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Survey Plans and Data Collection and Analysis Methodologies: Results of a Pre-survey for the Magnitude and Extent of the Lead Based Paint Hazard in Housing

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Final Report

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Contents

Contents (cont.)

Abstract

A pilot survey of housing in Washington, D.C. was carried out in order to develop and test methodologies, data collection procedures and formats that will be used in subsequent full scale surveys of cities to determine the magnitude and extent of the lead-based paint hazard in housing.

On site measurements of lead contents of interior and exterior surfaces were made (with portable x-ray fluorescence lead detectors, hereafter referred to as XRF's) on 115 dwelling units which were randomly selected from a Washington, D.C. city directory.

This report describes the procedures for identifying the survey sample, drawing the sample, and carrying out the survey. Computer programs for data handling and analysis are included and a brief summary of the data obtained from the pilot survey is presented.

Key Words: Housing; housing survey; lead; lead hazard; lead paint; lead poisoning; survey; urban health problems.

Survey Plans and Data Collection and Analysis Methodologies: Results of a Pre-Survey for the Magnitude and Extent of the Lead Based Paint Hazard in Housing

1. Introduction

Lead poisoning in children has been a serious health problem for many years although its magnitude has not been universally recognized until very recently. It is easy for lead poisoning to be misdiagnosed or even unnoticed since its initial symptoms are very non-specific; they include nausea, vomiting, abdominal pain, constipation, anemia, irritability, anorexia, and listlessness. The disease, if untreated, may lead to central nervous system involvement and result in blindness, paralysis, mental retardation and death; less severe cases may leave the victim with learning problems, partial loss of sensory perception, and behavioral and other emotional difficulties. These insidious characteristics, and the fact that there are an estimated 600,000 children in the United States with elevated blood lead levels* point up the gravity of the lead poisoning problem.

It is generally assumed that the primary cause of lead poisoning among children is the ingestion of lead based paints from surfaces of residences. But even though the cause of lead poisoning has been identified (at least by conventional wisdom), virtually all of the efforts to determine the extent of the hazard have been follow ups to the location and treatment of lead poisoning victims. There has been

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* Gilsinn, Judith F., Estimates of the Nature and Extent of Lead Paint Poisoning In the United States, NBS Technical Note 746.

no research performed which was scientifically designed to identify, measure, or characterize the actual or potential hazard due to lead based paint in dwelling units.

A Washington, D.C. pre-survey was designed and executed as a microcosm of a large scale survey for determining the magnitude and extent of the lead based paint hazard in dwelling units. The feasibility of such a survey was assumed; our primary objective, aside from the validation of parameter estimates, was to determine (and develop, if necessary) the most practical and efficient means of performing each of the aspects of a large survey. These aspects ranged from sample design through development of computer programs for editing and analysis of the data collected.

Several of the data analyses are presented, but their usefulness is serendipitous; the real objective being the development and refinement of procedures and mechanisms for use in a large scale survey.

2. Sampling Plan

There are three reasonable approaches for determining the magnitude of the lead-based paint hazard in housing. The first is to develop a mathematical model and use previously published demographic and housing data to calculate the hazard*. Unfortunately, there is not enough known about the distribution of lead-based paint to make this approach feasible. It is conceivable (but by no means certain) that such methodology can be developed as appropriate data become available.

A second approach is the 100% census of all units; this method can be discarded immediately on the basis of cost. A conservative estimate of cost is $10 per dwelling unit for data collection alone.

The one reasonable alternative is use of a statistical sample. Obviously all the housing stock within a city is not homogeneous with respect to all possible predictors of the existence of lead based paint. This fact forces the stratification of the sample into cells in a way based on the general criteria:

1. Cells should be compatible with those commonly used in previously published housing data.
2. Cells should be as nearly homogeneous as practicable with respect to all attributes which are predictors of lead-based paint.
3. The number of cells should be as small as is practicable.

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* This approach was used quite successfully (NBS Technical Note 746) for estimating the extent of lead poisoning in the United States.

The cells which have been tentatively selected are defined combinations of age of unit, occupancy class (by number of families) and whether occupancy is by owner or renter.

Not all combinations are required; none are precluded by limitation of data collected. The age categories are:

1. pre 1940
2. 1940 through 1959
3. 1960 to present

These categories are consistent with Bureau of the Census data (Metropolitan Housing Characteristics HC(2) - 232) and correspond to eras which differed as to the technological restrictions and/or legal requirements for the lead content of paint.

The occupancy class categories (identical to those of Bureau of the Census, Detailed Housing Characteristics HC(10) - B1) are:

1. Single family detached
2. Single family attached
3. Two to four families
4. Five to nine families
5. Ten to nineteen families
6. Twenty to forty-nine families
7. Fifty or more families.

It is expected that different maintenance (including painting) practices will have been followed for different sizes of buildings.

A likely cell configuration is shown below:

Age of Dwelling Units

		Pre 1940	1940-1959	1960-1973
Single Family	Owner			
	Renter			
Two to Four Units				
Five to Nineteen Units				
Twenty or More Units				

Assume P% of the dwelling units in a cell have a specified characteristic (incidence of lead based paint, for example), and it is necessary to estimate P at the M% confidence level* (i.e. M% of the time P is correct to within $\pm$T%), the required sample size S is given by:

$$S = \frac{K^2 P(100-P)}{T^2}$$

where K is dependent upon M. For any "large" population, S is independent of the cell population and attains its maximum at P = 50%. By way of illustration, assume T = 5% and M = 95% (for M = 95%, K = 1.96 which is rounded to 2.0 for computational convenience). Then

$$S = \frac{4\ P(100-P)}{25}$$

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* Cochran, William G., Sampling Techniques, John Wiley & Sons, Inc., New York, 1953, p. 51.

For representative values of P, S is:

P = 10%; (100-P) = 90%	S = 144
P = 20%; (100-P) = 80%	S = 256
P = 30%; (100-P) = 70%	S = 336
P = 40%; (100-P) = 60%	S = 384
P = 50%; (100-P) = 50%	S = 400
P = 60%; (100-P) = 40%	S = 384
P = 70%; (100-P) = 30%	S = 336
P = 80% (100-P) = 20%	S = 256
P = 90%; (100-P) = 10%	S = 144

Note that S is symmetric about P = 50% and has its maximum value there, (i.e. P = 10% and P = 90% the sample size is identical). An estimate of P = 50% is always safe although it may be expensive.

An adjustment may be made for small populations* by:

$$S_A = \frac{S}{1+\frac{S-1}{N}}$$

where S is the original estimate, N is the population size, and S_A is the adjusted sample size.

To illustrate the value (in cost savings) of this adjustment procedure, the following S_A values are calculated for various values of N with S = 400:

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* Cochran, William G., Sampling Techniques, John Wiley & Sons, Inc., New York, 1953, p. 55.

N	S_A
100	81
200	134
300	172
400	200
500	222
750	261
1,000	286
10,000	385
100,000	399
1,000,000	400

The sample size estimate should be determined independently for each cell using the best available prior estimates of P and of the cell population. If at some point in the survey the value of P is different from the estimated value that was used initially, then the size of the sample for that cell should be adjusted. In this way oversampling can be avoided.

3. Data Collection Form

The intent in designing the data collection form (see Appendix A) was to achieve an "overdesign". This was felt to be desirable for the following reasons:

1. Data should be compatible with published housing data.
2. The lead-based paint "hazard" is susceptible to various definitions. The data should be amenable to selection and aggregation according to any likely definition of "hazard".
3. The nature of the data to be collected is such that there is little intrinsic redundancy,
4. Little is known about the distribution of lead-based paint within dwelling units; it is conceivable that the distribution of lead within the dwelling units may be of as much interest as its distribution among dwelling units.
5. Incremental cost of extra readings is low.
6. The data collections form is the reporting instrument from field collection to local management and from local management to NBS.
7. The data collected is a useful data base for estimating costs of deleading.

Aside from the content of the form, a primary goal of form design was to ease conceptually and mechanically the task of the survey team. Other goals were to provide an instrument useful to survey administration and convenient for automated data processing use.

The final version of the data collection form is believed to be acceptable on all counts.

4. Drawing of Sample

A specific procedure for drawing the sample population of dwelling units for a city survey is given in section 7.1.

The basic ingredient required for the drawing of a good sample is an address list containing each current dwelling unit of the population. Unfortunately such a list is not likely to exist; some alternatives must be investigated.

A list approximating that required may exist or be derivable from tax assessor's records or real estate transaction records. There is high probability that such a list would be oriented to tracts or buildings rather then dwelling units.

Another potential source is Bureau of Census tapes. However, use of nonaggregated census data involves severe confidentiality problems as well as the technical problems (selection criteria, disaggregation, sorting, etc.) of producing a dwelling unit list.

A third source is the commercially published city directory such as "R. L. Polk City Directories" or "Lusk Assessment Directories", which exist for most cities.

One difficulty common to any of the lists is that of being out of date; subsequent to preparation of the list, some dwelling units will have been razed, some will have been constructed, and there will have been conversions to and from residential use from and to nonresidential use. A second common difficulty is that none of the available or producible lists are amenable to drawing of samples by cell (as defined in section 2.), but this can be overcome by proper sampling methodology.

Both the City Directory and the tax lists have a bias due to the known tendency for surreptitious conversions which increase the number of dwelling units per building. Nevertheless, a city directory is believed to be a "good" source for generation of samples. The directory used for the Washington, D.C. work was the "R. L. Polk City Directory" and the sample was drawn manually. This procedure was adequate but the use of the computer program subsequently developed (and described in section 7.1.) will produce samples more economically and efficiently.

5. Survey Manual

One of the important products of the pre-survey was a Survey Manual which is intended to be sufficiently comprehensive to serve any city performing a similar survey. This Manual will be published by NBS as a separate document.

A first draft of the Manual was written before the pre-survey began. It was considered a "living" document and was continually modified and refined as experience dictated. The Manual contains enough information about statistical methodology to be self-contained in that respect, but is oriented primarily toward the mechanics of performing a survey.

6. Washington, D.C. Sample

For the Washington, D.C. pre-survey, a sample of 233 dwelling units was drawn manually using the "R. L. Polk City Directory" for 1968 as a population list. Table 6-1 shows the outline of attempted units by ZIP code.

For the total units on which data were collected, table 6-2 shows their breakdown by occupancy class and age of unit.

Table 6-3 compares the characteristics of dwelling units appearing in the pre-survey with those indicated by 1970 census data by occupancy class and age of unit.

Table 6-4 defines (using 1970 census data for cell population, and probabilities of hazard as derived from data collected - Appendix B) for alternative definitions of what constitutes a hazard.* S is the sample size** for the worst case (maximum sample size); this occurs when P, the probability that a hazard exists, is 50%. S_1 is the sample size required for P_1 defined as the probability that there exists at least one surface within a dwelling unit which has a lead content of 1.0 mg/cm^2 or more. S_2 is the sample size required for P_2 defined as the probability that there exists at least one surface within a dwelling unit which has a lead content of 2.0 mg/cm^2 or more.

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* There is no accepted definition of "hazard" in terms of mg/cm^2 of lead, condition of surface and/or substrate and/or location within dwelling unit. The definitions for hazard here are for illustration only. A firm definition is required before a large scale survey can be executed.

** Sample size is predicated on 95% confidence $\pm$5%.

Table 6-1. Status of Sample Dwelling Units by Zip Codes

Status	Code	20001	20002	20003	20004	20005	20006	20007	20008	20009	20010	20011	20012	20015	20016	20017	20018	20019	20020	20024	20032	20036	20037	Total #	Total %
Completed Measurements	1	3	14	2		6		6	8	9	8	15	2	1	11		2	8	9	3	6		2	115	49.4
Occupant Not Home	2	2	3	1		2		3	3	4	1	3	3	1	3	1	1		5	2	3	1	42	42	18.0
Refusal	3	2		2			4	2	5		2	2	2	1	1	2	2	3	1		2	1	1	35	15.0
Non-Existing Address	4	1					1			1		1					3			1	1			9	3.9
Abandoned Property	5	3																						3	1.3
Under Construction	6	1																	1		1			3	1.3
Demolished Property	7					1													1			1		3	1.3
New Structure or Converted	8					1		1										1						3	1.3
Lobby Entrance Locked, Unattended	9		1							1		2							1	2				7	3.0
Inconvenient Timing	10			1					1	3	2	0				1		1				3	1	13	5.6
Total #		12	18	6	0	10	5	12	17	18	13	23	7	3	15	4	8	13	18	8	13	6	4	233	
Total %		5.2	7.7	2.6	0.0	4.3	2.1	5.2	7.3	7.7	5.6	9.9	3.0	1.3	6.4	1.7	3.4	5.6	7.7	3.4	5.6	2.6	1.7		100.0

Table 6-2. Types of Dwelling Units by Occupancy Type and Age of Structure

	Owner Occupied Housing				Renter Occupied Housing				Total
	1939 or Earlier	1940 to 1959	1960 to Present	Total	1939 or Earlier	1940 to 1959	1960 to Present	Total	
Single family detached	8	7	1	16	5	0	0	5	21
Single family attached	14	2	0	16	9	4	0	13	29
2 to 4 Families	0	0	0	0	5	1	0	6	6
5 to 9 Families	1	0	0	1	3	2	1	6	7
10 to 19 Families	0	0	0	0	7	6	3	16	16
20 to 49 Families	0	0	0	0	4	0	2	6	6
50 or more Families	1	0	0	1	12	7	10	29	30
Total	24	9	1	34	45	20	16	81	115

Table 6-3. Distribution of Housing Units: 1970 Census Data* Compared with Data from the 1973 Lead Paint Survey

	Census Bureau		Lead Paint Survey		% Difference
All Housing	278390	%	115	%	
Owner Occupied Housing	74054	26.6	34	29.6	+3
Single Detached	28326	10.2	16	13.9	+3.7
Single Attached	38398	13.8	16	13.9	+0.1
2 to 4	2587	.9	0	.0	-0.9
5 or more	4587	1.6	2	1.7	+0.1
Renter Occupied Housing	188484	67.7	81	70.4	+2.7
Single Detached	7377	2.6	5	4.3	+1.7
Single Attached	24489	8.8	13	11.3	+2.5
2 to 4	28874	10.4	6	5.2	-5.2
5 to 9	20244	7.3	6	5.2	-2.1
10 to 19	35541	12.8	16	13.9	+1.1
20 to 49	18478	6.6	6	5.2	-1.4
50 or more	53391	19.2	29	25.2	+6
1939 or Earlier (Total)	130764	47.0	69	60.0	+13.0
Owner	44532	16.0	24	20.9	+4.9
Renter	78224	28.1	45	39.1	+11.0
1940 to 1959 (Total)	103756	37.3	29	25.2	-12.1
Owner	25220	9.1	9	7.8	1.3
Renter	72959	26.2	20	17.4	-8.8
1960 to Present	43870	15.8	17	14.8	-1.0
Owner	4302	1.5	1	0.9	-.6
Renter	37301	13.4	16	13.9	+.5

* U.S. Bureau of the Census, Census of Housing: 1970 Detailed Housing Characteristics, Final Report HC(1)-B1 United States Summary

Table 6-4. Sample Size Required By Cell
for Alternate Definitions of Hazard

	Pre-1940				1940-1959				1960-Present			
		P	P_1	P_2		P	P_1	P_2		P	P_1	P_2
	N	50	100	81	N	50	92	58	N	50	65	18
Owner Occupied												
Single Family	40386				23530				2808			
S		397				394				341		
S_1			0				118				323	
S_2				246				384				219
Two or More Family	4122				1653				1399			
S		361				321				310		
S_1			0				111				290	
S_2				234				316				203
Renter Occupied												
Single Family	17884				10887				3095			
S		393				388				354		
S_1			0				117				326	
S_2				244				377				221
Two to Four Family	15856				11951				1067			
S		392				388				292		
S_1			0				117				272	
S_2				244				378				195
Five to Nineteen	17482				24696				13637			
S		393				394				391		
S_1			0				118				355	
S_2				244				384				233
Twenty or More	26937				25436				19496			
S		394				394				393		
S_1			0				118				358	
S_2				245				385				235
Totals												
S = 6690		2330				2279				2081		
S_1 = 2623			0				699				1924	
S_2 = 3987				1457				2224				1306

7. Computer Programs

The computer programs described below would not have been developed just for the Washington, D.C. survey. The amount of data gathered was not sufficient to justify the effort of computer program development. Appendices B, C, D, and E contain sample results and the computer program listings.

This effort was undertaken in line with the understanding that the Washington, D.C. survey was a precursor of a large scale survey; suitable computer programs are indispensable for such a survey.

Additional programs may be required, and the existing ones may require modification if preliminary analyses indicate the desirability of additional analyses.

7.1. Sample Generator

This computer program is reported here for convenience. Although the program was not used during the Washington, D.C. pre-survey, it was prepared as an element of computer program support to be used in subsequent city surveys. The need for such a program became obvious during the pre-survey; the time and effort required for manually drawing a sample, and for maintaining records adequate for preventing duplication of entries became excessive.

The sample generator creates a set of samples from a hard copy directory. It is parameterized so that any directory may be used. The parameters are:

1. Page number of first page containing addresses (must be $\geq$ 1 and <1024)
2. Page number of last page containing addresses (must be $\geq$ 1 and <1024)

3. Number of columns per page (must be ≥ 1 and <8)

4. Number of lines per page (must be ≥ 1 and <512)

5. Size of first sample (must be ≤ 8160; the number of addresses in the sample produced will be the least multiple of 160 which is greater than or equal to the size specified).

The program generates 8191 triples, every triple being a set of indices each of which is randomly selected, denoting page, column and line of the directory. Duplicates are eliminated and the first sample is sorted by order of appearance in the directory and printed. This is the original sample to be used in the survey. The remainder of the triples are then sorted by 40-entry blocks into directory order and these samples are printed. (Examples of each sample type appear in Appendix C).

Each of the samples thus generated is a random sample, as is any combination of these samples. If any entry from a sample is used, then the entire sample must be used in order to preserve the validity (absence of bias) of the procedure.

In using the samples, the entire first sample is used to start a survey. Some, because of directory anomalies such as short pages, commerical addresses, blank lines, etc., can be identified in advance as not denoting dwelling units; others will be found, in the field, to denote non-existent or nonresidential buildings. If the remaining sample is smaller than that required, one or more of the 40-entry samples must be added to the survey sample. This process of adding 40-entry samples to the survey sample may be iterated until the survey sample is of sufficient size for the desired confidence level.

The program consists of a main program (DIRECT) and a subroutine (SORT) both written in FORTRAN V, and a function subroutine (RAND) in assembly language. The FORTRAN programs should be readily transportable to any computer system of sufficient size with word length of 36 bits or more. On other systems RAND must be replaced by some function* which calculates a random variable X, $0 \leq X < 1$, with a statement:

X = RANDNO (0, SEED)

where SEED is changed within the function subroutine to advance the random variable with successive calls. The method used in RAND is the conventional multiplicative one which requires input of a starting value of SEED and provides for generation of a different sequence of random variables on subsequent runs by printing the last value of SEED at run termination.

Required Input

1. Seed & sentinel (Format 30I3)
    a. High order part of SEED
    b. Low order part of SEED
    c. Sentinel of binary 1's (377777777777)
2. Directory Parameters (Format 515)
    a. IPS (number of starting page)
    b. IPN (number of last page)
    c. IC (number of columns/page)
    d. IL (number of lines/page)
    e. IFIRST (size of first sample)

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* Mihram, G. Arthur, Simulation: Statistical Foundations and Methods, Academic Press, New York, 1972.

Output:

INPUT PRINT

α_1 α_2 α_3

β_1 β_2 β_3 β_4 β_5

NEXT VALUE OF SEED γ_1 γ_2 THERE ARE δ UNIQUE UNITS

followed by the samples generated.

α_1 is 12 character octal high order part of initial SEED

α_2 is 12 character octal low order part of initial SEED

α_3 is 377777777777 (α_1 -α_3 are print back of seed & sentinel input)

β_1 is IPS

β_2 is IPN

β_3 is IC

β_4 is IL

β_5 is IFIRST (β_1 -β_5 are print back of directory parameters.)

γ_1 is 12 character octal high order part of last SEED

γ_2 is 12 character octal low order part of last SEED

δ is the number of distinct units in the 8191 unit sample after duplicates have been eliminated.

7.2. Edit Program

Although there is little redundancy in the data on the data collection forms, it was believed essential to edit those collected data before analysis programs were run. The edit program, using a punched card version of the data collection for an input, produces a "clean" file; all entries are processable.

XRF readings are "corrected" according to the calibration parameters of the instrument being used. In addition, each data field of input which appears to the program either in error within itself or to be inconsistent with other data fields from the same form is printed as a computer output facsimile input record with indicators as to the error suspected by the program.

The suspect data are replaced by default values; there is a simple mechanism for removal, replacement or deletion from the clean file. Certain default values are inserted automatically by EDIT. (For example, a blank in the data collection form's column which denotes room condition is defaulted to "good".)

In practice, EDIT will be run for a group of data collection forms; outputs will be : (a) summary by dwelling unit types; (b) number of lines entered, etc.; (c) an error file; and (d) a "clean" output file.

The summary is useful for both control and reconciliation. The error file indicates which entries must be checked manually. The clean file may be used for analysis with the user knowing full well that some data in the clean file may have "default values". It is thus possible

to get an intermediate data file very rapidly with updating done subsequently as convenient.

7.3. Histogram Program

The program HIST is used with the subroutine TABULA to produce histograms of lead levels within an individual cell (or specified combination of cells). The intervals used are: 0.0 through 1.0 by steps of .2 mg/cm^2, 1.0 through 3.0 by steps of .5 mg/cm^2, 3.0 through 5.0 by steps of 1.0 mg/cm^2, 5.0 through 10.0 by steps of 2.5 mg/cm^2 and 10.0 and over. These intervals are not parameterized but fixed in the program.

The allowable "universes" for the histograms are fixed by the program; they consist of each possible combination of age of unit and occupancy class as they are defined on the data collection form, plus totals and selected subtotals. Each selection criterion causes the generation of 68 histograms plus some summary statistics for each. These data appear as a five page report (see Appendix E for an example). All pages contain a page number and a test heading describing the selection criteria used.

Page 1 contains histograms for all dwelling units (DU's) built prior to 1940 (major heading "TO 39"); column headings are lead level intervals. The occupancy classes appear as minor line headings. Abbreviations used in computer reports appear in parentheses with respective occupancy class definitions. Occupancy classes which do not appear explicitly on the data collection form are indicated by *:

Single-Detached-Owner Occupied*	(S-D-O)
Single-Detached Renter Occupied*	(S-D-R)
Single-Detached	(S-D)
Single-Attached-Owner Occupied*	(S-A-O)
Single-Attached-Renter Occupied*	(S-A-R)
Single-Attached	(S-A)
Single*	(SINGLE)
Two to Four Unit/Building	(2-4)
Five to Nine Units/Building	(5-9)
Two to Nine Units/Building*	(2-9)
Ten to Nineteen Units/Building	(10-19)
Twenty to Forty Nine Units/Building	(20-49)
Fifty or more Units/Building	(50+)
Ten or more Units/Building*	(10-50+)
Two or more Units/Building*	(2-50)
Unknown occupancy class	(UNKWN)
All Units*	(TOTAL)

Pages 2, 3, and 4 have the same format as page 1. These data are for the different age categories: 1940 through 1959 (major heading "40-59"), 1960 and after (major heading "60-73"), and all units (major heading "00-73") respectively.

Page 5 contains the number of entries, mean and standard deviation for each cell. The major headings for pages 1-4 (year built) are the column headings for this page.

The selection criteria are only partially parameterized. Parameterization includes a selection on CONDITION, the choices being: all conditions,

good for substrate and surface with no water damage, and not good (either substrate and/or surface is not good and/or there is indication of water damage); and a selection by room type (any single room type or any room types which appear consecutively on the data collection form).

Other selection criteria have been used but by modification of the program.

Criteria which have been used are:

A. Unit Room element

1. Walls

All Walls

High wall/room

2. Trim

All

High trim/room

All Doors

B. Room categories (with room indices as on data collection form)

1. All rooms (11-73)
2. Living rooms (11)
3. Living, dining & family rooms (11-13)
4. Kitchens (21)
5. Bathrooms (31-32)
6. Adult's Bedrooms (41-43)
7. Children's Bedrooms (51-53)
8. All Bedrooms (41-53)

C. Condition Criterion

1. All

2. Good

3. Not good

D. Others

1. High Wall/DU

2. High trim/DU

3. High reading/DU

The capability exists to use types of "and-or" combinations with little or no change to the existing programs.

Appendix E contains a program listing and sample results. The figures and tables of Appendix B were derived from output of this program.

8. Feedbacks and Judgment Factors

Sections 2, 3, 4, 5, and 7 and the appendices of this report describe, in a rather academic manner, procedures for performing major elements of a lead-based paint survey; the feedback from the knowledge gained in performing the pre-survey is implicit. For most of the products described, there was extensive modification from the initial conceptualization to the final version.

For the survey manual, prescriptions or recipes for all of the elements of a survey were required. Where appropriate, these prescriptions have the same content (with different orientation) as the sections and appendices of this report. Other areas required prescriptions based on subjective judgment of the NBS personnel who performed the pre-survey.

8.1. Dwelling Accessibility

It is believed that NBS experience in gaining access to dwelling units represents a "worst case" when compared to the access rate which can be expected in a full scale survey performed by a local government agency. The refusal rate of 15% (table 6-1) of the total sample is higher than that usually considered acceptable.* It is believed that a local agency will do much better with respect to refusals for several reasons:

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* Hansen, Morris H., Hurwitz, William U., and Madow, William G., Sample Survey Methods and Theory, Vol. I, Methods and Applications.

1. The geographic density of the units in the sample will be high compared to the pre-survey. (Samples size for a Washington, D.C. survey would be about 2% of the population or one unit in fifty.) Word of mouth in the neighborhoods after a survey is in progress should tend to allay the fear and suspicion of the resident. Fear was believed to be the dominant motive for refusal of entry in the pre-survey.

2. The magnitude of a large scale survey will justify media coverage. Cooperation from newspapers and radio and television stations whether as news or public service items should tend to allay fear and suspicion of the resident and encourage the cooperation of the populace. In the pre-survey it was noted that residents of poorer neighborhoods were more cooperative and less suspicious of the survey crews than residents of more affluent neighborhoods. Residents of the poorer neighborhoods seemed to be much more aware of lead-based paint as a hazard; this we attributed to the educational and screening programs which have been and are being carried out by the D.C. government (Accident Prevention Bureau of the Department of Human Resources).

3. It is expected that the local agency performing the survey will be one with an inspection authority or at least a perceived inspection authority.

8.2. XRF Adequacy

Some of the characteristics of the XRF instruments had to be verified to determine the practicality of a large scale survey. These were:

1. The number of readings between charges.
2. Ability to survive and function in field rather than laboratory use.
3. Accuracy.
4. Amenability to calibration by relatively unskilled personnel.

The number of readings between charges could perhaps be the limiting factor for the number of dwelling units which can be measured in a day. If this is the limiting factor, the limitation is not severe; based on the pre-survey, the instrument is capable of measuring six to eight dwelling units between charges. This is about the number of units a single survey team could expect to visit in a work day. The number of units measurable could be extended by use of a charger in the automobile used by the survey team.

The XRF instrument showed sufficient reliability and durability for use in the field. There were some instrument malfunctions during the pre-survey, but "down" time was not a major problem. Instrument malfunctions were either complete failures or were accompanied by obvious indicators of malfunction (at least as far as is known). Such graceful degradation is quite important since the inability to collect data is much less severe than the collection of erroneous data. One spare instrument for six or eight survey teams should assure that excessive time will not be lost due to instrument failure.

The accuracy* of the XRF's is less than one would like particularly in the critical 0 to 2.0 mg/cm^2 range. There is some evidence also of a drift as a function of temperature**. In spite of these limitations, there is no alternative technology for performing a large survey which is competitive in terms of cost effectiveness.

The calibration procedure (Appendix F) is relatively simple and quite rapid; it imposes no excessive limitation either as to time required or personnel prerequisites. Implicit in the advocacy of this procedure is the assumption that an additional "correction" procedure (as in Edit Program, section 7.2) is to be used in data reduction.

8.3. Cost

The actual measurement time required per unit for the pre-survey was about 30 minutes. Times were fairly constant ranging from a minimum of 20 minutes to a maximum of 51 minutes. Questionnaire data collection was concurrent with and always less time consuming than the taking of measurements. Travel time, both that between successive units and that to and from Washington, D.C. was quite high for the pre-survey.

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* Spurgeon, Joe C., Response Characteristics of a Portable X-Ray Fluorescence Lead Detector: Detection of Lead in Paint, NBSIR 72-231, June 1973.

** Street, William G., NBS Lead Paint Project, Private Communication.

Inter-unit travel time was quite variable ranging from a few minutes to more than an hour. Travel time to the survey area from NBS was consistently high. Both of these time components are believed to have been "worst" case for the pre-survey. It is difficult to conceive of a facility more remotely located than NBS; the inter-unit time for the pre-survey was a natural result of a small sample from a widely dispersed population. For a larger sample, the travel time can be cut dramatically because of the density of the sample with respect to geographic area and also by improvement of single day itineraries. (Reasonable itineraries are a natural consequence of the use of the Sample Generator Program since the city directories are in address order.) It is believed that six dwelling units per day is a reasonable goal for performing a survey; this should allow for daily calibration of the XRF, travel to and from the survey area, inter-unit travel, and survey execution.

Other personnel costs are for administrative/clerical support and for supervisors. At least one administrator/clerk is required on a full time basis for handling mail, sample control, scheduling call-backs, and in general supplying the survey teams a base of operations. The supervisory requirements could be met by full or part time people depending on the organization and managerial style of the agency performing the survey.

Training and orientation at the beginning of the survey should require three to five working days. The Survey Manual recommends a training schedule consisting of two days of classroom and laboratory work plus one day of field work for survey teams. Other survey personnel should require little additional training.

Other overhead components are automobile expenses for the survey crews, mail, telephone, and office space.

8.4. Resident Notification and Call-Back Procedures

Recommendations as to best procedure for resident notification and call-back procedures which appear in the Survey Manual represent the considered best judgment of NBS personnel involved in the pre-survey.

It is felt rather strongly that initial contact should be by letter rather than by telephone, and that the letter should be brief and concise. Several form letters were tried during the pre-survey and that which was believed most effective is included in the Survey Manual.

The call-back procedures recommended in the manual proved workable in the pre-survey. Other procedures may work equally well or better for a full scale survey performed by a local agency in some other city with different economic, geographic and demographic characteristics.

9. Summary and Conclusions

It is practicable to perform a large scale survey. A two man team can survey at least six DU's per eight hour work day. The cost per unit should be approximately 15 to 20 dollars per unit for an entire survey including local administration, local travel, training, start up costs etc.

The cost and nature of the analysis to which the collected data will be subjected are far more uncertain. The computer programs (section 7) which have been developed are fairly transportable (i.e., can be easily adapted to use computer systems other than the UNIVAC 1108), and may be used by any agency performing a survey. The ADP functions performed by these programs are conceptually fundamental. They also are those which are required very early in a survey: a sample selection procedure, data base construction, and some fairly general ways to select, aggregate, and present the data.

Computer generated reports (such as these in Appendices B and E) based on adequate samples will enable the development of more detailed insights into the characteristics of the lead-based paint hazard. Efforts to validate these insights and work out their consequences will require subjecting the data to additional analyses, the nature of which cannot now be predicted.

Appendix A - Data Collection Form

SERIAL NO.	LINE CODE	ZIP	ZERO	CALIBRATE	VISITATION	TRACT	BLOCK
	00						
ADDRESS	01						

		XRF	INSP NO	DAY	SEQ	TP	XS	ST	OC	YR	OR	M	P	S	CR	CC	EBLL
	02																

INTERIOR ROOMS		WALLS AND CEILING						TRIMMINGS						OTHER			
		COND	W1 RDG	W2 RDG	W3 RDG	W4 RDG	CLG RDG	COND	WINDOW NO	WINDOW RDG	DOOR NO	DOOR RDG	BASE-BOARD	FLOOR	RAD	CAB	FIRE-PLACE
LIVING	11																
DINING	12																
FAMILY	13																
KITCHEN	21																
BATH I	31																
BATH II	32																
BED I	1																
BED II	2																
BED III	3																
BASEMENT I	61																
BASEMENT II	62																
HALL	71																
FOYER-LOBBY	72																
STAIRWAY	73																

EXTERIOR		COND	RDG	COND	RDG
WALL	80				
PORCH	81				
DOOR	82				
WINDOW	83				
RAILING	84				
FENCE	85				
GARAGE	86				

*NUMBER OF ROOMS OR HALLWAYS NOT INCLUDED IN THIS SURVEY?

	ROOMS	HALLS	OTHER
90			

VISITATION CODES

1=COMPLETED
2=NOT HOME
3=REFUSAL
4=NO SUCH ADDRESS
5=ABANDONED
6=UNDER CONSTRUCTION
7=DEMOLISHED
8=NEW STRUCTURE/CONVERTED
9=LOBBY LOCKED
10=INCONVENIENT TIMING

Type of Construction (TP)
1 Frame
2 Masonry
3 Concrete

Outside Surface of Building (XS)
1 Wood Siding
2 Wood Shingle
3 Asbestos Shingle
4 Asphalt Siding
5 Brick or Stone
6 Stucco or Cement Block
7 Aluminum Siding

Occupancy (OC)
1 one-family detached
2 one-family attached
3 2 to 4 families
4 5 to 9 families
5 10 to 19 families
6 20 to 49 families
7 50 or more families

Year (YR)
1 1939 or Earlier, 2 1940 to 1959, 3 1960 to Present

MATERIAL & CONDITION SYMBOLS

BASE MATERIAL
P PLASTER
V VINYL
G GYPSUM BOARD
M MASONRY
T TILE
W WOOD
M METAL

WALL CONDITION
1 GOOD
2 FAIR
3 POOR
4 BAD
5 VERY BAD

WATER DAMAGE
Y SHOWS SIGNS

SURFACE
Q PEELING PAINT
C CRACKED, LOOSE OR BULGING PLASTER
B BROKEN PLASTER, HOLES

Appendix B

Cumulative Distribution of Data from Washington, D.C. Pre-Survey

For each graph (a set of cumulative distribution functions), there is a corresponding table.

The graphs are presented as follows:

1. The horizontal axis shows lead levels from zero to 10.0 mg/cm^2.
2. The vertical axis shows the percent of population.
3. For each point on a curve the ordinate indicates the percentage of surfaces in the population which indicated a lead level less than the value of the abscissa.

Figures 1-4, and 10 indicate that the older the unit, the higher the lead content for each of the four selection criteria. Further, figures 1 and 2 indicate relatively little variability of lead levels in the newer dwelling units. Figures 1 and 3 indicate that trim readings are higher than wall readings. Figures 1, 3, and 4 indicate that lead content of painted surfaces within a dwelling unit vary considerably in all age groups, but most markedly in the older units.

Figure 5 shows again that trim surfaces are higher in lead content than wall surfaces and also that there is more variability among trim areas than among wall surfaces.

Figures 6, 7, and 9 show that lead readings are highest in kitchens and lowest in living rooms; bathrooms have intermediate readings. Figure 8 indicates that walls in bad condition are likely to have higher lead content than walls in good condition.

TABULAR SUMMARY OF FIGURE 1

Table 1. All Walls, All Rooms, By Age Group - Condition All

Surface, Age Group and Total Number Measured	Cumulative Total Surfaces in (mg/cm^2) Intervals													
	.0-.1	.2-.3	.4-.5	.6-.7	.8-.9	1.0-1.4	1.5-1.9	2.0-2.4	2.5-2.9	3.0-3.9	4.0-4.9	5.0-7.4	7.5-9.9	10.0+
Walls Pre-1939 1309	489	623	739	840	936	1037	1087	1116	1130	1149	1168	1208	1239	1309
Walls 1940-1959 492	162	238	307	363	402	450	473	475	478	483	485	487	490	492
Walls 1960-1973 232	162	140	174	197	216	230	231	231	231	231	232	-	-	-
Walls 00-1973* 2044	756	1006	1227	1407	1564	1728	1802	1833	1850	1874	1896	1938	1972	2044

* The reported total number of surfaces measured in the 00-1973 class includes those surfaces from dwelling units of unknown age group. Thus, this total may be slightly more than the sum of the totals of the three age groups.

TABULAR SUMMARY OF FIGURE 2

Table 2. High Wall Per Room, All Rooms - By Age Group - Condition All

Surface, Age Group and Total Number Measured	Cumulative Total Surfaces in (mg/cm^2) Intervals													
	.0-.1	.2-.3	.4-.5	.6-.7	.8-.9	1.0-1.4	1.5-1.9	2.0-2.4	2.5-2.9	3.0-3.9	4.0-4.9	5.0-7.4	7.5-9.9	10.0 +
High Wall Pre-1939 349	41	65	94	132	173	233	264	277	280	285	292	306	318	341
High Wall 1940-1959 139	13	19	42	62	87	114	131	132	133	134	136	137	138	139
High Wall 1960-1973 67	8	16	27	43	54	65	66	66	66	66	67	-	-	-
High Wall 00-1973* 558	62	100	163	237	316	415	464	478	482	488	498	513	526	558

* The reported total number of surfaces measured in the 00-1973 class includes those surfaces from dwelling units of unknown age group. Thus, this total may be slightly more than the sum of the totals of the three age groups.

TABULAR SUMMARY OF FIGURE 3

Table 3. All Trim, All Rooms - By Age Group - Condition All

Surface, Age Group and Total Number Measured	Cumulative Total Surfaces in (mg/cm^2) Intervals													
	.0-.1	.2-.3	.4-.5	.6-.7	.8-.9	1.0-1.4	1.5-1.9	2.0-2.4	2.5-2.9	3.0-3.9	4.0-4.9	5.0-7.4	7.5-9.9	10.0+
Trim Pre-1939 1394	491	563	661	742	820	960	1027	1068	1090	1124	1149	1206	1255	1394
Trim 1940-1959 529	184	218	271	318	361	433	466	478	483	486	490	495	500	529
Trim 1960-1973 206	103	125	142	157	170	193	202	204	205	205	206	-	-	-
Trim 00-1973* 2140	785	913	1082	1225	1360	1597	1706	1761	1789	1826	1856	1918	1972	2140

* The reported total number of surfaces measured in the 00-1973 class includes those surfaces from dwelling units of unknown age group. Thus, this total may be slightly more than the sum of the totals of the three age groups.

TABULAR SUMMARY OF FIGURE 4

Table 4. High Reading per Dwelling Unit - By Age Group - Condition All

Surface, Age Group and Total Number Measured	Cumulative Total Surfaces in (mg/cm^2) Intervals													
	.0-.1	.2-.3	.4-.5	.6-.7	.8-.9	1.0-1.4	1.5-1.9	2.0-2.4	2.5-2.9	3.0-3.9	4.0-4.9	5.0-7.4	7.5-9.9	10.0+
All Surfaces Pre-1939 63	0	0	0	0	0	5	11	13	14	14	16	22	29	63
All Surfaces 1940-1959 26	1	1	1	2	2	5	11	16	17	18	20	23	24	26
All Surfaces 1960-1973 17	1	1	1	1	4	11	14	14	15	15	17	-	-	-
All Surfaces 00-1973* 107	2	2	2	3	8	22	37	44	47	48	54	63	71	107

* The reported total number of surfaces measured in the 00-1973 class includes those surfaces from dwelling units of unknown age group. Thus, this total may be slightly more than the sum of the totals of the three age groups.

TABULAR SUMMARY OF FIGURE 5

Table 5. Pre-1939 Age Group - All Walls, High Wall, All Trim, High Trim - Condition All

Surface, Age Group and Total Number Measured	Cumulative Total Surfaces in (mg/cm^2) Intervals													
	.0-.1	.2-.3	.4-.5	.6-.7	.8-.9	1.0-1.4	1.5-1.9	2.0-2.4	2.5-2.9	3.0-3.9	4.0-4.9	5.0-7.4	7.5-9.9	10.0+
All Walls Pre-1939 1309	489	623	739	840	936	1037	1087	1116	1130	1149	1168	1208	1239	1309
High Wall Pre-1939 349	41	65	94	132	173	233	264	277	280	285	292	306	318	349
All Trim Pre-1939 1394	491	563	661	742	820	960	1027	1068	1090	1124	1149	1206	1255	1394
High Trim Pre-1939 351	20	27	42	64	85	132	166	178	189	202	214	241	264	351

TABULAR SUMMARY OF FIGURE 6

Table 6. Pre-1939 Age Group - All Walls, All Rooms, Living Rooms, Kitchens, Bathrooms, - Condition All

Surface, Age Group and Total Number Measured	Cumulative Total Surfaces in (mg/cm^2) Intervals													
	.0-.1	.2-.3	.4-.5	.6-.7	.8-.9	1.0-1.4	1.5-1.9	2.0-2.4	2.5-2.9	3.0-3.9	4.0-4.9	5.0-7.4	7.5-9.9	10.0+
Kitchen Walls Pre-1939 224	49	67	91	101	112	125	133	142	145	150	158	175	188	224
Bathroom Walls Pre-1939 236	67	83	97	115	135	153	163	173	182	193	199	210	220	236
All Rooms (Walls) Pre-1939 1309	489	623	739	840	936	1037	1087	1116	1130	1149	1168	1208	1239	1309
Living Room Walls Pre-1939 = 231	98	125	143	164	182	205	217	222	223	224	225	227	230	231

TABULAR SUMMARY OF FIGURE 7

Table 7. Pre-1939 Age Group - High Wall Per Room - Kitchens, Bathrooms, All Rooms, Living Rooms - Condition All

Surface, Age Group and Total Number Measured	Cumulative Total Surfaces in (mg/cm^2) Intervals													
	.0-.1	.2-.3	.4-.5	.6-.7	.8-.9	1.0-1.4	1.5-1.9	2.0-2.4	2.5-2.9	3.0-3.9	4.0-4.9	5.0-7.4	7.5-9.9	10.0+
Kitchen Wall Pre-1939 59	2	4	9	15	20	23	26	29	30	30	33	40	44	59
Bathroom Wall Pre-1939 63	5	9	10	16	24	33	38	40	42	46	49	52	56	63
All Rooms (Wall) Pre-1939 349	41	65	94	132	173	233	264	277	280	285	292	306	318	349
Living Room Walls Pre-1939 61	12	13	19	24	31	48	54	58	58	58	59	59	60	61

TABULAR SUMMARY OF FIGURE 8

Table 8. Pre-1939 Age Group - All Walls - Kitchen, Bath - Condition Bad - Condition All

Surface, Age Group and Total Number Measured	Cumulative Total Surfaces in (mg/cm^2) Intervals													
	.0-.1	.2-.3	.4-.5	.6-.7	.8-.9	1.0-1.4	1.5-1.9	2.0-2.4	2.5-2.9	3.0-3.9	4.0-4.9	5.0-7.4	7.5-9.9	10.0+
Kitchens (Bad) Pre-1939 113	16	26	38	40	47	55	58	63	63	66	68	73	80	113
Kitchens (All) Pre-1939 224	49	67	91	101	112	125	133	142	145	150	158	175	188	224
Baths (Bad) Pre-1939 105	14	17	27	35	42	48	53	57	62	72	76	86	92	105
Baths (All) Pre-1939 236	67	83	97	115	135	153	163	173	182	193	199	210	220	236

TABULAR SUMMARY OF FIGURE 9

Table 9. Pre-1939 Age Group - High Wall, High Reading - Kitchen and Bath - Condition All, Except Kitchen and Bath

Surface, Age Group and Total Number Measured	Cumulative Total Surfaces in (mg/cm^2) Intervals													
	.0-.1	.2-.3	.4-.5	.6-.7	.8-.9	1.0-1.4	1.5-1.9	2.0-2.4	2.5-2.9	3.0-3.9	4.0-4.9	5.0-7.4	7.5-9.9	10.0 +
High Wall Kitchen and Bath Pre-1939 63	2	3	5	9	15	24	29	30	31	31	34	40	45	63
High Reading Kitchen and Bath Pre-1939 63	1	1	1	1	4	8	14	16	19	19	22	28	34	63
High Wall Non Kitchen and Bath Pre-1939 63	3	4	7	9	15	31	41	47	47	47	47	51	53	63
High Reading NonKitchen and Bath Pre-1939 63	0	0	0	1	2	10	20	23	24	25	27	35	37	63

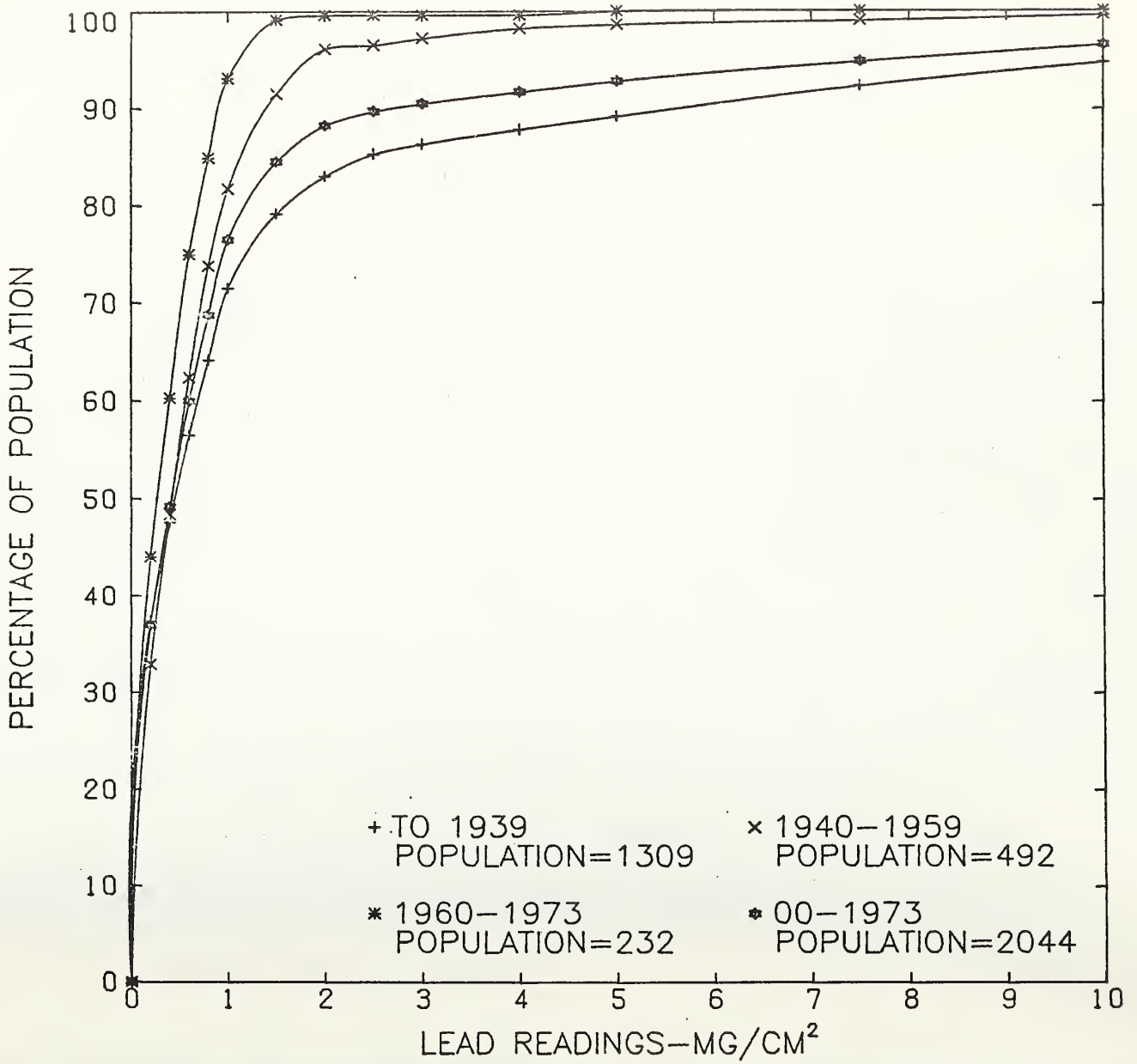
TABULAR SUMMARY OF FIGURE 10

Table 10. All Rooms, All Doors - By Age Group - Condition All

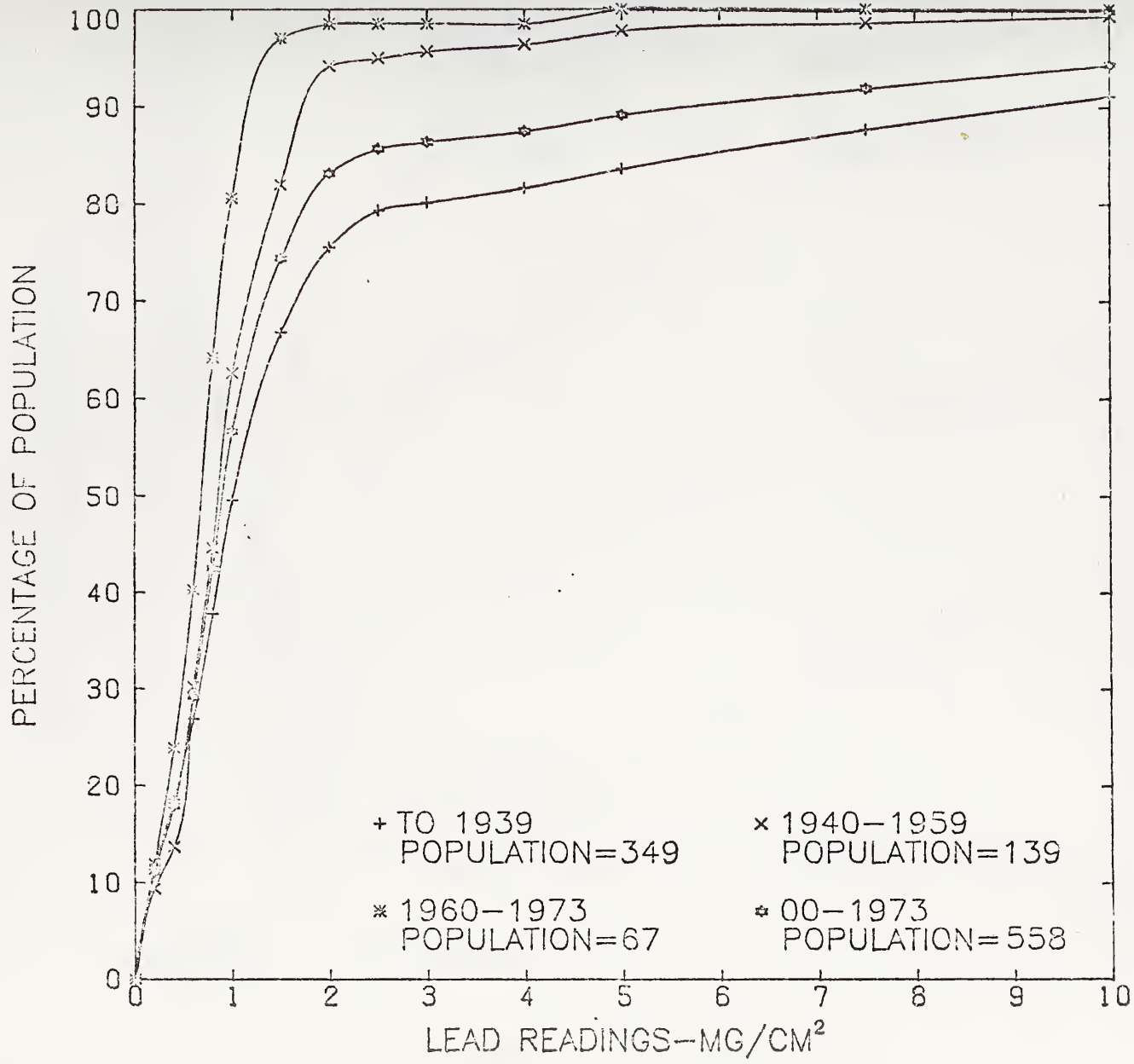
Surface, Age Group and Total Number Measured	Cumulative Total Surfaces in (mg/cm^2) Intervals													
	.0-.1	.2-.3	.4-.5	.6-.7	.8-.9	1.0-1.4	1.5-1.9	2.0-2.4	2.5-2.9	3.0-3.9	4.0-4.9	5.0-7.4	7.5-9.9	10.0+
All Doors Pre-1939 444	105	138	184	223	249	289	311	325	325	332	339	365	381	444
All Doors 1940-1959 181	29	45	73	98	108	144	161	167	170	172	176	176	176	181
All Doors 1960-1973 63	23	36	49	53	53	59	63	-	-	-	-	-	-	-
All Doors 00-1973* 690	159	221	308	376	412	494	537	557	560	569	580	606	622	690

* The reported total number of surfaces measured in the 00-1973 class includes those surfaces from dwelling units of unknown age group. Thus, this total may be slightly more than the sum of the totals of the three age groups.

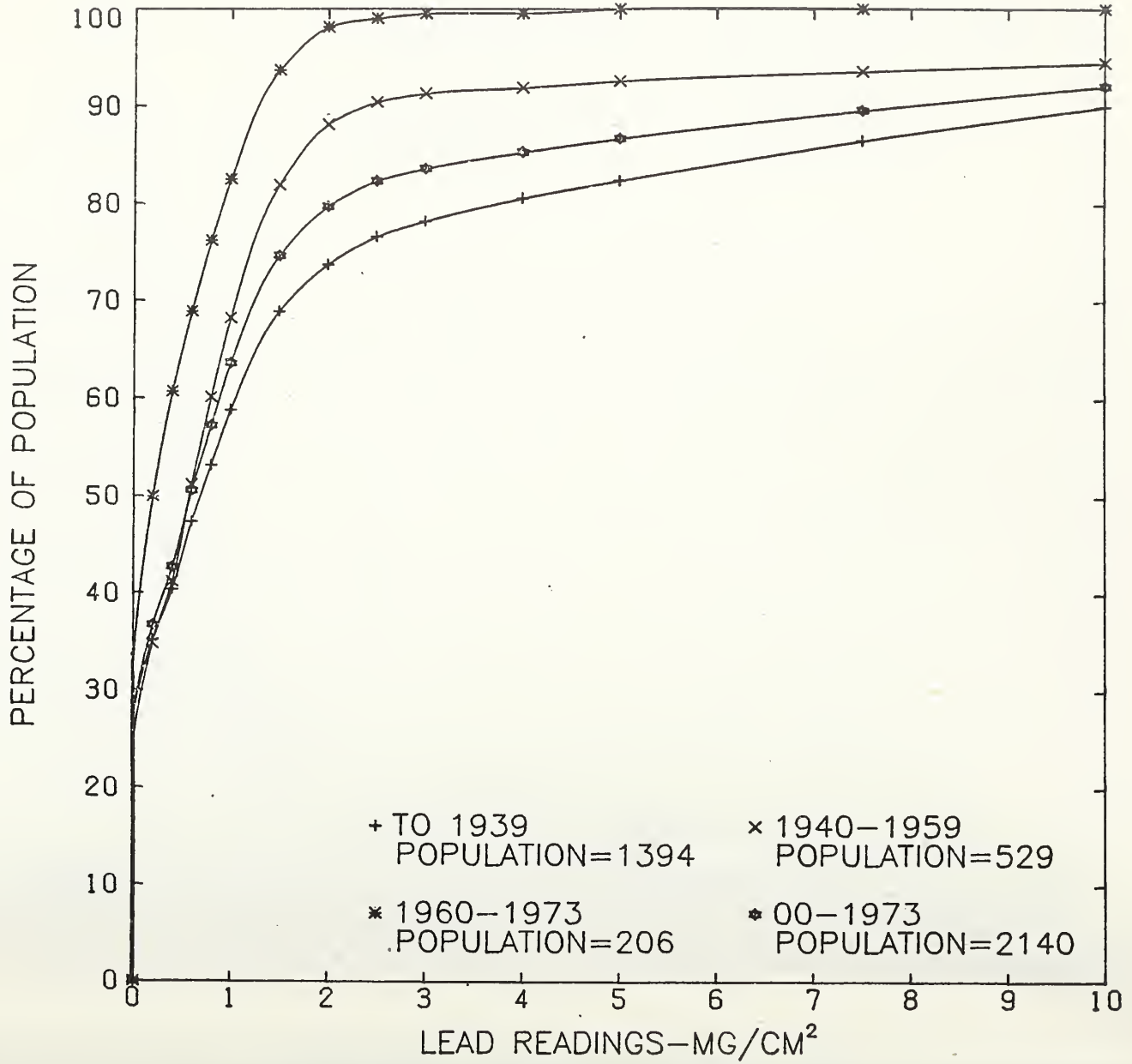
GRAPH NO. 1—ALL WALLS—BY AGE



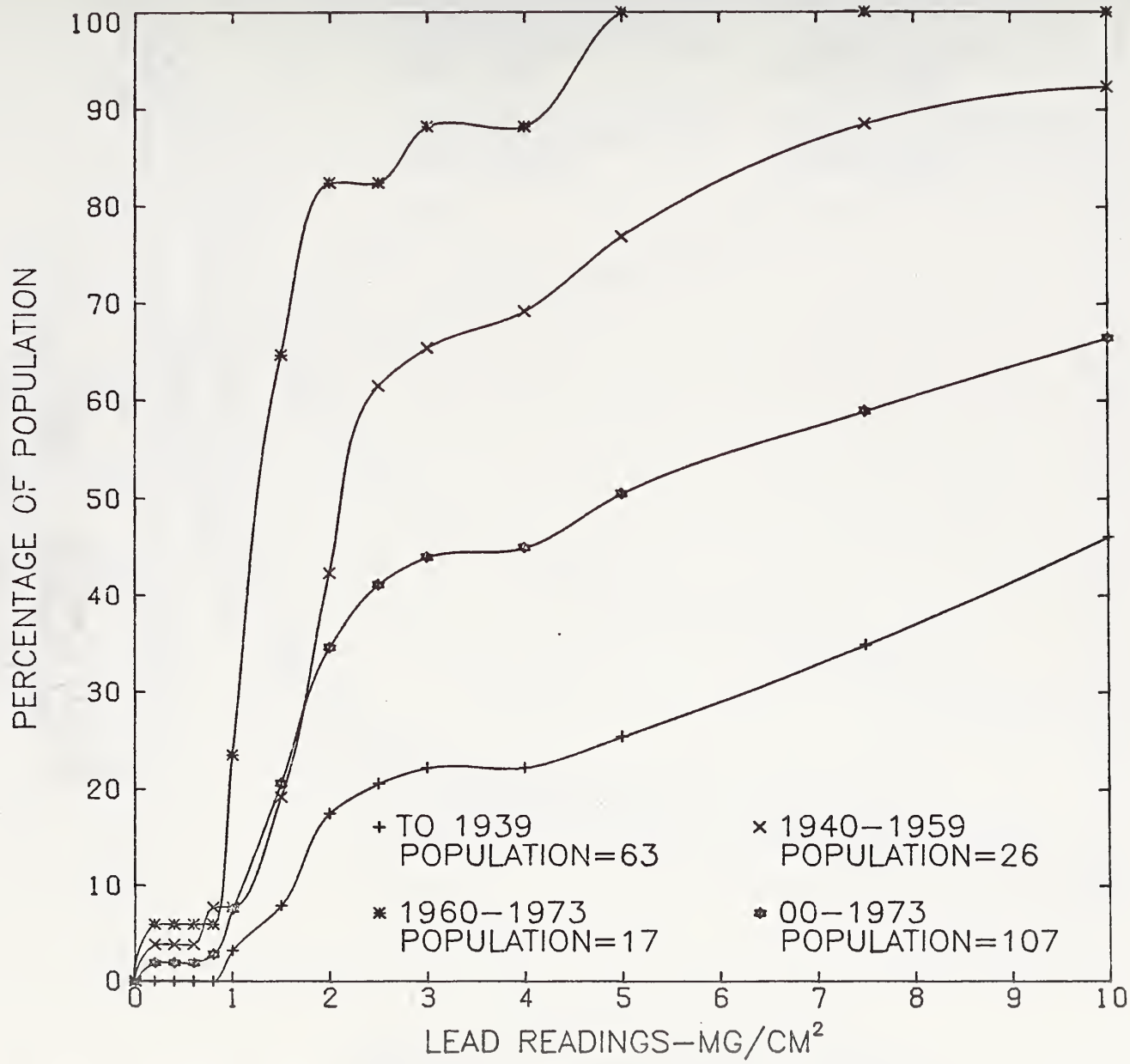
GRAPH NO. 2—HIGH WALL—BY AGE



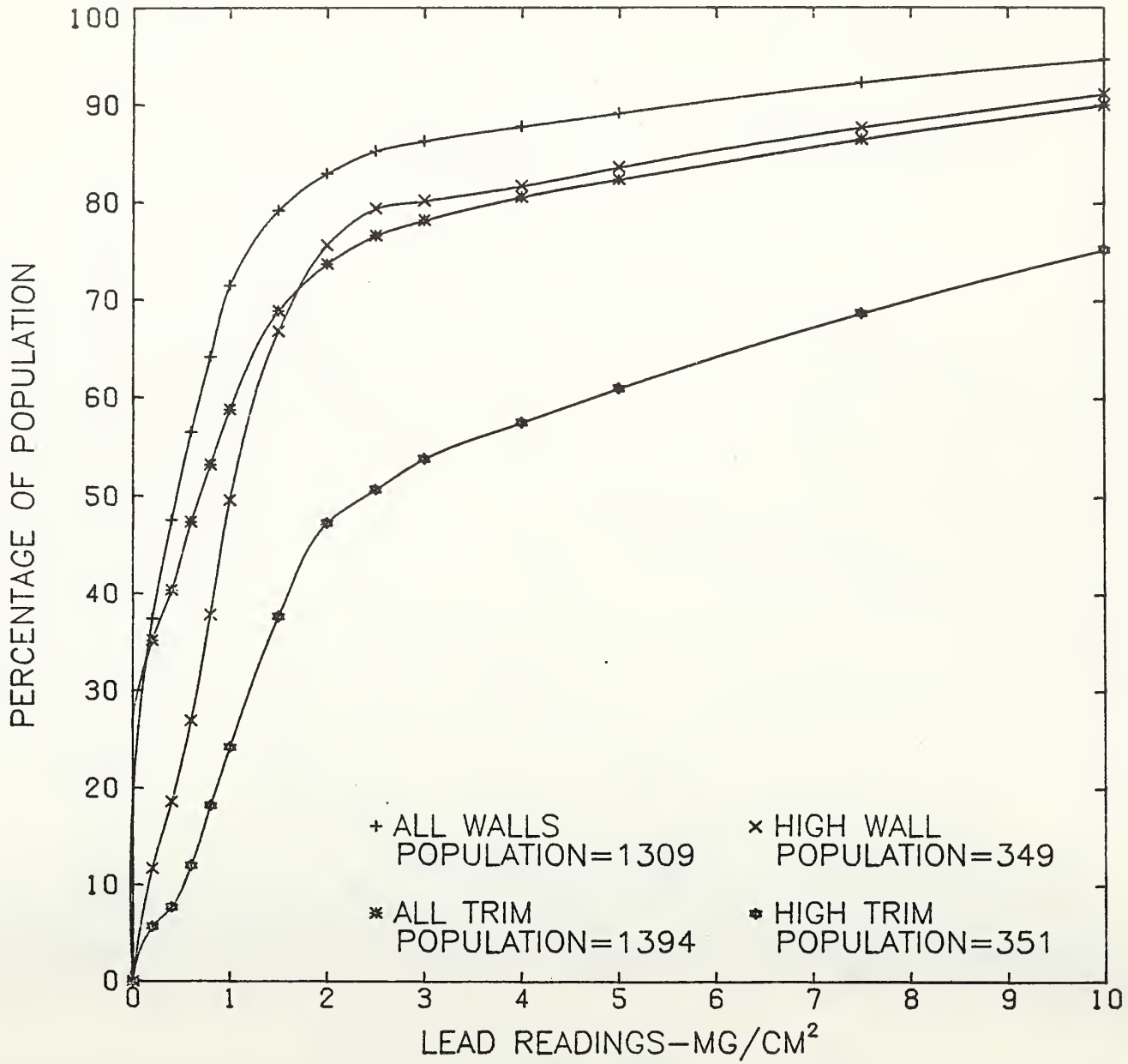
GRAPH NO. 3—ALL TRIM—BY AGE



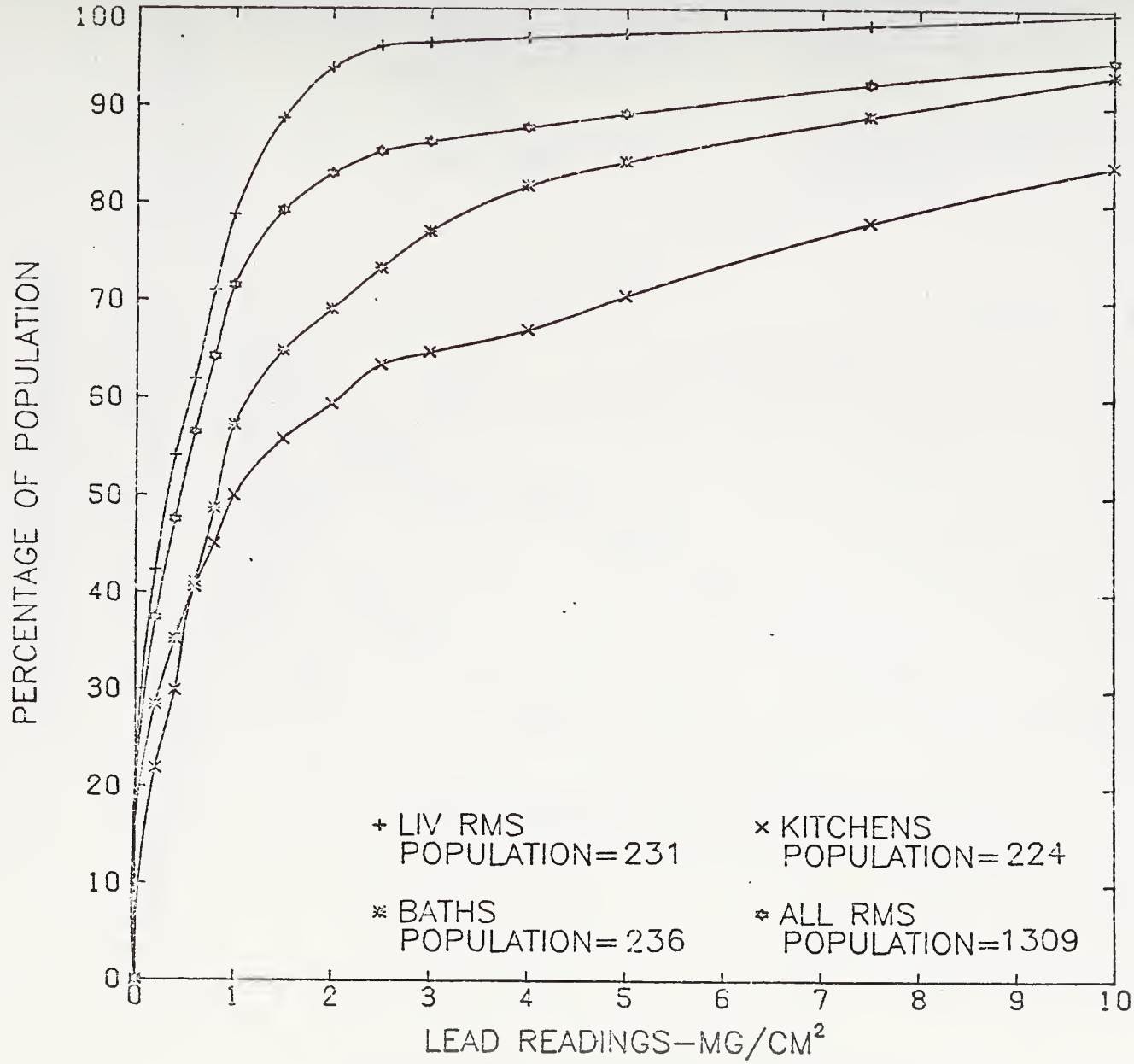
GRAPH NO. 4—BY AGE
HIGH READING/DWELLING



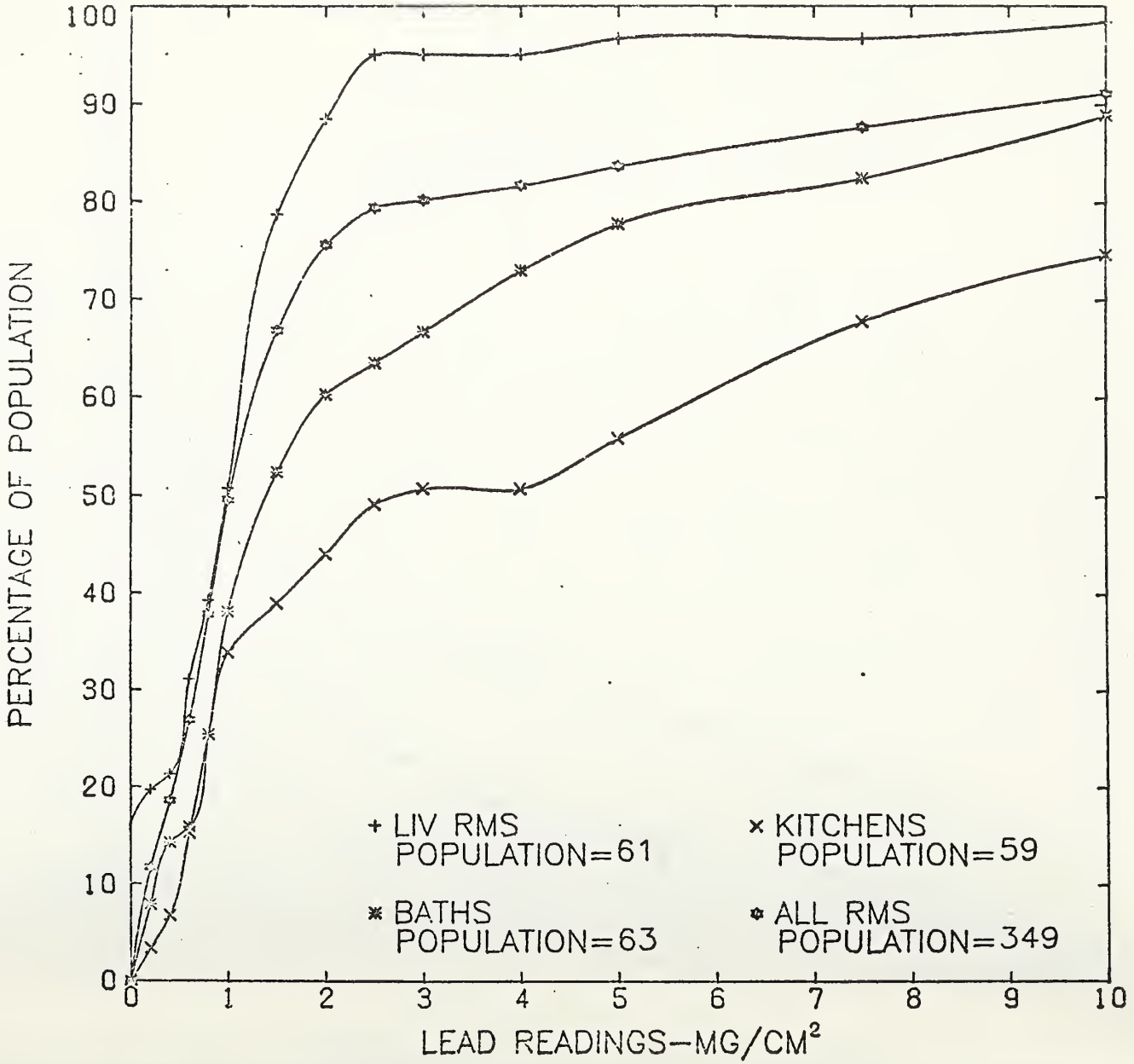
GRAPH NO. 5—TO 1939—ALL WALLS,
HIGH WALL, ALL TRIM, HIGH TRIM



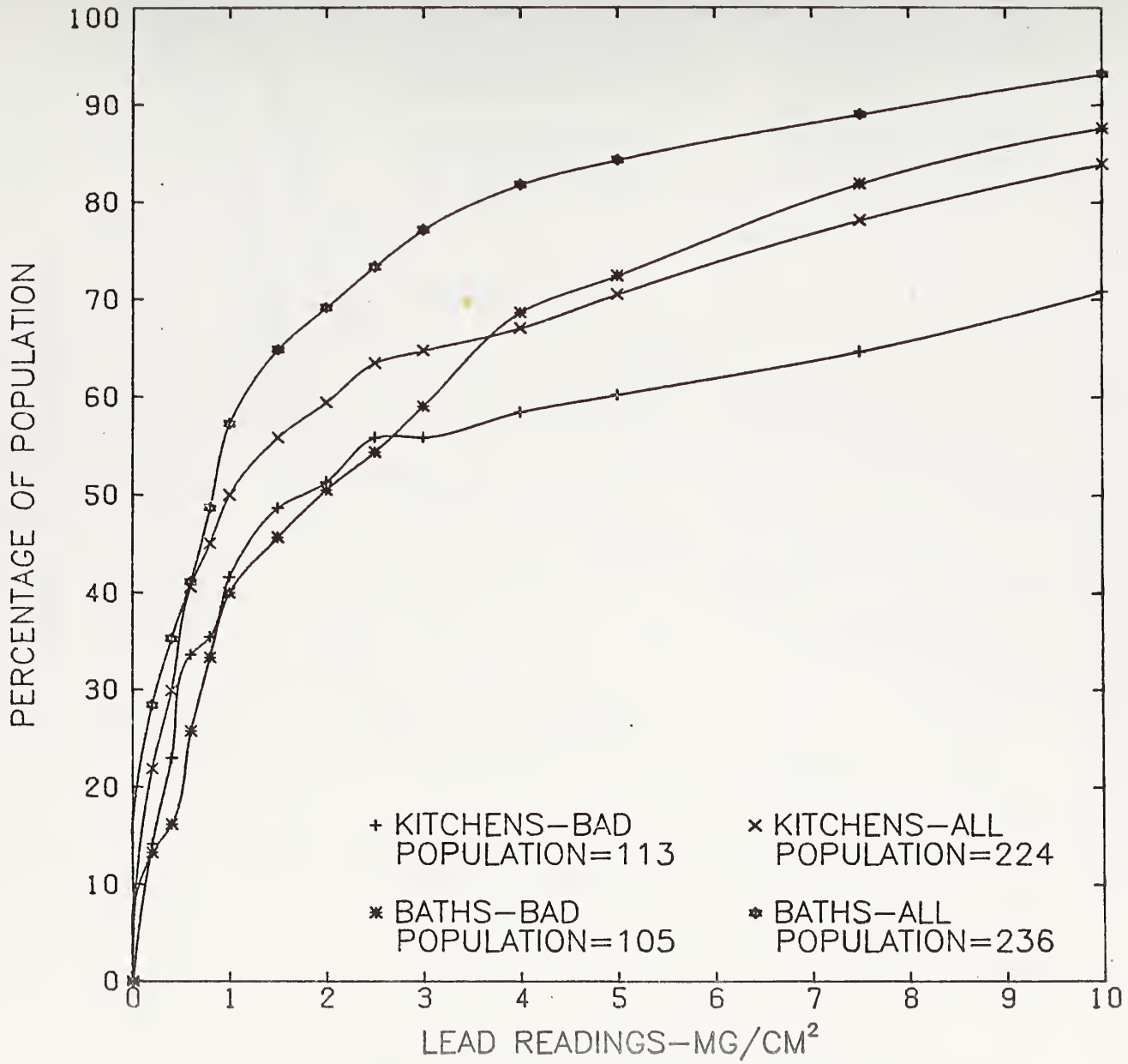
GRAPH NO. 6--TO 1939--ALL WALLS
LIV RM, KIT, BATH, ALL RMS



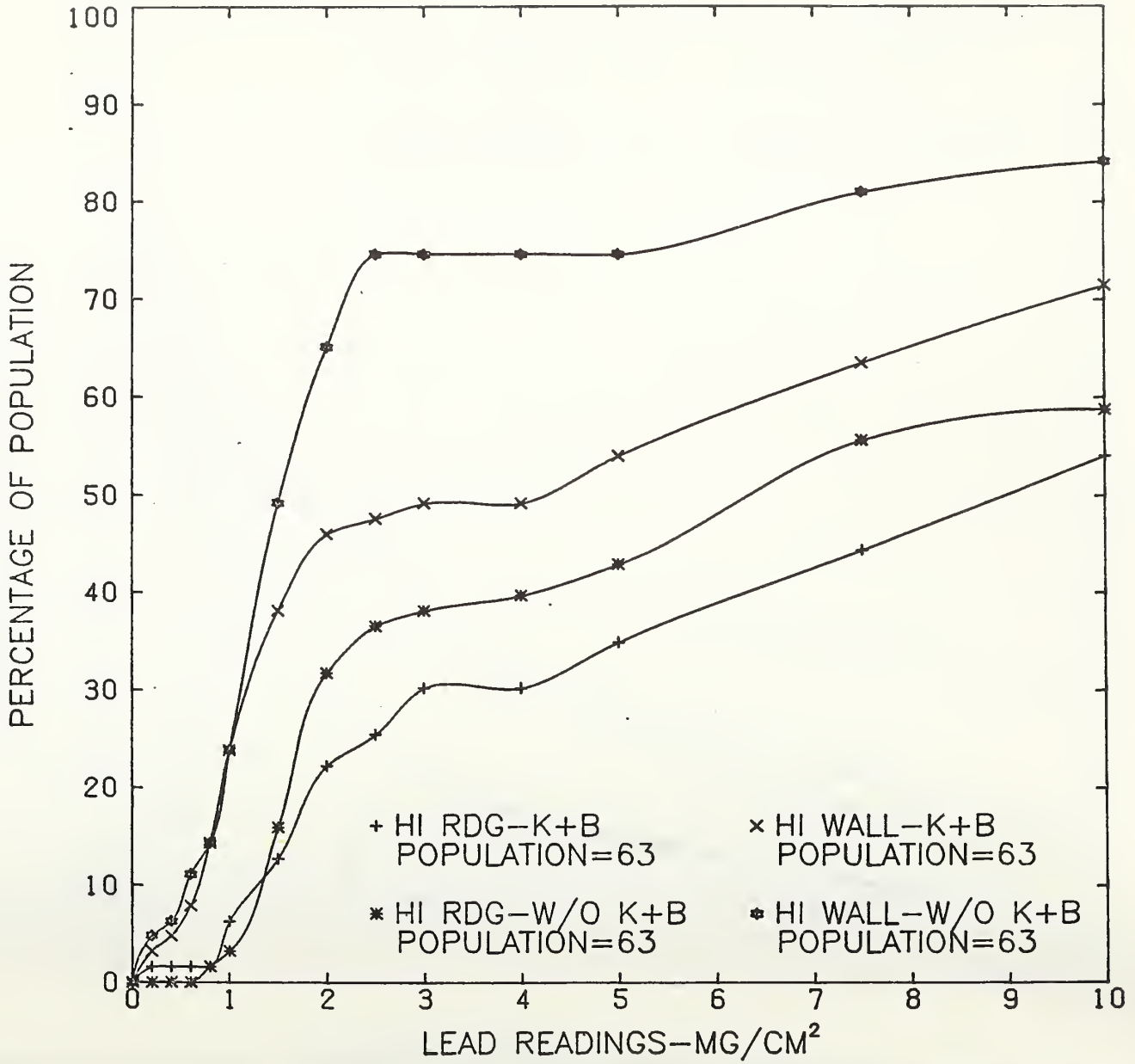
GRAPH NO. 7–TO 1939–HIGH WALL
LIV RM, KIT, BATH, ALL RMS



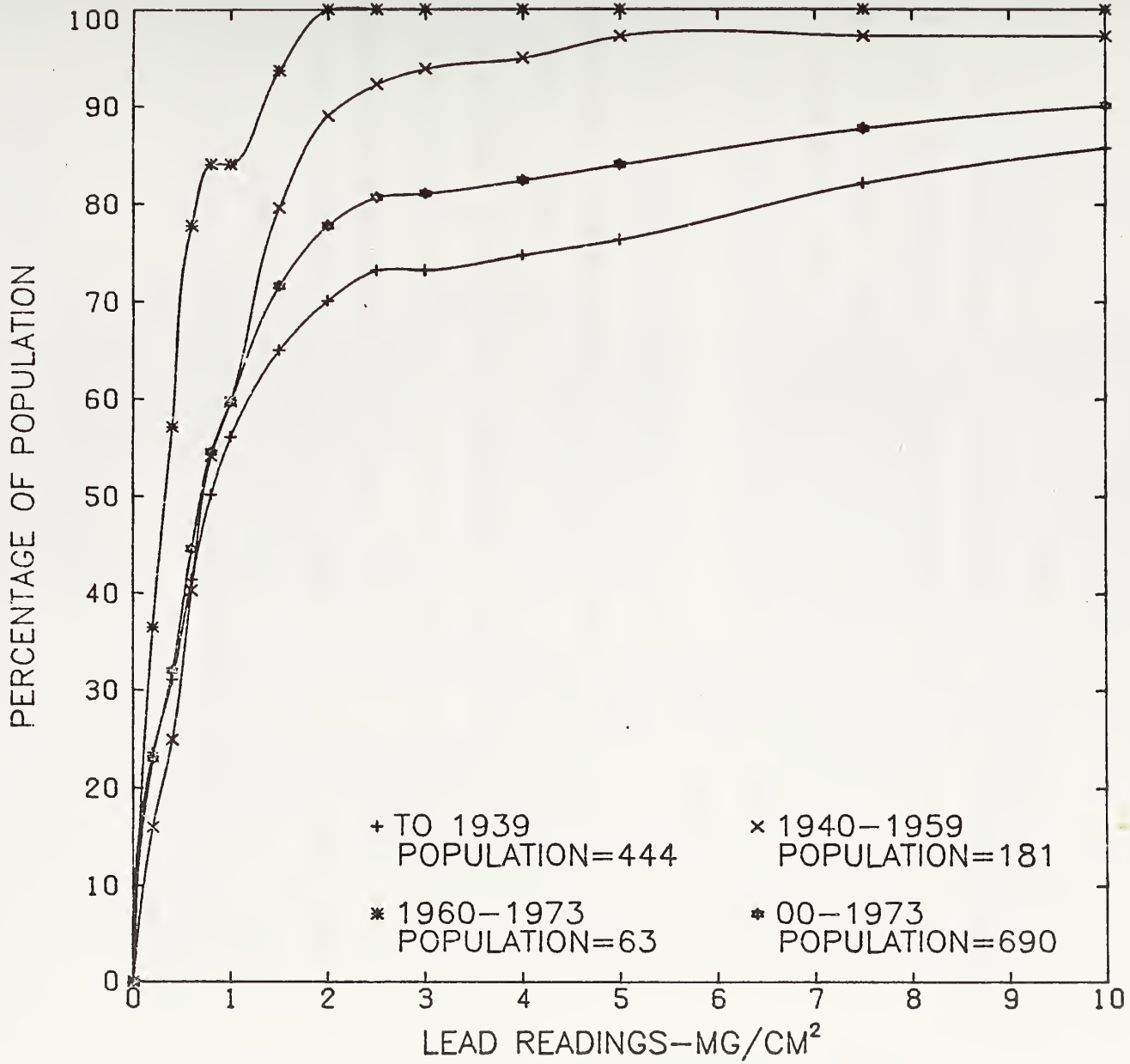
GRAPH NO. 8—TO 1939—ALL WALLS
KIT,BATH (CONDITION BAD--ALL)



GRAPH NO. 9–TO 1939–PER DWELLING
KIT + BATH, WITHOUT KIT + BATH



GRAPH NO. 10–DOORS–BY AGE



Appendix C

Sample Generator Program

This program generates 8191 triples, every triple being a set of indices each of which is randomly selected, denoting respectively page, column, and line of the city directory. Duplicates are removed and the total sample is partitioned into an original sample (number of entries as specified by the input parameter) and a set of 40-entry samples. These samples are each presented in directory order in a self-explanatory format.

In the listing used for illustration, the total sample is 1023 (rather than the 8191 specified in the program description; restoration to 8191 requires changing lines 2, 3, and 4 to NO = 8190, N1 = 8191, and N2 = 8192 respectively); the original sample has 320 entries; the directory has names from page 6 through page 50, two columns, and 60 lines per column. In the last 40-entry sample, entries 10 through 40 are identical and denote non-existent entries in the directory; an artificial entry of 1023-7-511 arises as a result of discarding duplicate entries. The remaining entries of the last sample constitute a valid 9-entry sample.

```
@FOR,IS DIRECT
FOR 010A-04/19/73-00:15:30 (.0)

    MAIN PROGRAM

    STORAGE USED: CODE(1) 000654; DATA(0) 020447; BLANK COMMON(2) 000000

    EXTERNAL REFERENCES (BLOCK, NAME)

     0003    RANDNO
     0004    SQRT
     0005    NINTR$
     0006    NRDC$
     0007    NI02$
     0010    NPRT$
     0011    NI01$
     0012    NSTOP$

    STORAGE ASSIGNMENT  (BLOCK, TYPE, RELATIVE LOCATION, NAME)

     0001    000403 110L      0001    000077 144G      0001    000104 151G      0001    000220 174G      0001    000253 215G
     0001    000274 226G      0001    000332 246G      0001    000342 253G      0001    000414 276G      0001    000240 30L
     0001    000452 315G      0001    000536 341G      0001    000544 346G      0001    000554 353G      0001    000424 374G
     0001    000415 430L      0001    000315 90L       0000    020551 900F      0000    020553 901F      0000    020554 950F
     0000    020557 951F      0000    020564 952F      0000    020573 953F      0000    020404 954F      0000    020412 955F
     0000    020420 956F      0000    020627 957F      0000 I  020517 IC        0000 I  020521 IFIRST    0000 I  020520 IL
     0000 I  020535 IPAGE     0000 I  020516 IPN       0000 I  020515 IPS       0000 I  020527 I1        0000 I  020530 I2
     0000 I  020531 I3        0000 I  020533 I4        0000 I  020534 I5        0000 I  020525 J         0000 I  020543 J1
     0000 I  020544 J4        0000 I  020532 JN        0000 I  020541 J1        0000 I  020542 J2        0000 I  020536 J3
     0000 I  020537 J4        0000 I  020545 J5        0000 I  020546 J6        0000 I  020547 J7        0000 I  020550 J8
     0000 I  020540 J9        0000 I  000000 K         0000 I  020464 L         0000 R  020512 N0        0000 I  020513 N1
     0000 I  020514 N2        0003 R  000000 RANDNO    0000 R  020523 RC        0000 R  020524 RL        0000 R  020522 RP
     0000 R  020510 SEED      0000 R  020526 X

000101      1•          DIMENSION K(85001),I(501,SEED(2)                                    10
000103      2•          N0=1023
000104      3•          N1=1023
000105      4•          N2=1024
000106      5•          READ 900 SEED(1),SEED(2),K(1)                                       60
000113      6•          READ 901 IPS,IPN,IC,IL,IFIRST                                       70
000122      7•          PRINT 950                                                           80
000124      8•          PRINT 900 SEED(1),SEED(2),K(1)                                      90
000131      9•          PRINT 901 IPS,IPN,IC,IL,IFIRST                                     100
000140     10•          RP=IPN-IPS                                                         110
000141     11•          RC=IC                                                              120
000142     12•          RL=IL                                                              130
000143     13•          DO 10  J=2,85001                                                   133
000144     14•       10 K(J)=K(1)                                                          136
000146     15•     C • • GENERATE 8191 ENTRIES • • • • • • • • • • • • • • • • • • • • •   140
000150     16•          DO 20  J=1,N1                                                      150
000153     17•          X=RANDNO(0,SEED)                                                   160
000154     18•          I1=RP•X+IPS                  @ PAGE                                170
000155     19•          X=RANDNO(0,SEED)                                                   180
```

```
00154     20.          I2=RC*Y+1                    @ COLUMN                    190
00157     21.          X=RANDMO(0,SEED)                                         200
00160     22.          I3=RL*Y+1                    @ LINE                      210
00160     23.      C SAMPLE SIZE 13 BITS A1=1                                   220
00160     24.      C PAGE SIZE   10 BITS  1023                                  230
00160     25.      C COLUMN SIZE  3 BITS     7                                  240
00160     26.      C LINE SIZE    9 BITS   511                                  250
00161     27.          K(J)=((I1*A)+I2)*512+I3)*A192+J                          260
00162     28.       20 CONTINUE                                                 270
00164     29.          PRINT 951 SEED(1),SEED(2)                                280
00164     30.      C * * SORT INTO DIRECTORY ORDER * * * * * * * * * * * * * *  290
00170     31.          CALL SORT (K,N1,1)                                       300
00171     32.          I1=1                                                     310
00172     33.          I2=K(1)/A192                                             320
00173     34.          DO 30  JN=2,N1                                           330
00176     35.          I4=K(JN)                                                 340
00177     36.          I5=I4/A192                                               350
00200     37.          K(JN)=X(A500)                                            360
00201     38.          IF (I2.EQ.I5)   GO TO 30                                 370
00203     39.          K(JN)=I4                                                 380
00204     40.          I1=I1+1                                                  390
00205     41.          I2=I5                                                    400
00206     42.       30 CONTINUE                                                 410
00210     43.          JN=I1                                                    420
00211     44.          PRINT 952  I1                                            440
00214     45.          DO 70 J=1,N1                                             460
00217     46.          I1=K(J)/A192                                             470
00220     47.          I2=K(J)-A192*I1                                          480
00221     48.          K(J)=I1*4194304+I2                                       490
00222     49.       70 CONTINUE                                                 495
00222     50.      C * * SORT INTO GENERATED ORDER * * * * * * * * * * * * *   500
00224     51.          CALL SORT (K,N1,1)                                       510
00225     52.          DO 80 I=1,A499                                           520
00230     53.          I1=K(J)/4194304                                          530
00231     54.       80 K(J)=K(J)-4194304*I1                                     540
00231     55.      C * * TOTAL SAMPLE INTO REGISTER SORT * * * * * * * * * *   550
00233     56.          CALL SORT (K,IFIRST,1)                                   560
00234     57.          IPAGE =1                                                 570
00235     58.          J3=1                                                     580
00236     59.          J4=40                                                    590
00237     60.       90 I3=5                                                     600
00240     61.          J9=0                                                     605
00241     62.          PRINT 953 IPAGE,IFIRST                                   610
00245     63.          DO 120  J=J3,J4                                          620
00250     64.          J9=J9+1                                                  625
00251     65.          I2=1                                                     630
00252     66.          DO 100  J1=1,121,40                                      640
00255     67.          J2=J+J1-1                                                650
00256     68.          L(I2)=K(J2)/4096                                         660
00257     69.          I1=K(J2)-L(I2)*4096                                      670
00260     70.          L(I2+1)=I1/512                                           680
00261     71.          L(I2+2)=I1    -L(I2+1)*512                               690
00262     72.          I2=I2+3                                                  693
00263     73.       100 CONTINUE                                                696
00265     74.          IF (I3.LT.5)  GO TO 110                                  700
00267     75.          I3=0                                                     710
00270     76.          PRINT 954                                                720
00272     77.       110 I3=I3+1                                                 730
```

```
00273     78.           PRINT 955 J9,(L(J2),J2=1,12),J9                                  750
00303     79.       120 CONTINUE                                                         760
00305     80.           IPAGE=IPAGE+1                                                    770
00306     81.           J3=J3+160                                                        780
00307     82.           J4=J4+160                                                        790
00310     83.           IF (J3.LT.IFIRST)  GO TO 90                                      800
00312     84.       400 JL=(JN-IFIRST)/160+1                                             810
00313     85.           L(16)=0                                                          815
00314     86.           DO 450  JM=1,JL                                                  820
00317     87.           J5=J3+40                                                         830
00320     88.           J6=J5+40                                                         840
00321     89.           J7=J6+40                                                         850
00322     90.           CALL SORT (K,40,J3)                                              860
00323     91.           CALL SORT (K,40,J5)                                              870
00324     92.           CALL SORT (K,40,J6)                                              880
00325     93.           CALL SORT (K,40,J7)                                              890
00326     94.           I3=5                                                             900
00327     95.           J9=0                                                             910
00330     96.           PRINT 956  IPAGE                                                 920
00333     97.           L(13)=L(16)+1                                                    930
00334     98.           L(14)=L(13)+1                                                    940
00335     99.           L(15)=L(14)+1                                                    950
00336    100.           L(16)=L(15)+1                                                    960
00337    101.           PRINT 957 (L(JA),JA=13,16)                                       970
00345    102.           DO 440  J=J3,J4                                                  980
00350    103.           J9=J9+1                                                          980
00351    104.           I2=1                                                             990
00352    105.           DO 420  J1=1,121,40                                             1000
00355    106.           J2=J+J1-1                                                       1010
00356    107.           L(I2)=K(J2)/4096                                                1020
00357    108.           I1=K(J2)-L(I2)*4096                                             1030
00360    109.           L(I2+1)=I1/512                                                  1040
00361    110.           L(I2+2)=I1   -L(I2+1)*512                                       1050
00362    111.           I2=I2+3                                                         1053
00363    112.       420 CONTINUE                                                        1056
00365    113.           IF (I3.LT.6)  GO TO 430                                         1060
00367    114.           I3=0                                                            1070
00370    115.           PRINT 954                                                       1080
00372    116.       430 I3=I3+1                                                         1090
00373    117.           PRINT 955 J9,(L(J2),J2=1,12),J9                                 1100
00403    118.       440 CONTINUE                                                        1120
00405    119.           IPAGE=IPAGE+1                                                   1130
00406    120.           J3=J3+160                                                       1140
00407    121.           J4=J4+160                                                       1150
00410    122.       450 CONTINUE                                                        1160
00412    123.           STOP                                                            1170
00413    124.       900 FORMAT (10013)                                                  3000
00414    125.       901 FORMAT (515)                                                    3010
00415    126.       950 FORMAT ('0INPUT PRINT')                                         3020
00416    127.       951 FORMAT (' NEXT VALUE OF SEED',2013)                             3030
00417    128.       952 FORMAT (' THERE ARE',15,' UNIQUE UNITS.')                       3040
00420    129.       953 FORMAT ('1PAGE',13,' OF ORIGINAL SAMPLE OF',15,' UNITS')        3050
00421    130.       954 FORMAT ('                                    ')                 3060
00422    131.       955 FORMAT (15,4(17,'-',11,'=',13,),16)                             3070
00423    132.       956 FORMAT ('1PAGE',13,' FORTY UNIT SAMPLES')                       3080
00424    133.       957 FORMAT ('0',1I4,3I14)                                           3090
00425    134.           END                                                             9000
```

```
@FOR,IS SORT
FOR 010A-06/19/73-00115136 (.0)

    SUBROUTINE SORT      ENTRY POINT 000064

    STORAGE USED: CODE(1) 000078; DATA(0) 000231 BLANK COMMON(2) 000000

    EXTERNAL REFERENCES (BLOCK, NAME)

     0003   NERR35

    STORAGE ASSIGNMENT  (BLOCK, TYPE, RELATIVE LOCATION, NAME)

     0001   000022 I06G      0001   000027 II2G      0001   000041 20L       0001   000050 40L       0000 I 000001 I
     0000   000004 INJPS     0000 I 000002 II        0000 I 000003 I2        0000 I 000000 NL


00101      1.          SUBROUTINE SORT (K,N,L)                                          10
00103      2.          DIMENSION K(1)                                                   20
00104      3.          NL=N+L-2                                                         30
00105      4.          DO 30 I=1,N                                                      40
00110      5.          II=0                                                             50
00111      6.          DO 20  I2=L,NL                                                   60
00114      7.          IF (K(I2).LT.K(I2+1))  GO TO 20                                  70
00116      8.          II=K(I2)                                                         80
00117      9.          K(I2)=K(I2+1)                                                    90
00120     10.          K(I2+1)=II                                                      100
00121     11.       20 CONTINUE                                                        110
00123     12.          IF (II.EQ.0)  GO TO 40                                          120
00125     13.       30 CONTINUE                                                        130
00127     14.       40 RETURN                                                          170
00130     15.          END                                                            9000

      END OF COMPILATION:        NO  DIAGNOSTICS.
```

```
@ASM,IS RAND
ASMIIF 06/19-0011S-(.01)

     1.       00   000000  71 13 01 13 1 000001   RANDNO.   DL     13,.1,11
     2.            000001  71 12 01 00 0 000000             DS     13,1S
     3.            000002  27 17 14 00 000000               L.017  12,0
     4.            000003  27 00 15 00 0 000001             L      13,1S+1
     5.            000004  32 00 01 00 0 000002             MF     13,M
     6.            000005  73 00 02 00 0 000001             SSC    14,1
     7.            000006  27 00 17 00 0 000000             L      15,1S
     8.            000007  30 00 03 00 0 000002             MI     15,M
     9.            000010  71 10 00 00 0 000017             DA     12,1S
    10.            000011  73 12 01 00 0 000001             LSSL   13,1
    11.            000012  73 02 01 00 0 000001             SSL    13,1
    12.            000013  71 12 01 00 0 000000             DS     13,1S
    13.            000014  27 17 14 00 000170               L.017  12,0170
    14.            000015  76 05 00 00 0 000015             LCF    12,13
    15.            000016  27 00 14 00 0 000015             L      12,13
    16.            000017  71 13 01 00 0 000000             DL     13,1S
    17.            000020  71 12 01 13 1 000001             DS     13,.1,11
    18.            000021  51 00 00 13 1 000000             TNZ    .0,11
    19.            000022  74 04 00 13 0 000003             J      3,11
    20.            000023  24 00 14 00 0 000003             A      12,01T
    21.            000024  76 01 00 00 0 000004             FAN    12,ONE
    22.            000025  74 04 00 13 0 000003             J      3,11
    23.       01   000000  154447730601           S(1),1S   +0154447730601
    24.            000001  255751305244                     +0255751305244
    25.            000002  011060471625           M         +0011060471625
    26.            000003  001000000000           BIT       +0001000000000
    27.            000004  200777777777           ONE       +0200777777777
    28.                                                     END
 END ASM ERRORS : NONE

@XQT
MAP 0023-06/19-00:15

ADDRESS LIMITS    001000 006535      040000 041767
STARTING ADDRESS  005662

WORDS DECIMAL       2910 IBANK         920B DBANK

              SEGMENT MAIN           001000 006535      040000 041767

NROCVS/FOR64                 1   001000 001126        2   040000 040042
NFTVS/FOR                    1   001124 001150
NCNVTS/FOR6B                 1   001151 001372        2   040043 040137
NOUTS/FOR6B                  1   001373 002404        2   040140 040172
```

```
[illegible]                    1   [illegible]          2   [illegible]
[illegible]                    1   [illegible]          2   040332 040365
NERRS/FOR68                    1   003454 003331        2   040366 040432
NTABS                                                   2   040433 040511
ERUS/SYS68=2
NSTOPS/FOR68                   1   004334 004351        2   040512 040521
NOSYMS/FOR68                   1   004352 004565        2   040522 040525
NIERS/FOR68                    1   004566 004737        2   040526 040644
NISYMS/FOR68                   1   004740 005131        2   040645 040650
NINTRS/FOR68                   1   005132 005170        2   040651 040667
NERRS/FOR68                    1   005171 005557        2   040670 041047
BLANKSCOMMON (COMMON BLOCK)
RAND                           1   005560 005564        0   041050 041075
SORT                           1   005565 005661        0   041076 041120
                                                        2   BLANKSCOMMON
DIRECT                         1   005662 006536        0   041121 041767
                                                        2   BLANKSCOMMON

SYS$RLIBS. LEVEL 68-2
END OF COLLECTION - TIME 0.762 SECONDS

 INPUT PRINT
 000011111111 012345612345 377777777777
    4   50    2   60  320
 NEXT VALUE OF SEED 141634423274 152315541031
 THERE ARE  929 UNIQUE UNITS.
```

PAGE 1 OF ORIGINAL SAMPLE OF 320 UNITS

1	6-1- 18	12-2- 50	18-1- 33	22-2- 30	1
2	6-1- 27	12-2- 52	18-1- 54	22-2- 33	2
3	6-1- 29	12-2- 54	18-1- 56	23-1- 11	3
4	6-2- 3	13-1- 5	18-2- 29	23-1- 25	4
5	7-1- 56	13-1- 32	18-2- 31	23-1- 46	5
6	7-2- 1	13-1- 43	18-2- 33	23-2- 11	6
7	7-2- 13	13-1- 52	18-2- 41	23-2- 13	7
8	7-2- 26	13-2- 24	18-2- 49	23-2- 16	8
9	7-2- 32	13-2- 25	19-1- 23	23-2- 40	9
10	7-2- 39	14-1- 19	19-1- 25	23-2- 55	10
11	7-2- 43	14-1- 37	19-2- 7	24-1- 59	11
12	8-1- 33	14-1- 47	19-2- 21	24-2- 9	12
13	8-1- 54	14-2- 1	19-2- 28	24-2- 15	13
14	8-2- 4	14-2- 10	19-2- 29	24-2- 23	14
15	8-2- 5	14-2- 39	20-1- 8	24-2- 38	15
16	8-2- 15	14-2- 45	20-1- 9	24-2- 58	16
17	9-1- 6	14-2- 53	20-1- 41	25-1- 12	17
18	9-1- 7	14-2- 54	20-1- 42	25-1- 19	18
19	9-1- 10	14-2- 55	20-1- 45	25-1- 21	19
20	9-1- 34	15-1- 4	20-2- 27	25-1- 54	20
21	9-1- 42	15-1- 14	20-2- 29	25-2- 33	21
22	9-2- 18	15-1- 40	20-2- 32	25-2- 53	22
23	9-2- 20	15-1- 60	20-2- 40	26-1- 36	23
24	9-2- 35	15-2- 2	20-2- 42	26-1- 38	24
25	9-2- 53	15-2- 31	20-2- 52	26-1- 50	25
26	9-2- 58	15-2- 44	21-2- 3	26-2- 8	26
27	10-1- 2	16-1- 14	21-2- 10	26-2- 12	27
28	10-1- 47	16-1- 19	21-2- 23	26-2- 26	28
29	10-1- 50	16-1- 34	21-2- 27	26-2- 47	29
30	10-2- 24	16-2- 20	21-2- 29	26-2- 49	30
31	11-1- 3	16-2- 30	21-2- 38	27-1- 26	31
32	11-1- 41	17-1- 13	21-2- 41	27-1- 28	32
33	11-2- 2	17-1- 19	21-2- 54	27-2- 26	33
34	11-2- 32	17-2- 17	22-1- 22	27-2- 36	34
35	11-2- 53	17-2- 39	22-1- 48	27-2- 49	35
36	12-1- 57	17-2- 41	22-1- 51	27-2- 54	36
37	12-2- 1	17-2- 44	22-2- 12	28-1- 12	37
38	12-2- 24	17-2- 49	22-2- 19	28-1- 24	38
39	12-2- 27	18-1- 1	22-2- 20	28-1- 25	39
40	12-2- 45	18-1- 11	22-2- 25	28-1- 34	40

PAGE 2 OF ORIGINAL SAMPLE OF 320 UNITS

1	28-1- 36	33-1- 54	39-1- 31	44-2- 18	1
2	28-1- 56	33-2- 20	39-1- 50	44-2- 20	2
3	28-2- 24	33-2- 47	39-2- 37	44-2- 29	3
4	28-2- 37	34-1- 21	39-2- 49	44-2- 49	4
5	28-2- 59	34-2- 6	40-1- 17	44-2- 55	5
6	29-1- 18	34-2- 11	40-2- 13	45-1- 32	6
7	29-1- 35	34-2- 24	40-2- 19	45-1- 33	7
8	29-2- 7	34-2- 39	40-2- 25	45-1- 35	8
9	29-2- 19	34-2- 43	40-2- 28	45-1- 48	9
10	29-2- 21	34-2- 45	41-1- 18	45-1- 55	10
11	29-2- 47	34-2- 54	41-1- 56	45-1- 60	11
12	29-2- 58	34-2- 58	41-2- 20	45-2- 4	12
13	30-1- 7	35-1- 24	41-2- 27	45-2- 59	13
14	30-1- 23	35-1- 57	41-2- 37	46-1- 8	14
15	30-1- 29	35-2- 20	41-2- 46	46-1- 21	15
16	30-2- 2	35-2- 38	41-2- 51	46-1- 27	16
17	30-2- 23	35-2- 40	41-2- 55	46-1- 52	17
18	30-2- 33	36-1- 2	41-2- 56	46-2- 9	18
19	30-2- 41	36-1- 9	42-1- 1	47-1- 1	19
20	31-1- 1	36-1- 30	42-1- 22	47-1- 37	20
21	31-1- 44	36-1- 49	42-1- 29	47-1- 53	21
22	31-1- 48	36-1- 51	42-2- 7	47-2- 3	22
23	31-1- 52	36-2- 13	42-2- 23	47-2- 46	23
24	31-1- 56	36-2- 27	42-2- 29	48-1- 14	24
25	31-2- 13	36-2- 43	42-2- 46	48-1- 31	25
26	31-2- 60	36-2- 59	42-2- 53	48-1- 33	26
27	32-1- 3	37-1- 27	43-1- 5	48-1- 45	27
28	32-1- 19	37-1- 59	43-1- 7	48-1- 52	28
29	32-1- 22	37-2- 12	43-1- 20	48-1- 53	29
30	32-1- 24	37-2- 31	43-1- 30	48-2- 7	30
31	32-1- 47	37-2- 41	43-1- 32	48-2- 26	31
32	32-2- 3	37-2- 47	43-2- 14	48-2- 29	32
33	32-2- 11	37-2- 59	43-2- 32	49-1- 11	33
34	32-2- 24	37-2- 59	43-2- 35	49-1- 31	34
35	32-2- 33	38-1- 34	43-2- 41	49-1- 44	35
36	32-2- 36	38-1- 48	43-2- 44	49-1- 47	36
37	32-2- 41	38-2- 24	43-2- 55	49-1- 52	37
38	33-1- 5	38-2- 54	44-1- 33	49-1- 58	38
39	33-1- 28	38-2- 58	44-1- 44	49-2- 48	39
40	33-1- 51	39-1- 9	44-2- 15	49-2- 55	40

	1	2	3	4	
1	6-2- 60	7-1- 49	6-2- 15	6-1- 60	1
2	9-2- 32	8-1- 27	6-2- 49	7-1- 28	2
3	10-2- 55	9-1- 35	7-1- 38	7-1- 44	3
4	12-1- 37	9-1- 59	8-2- 40	8-1- 9	4
5	14-1- 43	9-2- 38	13-2- 14	9-1- 11	5
6	14-2- 5	10-1- 60	15-1- 28	9-2- 17	6
7	15-1- 57	13-2- 8	16-2- 25	11-2- 31	7
8	16-2- 23	15-1- 49	17-1- 27	12-2- 5	8
9	17-1- 46	16-2- 4	17-1- 28	13-2- 57	9
10	18-1- 9	17-1- 45	18-2- 2	14-2- 36	10
11	20-1- 59	18-2- 21	18-2- 19	16-2- 60	11
12	24-2- 48	19-1- 21	18-2- 60	17-1- 30	12
13	25-2- 59	19-2- 33	20-2- 47	17-1- 56	13
14	26-1- 1	20-2- 5	21-2- 58	17-2- 7	14
15	27-2- 41	20-2- 37	23-1- 4	18-1- 50	15
16	29-1- 56	20-2- 49	23-2- 51	21-1- 4	16
17	29-2- 37	24-1- 45	25-1- 60	21-1- 48	17
18	30-1- 20	24-2- 19	26-2- 14	21-2- 33	18
19	31-1- 6	24-2- 29	26-2- 15	22-2- 56	19
20	32-1- 54	25-1- 51	28-1- 5	23-2- 57	20
21	34-2- 21	27-1- 29	28-1- 30	28-2- 25	21
22	35-1- 29	28-1- 44	28-2- 35	32-2- 4	22
23	35-1- 45	33-2- 39	29-2- 42	32-2- 14	23
24	36-1- 3	34-1- 8	30-2- 20	33-1- 47	24
25	36-1- 36	34-1- 21	30-2- 26	36-1- 48	25
26	38-2- 5	34-1- 49	31-1- 42	37-1- 5	26
27	39-1- 3	36-1- 28	31-2- 58	37-1- 49	27
28	39-2- 6	36-1- 57	32-2- 58	37-2- 3	28
29	40-1- 31	36-2- 7	35-2- 22	38-1- 35	29
30	40-2- 1	39-1- 58	37-2- 44	38-2- 29	30
31	41-2- 35	41-1- 37	38-2- 58	38-2- 42	31
32	42-1- 44	44-1- 14	39-1- 56	40-2- 8	32
33	43-1- 29	45-1- 21	39-2- 40	41-2- 42	33
34	46-2- 47	45-2- 60	40-1- 50	42-1- 39	34
35	48-1- 38	46-2- 59	42-1- 55	42-2- 48	35
36	48-2- 46	47-1- 4	42-2- 56	43-1- 27	36
37	48-2- 52	47-2- 24	44-1- 28	44-1- 30	37
38	49-1- 39	48-1- 1	47-1- 58	45-1- 25	38
39	49-2- 5	48-1- 24	48-2- 31	47-1- 45	39
40	49-2- 50	49-2- 6	49-1- 48	48-2- 15	40

	5	6	7	8	
1	6-1- 34	6-2- 34	7-1- 24	6-2- 54	1
2	8-1- 53	6-2- 38	7-1- 45	8-1- 56	2
3	11-1- 21	7-1- 8	8-1- 17	9-1- 21	3
4	12-2- 49	8-1- 23	8-2- 45	9-2- 34	4
5	14-1- 53	8-2- 14	10-1- 7	10-1- 39	5
6	14-2- 32	10-1- 29	11-1- 24	12-2- 21	6
7	15-2- 26	13-1- 54	13-1- 13	15-1- 50	7
8	15-2- 60	14-2- 25	13-1- 16	15-2- 57	8
9	16-2- 44	15-1- 25	13-2- 59	17-2- 55	9
10	19-1- 27	16-1- 50	15-1- 10	18-2- 8	10
11	19-2- 27	17-2- 8	15-2- 19	20-1- 57	11
12	20-1- 13	19-1- 32	19-2- 6	20-2- 54	12
13	20-2- 23	19-2- 25	20-1- 25	20-2- 56	13
14	21-1- 10	23-1- 58	22-1- 39	21-1- 21	14
15	21-1- 13	24-1- 58	22-2- 16	22-1- 3	15
16	22-1- 58	25-1- 15	23-2- 18	25-1- 17	16
17	22-2- 24	26-1- 43	23-2- 20	26-1- 35	17
18	26-1- 45	26-2- 4	24-2- 26	27-1- 31	18
19	28-1- 1	27-1- 32	26-2- 57	27-2- 43	19
20	28-2- 7	29-2- 48	27-1- 34	28-2- 12	20
21	31-1- 40	31-1- 24	27-1- 59	29-1- 16	21
22	32-1- 18	33-1- 12	29-2- 45	29-1- 34	22
23	32-2- 8	35-2- 27	30-2- 6	30-2- 44	23
24	35-1- 9	37-2- 14	30-2- 50	31-1- 25	24
25	35-1- 46	37-2- 60	32-1- 26	33-2- 17	25
26	35-2- 42	38-1- 24	33-2- 12	33-2- 25	26
27	36-1- 5	38-1- 58	34-1- 19	34-2- 17	27
28	37-1- 55	38-2- 1	36-2- 30	35-2- 25	28
29	37-2- 19	40-1- 18	36-2- 50	37-1- 6	29
30	38-1- 39	40-2- 48	38-2- 39	37-1- 8	30
31	38-2- 21	41-1- 23	38-2- 51	41-1- 19	31
32	38-2- 37	41-2- 54	39-1- 7	41-1- 54	32
33	40-1- 42	43-1- 60	40-2- 34	41-2- 36	33
34	40-1- 59	44-1- 24	40-2- 49	42-1- 3	34
35	42-2- 51	45-2- 12	44-1- 50	44-1- 11	35
36	43-1- 3	46-2- 40	44-2- 3	45-1- 12	36
37	45-2- 41	47-1- 13	45-1- 10	46-1- 20	37
38	46-2- 25	47-1- 60	47-1- 36	46-1- 22	38
39	46-2- 60	48-1- 32	48-2- 54	47-2- 37	39
40	47-2- 24	48-2- 42	49-1- 18	49-1- 22	40

	9	10	11	12	
1	6-1- 36	7-2- 10	6-2- 23	9-2- 36	1
2	7-1- 57	8-1- 15	7-1- 49	9-2- 60	2
3	9-1- 57	9-1- 17	7-2- 36	11-2- 15	3
4	11-1- 43	9-1- 55	10-2- 15	12-2- 31	4
5	13-1- 2	9-2- 11	11-1- 1	14-1- 55	5
6	13-1- 25	11-2- 4	11-1- 52	14-2- 23	6
7	13-1- 50	14-2- 40	13-1- 1	15-2- 35	7
8	13-2- 37	15-1- 54	13-1- 20	17-2- 37	8
9	15-2- 8	16-1- 1	15-1- 45	18-2- 4	9
10	17-1- 20	16-1- 37	15-2- 33	18-2- 14	10
11	17-1- 23	16-1- 40	16-1- 48	18-2- 30	11
12	18-2- 20	19-1- 15	19-2- 3	20-1- 54	12
13	20-2- 24	23-2- 34	19-2- 42	20-2- 41	13
14	23-1- 42	24-2- 44	20-1- 43	22-1- 43	14
15	23-2- 21	25-1- 10	21-1- 51	22-2- 11	15
16	24-1- 40	27-2- 1	21-2- 56	22-2- 57	16
17	25-1- 2	28-2- 20	24-2- 16	23-2- 10	17
18	26-1- 37	29-2- 44	25-1- 16	24-2- 13	18
19	28-1- 19	30-2- 52	25-1- 42	24-2- 36	19
20	28-1- 51	31-2- 7	25-2- 22	26-1- 27	20
21	29-1- 21	32-1- 10	25-2- 31	26-2- 29	21
22	29-1- 51	34-2- 38	29-2- 33	27-2- 39	22
23	30-1- 60	35-1- 60	34-2- 13	28-2- 33	23
24	30-2- 11	35-2- 53	34-2- 23	29-1- 14	24
25	31-1- 24	37-1- 32	34-2- 27	30-1- 50	25
26	32-1- 42	39-2- 13	37-1- 53	34-1- 32	26
27	33-2- 4	43-1- 43	38-1- 14	34-1- 57	27
28	33-2- 9	44-1- 15	38-1- 51	35-1- 7	28
29	38-2- 22	44-1- 34	38-2- 46	35-2- 9	29
30	39-1- 13	44-2- 4	41-2- 41	35-2- 14	30
31	42-1- 23	45-1- 3	42-1- 7	38-1- 12	31
32	42-2- 33	45-1- 18	43-2- 5	39-2- 9	32
33	42-2- 49	45-1- 49	43-2- 26	40-2- 31	33
34	43-1- 57	46-2- 20	44-2- 2	42-1- 45	34
35	43-2- 47	46-2- 51	44-2- 47	43-1- 38	35
36	46-1- 51	46-2- 59	44-2- 56	45-1- 17	36
37	47-1- 5	48-1- 23	45-2- 31	45-2- 28	37
38	48-1- 19	48-2- 0	45-2- 57	47-2- 15	38
39	48-1- 30	48-2- 33	46-2- 43	48-1- 13	39
40	49-1- 36	49-1- 30	48-1- 2	49-2- 52	40

	13	14	15	16	
1	6-1- 31	7-1- 7	6-2- 4	8-2- 16	1
2	8-1- 28	7-1- 55	7-1- 6	23-2- 28	2
3	8-1- 31	9-1- 20	7-1- 14	24-1- 57	3
4	10-1- 16	9-2- 14	8-2- 13	26-1- 23	4
5	10-1- 46	10-1- 21	9-2- 50	29-2- 17	5
6	10-2- 12	12-1- 6	12-1- 18	30-2- 8	6
7	10-2- 28	12-1- 27	14-1- 31	40-1- 58	7
8	14-1- 42	13-1- 40	14-2- 28	41-2- 5	8
9	14-2- 43	14-1- 24	16-1- 58	44-1- 3	9
10	14-2- 47	14-2- 42	17-1- 10	1023-7-511	10
11	16-1- 35	15-1- 39	17-1- 29	1023-7-511	11
12	17-2- 14	16-1- 53	17-2- 40	1023-7-511	12
13	20-1- 24	17-2- 60	18-1- 52	1023-7-511	13
14	20-1- 39	19-1- 1	19-1- 50	1023-7-511	14
15	21-2- 15	21-1- 0	20-1- 40	1023-7-511	15
16	22-2- 50	21-2- 29	22-1- 11	1023-7-511	16
17	22-2- 59	23-1- 1	22-1- 46	1023-7-511	17
18	23-2- 33	23-1- 44	22-2- 39	1023-7-511	18
19	24-2- 32	23-2- 20	26-1- 49	1023-7-511	19
20	24-2- 39	24-1- 32	28-2- 13	1023-7-511	20
21	26-2- 41	24-2- 25	32-1- 7	1023-7-511	21
22	26-2- 51	26-1- 52	34-1- 39	1023-7-511	22
23	27-1- 19	26-2- 8	34-1- 50	1023-7-511	23
24	27-2- 52	26-2- 43	37-1- 31	1023-7-511	24
25	28-1- 29	27-2- 30	37-2- 36	1023-7-511	25
26	29-1- 8	28-2- 34	38-2- 9	1023-7-511	26
27	32-2- 32	30-1- 28	39-2- 19	1023-7-511	27
28	33-1- 44	31-1- 57	40-1- 24	1023-7-511	28
29	33-2- 11	32-2- 14	40-2- 9	1023-7-511	29
30	35-2- 2	33-1- 41	41-2- 9	1023-7-511	30
31	38-2- 7	35-1- 43	42-2- 20	1023-7-511	31
32	40-2- 37	35-2- 36	42-2- 41	1023-7-511	32
33	41-2- 13	36-1- 44	46-1- 19	1023-7-511	33
34	43-1- 58	36-1- 58	46-1- 29	1023-7-511	34
35	44-1- 2	36-2- 43	46-1- 58	1023-7-511	35
36	44-2- 10	38-2- 57	47-1- 21	1023-7-511	36
37	45-2- 52	39-1- 48	47-2- 6	1023-7-511	37
38	46-1- 41	43-1- 1	48-1- 3	1023-7-511	38
39	47-1- 29	46-2- 32	48-1- 29	1023-7-511	39
40	49-1- 25	48-1- 17	49-1- 16	1023-7-511	40

Q FIN

Appendix D - Edit

XRF readings are "corrected" according to the calibration parameters (fields "ZERO" and "CALIBRATE" from the data collection form) of the particular instrument used to collect the raw data. In addition, each data field which appears (to the program) to be either in error within itself or inconsistent with other data fields from the same form, is printed as a computer output facsimile input record with indicators as to the error suspected by the program.

The illustration is a test of twenty forms.

```
@FOR,IS EDIT
FOR 010A-06/22/73-11:48:13 (,0)

    MAIN PROGRAM

    STORAGE USED: CODE(1) 004001, DATA(0) 001506, BLANK COMMON(2) 000000

    EXTERNAL REFERENCES (BLOCK, NAME)

      0003    NINTR$
      0004    NRDC$
      0005    NIO1$
      0006    NIO2$
      0007    NPRT$
      0010    NWDU$
      0011    NWEF$
      0012    NSTOP$

    STORAGE ASSIGNMENT  (BLOCK, TYPE, RELATIVE LOCATION, NAME)

      0001   003605 1001L     0001   003554 1000L     0001   002365 1061G     0001   002367 1060G     0001   000011 11B6
      0001   003625 1101L     0001   002421 1100G     0001   002426 1103G     0001   000017 1156      0001   000023 1216
      0001   003046 1230G     0001   003062 1237G     0001   003213 1270G     0001   003201 1301G     0001   000037 1336
      0001   003361 1330G     0001   003426 1353G     0001   003457 1370G     0001   003476 1402G     0001   003507 1410G
      0001   003520 1416G     0001   003533 1426G     0001   003546 1436G     0001   003564 1447G     0001   003633 1472G
      0001   003652 1505G     0001   003705 1526G     0001   003726 1543G     0001   003752 1561G     0001   000143 1776
      0001   003637 2001L     0001   000147 2046      0001   000165 2206      0001   000204 2346      0001   000221 2456
      0001   000313 2716      0001   000156 301L      0001   003657 3001L     0001   000326 3016      0001   000337 3076
      0001   003716 3101L     0001   003742 3111L     0001   003762 3121L     0001   000352 3216      0001   000405 3426
      0001   000517 3776      0001   000676 4526      0001   000767 4676      0001   000175 501L      0001   000300 511L
      0001   001045 5116      0001   000335 521L      0001   001062 5246      0001   001141 5476      0001   001151 5576
      0001   001215 5746      0001   000412 621L      0001   000601 630L      0001   000606 631L      0001   000624 632L
      0001   000657 633L      0001   000674 634L      0001   000731 635L      0001   000733 636L      0001   001022 637L
      0001   001025 638L      0001   001043 639L      0001   000476 640L      0001   001053 640L      0001   001056 642L
      0001   001107 643L      0001   001134 644L      0001   001137 645L      0001   001146 647L      0001   001210 648L
      0001   001213 650L      0001   001405 650G      0001   000534 66L       0001   001223 700L      0001   001431 701L
      0001   001454 703L      0001   001460 704L      0001   001522 705L      0001   001531 706L      0001   001553 708L
      0001   001572 710L      0001   001601 712L      0001   001623 714L      0001   001642 716L      0001   001650 718L
      0001   001667 720L      0001   001673 722L      0001   001712 724L      0001   001716 726L      0001   001744 727L
      0001   001763 729L      0001   001771 730L      0001   002010 732L      0001   002014 734L      0001   002033 736L
      0001   002037 738L      0001   002063 740L      0001   002067 742L      0001   002162 744L      0001   002202 746L
      0001   002222 748L      0001   002245 749L      0001   002251 750L      0001   002274 751L      0001   002300 752L
      0001   002323 753L      0001   002330 760L      0001   002554 762L      0001   002560 764L      0001   002564 766L
      0001   002570 768L      0001   002573 770L      0001   002633 772L      0001   003012 774L      0001   003036 780L
      0001   003114 782L      0001   003117 784L      0001   003123 786L      0001   003126 788L      0001   003355 790L
      0001   003221 790L      0001   003322 799L      0001   003374 800L      0001   003370 802L      0001   003314 803L
      0001   003400 810L      0000   001305 900F      0000   001306 901F      0000   001311 902F      0000   001320 903F
      0000   001333 904F      0000   001343 905F      0000   001362 906F      0000   001367 907F      0000   001400 908F
      0000   001405 909F      0000   001411 910F      0000   001417 911F      0000   001427 912F      0000   001433 913F
      0000   001444 914F      0000   001451 915F      0001   003423 999L      0001   003451 995L      0001   003467 996L
      0000 I 001211 I         0000 I 001272 IA        0000 I 001273 IB        0000 I 000123 IBUF      0000 I 000343 IDV
      0000 I 001261 ICAR      0000 I 001262 ICARN     0000 I 001214 ICARO     0000 I 000627 II        0000 I 001254 ILINES
      0000 I 001257 ILPI      0000 I 000233 IOBUF     0000 I 001210 IOUT      0000 I 000453 IPR       0000 I 001263 IRM
      0000 I 001260 ISER      0000 I 001213 ISERO     0000 I 001270 ISERX     0000 I 001255 ISO       0000 I 001256 ITEMS
      0000 I 001271 IX        0000 I 001267 IXS       0000 I 001264 I1        0000 I 001265 I2        0000 I 000000 J
      0000 I 001232 JA        0000 I 001215 JAL       0000 I 001233 JC        0000 I 001216 JDO       0000 I 001234 JF
```

```
0000 I 001261 ICAR      0000 I 001262 ICARN     0000 I 001214 ICARO     0000 I 000021 II        0000 I 001263 IPR
0000 I 001257 ILPI      0000 I 000233 IOBUF     0000 I 001210 IOUT      0000 I 000453 IPR       0000 I 001264 IPW
0000 I 001260 ISER      0000 I 001213 ISERO     0000 I 001270 ISERX     0000 I 001255 ISO       0000 I 001256 ITEMS
0000 I 001271 IX        0000 I 001267 IXS       0000 I 001264 I1        0000 I 001265 I2        0000 I 000000 J
0000 I 001232 JB        0000 I 001215 JBL       0000 I 001233 JC        0000 I 001216 JDO       0000 I 001234 JF

0000 I 001235 JG        0000 I 001236 JM        0000 I 001217 JMI       0000 I 001253 JN        0000 I 001237 JO
0000 I 001240 JP        0000 I 001241 JQ        0000 I 001242 JR        0000 I 000737 JROOM     0000 I 001243 JS
0000 I 000035 JSIZE     0000 I 001252 JST       0000 I 001244 JT        0000 I 000066 JTYPE     0000 I 001245 JU
0000 I 000770 JUNK1     0000 I 001100 JUNK2     0000 I 001246 JV        0000 I 001247 JW        0000 I 001250 JX
0000 I 001251 JY        0000 I 001220 J0        0000 I 001221 J1        0000 I 001222 J2        0000 I 001223 J3
0000 I 001224 J4        0000 I 001225 J5        0000 I 001226 J6        0000 I 001227 J7        0000 I 001230 J8
0000 I 001231 J9        0000 I 001274 K         0000 I 001212 L         0000 I 001275 LMAX      0000 I 000563 LV
0000 I 001276 L1        0000 I 001277 L2        0000 I 001300 L3        0000 I 001301 L4        0000 I 001302 L5
0000 I 001303 L6        0000 I 001304 L7        0000 I 001266 L9
```

```
00101      1*        DIMENSION J(20),JSIZE(25),JTYPE(29),IBUF(72),IOBUF(72)                    1   1000
00103      2*        DIMENSION IAV(72),IPR(72),LV(12,3),II(72),JROOM(25)                       1   1010
00104      3*        DIMENSION JUNK1(72),JUNK2(72)                                             1   1020
00105      4*        IOUT=8
00106      5*        READ 900 (J(I),I=1,29)        C  ROOM CODES                               1   1040
00114      6*        DO 3  L=1,3                                                               1   1050
00117      7*        READ 900 (LV(I,L),I=1,12)   C NUMERIC FIELD STARTS                        1   1060
00125      8*      3 CONTINUE                                                                  1   1070
00127      9*        READ 901 ISERO,ICARO,(IOBUF(I),I=10,72)   C ALPHA COMPARANDS              1   1080
00137     10*        JBL=FLD(0,6,IOBUF(10))                                                   15   1090
00140     11*        JDO=FLD(0,6,IOBUF(11))                                                   15   1100
00141     12*        JMI=FLD(0,6,IOBUF(12))                                                   15   1110
00142     13*        J0 =FLD(0,6,IOBUF(13))                                                   15   1120
00143     14*        J1 =FLD(0,6,IOBUF(14))                                                   15   1130
00144     15*        J2 =FLD(0,6,IOBUF(15))                                                   15   1140
00145     16*        J3 =FLD(0,6,IOBUF(16))                                                   15   1150
00146     17*        J4 =FLD(0,6,IOBUF(17))                                                   15   1160
00147     18*        J5 =FLD(0,6,IOBUF(18))                                                   15   1170
00150     19*        J6 =FLD(0,6,IOBUF(19))                                                   15   1180
00151     20*        J7 =FLD(0,6,IOBUF(20))                                                   15   1190
00152     21*        J8 =FLD(0,6,IOBUF(21))                                                   15   1200
00153     22*        J9 =FLD(0,6,IOBUF(22))                                                   15   1210
00154     23*        JB =FLD(0,6,IOBUF(23))                                                   15   1220
00155     24*        JC =FLD(0,6,IOBUF(24))                                                   15   1230
00156     25*        JF =FLD(0,6,IOBUF(25))                                                   15   1240
00157     26*        JG =FLD(0,6,IOBUF(26))                                                   15   1250
00160     27*        JM =FLD(0,6,IOBUF(27))                                                   15   1260
00161     28*        JO =FLD(0,6,IOBUF(28))                                                   15   1270
00162     29*        JP =FLD(0,6,IOBUF(29))                                                   15   1280
00163     30*        JQ =FLD(0,6,IOBUF(30))                                                   15   1290
00164     31*        JR =FLD(0,6,IOBUF(31))                                                   15   1300
00165     32*        JS =FLD(0,6,IOBUF(32))                                                   15   1310
00166     33*        JT =FLD(0,6,IOBUF(33))                                                   15   1320
00167     34*        JU =FLD(0,6,IOBUF(34))                                                   15   1330
00170     35*        JV =FLD(0,6,IOBUF(35))                                                   15   1340
00171     36*        JW =FLD(0,6,IOBUF(36))                                                   15   1350
00172     37*        JX =FLD(0,6,IOBUF(37))                                                   15   1360
00173     38*        JY=FLD(0,6,IOBUF(38))                                                    15   1370
00174     39*        JST=FLD(0,6,IOBUF(39))                                                   15   1380
00175     40*        JN=FLD(0,6,IOBUF(40))                                                    15   1390
00176     41*        DO 10  I=1,29                                                            20   1400
00201     42*     10 JTYPE(I)=0        C CARD TYPE COUNTS                                    20   1410
00203     43*        DO 20  I=1,25                                                            20   1420
00206     44*        JROOM(I)=0                                                               20   1430
00207     45*     20 JSIZE(I)=0        C  DWELLING UNITS BY SIZE                             20   1440
```

```
00201   42*          10 JTYPE(I)=0      Q CARD TYPE COUNTS                                    20 1420
00203   43*             DO 20  I=1,25                                                         20 1430
00206   44*             JROOM(I)=0                                                            20 1440
00207   45*          20 JSIZE(I)=0      Q  DWELLING UNITS BY SIZE                             20 1450

00211   46*             ILINES=0                                                              20 1460
00212   47*             ISO=0                                                                 20 1470
00213   48*             JTYPE(1)=1                                                            20 1480
00214   49*          30 READ 901 ISERO,ICARO, (IOBUF(I),I=10,72)                              20 1490
00214   50*        C * * INITIAL CARD READ * * * * *                                          20 1500
00224   51*             IF (ICARO.NE.0)  GO TO 200  Q ERROR                                   20 1510
00226   52*             ITEMS=0                     Q  NUMBER OF FORMS                        20 1520
00227   53*             ILPI=0                      Q  NUMBER OF FORM LINES                   20 1530
00230   54*          50 READ 901 ISER,ICAR,(IBUF(I),I=10,72)                                  20 1540
00240   55*             IF (ICARO.EQ.0) PRINT 901 ISERO,ICARO,(IOBUF(I),I=10,72)              TEST
00251   56*             IF (ISER.GT.ISERO)  GO TO 52                                          20 1550
00253   57*             IF (ISER.LT.ISERO)  GO TO 51                                          20 1560
00255   58*             IF (ICAR.GT.ICARO)  GO TO 52                                          20 1570
00257   59*             IF(ICAR.LT.41.OR.ICAR.GT.53) GO TO 51                                 20 1580
00261   60*             IF(ICARO.GT.40.AND.ICARO.LT.54) GO TO 52                              20 1590
00263   61*          51 PRINT 912                                                             20 1600
00265   62*             PRINT 901 ISERO,ICARO,(IOBUF(I),I=10,72)                              20 1610
00275   63*             PRINT 901 ISER,ICAR,(IBUF(I),I=10,72)                                 20 1620
00305   64*             ISO=ISO+1                                                             20 1630
00306   65*          52 DO  63  I=10,72                                                       185 1640
00311   66*             IBV(I)=' '                                                            185 1650
00312   67*             JUNK1(I)=' '                                                          185 1660
00313   68*             JUNK2(I)=' '                                                          185 1670
00314   69*             IPR(I)=IOBUF(I)                                                       185 1680
00315   70*             II(I)=FLD(0,6, IPR(I))                                                185 1690
00316   71*          63 CONTINUE                                                              185 1700
00320   72*             DO 60  I=1,28                                                         20 1710
00323   73*             IF (ICAR.EQ.J(I))  GO TO 62                                           20 1720
00325   74*          60 CONTINUE                                                              20 1730
00327   75*             JTYPE(29)=JTYPE(29)+1                                                 20 1740
00330   76*             IF (ICAR.EQ.99)  GO TO 66                                             20 1750
00332   77*             PRINT 903 ISERO,ICARO                                                 20 1760
00336   78*             PRINT 901 ISER,ICAR,(IBUF(I),I=10,72)                                 20 1770
00346   79*             GO TO 50                                                              20 1780
00347   80*          62 JTYPE(I)=JTYPE(I)+1                                                   20 1790
00350   81*             IF (ICARO.EQ.0.AND.ICAR.GT.1)  PRINT 902 (ISERO,ICARO)                20 1800
00355   82*             IF ( ICARO.LE.1.AND.ICAR.GT.2)  PRINT 904 ISERO,ICARO                 20 1810
00362   83*             IF (ISER.NE.ISERO.AND.ICAR.NE.0)  GO TO 64                            20 1820
00364   84*             GO TO 66                                                              20 1830
00365   85*          64 PRINT 905                                                             20 1840
00367   86*             PRINT 901 ISERO,ICARO                                                 20 1850
00373   87*             PRINT 901 ISER,ICAR,(IBUF(I),I=10,72)                                 20 1860
00403   88*             GO TO 50                                                              20 1870
00404   89*          66 ICARN=ICAR                                                            20 1880
00405   90*             IF (ICARO.NE.0)  GO TO 700   Q  NOT CARD 00                           185 1890
00407   91*             IRM=0                                                                 185 1900
00407   92*       C * * CARD 00 * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *  185 1910
00407   93*       C * * * BLANK COLUMN CHECK * * * *                                         185 1920
00410   94*             IF (II(10)  .NE.JBL)   IBV(10)='X'                                    185 1930
00412   95*             IF (II(16)  .NE.JBL)   IBV(16)='X'                                    185 1940
00414   96*             IF (II(20,  .NE.JBL)   IBV(20)='X'                                    185 1950
00416   97*             IF (II(24)  .NE.JBL)   IBV(24)='X'                                    185 1960
00420   98*             IF (II(26)  .NE.JBL)   IBV(26)='X'                                    185 1970
00422   99*             IF (II(34)  .NE.JBL)   IBV(34)='X'                                    185 1980
00422  100*       C * * * VISITATION CHECK * * * * *                                         185 1990
00424  101*             IF (II(25).NE.JBL)  GO TO 630   Q  NON BLANK VISITATION               185 2000
00426  102*          629 IPR(25)='I'                                                          185 2010
00427  103*             IBV(25)='X'     Q  CORRECT VISIT                                      185 2020
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00424   101*          IF (II(25).NE.JBL)  GO TO 630   0   NON BLANK VISITATION          185 1990
00426   102*      629 IPR(25)='1'                                                         185 2000
00427   103*          IBV(25)='X'     0 CORRECT VISIT                                     185 2010


00430   104*          GO TO 632                                                           185 2020
00431   105*      630 IF (II(25).LT.J1.OR.II(25).GT.J9)  GO TO 629                        185 2030
00433   106*      632 IF (II(19) .LT.J0.OR.II(19).GT.J9)  GO TO 633                       185 2040
00433   107*        C * * * XRF ZERO * * * * * * * * * * *                                185 2050
00435   108*          IF (II(18).EQ.JBL.AND.II(17).NE.JBL)  GO TO 633                     185 2060
00437   109*          GO TO 634                                                           185 2070
00440   110*      633 IPR(17)='0'                                                         185 2080
00441   111*          IPR(18)='0'                                                         185 2090
00442   112*          IPR(19)='0'                                                         185 2100
00443   113*          IF (IPR(25).NE.'1') GO TO 636                                       185 2105
00445   114*          IBV(17)='X'                                                         185 2110
00446   115*          IBV(18)='X'                                                         185 2120
00447   116*          IBV(19)='X'                                                         185 2100
00450   117*          GO TO 636                                                           185 2140
00451   118*      634 DO 635  I=17,19                                                     185 2150
00454   119*          IF (II(I).EQ.JBL.OR.II(I).EQ.JMI)  GO TO 635                        185 2160
00456   120*          IF (II(I).LT.J0.OR.II(I).GT.J9)  GO TO 633                          185 2170
00460   121*      635 CONTINUE                                                            185 2180
00462   122*      636 IF (II(23). LT.J0.OR.II(23).GT.J9)  GO TO 638                       185 2190
00462   123*        C * * * CALIBRATE * * * * * * * *                                     185 2200
00464   124*          IF (II(22).EQ.JBL.AND.II(21).NE.JBL)  GO TO 639                     185 2210
00466   125*          DO 637  I=21,23                                                     185 2220
00471   126*          IF (II(I).EQ.JBL.OR.II(I).EQ.JMI)  GO TO 637                        185 2230
00473   127*          IF (II(I).LT.J0.OR.II(I).GT.J9)  GO TO 639                          185 2240
00475   128*      637 CONTINUE                                                            185 2250
00477   129*          GO TO 639                                                           185 2260
00500   130*      638 IPR(21)='0'                                                         185 2270
00501   131*          IPR(22)='0'                                                         185 2280
00502   132*          IPR(23)='0'                                                         185 2290
00503   133*          IF(IPR(25).NE.'1'.GO TO 639                                         185 2295
00505   134*          IBV(21)='X'                                                         185 2300
00506   135*          IBV(22)='X'                                                         185 2310
00507   136*          IBV(23)='X'                                                         185 2320
00510   137*      639 DO 640  I=27,33                                                     185 2330
00510   138*        C * * * CENSUS ID * ALL BLANK CHECK * * *                             185 2340
00513   139*          IF (II(I).EQ.JBL)  GO TO 640                                        185 2350
00515   140*          GO TO 642                                                           185 2360
00516   141*      640 CONTINUE                                                            185 2370
00520   142*          GO TO 647                                                           185 2380
00521   143*      642 I1=0                                                                185 2390
00521   144*        C * * * CENSUS ID * ONE NON BLANK * *                                 185 2400
00522   145*          I2=0                                                                185 2410
00523   146*          DO 644  I=27,33                                                     185 2420
00526   147*          IF (II(I).EQ.JBL.AND.I1.NE.0)  GO TO 645                            185 2430
00530   148*          IF (II(I).NE.JDO)  GO TO 643                                        185 2440
00532   149*          I2=I2+1                                                             185 2450
00533   150*          IF (I2-1)  645,644,645                                              185 2460
00536   151*      643 IF (II(I).EQ.JBL)  GO TO 644                                        185 2470
00540   152*          IF (II(I).LT.J0.OR.II(I).GT.J9)  GO TO 645                          185 2480
00542   153*          I1=I1+1                                                             185 2490
00543   154*      644 CONTINUE                                                            185 2500
00545   155*          GO TO 647                                                           185 2510
00546   156*      645 DO 646  I=27,33                                                     185 2520
00551   157*          IBV(I)='X'                                                          185 2530
00552   158*          IPR(I)=' '                                                          185 2540
00553   159*      646 CONTINUE                                                            185 2550
00555   160*      647 I1=0                                                                185 2560
00556   161*          DO 648  I=35,38                                                     185 2570
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00552   158*          IPR(I)=' '                                                  IBS 2540
00553   159*      646 CONTINUE                                                    IBS 2550
00555   160*      647 I1=0                                                        IBS 2560
00556   161*          DO 648  I=35,98                                             IBS 2570

00561   162*          IF (II(I).EQ.JBL.AND.I1.NE.0)  GO TO 650                    IBS 2580
00563   163*          IF (II(I).EQ.JBL)  GO TO 648                                IBS 2590
00565   164*          IF (II(I).LT.J0.OR.II(I).GT.J9)  GO TO 650                  IBS 2600
00567   165*          I1=1                                                        IBS 2610
00570   166*      648 CONTINUE                                                    IBS 2620
00572   167*          GO TO 990                                                   IBS 2630
00573   168*      650 DO 652  I=35,98                                             IBS 2640
00576   169*          IBV(I)='X'                                                  IBS 2650
00577   170*          IPR(I)=' '                                                  IBS 2660
00600   171*      652 CONTINUE                                                    IBS 2670
00602   172*          GO TO 990                                                   IBS 2680
00603   173*      700 IF (ICARD.EQ.1)  GO TO 990   Q CARD TYPE 01                 IBS 2690
00605   174*          IF (ICARD.NE.2)  GO TO 760                                  IBS 2700
00607   175*          IBV=0                                                       IBS 2710
00607   176*    C * * CARD 02 * * * * * * * * * *                                 IBS 2720
00607   177*    C * * * BLANK CHECK * * * * * * *                                 IBS 2730
00610   178*          IF (II(10).NE.JBL)  IBV(10)='X'                             IBS 2740
00612   179*          IF (II(16).NE.JBL)  IBV(16)='X'                             IBS 2750
00614   180*          IF (II(20).NE.JBL)  IBV(20)='X'                             IBS 2760
00616   181*          IF (II(23).NE.JBL)  IBV(23)='X'                             IBS 2770
00620   182*          IF (II(26).NE.JBL)  IBV(26)='X'                             IBS 2780
00622   183*          IF (II(29).NE.JBL)  IBV(29)='X'                             IBS 2790
00624   184*          IF (II(31).NE.JBL)  IBV(31)='X'                             IBS 2800
00626   185*          IF (II(33).NE.JBL)  IBV(33)='X'                             IBS 2810
00630   186*          IF (II(36).NE.JBL)  IBV(36)='X'                             IBS 2820
00632   187*          IF (II(38).NE.JBL)  IBV(38)='X'                             IBS 2830
00634   188*          IF (II(40).NE.JBL)  IBV(40)='X'                             IBS 2840
00636   189*          IF (II(42).NE.JBL)  IBV(42)='X'                             IBS 2850
00640   190*          IF (II(44).NE.JBL)  IBV(44)='X'                             IBS 2860
00642   191*          IF (II(46).NE.JBL)    IBV(46)='X'                           IBS 2870
00644   192*          IF (II(48).NE.JBL)  IBV(48)='X'                             IBS 2880
00646   193*          IF (II(50).NE.JBL)  IBV(50)='X'                             IBS 2890
00650   194*          IF (II(52).NE.JBL)  IBV(52)='X'                             IBS 2900
00650   195*    C * * * XRF CHECK * * * * * * * *                                 IBS 2910
00652   196*          L9=0                                                        IBS 2920
00653   197*          DO 702  I=11,15                                             IBS 2930
00656   198*          IF (II(I).EQ.JBL)  L9=L9+1                                  IBS 2940
00660   199*      702 CONTINUE                                                    IBS 2950
00662   200*          IF(L9.LE.2) GO TO 701                                       IBS 2960
00664   201*          IBV(11)='X'                                                 IBS 2970
00665   202*          IBV(12)='X'                                                 IBS 2980
00666   203*          IBV(13)='X'                                                 IBS 2990
00667   204*          IBV(14)='X'                                                 IBS 3000
00670   205*          IBV(15)='X'                                                 IBS 3010
00670   206*    C * * * INSPECTOR CHECK * * * * *                                 IBS 3020
00671   207*      701 IF (II(17).EQ.JBL.AND.II(18).EQ.JBL.AND.II(19).EQ.JBL)  GO TO 703 IBS 3030
00673   208*          GO TO 704                                                   IBS 3040
00674   209*      703 IBV(17)='X'                                                 IBS 3050
00675   210*          IBV(18)='X'                                                 IBS 3060
00676   211*          IBV(19)='X'                                                 IBS 3070
00677   212*      704 IF (II(21).NE.JBL.AND.II(21).NE.J0.AND.II(21).NE.J1)  GO TO 705 IBS 3080
00677   213*    C * * * MONTH CHECK * * * * * * *                                 IBS 3090
00701   214*          IF (II(22).LT.J0.OR.II(22).GT.J9)  GO TO 705                IBS 3100
00703   215*          GO TO 706                                                   IBS 3110
00704   216*      705 IBV(21)='X'                                                 IBS 3120
00705   217*          IBV(22)='X'                                                 IBS 3130
00706   218*          IPR(21)='1'                                                 IBS 3140
00707   219*          IPR(22)='3'                                                 IBS 3150
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00704   216*      705 IBV(21)='X'                                                  185 3050
00705   217*          IBV(22)='X'                                                  185 3060
00706   218*          IPR(21)='1'                                                  185 3070
00707   219*          IPR(22)='3'                                                  185 3080


00710   220*      706 IF (II(24).EQ.JBL)  GO TO 708                                185 3090
00710   221*    C * * * DAY CHECK * * * * * * * * *                                185 3100
00712   222*          IF (II(24).LT.J0.OR.II(24).GT.J9)  GO TO 710                 185 3110
00714   223*      708 IF (II(25).LT.J0.OR.II(25).GT.J9)  GO TO 710                 185 3120
00716   224*          GO TO 712                                                    185 3130
00717   225*      710 IBV(24)='X'                                                  185 3140
00720   226*          IBV(25)='X'                                                  185 3150
00721   227*          IPR(24)='3'                                                  185 3160
00722   228*          IPR(25)='2'                                                  185 3170
00723   229*      712 IF (II(27).EQ.JBL)  GO TO 714                                185 3180
00723   230*    C * * * SEQ CHECK * * * * * * * * *                                185 3190
00725   231*          IF (II(27).LT.J0.OR.II(27).GT.J9)  GO TO 716                 185 3200
00727   232*      714 IF (II(28).LT.J0.OR.II(28).GT.J9)  GO TO 716                 185 3210
00731   233*          GO TO 718                                                    185 3220
00732   234*      716 IBV(27)='X'                                                  185 3230
00733   235*          IBV(28)='X'                                                  185 3240
00734   236*          IPR(27)='0'                                                  185 3250
00735   237*          IPR(28)='0'                                                  185 3260
00736   238*      718 IF (II(30).LT.J1.OR.II(30).GT.J3)  GO TO 720                 185 3270
00736   239*    C * * * TYPE * * * * * * * * * * * *                               185 3280
00740   240*          GO TO 722                                                    185 3290
00741   241*      720 IBV(30)='X'                                                  185 3300
00742   242*          IPR(30)='4'                                                  185 3310
00743   243*      722 IF (II(32).LT.J1.OR.II(32).GT.J7)  GO TO 724                 185 3320
00743   244*    C * * * EXTERIOR SURFACE * * * * *                                 185 3330
00745   245*          GO TO 726                                                    185 3340
00746   246*      724 IBV(32)='X'                                                  185 3350
00747   247*          IPR(32)='8'                                                  185 3360
00750   248*      726 IXS=IPR(32)                                                  185 3370
00751   249*          ISERX=ISER                                                   185 3380
00752   250*          IF (II(34).EQ.JBL) GO TO 727                                 185 3390
00752   251*    C * * * STORIES * * * * * * * * * *                                185 3400
00754   252*          IF (II(34).LT.J0.OR.II(34).GT.J9)  GO TO 728                 185 3410
00756   253*      727 IF (II(35).LT.J0.OR.II(35).GT.J9)  GO TO 728                 185 3420
00760   254*          GO TO 730                                                    185 3430
00761   255*      728 IBV(34)='X'                                                  185 3440
00762   256*          IBV(35)='X'                                                  185 3450
00763   257*          IPR(34)='9'                                                  185 3460
00764   258*          IPR(35)='9'                                                  185 3470
00765   259*      730 IF (II(37).LT.J1.OR.II(37).GT.J7)  GO TO 732                 185 3480
00765   260*    C * * * OCCUPANCY CLASS * * * * *                                  185 3490
00767   261*          GO TO 734                                                    185 3500
00770   262*      732 IBV(37)='X'                                                  185 3510
00771   263*          IPR(37)='8'                                                  185 3520
00772   264*      734 IF (II(39).LT.J1.OR.II(39).GT.J3)  GO TO 736                 185 3530
00772   265*    C * * * YEAR BUILT * * * * * * * *                                 185 3540
00774   266*          GO TO 738                                                    185 3550
00775   267*      736 IBV(39)='X'                                                  185 3560
00776   268*          IPR(39)='4'                                                  185 3570
00777   269*      738 IF (II(41).NE.JO.AND.II(41).NE.JR.AND.II(41).NE.JU)  GO TO 740  185 3580
00777   270*    C * * *  OWNER-RENTER * * * * * *                                  185 3590
01001   271*          GO TO 742                                                    185 3600
01002   272*      740 IBV(41)='X'                                                  185 3610
01003   273*          IPR(41)='U'                                                  185 3620
01004   274*      742 I=II(43)                                                     185 3630
01004   275*    C * * * MORTGAGE  TYPE * * * * * *                                 185 3640
01005   276*          IF (I.EQ.JC.OR.I.EQ.JV.OR.I.EQ.JF.OR.I.EQ.JN.OR.I.EQ.JU) GO TO 744185 3650
01007   277*          IF (I.EQ.JBL.AND.II(41).EQ.JR)  GO TO 744                    185 3660
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01009    274*        742 I=II(42)                                                    185 3630
01004    275*      C * * * MORTGAGE  TYPE * * * * * *                               185 3640
01005    276*            IF (I.EQ.JC.OR.I.EQ.JV.OR.I.EQ.JF.OR.I.EQ.JN.OR.I.EQ.JU) GO TO 744 185 3650
01007    277*            IF (I.EQ.JBL.AND.II(41).EQ.JR)  GO TO 744                 185 3660

01011    278*            IF (I.EQ.JBL.AND.II(41).EQ.JU)  GO TO 748                 185 3670
01013    279*            IBV(43)='X'                                               185 3680
01014    280*            IPR(43)='U'                                               185 3690
01015    281*        744 IF (II(45).EQ.JP.OR.II(45).EQ.JBL)  GO TO 746             185 3700
01015    282*      C * * * PUBLIC HOUSING * * * * * *                              185 3710
01017    283*            IBV(45)='X'                                               185 3720
01020    284*            IPR(45)=' '                                               185 3730
01021    285*        746 IF (II(47).EQ.JS.OR.II(47).EQ.JBL)  GO TO 748             185 3740
01021    286*      C * * *  SUBSIDIZED * * * * * * *                               185 3750
01023    287*            IBV(47)='X'                                               185 3760
01024    288*            IPR(47)=' '                                               185 3770
01025    289*        748 IF (II(49).EQ.JBL)  GO TO 750                             185 3780
01025    290*      C * * * CHILDREN RESIDENT * * * *                               185 3790
01027    291*            IF (II(49).LT.J0.OR.II(49).GT.J9)  GO TO 749              185 3800
01031    292*            GO TO 750                                                 185 3810
01032    293*        749 IBV(49)='X'                                               185 3820
01033    294*            IPR(49)='0'                                               185 3830
01034    295*        750 IF (II(51).EQ.JBL)  GO TO 752                             185 3840
01034    296*      C * * * CHILDREN CARED FOR * * * *                              185 3850
01036    297*            IF (II(51).LT.J0.OR.II(51).GT.J9)  GO TO 751              185 3860
01040    298*            GO TO 752                                                 185 3870
01041    299*        751 IBV(51)='X'                                               185 3880
01042    300*            IPR(51)='0'                                               185 3890
01043    301*        752 IF (II(53).EQ.JBL)  GO TO 990                             185 3900
01043    302*      C * * * ELEVATED BLOOD LEVEL * * *                              185 3910
01045    303*            IF (II(53).LT.J0.OR.II(53).GT.J9)  GO TO 753              185 3920
01047    304*            GO TO 990                                                 185 3930
01050    305*        753   IBV(53)='X'                                             185 3940
01051    306*            IPR(53)='0'                                               185 3950
01052    307*            GO TO 990                                                 185 3960
01053    308*        760 IF (ICARD.GE.80)  GO TO 810                               185 3970
01055    309*            IF (ICARD.LT.70)  IRM=IRM+1                               185 3980
01055    310*      C * * CARDS 11 THRU 69 * * * * * *                              185 3990
01057    311*            IX=10                                                     185 4000
01060    312*            DO 763  I=1,2                                             185 4010
01063    313*            DO 761    IA=1,4                                          185 4020
01066    314*            IB=IX+IA                                                  185 4030
01067    315*        761 IPR(IB)=' '                                               185 4040
01071    316*            IX=36                                                     185 4050
01072    317*            IF (ICARD.GE.80)  IX=19                                   185 4060
01074    318*        763 CONTINUE                                                  185 4070
01076    319*            IX=10                                                     185 4080
01076    320*      C * * * CARDS 11 THRU 73 * * * * *                              185 4090
01077    321*            DO 774  I=1,2                                             185 4100
01102    322*            DO 770  IA=1,4                                            185 4110
01105    323*            IB=IX+IA                                                  185 4120
01106    324*            K=II(IB)                                                  185 4130
01107    325*            IF (K.EQ.JP.OR.K.EQ.JV.OR.K.EQ.JG.OR.K.EQ.JM.OR.K.EQ.JT.OR.K.EQ.JW 185 4140
01107    326*           1)  GO TO 768                                              185 4150
01111    327*            IF (K.GT.J0.AND.K.LT.J6) GO TO 766                        185 4160
01113    328*            IF (K.EQ.J0.OR.K.EQ.JC.OR.K.EQ.JR)  GO TO 764             185 4170
01115    329*            IF (K.EQ.JY)  GO TO 762                                   185 4180
01117    330*            IF (K.EQ.JBL)  GO TO 770                                  185 4190
01121    331*            IBV(IB)='X'                                               185 4200
01122    332*            GO TO 770                                                 185 4210
01123    333*        762 IPR(IX+4)=IOBUF(IB)                                       185 4220
01124    334*            GO TO 770                                                 185 4230
01125    335*        764 IPR(IX+3)=IOBUF(IB)                                       185 4240
```

```
01123    333*      762 IPR(IX+4)=IOBUF(IB)                                          IBS 4220
01124    334*          GO TO 770                                                    IBS 4230
01125    335*      764 IPR(IX+3)=IOBUF(IB)                                          IBS 4240
01126    336*          GO TO 770                                                    IBS 4250
01127    337*      766 IPR(IX+2)=IOBUF(IB)                                          IBS 4260
01130    338*          GO TO 770                                                    IBS 4270
01131    339*      768 IPR(IX+1)=IOBUF(IB)                                          IBS 4280
01132    340*      770 CONTINUE                                                     IBS 4290
01134    341*          IF (IPR(IX+1).NE.' ') GO TO 772                              IBS 4300
01136    342*          IPR(IX+1)='P'                                                IBS 4310
01137    343*          IF (IX.EQ.36.OR.ICARD.GT.80)  IPR(IX+1)='W'                  IBS 4320
01141    344*          IF (ICARD.NE.80)  GO TO 772                                  IBS 4330
01143    345*          IPR(IX+1)='U'                                                IBS 4340
01144    346*          IF (ISERD.EQ.ISERX)  IPR(IX+1)=IYS                           IBS 4350
01146    347*      772 IX=36                                                        IBS 4360
01147    348*          IF (ICARD.GE.80)  IX=19                                      IBS 4370
01151    349*      774 CONTINUE                                                     IBS 4380
01153    350*          IF (II(10).NE.JBL)  IBV(10)='X'                              IBS 4390
01155    351*          IF (II(15).NE.JBL)  IBV(15)='X'                              IBS 4400
01157    352*          IF (II(19).NE.JBL)  IBV(19)='X'                              IBS 4410
01161    353*          IF (II(24).NE.JBL)  IBV(24)='X'                              IBS 4420
01163    354*          IF (ICARD.GE.80)  GO TO 776                                  IBS 4430
01165    355*          IF (II(28).NE.JBL)  IBV(28)='X'                              IBS 4440
01167    356*          IF (II(32).NE.JBL)  IBV(32)='X'                              IBS 4450
01171    357*          IF (II(36).NE.JBL)  IBV(36)='X'                              IBS 4460
01173    358*          IF (II(41).NE.JBL)  IBV(41)='X'                              IBS 4470
01175    359*          IF (II(43).NE.JBL)  IBV(43)='X'                              IBS 4480
01177    360*          IF (II(47).NE.JBL)  IBV(47)='X'                              IBS 4490
01201    361*          IF (II(49).NE.JBL)  IBV(49)='X'                              IBS 4500
01203    362*          IF (II(53).NE.JBL)  IBV(53)='X'                              IBS 4510
01205    363*          IF (II(57).NE.JBL)  IBV(57)='X'                              IBS 4520
01207    364*          IF (II(61).NE.JBL)  IBV(61)='X'                              IBS 4530
01211    365*          IF (II(65).NE.JBL)  IBV(65)='X'                              IBS 4540
01213    366*          IF (II(69).NE.JBL)  IBV(69)='X'                              IBS 4550
01215    367*      776 L=1                                                          IBS 4560
01216    368*          LMAX=1                                                       IBS 4570
01217    369*          IF (ICARD.LT.80)  GO TO 780   @ ROOM CARD                    IBS 4580
01221    370*          L=2                                                          IBS 4590
01222    371*          LMAX=2                                                       IBS 4600
01223    372*          IF (ICARD.LT.90)  GO TO 780    @ EXTERIOR CARD               IBS 4610
01225    373*          L=3                            @ INCOMPLETE SIGNAL           IBS 4620
01226    374*          LMAX=3                                                       IBS 4630
01227    375*      780 DO 900 L1=1,LMAX                                             IBS 4640
01232    376*          L2=LV(L1,L)                                                  IBS 4650
01233    377*          L3=L2+2                                                      IBS 4660
01234    378*          L4=0                                                         IBS 4670
01235    379*          L5=1                                                         IBS 4680
01236    380*          DO 790  L6=L2,L3                                             IBS 4690
01241    381*          IF (II(L6).GE.J0.AND.II(L6).LE.J9)  GO TO 782   @ NUMERIC    IBS 4700
01243    382*          IF (II(L6).EQ.JMI)  GO TO 784  @MINUS                        IBS 4710
01245    383*          IF (II(L6).EQ.JBL)  GO TO 786  @ BLANK                       IBS 4720
01247    384*          L7=4*L5      @  ILLEGAL CHARACTER                            IBS 4730
01250    385*          GO TO 788                                                    IBS 4740
01251    386*      782 L7=L5        @  NUMERIC                                      IBS 4750
01252    387*          GO TO 788                                                    IBS 4760
01253    388*      784 L7=2*L5      @  MINUS                                        IBS 4770
01254    389*          GO TO 788                                                    IBS 4780
01255    390*      786 L7=3*L5      @  BLANK                                        IBS 4790
01256    391*      788 L4=L4+L7                                                     IBS 4800
01257    392*          L5=10*L5                                                     IBS 4810
01260    393*      790 CONTINUE                                                     IBS 4820
```

```
01255    390*        786 L7=3*L5     0 BLANK                                                    185 4790
01256    391*        788 L4=L4+L7                                                               185 4800
01257    392*            L5=10*L5                                                               185 4810
01260    393*        790 CONTINUE                                                               185 4820
01262    394*            L6=L2-2                                                                185 4830
01263    395*            IF (L4.EQ.111.OR.L4.EQ.113.OR.L4.EQ.133.OR.L4.EQ.112.OR.L4.EQ.132.185 4840
01263    396*           1OR.L4.EQ.123)  GO TO 798                                               185 4850
01265    397*            IF (L4.EQ.333)  GO TO 799                                              185 4860
01267    398*            DO 792  L6=L2,L3                                                       185 4870
01272    399*            IPR(L6)=' '                                                            185 4880
01273    400*        792 IBV(L6)='X'                                                            185 4890
01275    401*            GO TO 795                                                              185 4900
01276    402*        798 IF (L2.NE.44.AND.L2.NE.50)  GO TO 800                                  185 4910
01300    403*            DO 797 L9=L2,L3
01303    404*            IF(II(L9).NE.J9) GO TO 802
01305    405*        797 CONTINUE
01307    406*            L9=L2-2
01310    407*            IF(II(L9).EQ.J8L.OR.II(L9).EQ.J0) GO TO 803
01312    408*        802 IF(II(L6).GT.J0.AND.II(L6).LE.J9) GO TO 800
01314    409*            IPR(L6)='1'                                                            185 4930
01315    410*        801 IBV(L6)='X'                                                            185 4940
01316    411*            GO TO 800                                                              185 4950
01317    412*        803 IPR(L9)=' '
01320    413*            IBV(L9)='X'
01321    414*            GO TO 800
01322    415*        799 IF (L2.NE.44.AND.L2.NE.50)  GO TO 795                                  185 4960
01324    416*            IF (II(L6).EQ.J8L.OR.II(L6).EQ.J0)  GO TO 795                          185 4970
01325    417*            IPR(L6)='0'                                                            185 4980
01327    418*        795 DO 796  L6=L2,L3                                                       185 4990
01332    419*            IPR(L6)='9'                     0 NON EXISTENT                         185 5000
01333    420*            IF (L6.EQ.35)  IPR(L6)='8'                                             185 5010
01335    421*        796 CONTINUE                                                               185 5020
01337    422*        800 CONTINUE                                                               185 5030
01341    423*            GO TO 990                                                              185 5040
01342    424*        810 IF (II(10).NE.J8L)   IBV(10)='X'                                       185 5050
01344    425*            IF (II(15).NE.J8L)   IBV(15)='X'                                       185 5060
01346    426*            IF (II(19).NE.J8L)   IBV(19)='X'                                       185 5070
01350    427*            GO TO 776                                                              185 5080
01351    428*        990 L=0                                                                    185 5090
01352    429*            DO 995  K=10,72                                                        185 5100
01355    430*            IF (IBV(K).EQ.' ')  GO TO 995                                          185 5110
01357    431*            JUNK1(K)=(K/10)                                                        185 5120
01360    432*            JUNK2(K)=K-JUNK1(K)*10+48                                              185 5130
01361    433*            JUNK1(K)=JUNK1(K)+48                                                       5140
01362    434*            L=L+1                                                                  185 5150
01363    435*        995 CONTINUE                                                               185 5160
01365    436*            IF(L.EQ.0) GO TO 1000                                                  185 5170
01367    437*            DO 996  I=10,72                                                            5180
01372    438*            IF (JUNK1(I).EQ.' ')  GO TO 996                                            5190
01374    439*            FLD(0,6,JUNK1(I))=FLD(30,6,JUNK1(I))                                       5200
01375    440*            FLD(0,6,JUNK2(I))=FLD(30,6,JUNK2(I))                                       5210
01376    441*        996 CONTINUE                                                                   5220
01400    442*            PRINT 909 (JUNK1(I),I=10,72)                                       185 5230
01406    443*            PRINT 915 (JUNK2(I),I=10,72)                                       185 5240
01414    444*            PRINT 915 (IBV(I),I=10,72)                                         185 5250
01422    445*            PRINT 901 ISER0,ICAR0,(IOBUF(I),I=10,72)                           185 5260
01432    446*            PRINT 901 ISER0,ICAR0,(IPR(I),I=10,72),ICARN                       185 5270
01443    447*       1000 WRITE(IOUT,901) ISER0,ICAR0,(IPR(I),I=10,72),ICARN                         5280
01454    448*            ILINES=ILINES+1                                                            5290
01455    449*            ILPI=ILPI+1                                                                5300
01456    450*            IF (ISER.NE.ISER0)  GO TO 100                                              5310
01460    451*            GO TO 110                                                                  5320
```

```
01455    449*          ILPI=ILPI+1                                                    5300
01456    450*          IF (ISER.NE.ISER0)  GO TO 100                                  5310
01460    451*          GO TO 110                                                      5320

01461    452*      100 ITEMS=ITEMS+1                                                  5330
01462    453*          JROOM(IRM+I)=JROOM(IRM+I)+1                                    5340
01463    454*          JSIZE(ILPI)=JSIZE(ILPI)+1                                      5350
01464    455*          ILPI=0                                                         5360
01465    456*          IF (ISER.EQ.999999)  GO TO 300                                 5370
01467    457*      110 ISER0=ISER                                                     5380
01470    458*          ICAR0=ICAR                                                     5390
01471    459*          DO 120   I=10,72                                               5400
01474    460*      120 IQUE(I)=IQUE(I)                                                5410
01476    461*          GO TO 50                                                       5420
01477    462*      200 PRINT 906                                                      5430
01501    463*          PRINT 901  ISER0,ICAR0,(IQUE(I),I=10,72)                       5440
01511    464*          GO TO 30                                                       5450
01512    465*      300 PRINT 910 ITEMS,ILINES                                         5460
01516    466*          WRITE(IOUT,901) ISER,ICAR                                      5470
01522    467*          END FILE IOUT                                                  5480
01523    468*          PRINT 913                                                      5490
01525    469*          DO 310  I=1,25                                                 5500
01530    470*          IF (JSIZE(I).EQ.0)  GO TO 310                                  5510
01532    471*          PRINT 907 JSIZE(I),I                                           5520
01535    472*      310 CONTINUE                                                       5530
01540    473*          PRINT 913                                                      5540
01542    474*          DO 311  I=1,25                                         5PC 5550
01545    475*          IF (JROOM(I).EQ.0)  GO TO 311                          41P 5560
01547    476*          I1=I-1                                                 41P 5570
01550    477*          PRINT 911 JROOM(I1,I1                                  41P 5580
01554    478*      311 CONTINUE                                               41P 5590
01556    479*          PRINT 913                                                      5600
01560    480*          DO 312  I=1,28                                                 5610
01563    481*          IF (JTYPE(I).EQ.0)  GO TO 312                                  5620
01565    482*          PRINT 908  (JTYPE(I),J(I))                                     5630
01571    483*      312 CONTINUE                                                       5640
01573    484*          PRINT 913                                                      5650
01575    485*          PRINT 914 ISQ                                                  5660
01600    486*          STOP                                                           5670
01601    487*      900 FORMAT (29I2)                                                  5680
01602    488*      901 FORMAT (I6,I3,63A1,I3)                                         5690
01603    489*      902 FORMAT(1H0,I6,I3,      * 01 ADDRESS CARD MISSING*)             5700
01604    490*      903 FORMAT (*0PRINTED CARD HAS ILLEGAL ROOM TYPE.  FOLLOWS CARD*,I7,I3  5710
01604    491*         1)                                                              5720
01605    492*      904 FORMAT (1H0,I6,I3,      * 02 QUESTIONNAIRE CARD MISSING*)      5730
01606    493*      905 FORMAT (*0 00 CARD MISSING OR SERIAL NUMBER IS WRONG,  SECOND CARD  5740
01606    494*         1 SHOWN HAS BEEN DROPPED.*)                                     5750
01607    495*      906 FORMAT (*0 INITIAL CARD ERROR*)                                5760
01610    496*      907 FORMAT (1H ,I6,* DWELLING UNITS HAVE*I6,* FORM LINES*)         5770
01611    497*      908 FORMAT (I6,* CARDS OF TYPE*,I3)                                5780
01612    498*      909 FORMAT (*0ERROR   *,63A1)                                      5790
01613    499*      910 FORMAT (1H1,I6,* FORMS--*,I6,* LINES*)                         5800
01614    500*      911 FORMAT (* *,I6,* DWELLING UNITS HAVE*I6,* ROOMS*)              5810
01615    501*      912 FORMAT (*0 SEQUENCE ERROR*)                                    5820
01616    502*      913 FORMAT (*                                          *)          5830
01617    503*      914 FORMAT (I ,* SEQUENCE ERRORS*)                                 5840
01620    504*      915 FORMAT (9X,63A1)                                               5850
01621    505*          END                                                            5860

 END OF COMPILATION:        NO  DIAGNOSTICS.
```

```
        END OF COMPILATION:        NO  DIAGNOSTICS.


@XQT
MAP 0023-06/22-11:48


ADDRESS LIMITS    001000 014036      040000 045274
STARTING ADDRESS  010036

WORDS DECIMAL       5663 IBANK         2749 DBANK


             SEGMENT MAIN          001000 014036      040000 045274

NRWND$/FOR6A                 1    001000 001061         2   040000 040011
NBF00$/FOR                                              2   040012 042213
NBDCV$/FOR64                 1    001062 001207         2   042214 042256
NFIV$/FOR                    1    001210 001232
NCNVT$/FOR6A                 1    001233 001454         2   042257 042353
NCLOS$/FOR6A                 1    001455 001545         2   042354 042404
NSWTC$/FOR                   1    001546 001567
NWBLK$/FOR6A                 1    001670 002001
NBSPL$/FOR6A                 1    002002 002042
NUPDA$/FOR6A                 1    002043 002076
NRBLK$/FOR6A                 1    002077 002121
NOTIN$/FOR6A                 1    002122 002416         2   042405 042410
NFCHK$/FOR6A                 1    002417 003403         2   042411 042564
                                                        4   042565 042636
NOUT$/FOR6A                  1    003404 004417         2   042637 042671
NIOER$/FOR6A                 1    004420 004601         2   042672 043030
NINPT$/FOR6A                 1    004602 005466         2   043031 043054
NFMT$/FOR6A                  1    005467 006344         2   043055 043131
NTAB$                                                   2   043132 043210
ERR$/SYS6A-2
NERR$/FOR6A                  1    006345 006733         2   043211 043370
NSTOP$/FOR6A                 1    006734 006751         2   043371 043400
NXEF$/FOR6A                  1    006752 007155         2   043401 043420
NOBUF$/FOR6A                 1    007156 007216
NOSYM$/FOR6A                 1    007217 007432         2   043421 043424
NIER$/FOR6A                  1    007433 007604         2   043425 043543
NISYM$/FOR6A                 1    007605 007776         2   043544 043547
NINTR$/FOR6A                 1    007777 010035         2   043550 043566
BLANK$COMMON (COMMON BLOCK)
EDIT                         1    010036 014036         0   043567 045274
                                                        2   BLANK$COMMON


SYS$*RLIB$, LEVEL 6A-2
END OF COLLECTION - TIME 1.215 SECONDS

     8  0 20010

 ERROR          111 222 2
                789 123 5
```

```
      8  0 20010

ERROR           111 222 2
                789 123 5
                XXX XXX X
      8  0 20010
      8  0 20010 000 750 1                                              1
      9  0 20011

ERROR           111 222 2
                789 123 5
                XXX XXX X
      9  0 20011
      9  0 20011 000 750 1                                              1
     10  0 20002

ERROR           111 222 2
                789 123 5
                XXX XXX X
     10  0 20002
     10  0 20002 000 750 1                                              1
     14  0 20009

ERROR           111 222 2
                789 123 5
                XXX XXX X
     14  0 20009
     14  0 20009 000 750 1                                              1
     15  0 20008

ERROR           111 222 2
                789 123 5
                XXX XXX X
     15  0 20008
     15  0 20008 000 750 1                                              1

ERROR                                   4
                                        3
                                        X
     15 11 P    005  008 020 013     W    20092 2 003 040     006
     15 11 P    005  008 020 013 998 W    20092 2 003 040 999 006 999     21
     16  0 20008

ERROR           111 222 2
                789 123 5
                XXX XXX X
     16  0 20008
     16  0 20008 000 750 1                                              1
     17  0 20016

ERROR           111 222 2
                789 123 5
                XXX XXX X
     17  0 20016
     17  0 20016 000 750 1                                              1
     18  0 20009

ERROR           111 222 2
                789 123 5
                XXX XXX X
     18  0 20009
     18  0 20009 000 750 1                                              1
```

```
                    789 123 5
                    XXX XXX X
    18  0 20009
    18  0 20009 000 750 1                                                  1

    19  0 20007

ERROR               111 222 2
                    789 123 5
                    XXX XXX X
    19  0 20007
    19  0 20007 000 750 1                                                  1
    20  0 20007

ERROR               111 222 2
                    789 123 5
                    XXX XXX X
    20  0 20007
    20  0 20007 000 750 1                                                  1
    21  0 20011

ERROR               111 222 2
                    789 123 5
                    XXX XXX X
    21  0 20011
    21  0 20011 000 750 1                                                  1
    22  0 20009

ERROR               111 222 2
                    789 123 5
                    XXX XXX X
    22  0 20009
    22  0 20009 000 750 1                                                  1
    31  0 20009           1

ERROR               111 222
                    789 123
                    XXX XXX
    31  0 20009           1
    31  0 20009 000 750 1                                                  1
    32  0 20009           1

ERROR               111 222
                    789 123
                    XXX XXX
    32  0 20009           1
    32  0 20009 000 750 1                                                  1
    33  0 20010           1

ERROR               111 222
                    789 123
                    XXX XXX
    33  0 20010           1
    33  0 20010 000 750 1                                                  1
    34  0 20011           1

ERROR               111 222
                    789 123
                    XXX XXX
    34  0 20011           1
    34  0 20011 000 750 1                                                  1

ERROR
```

```
                    XXX XXX
      34  0 20011           1
      34  0 20011 000 750 1                                                  1

ERROR                                   4

                                                                           3
                                                                           X
      34  2 C-155 WES 02 2A 04 2 5 02 1 2 0
      34  2 C-155 WES 02 2A 04 2 5 02 1 2 0 U                                    11
      35  0 20020           1

ERROR               111 222
                    789 123
                    XXX XXX
      35  0 20020           1
      35  0 20020 000 750 1                                                  1
      36  0 20020

ERROR               111 222 2
                    789 123 5
                    XXX XXX X
      36  0 20020
      36  0 20020 000 750 1                                                  1

ERROR                                                   4
                                                        2
                                                        X
      36 21   P1   54   61   49  35   9   W2 0 999 1   2  12
      36 21 P1     54   61   49  35   9 W2     999 1   2  12 999 999 999      31

ERROR                                                   4
                                                        2
                                                        X
      36 31   P2    6    8    9 998 998   W2 0 999 1 116  66      2
      36 31 P2      6    8    9 998 998 W2     999 1 116  66 999   2 999      41

ERROR                                                   4
                                                        2
                                                        X
      36 71   P1    4    9    6   0 998   W2 0 999 6  21  10
      36 71 P1      4    9    6   0 998 W2     999 6  21  10 999 999 999       0
      37  0 20020

ERROR               111 222 2
                    789 123 5
                    XXX XXX X
      37  0 20020
      37  0 20020 000 750 1                                                  1

ERROR                                                   4
                                                        2
                                                        X
      37 12  PC2    4    6    3 999 99A   W1 0 999 4  14  14
      37 12 P2C     4    6    3 999 99A W1     999 4  14  14 999 999 999     21

ERROR                                                                   4
                                                                        A
                                                                        X
      37 21  PC2    2    2   12   5   2   W1 1  10 0 999  15           5
      37 21 P2C     2    2   12   5   2 W1   1  10   999  15 999 999   5      31
      38  0 20002           1

ERROR               111 222
```

```
      38  0 20002          1

ERROR           111 222


                    789 123
                    XXX XXX
      38  0 20002           1
      38  0 20002 000 750 1                                              1

ERROR                                          4     4
                                               2     A
                                               X     X
      38 12   P1    1  99A 99A 99A    8       0 999 0 999                 7
      38 12 P1      1  99A 99A 99A    8 W       999   999 999 999 999     7      21

ERROR                                                4
                                                     A
                                                     X
      38 21   P2  10    4  14 999  12   M2  1  15 0 999 999               12
      38 21 P2    10    4  14 999  12 M2    1  15   999 999 999 999      12      31

ERROR                                          4
                                               2
                                               X
      38 73   P1    5  999 999 999 999    W1 0 999 4  34 999
      38 73 P1      5  999 999 999 999 W1      999 4  34 999 999 999 999      99
```

20 FORMS-- 186 LINES

1	DWELLING UNITS HAVE	3 FORM LINES
1	DWELLING UNITS HAVE	6 FORM LINES
3	DWELLING UNITS HAVE	7 FORM LINES
5	DWELLING UNITS HAVE	8 FORM LINES
2	DWELLING UNITS HAVE	9 FORM LINES
2	DWELLING UNITS HAVE	10 FORM LINES
1	DWELLING UNITS HAVE	11 FORM LINES
2	DWELLING UNITS HAVE	12 FORM LINES
2	DWELLING UNITS HAVE	13 FORM LINES
1	DWELLING UNITS HAVE	17 FORM LINES

1	DWELLING UNITS HAVE	0 ROOMS
1	DWELLING UNITS HAVE	3 ROOMS
7	DWELLING UNITS HAVE	4 ROOMS
3	DWELLING UNITS HAVE	5 ROOMS
3	DWELLING UNITS HAVE	6 ROOMS
1	DWELLING UNITS HAVE	7 ROOMS
3	DWELLING UNITS HAVE	8 ROOMS
1	DWELLING UNITS HAVE	9 ROOMS

20	CARDS OF TYPE 0
20	CARDS OF TYPE 1
20	CARDS OF TYPE 2
19	CARDS OF TYPE 11
12	CARDS OF TYPE 12
4	CARDS OF TYPE 13
19	CARDS OF TYPE 21
19	CARDS OF TYPE 31
1	CARDS OF TYPE 32
15	CARDS OF TYPE 41
7	CARDS OF TYPE 42
5	CARDS OF TYPE 43
1	CARDS OF TYPE 51
1	CARDS OF TYPE 61
1	CARDS OF TYPE 62
10	CARDS OF TYPE 71
1	CARDS OF TYPE 72
1	CARDS OF TYPE 73
2	CARDS OF TYPE 80
2	CARDS OF TYPE 81
1	CARDS OF TYPE 82
2	CARDS OF TYPE 83
2	CARDS OF TYPE 84
1	CARDS OF TYPE 86

0 SEQUENCE ERRORS

QEOF
QEOF IGNORED - IN CONTROL MODE

QFIN

```
WEOF IGNORED - IN CONTROL MODE

@FIN

RUNID:  HALL01   ACCOUNT: 31920-HALLWI   PROJECT: HALLWIEDIT
TIME: 00:00:12.140   IN: 703   OUT: 0   PAGES:  19
INITIATION  TIME:   11:48:12-JUN 22,1973
TERMINATION TIME:   11:48:43-JUN 22,1973
```

Appendix E - Analysis (Histogram)

The cells which are fixed by the program consist of each possible combination of age of unit and occupancy class as they are defined on the data collection form plus totals and selected subtotals. Each selection criterion causes the generation of sixty-eight histograms plus summary statistics for each histogram.

```
@FOR,IS MIST
FOR 010A=07/02/73=18121929 1,01

   MAIN PROGRAM

   STORAGE USE0( CODE(1) 0011(2( DATA(0) 0014211 BLANK COMMON(2( 000000

   EXTERNAL REFERENCES (BLOCK, NAME)

    0003   TABULA
    0004   NINTRS
    0005   NROUS
    0006   NIOIS
    0007   NIO2S
    0010   NWOUS
    0011   NWEFS
    0012   NREAS
    0013   NPRTS
    0014   NSTOPS

   STORAGE ASSIGNMENT  (BLOCK, TYPE, RELATIVE LOCATION, NAME)

    0001   000222 100L      0001   000224 110L      0001   000019 111G      0001   000032 122G      0001   000247 125L
    0001   000061 140G      0001   000334 150L      0001   000100 151G      0001   000362 160L      0001   000423 200L
    0001   000171 210G      0001   000513 210L      0001   000633 215L      0001   000701 220L      0001   000220 221G
    0001   000704 230L      0001   000766 240L      0001   000771 250L      0001   000265 253G      0001   001021 260L
    0001   001034 270L      0001   001062 280L      0001   001070 290L      0001   000345 310G      0001   000467 372G
    0001   000504 403G      0001   000553 423G      0001   000566 433G      0001   000643 452G      0001   000730 502G
    0001   001012 525G      0001   001101 554G      0001   000004 8L        0000   001271 900F      0000   001303 901F
    0000   001307 902F      0000   001326 903F      0000   001343 904F      0000   001351 906F      0000   001364 907F
    0000   001372 908F      0000   001400 909F      0000 R 001264 BLOK      0000 R 000710 H         0000 R 001245 HM
    0000 R 001244 HOR       0000 R 001246 HP        0000 R 001247 HS        0000 I 001225 I         0000 I 001236 IBL
    0000 I 001261 ICAL      0000 I 001256 ICAR      0000 I 001226 ICARN     0000 I 001224 ICARO     0000 I 001251 ICC
    0000 I 001233 ICD       0000 I 000724 ICNO      0000 I 001230 ICNOC     0000 I 001266 ICNO@     0000 I 001250 ICR
    0000 I 001242 IDC       0000 I 001070 IPR       0000 I 000000 IR        0000 I 000620 IRM       0000 I 001232 ISER
    0000 I 001223 ISERO     0000 I 000654 ISIG      0000 I 001241 IST       0000 I 001237 ITP       0000 I 001263 ITR
    0000 I 001262 IV        0000 I 000454 IVEC      0000 I 001240 IXS       0000 I 001231 IXX       0000 I 001243 IYR
    0000 I 001227 IZ        0000 I 001260 IZERO     0000 I 001257 IZIP      0000 I 001222 K1        0000 I 001265 L
    0000 I 001270 LIMIN     0000 I 001235 LMAX      0000 I 001234 LMIN      0000 I 001006 NO        0000 R 001252 PK
    0000 R 001253 PK1       0000 R 001267 R         0000 R 001254 X1        0000 R 001255 X2

00101    1*          DIMENSION IR(25,12),IVEC(1001,IRM(28),ISIG(28),H(12),ICNO(25,21      1000
00103    2*          DIMENSION NO(25,21,IPR(90)                                          1010
00104    3*          K1=8                                                                1020
00105    4*        8 READ(7,909( ISERO,ICARO,(IPR(I),I=10,72),ICARN                      1030
00116    5*          WRITE(K1,909) ISERO,ICARO,(IPR(I),I=10,72),ICARN                    1040
00127    6*          IF(ISERO.NE.192) GO TO 8                                            1050
00131    7*          ISERO=999999                                                        1060
00132    8*          ICARN=99                                                            1070
00133    9*          ICARO=99                                                            1080
00134   10*          WRITE(K1,909( ISERO,ICARO,(IPR(I),I=10,72),ICARN                    1090
00145   11*          END FILE K1                                                         1100
00146   12*          I7='1   '                                                           1110
```

```
00132      8.          ICARN=9                                                    1070
00133      9.          ICARO=99                                                   1080
00134     10.          WRITE(K1,909) ISERO,ICARO,(IPRII),I=10,721,ICARN           1090
00145     11.          END FILE K1                                                1100
00146     12.          IZ=1  .                                                    1110

00147     13.          ICNDC=FLD(0,18,IZ)                                         1120
00150     14.          DO 10 I=1,100                                              1130
00153     15.       10 IVEC(I)=0                                                  1140
00155     16.          IVEC(11)=1                                                 1150
00156     17.          IVEC(12)=2                                                 1160
00157     18.          IVEC(13)=3                                                 1170
00160     19.          IVEC(21)=4                                                 1180
00161     20.          IVEC(31)=5                                                 1190
00162     21.          IVEC(32)=6                                                 1200
00163     22.          IVEC(41)=7                                                 1210
00164     23.          IVEC(42)=8                                                 1220
00165     24.          IVEC(43)=9                                                 1230
00166     25.          IVEC(51)=10                                                1240
00167     26.          IVEC(52)=11                                                1250
00170     27.          IVEC(53)=12                                                1260
00171     28.          IVEC(61)=13                                                1270
00172     29.          IVEC(62)=14                                                1280
00173     30.          IVEC(71)=15                                                1290
00174     31.          IVEC(72)=16                                                1300
00175     32.          IVEC(73)=17                                                1310
00176     33.          IVEC(80)=18                                                1320
00177     34.          IVEC(81)=19                                                1330
00200     35.          IVEC(82)=20                                                1340
00201     36.          IVEC(83)=21                                                1350
00202     37.          IVEC(84)=22                                                1360
00203     38.          IVEC(85)=23                                                1370
00204     39.          IVEC(8A)=24                                                1380
00205     40.          IVEC(90)=25                                                1390
00206     41.          IVEC(99)=26                                                1400
00207     42.          DO 300 IXX=1,100                                           1410
00212     43.          REWIND K1                                                  1420
00213     44.          ISER=0                                                     1430
00214     45.          CALL TABULA(ISER,ISER,ISER,ISER,ISER,ISER,ISER,ICD,LMIN,LMAX,NO)  1440
00215     46.          ICARN=0                                                    1450
00216     47.          IZ=0                                                       1460
00217     48.          ISER=0                                                     1470
00220     49.          DO 20  I=1,28                                              1480
00223     50.       20 IRM(I)=0                                                   1490
00225     51.      100 IF (ICARN.NE.0)  GO TO 125                                 1500
00225     52.        C  . . ZERO CARD . . NEW ITEM                                1510
00227     53.      110 IRL=0                                                      1520
00227     54.        C  . . CARD 2 DEFAULT SET                                    1530
00230     55.          ITP=4                                                      1540
00231     56.          IXS=8                                                      1550
00232     57.          IST=99                                                     1560
00233     58.          IOC=8                                                      1570
00234     59.          IYR=4                                                      1580
00235     60.          HOR='U'                                                    1590
00236     61.          HM=' '                                                     1600
00237     62.          HP=' '                                                     1610
00240     63.          HS=' '                                                     1620
00241     64.          ICR=0                                                      1630
00242     65.          ICC=0                                                      1640
00243     66.          PK=1.0                                                     1650
00244     67.          PK1=0.0                                                    1660
00245     68.          X1=0.0                                                     1670
00246     69.          X2=750.0                                                   1680
00247     70.          PK=750.0/(X2-X1)                                           1690
```

```
00244    67*          PKI=0.0                                                    1660
00245    68*          X1=0.0                                                     1670
00246    69*          X2=750.0                                                   1680
00247    70*          PK=750.0/(X2-X1)                                           1690


00250    71*          PKI=PK*XI                                                  1700
00251    72*      115 IZ=1          C ZERO-IN FLAG                               1710
00252    73*          DO 120 I=1,28                                              1720
00255    74*      120 ISIG(I)=0                                                  1730
00257    75*      125 IF (ICARN-11) 130,150,160                                  1740
00262    76*      130 READ(K1,900, END=280)ISER,ICAR,IZIP,IZERO,ICAL,IV,ITR,BLOK,ICARN  1750
00275    77*          ISIG(11=1                                                  1760
00276    78*          XI=IZERO                                                   1770
00277    79*          X2=ICAL                                                    1780
00300    80*          PK=750.0/(X2-XI)                                           1790
00301    81*          PKI=PK*XI                                                  1800
00301    82*      C * * READING VALUE =PK*R*PKI                                  1810
00302    83*          IRM(I)=IRM(I)+1                                            1820
00303    84*          GO TO 260                                                  1830
00304    85*      150 READ(K1,901, END=280)ISER,ICAR,(H(I),I=1,11),ICARN         1840
00315    86*          ISIG(2)=1                                                  1850
00316    87*          IRM(2)=IRM(2)+1                                            1860
00317    88*          IF(IZ.EQ.0) GO TO 110                                      1870
00321    89*          GO TO 260                                                  1880
00322    90*      160 IF (ICARN.NE.21  GO TO 200                                 1890
00324    91*          IF (IZ.EQ.0)  GO TO 110                                    1900
00326    92*          IZ=0                                                       1910
00327    93*          READ(K1,902,END=280)ISER,ICAR,ITP,IXS,IST,IOC,IYR,HOR,HM,HP,HS,ICR  1920
00327    94*         1,ICC,IPL,ICARN                                             1930
00360    95*          ISIG(3)=1                                                  1940
00351    96*          IRM(3)=IRM(3)+1                                            1950
00352    97*          GO TO 260                                                  1960
00352    98*      C*************************************************************
00352    99*      C  HIST-NORMAL ROOM SELECTION-LINE 1970
00353   100*        200 IF(ICARN.LT.LMIN.OR.ICARN.GT.LMAX) GO TO 290             1970
00353   101*      C*************************************************************
00355   102*          L=IVEC(ICARN)                                              1980
00356   103*          IF (L.NE.0)  GO TO 210                                     1990
00360   104*          IZ=0                                                       2000
00361   105*          PRINT 903 ISER,ICAR,ICARN                                  2010
00366   106*          READ(K1,901,END=280) ISER,ICAR,(H(I),I=1,11),ICARN         2020
00377   107*          PRINT 904 ISER,ICAR,(H(I),I=1,11),ICARN                    2030
00410   108*          GO TO 260                                                  2040
00411   109*        210 IRM(L+1)=IRM(L+3)+1                                      2050
00412   110*          IF (L.GE.251  GO TO 250                                    2060
00414   111*          IF(L.GT.17) GO TO 230                                      2070
00416   112*          READ(K1,906,END=280)ISER,ICAR,ICND(L,1),(IR(L,I),I=1,5),ICND(L,2),  2080
00416   113*         1NO(L,1),IR(L,6),NO(L,2),(IR(L,I),I=7,12),ICARN             2090
00440   114*          IF(ICO.EQ.3) GO TO 215                                     2100
00440   115*      C*************************************************************
00440   116*      C  HIST-HIGH WALL/D.U.
00440   117*      C  WALL CONDITION DISTINCTION-LINE 2110
00442   118*          ICNDW=FLD(6,18,ICND(L,1))                                  2110
00442   119*      C*************************************************************
00443   120*          IF((ICNDW.LQ.ICNDC.AND.ICO.EQ.1) GO TO 240                 2140
00445   121*          IF((ICNDW.NE.ICNDC.AND.ICO.EQ.2) GO TO 260                 2150
00447   122*        215 IZ=0                                                     2160
00450   123*          ISIG(L+3)=1                                                2170
00451   124*          DO 220  I=1,12                                             2180
00454   125*          IF (IR(L,I).GE.998)  GO TO 220                             2190
00456   126*          K=IR(L,I)                                                  2200
00457   127*          IR(L,I)=PK*R-PKI                                           2210
00460   128*          IF (IR(L,I).GT.750)  IR(L,I)=750                           2220
```

```
00454    125*          IF (IR(L,I).GE.998) GO TO 220                                  2190
00456    126*          R=IR(L,I)                                                      2200
00457    127*          IR(L,I)=PK*R-PK1                                               2210
00460    128*          IF (IR(L,I).GT.750) IR(L,I)=750                                2220

00462    129*          IF (IR(L,I).LT.0) IR(L,I)=0                                    2230
00464    130*      220 CONTINUE                                                       2240
00466    131*          GO TO 240                                                      2250
00467    132*      230 READ(KT,907,END=280)ISER,ICAR,ICNO(L,I),IR(L,I),ICND(L,2),IR(L,2),  2260
00467    133*         1ICARN                                                          2270
00500    134*          IZ=0                                                           2280
00501    135*          DO 240 I=1,2                                                   2290
00504    136*          IF (IR(L,I) .GT.997) GO TO 240                                 2300
00506    137*          R=IR(L,I)                                                      2310
00507    138*          IR(L,I)=R*PK-PK1                                               2320
00510    139*          IF (IR(L,I).GT.750) IR(L,I)=750                                2330
00512    140*          IF (IR(L,I).LT.0) IR(L,I)=0                                    2340
00514    141*      240 CONTINUE                                                       2350
00516    142*          GO TO 260                                                      2360
00517    143*      250 IF (ICARN.EQ.99) GO TO 270                                     2370
00521    144*          READ(KT,908,END=280)ISER,ICAR,(IR(L,I),I=1,3),ICARN            2380
00532    145*          IZ=0                                                           2390
00533    146*      260 IF (ICARN.GT.2) GO TO 100                                      2400
00535    147*          IF (ICARN.GT.ICAR) GO TO 100                                   2410
00537    148*      270 CALL TABULA(IR,ISER,IV,IYR,IOC,MOF,ISIG,ICD,LIMIN,LMAX,NO)     2420
00540    149*          IF (ICARN.NE.99) GO TO 100                                     2430
00542    150*      300 CONTINUE                                                       2440
00544    151*      280 ICAR=99                                                        2450
00545    152*          ISER=999999                                                    2460
00546    153*          ICARN=99                                                       2470
00547 *01AGNOSTIC*  THE TRANSFER TO 270 IS BAD BECAUSE 270 IS NOT IN THE INNERMOST DO OF A NEST.
00547    154*          GO TO 270                                                      2480
00550    155*      290 READ(KT,901,END=280) ISER,ICAR,(H(I),I=1,11),ICARN             2490
00561 *01AGNOSTIC*  THE TRANSFER TO 260 IS BAD BECAUSE 260 IS NOT IN THE INNERMOST DO OF A NEST.
00561    156*          GO TO 260                                                      2500
00562    157*      900 FORMAT (16,1X,12,1X,15,1X,13,1X,13,1X,11,1X,14,1X,F7.0,39X,13) 2510
00563    158*      901 FORMAT (16,1X,12,1X,10A6,A2,13)                                2520
00564    159*      902 FORMAT (16,1X,12,20X,11,1X,11,1X,12,1X,11,1X,11,1X,A1,1X,A1,1X,A1,  2530
00564    160*         1 1X,A1,1X,11,1X,11,1X,11,19X,13)                               2540
00565    161*      903 FORMAT('0CURRENT SERIAL',17,' CURRENT CARD',13,' NEXT CARD ',16,'  2550
00565    162*         1 ILLEGAL')                                                     2560
00566    163*      904 FORMAT(' SKIPPED',18,13,1X,10A6,A2,13)                         2570
00567    164*      906 FORMAT (16,1X,12,1X,A4,1X,13,2X,4(13,1X),A4,2(1X,11,1X,13),5(1X,13  2580
00567    165*         1 11,13)                                                        2590
00570    166*      907 FORMAT (16,1X,12,2(1X,A4,1X,13),45X,13)                        2600
00571    167*      908 FORMAT (16,1X,12,2X,13,1X,13,2X,13,49X,13)                     2610
00572    168*      909 FORMAT (16,13,63A1,131                                         2620
00573    169*          END                                                            2630

        END OF COMPILATION!          2 DIAGNOSTICS.
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@FOR,IS TABU
FOR 010A=07/02/73=18121131_4,01

    SUBROUTINE TABULA   / ENTRY POINT 001022

    STORAGE USED: CODE(I) 001047; DATA(D) 002515; BLANK COMMON(2) 000000

    EXTERNAL REFERENCES (BLOCK, NAME)

      0003    NRDC$
      0004    NIO1$
      0005    NIO2$
      0006    NSTOP$
      0007    NPRT$
      0010    SQRT
      0011    NERR3$

    STORAGE ASSIGNMENT  (BLOCK, TYPE, RELATIVE LOCATION, NAME)

      0001   000205 100L      0001   000260 114L      0001   000024 114G      0001   000263 116L      0001   000266 120L
      0001   000040 125G      0001   000041 130G      0001   000274 130L      0001   000042 133G      0001   000320 140L
      0001   000056 142G      0001   000057 145G      0001   000355 145L      0001   000060 150G      0001   000377 160L
      0001   000455 170L      0001   000457 180L      0001   000357 200L      0001   000461 210L      0001   000325 272G
      0001   000340 300G      0001   000344 314G      0001   000404 324G      0001   000421 332G      0001   000467 353G
      0001   000500 361G      0001   000512 370G      0001   000576 401G      0001   000620 415G      0001   000631 423G
      0001   000646 432G      0001   000651 435G      0001   000761 457G      0001   000464 500L      0001   000676 600L
      0000   002317 900F      0000   002324 901F      0000   002352 902F      0000   002361 903F      0000   002364 904F
      0000   002367 905F      0000   002374 906F      0000   002404 907F      0000   002411 910F      0000   002415 911F
      0000 R 002271 AVG       0000 R 001774 H         0000 R 002000 HH        0000 I 002301 I         0000 I 002045 IBUF
      0000   002455 INJP$     0000 I 002314 IPAGE     0000 I 002302 J         0000 I 002021 J1        0000 I 002312 J2
      0000 I 002303 K         0000 I 002025 K1        0000 I 002311 K2        0000 I 002305 L         0000 I 002027 LR
      0000 I 002307 L1        0000 I 002304 L2        0000 I 002310 L3        0000 I 002306 M         0000 I 000000 N
      0000 R 002061 S         0000 R 002275 SIG       0000 R 002313 S2        0000 R 002315 XN        0000 R 002316 XQ

00101      1*          SUBROUTINE TABULA(IR,ISER,IV,IYR,IOC,HOR,ISIG,ICD,LMIN,LMAX,NO)        1000
00103      2*          DIMENSION N(15,17,41,4),H(4),HH(17),J1(41,K)(2),IR(25,121,LR(14)        1010
00104      3*          DIMENSION IBUF(121,ISIG(28),S(2,17,41),AVG(41,SIG(41,NO(25,2)           1020
00105      4*          IF (ISER.EQ.9999999)  GO TO 500                                         1030
00107      5*          IF (ISER.NE.0)  GO TO 100                                               1040
00111      6*          READ 904 ICD,LMIN,LMAX,(IBUF(I),I=1,12)                                 1050
00122      7*          IF(ICD.EQ.999) STOP                                                     1060
00124      8*          DO 2  I=1,15              @ LEAD INTERVAL                               1070
00127      9*          DO 2   J=1,17             @ OCCUPANCY                                   1080
00132     10*          DO 2   K=1,4              @ YEAR BUILT                                  1090
00135     11*        2 N(I,J,K)=0                                                            1100
00141     12*          DO 4 I=1,2                @ X OR X**2                                   1110
00144     13*          DO 4 J=1,17               @ OCCUPANCY                                   1120
00147     14*          DO 4 K=1,4                @ YEAR BUILT                                  1130
00152     15*        4 S(I,J,K)=0.0                                                          1140
00156     16*          H(1)='70 39 *                                                         1150
00157     17*          H(2)='40-69 *                                                         1160
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```
00146    13*          DO 4 J=1,17          @ OCCUPANCY                    1120
00147    14*          DO 4 K=1,4           @ YEAR BUILT                   1130
00152    15*        4 S(I,J,K)=0.0                                        1140
00156    16*          H(1)='TO 39 '                                       1150
00157    17*          H(2)='40-59 '                                       1160

00160    18*          H(3)='60-73 '                                       1170
00161    19*          H(4)='00-73 '                                       1180
00162    20*          HH(1)='S-0-0 '                                      1190
00163    21*          HH(2)='S-0-R '                                      1200
00164    22*          HH(3)='S-0   '                                      1210
00165    23*          HH(4)='S-A-0 '                                      1220
00166    24*          HH(5)='S-A-R '                                      1230
00167    25*          HH(6)='S-A   '                                      1240
00170    26*          HH(7)='SINGLE'                                      1250
00171    27*          HH(8)=' 2-4  '                                      1260
00172    28*          HH(9)=' 5-9  '                                      1270
00173    29*          HH(10)=' 2-9  '                                     1280
00174    30*          HH(11)='10-19 '                                     1290
00175    31*          HH(12)='20-49 '                                     1300
00176    32*          HH(13)=' 50+  '                                     1310
00177    33*          HH(14)='10-50+'                                     1320
00200    34*          HH(15)=' 2-50 '                                     1330
00201    35*          HH(16)='UNKWN '                                     1340
00202    36*          HH(17)='TOTAL '                                     1350
00203    37*          JJ(1)=17                                            1360
00204    38*          LR(1)=2                                             1370
00205    39*          LR(2)=4                                             1380
00206    40*          LR(3)=6                                             1390
00207    41*          LR(4)=8                                             1400
00210    42*          LR(5)=10                                            1410
00211    43*          LR(6)=15                                            1420
00212    44*          LR(7)=20                                            1430
00213    45*          LR(8)=25                                            1440
00214    46*          LR(9)=30                                            1450
00215    47*          LR(10)=40                                           1460
00216    48*          LR(11)=50                                           1470
00217    49*          LR(12)=75                                           1480
00220    50*          LR(13)=100                                          1490
00221    51*          LR(14)=997                                          1500
00222    52*          RETURN                                              1510
00223    53*      100 IF (IV.NE.11  GO TO 210          @ NO DATA?)        1520
00225    54*          JJ(2)=16                                            1530
00226    55*          JJ(3)=0                                             1540
00227    56*          JJ(4)=0                                             1550
00230    57*          KK(2)=4                                             1560
00231    58*          KK(1)='YR                                           1570
00232    59*          IF (IYR.EQ.4) KK(2)=0                               1580
00234    60*          IF(IOC.GT.7) GO TO 140                              1590
00236    61*          IF (IOC.LT.3)  GO TO 130                            1600
00240    62*          JJ(2)=15                 @ 2-50+                    1610
00241    63*          IF (IOC.LT.5)  GO TO 120                            1620
00243    64*          JJ(3)=14                 @ 10-50+                   1630
00244    65*          IF (IOC-6)  112,114,116                             1640
00247    66*      112 JJ(4)=11                 @ 10-19                    1650
00250    67*          GO TO 140                                           1660
00251    68*      114 JJ(4)=12                 @ 20-49                    1670
00252    69*          GO TO 140                                           1680
00253    70*      116 JJ(4)=13                 @ 50+                      1690
00254    71*          GO TO 140                                           1700
00255    72*      120 JJ(3)=10                 @ 2-9                      1710
00256    73*          JJ(4)=IOC+5              @ 2-4 OR 5-9               1720
00257    74*          GO TO 140                                           1730
00260    75*      130 JJ(2)=7                  @ ALL SINGLES              1740
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00252    69*          GO TO 140
00253    70*      116 J1(4)=13                          @ 50+                    1690
00254    71*          GO TO 140                                                  1700
00255    72*      120 J1(3)=10                          @ 2=9                    1710
00256    73*          J1(4)=10C+5                       @ 2=4 OR 5=9             1720
00257    74*          GO TO 140                                                  1730
00260    75*      130 J1(2)=7                           @ ALL SINGLES            1740
00261    76*          J1(3)=9+10C                       @ ATTACHED OR DETACHED   1750
00262    77*          J1(4)=0                                                    1760
00263    78*          IF (IHO*,EQ,*U*)  GO TO 140       @ UNKNOWN                1770
00265    79*          J1(4)=J1(3)=2                     @ OWNER                  1780
00266    80*          IF IHO*,EQ,*R*)  J1(4)=J1(4)+1    @ RENTER                 1790
00266    81*    C*****************************************************************
00266    82*    C  TABULA-HIGH WALL/O.U.-PLACE BETWEEN LINES 1790 AND 2120
00270    83*      140 L2=-1
00271    84*          DO 200 L=4,20
00274    85*          IF(ISI*(L),EQ.0) GO TO 200
00276    86*          M=L-3
00277    87*          DO 145 L1=1,4
00302    88*          L3=IR(M,L1)
00303    89*          IF(L3,GT.997) GO TO 145
00305    90*          IF(L3,GT,L2) L2=L3
00307    91*      145 CONTINUE
00311    92*      200 CONTINUE
00313    93*          DO 150  L3=1,13
00316    94*          IF (L2,LT,LR(L3)) GO TO 160
00320    95*      150 CONTINUE
00322    96*          L3=L3+1
00323    97*      160 DO 180  K=1,2
00326    98*          K2=K1(K)
00327    99*          IF (K2,EQ,0)  GO TO 180
00331   100*          DO 170  J=1,4
00334   101*          J2=J1I(J)
00335   102*          IF(J2.EQ.0) GO TO 170
00337   103*          N(L3,J2,K2)=N(L3,J2,K2)+1
00340   104*          N(15,J2,K2)=N(15,J2,K2)+1                @ N
00341   105*          S2=L2
00342   106*          S2=S2**2
00343   107*          S(1,J2,K2)=S(1,J2,K2)+S2                 @ SUM
00344   108*          S(2,J2,K2)=S(2,J2,K2)+S2*S2              @ SUM SQ
00345   109*      170 CONTINUE
00347   110*      180 CONTINUE
00347   111*    C*****************************************************************
00351   112*      210 RETURN                                                     2120
00352   113*      500 DO 520  K=1,4                                              2130
00355   114*          IPAGE=IPAGE+1                                              2140
00356   115*          PRINT 900 (IPAGE,(IBUF(I),I=1,12)                          2150
00365   116*          PRINT 901                                                  2160
00367   117*          DO 510 J=1,17                                              2170
00372   118*          IF (J.EQ.1.OR.J.EQ.4.OR.J.EQ.7.OR.J.EQ.8.OR.J.EQ.11.OR.J.GT.13)  2180
00372   119*         1 PRINT 902                                                 2190
00375   120*          PRINT 903  HIK),HH(J),(N(I,J,K),I=1,14)                    2200
00405   121*      510 CONTINUE                                                   2210
00407   122*      520 CONTINUE                                                   2220
00411   123*          IPAGE=IPAGE+1                                              2230
00412   124*          PRINT 900 (IPAGE,(IBUF(I),I=1,12)                          2240
00421   125*          PRINT 905 (HIK),K=1,4)                                     2250
00427   126*          PRINT 906                                                  2260
00431   127*          DO 610 J=1,17                                              2270
00434   128*          DO 600 K=1,4                                               2280
00437   129*          AVG(K)=0.0                                                 2290
00440   130*          SIG(K)=0.0                                                 2300
00441   131*          XN=N(15,J,K)                                               2310
00442   132*          IF(XN.LE.0.0) GO TO 600                                    2320
00444   133*          AVG(K)=S(1,J,K)/XN                                         2330
```

```
00440   130.        SIG(K)=0.0                                                   2300
00441   131.        XN=N(IE,J,K)                                                 2310
00442   132.        IF(XN.LE.0.0) GO TO 600                                      2320
00444   133.        AVG(K)=S(1,J,K)/XN                                           2330

00445   134.        XQ=S(2,J,K)                                                  2340
00446   135.        SIG(K)=SQRT(XQ/XN-AVG(K)*AVG(K))                             2350
00447   136.    600 CONTINUE                                                     2360
00451   137.        IF(J.EQ.1.OR.J.EQ.4.OR.J.EQ.7.OR.J.EQ.8.OR.J.EQ.11.OR.J.GT.13) 2370
00451   138.       1PRINT 902                                                    2380
00454   139.        PRINT 907 HH(J),((N(IS,J,K),AVG(K),SIG(K)),K=1,4)            2390
00465   140.    610 CONTINUE                                                     2400
00467   141.        RETURN                                                       2410
00470   142.    900 FORMAT ('1PAGE',I4,' OF',12A6)                               2420
00471   143.    901 FORMAT ('0 YEAR  TYPE   0.0-0.1 0.2-0.3 0.4-0.5 0.6-0.7 0.8-0.9 1.  2430
00471   144.       10-1.4 1.5-1.9 2.0-2.4 2.5-2.9 3.0-3.9 4.0-4.9 5.0-7.4 7.5-9.9   10  2440
00471   145.       2.0+')                                                        2450
00472   146.    902 FORMAT ('                                         ')         2460
00473   147.    903 FORMAT (1H ,2A6,1X,14I8)                                     2470
00474   148.    904 FORMAT(3I3,11A6,A5)                                          2480
00475   149.    905 FORMAT('0 TYPE   ',4(12X,A6,5X))                             2490
00476   150.    906 FORMAT(8X,4(7X,'NO ',3X,'MEAN',1X,'SIGMA'))                  2500
00477   151.    907 FORMAT(' ',A6,' ',4(I9,2F7.2))                               2510
00500   152.    910 FORMAT(I6,I3,I2,I2,1X,A1)                                    2520
00501   153.    911 FORMAT(16I4)                                                 2530
00502   154.        END                                                          2540

    END OF COMPILATION:        NO  DIAGNOSTICS.

@XQT
MAP 0023-07/02-18:21

ADDRESS LIMITS     001000 013012    040000 047757
STARTING ADDRESS 011701
WORDS DECIMAL     5131 IBANK        4080 DBANK

         SEGMENT MAIN         001000 013012      040000 047757

NETCHS/FOR68            001000 001261    2   040000 040013
NBFOOS/FOR                                2   040014 042215
NBOCVS/FOR64            001262 001407    2   042216 042260
NFTVS/FOR               001410 001432
NCNVTS/FOR68            001433 001654    2   042261 042355
NCLOSS/FOR68            001655 002045    2   042356 042406
NSATCS/FOR              002046 002067
NWBLKS/FOR68            002070 002201
NBSBLS/FOR68            002202 002242
NUPDAS/FOR68            002243 002276
NRBLKS/FOR68            002277 002321
NOTINS/FOR68            002322 002616    2   042407 042412
NININS/FOR68            002617 003007    2   042413 042416
```

```
NUPDAS/FOR68                1   002243 002276
NRBLKS/FOR68                1   002277 002321
NOTINS/FOR68                1   002322 002616        2   042407 042412
NININS/FOR68                1   002617 003007        2   042413 042416

NFCHKS/FOR68                1   003010 003774        2   042417 042572
                                                     4   042573 042644
NOUTS/FOR68                 1   003775 005010        2   042645 042677
ERUS/SYS68=2
NIOFRS/FOR68                1   005011 005172        2   042700 043036
NINPTS/FOR68                1   005173 006057        2   043037 043062
NFMTS/FOR68                 1   006060 006735        2   043063 043137
NTABS                                                2   043140 043216
NRWNDS/FOR68                1   006736 007017        2   043217 043230
NWEFS/FOR68                 1   007020 007223        2   043231 043250
NOBUFS/FOR68                1   007224 007264
NIBUFS/FOR68                1   007265 007324        2   043251 043251
NINTRS/FOR60                1   007325 007363        2   043252 043270
NERRS/FOR68                 1   007364 007752        2   043271 043450
SQRTS/FOR59                 1   007753 010013        2   043451 043462
NOSYMS/FOR68                1   010014 010227        2   043463 043466
NSTOPS/FOR68                1   010230 010245        2   043467 043476
NIERS/FOR68                 1   010246 010417        2   043477 043615
NISYMS/FOR68                1   010420 010611        2   043616 043621
BLANK$COMMON (COMMON BLOCK)
TABU                        1   010612 011700        0   043622 046336
                                                     2   BLANK$COMMON
HIST                        1   011701 013012        0   046337 047757
                                                     2   BLANK$COMMON

SYS$RL18$, LEVEL 68=2
END OF COLLECTION = TIME 1.154 SECONDS
```

PAGE 1 OF CONDITION ALL***HIGH WALL PER DWELLING UNIT**ALL ROOMS

YEAR	TYPE	0.0-0.1	0.2-0.3	0.4-0.5	0.6-0.7	0.8-0.9	1.0-1.4	1.5-1.9	2.0-2.4	2.5-2.9	3.0-3.9	4.0-4.9	5.0-7.4	7.5-9.9	10.0+
TO 39	S-D-O	0	1	0	0	0	1	0	0	0	0	0	0	0	1
TO 39	S-D-R	0	0	0	0	0	0	0	2	0	0	1	0	1	2
TO 39	S-D	0	1	0	0	0	1	0	2	0	0	1	0	1	4
TO 39	S-A-O	0	0	1	0	1	2	1	0	0	0	0	1	1	4
TO 39	S-A-R	0	0	0	0	0	0	0	1	0	0	0	2	0	3
TO 39	S-A	0	0	1	0	1	2	1	1	0	0	0	3	1	8
TO 39	SINGLE	0	1	1	0	1	3	1	3	0	0	1	3	2	14
TO 39	2-4	0	0	0	0	0	0	1	0	0	0	0	0	2	1
TO 39	5-9	0	0	0	0	0	1	1	0	0	0	0	1	0	1
TO 39	2-9	0	0	0	0	0	1	2	0	0	0	0	1	2	2
TO 39	10-19	0	0	0	0	0	4	0	0	0	0	0	0	0	3
TO 39	20-49	0	0	0	0	0	2	0	0	0	0	1	0	0	2
TO 39	50+	0	0	1	1	3	0	2	1	0	0	1	2	1	1
TO 39	10-50+	0	0	1	1	3	6	2	1	0	0	2	2	1	6
TO 39	2-50	0	0	1	1	3	7	4	1	0	0	2	3	3	8
TO 39	UNKWN	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TO 39	TOTAL	0	1	2	1	4	10	5	4	0	0	3	6	5	22

PAGE 2 OF CONDITION ALL***HIGH WALL PER DWELLING UNIT**ALL ROOMS

YEAR	TYPE	0.0-0.1	0.2-0.3	0.4-0.5	0.6-0.7	0.8-0.9	1.0-1.4	1.5-1.9	2.0-2.4	2.5-2.9	3.0-3.9	4.0-4.9	5.0-7.4	7.5-9.9	10.0+
40-59	S-O-O	0	0	0	0	0	2	2	0	0	0	0	0	1	0
40-59	S-O-R	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40-59	S-O	0	0	0	0	0	2	2	0	0	0	0	0	1	0
40-59	S-A-O	0	0	0	0	1	0	1	0	0	0	0	1	0	0
40-59	S-A-R	0	0	0	0	0	0	1	0	0	0	1	0	0	1
40-59	S-A	0	0	0	0	1	0	2	0	0	0	1	1	0	1
40-59	SINGLE	0	0	0	0	1	2	4	0	0	0	1	1	1	1
40-59	2-4	0	0	0	0	0	0	1	0	0	0	0	0	0	0
40-59	5-9	0	0	1	0	0	0	0	0	0	0	1	0	0	0
40-59	2-9	0	0	1	0	0	0	1	0	0	0	1	0	0	0
40-59	10-19	0	0	1	0	0	2	1	1	0	0	0	0	0	0
40-59	20-49	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40-59	50+	1	0	0	0	1	3	2	0	0	0	0	0	0	0
40-59	10-50+	1	0	1	0	1	5	3	1	0	0	0	0	0	0
40-59	2-50	1	0	2	0	1	5	4	1	0	0	1	0	0	0
40-59	UNKWN	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40-59	TOTAL	1	0	2	0	2	7	8	1	0	0	2	1	1	1

PAGE 3 OF CONDITION ALL...HIGH WALL PER DWELLING UNIT...ALL ROOMS

YEAR	TYPE	0.0-0.1	0.2-0.3	0.4-0.5	0.6-0.7	0.8-0.9	1.0-1.4	1.5-1.9	2.0-2.4	2.5-2.9	3.0-3.9	4.0-4.9	5.0-7.4	7.5-9.9	10.0+
60-73	S-O-O	0	0	0	1	0	0	0	0	0	0	0	0	0	0
60-73	S-O-R	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60-73	S-O	0	0	0	1	0	0	0	0	0	0	0	0	0	0
60-73	S-A-O	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60-73	S-A-R	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60-73	S-A	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60-73	SINGLE	0	0	0	1	0	0	0	0	0	0	0	0	0	0
60-73	2-4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60-73	5-9	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60-73	2-9	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60-73	10-19	0	0	0	1	1	0	0	0	0	0	1	0	0	0
60-73	20-49	0	0	0	0	0	1	0	0	0	0	0	0	0	0
60-73	50+	1	0	0	1	4	5	1	0	0	0	0	0	0	0
60-73	10-50+	1	0	0	2	5	6	1	0	0	0	1	0	0	0
60-73	2-50	1	0	0	2	5	6	1	0	0	0	1	0	0	0
60-73	UNKWN	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60-73	TOTAL	1	0	0	3	5	6	1	0	0	0	1	0	0	0

PAGE 4 OF CONDITION ALL•••HIGH WALL PER DWELLING UNIT••ALL ROOMS

YEAR	TYPE	0.0-0.1	0.2-0.3	0.4-0.5	0.6-0.7	0.8-0.9	1.0-1.4	1.5-1.9	2.0-2.4	2.5-2.9	3.0-3.9	4.0-4.9	5.0-7.4	7.5-9.9	10.0+
00-73	S-D-O	0	1	0	1	0	3	2	0	0	0	0	0	1	4
00-73	S-D-R	0	0	0	0	0	0	0	2	0	0	1	0	1	2
00-73	S-D	0	1	0	1	0	3	2	2	0	0	1	0	2	6
00-73	S-A-O	0	0	1	0	2	2	2	0	0	0	0	2	1	4
00-73	S-A-R	0	0	0	0	0	0	1	1	0	0	1	2	0	5
00-73	S-A	0	0	1	0	2	2	3	1	0	0	1	4	1	9
00-73	SINGLE	0	1	1	1	2	5	5	3	0	0	2	4	3	15
00-73	2-4	0	0	0	0	0	0	2	0	0	0	0	0	2	1
00-73	5-9	0	0	1	0	0	1	1	0	0	0	1	1	0	1
00-73	2-9	0	0	1	0	0	1	3	0	0	0	1	1	2	2
00-73	10-19	0	0	1	1	1	6	1	1	0	0	1	0	0	3
00-73	20-49	0	0	0	0	0	3	0	0	0	0	1	0	0	2
00-73	50+	2	0	1	2	8	8	5	1	0	0	1	2	1	1
00-73	10-50+	2	0	2	3	9	17	6	2	0	0	3	2	1	6
00-73	2-50	2	0	3	3	9	18	9	2	0	0	4	3	3	8
00-73	UNKWN	0	0	0	0	0	1	0	0	0	0	0	0	0	0
00-73	TOTAL	2	1	4	4	11	24	14	5	0	0	4	7	4	23

PAGE 5 OF CONDITION ALL***HIGH WALL PER DWELLING UNIT**ALL ROOMS

TYPE	TO 39			40-59			60-79			80-79		
	NO	MEAN	SIGMA	NO	MEAN	SIGMA	NO	MEAN	SIGMA	NO	MEAN	SIGMA
S-D-O	6	13.35	9.29	5	2.84	3.04	1	.70	.00	12	7.92	8.73
S-D-R	6	7.33	4.94	0	.00	.00	0	.00	.00	6	7.33	4.94
S-D	12	10.34	7.99	5	2.84	3.04	1	.70	.00	18	7.72	7.68
S-A-O	11	9.78	13.89	3	3.13	2.55	0	.00	.00	14	8.36	12.65
S-A-R	7	12.49	7.34	3	7.63	6.67	0	.00	.00	10	11.03	7.50
S-A	18	10.83	11.85	6	5.38	5.53	0	.00	.00	24	9.47	10.88
SINGLE	30	10.64	10.48	11	4.23	4.74	1	.70	.00	42	8.72	9.68
2-4	4	8.90	5.11	1	1.60	.00	0	.00	.00	5	7.44	5.42
5-9	4	5.47	4.48	2	2.65	2.25	0	.00	.00	6	4.53	4.04
2-9	8	7.19	5.07	3	2.30	1.90	0	.00	.00	11	5.85	4.94
10-19	7	6.86	6.89	5	1.32	.54	3	2.00	1.70	15	4.04	5.45
20-49	5	13.34	14.15	0	.00	.00	1	1.00	.00	6	11.28	13.71
50+	13	3.45	3.14	7	1.14	.55	12	.92	.39	32	2.00	2.36
10-50+	25	6.38	8.59	12	1.22	.55	16	1.13	.91	53	3.63	6.43
2-50	33	6.58	7.89	15	1.43	1.07	16	1.13	.91	64	4.01	6.26
UNKWN	0	.00	.00	0	.00	.00	0	.00	.00	1	1.00	.00
TOTAL	63	8.51	9.41	26	2.62	3.47	17	1.11	.89	107	5.83	8.10

Appendix F

Calibration of XRF Lead Detectors for the D.C. Pre-Survey

I. Peak Dial Setting

A. Unlock the "peak" dial. Using the manufacturer supplied leaded block, arbitrarily select 4 settings which yield readings in the neighborhood ($\pm$3 mg/cm^2) of the reported level on the lead block.

B. Find the arithmetic mean (average) of 3 readings at each of the selected settings.

C. Lock the "peak" dial at that setting which yields the highest mean.

Example: Suppose the reported level of the supplied lead block is 75 mg/cm^2 and that between settings of 5.0 and 6.0, the readings are in the neighborhood of 75 mg/cm^2. Then, arbitrarily pick 4 settings (5.4, 5.5, 5.6, 5.7) and compute the mean for 3 readings at each setting:

Setting	3 Readings			Mean	Best Setting
5.4	74.5	75.9	74.1	74.8	
5.5	75.2	76.0	75.1	75.4	5.5
5.6	75.7	74.9	73.8	74.8	
5.7	74.5	72.1	72.5	73.0	

II. Zero Dial Setting

A. Unlock the "zero" dial. Using the 00 mg/cm^2 block, locate an arbitrary setting which yields a negative reading.

B. Arbitrarily select a second setting (near the first) which yields a positive reading.

C. Select a setting between the two previously selected settings which seems likely to give a reading close to zero. Lock in on this setting.

D. Take ten readings at this setting and compute the mean.

Example: Readings are -.2 at 7.1 and +.3 at 7.2. Estimate that 7.15 might yield a 0.0 reading. Thus, lock the "zero" dial at 7.15 and take the mean of 10 readings at that setting:

.5
1.0
.7
.5
.7
.6
.3
-.2
.2
-.5

sum = 3.8

mean = .38 and rounds to .4

III. Calibrate Dial Setting

A. Unlock the "calibrate" dial and, using the leaded block included, pick an arbitrary setting which yields a reading lower than the reported level of the block, but no lower than the reported level minus 3 mg/cm^2.

B. Pick an arbitrary setting, above the first setting, which yields a reading higher than the reported lead block level but no higher than the reported level plus 3 mg/cm^2.

C. Lock the "calibrate" dial at a setting between the first two settings, which is likely to yield a reading near the lead block level.

D. Take ten readings at this setting and compute the mean.

Example: Suppose the reported lead level of the supplied block is 75 mg/cm^2. Readings are 77.2 at a setting of .80 and 73.1 at a setting of .70. This pair of readings satisfies the criteria specified in A. and B. A calibrate dial setting of .75 is likely to produce a reading near the lead block level of 75 mg/cm^2. Thus, the calibrate dial should be locked at .75; ten readings should be taken and their mean calculated.

77.0
77.2
76.2
76.2
75.6
76.4
75.9
76.6
77.3
77.5

sum = 765.9

mean = 76.59 and rounds to 76.6

The final (locked in) settings of each dial should be recorded in the log book of the particular detector being calibrated. The mean values for the "zero" and "calibrate" dials should be recorded in the log book and in the required spaces on the survey forms. These procedures should be carried out daily.

Appendix G - Resident Notification Letter

March 21, 1973

Mr. John Doe, or
Present Occupant
22A 0 Street, N.W.
Any City, State Zip Code

Dear Sir:

Your home will be surveyed by two trained professionals from the Department of Health sometime between March 12 and March 30, 1973. They will make measurements on interior walls, doors, and windows as well as painted exterior surfaces. The lead detector that they will be using is safe, uses no chemicals, and leaves no marks of any kind on the surfaces measured.

Many dwelling units have one or more layers of lead paint on walls or woodwork. The lead containing layer need not be a surface coat in order to be hazardous. When children eat even small quantities of dried lead paint, either as chips pulled from walls or bitten off windowsills and door edges, they risk serious illness, mental retardation and even death.

Your cooperation is requested whether or not you have children, or even if you believe your home to be lead free.

Sincerely,

Lead Paint Poisoning Project
Department of Public Health
Any City, State Zip Code

Telephone:

References

1. Gilsinn, Judith F., Estimates of the Nature and Extent of Lead Paint Poisoning In The United States, NBS Technical Note 746.

2. Cochran, William G., Sampling Techniques, John Wiley and Sons, Inc., New York, 1953

3. Mihram, G., Arthur, Simulation: Statistical Foundations and Methods, Academic Press, New York, 1972.

4. Hanson, Morris H., Hurwitz, William U., and Madow, William G., Sample Survey Methods and Theory, Vol. I, Methods and Applications.

5. Spurgeon, Joe C., Response Characteristics of a Portable X-Ray Fluorescence Lead Detector: Detection of Lead in Paint, NBSIR 73-231, June, 1973.

FORM NBS-114A (1-71)

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5. Publication Date

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16. ABSTRACT (A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here.)

A pilot survey of housing in Washington, D.C. was carried out in order to develop and test methodologies, data collection procedures and formats that will be used in subsequent full scale surveys of cities to determine the magnitude and extent of the lead-based paint hazard in housing.

On site measurements of lead contents of interior and exterior surfaces were made (with portable x-ray fluorescence lead detectors, hereafter referred to as XRF's) on 115 dwelling units which were randomly selected from a Washington, D.C. city directory.

This report describes the procedures for identifying the survey sample, drawing the sample, and carrying out the survey. Computer programs for data handling and analysis are included and a brief summary of the data obtained from the pilot survey is presented.

17. KEY WORDS (Alphabetical order, separated by semicolons)

Housing; housing survey; lead; lead hazard; lead paint; lead poisoning; survey; urban health problems.

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