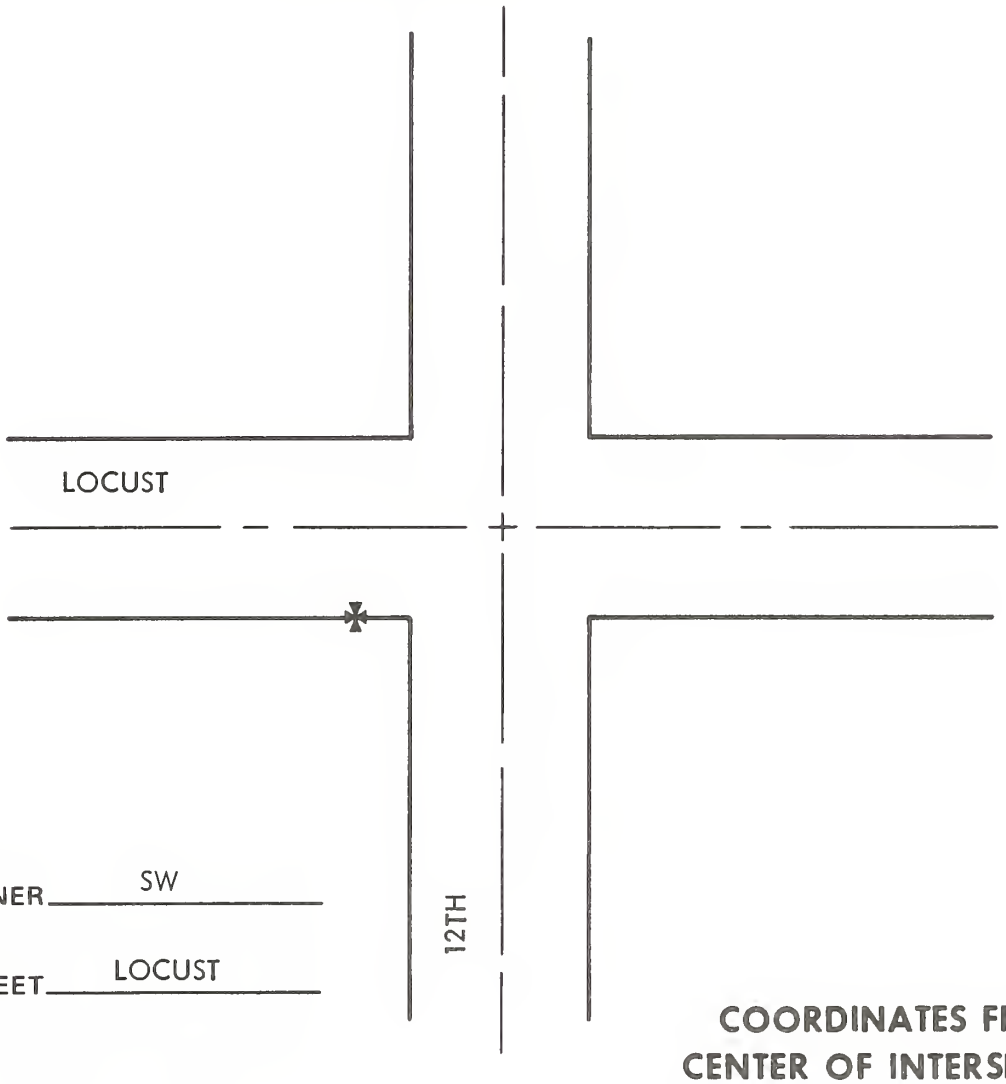
COORDINATES FROM CENTER OF INTERSECTION

15 FT SOUTH
25 FT EAST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 27





CORNER SW

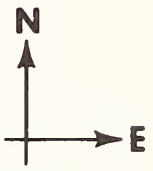
STREET LOCUST

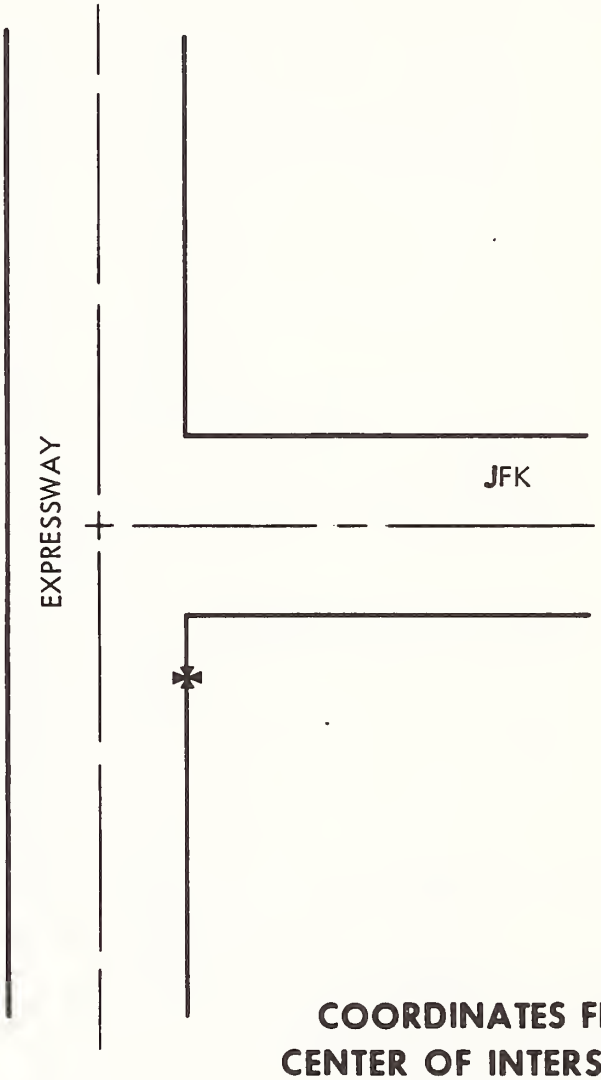
COORDINATES FROM CENTER OF INTERSECTION

15 FT SOUTH
23 FT WEST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 30





CORNER SE

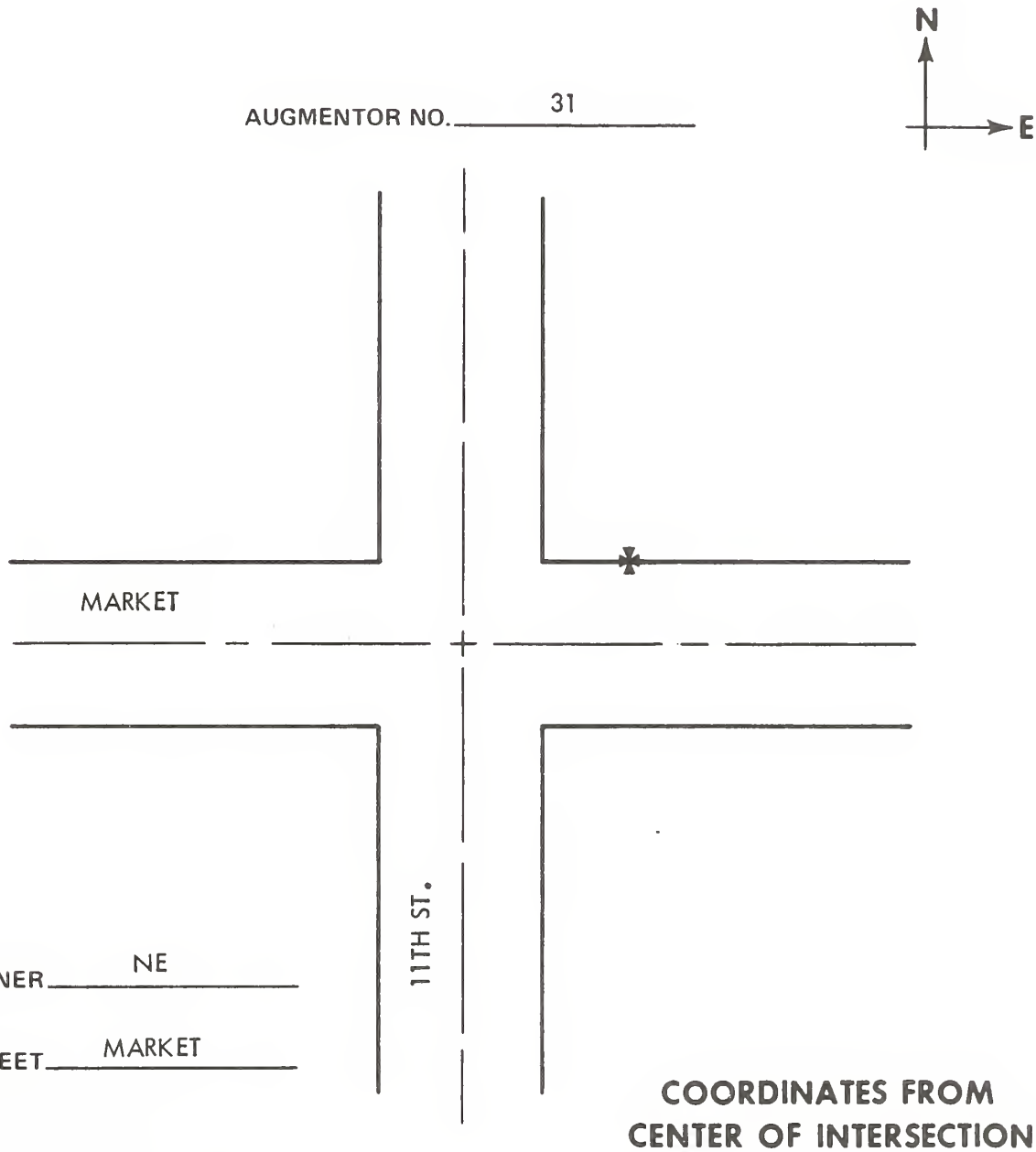
STREET JFK

COORDINATES FROM CENTER OF INTERSECTION

56 FT SOUTH
38 FT EAST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 31



CORNER NE

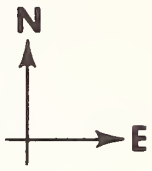
STREET MARKET

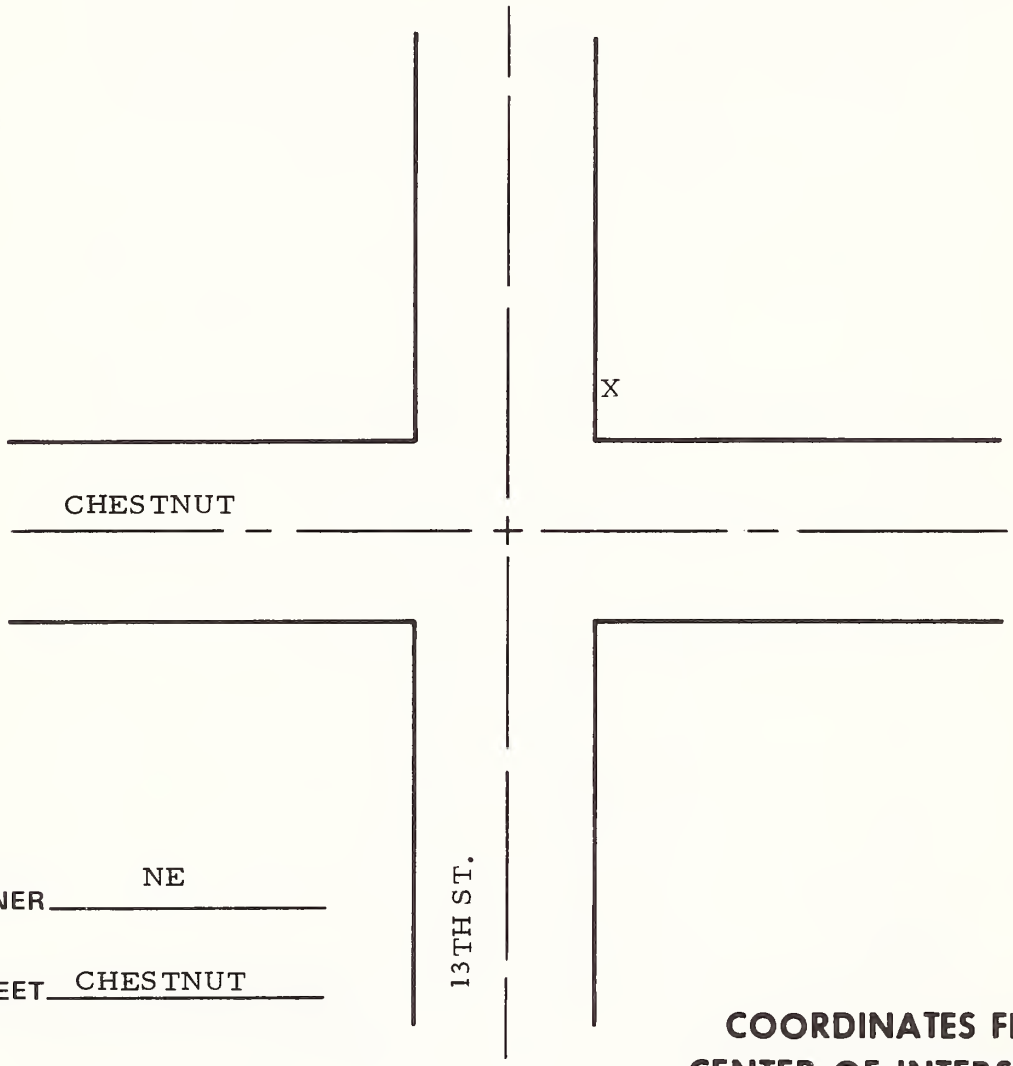
COORDINATES FROM CENTER OF INTERSECTION

33.5 FT NORTH
28.5 FT EAST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 32





CORNER NE

STREET CHESTNUT

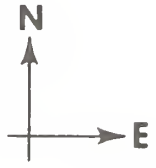
COORDINATES FROM CENTER OF INTERSECTION

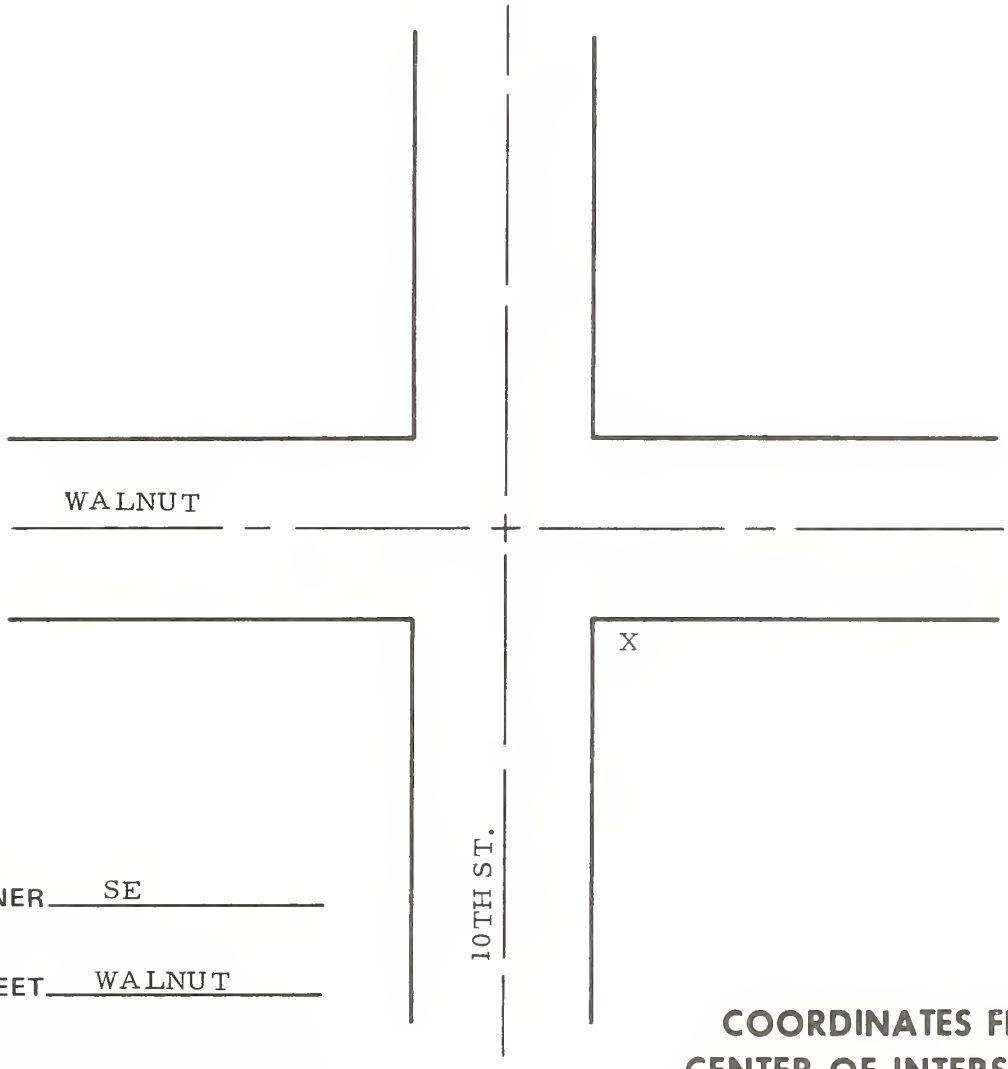
32 FT NORTH

15 FT EAST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 33





CORNER SE

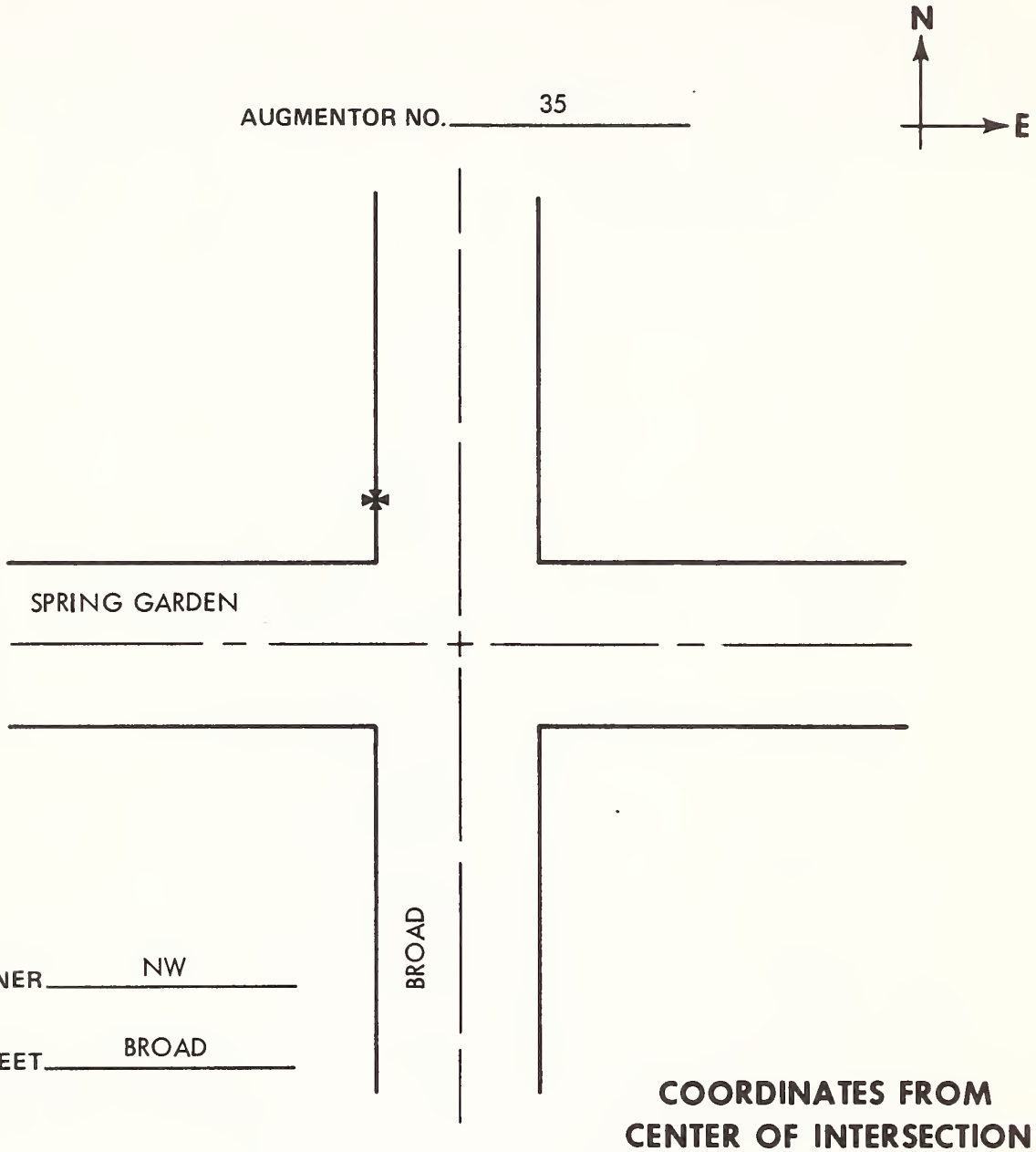
STREET WALNUT

COORDINATES FROM CENTER OF INTERSECTION

16 FT SOUTH
35 FT EAST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 35



CORNER NW

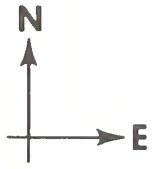
STREET BROAD

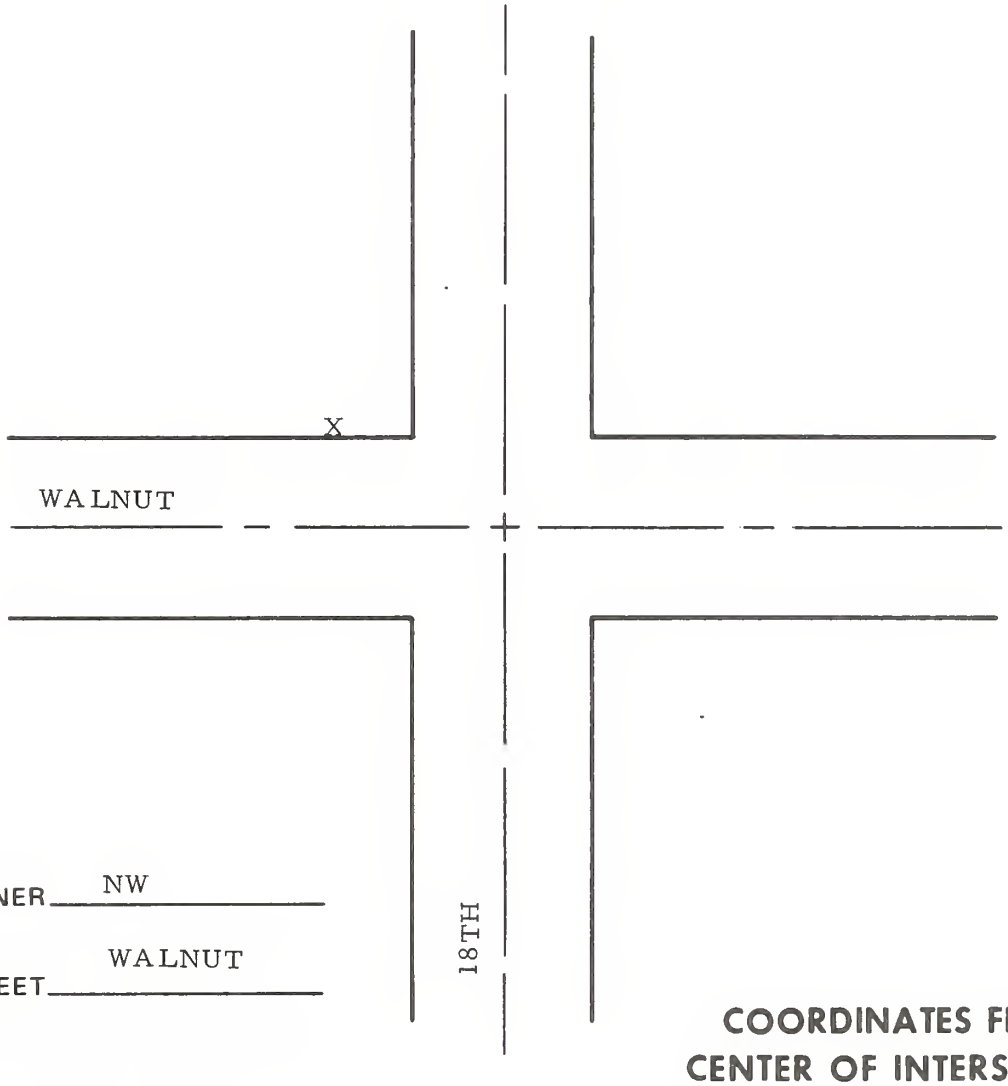
COORDINATES FROM CENTER OF INTERSECTION

45 FT NORTH
36 FT WEST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 37





CORNER NW

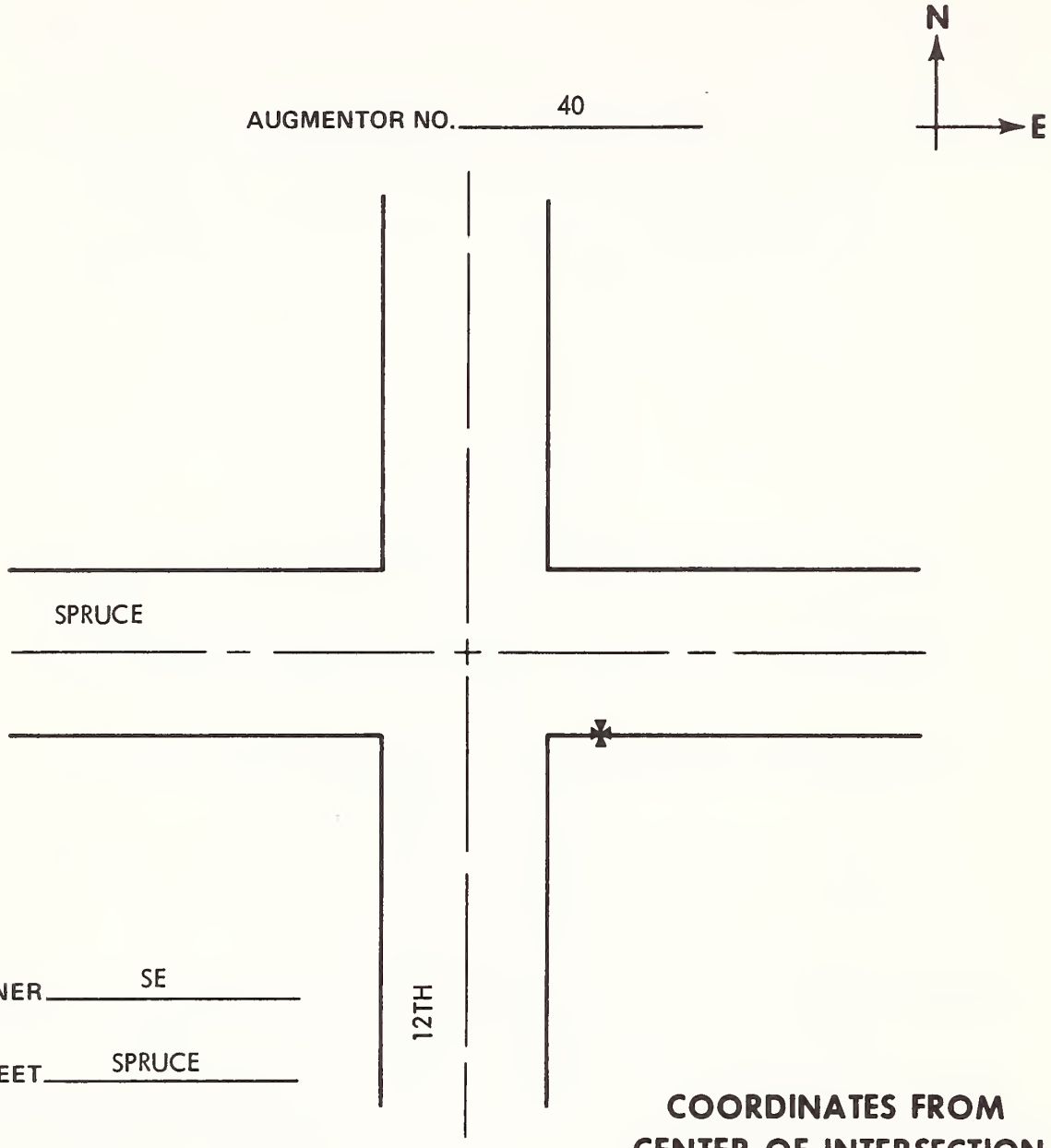
STREET WALNUT

COORDINATES FROM CENTER OF INTERSECTION

15 FT NORTH
29 FT WEST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 40



CORNER SE

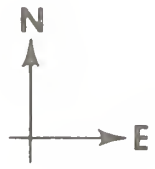
STREET SPRUCE

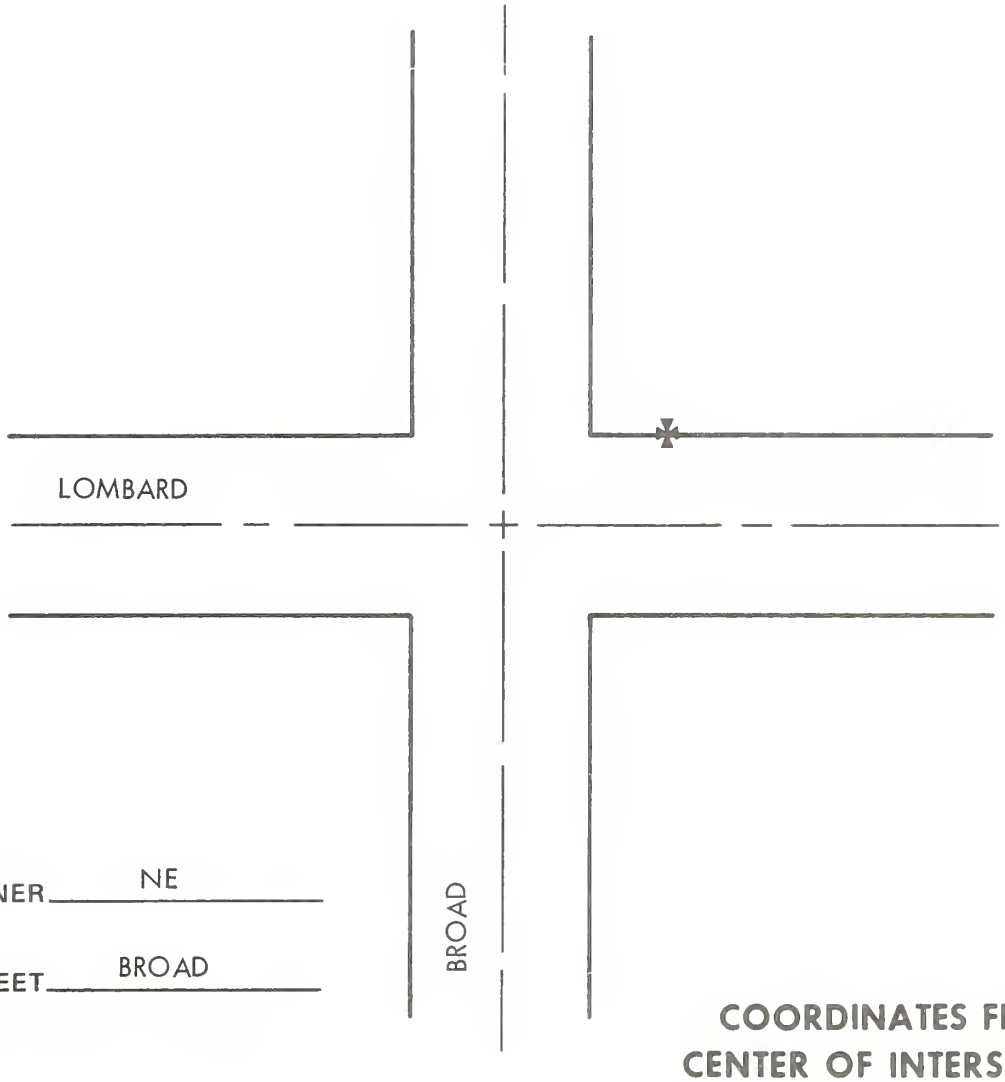
COORDINATES FROM CENTER OF INTERSECTION

15 FT SOUTH
24 FT EAST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 42





CORNER NE

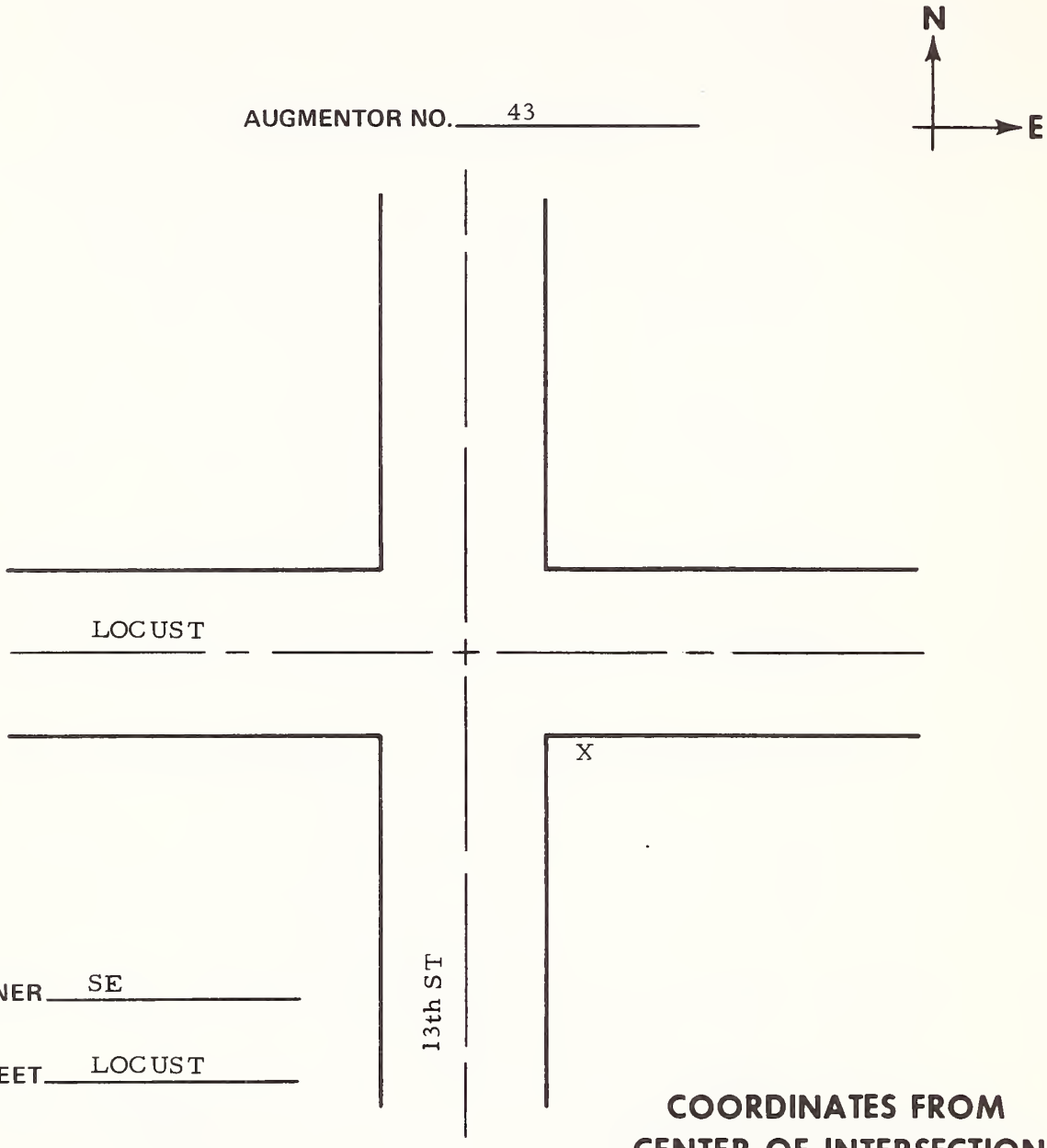
STREET BROAD

COORDINATES FROM CENTER OF INTERSECTION

24 FT NORTH
37 FT EAST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 43



CORNER SE

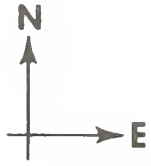
STREET LOCUST

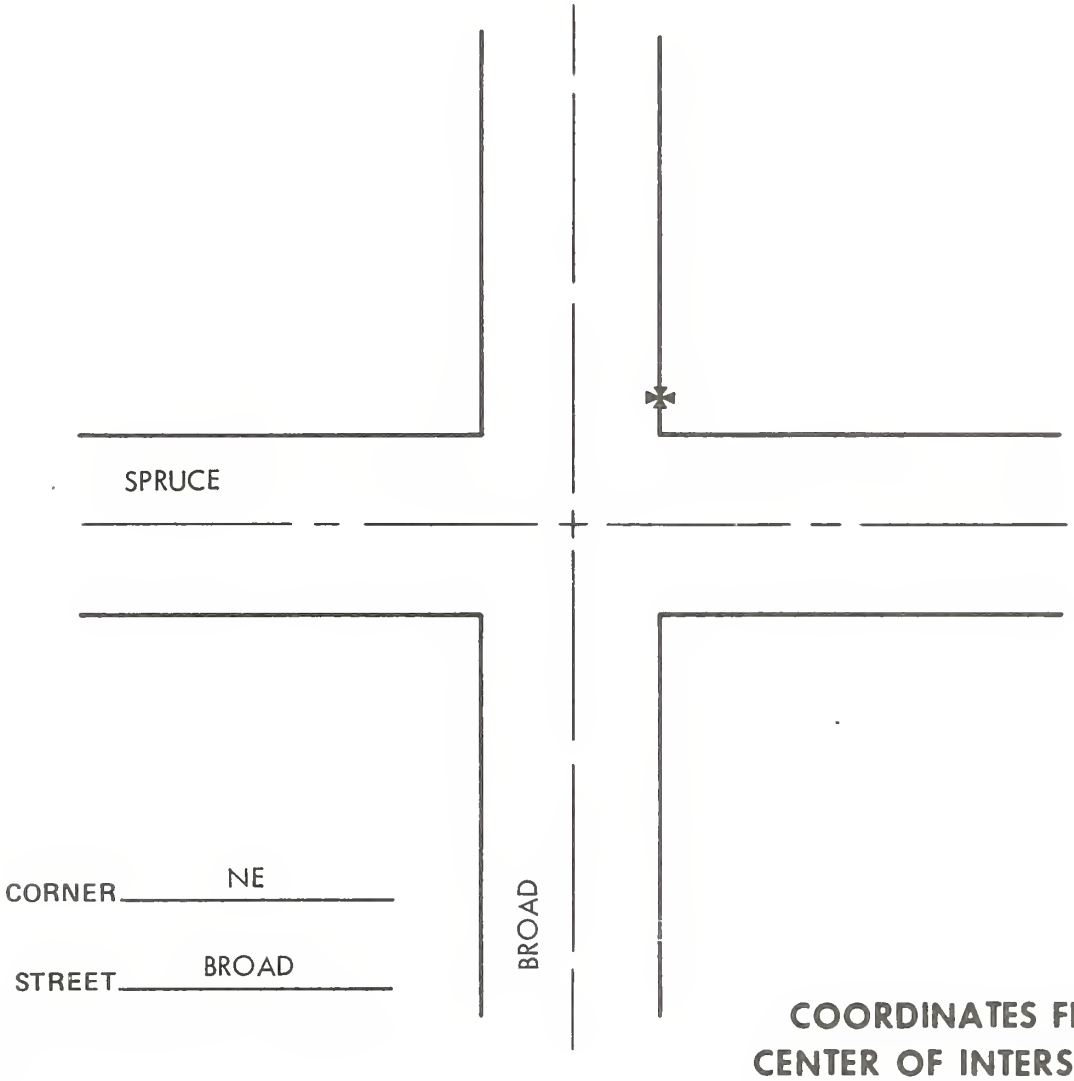
COORDINATES FROM CENTER OF INTERSECTION

16 FT SOUTH
26 FT EAST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 44





CORNER NE

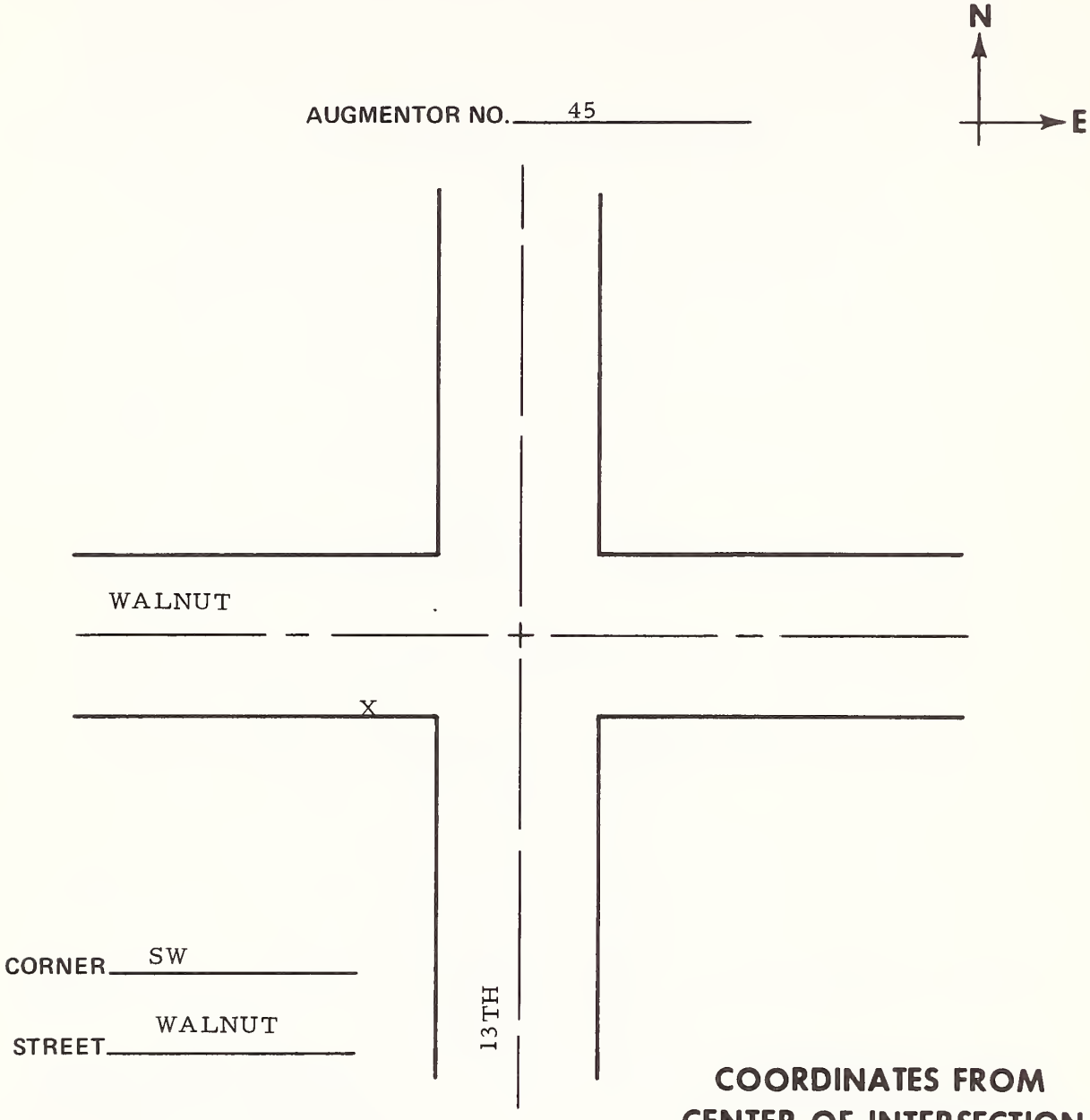
STREET BROAD

COORDINATES FROM CENTER OF INTERSECTION

34 FT NORTH
39 FT EAST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 45



CORNER SW

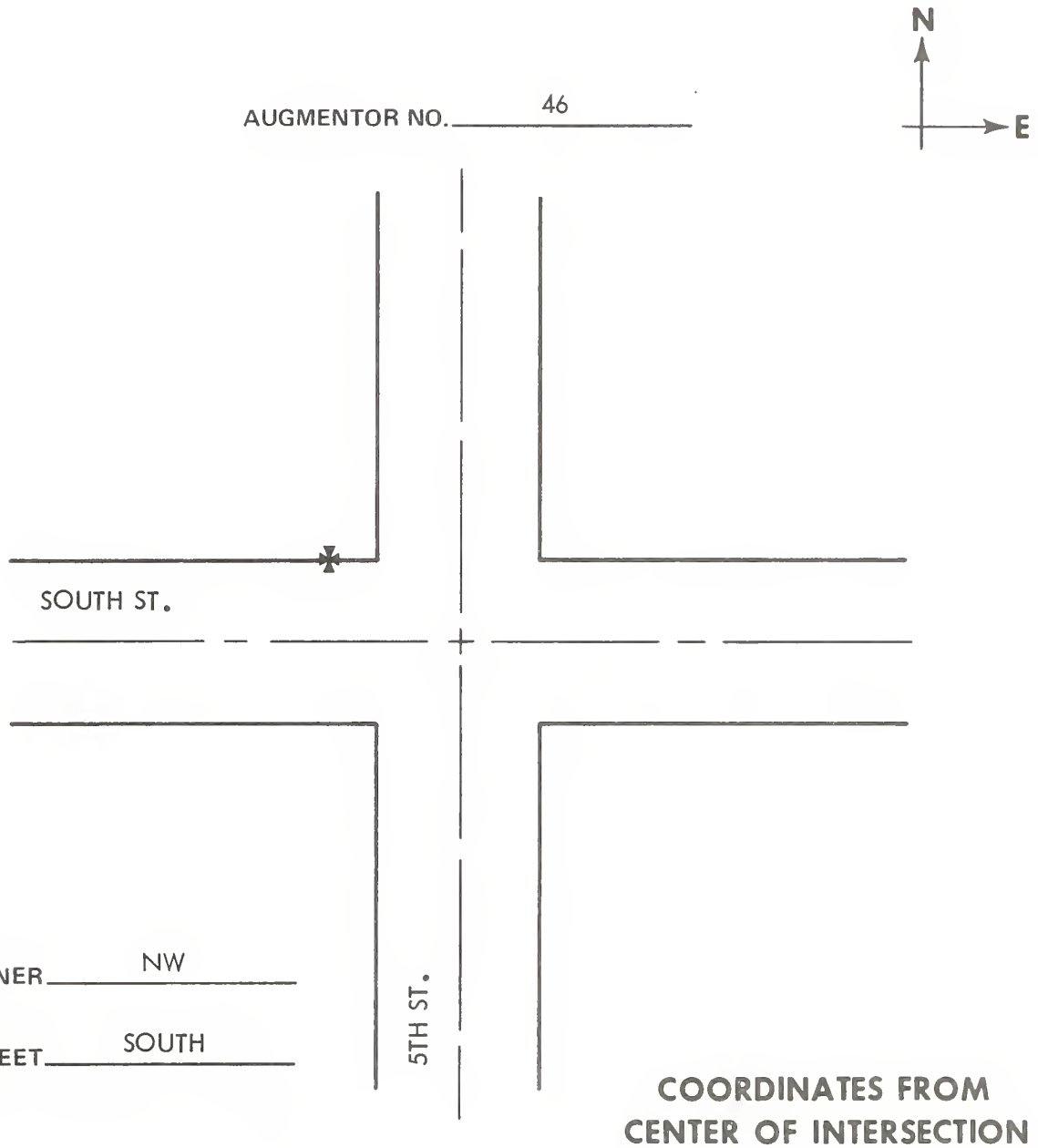
STREET WALNUT

COORDINATES FROM CENTER OF INTERSECTION

15 FT SOUTH
25 FT WEST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 46



CORNER NW

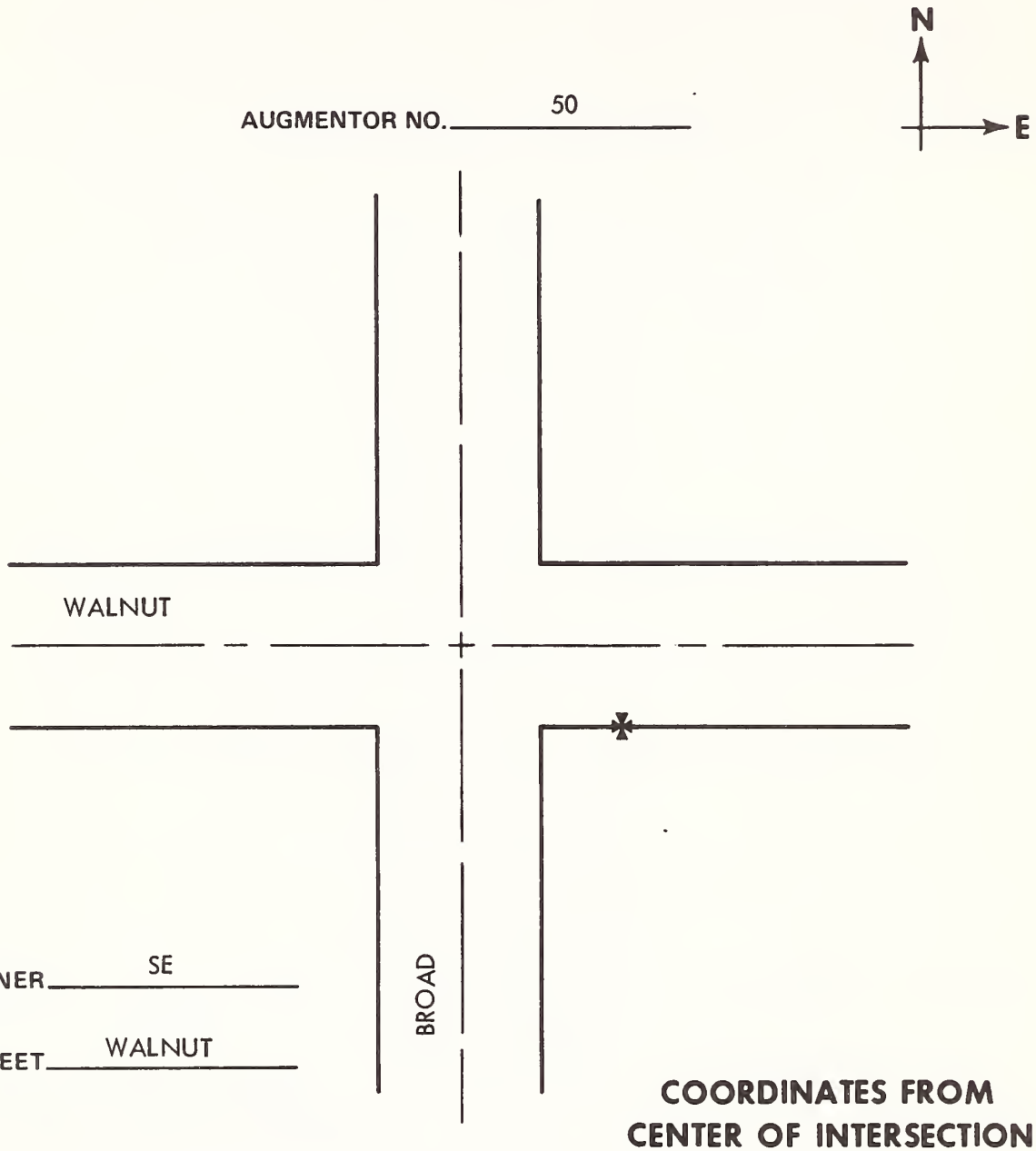
STREET SOUTH

COORDINATES FROM CENTER OF INTERSECTION

16 FT NORTH
23 FT WEST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 50



CORNER SE

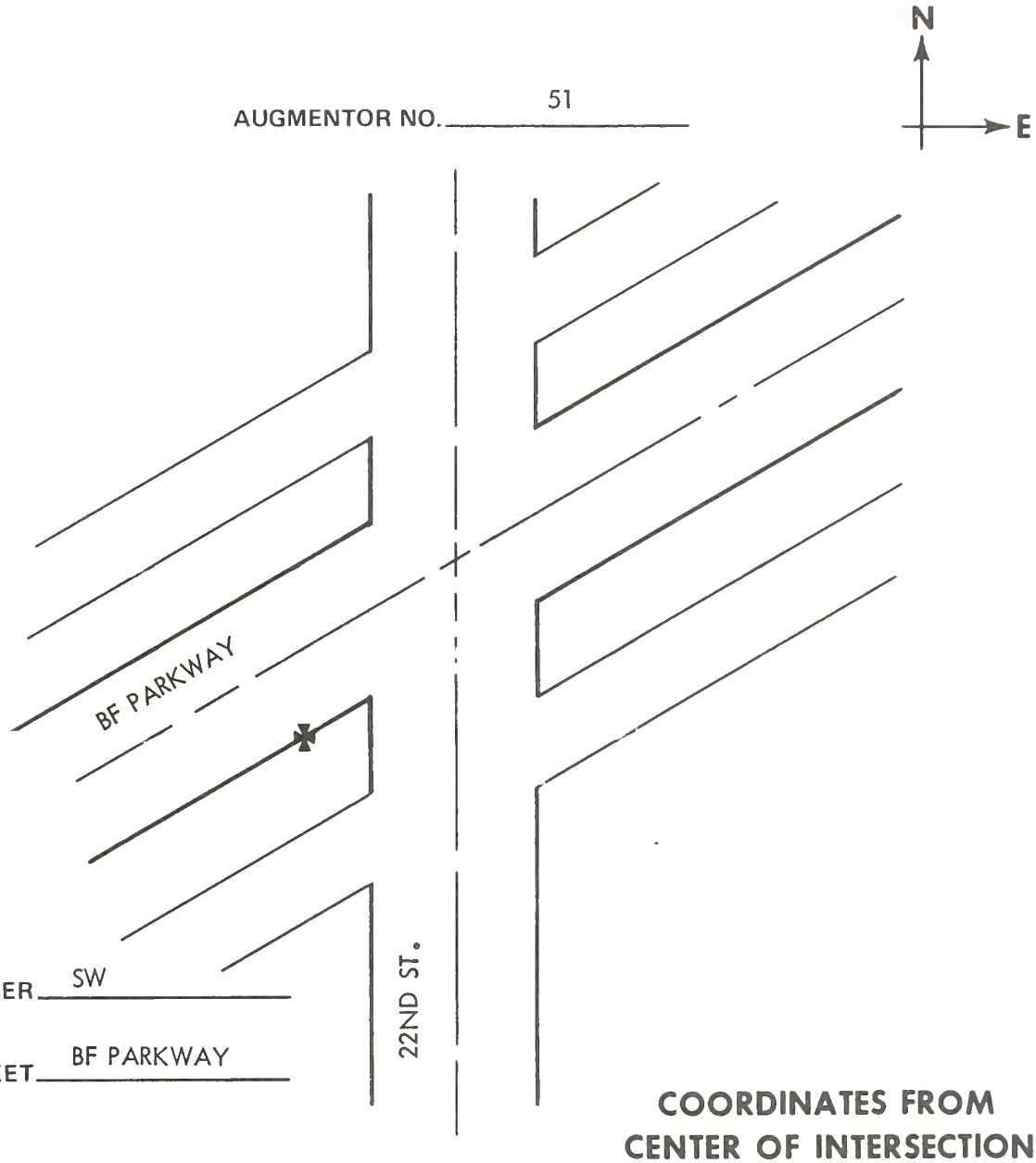
STREET WALNUT

COORDINATES FROM CENTER OF INTERSECTION

15 FT SOUTH
59 FT WEST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 51



CORNER SW

STREET BF PARKWAY

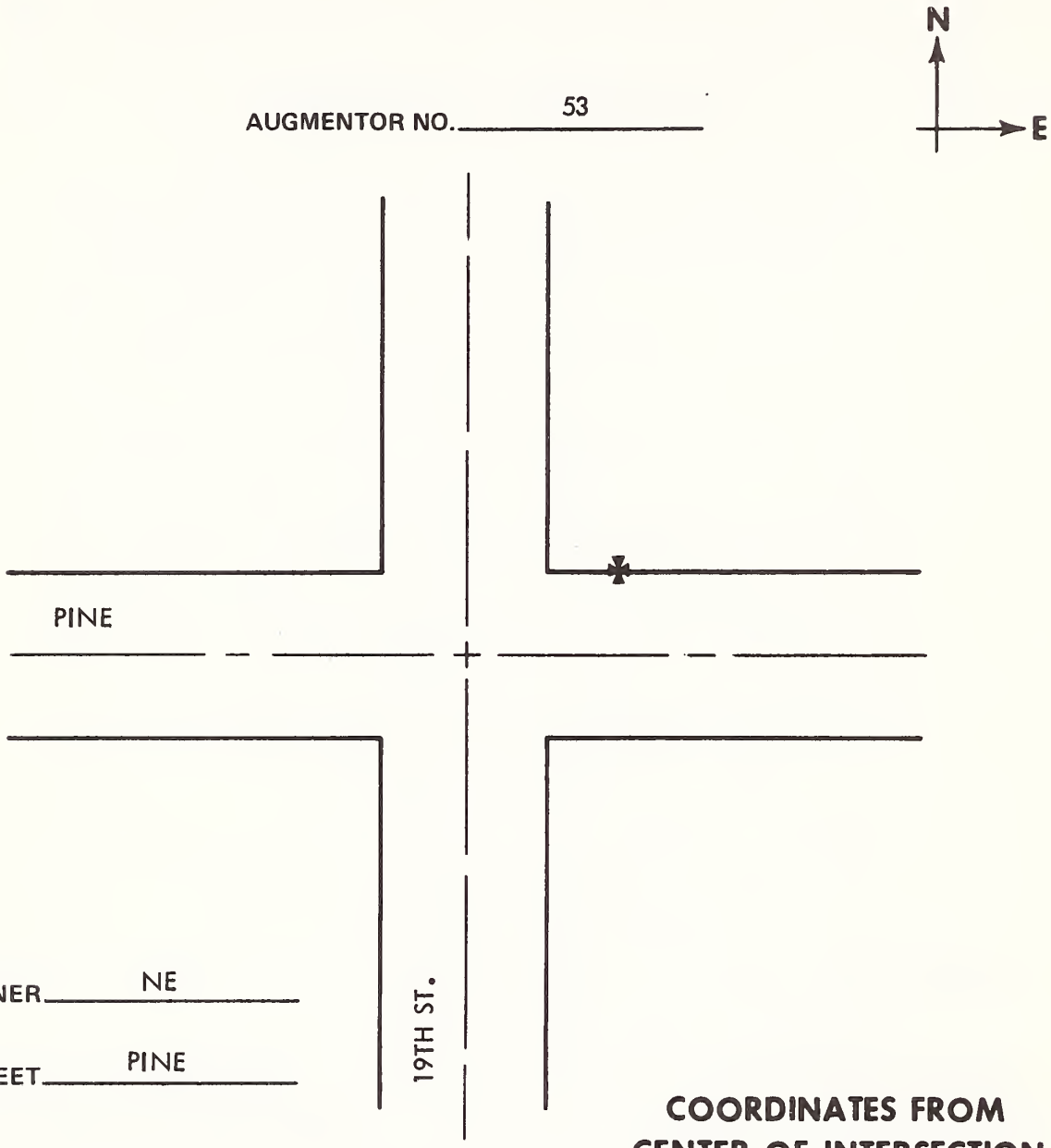
COORDINATES FROM CENTER OF INTERSECTION

45 FT SOUTH

43.5 FT WEST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 53



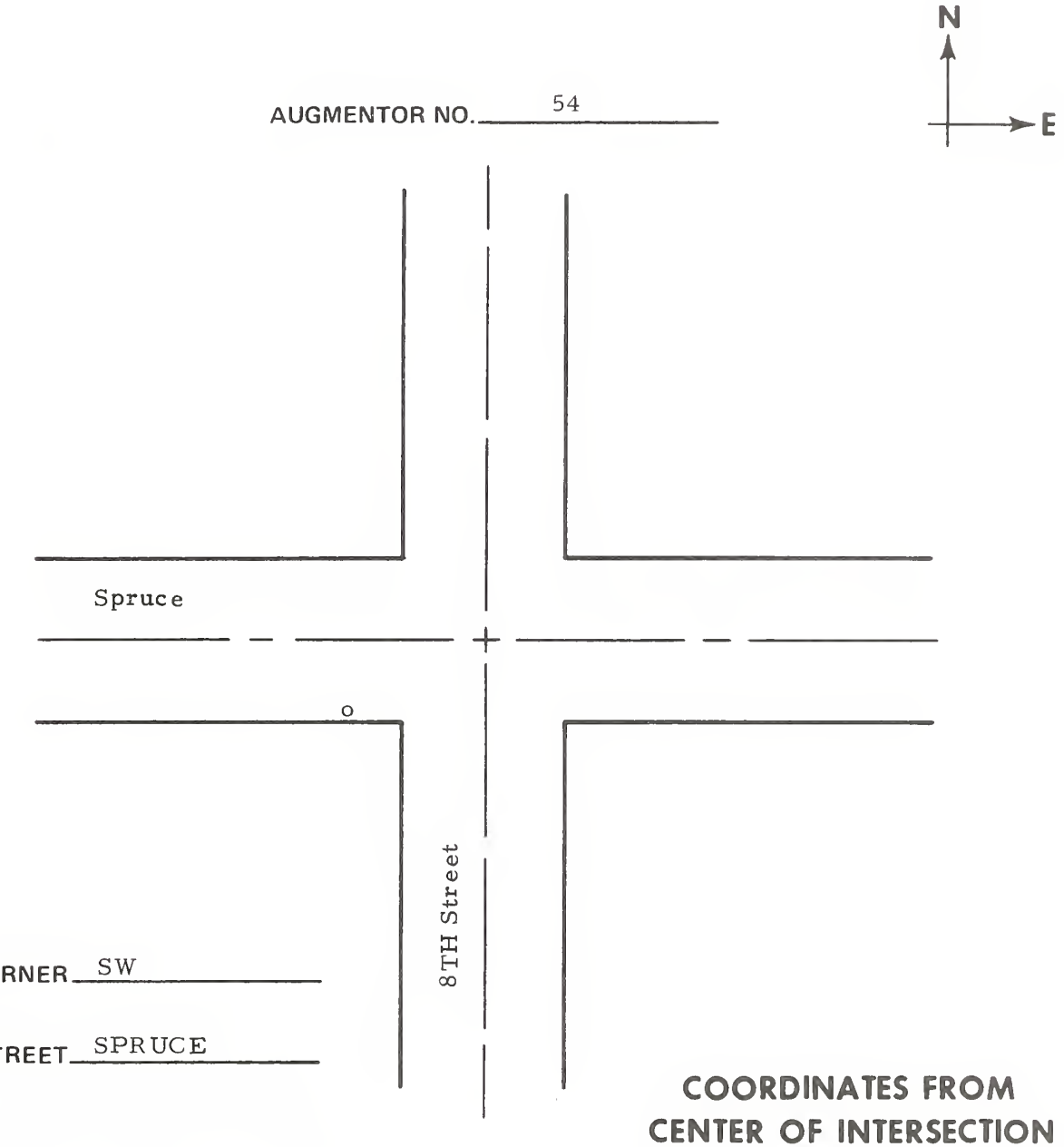
CORNER NE

STREET PINE

COORDINATES FROM CENTER OF INTERSECTION

16 FT NORTH
33 FT EAST

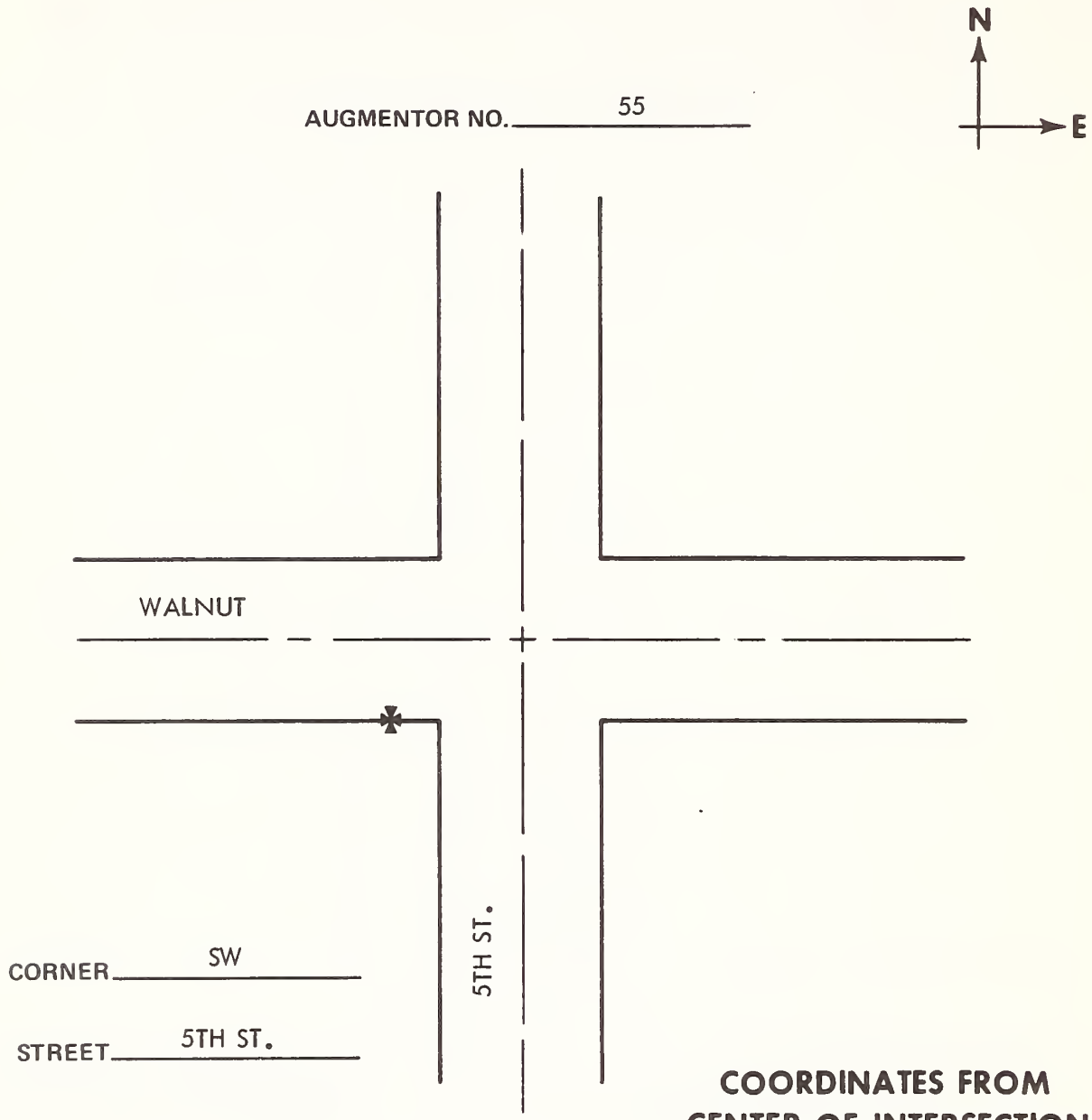
AUGMENTOR LOCATION DESCRIPTION



COORDINATES FROM CENTER OF INTERSECTION

16 FT SOUTH
25 FT WEST

AUGMENTOR LOCATION DESCRIPTION



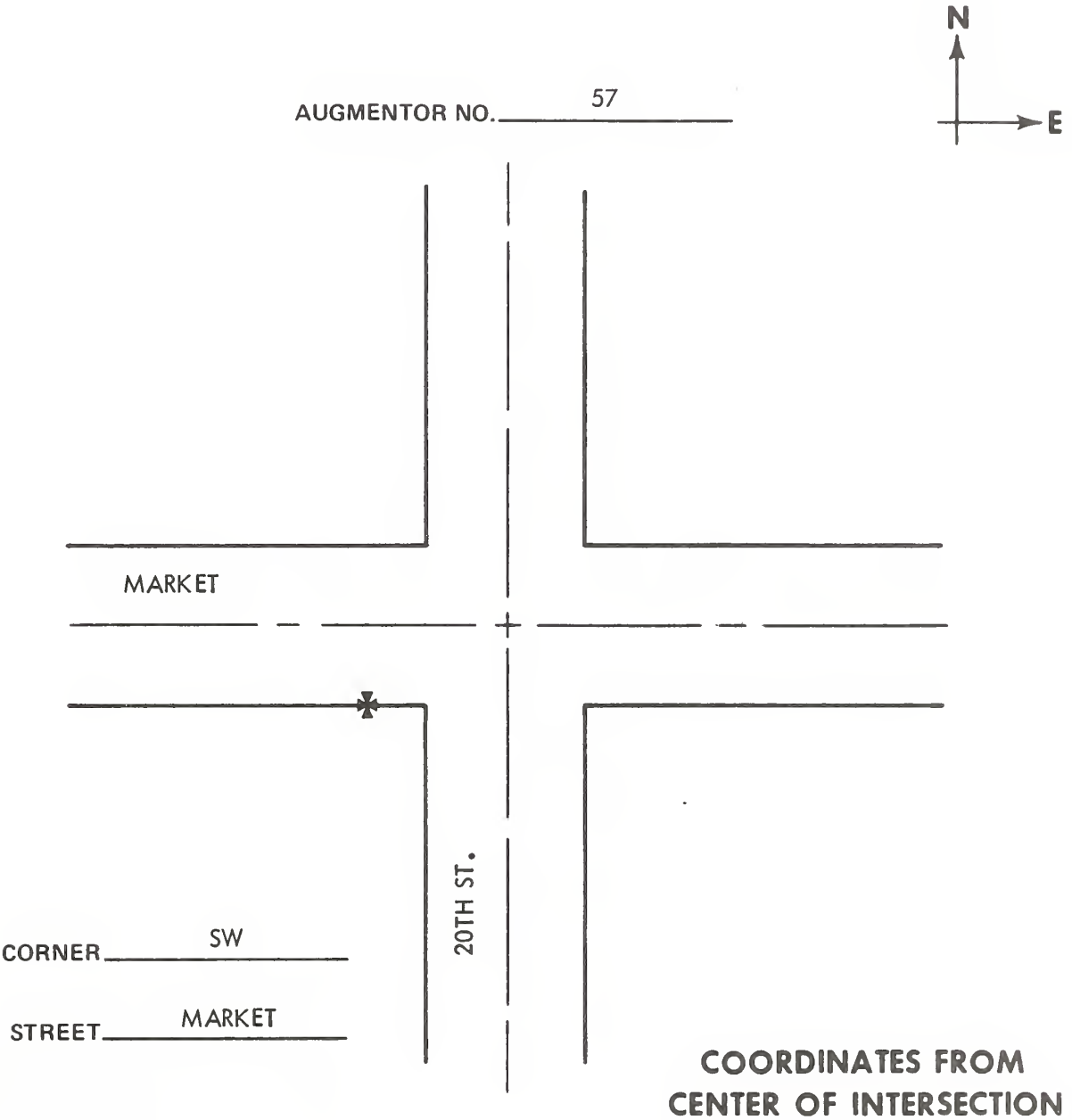
COORDINATES FROM CENTER OF INTERSECTION

27 FT SOUTH

16 FT WEST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 57



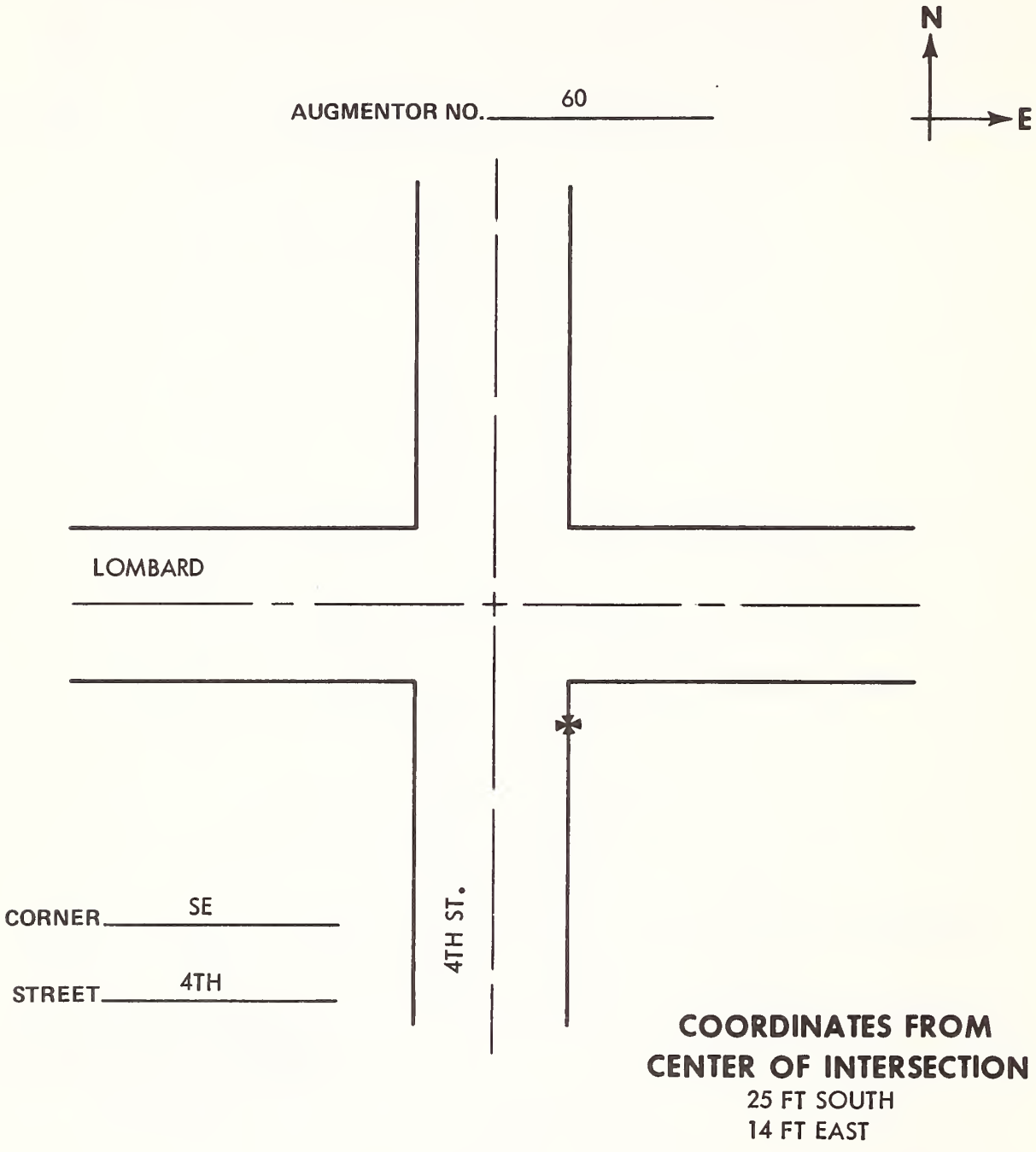
CORNER SW

STREET MARKET

COORDINATES FROM CENTER OF INTERSECTION

33 FT SOUTH
27 FT WEST

AUGMENTOR LOCATION DESCRIPTION

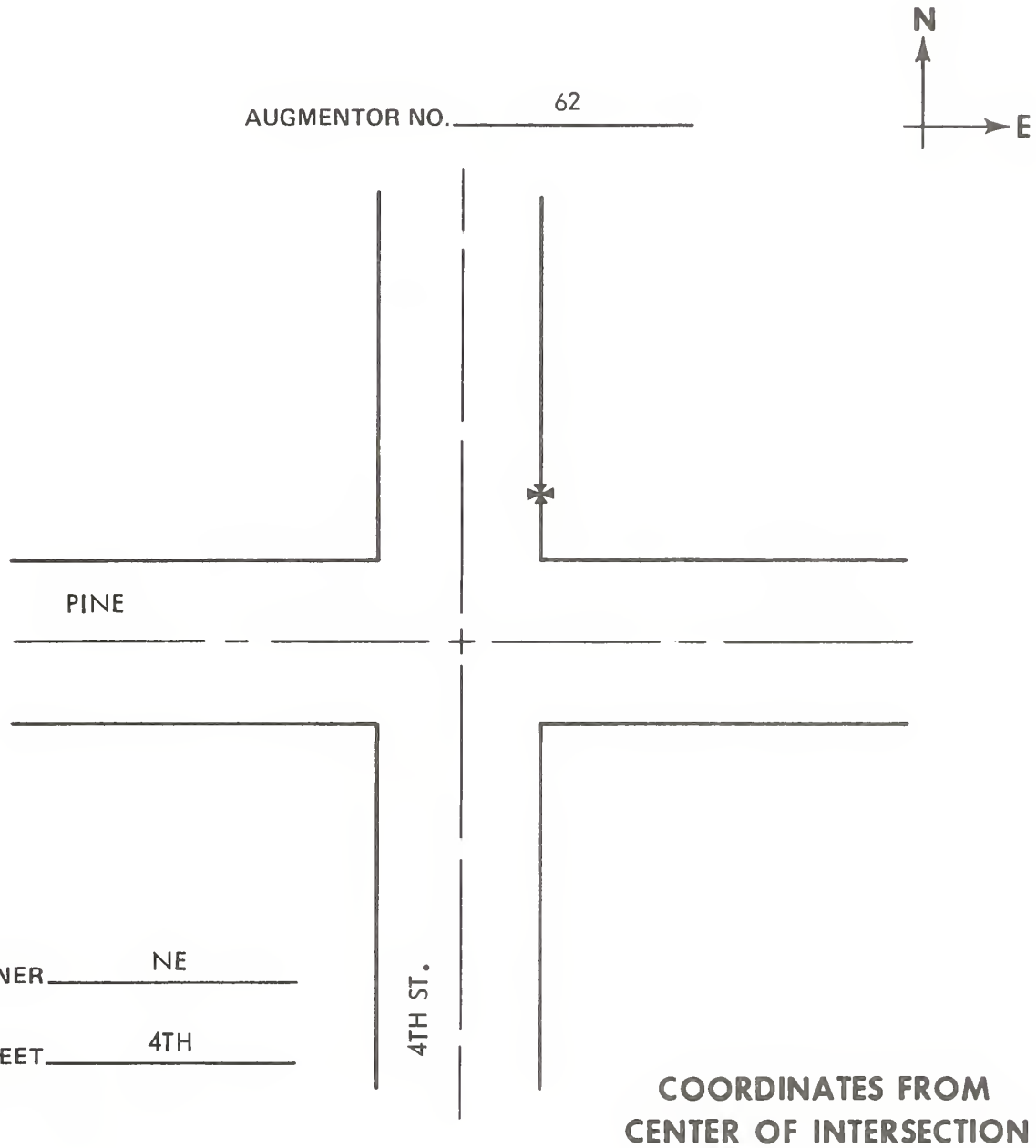


COORDINATES FROM CENTER OF INTERSECTION

25 FT SOUTH
14 FT EAST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 62



CORNER NE

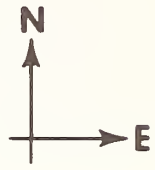
STREET 4TH

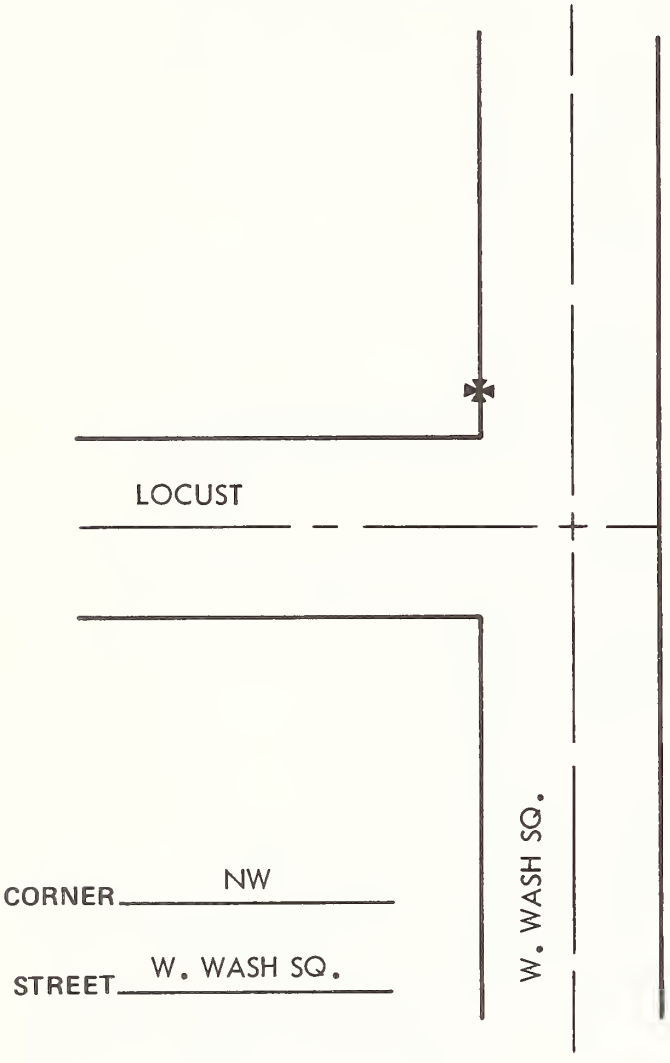
COORDINATES FROM CENTER OF INTERSECTION

30 FT NORTH
15 FT EAST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 63





CORNER NW

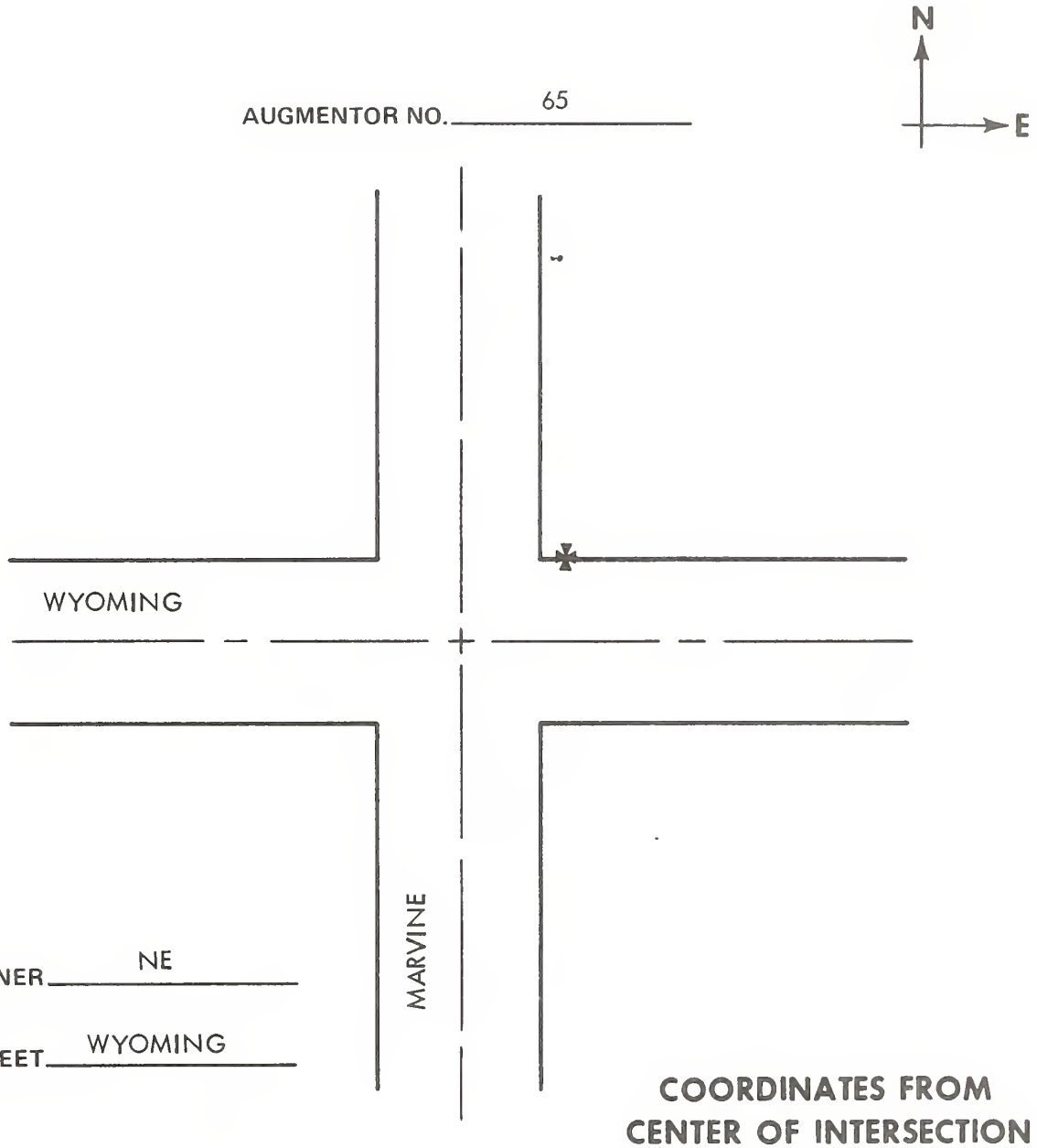
STREET W. WASH SQ.

COORDINATES FROM CENTER OF INTERSECTION

26 FT NORTH
16 FT WEST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 65



CORNER NE

STREET WYOMING

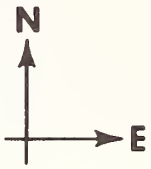
COORDINATES FROM CENTER OF INTERSECTION

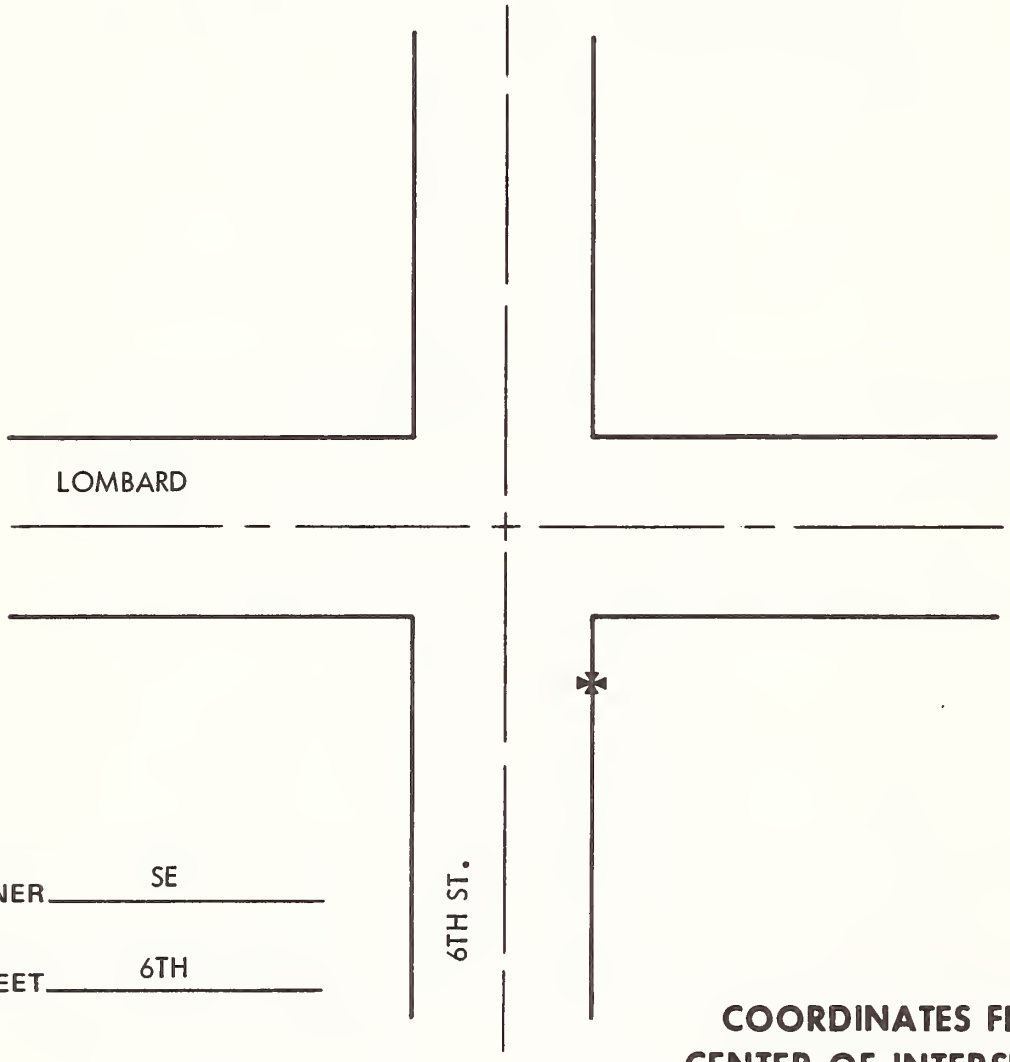
30 FT NORTH

24 FT EAST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 66





CORNER SE

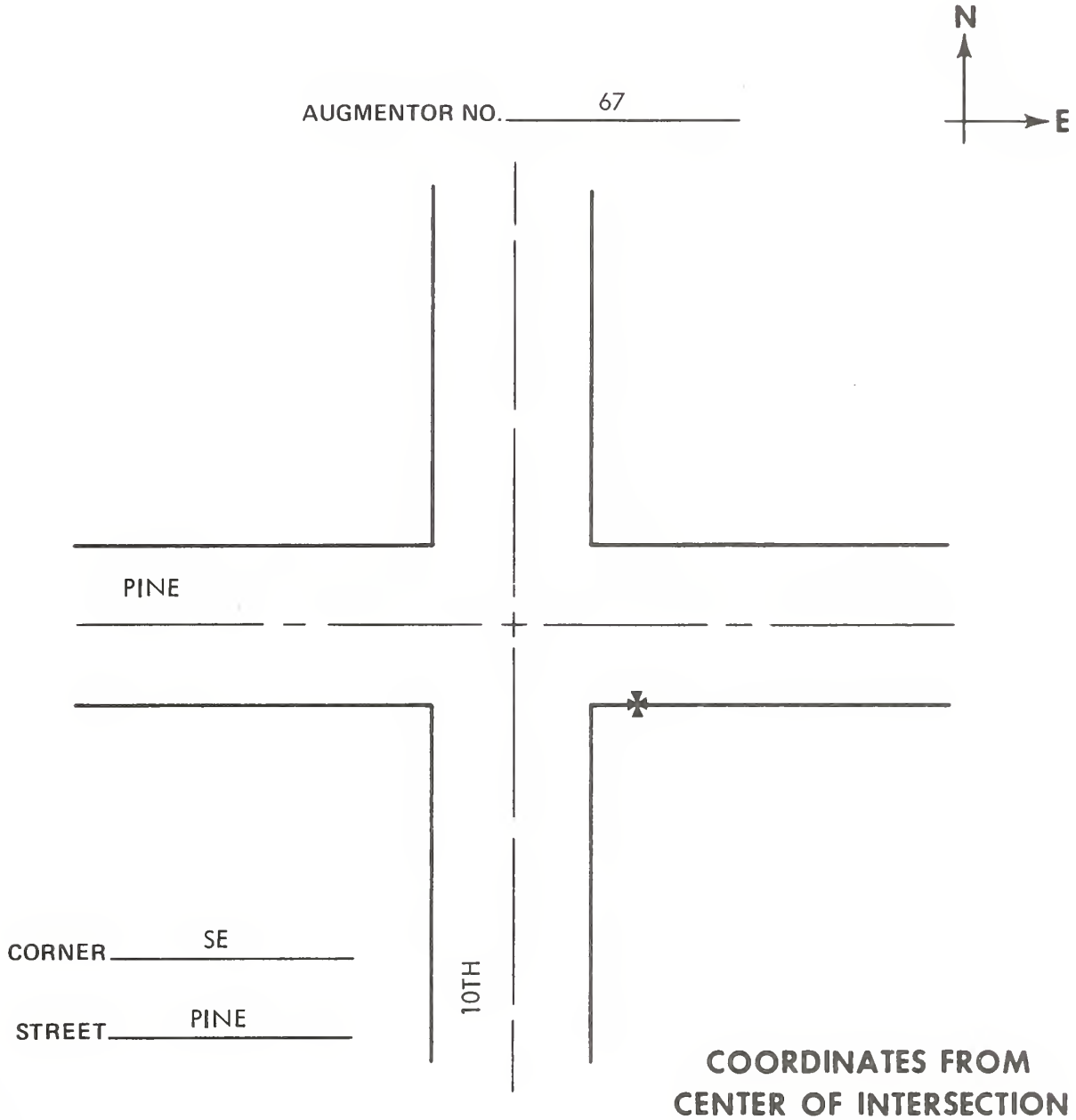
STREET 6TH

COORDINATES FROM CENTER OF INTERSECTION

27 FT SOUTH
15 FT EAST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 67



CORNER SE

STREET PINE

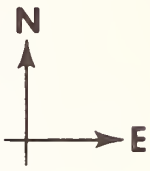
COORDINATES FROM CENTER OF INTERSECTION

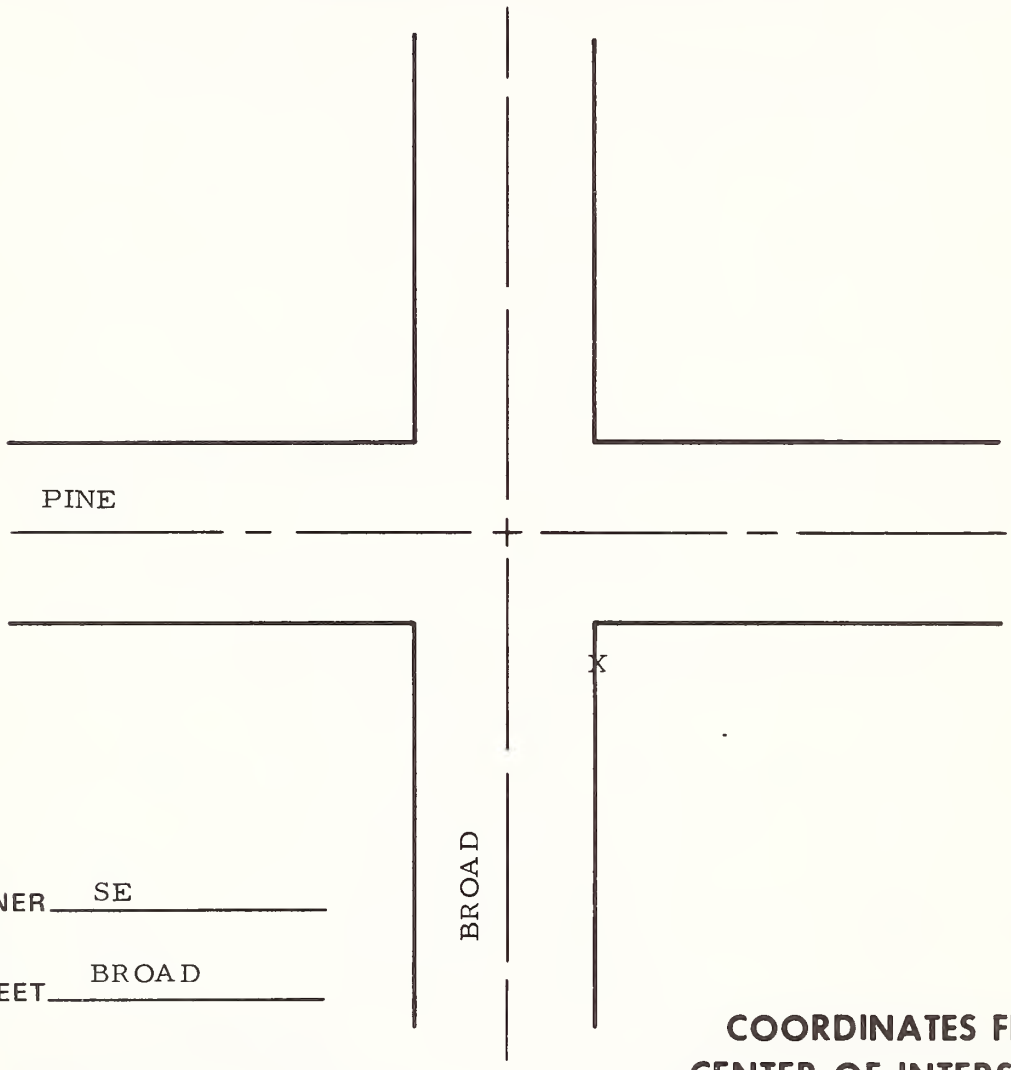
14 FT SOUTH

23 FT EAST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 70





CORNER SE

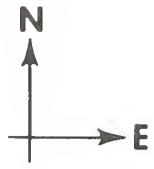
STREET BROAD

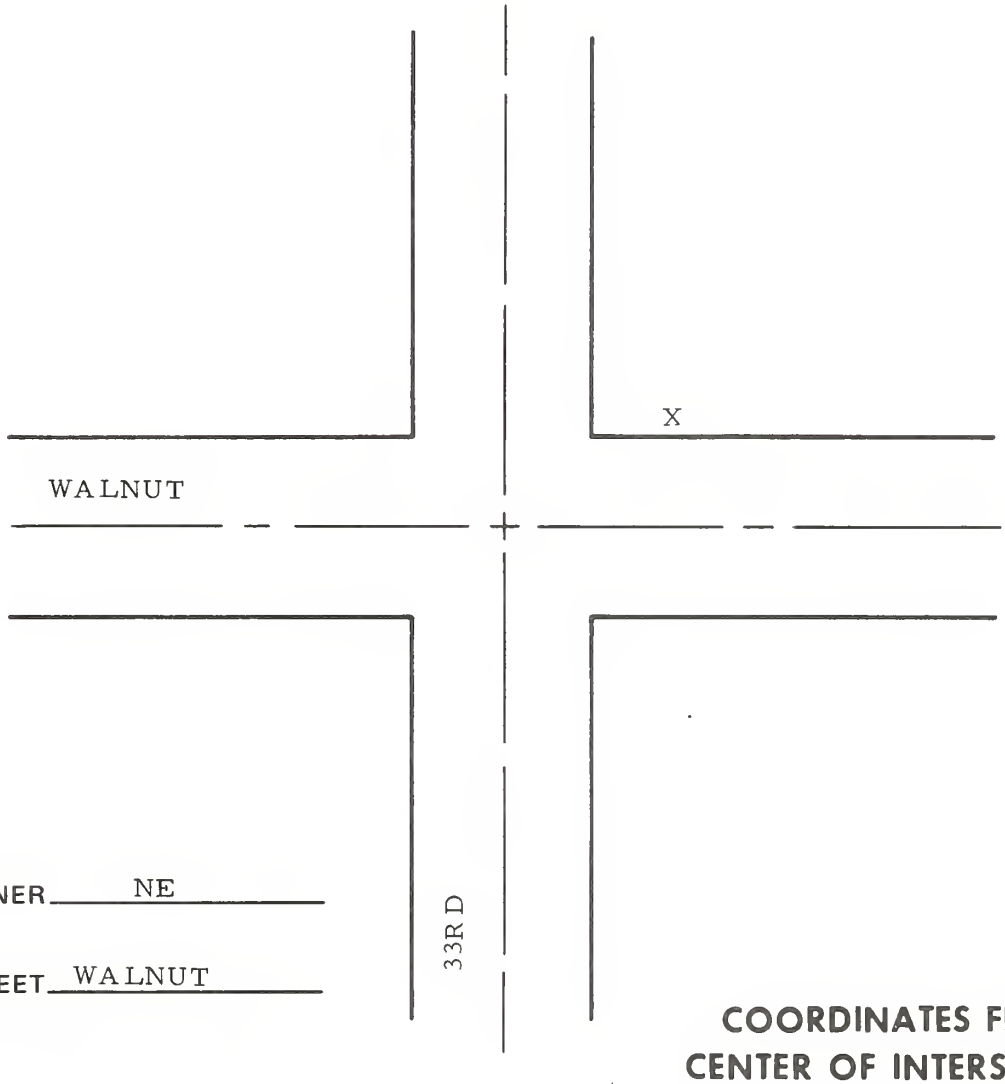
COORDINATES FROM CENTER OF INTERSECTION

37 FT SOUTH
37 FT EAST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 72





CORNER NE

STREET WALNUT

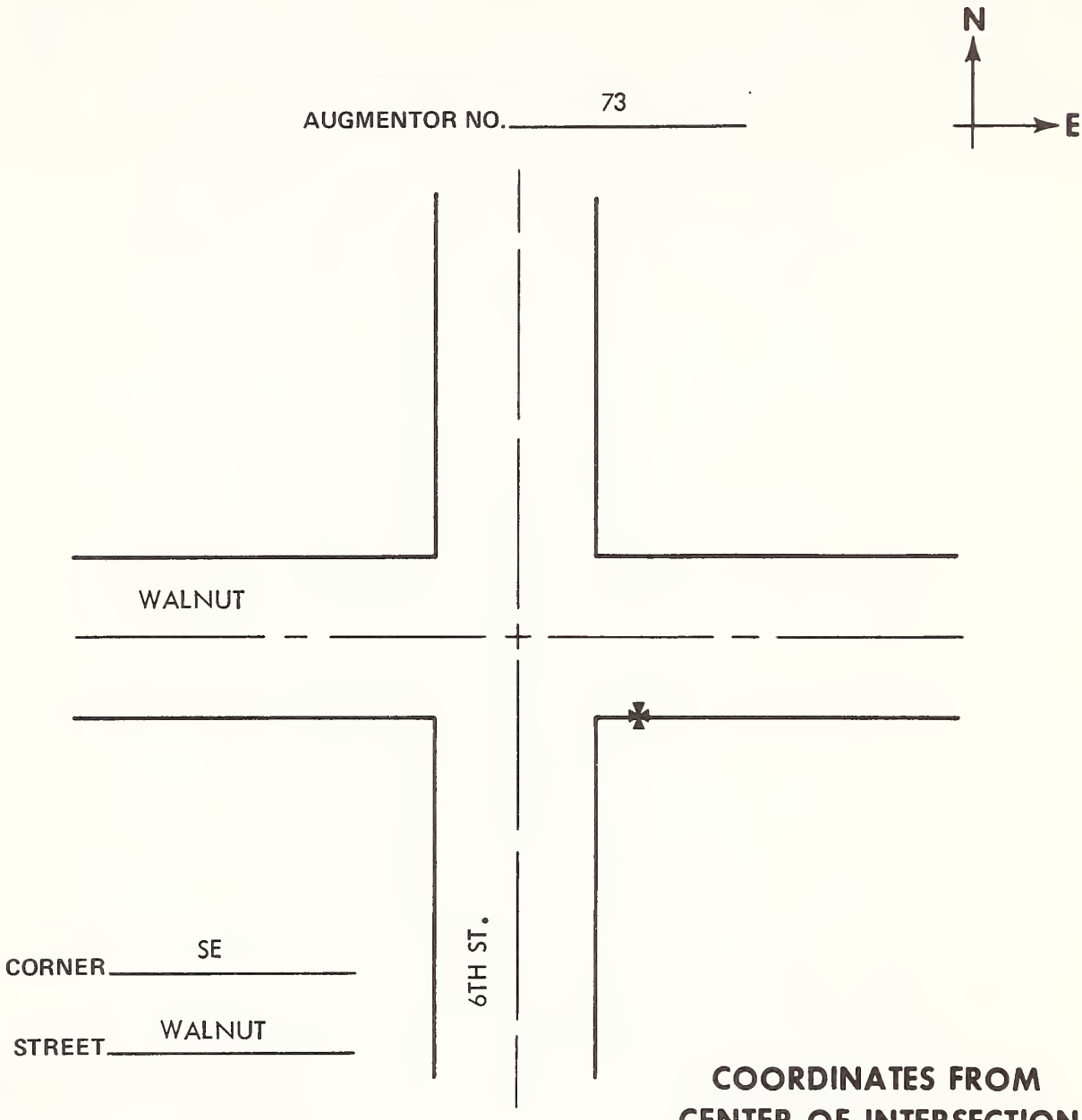
COORDINATES FROM CENTER OF INTERSECTION

25 FT NORTH

39 FT EAST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 73



CORNER SE

STREET WALNUT

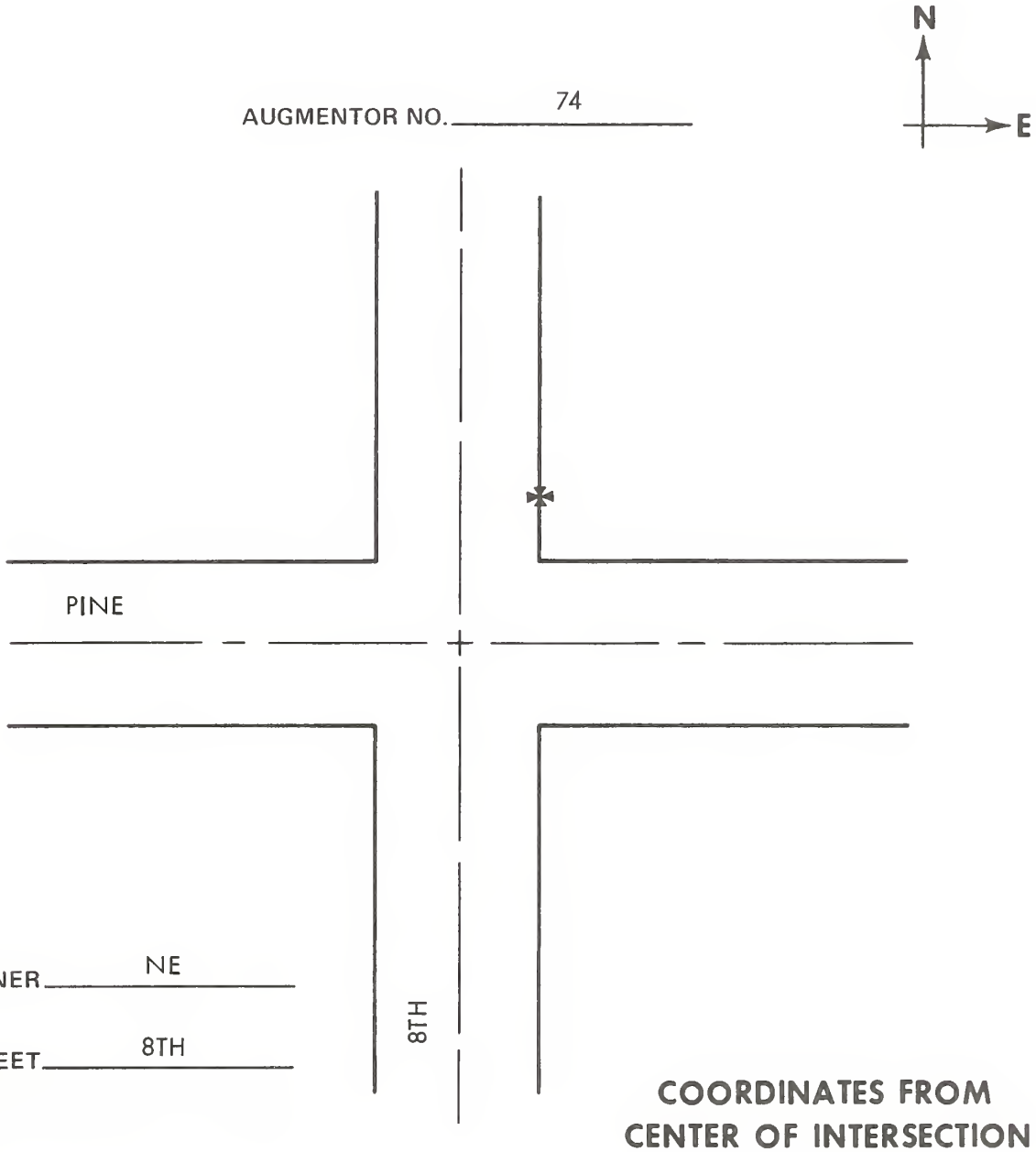
COORDINATES FROM CENTER OF INTERSECTION

16 FT SOUTH

28 FT EAST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 74



CORNER NE

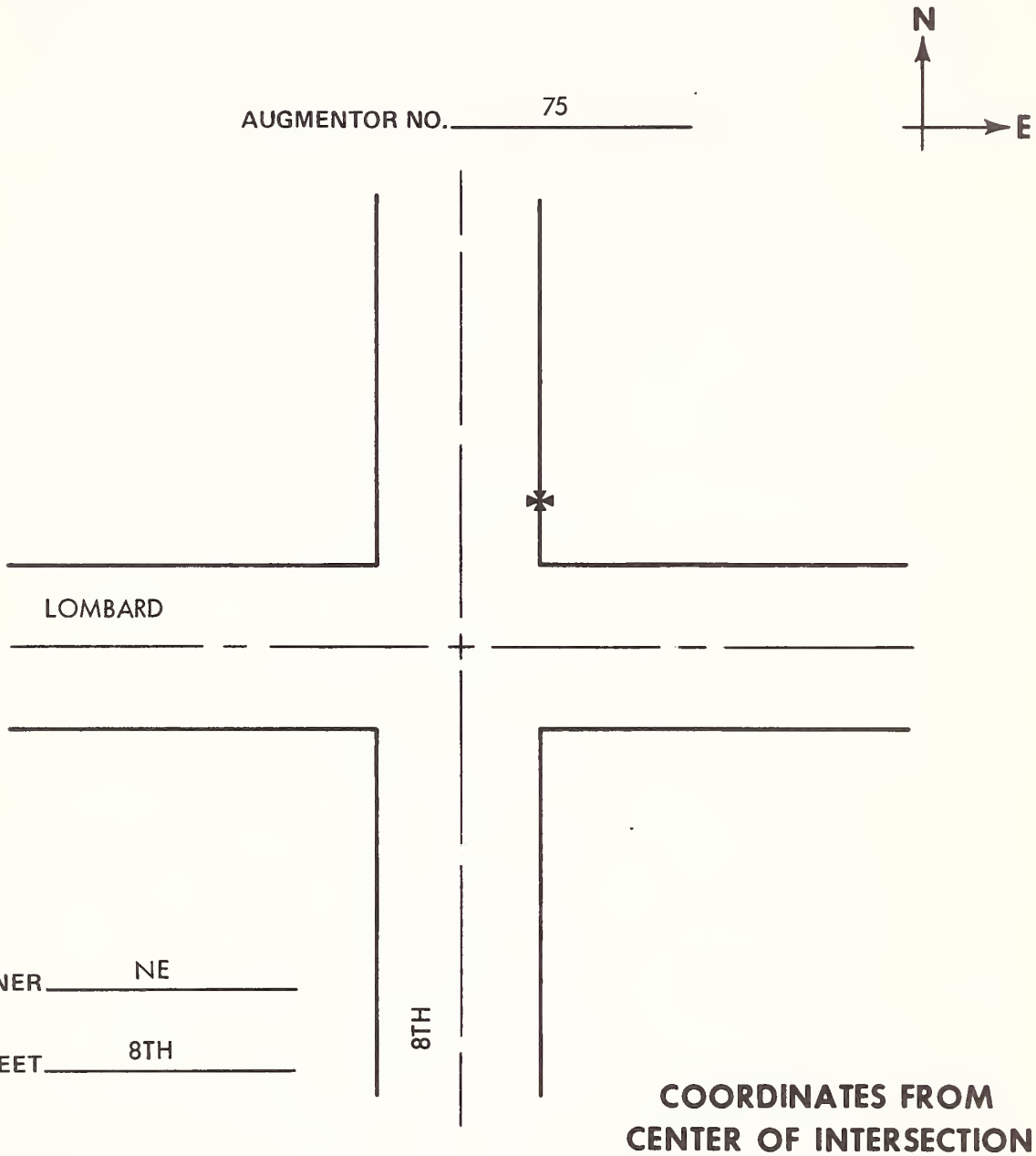
STREET 8TH

COORDINATES FROM CENTER OF INTERSECTION

30 FT NORTH
14 FT EAST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 75



CORNER NE

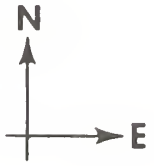
STREET 8TH

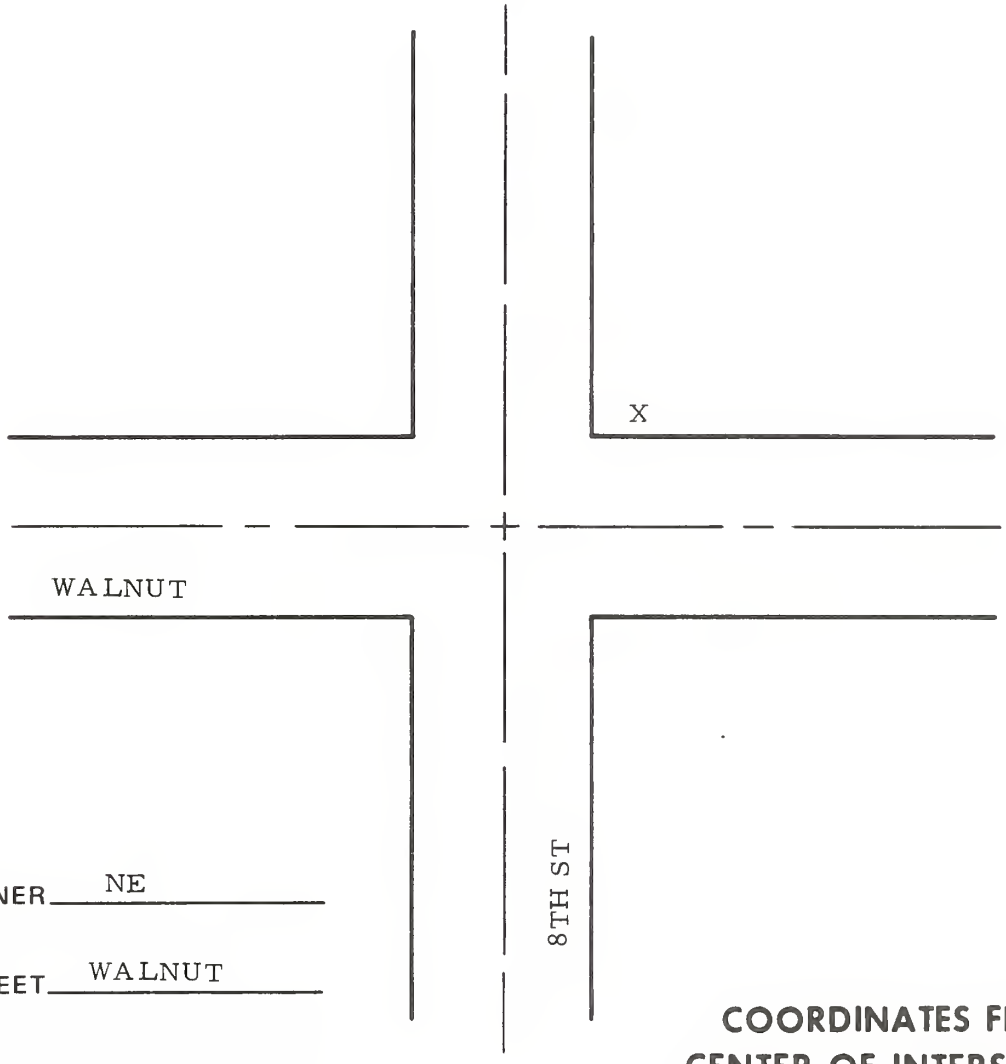
COORDINATES FROM CENTER OF INTERSECTION

29 FT NORTH
15 FT EAST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 76





CORNER NE

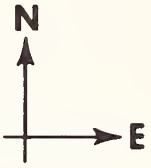
STREET WALNUT

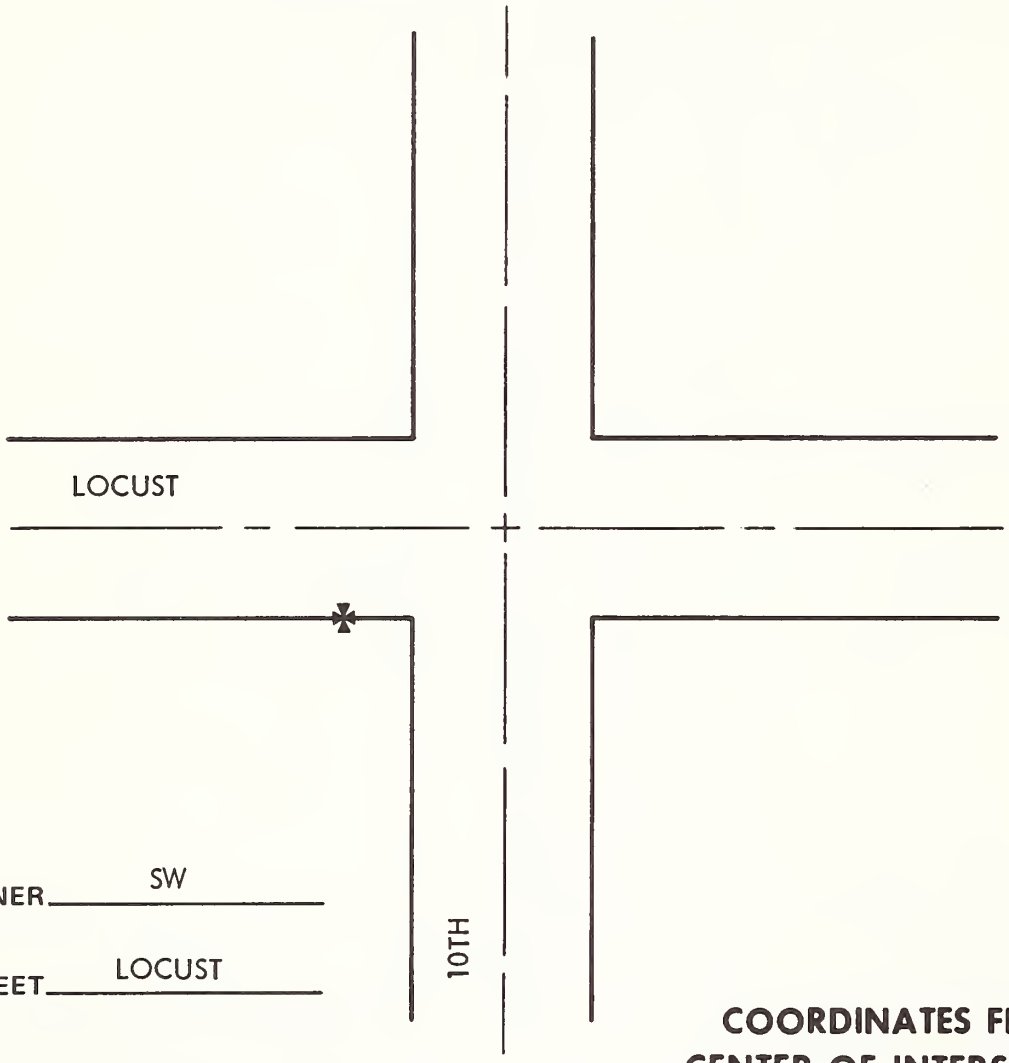
COORDINATES FROM CENTER OF INTERSECTION

15 FT NORTH
24 FT EAST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 77





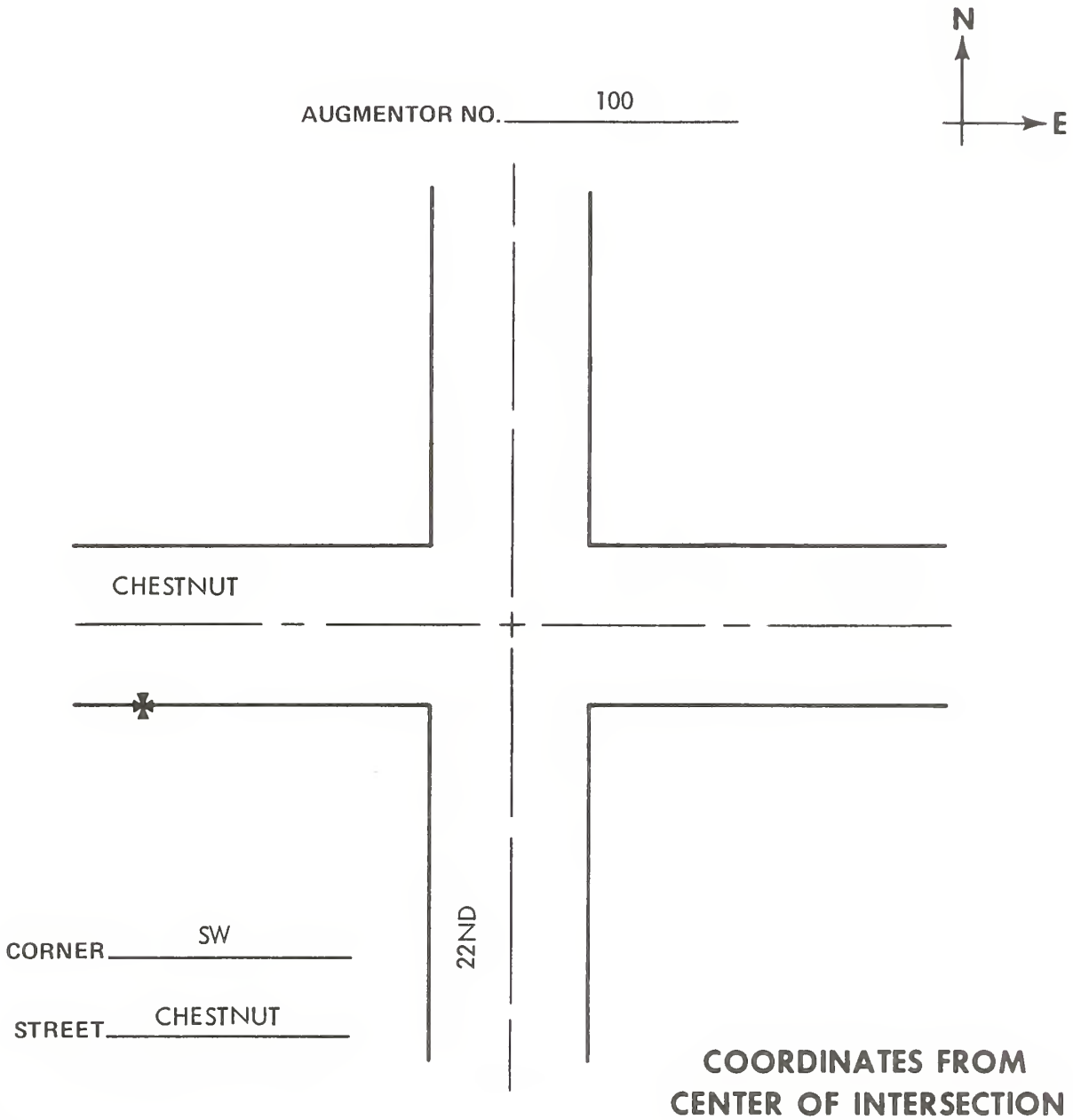
CORNER SW

STREET LOCUST

COORDINATES FROM CENTER OF INTERSECTION

15 FT SOUTH
26 FT WEST

AUGMENTOR LOCATION DESCRIPTION

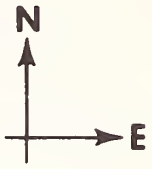


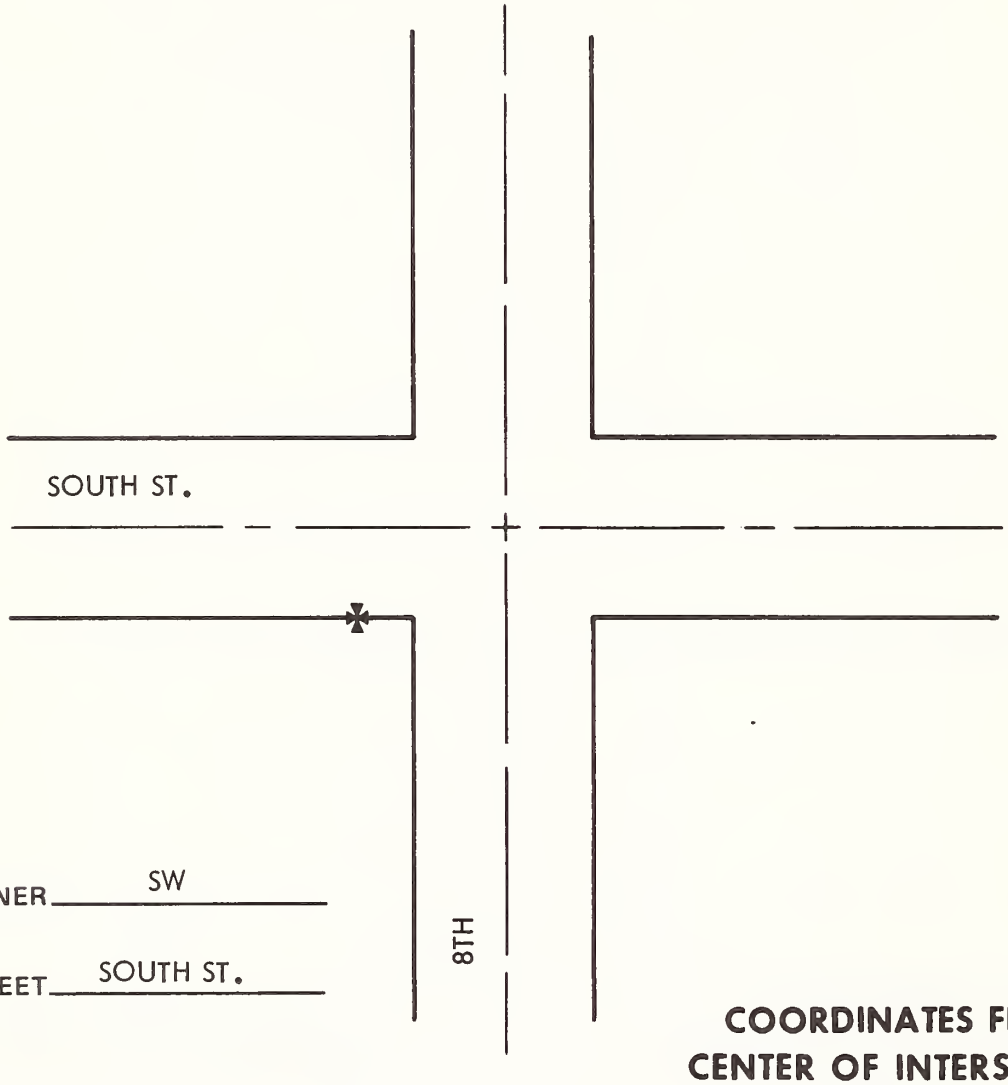
COORDINATES FROM CENTER OF INTERSECTION

21 FT SOUTH
223 FT WEST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 107





CORNER SW

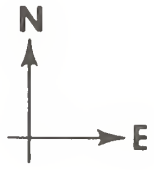
STREET SOUTH ST.

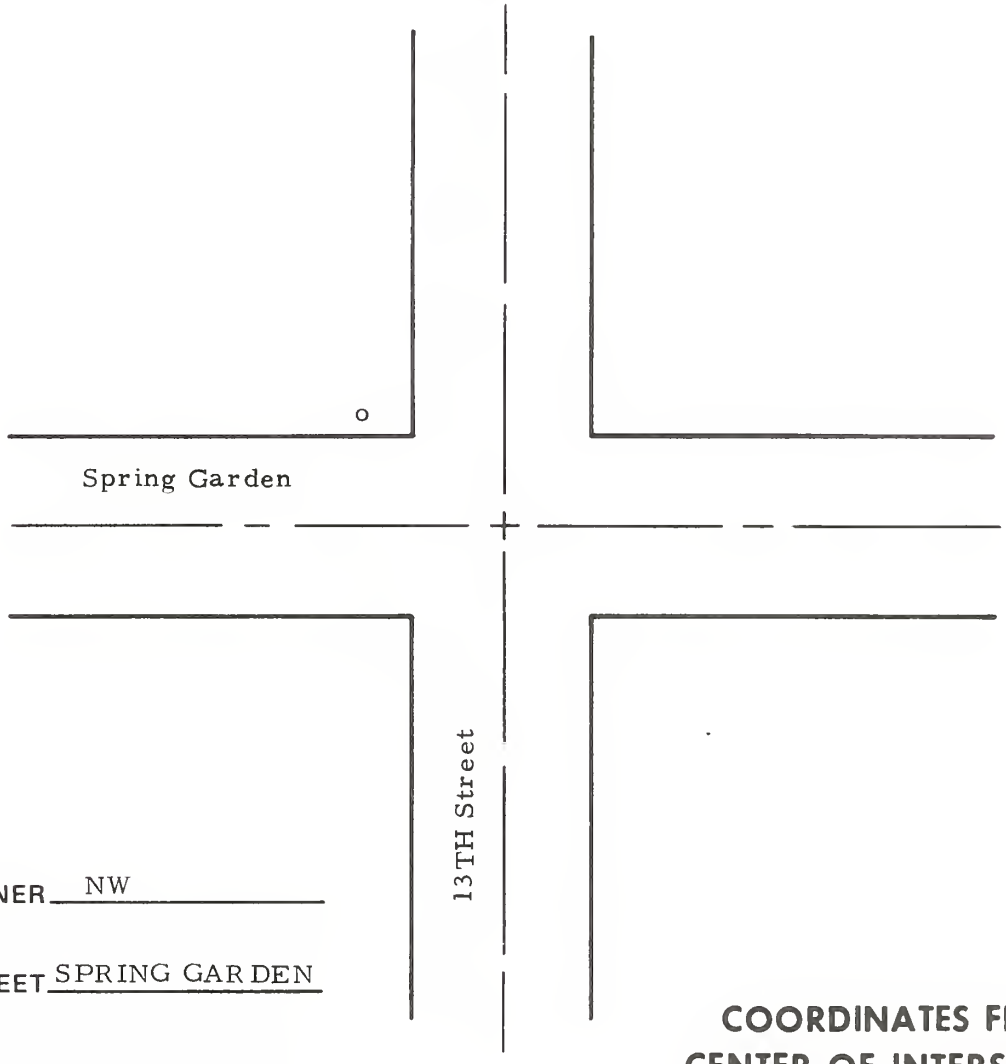
COORDINATES FROM CENTER OF INTERSECTION

16 FT SOUTH
24 FT WEST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 110





CORNER NW

STREET SPRING GARDEN

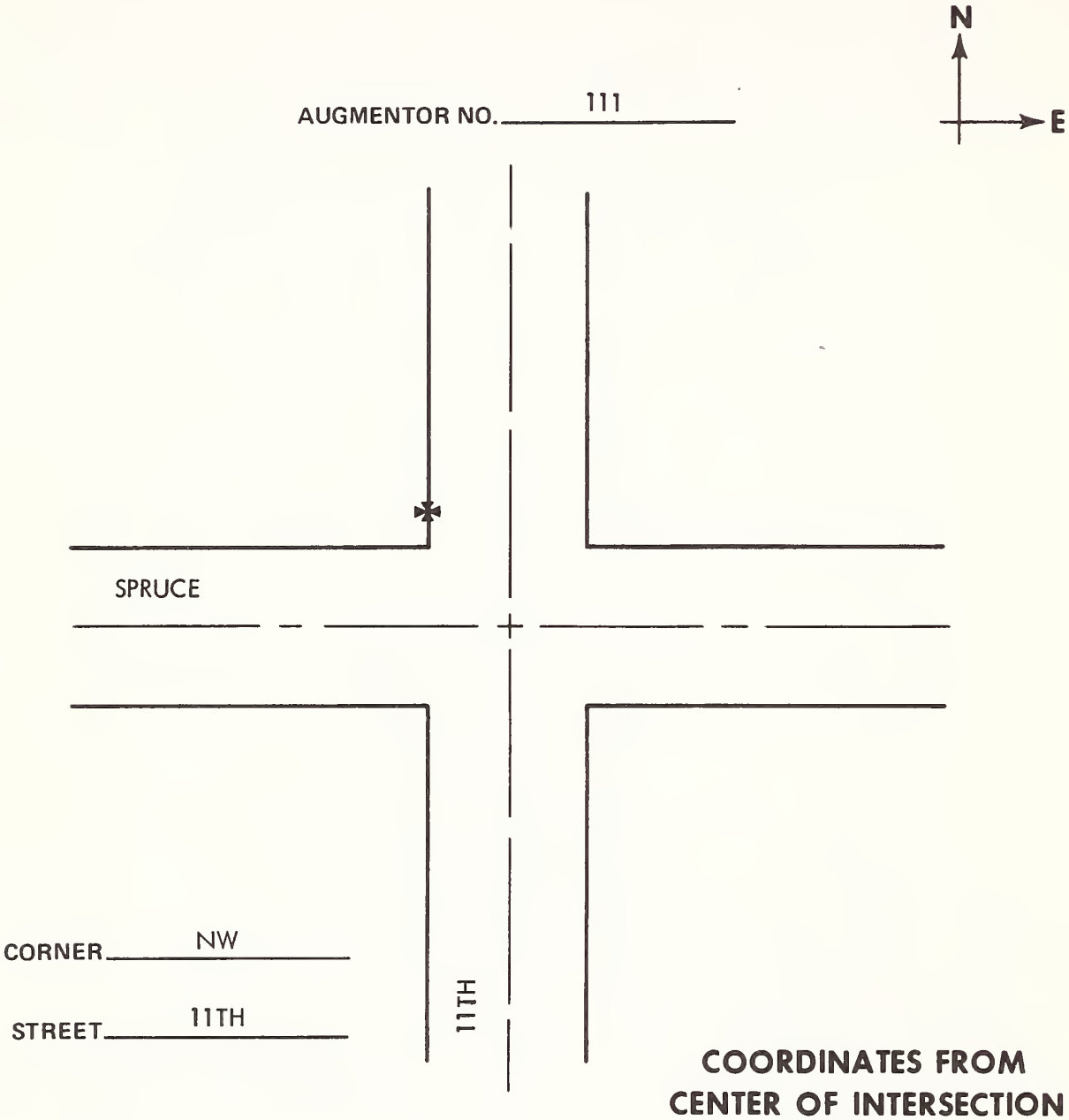
COORDINATES FROM CENTER OF INTERSECTION

39 FT NORTH

24 FT WEST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 111



CORNER NW

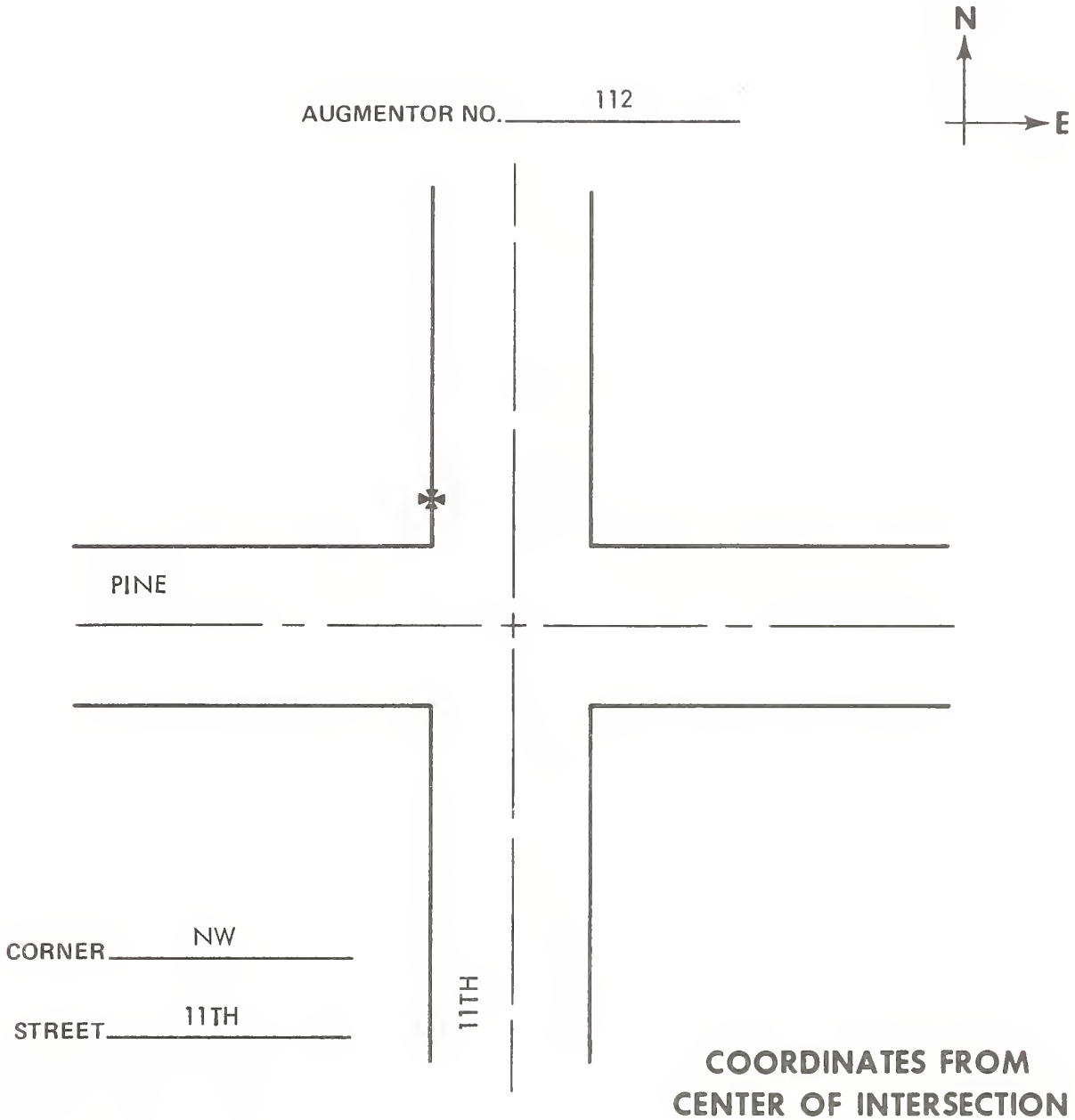
STREET 11TH

COORDINATES FROM CENTER OF INTERSECTION

28 FT NORTH
15 FT WEST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 112



CORNER NW

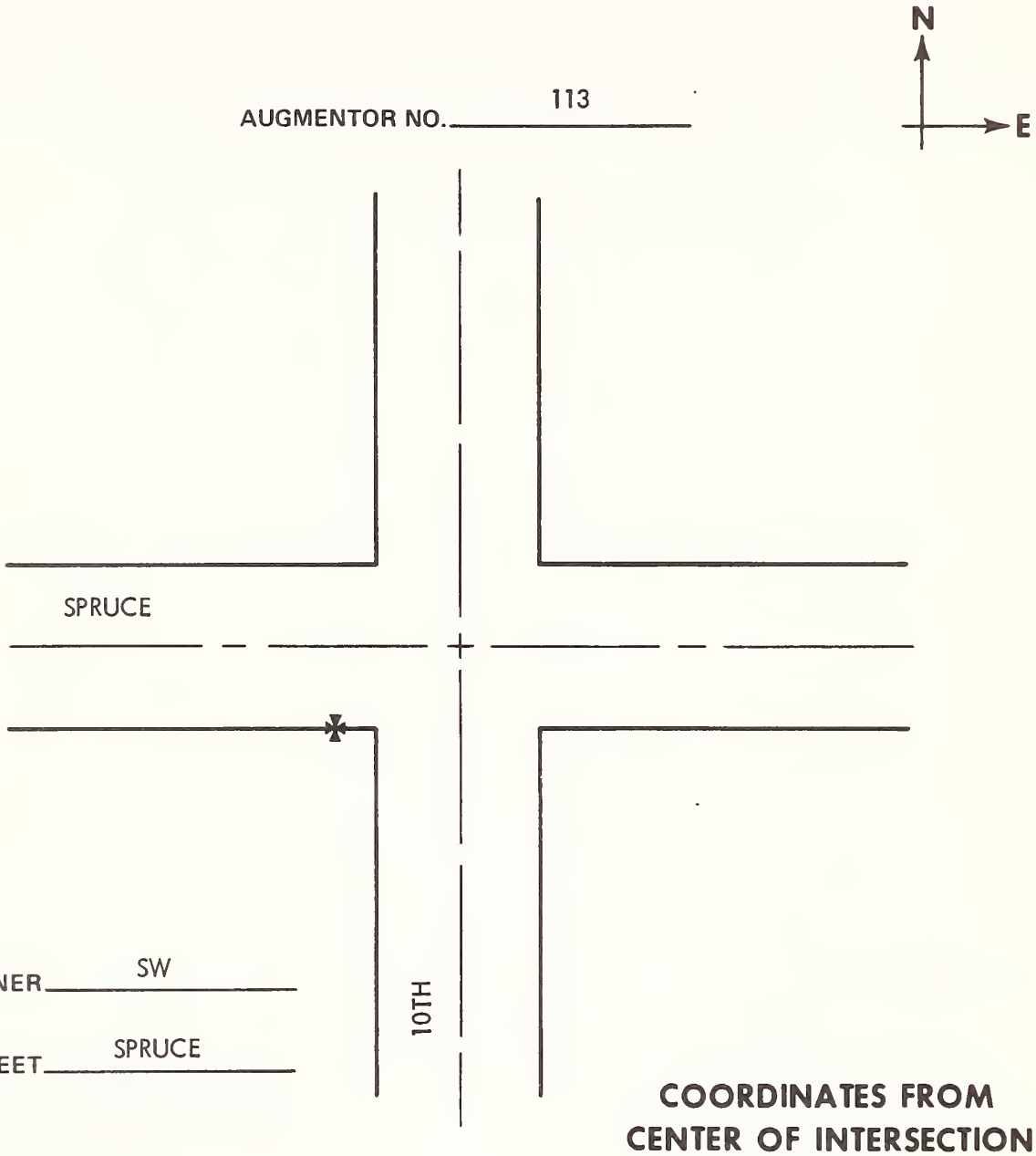
STREET 11TH

COORDINATES FROM CENTER OF INTERSECTION

26 FT NORTH
15 FT WEST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 113



CORNER SW

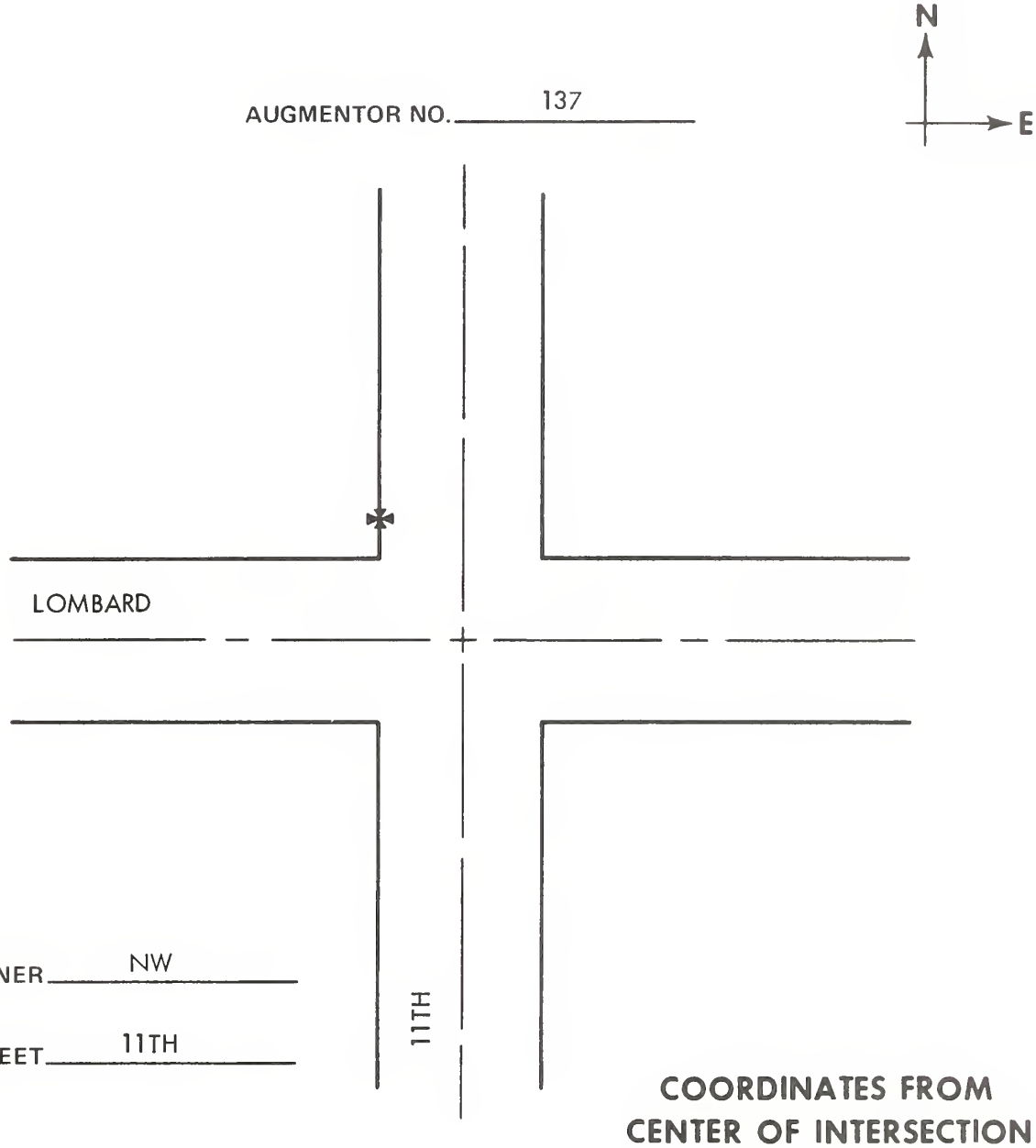
STREET SPRUCE

COORDINATES FROM CENTER OF INTERSECTION

16 FT SOUTH
23 FT WEST

AUGMENTOR LOCATION DESCRIPTION

AUGMENTOR NO. 137



CORNER NW

STREET 11TH

COORDINATES FROM CENTER OF INTERSECTION

25 FT NORTH
15 FT WEST

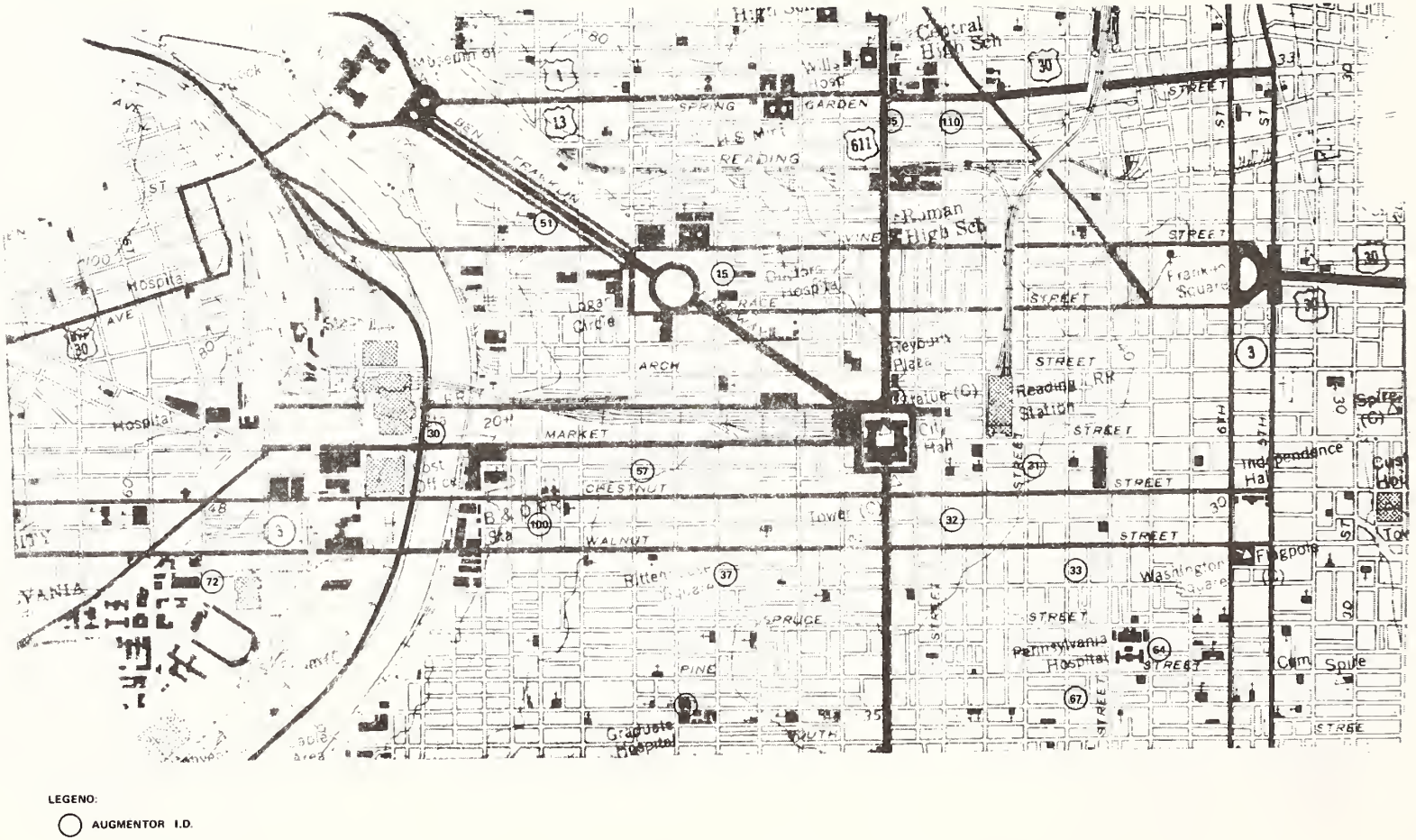


Figure C-1. Fixed Route Augmentor Deployment

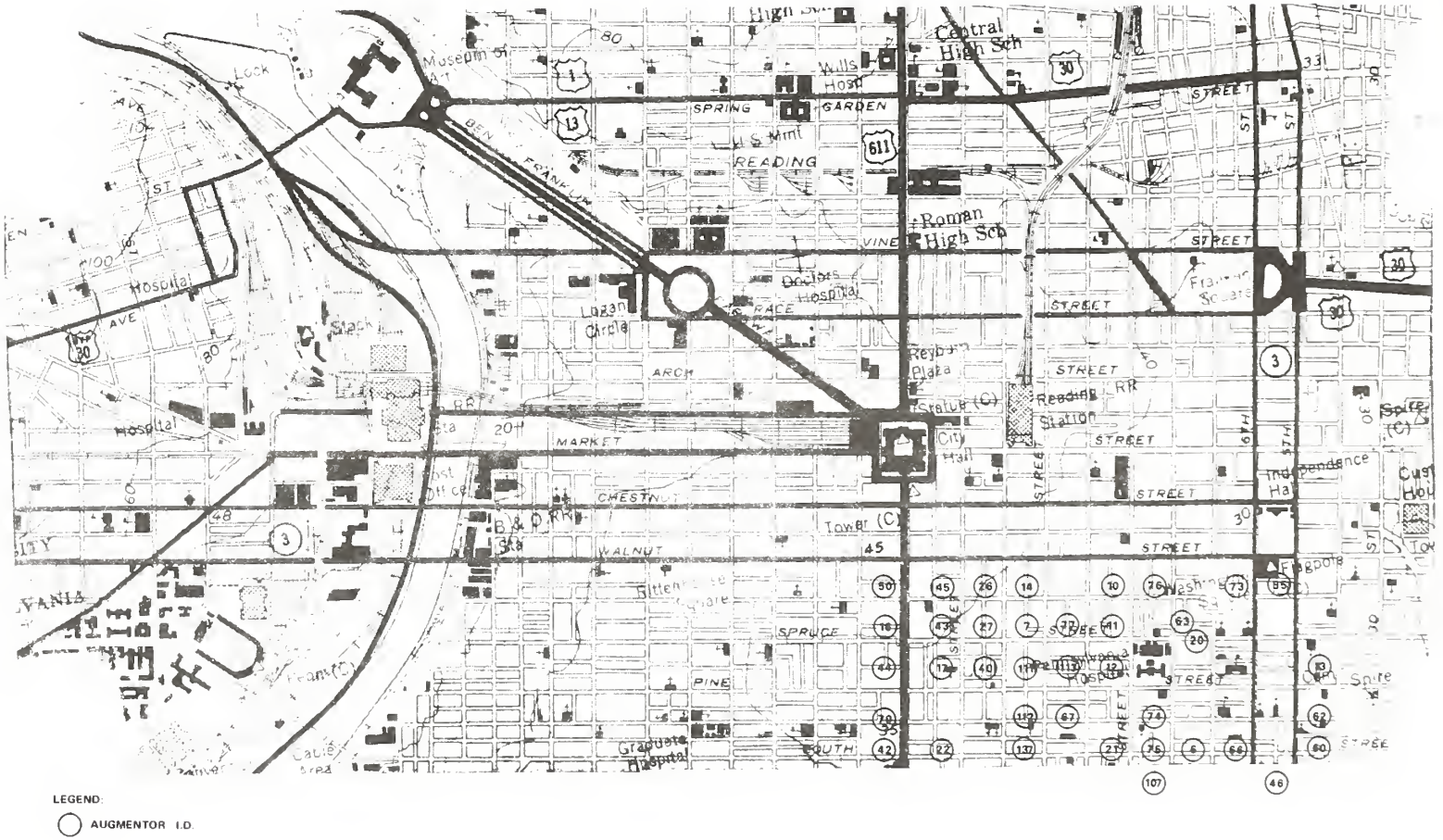
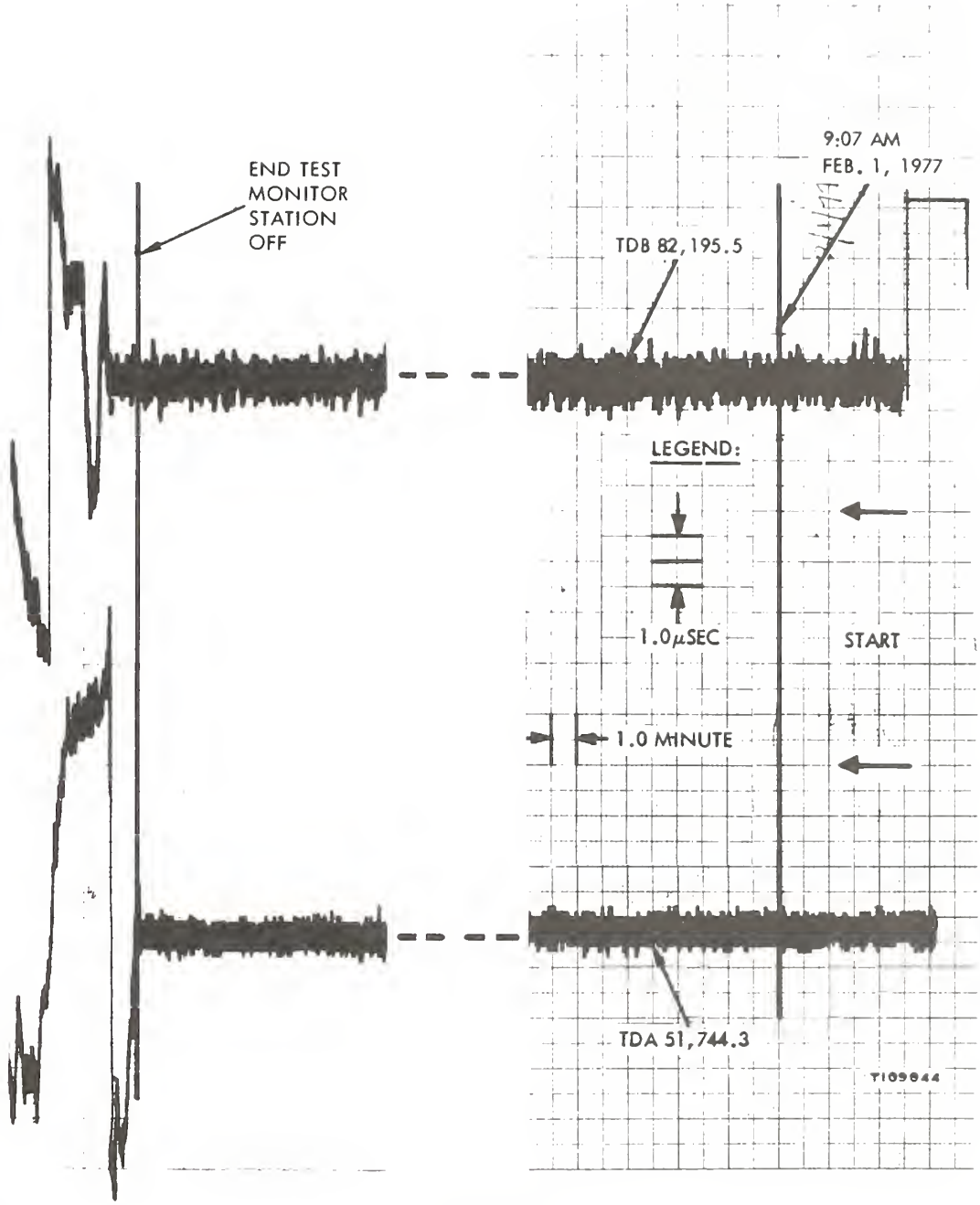


Figure C-2. Random Route Augmentor Deployment

APPENDIX D - TYPICAL MONITOR STATION STRIP CHART RECORDING

The following stripchart recording is for February 1, 1977 and is a sample of the type of monitor station data recorded during a day's test. The legend and calibrated values are given on the chart for its interpretation.



APPENDIX E - REPORT OF INVENTIONS

After a diligent review of the work performed under this contract, no new innovation, or discovery was made. However, in the process of implementing such a comprehensive test, there were improvements in that a great deal of practical experience was gained. The severe winter of 1976-77 exposed a deficiency in augmentor circuit design. The test itself could have had additional self-checks to preclude taking data when the AVM system was not operational. The software could have contained a self-analysis routine which would have prevented contaminated data from being melded with good data. All the experience gained is directly applicable to the Phase II program. In summary, a list of technical areas in which valuable experience was gained is given below:

1. The time required to install and adjust wayside devices under difficult conditions should not be underestimated.
2. A self-test or built-in Go/No-Go test capability would be highly desirable.
3. A reliable method of sensing vehicle heading would greatly simplify the random route software.
4. Augmentor range becomes difficult to control at elevations of greater than 15 feet.
5. An odometer 'reasonableness check' will prevent some large errors in the random route software.
6. Time of passage errors can be significantly reduced by integrating the odometer and a door open/closed sensor.
7. In areas of reasonable LORAN signal coverage, the LORAN only location subsystem will exceed the specified accuracy requirement.

☆U.S. GOVERNMENT PRINTING OFFICE: 1977—701-737/196

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